

SCIENCE

Teacher's Manual



Grade 3



Issued free to schools by the Department of Education

First Edition

Published in 2019 by the Department of Education, Papua New Guinea.

© Copyright 2019, Department of Education, Papua New Guinea.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted by any form or by any means of electronic, mechanical, photocopying, recording or otherwise without the prior written permission of the publisher.

ISBN 978-9980-905-21-5

Acknowledgements

The Grade 3 Science Teacher's Manual was developed by the Curriculum Development Division in partnership with the Science specialists from Japan through the Project for Improving the Quality of Mathematics and Science Education also known as QUIS-ME Project.

The Science curriculum officers, textbook writers, pilot teachers from NCD and Central Provinces and the Subject Curriculum Group (SCG) are acknowledged for their contribution in writing, piloting and validating this teacher's manual.

The Curriculum Panel members, members of the Subject Advisory Committee (SAC) and the Basic Education Board of Studies (BEBOS) are also acknowledged for their advice, recommendation and endorsement of this teacher's manual.

A special acknowledgement is given to the People and the Government of Japan for the partnership and support in funding and expertise through Japan International Cooperation Agency (JICA) - QUIS-ME Project with Curriculum Development Division (CDD).

Science Teacher's Manual

Grade 3

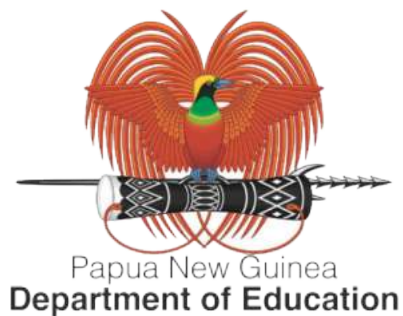


Table of Contents

<i>Content</i>	<i>Page Number</i>
Secretary's Message	3
How to use Teacher's Manual.....	4
Chapter 1. Observing Our Environment	14
Chapter 2. Properties of Matter	34
Chapter 3. Characteristics of Plants	70
Chapter 4. Characteristics of Animals	90
Chapter 5. Energy	112
Chapter 6. The Sun	122
Chapter 7. Light.....	140
Chapter 8. Magnet	160
Chapter 9. Force	178
Chapter 10. The Earth.....	206
Science Tool Box	222
Glossary	227
Basic Science Instruments	230
Teacher's Manual Development Committee	232

Secretary's Message

Dear Teacher,

I am aware that the teaching and learning of Science is a challenging experience in our schools today. Therefore it is my pleasure to inform all Grade 3 Teachers in our Primary Schools that a scoped and sequenced content-based curriculum resource, Teacher's Manual for Grade 3 Science has been developed to assist you in the delivery of quality, effective and meaningful Science lessons to the grade 3 students in our schools. The lessons are aimed at preparing and shaping our young scientists and equipping them with the relevant scientific skills for the 21st century.

This Teacher's Manual will facilitate the delivery of the science lessons prescribed in the National Science Textbook. It is designed to achieve the grade 3 content standards and benchmarks outlined in the syllabus. It promotes and maintains standard lessons for yearly, termly and daily teaching and learning activities for all teachers. It will help to guide teachers to plan and teach the Science lessons in line with the National Science Textbook. The Science syllabus for grades 3- 5 provides the curriculum content expanded in the Science Teacher's Manual and National Science Textbook respectively.

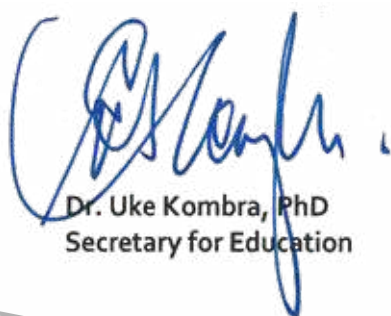
This Teacher's Manual guides critical thinking and problem solving approaches in which you can easily visualise concepts in the lesson flow, expanded in the textbook. The Teacher's Manual addresses areas of what to teach, how to teach and what to measure (assess). It is user friendly and reflects PNG contexts in daily situations to help students acquire key concepts; knowledge, skills, attitudes and values set out in the lesson objectives. Therefore, this Teacher's Manual was developed to guide all teachers with clear and precise step by step lesson flow and activity steps for all lessons and teacher notes to assist teachers' understanding of the science concepts.

This teacher resource was produced by the National Department of Education, in partnership with JICA our partners in global education. The development of these teacher and student materials took three years which started in 2016 and ended in 2019. I commend all personnel involved, science experts from Japan and the department's very own curriculum officers and textbook writers for the excellent work done.

You are encouraged to use this Teacher's Manual as a tool to effectively deliver the content of the textbook and other relevant resources such as science equipment recommended to generate creative teaching and interactive learning.

Teachers, Science can be fun if you tune in and engage with students in all the scientific ideas and concepts presented in the content of the lessons and activities that are in the textbook through this Teacher's Manual.

I approve this Teacher's Manual for Grade 3 Science to be used in all primary schools throughout Papua New Guinea.



Dr. Uke Kombra, PhD
Secretary for Education

1. How to use the Teacher's Manual

Teacher's Manual has been developed for teachers to teach learning contents to their students more effectively with using the National Science Textbook. As for the features of this Teacher's Manual, its contents correspond to that in the textbook according to the Grades 3-5 Science Syllabus. The syllabus sets the national standards that are taught by teachers in the classroom that all students should acquire throughout the country, regardless of the context. These standards outlined in the syllabus are reflected in this teacher's manual. Therefore, information in this teacher's manual will help teachers to prepare lesson plans and to conduct lessons in line with the syllabus.

Firstly, the composition of the textbook is introduced, then, the components in this teacher's manual are introduced in the following section.

1.1 Composition of Science textbook

The Science textbook is designed like this to have its components to repeatedly appear in each chapter, as shown in the top-right box ('structure in a chapter'). Each component is shown in the right.

The teacher's manual is designed according to the structure of the textbook in order to help the teacher to easily refer to the teacher's manual for preparation and implementation of a lesson.

Chapter Introduction

Chapter No. and Name



Lesson

Topic Title

Lesson Title

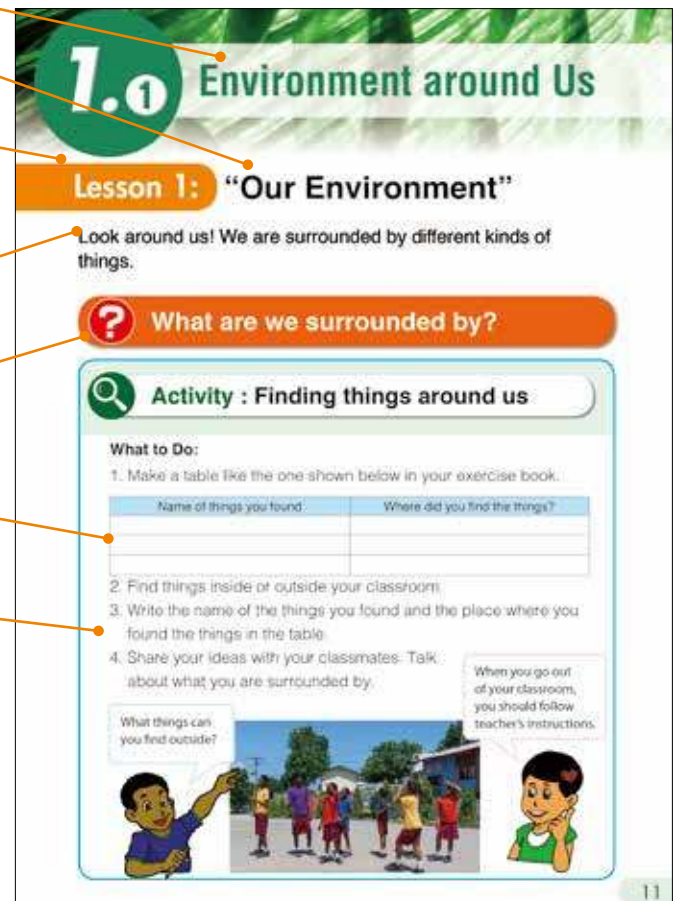
Lesson No. in the Topic

Introduction of the lesson

Key Question in the lesson

Activity

Discussion based on student's findings



Science textbook consists of several chapters based on learning contents according to the syllabus. All chapters have regular components as shown in the diagram below.

- [illegible]

Exercise

Summary of the lesson



Summary 7.1 Environment around Us

Chapter 7

Our Environment

- ☒ Environment is everything that makes up our surrounding.
- ☒ Environment can be divided into natural and man-made environment.
 - Natural environment is how environment made in nature things.
 - Man-made environment of the environment made of man-made things.

Natural Things



Man-made Things



Things in the Environment

- ☒ All things can be classified into living and non-living things.




Living Things

- Chicken
- Butterfly
- Fish
- Plant

Non-living Things

- Hammer
- Car
- Boat
- Spoon
- Knife
- Basket
- Sun
- Fire

Using Things and Non-living Things

- ☒ Using things need non-living things to create.
 - Animals and people need air to breathe and water to drink.
 - Plants need sunlight, air and water to make food.
 - People use non-living things to make their life easier.



Exercise

Unit 10 Environment around the world

(1) Complete each sentence with the correct word.

(a) All things except air travel by plane.

(b) A _____ thing prices changes and increases.

(c) Books, bags and the sun are _____.

(d) The environment can't be protected into natural and _____ environment.

(e) Plastic needs sunlight _____ and waste is not easy to deal.

(2) Choose the letter with the correct answer.

(a) Which of these are parts of the (ecosystem) environment?

A. Desk
B. Pencil
C. Students
D. Air above

(b) Arrange in the following picture is a living thing?



A. Hammer



B. Stone



C. Rose



D. Fire

(3) Answer the question below.

Look at the picture of a beauty on the right.

What are the living things and non-living things in the environment?



(4) Circle river and change shapes.

But it is a non-living thing. Explain why it isn't a living thing?



Column

Chapter 4
«Extreme Environments»

Living things in Extreme Environments

It is tough for living things to live in extreme environments on the Earth. But we can find living things in such extreme environments.

Desert is an extremely hot and dry place for living things to survive. There is almost no rain throughout the year so plants cannot grow and the surface of desert is covered by dry and hot sand.



Arctic and Antarctic are places covered by ice and snow all year. It is extremely cold to survive there. Animals living in this environment have thick fur to keep themselves warm against the cold temperature.



[illegible]

After all topics done...

1.2 Main contents page in Teacher's Manual

The main content page in this Teacher's manual has 8 components, Basic lesson information, Lesson objectives, Assessment, Preparation, Lesson flow, Teacher's note, Sample Blackboard Plan and a reduced textbook page.

Basic lesson information

Basic information such as name of the unit, chapter and topic in which the lesson is involved is shown. In addition, numbering (numerical code) and total number of lessons in the chapter are also shown to make teaching schedule easier.

Preparation

Materials and apparatuses recommended for use in the lesson are shown.

Textbook page of the lesson

Corresponding textbook page number is shown at the center. The numbers in red circle on the page correspond to the 'Lesson Flow' to show where the content is in the lesson flow.

Teacher's Notes

Supplementary information that would be useful for teaching, such as background knowledge and more detailed explanation, is introduced.

In case of materials or equipment not accessible nationwide, the alternatives are mentioned and instructions on how to improvise are provided.

Unit: Environment
Chapter: 1: Observing Our Environment
Topic: 1.1: Environment around Us
Time: Lesson No. 1 / 94
Textbook page: 11 / 12

Lesson Title: Our Environment
Lesson: 1 / 9
Preparation: Nil

Lesson Flow:

- 1 Introduction (10 min.)**
 - Ask students about the Environment around us.
 - Ask students to answer these questions:
 - Q. What are some things we see inside the classroom? (Desk, chairs, students, classrooms and more)
 - Q. What are some things we see outside the classroom? (Classrooms, teacher's houses, field, roads, mountains)
- 2 Introduce the key question**

What are we surrounded by?
- 3 Activity (20 min.)**
 - Explain ground rules for outdoor activity.
 - Organize students into groups.
 - Explain the steps of the activity.
 - Advise students to refer to the picture as shown before the activity and the talking characters.
 - Ask students to do the activity.
 - Check students' activity. If necessary, guide students to do their findings.
 - Give enough time for student to do their findings through the activity.
- 4 Discussion for findings (10 min.)**
 - Ask students to present the findings from their activity.
 - Display students' findings on board.
 - Facilitate students taking part in the discussions actively. (Continue)

Teacher's Notes

Examples of the answers that the students will write down in the table

Name of things you found	Place where you found things
Desk	Inside the Classroom
Chair	Inside the Classroom
Table	Inside the Classroom
Garden	Outside the Classroom (in field/mountain)
Trees	Outside the Classroom (in field/mountain)
Flowers	Outside the Classroom (in field/hill)
Birds	Outside the Classroom (in field/sky)
Fish	Outside the Classroom (in water)
Car	Outside the Classroom (road)
Rock	Outside the Classroom (field)

In outside activity, assist students to write down at least 6 or more different things found around them.

The lesson flow should be followed in line with the concept of textbook;

1 Introduction

In the introduction, normally teacher makes students review the previous lesson to connect the new lesson through the key question. An example of the introduction is shown in the lesson flow.

2 Showing a key question

The key question is closely related to the core or main points of the lesson including the new knowledge, new concepts and new skills. The teacher delivers the key question by using the review of the previous lesson or a new phenomena at the beginning of a new lesson. In this particular lesson, students try to answer the key question by guessing or predicting based on their experiences.

3 Activity

The activity is delivered to examine their guess and prediction to the key question. In some lessons, the teacher may deliver the activity without students' prediction or hypothesis. These two different ways are dependent on the lesson content. Activities are carried out by a group, individually or done by teacher's demonstration, which is dependent on the availability of the materials and contexts of the lesson topics. Teacher allows students to have enough time to do the activity.

Lesson Flow

A lesson flow includes several teaching points. The main components are:

1. Introduction,
2. Key question,
3. Activity,
4. Discussion and
5. Summary.

Lesson flow in some lessons contains additional information like "Result" or "Challenge", according to the content of the lesson in the textbook.

Lesson Objectives

Objectives Objectives capturing the main knowledge and skills in the lesson are provided in the textbook.

Lesson Objectives

Students will be able to:

- Define the environment.
- Identify different things in the environment.

Assessment

Students are able to:

- Explain what an environment is.
- Describe the different things in the environment.
- Listen to their classmates responses with respect.

Summary

We can find many different things around us. In the classroom, we may find pens, textbooks, chairs, desks and computers. We may also find different kinds of things outside the classroom, such as flowers, trees, ants, butterflies, rocks and water. We are surrounded by various kinds of things. All things around us make up our **environment**. The environment is everything that makes up our surroundings. We all live in the environment.

Sample Blackboard Plan

Our Environment	Discussion	Conclusion
Key question: What are we surrounded by?	Q: What are we surrounded by? (We are surrounded by many different things in and outside the classroom.)	Q: What are we surrounded by? (We are surrounded by many different things in and outside the classroom.)
Activity: Finding things around us	Q: Where can you find things? (Classroom, house, beach, mountain, rivers, etc.)	Q: Where can you find things? (Classroom, house, beach, mountain, rivers, etc.)
Names of things you found	Q: We are also surrounded by the things that surround us.	Q: We are also surrounded by the things that surround us.
When did you find the things?	Q: It always surrounds us. (It is always around us.)	Q: It always surrounds us. (It is always around us.)
How did you find the things?	Q: We can find it at daytime. Without it we cannot see anything at night. (Light)	Q: We can find it at daytime. Without it we cannot see anything at night. (Light)
Conclusion	Q: We can find it at daytime. Without it we cannot see anything at night. (Light)	Q: We can find it at daytime. Without it we cannot see anything at night. (Light)

Assessment

Teacher should reflect own lesson along this criteria through the lesson. The three components of knowledge, thinking skills, attitude & values are also indicated in the teacher's manual.

'**Knowledge**' means new concepts, new findings and their relationships.

'**Thinking skills**' means scientific process skills, which contain observing, measuring, inferring, classifying, predicting and communicating.

'**Attitude and Value**' means the interests, curiosities and respect for nature and recognition on the importance and usefulness of the content.

Refer to Teachers Guide for detail information.

Sample Blackboard Plan

A sample of blackboard of lesson notes writing is introduced. Contents of the blackboard sample are equivalent to the main teaching points of the lesson and can be utilised as a guide. In the sample blackboard plan, examples of the results in the activity and expected student's answers are written in coloured words.

4 Discussion

In the discussion part, the teacher allows students to present their results or findings from the activity and to share with all other students. The teacher allows time to students to think and seek the answers for the key question by using the results or findings in the activity. The teacher must verify the results to the students to avoid misconceptions. In the case, for Grade 3, some of the results in the activity would be same as the conclusion of the lesson.

5 Summary

The summary confirms the core points of the lesson. The teacher asks questions shown in the teacher's manuals as summative assessment to students in order to confirm if they have acquired the main knowledge and skills in the lesson. The summary points may be the students' findings or results in the discussion part of the textbook which the teacher would facilitate and direct students.

1.3 Chapter Introduction in Teacher's Manual

In the beginning of a chapter, the necessary information for the chapter such as chapter and topic objectives, linkages of the learning contents with other chapters and grades and a list of lessons are introduced. Student's prior knowledge learned in previous lesson or grade or experiences through their daily life are also provided.

Chapter Objectives

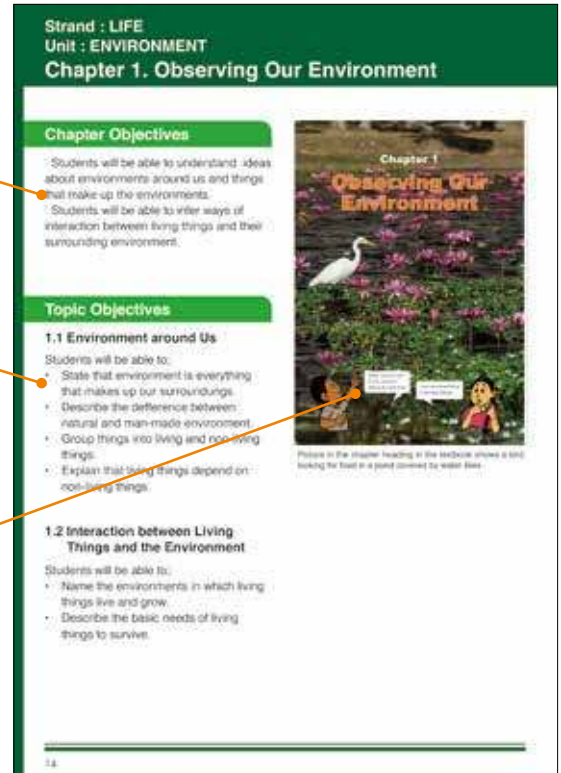
The objectives to achieve the chapter are introduced.

Topic Objectives

The objectives to achieve each topic are introduced.

Chapter heading

A picture of nature in Papua New Guinea or things in daily life related to the learning contents in the chapter is introduced with the list of lesson titles at each chapter heading in textbook.



1.4 Summary and Exercise / Science Extras in Teacher's Manual

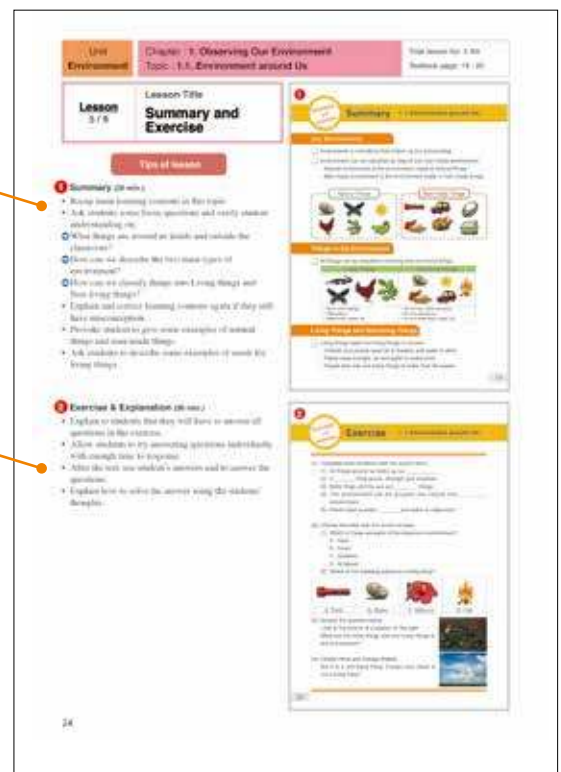
Summary and Exercise are inserted at the end of each topic, and column is inserted at the end of each chapter.

Summary in the Topic

The summary in the topic are shown with supplementary information.

Exercise of the Topic

Questions as student's exercise for learning contents in each topic are shown. To know students understanding, allow all students enough time to try solving the questions. After that, teacher must give the answer to students and teach how to solve each question.



Related Learning Contents

The learning contents in this chapter connect to the following topics:

- Grade 3: Observing Our Environment
- Grade 4: Living Things in the Environment
- Grade 5: Habitat & Adaptation, Energy in Food
- Grade 6: Paths of Energy
- Grade 3: Characteristics of Plants, Characteristics of Animals

Teaching Overview

This chapter consists of 9 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
1.1 Environment around Us	1	Our Environment: What are we surrounded by?		11-12
	2	Types of Environments: What types of environments are there?		13-14
	3	Things in the Environment: Can we group things in the environment in different ways?		15-16
	4	Living Things and Non-living Things: How do living things depend on non-living things?		17-18
	5	Summary and Exercise	2.1.4	19-20
1.2 Interaction between Living Things and the Environment	6	Living Things in the Environment: Where do living things live and grow in the environment?		21-22
	7	Basic Needs of Living Things: What do living things need to live?		23-24
	8	Summary and Exercise		25-27
Chapter Test	9	Chapter Test		28-29

Related Learning Contents

In the Syllabus, key learning contents are scoped and sequenced across all grades, from elementary to grade 12. The linkage of main learning contents of a chapter links to that in other chapters including other Grades from Grade 3 to Grade 6 are outlined as a concept map. Content in a chapter of a grade is necessary to be taught which links the contents to be learned in the same grade or the next grade. The concept map will help the teachers to visualise such a scope and sequence to teach in the classroom.

Teaching Overview

Topic, lesson titles and key questions, lesson number in the chapter, textbook page number and numerical code of related content standards written in the syllabus are introduced in this list.

Exercise answers

Q1) **Environment**
The environment is also made of both land and water.

Q2) **Environment**
The biggest body of water that covers only in the ocean. It is also an environment for a lot of plants and animals.

Q3) **Forest**
A forest is usually covered with lots of trees which provide a good environment for plants and animals to live in.

Q4) **Forest**
Living things need food to get energy to live and grow.

Q5) **Yes**
All animals need to breathe in air to survive otherwise they will die.

Q6) **No**
Plants use the sunlight to make their food.

Science Extras (10 mins)

- Using opportunities to conduct the literacy activities in the science and in phenomena in the world.
- Active students to ask questions that demonstrate curiosity about the content in the column.

Living Things in Extreme Environments

Most of the living things that live in extreme environments are in the desert. We can see the living things in the desert environment.

Some of the living things that live in the desert environment are: **Camels, Goats, Sheep, Horses, Donkeys, etc.**

These animals are adapted to live in the desert environment.

Answer of Exercise question

Answers of the questions in exercise are provided.

Science Extras (Column)

In column page, interesting information related to the chapter contents are introduced as 'Science Extras' to make students really interested in science. Students are given time to read the column and discuss about the content with classmates.

2. How to deliver a Science lesson

Both the Textbook and the Teacher's Manual work hand in hand to deliver a meaningful and successful lesson. However, there are a few important things to consider before lessons are taught to avoid misconceptions. Teacher should consider:

1. Having a Textbook and Teacher Manual on hand.
2. Knowing what was the previous and the next day's lesson contents before delivering the current lesson.
3. Preparing teaching materials prior to the lesson.
4. Reading the Lesson Objectives and understanding it very well.
5. Reading and understanding the Teacher's notes to have some background content knowledge of the lesson before teaching.
6. Following the sequence of the lesson carefully and consult the sample blackboard plan to confirm the lesson flow and notes.
7. Studying carefully the sample blackboard plan.

3. What to consider while presenting the lesson

Teacher should always consider the points mentioned above to help present the lesson effectively to the students. Everything that the teacher needs to know prior to the lesson is clearly written in the Teacher's Manual. The teacher would only have the manual while delivering the lesson because the reduced size of the textbook is inserted in the manual to help guide and follow with the class.

At the beginning of each lesson, all lessons have a key question that students are asked to think about ways on how to find out. Teachers will also realise that it encourages Problem Solving approach (Page 8-9) through the lesson. Teachers must be mindful that student's presentation of their findings is very rare and special. While doing

problem solving, some findings presented may result in some misconceptions. However, when such arises consider those opinions or findings and always direct their attention back to the main focus of the lesson to flow with everyone in the class so that they learn and understand.

In several lessons, basic science instruments such as a thermometer, compass and simple electric circuit are required. For Grades 3 and 4 students, teachers must assist them to master how to use the instruments to develop their manipulative skills.



Concept of problem solving approach in the layout of students textbook (page 8 and 9)

4. What to do during Lesson Preparation

1. Annual Overview (Page 12-13)

The Yearly overview for Grade 3 Science lessons provides the links to the syllabus. The annual overview shows strand, unit, chapter, topics and lesson titles. The time allocation for each lesson in Science is recognised as a double period for 60 minutes (30 minutes x 2 lessons).

2. Read Teacher's manual

Necessary information for teaching is introduced in the Teacher's Manual. Teacher will read and understand the components of the teacher's manual as follows; lesson objectives, assessments, preparation, lesson flow, teacher's notes and sample blackboard.

3. Test the activity

Before the lesson, a teacher has to prepare the

necessary materials and equipment written in teacher's manual. In addition, it is essential for teachers to do a trial of the activity involving on experiment before the lesson. Conditions such as temperature, humidity, materials and equipment used in the lesson may vary. If you are able to find that the result obtained differs or is incorrect, then you should be aware of how to adjust the ways of presenting the activity. The success of the lesson depends entirely on how well a teacher prepares and facilitates students learning to be concrete and effective.

4. Prepare blackboard plan

After understanding the lesson contents, teacher prepares the black board plans shown in the Teacher's Manual. The effective use of blackboard is important for student-friendly lessons because students can easily take notes.

5. How to use blackboard

The common practice for the teachers utilising the blackboard is dividing it into sections for each subject. The Blackboard is an important teaching tool for teachers when utilised well. Therefore, in this Teacher's Manual it introduces the strategy for enhancing the effectiveness of blackboards for improving student learning.

done in the Sample Blackboard Plan. The utilisation of the blackboard will accommodate the components of the blackboard plan below.

1. To start a lesson, utilise the blackboard from the top left-hand corner of the blackboard to the right, top to the bottom chronologically as

2. Encourage students to come out to the board to display their ideas and findings by writing and explaining what they have.

3. Allow students sufficient time to copy what you wrote before you erase it.

Sample Blackboard Plan

Lesson Title

Key Question

Activity

Discussion

Summary

The diagram shows a blackboard with a green border, divided into three main vertical sections. The left section contains the Lesson Title, Key Question, and Activity. The middle section contains the Discussion. The right section contains the Summary. Arrows point from the labels to the corresponding sections on the blackboard.

Lesson Title	
Title: "Our Environment"	

Key question: What are we surrounded by?

Activity: Finding things around us

Name of things you found	Where did you find the things?
Flower garden	Insects
Classroom	desks

Discussion

Q: What are we surrounded by? We are surrounded by many different things in and outside the classroom.

Q: Where can you find things? Classroom, house, beach, mountain, rivers, etc.

Q: We are also surrounded by the things that we cannot see.

(1) It always surrounds us. We breathe it in and out. Can you guess? Air

(2) We can find it in daytime. Without it we cannot see anything at night. Light

Summary

(3) We can feel it when we touch ice cubes. We also feel it when we are in the sunshine or in the shade. Temperature or coldness

Summary:

- The environment is everything that makes up of our surroundings.
- All things around us make up our environment.
- Air, light, temperature, wet or dry also surround us.
- Different environments have different things.

6. Yearly Overview

Yearly overview is designed purposely for the systematic flow of the grade content. It is helpful in the preparation of the yearly program to effectively plan for teaching strategies. The strands, 'Life', 'Physical Science' and 'Earth and Space' are core strands of science in the syllabus.

STRAND	UNIT	Chapter	Topic	Term	No	LESSON in Chap.	Lesson Contents	Page Number	
LIFE	Environment	1. Observing Our Environment	1.1 Environment around Us	Term 1	1	1	Our Environment	16	
					2	2	Types of Environments	18	
					3	3	Things in the Environment	20	
					4	4	Living Things and Non-living Things	22	
					5	5	Summary and Exercise	24	
			1.2 Interaction between Living Things and the Environment		6	6	Living Things in the Environment	26	
					7	7	Basic Needs of Living Things	28	
					8	8	Summary and Exercise	30	
					9	9	Chapter Test	32	
PHYSICAL SCIENCE	MATTER	2. Properties of Matter	2.1 Describing Matter		10	1	Matters around Us	36	
					11	2	Properties of Matter	38	
					12	3	Heavy or Light?	40	
					13	4	Big or Small?	42	
					14	5	Float or Sink?	44	
					15	6	What Matter Do We Use?	46	
					16	7	Summary and Exercise	48	
			2.2 Measuring Matter		17	8	Taking Up Space	50	
					18	9	Measuring Volume of Water	52	
					19	10	Measuring Volume of Stone	54	
					20	11	Weight and Shape of Matter	56	
					21	12	Weight and Volume of Matter	58	
					22	13	Summary and Exercise	60	
			2.3 Mixing Matter		23	14	Observing a Mixture	62	
					24	15	Separating a Mixture	64	
					25	16	Summary and Exercise	66	
					26	17	Chapter Test	68	
LIFE	PLANTS	3. Characteristics of Plants	3.1 Observing Plants	Term 2	27	1	Plants around us	72	
					28	2	Observing Plant Parts	74	
					29	3	Function of Plant Parts	76	
					30	4	Summary and Exercise	78	
			3.2 Grouping Plants		31	5	How to Group Plants: Roots	80	
					32	6	How to Group Plants: Stems	82	
					33	7	How to Group Plants: Leaves	84	
					34	8	Summary and Exercise	86	
					35	9	Chapter Test	88	
					36	1	Animal Groups	92	
LIFE	ANIMALS	4. Characteristics of Animals	4.1 Observing Animals		37	2	Observing Insects	94	
					38	3	Observing Fish	96	
					39	4	Observing Amphibians	98	
					40	5	Observing Reptiles	100	
					41	6	Observing Birds	102	
					42	7	Observing Mammals	104	
					43	8	Animal Body Parts and Their Uses	106	
					44	9	Summary and Exercise	108	
					45	10	Chapter Test	110	
					PHYSICAL SCIENCE	ENERGY	5. Energy	5.1 Energy around Us	
47	2	Uses of Energy	116						
48	3	Summary and Exercise	118						
49	4	Chapter Test	120						

Chapters are arranged in sequential order from the first to the last. Each chapter contains one or more topics. The lesson number in the chapter is given to each lesson according to the students' textbook. Each lesson is recommended to be conducted as double periods (60 minutes). Finally, the page numbers are attached to each lesson to easily identify the lesson topics for planning and teaching.

STRAND	UNIT	Chapter	Topic	Term	No	LESSON in Chap.	Lesson Contents	Page Number
EARTH AND SPACE	SPACE	6. The Sun	6.1 Properties of the Sun	Term 3	50	1	The Sun in the Sky	124
					51	2	Sunny Place and Shady Place	126
					52	3	Summary and Exercise	128
			6.2 Movement of the Sun		53	4	Sun and Shadow	130
					54	5	Movement of the Sun:	132
					55	6	Day and Night	134
					56	7	Summary and Exercise	136
					57	8	Chapter Test	138
PHYSICAL SCIENCE	ENERGY	7. Light	7.1 Properties of Light		58	1	What Makes Us See Objects?	142
					59	2	How Does Light Travel?	144
					60	3	Light Passing Through Objects	146
					61	4	Formation of Shadow	148
					62	5	Shape and Size of Shadow	150
					63	6	Light Reflection	152
					64	7	Gathering Light	154
					65	8	Summary and Exercise	156
PHYSICAL SCIENCE	ENERGY	8. Magnet	8.1 Properties of Magnet		66	9	Chapter Test	158
					67	1	Magnet around Us	162
					68	2	What is Attracted to a Magnet?	164
					69	3	Force of Attraction between Magnet and Object	166
					70	4	Properties of Poles of Magnets	168
					71	5	Making a Magnet	170
					72	6	Which way?	172
					73	7	Summary and Exercise	174
PHYSICAL SCIENCE	FORCE AND MOTION	9. Force	9.1 Objects in Motion		74	8	Chapter Test	176
					75	1	How Objects Move	180
					76	2	Push and Pull	182
					77	3	Slower and Stop	184
					78	4	Speed Up and Slow Down	186
			9.2 Simple Machine		79	5	The Way Objects Move	188
					80	6	More about Forces	190
					81	7	Summary and Exercise	192
82	8	What is a Simple Machine?		194				
83	9	Inclined Plane		196				
EARTH AND SPACE	OUR EARTH	10. The Earth	10.1 Surface of the Earth	Term 4	84	10	Lever	198
					85	11	Pulley	200
					86	12	Summary and Exercise	202
					87	13	Chapter Test	204
					88	1	Covering the Earth	208
					89	2	Rocks	210
					90	3	Soil around Us	212
					91	4	Properties of Soil	214
92	5	Importance of Soil for Plants and Animals	216					
93	6	Summary and Exercise	218					
94	7	Chapter Test	220					

Chapter Objectives

Students will be able to understand ideas about environments around us and things that make up the environments.

Students will be able to infer ways of interaction between living things and their surrounding environment.

Topic Objectives

1.1 Environment around Us

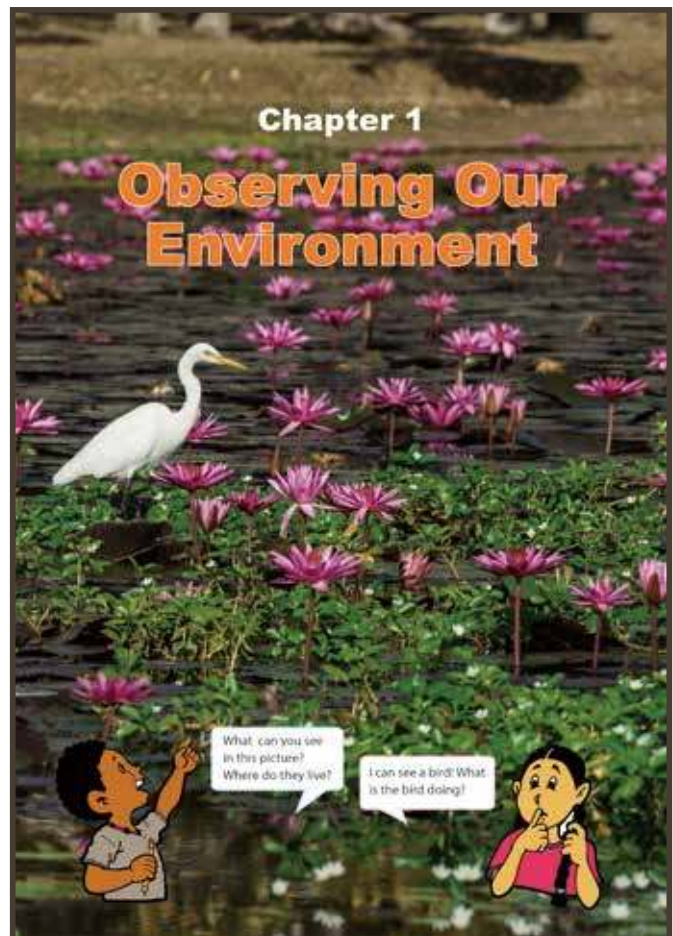
Students will be able to;

- State that environment is everything that makes up our surroundings.
- Describe the difference between natural and man-made environment.
- Group things into living and non-living things.
- Explain that living things depend on non-living things.

1.2 Interaction between Living Things and the Environment

Students will be able to;

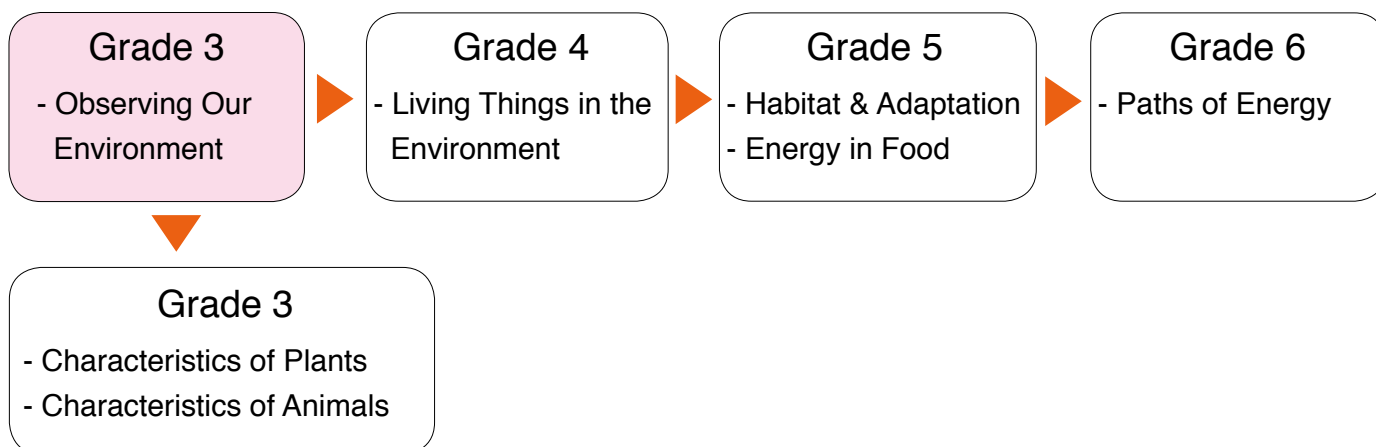
- Name the environments in which living things live and grow.
- Describe the basic needs of living things to survive.



Picture in the chapter heading in the textbook shows a bird looking for food in a pond covered by water lilies.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 9 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
1.1 Environment around Us	1	Our Environment What are we surrounded by?	3.1.4	11 - 12
	2	Types of Environments What types of environments are there?		13 - 14
	3	Things in the Environment Can we group things in the environment in different ways?		15 - 16
	4	Living Things and Non-living Things How do living things depend on non-living things?		17 - 18
	5	Summary and Exercise		19 - 20
1.2 Interaction between Living Things and the Environment	6	Living Things in the Environment Where do living things live and grow in the environment?		21 - 22
	7	Basic Needs of Living Things What do living things need to live?		23 - 24
	8	Summary and Exercise		25 - 27
Chapter Test	9	Chapter Test		28 - 29

Lesson
1 / 9**Lesson Title****Our Environment****Preparation**

• Nil

Lesson Flow**1 Introduction (10 min.)**

- Ask students about the 'Environment around them' with these questions

Q:What are some things we see inside the classroom? (Desk, chairs, students, classrooms and more)

Q:What are some things we see outside the classroom? (Classrooms, teacher's houses, field, roads, mountains)

2 Introduce the key question

What are we surrounded by?

3 Activity (20 min.)

- Explain ground rules for outdoor activity.
- Organise students into groups.
- Explain the steps of the activity.
- Advice students to refer to the picture as shown below the activity and the talking characters.
- Ask students to do the activity.
- Check students' activity. If necessary, guide students to do their findings.
- Give enough time for student to do their findings through the activity.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Display students' findings on the board.
- Facilitate students taking part in the discussions actively. (Continue)

1.1 Environment around Us

Lesson 1: "Our Environment"

1 Look around us! We are surrounded by different kinds of things.

2 ? What are we surrounded by?

3 **Activity : Finding things around us**

What to Do:

- Make a table like the one shown below in your exercise book.

Name of things you found	Where did you find the things?

- Find things inside or outside your classroom.
- Write the name of the things you found and the place where you found the things in the table.
- Share your ideas with your classmates. Talk about what you are surrounded by.

When you go out of your classroom, you should follow teacher's instructions.

What things can you find outside?

11

Teacher's Notes

- Examples of the answers that the students will write down in the table.

Name of things you found	Place where you found things
Desk	Inside the Classroom
Chair	Inside the Classroom
Table	Inside the Classroom
Grasses	Outside the Classroom/field/mountain
Trees	Outside the Classroom/hills/mountain
Flowers	Outside the Classroom/field/hill
Birds	Outside the Classroom/field/sky
Fish	Outside the Classroom/in water
Car	Outside the Classroom/road
Rock	Outside the Classroom/field

- In outside activity, assist students to write down at least 6 or more different things found around them.

Lesson Objectives

Students will be able to:

- Define the environment.
- Identify different things in the environment.

Assessment

Students are able to:

- Explain what an environment is.
- Describe the different things in the environment.
- Listen to their classmates responses with respect.

Summary

We can find many different things around us. In the classroom, we may find pens, textbooks, chairs, desks and classmates. We may also find different kinds of things outside the classroom, such as flowers, trees, ants, butterfly, rocks and water. We are surrounded by various kinds of things. All things around us make up our **environment**. The **environment** is everything that makes up our surroundings. We all live in the environment.



Things inside the classroom



Things outside the classroom

Our surroundings include houses, roads, bridges and buildings.

The air, soil, water, plants and animals also make up our environment. In some environments, it is hot, warm or cold. It may be dark or bright and dry or wet in other environments.



What things make up this environment?

5

- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q:What are we surrounded by?(We are surrounded by many different things in and outside the classroom.)

Q:Where can you find things? (Classroom, house, beach, mountain, rivers, etc)

- Ask the following questions to encourage students to realise that air, light and temperature also surround us:

Q:We are also surrounded by the things that we cannot see.

(1) It always surrounds us. We breathe it in and out. Can you guess? (Air)

(2) We can find it in daytime. Without it we cannot see anything at night.(Light)

(3) We can feel it when we touch ice cubes and when we are in the sunshine or in the shade. (Temperature or coldness/hotness)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson. (Refer to Blackboard)
- Ask the following questions:
Q: What is the meaning of environment?
Q: What are we surrounded by?
Q: What are we surrounded by in a house, on the beach and on mountain?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Our Environment"

Key question

What are we surrounded by?

Activity

Finding things around us

Name of things you found	Where did you find the things?
insects	Flower garden
desks	Classroom

Discussion

Q:What are we surrounded by? **We are surrounded by many different things in and outside the classroom.**

Q:Where can you find things? **Classroom, house, beach, mountain, rivers, etc**

Q:We are also surrounded by the things that we cannot see.

(1) It always surrounds us. We breathe it in and out. Can you guess? **Air**

(2) We can find it in daytime. Without it we cannot see anything at night. **Light**

(3) We can feel it when we touch ice cubes. We also feel it when we are in the sunshine or in the shade. **Temperature or coldness**
Summary

- The **environment** is everything that makes up of our surroundings
- All things around us make up our environment.
- Air, light, temperature, wet or dry also surround us.
- Different environments have different things.

Lesson
2 / 9

Lesson Title

Types of Environments

Preparation

• Nil

Lesson Flow

1 Introduction (10 min.)

- Review the last lesson:

Q:What is an environment?

Q:What are examples of some things found in the environment?

- Encourage students to think about the different types of environment by asking questions.

Q:Are there any different types of environment around us?

2 Introduce the key question

What types of environments are there?

3 Activity (20 min.)

- Organise students in pairs or some groups.
- Explain the steps for the activity.
- Advise students to refer to the two pictures and characters' talking in the activity for their investigation.
- Ask students to do the activity.
- Check students' activity. If necessary guide students to do their findings.
- Give enough time to students to find their answers and fill their tables.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity
- Display students table of results on board. (Continue)

Lesson 2: "Types of Environments"

- 1** The environment is everything that makes up our surroundings. We all live in the environment. Are there different types of environment around us?

- 2** **? What types of environments are there?**

3 **Activity : Finding different types of things**

What to Do:

1. Make a table like the one shown below in your exercise book.
2. Observe things around you and sort the things into two groups; the things made by people and the things not made by people. Write your observation in the table.
3. Share your ideas with your classmates.

Things made by people	Things not made by people



Chicken



Fried Chicken

A chicken and fried chicken, are they the same thing, or not?



Teacher's Notes

- Examples of answers the students may write or give in the table.

Things made by people	Things not made by people
Table	Trees
Desk	Grasses
Chair	Flowers
Classroom	Clouds
Books	Sun

- Some students will struggle to draw a table so the teacher has to identify them and assist them by demonstrating the steps involved over again.
- Students should at least record 6 things under each heading of the table.

Lesson Objectives

Students will be able to:

- Identify two main types of environment.
- Classify things into natural and man-made things.

Assessment

Students are able to:

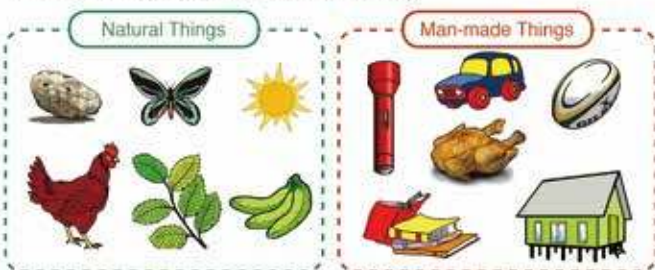
- Describe how two types of environment are different.
- List examples of natural things and man-made things.
- Listen to the opinions from others with respect.

Summary

Natural Things and Man-made Things

We can group things into **natural things** and **man-made things**. Natural things are things that come from nature and not made by people. Plants, animals, soil, air and water are natural things.

Man-made things are things made by people. Houses, food, clothes, and cars are examples of man-made things.



Types of Environment

The environment can be grouped into natural and man-made environment. **Natural environment** is the environment made of natural things. **Man-made environment** is the environment that is made of man-made things. We usually live in both the natural and the man-made environment.



Man-made Environment

Natural Environment

- Facilitate students taking part in the discussion actively.

- Confirm the 'things made by people and things not made by people' with students.

- **Based on their findings**, ask the following questions.

Q: Why do you think chicken that is cooked is human made? (Because people cooked it)

Q: What about the living chicken? Why is it a thing from nature? (Because people did not make it alive (life))

Q: How can we group things? (The things made by people and the things not made by people.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson.(refer to Blackboard sample)

- Ask the following questions in order to check students' understanding (Assessment).

Q: How can we group things into two groups?

Q: Give some examples of natural and man-made things.

Q: What is natural environment?

Q: What is man-made environment

Q: In which environment do we live?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title: "Types of Environments"

Key question

What types of environments are there?

Activity

Finding different types of things.

Things made by people	Things not made by people
Table	Trees
Desk	Grass
Chair	Flowers
Classroom	Clouds
Books	Sun

Discussion

Q: Why do you think chicken that is cooked is human made?

Because people cooked it.

Q: What about the living chicken? Why is it a thing from nature?

Because people did not make it alive (life)

Q: How can we group the things?

The things made by people and the things not made by people.

Summary

- The things around us can be grouped: **Natural things** and **Man-made things**
 - Natural things are things that come from nature and not made by people. e.g. trees and animals etc.
 - Man-made things are things made by man. e.g. buildings and trucks etc.
- The environment can be grouped into: **Natural** and **Man-made environment**
 - Natural environment is the environment made of natural things.
 - Man-made environment is the environment made of man-made things.
- People live in both environments.

Lesson
3 / 9

Lesson Title
Things in the Environment

Preparation

- Flower pot with a growing plant

Lesson Flow

1 Introduction (10 min.)

- Revise the last lesson on 'natural and man-made environment.'

Q:What are the two main types of environment?
(Natural and man-made)

- Show students a plant growing in a pot and ask this question;

Q:What makes the plant and the pot different?
(Plant has leaves and pot doesn't, plant is green and pot isn't, plant grows and pot doesn't)

2 Introduce the key question

Can we group things in the environment in different ways?

3 Activity (20 min.)

- Explain ground rules for outside activity.
- Organise students into groups.
- Explain the steps of the activity.
- Ask students to study the pictures below the activity and take note of the talking characters.
- Ask the students to do the activity.
- Check students' activity. If necessary guide students to do their findings.
- Give enough time for the students to do their findings.

Lesson 3: "Things in the Environment"

- 1** We learnt that there are two types of things in the environment; natural and man-made things. But, are there any other ways to group things in the environment?

- 2** **? Can we group things in the environment in different ways?**

3 **Activity : Is it living or not?**

What to Do:

1. Make a table like the one shown below in your exercise book.

It is living.	It is not living.

2. Look at the pictures of different things below. Group the things into living or not living and write them in the table.

3. Share your ideas with your classmates. Talk about how you sorted the things into two groups.

4



Teacher's Notes

Characteristics of Living things

All living things have these seven characteristics.

- **Growth** - change of size and shape. e.g. baby to an adult.
- **Movement** - type of movement [fast, slow]
- **Breathe** - gas exchange [Breathing and exhaling air]
- **Feeding** - where it gets its food and what it eats.
- **Excretion** - giving out waste e.g. urine, excrete, oxygen from plants.
- **Reproduction**- how and when it reproduce
- **Respond** to stimuli- how sensitive is it to the environment e.g. touching, smelling, tasting and sunlight for plants.

Lesson Objectives

Students will be able to:

- Classify things as living things and non-living things according to their characters.
- Explain the characters of living things and non-living things in the environment.

Assessment

Students are able to:

- List things in the environment as living and non-living things
- Describe the characters of living things and non-living things in the environment
- Respect and assist each other to classify things.

Summary

All things in the environment can be classified into **living things** and **non-living things**.

Living things

People, birds, frogs and trees are living things. Living things grow, change and breathe. Living things can move by themselves and produce new living things. Living things need water, food and air to survive. Living things can be classified into plants and animals. People, cows, and birds are animals. Trees and grasses are plants.

Non-living things

Cars, air, water and soil are non-living things. Non-living things do not grow, change and breathe. Non-living things do not eat and drink. They cannot produce new ones. Some non-living things such as a fire may act like living things. For example, a fire moves and grows. But a fire doesn't drink water and eat food. A fire is a non-living thing.



Dogs grow and produce new ones



Plant pot is a non-living thing.

Plant is a living thing.



A fire is non-living thing

5

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Display students table of results on board.
- Facilitate students taking part actively in the discussion.
- Confirm the things that are 'living and non-living'.

Q:How can we group things? (Things that live and things that do not live.)

Q:How are they different? (Living things grow, move, breathe, produce new ones and need food and air. Non-living things don't live, move, eat, and grow, etc)

Q:Wind, flame, cars and water in a river are moving. Are they living things or not? Why do you think so? (They are non-living things. They do not eat, grow, breath, change or produce new ones like living things do.)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson.(refer to Blackboard sample)
- Ask the following questions in order to check students' understanding (Assessment):

Q:How can we group things into living things and non-living things?

Q:What are some examples of characters of living things?

Q:What are some examples of living things and non-living things?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Things in the Environment"

Key question

Can we group things in the environment in different ways?

Activity Is it living or not?

It is living	It is not living
Fish	Car
Bird	Fire
Butterfly	Books

Discussion

Q: How can we group things?

Things that live and things that not live.

Q: How are they different?

Living things grow, move, breathe, produce new ones and need for food, air. Things don't live don't move, eat, and grow, etc

Q: Wind, flame, cars and water in a river are moving. Are they living things or not? Why do you think so?

They are non-living things. They do not eat, grow, breath, change or produce new ones like living things do.

Summary

- All things can be grouped into living thing and non-living thing.
- **Living things** can grow, move on their own, breathe and can produce new ones. e.g. people, birds, trees, grasses, etc.
- Living things can be **plants** and **animals**.
- **Non-living** things do not grow, change, breathe, do not eat and reproduce new ones. e.g. car, air, water, soil, fire, etc

Lesson
4 / 9**Lesson Title****Living Things and Non-living Things****Preparation**

• Nil

Lesson Flow**1 Introduction (10 min.)**

- Review the last lesson.

Q:How can we group things?

Q:How are living and non-living things different?

- Motivate students to think about the different ways to classify things by asking;

Q:What are the relationships between living and non-living things in the environment?

2 Introduce the key questionHow do living things depend on non-living things?**3 Activity (20 min.)**

- Organise the students into groups.
- Explain the steps of activity.
- Advice students to study the pictures below the activity and the talking characters.
- Ask students to do the activity.
- Check students' activity and if necessary guide them to do their findings.
- Give enough time for student to find new ideas through activity.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity. (Continue)

Lesson 4:**"Living Things and Non-living Things"**

- All things in the environment can be grouped into living and non-living things. What is the relationship between living and non-living things?

- ? How do living things depend on non-living things?**

3 Activity : Non-living things necessary for living things**What to Do:**

- Make a table like the one shown below.

Living Things	What kind of non-living things do living things need?	How do living things use the non-living things?
Animals		
Plants		
People		

- Make a list of non-living things needed by living things to live.

And then, think about how living things use the non-living things and write your ideas in the table.

- Share your ideas with your classmates. Talk about how living things depend on non-living things.

Non-living things are water, air, soil... mmm. How do living things use non-living things?



What kind of non-living things can you find?

Teacher's Notes

- Examples of answer from the students

Types of Living Things	Non-living Things that Living Things depend on
Animals	Air to breathe, water to drink, place to live, hiding place (protection)
Plants	Sunlight, air, water, use soil as space to grow
People	Air to breathe, water to drink, use soil for growing food and making pottery, and technology to make life better

- Some animals eat plants to survive, but most animals get oxygen to breathe to be alive from plants.
- Plants also depend on the animals for carbon dioxide to make own food
- A spider hides under a rock, plants take in nutrients from the soil, and people breathe in air to be alive

Lesson Objectives

Students will be able to:

- Explain how living things depend on non-living things.
- Infer the ways that living things use the non-living things.

Assessment

Students are able to:

- List the ways in which living things depend on the non-living thing.
- Describe the reason why living things depend on non-living things.
- Listen to others' responses with respect.

Summary

Living things need non-living things to survive. They depend on non-living things in many ways.

Animals

Animals need non-living things for survival. Animals use air to breathe and water to drink. Some animals live in soil and some live in water.



Some animals need water to live.

Plants

Non-living things are very important for plants too. Plants need sunlight, air and water to make food. Plants use soil, water and space to live and grow.



Plants need soil and water to grow.

People

People also depend on non-living things in many ways. They need air to breathe and water to drink for survival. They use soil for growing crops and for making pottery. They also use non-living things such as cars and electric appliances to make their life easier.



People depend on non-living things in many ways.

- Write down their findings on blackboard.
- Facilitate students taking part in the discussions actively.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q:How do animals depend on non-living things? (For air to breathe, water to drink, soil to live in etc.)

Q:How do plants depend on non-living things? (For sunlight, air and water to make food, soil for growing etc.)

Q:How do people depend on non-living things? (For air to breathe, food to eat and water to drink, soil for agriculture, cars to move and carry etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson.(refer to Blackboard)
- People depend on air to breathe, water to drink, and use soil for growing food and making pottery
- Ask the following questions as assessment:
Q: How do plants depend on non-living things?
Q: How do animals depend on the non-living things?
Q: How do people depend on the non-living things?
Q: Why do living things depend on non-living things?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title: "Living things and Non-living things"

Key question

How do living things depend on non-living things?

Activity

Non-living things necessary for living things

Living things	What kinds of non-livings do living things need?	How do the living things use the non-living things?
Refer to Teacher's Note		

Discussion

Q: How do animals depend on non-living things?

Air to breathe, water to drink, soil to live, etc

Q: How do plants depend on non-living things?

Sunlight, air and water for making food, soil for growing, etc

Q: How do people depend on non-living things?

Air to breathe, food to eat and water to drink, soil for agriculture, cars to move and carry, etc

Summary

- Living things depend on non-living things to survive.
- Animals depend on air to breathe, water to drink, and soil to live in.
- Plants depend on sunlight, air and water to make food, and use soil as space to grow.
- People depend on air to breathe, water to drink, and use soil for growing food.
- People also use cars to move or carry and houses to live.

Lesson
5 / 9

Lesson Title
Summary and Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic
- Ask students some focus questions and verify student understanding on;
 - What things are around us inside and outside the classroom?
 - How can we describe the two main types of environment?
 - How can we classify things into Living things and Non-living things?
- Explain and correct learning contents again if they still have misconception.
- Provoke student to give some examples of natural things and man-made things.
- Ask students to describe some examples of needs for living things.

2 Exercise & Explanation (30 min.)

- Explain to students that they will have to answer all questions in the exercise.
- Allow students to try answering questions individually with enough time to respond.
- After the test, use student's answers to answer the questions.
- Explain how to solve the answer using the students' thoughts.

1 Summary 1.1 Environment around Us

Our Environment

- Environment is everything that makes up our surrounding.
- Environment can be classified as natural and man-made environment.
 - Natural environment is the environment made of natural things.
 - Man-made environment is the environment made of man-made things.

Natural Things	Man-made Things

Things in the Environment

- All things can be classified into living and non-living things.

Living Things	Non-living Things
- Grow and change - Reproduce - Need food, water, air	- Do not eat, drink and grow - Do not reproduce - Do not need food, water, air

Living Things and Non-living Things

- Living things need non-living things to survive.
 - Animals and people need air to breathe and water to drink.
 - Plants need sunlight, air and water to make food.
 - People also use non-living things to make their life easier.

19

2 Exercise 1.1 Environment around Us

Q1. Complete each sentence with the correct word.

- All things around us make up our _____.
- A _____ thing grows, changes and breathes.
- Birds, frogs and the sun are _____ things.
- The environment can be grouped into natural and _____ environment.
- Plants need sunlight, _____ and water to make food.

Q2. Choose the letter with the correct answer.

- Which of these are parts of the classroom environment?
 - A. Desk
 - B. Pencil
 - C. Students
 - D. All above
- Which of the following picture is a living thing?

A. Torch	B. Stone	C. Hibiscus	D. Fire

Q3. Answer the question below.
Look at the picture of a swamp on the right.
What are the living things and non-living things in this environment?

Q4. Clouds move and change shapes.
But it is a non-living thing. Explain why cloud is not a living thing?

20

Exercise answers

Q1.

(1) **environment**

Where we are and everything around us are our environment.

(2) **living**

(3) **natural**

The sun isn't a living thing but a natural thing.

(4) **man-made**

(5) **air**

Plants depends on non-living things to make their food.

Q2.

(1) **D**

All things in an environment are parts of the environment.

(2) **C**

Hibiscus is a plant and plants are living things.

Q3. Example of the answer:

- Living things

birds, water lilies

- Non-living things

Water, air

This is a swamp environment that are made up of both living and non-living things.

Q4. Example of the answers

A cloud is a non-living thing because it does not need food or water and does not reproduce its children.

Lesson 6 / 9

Lesson Title

Living Things in the Environment

Preparation

• Nil

Lesson Flow

1 Introduction (10 min.)

- Review the Lesson 1: 'Our Environment' and Lesson 3: 'Things in the Environment' in Topic 1.1:

Q:What is environment?

Q:How can we group living things?

- Motivate students to think about the place where living things live by asking;

Q:Where can we find plants and animals in the environment?

2 Introduce the key question

Where do living things live and grow in the environment?

3 Activity (20 min.)

- Organise students in groups.
- Explain the steps of the activity.
- Ask students to refer to the pictures below the activity and the talking characters.
- Ask the students to do the activity.
- Check students' activity. If necessary, guide students to do their findings.
- Give enough time for the students to come up with their results.

4 Discussion for findings (20 min.)

- Ask students to present the findings from the activity.
 - Write down their findings on the board.
- (Continue)

1.2 Interaction between Living Things and the Environment

Lesson 1: "Living Things in the Environment"

1 Plants and animals are living things. Living things make up our environment. Where can we find them in the environment?

2 ? Where do living things live and grow in the environment?

3 **Activity : Finding where living things live**

What to Do:

1. Draw a table like the one shown below.

Name of animal	Where the animal lives

2. Think of different animals you have seen. Write the names of the animals and the places where they live in the table.

3. Share your ideas with other groups. Talk about where animals live in the environment.

Where can we find plants and animals? Do pigs and fish live in the same place?

We can find a mango tree on the ground. Can we also find seaweeds on the ground or not?

21

Teacher's Notes

- Examples of answers that students would write down in their table. Please note that this activity asks students to find real animals around the classroom. Thus, the table allow students to list animals which students actually find. For instance, 'Lion' in the table cannot be found in PNG, it is obviously strange.
- Bird and fish are not the name of animals (They are 'classes' of animals). Ask students to identify the name of animals such as 'eagle' and 'eel'. But if the students cannot name the animal, they can just write how the it look like (e.g. small insects). Memorising the names of the animals is NOT the focus of this lesson.
- Once students identify the places animals grow, let them think about other animals in different environment. Students should at least record 3-5 different animals from different places.

Names of Animals	Place where you found the animals
Grasshopper	In the grassland
Bird	On the tree branches
Fish	In the river/sea
Gecko	On the classroom walls

Bird and fish are not the name.

"river/sea" is too general, try to specify with the place they live.

Lesson Objectives

Students will be able to:

- Identify the different types of plants and animals in the different environments.
- Define forests, wetlands and oceans.

Assessment

Students are able to:

- List the different kinds of living things and the places where they live.
- Explain what a forest, wetland and ocean is.
- Take part in the activity with interest.

Summary

Different plants and animals live and grow in the different environments:

Forest

A **forest** is a place with many trees that grow close together. Different kinds of plants and animals can be found in a forest. Forest animals live in trees, bushes, on the ground or underground.



Wetland

A **wetland** is a place that is very wet. It includes areas such as rivers, lakes and swamps. Many kinds of plants and animals live in wetlands.



Ocean

An **ocean** is a vast body of salt water. Oceans have many plants and animals in them.



5

- Facilitate students taking part in the discussions actively.
- Confirm the findings with students.
- Explain what a forest, wetland and ocean is.
- Ask students to classify living things into three groups: living things that live in a forest, wetland and ocean.
- **Based on the students finding**, ask the following questions.
Q: What kinds of animals live in the forest?
 (Snake, bird of paradise, owl, cuscus etc.)
Q: What kinds of animals live in rivers, lakes and swamps? (Crocodile, eels, frogs, heron, tilapia etc.)
Q: What kinds of living things live in ocean?
 (Octopus, lobster, shark, dolphin, whale, star fish, etc)
 • Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson. (refer to Blackboard sample)
- Ask the following questions as assessment:
 Q: What is a forest, wetland and ocean?
 Q: Give some examples of living things that live in a forest, wetland and ocean.
 Q: Where can we find the different kinds of living things?
- Ask students to copy the notes on the blackboard into their exercise books.

22

Sample Blackboard Plan

Title:

"Animals in the Environment"

Key question

Where do living things live and grow in the environment?

Activity

Finding where living things live

Name of Animals	Place where you find the animals
Tilapia	In the river next our school
Cuscus	On the tree in forest
Sea turtle	Ocean

Discussion

Q: What kinds of living things live in the forest?

Trees, Snake, bird of paradise, owl, cuscus, etc

Q: What kinds of living things live in rivers, lakes and swamps? Trees, lilies, crocodile, eels, frogs, heron, tilapia, etc

Q: What kinds of living things live in ocean?

Octopus, lobster, shark, dolphin, whale, star fish, etc

Q: Where can we find the different kinds of living things? The different kinds of living things can be found in the different places.

Summary

• Different living things live and grow in the different environment.

• **Forest** environment

It is a place with many trees that grow close together.

• **Wetland** environment

It is a place that is very wet such as rivers, lakes, and swamp.

• **Ocean** environment

It is the vast body of salt water.

Lesson
7 / 9

Lesson Title
Basic Needs of Living Things

Preparation

• Nil

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson.

Q: What are the environments where animals live in?

Q: What are examples of plants that grow in the forests, wetlands and oceans?

- Encourage students to think about the basic needs of living things by asking:

Q: What do we need to survive and grow?

Q: From where do living things get their needs?

2 Introduce the key question

What do living things need to live?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Refer students to the pictures below the activity and the talking characters.
- Ask students to do the activity.
- Check students' activity where necessary.
- Give time for the students to find their answers and fill in their tables.

4 Discussion for findings (20 min.)

- Ask students to present the findings from their activity.
- Write down their findings on a board.
- Facilitate students taking part in the discussions actively. (Continue)

Lesson 2: "Basic Needs of Living Things"

- 1** Living things grow. What do they need to grow? From where do they get their needs?

- 2** **? What do living things need to live?**

3 **Activity : The needs of living things**

What to Do:

1. Make a table like the one shown below.

What do living things need to live?

2. Think about what living things need in order to grow and write your ideas in the table.

3. Share your ideas with your classmates. Talk about the needs of living things for growth.



If I cover my nose and mouth with my hand, I cannot breathe!



When we feel thirsty or hungry, what do we do?



Teacher's Notes

- The environment in which an animal lives is called 'habitat'. Each plant and animal have their favourite habitat.
- Characteristics of a habitat are usually divided into two components, abiotic and biotic components.
- Abiotic components are non-living factors which include things that are not alive but are necessary for plants and animals to live. Biotic components are living factors that affect life that affects another organism. They are summarised as below.

Abiotic components	Biotic components
Air (oxygen)	Plants
Sunlight	Predators
Water and humidity	Parasites
Temperature and climate	Competitors
Soil etc.	Decomposers etc.

- 'Food' in the textbook is biotic component, and 'water', 'air', 'space' and 'shelter' are abiotic components.
- These components are needed in their environment to live.

- Teachers should facilitate students to implicitly find these two components (living and non-living) to systematically clarify basic needs of plants and animals.

Lesson Objectives

Students will be able to:

- Identify the basic needs of living things.
- Explain the reason why living things need the basic needs.

Assessment

Students are able to:

- Describe how the basic needs help living things to survive.
- List the different kinds of basic needs of living things.
- Participate in the activity with interest.

Summary

Living things get their needs from the environment. The following are the basic needs of living things. Living things need:

Food

Living things need food to get energy. Plants make food to grow by using sunlight, air and water. Animals eat plants or other animals as food.

Water

Living things dry up and die without water. Plants get water from roots. Most animals get water by drinking.

Air

Air is very important for living things. Plants use air to breathe and to make their own food. Animals breathe in air.

Space

All living things need space to grow and live. Plants need space to get enough sunlight and water and animals need space to find food and homes.

Sunlight

Living things need sunlight. The sunlight keeps the earth at the right temperature so that living things can grow. Plants use the light from the Sun to make food.



5

- Confirm that living things need food, water, air space and sunlight with students.

- **Based on their findings**, ask the following questions.

Q: Why do living things need food? (To get energy)

Q: Why do they need water? (To avoid drying up or dying)

Q: Why do they need air? (To breathe and to make a food)

Q: Why do they need space? (To get sunlight. To find food and homes)

Q: Why do living things need food, water, space and sunlight? (To survive and grow)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson. (refer to the blackboard sample)
- Ask the following question as assessment:
Q: What are the basic needs of living things?
Q: How do these needs help the plants and animals to survive?
Q: Why do living things need to get the basic needs?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Basic Needs of Living things"

Key question

What do living things need to live?

Activity

The Needs of Living things

Living Things	What do they need?
Plants	Sunlight,
Animals	Water
Animals	Food
Animals	Air
Plants	Space
Animals	Space

Discussion

Q: Why do living things need food?

To get energy

Q: Why do they need water?

To avoid drying up or dying

Q: Why do they need air?

To breathe and to make a food

Q: Why do they need space?

To get sun light. To find food and homes

Q: Why do they need sunlight?

To keep them warm. To make food

Q: Why do living things need food, water, air, space and sunlight?

To survive and grow

Summary

- All things necessary for living things comes from their environment.
- The basic needs of living things are: **food, water, air, space, and sunlight.**
- The living things need them to survive and grow.
- Without the basic needs, living things cannot grow and die.

Lesson
8 / 9

Lesson Title
Summary and Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some focus questions to students and verify student understanding on;
 - How can we find different plants and animals?
 - How does the different environment help the plants and animals?
- Explain and correct learning contents again if they still have misconception.
- Provoke student to give some examples of the different environment.
- Ask students to describe some examples of plants and animals of an environment.

2 Exercise and Explanation (30 min.)

- Explain to students that they will have to answer all questions in the exercise.
- Allow student to try answering questions individually with enough time to response.
- After the test, use student's answers and to answer the question.
- Explain how to solve the answer using the students' thoughts.

1 Summary 1.2 Interaction between Living Things and the Environment

Living Things in the Environment

Different plants and animals live and grow in the different environments.

- ☐ **Forest**
 - A forest is a place with many trees that grow close together.
 - Forest animals live in trees, bushes on the ground or underground.
- ☐ **Wetland**
 - A wetland is a place that is always wet including areas such as rivers, lakes and swamp.
- ☐ **Oceans**
 - An ocean is a vast body of salt water.



Basic Needs of Living Things

☐ Living things get their needs from the environment.



Food Water Air Space Sunlight

25

2 Exercise 1.2 Interaction between Living Things and the Environment

Q1. Complete each sentence with the correct word.

- Crocodile, frog and water lilies live and grow in the _____.
- An _____ is the vast body of salt water.
- A forest is a place where many _____ grow close together.
- Living things need _____ to get energy.
- Animals breathe in _____.

Q2. Choose the letter with the correct answer.

Which of the following is the correct explanation about basic needs of living things?

- Animals eat only plants as food.
- Animals need water by drinking.
- Plants don't need air to breathe.
- Plants use the sunlight to make water.

Q3. Answer the following.

- Name two living things that live in a river.
- Name two living things that live in a forest.



Q4. How do animals use a tree to meet their basic needs?

26

Exercise answers

Q1.

(1) **wetlands**

The environment is also made of both land and water.

(2) **ocean**

The biggest body of water that tastes salty is the ocean. It is also an environment for a lot of plants and animals

(3) **trees**

A forest is mainly covered with lots of trees which provide a good environment for plants and animals to live in.

(4) **food**

All living things need food to get energy to live and grow.

(5) **air**

All animals need to breathe in air to survive otherwise they will die.

Q2.

B

Plants use the sunlight to make their food.

Q3. Example of the answer:

(1) Living things in a river

Fish, Shrimp, Crab, Water grass

(2) Living things in a forest

Cuscus, Birds, Insects, Tree, Grass

Living things in different environments are different.

Q4. Example of the answers

- **Some animals eat fruits from trees**

- **Some animals use trees for their home.**

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the column.

3

Chapter 1

•Science Extras•

Living things in Extreme Environments

It is tough for living things to live in extreme environments on the Earth. But we can find living things in such extreme environments.

Desert is an extremely hot and dry place for living things to survive. There is almost no rain throughout the year so plants cannot grow and the surface of desert is covered by dry and hot sand.



Arctic and Antarctic are places covered by ice and snow all year. It is extremely cold to survive there. Animals living in this environment have thick fur to keep themselves warm against the cold temperature.



27

Chapter Test

1. Observing Our Environment

Q1

Complete each sentence with the correct word.

- (1) We all live in the environment, which is everything that makes up our surroundings. Such as air, soil, water, plants, animals, houses, roads, bridges and buildings.
- (2) A thing that grows, changes, breathes and reproduces children is called a living thing.
- (3) Animals need non-living things for their survival. For example, animals use air to breathe and water to drink.

Q2

Choose the letter with the correct answer.

- (1) Which of the following do not explain the use of non-living things by animals?
A. Some animals live in soil.
B. Some animals live in water.
C. Animals use air to breathe.
☒ D. Animals need sunlight to grow.
- (2) Why do plants need space shown in the picture?
A. To eat other plants or animals as food.
B. To find food and air.
☒ C. To get enough sunlight and water.
D. To breathe and make their own food.
- (3) Which of the following list contains natural things?
☒ A. Tree, soil and water
B. Cars, house and books
C. Fried chicken, grilled fish and shell money
D. Chicken, butterfly and fried meat
- (4) Which of the following is the correct explanation about fire?
A. It moves and grows, thus it is living thing.
☒ B. It does not eat and drink, thus it is non-living thing.
C. It breathes and changes, thus it is living thing.
D. It reproduces and moves, thus it is non-living thing.



Q3

- (1) Observe the picture on the right and identify at least three living things and non-living things.

living things: human, tree, grass, etc

non-living things: building, cloud, soil, etc



- (2) Identify and categorise the types of living things in the box according to their living place in a particular environment.

Trees, seaweed, snake, dolphins, owl, cuscus, lilies, crocodile, eels, frogs, sharks, heron, tilapia, bird of paradise and whales

List the living things in wetland: snake, lilies, crocodile, eels, frogs, heron, tilapia

- (3) Why is it important to grow vegetables in a garden and not inside a house? Explain it from the ideas of the basic needs of living things to grow.

The plants need enough water, space and sunlight, which are difficult to be obtained inside house.

Q4

- (1) The moon moves and changes its shape.

But it is a non-living thing. Explain why the moon is not a living thing?

Because moon does not eat food. Moon also does not reproduce small moons.



- (2) A camel is an animal living in extreme environment called desert. Camels, store fats in their humps on the back and their pee is very little. Explain how their body structure suits their living environment in terms of basic needs of living things.

The desert is covered by dry sand and difficult to find foods and water always. Camel store foods in their hump and spend less water from pee, so that they can survive in extreme environment of desert.



Chapter Objectives

Students will be able to understand the properties of matter by observing objects at various aspects, comparing their weight and volume.

Students will be able to also measure volume and weight of objects with appropriate apparatus.

Topic Objectives

2.1 Describing Matter

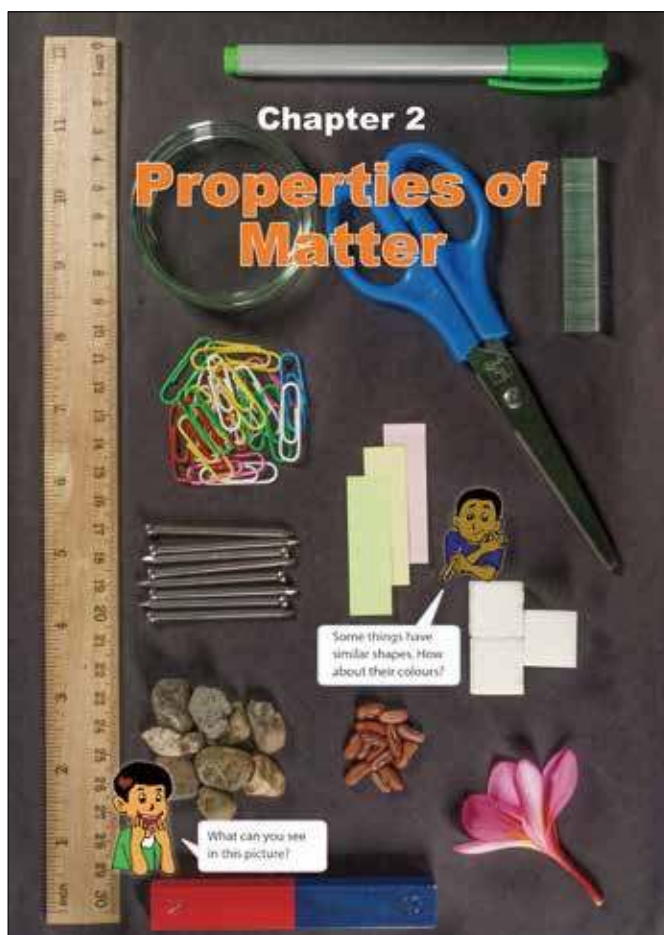
Students will be able to;

- Define that matter is everything around us.
- Describe matter using its properties.
- Compare the weight of matter by using a balance.
- Compare the size of matter by observing rise of the water level when the matter is put into the water in a container.
- Identify matter floating on or sinking in water.
- Identify materials that make an object.

2.2 Measuring Matter

Students will be able to;

- State that matter has its volume as a common property.
- Measure the volume of water by using measuring cylinder or measuring cup.
- Measure the volume of stone by calculating the increase of the water level when the stone is put into the



Picture in the chapter heading in the textbook shows things used in the textbook as the example of matter.

water in a measuring container.

- Explain that the weight of the matter did not change even if its shape changes.
- Explain that different kinds of matter with the same volume have different weight.

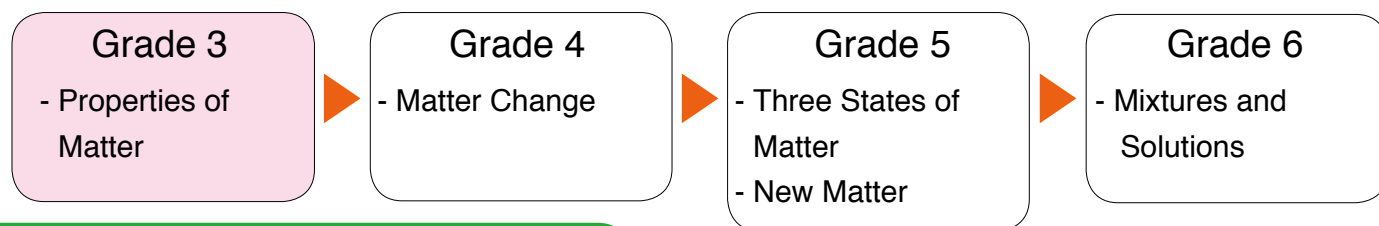
2.3 Mixing Matter

Students will be able to;

- Recognise that no new matter is produced when a mixture is made.
- Separate mixture into each matter by using ways such as sight, magnet, strainer and water.

Related Learning Content

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 17 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
2.1 Describing Matter	1	Matter around Us What is matter?	3.2.5	31 - 32
	2	Properties of Matter How can we describe matter?		33 - 34
	3	Heavy or Light? How can we compare the weight of different matter?		35 - 36
	4	Big or Small? How can we compare the size of matter?		37 - 38
	5	Float or Sink? Which matter float or sink in water?		39 - 40
	6	What Matter Do We Use? What kinds of matter do we use to make objects?		41 - 42
	7	Summary and Exercise		43 - 44
2.2 Measuring Matter	8	Taking Up Space What is a common property of matter?		45 - 46
	9	Measuring Volume of Water How can we measure the volume of water?		47 - 48
	10	Measuring Volume of Stone How can we measure the volume of a stone?		49 - 50
	11	Weight and Shape of Matter What will happen to the weight of matter if its shape changes?		51 - 52
	12	Weight and Volume of Matter How can we compare the weights of different matter?		53 - 54
	13	Summary and Exercise		55 - 56
2.3 Mixing Matter	14	Observing a Mixture What will happen when we mix different kinds of matter?	3.2.6	57 - 58
	15	Separating a Mixture How can we separate a mixture?		59 - 60
	16	Summary and Exercise		61 - 63
Chapter Test	17	Chapter Test	3.2.5, 3.2.6	64 - 65

Lesson
1 / 17**Lesson Title****Matter around Us****Preparation**

• Nil

Lesson Flow**1 Introduction (10 min.)**

- Encourage students to think about matter by asking;

Q:What things did you find outside?

Q:What do you think all things are made of?

- Explain that all things around us are made of matter, and ask;

Q:Can you find matter around you?

2 Introduce the key question

What is matter?

3 Activity (20 min.)

- Organise students to work in pairs
- Explain the steps of the activity
- Have students to do the activity
- Advise students to refer to the picture below the activity and the character's talking in the activity for their investigation.
- Ask students to discuss things that are matter or not. Give enough time for students to freely discuss their ideas in their groups

4 Discussion for findings (20 min.)

- Ask students to present their findings from their activity
- Have students' findings displayed or written on the blackboard. (Continue)

2.1 Describing Matter

Lesson 1: "Matter around Us"

1 What is matter? Matter is what all things are made of. Can you find matter around you?

2 **? What is matter?**

3 **Activity : Finding matter around us**

What to Do:

1. Make a table like the one shown below.
2. Look at the picture below and find different matter in the room.
3. Write in the table the names of the different matter you found.
4. Share your ideas with your classmates. Talk about things that are matter and things that are not matter.

Name of Matter You Find

You can find many things. Are they all matter?

31

Teacher's Notes

- Matter is the stuff which physically exists around us. It is tangible and visible. It has mass and takes up space. Thus, sound is not a matter. Things mentally exist such as ideas, ideologies, spirits and supersensual ones are not a matter, too. All matters are made of atoms. The atom is one of the smallest things in the world. Matter is found in 3 major states; solid, liquid and gas.
- Students may not believe air is a matter, because it is invisible and is not tangible. But if it is enclosed in a plastic bag, it takes up space. We can feel the air motion when wind blows. Therefore, air is a matter. Air is made up of atoms.
- A material and an object are the similar terminology to a matter. Matter is a kind of umbrella word and a material and an object are more specific. A material is a type of a matter and an object is a form made of a material. For example, a glass cup is the object and the glass is the material of which the glass cup is made.

Facilitation tips

- Before activity, teacher makes sure to remind students of safety ground rules when taking them outside.
- Bear in mind that the introduction activity is a lead up activity to the main activity therefore try to make it interesting as this is the first lesson for the unit. (matter).

Lesson Objectives

Students are able to:

- Define matter
- Identify which is matter or not matter.

Assessment

Students are able to:

- Explain what matter is
- List different kinds of matter found around them
- Give some examples of things that are not matter.
- Investigate in cooperation with classmates

Summary

Matter is everything around us. We are matter. Your friends and teachers are also matter. Air, water, sand, the Earth, animals and plants are all matter. Everything around us is made up of matter. People, rocks, the Sun, ice and clouds are all made up of matter.



Everything around us is matter.

What is not matter? Time, sound, sunlight, heat, thoughts and memories are examples of things that are not matter.

Can you give any example of things that are not matter?



Light

Sound



5

- Facilitate students to take part in the discussion actively
- Confirm the findings with students.
- **Based on their results**, ask these questions.

Q:What things are matter in our classroom?

(Friends, table, chair, notebook, textbook, pen, etc)

Q:Can you guess what things are not matter?

(Light, shadow, ideas, thinking, talking, time, etc)

Q:Why do you think so? (It depends on students)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (refer to Blackboard sample)
- Ask the following questions for assessment:
Q: What is matter?
Q: Give some examples of matter around us.
Q: Give some examples of the things that are not matter around us.
- Allow time for students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Matter around us"

Key question

What is matter?

Activity

Finding matter around us

Name of matter you find

Chair, television, table, blackboard, students, teacher, chart, books, paints and brushes.

Discussion

Q:What things are matter in our classroom?

Friends, table, chair, note, textbook, pen, etc

Q: Can you guess what things are not matter?

Light, shadow, ideas, thinking, talking, time, etc

Q:Why do you think so?

It depends on students.

Summary

- Matter is everything around us.
- Air, water, sand, the Earth, animals, and plants are all matter.
- **Matter** is what all things are made of.
- Everything around us is made up of matter.
- But, some things are not matter. Time, sound, sunlight, heat, thoughts, and memories are example of something that is not matter.

Lesson
2 / 17**Lesson Title****Properties of Matter****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q:What is matter?

Q:Give some examples of matter around us

Q:Give some examples of the things that are not matter around us

- Encourage students to think about the properties of matter by asking:

Q:How are those matter similar or different?

2 Introduce the key question

How can we describe matter?

3 Activity (20 min.)

- Organise students in groups.
- Explain the steps of the activity.
- Refer students to the characters' talking for their investigation.
- Have students do the activity and ask them to record their findings in the table.
- Teacher can use actual oranges and a basketball instead of the pictures.
- Ask students to discuss how they described the two objects based on their findings in a group.

4 Discussion for findings (25 min.)

- Ask students to present their findings from their activity. (Continue)

Lesson 2: "Properties of Matter"

- 1** Matter is everything around us. A desk, dog, flower, air and water are all matter. How are they similar or different?

2 **?** How can we describe matter?

3 **?** **Activity : Describing matter**

What to Do:

- Make a table like the one shown on the right.
- Observe the pictures of two different matter below and find how they are similar or different.
- Write the similarities and differences between the two matter in the table.
- Share your can ideas with your classmates. Talk about how you can describe two different matter.

How they are similar	How they are different



Orange



Basketball ball

Teacher's Notes

- Matter physically exists. Thus, it can be characterised physically. It is tangible, its texture can be described. It is visible, its colour and shape should be argued. It has mass, its weight will be measured. It takes up space, its size and volume must be defined.
- Those characteristics are scientifically called physical properties of a matter. In this activity, students practice how they tell properties in scientific manner. Teachers should be creative to prepare various objects to encourage students describe the similarities and differences when comparing their properties with the following questions;
 - Texture:** How does it feel like rough or smooth?
 - Temperature:** How is it hot or cold?
 - Colour:** What is the colour? How is it dark or bright?
 - Shape:** What does it look alike?
 - Size:** How long? How big?
 - Weight:** How is it heavy or light?
 - Taste and smell:** How does it taste like? How does it smell like?

Lesson Objectives

Students will be able to:

- Describe the properties of matter using their senses.
- Observe the properties of different matter.

Assessment

Students are able to:

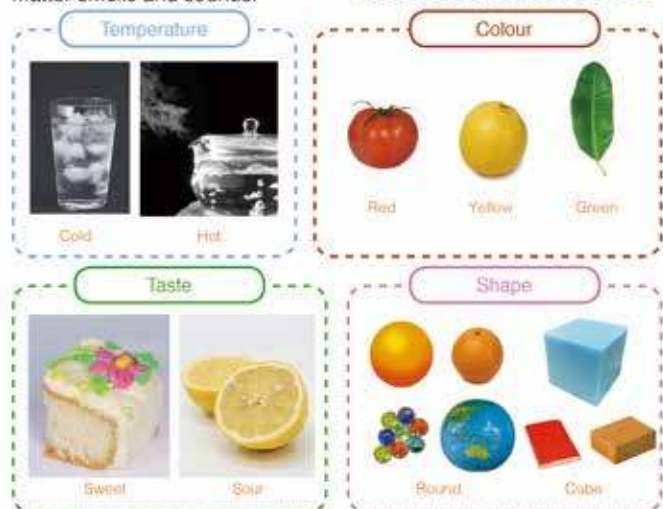
- List different properties of matter using our senses.
- Compare the similarities and differences of the properties of matter.
- Investigate the properties of matter with interest.

Summary

A **property** is anything about a matter that we learnt. **Weight, size, colour and texture** are all properties of matter. Temperature, taste and smell are also properties of matter.

We can compare and describe matter by using our senses. **Sight, smell, hearing, touch and taste** are our senses.

We can see the size, shape and colour of a matter. We can touch a matter to tell how it is rough or smooth and hot or cold. We taste a matter to test if it is sweet, sour or bitter. We can also tell how a matter smells and sounds.



5

- Write down students' findings on the blackboard
- Confirm the findings with students
- **Based on their observation**, ask these questions.

Q:How do they look alike? (They are round, the colours are orange.)

Q:How do they look different? (An orange is smaller than a ball, smell is different, a ball is heavier than an orange, etc)

Q:How did you describe the similarities and differences of the two objects? (Colour, shape, size, weight, texture, smell, etc)

Q:What body parts did you use to compare the orange and the ball? (Eyes to look, hand to touch, nose to smell, mouth to taste, ears to hear)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (refer to Blackboard sample)
- Ask the questions for assessment:
Q:How can we describe matter?
Q:What senses do you use to describe matter?
Q:Give some examples of the properties of matter?
- Ask students to copy the notes on the blackboard into their exercise books.

34

Sample Blackboard Plan

Title:

"Properties of Matter"

Key question

How can we describe matter?

Activity

Describing Matter

How they are similar	How they are different
• They are both orange in colour • They are both round • They both roll	• A basketball ball is heavier than an orange • An orange gives off a smell

Discussion

Q: How do they look alike?

They are round, the colours are orange.

Q: How do they look different?

An orange is smaller than a ball, smell is different, a ball is heavier than an orange, etc

Q: How did you describe the similarities and differences of the two objects?

Colour, shape, size, weight, texture, smell, etc

Q: What body parts did you use to compare the orange and the ball?

Eyes to look, hand to touch, nose to smell, mouth to taste, ears to hear

Summary

- A **property** is anything that we learn about a matter.
- Weight, size, colour, texture, temperature, taste, and smell are the properties of matter.
- We can compare and describe matter by using our senses.
- Sight, smell, hearing, touch, and taste are our **senses**.
- The properties of matter can be observed by seeing, smelling hearing, touching and tasting.

Lesson
3 / 17**Lesson Title****Heavy or Light?****Preparation**

- A balance or material for improvising beam balance
- Different coins- 10t, 20t, 50t, K1

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson

Q:How can we describe matter?

Q:Give some examples of the properties of matter?

- Motivate students to think about weight by asking:

Q:Weight is one of the properties of matter, but how can we compare the weight of matter?

2 Introduce the key question

How can we compare the weight of different matter?

3 Activity (25 min.)

- Arrange students into some groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise books.
- Demonstrate and explain how to use a balance.
- Ask students to guess which coin is heavier or lighter and to record their prediction in their exercise book.
- Have students do the activity based on their prediction and record their results in the table.
- Ask students to discuss which coin is the heaviest among the three coins based on their findings in their group.

Lesson 3: "Heavy or Light?"

- 1** Weight is a property of matter. **Weight** means how heavy a matter is. Let's compare the weight of matter!

- 2** **?** How can we compare the weight of different matter?

3 Activity : Comparing weight**What We Need:**

- a balance, three different coins [1 kina, 50 toea, and 20 toea]

What to Do:

1. Make a table like the one shown on the right.
2. Place two different coins at a time on the balance.
3. Compare the weight of the two coins and write which coin is heavier in the table.
4. Share your ideas with your classmates. Talk about what you observed and which coin is the heaviest.

Can you guess which coin is the heaviest?



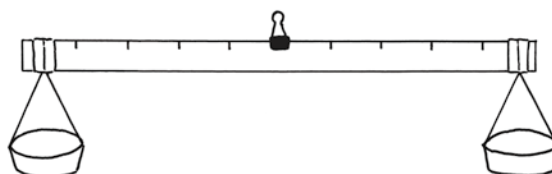
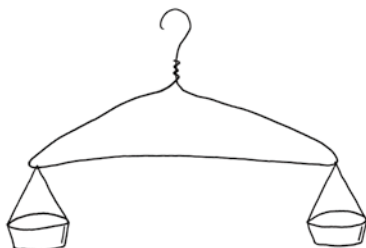
Coins:	Which is heavier?
1kina and 50toea	
1kina and 20toea	
50toea and 20toea	



You can also compare the weight of matter using a different kind of a balance!

**Teacher's Notes****IMPROVISATION FOR A BEAM BALANCE**

A balance shown in the textbook is specially called 'a double pan balance'. There are two types of the double pan balance. One is like the above diagram in which pans are placed on the upper side of the beam. The other type is the one in which the beam hangs pans. This 'hanging pan balance' is easier for improvisation. A hanger is a convenient material to create simple double pan balance as shown in Fig. 1. A ruler with crocodile clips provides you a quick but accurate improvised balance, too.



Lesson Objectives

Students will be able to:

- Compare weights of matter with a beam balance.
- Explain the function of a beam balance.

Assessment

Students are able to:

- Identify which coin is heavier or lighter amongst three different coins.
- Describe how a beam balance works for comparing the weight of matter.
- Show eagerness towards investigation.

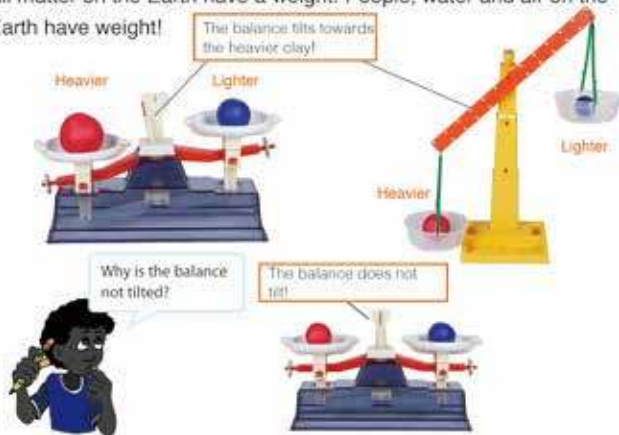
Result

A 50 toea coin is heavier than a 1 kina coin. A one kina coin is heavier than 20 toea coin. A 50 toea coin is heavier than 20 toea coin. From this result, we found that 50 toea coin is the heaviest and 20 toea coin is the lightest among them.



Summary

We can compare the weight of matter using a **balance**. A balance is a tool to weigh matter. A balance tells which matter is heavier or lighter than the other. The balance tilts towards the heavier matter. All matter on the Earth have a weight. People, water and air on the Earth have weight!



36

4 Discussion for findings (25 min.)

- Let students observe and record their result in the table.
- Write down students' results on the blackboard.
- Confirm the findings with students.

• **Based on their results**, ask these questions.

Q:When you placed 1 kina coin and 50 toea coin on a balance, which direction did the balance tilt to? (It tilted towards the 50 toea coin)

Q:Why did the balance tilt towards the 50 toea coin? (Because the 50 toea coin is heavier than the 1 kina coin)

Q:Which coin is the heaviest or lightest among the three coins? Why? (50 toea coin is the heaviest and 20 toea coin is the lightest among them.)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (refer to Blackboard sample).

• Ask the questions for assessment:

Q:What is the meaning of weight?

Q:How does a balance work when two objects are placed on it?

Q:When we place two objects on a balance, it does not tilt. Explain why the balance is not tilted?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Heavy or Light?"

Key question

How can we compare the weight of different matter?

Activity

Comparing weight

Coins	Which is heavier?
1 kina and 50 toea	50 toea
1 kina and 20 toea	1 kina
50 toea and 20 toea	50 toea

(Student's prediction)

Discussion

Q:When you placed 1 kina coin and 50 toea coin on a balance, which direction did the balance tilt to? **50 toea coin**

Q:Why did the balance tilt towards the 50 toea coin?

Because the 50 toea coin is heavier than 1 kina coin

Q:Which coin is the heaviest or lightest among three coins? Why?

50 toea coin is the heaviest and 20 toea coin is the lightest among them.

Summary

- **Weight** means how heavy a matter is.
- We can compare the weight of matter using a balance.
- A **balance** is a tool to weigh a matter.
- A balance tells which of a matter is heavier or lighter than another.
- A balance tilts toward a heavier matter.
- When two matter have the same weight, the balance does not tilt.
- All matter on the Earth have a weight.

Lesson
4 / 17**Lesson Title****Big or Small?****Preparation**

- Two same kind of glass cups
- Water, rubber band
- Two different stones

Lesson Flow**1 Introduction (5 min.)**

- Review previous lesson:

Q: How can we compare the weight of matters?

- Motivate students to think about how to compare the size of matter by asking:

Q: Size is one of the properties of matter, but how can we compare the size of matter?

2 Introduce the key question

How can we compare the size of matter?

3 Activity (20 min.)

- Arrange students into some groups.
- Explain the steps of the activity
- Advise students on safety rules.
- Demonstrate how to set up the activity
- Ask students to guess which stone is bigger or smaller and to record their prediction in their exercise book.
- Have students do the activity based on their prediction and record the results in their exercise book.
- Allow enough time for students to carry out their investigation.

4 Discussion for findings (25 min.)

- Ask students to present their results from their activity. (Continue)

Lesson 4: "Big or Small?"

- 1** Size is a property of matter. Size means how big a matter is. Let's compare the size of matter!

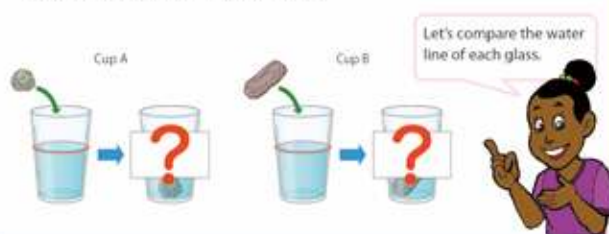
- 2**  How can we compare the size of matter?

3 Activity : Comparing the size of stones**What We Need:**

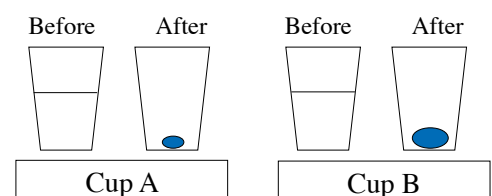
- two same kind of glass cups, water, rubber band, two different stones

What to Do:

1. Observe the two stones and guess which one is bigger or smaller.
2. Pour water into the two glasses.
3. Set the rubber band at the same level of the water line on each glass as shown on the picture on the right.
4. Place each stone into each glass slowly and observe what happens to the water line in each glass.
5. Share your ideas with your classmates. Talk about the size of the stone and increase in water level.

**Teacher's Notes**

- Prior to teaching the lesson, teacher must try out the activity to prepare proper size of stones for getting the intended results. The activity requires to show the clear difference between the small and the big stones. Teachers who don't try before the lesson tend to prepare too big stone which cannot be placed in the cup or pushes water spill out of the cup.
- **Prediction (guessing)** prior to the activity is also important for students, as the activity itself is very simple. Teachers are requested to take enough time to elaborate students' prediction so that students are more actively engaged in the activity. To do that, illustrations of glass cups without water line can help more than the real cup to facilitate students' thinking. Teachers ask students to copy the illustration and draw lines for their prediction. The same illustration should be used for the presentation and discussion of their observation result.



Lesson Objectives

Students will be able to:

- Compare the different size of matter.
- Infer which object is bigger or smaller based on the results of the activity.

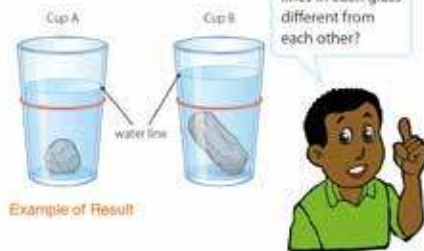
Assessment

Students are able to:

- Describe how to compare the size of matter.
- Relate the size of matter to the amount of water increased in a container.
- Show eagerness to investigate how to compare the size of matter.

Result

When we placed the stones into each glass, the water lines in the glasses rose. The water line of Cup B is higher than that of Cup A.

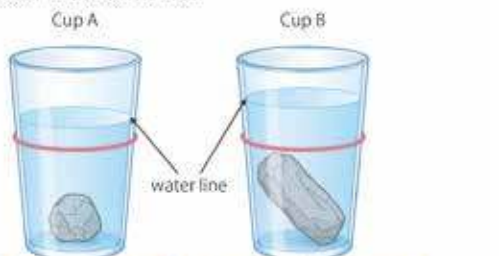


Example of Result

Summary

When we place matter into water in a container, the level of water line will rise. This is because the size of water in the container increases by the same amount as the size of the matter.

So, the bigger the matter is, the higher the water level in a container rises. We can compare the size of matter by observing the increase of the size of water in the container.



The bigger the stone is, the higher the water level in the container is.

- Write down students' results on the blackboard.
- Confirm the results with students.
- **Based on their findings**, ask these questions.

Q: Why did the water lines in the glasses rise when we placed the stones into the glasses? (The size of water in a glass increased by the same amount as the size of the stone.)

Q: Why are the water lines in each glass different from each other? (This is because the size of the stones are different)

Q: What happened to the water lines when we placed a bigger stone into a glass? (The bigger a stone is, the higher the water line is.)

Q: Which stone is bigger or smaller? (Stone in Cup B)

- Conclude the lesson

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (refer to Blackboard sample)
- Ask the questions for assessment:
Q: What is the meaning of size?
Q: How can we compare the size of matter?
- Ask students to copy the notes on the blackboard into their exercise books.

38

Sample Blackboard Plan

Title:

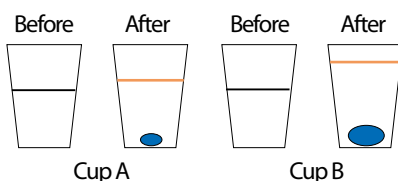
"Big or Small?"

Key question

How can we compare the size of matter?

Activity

Comparing the size of stones



Discussion

Q: Why did the water lines in the glasses rise when we placed the stones into the glasses?

The size of water in a glass increased by the same amount as the size of the stone.

Q: Why are the water lines in each glass different from each other?

This is because the size of the stones are different.

Q: What happened to the water lines when we place a bigger stone into a glass?

The bigger a stone is, the higher the water line is.

Q: Which stone is bigger or smaller?

Stone in Cup B

Summary

- **Size** means how big a matter is.
- We can compare the size of matter by observing the increase of the size of water in a container.
- The increase of the amount of water is equal to the size of a stone.
- The bigger the matter is, the higher the water level in a container rises.

Lesson
5 / 17**Lesson Title****Float or Sink?****Preparation**

- Wood,
- stone,
- glass cup,

- clear container or bowl and water

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q:What is the meaning of size?

Q:How can we compare the size of matter?

- Encourage students to think about floating and sinking of matter by asking:

Q:When we place some matter in water, what will happen?

2 Introduce the key question

Which matter floats or sinks in water?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw the table into their exercise books.
- Let students predict which matter will float or sink in water and record their predictions in the table.
- Have students carry out the activity and ask them to record their results in the table.
- Ask students to discuss which matter floated or sunk in the water based on their findings in their groups.

4 Discussion for findings (20 min.)

- Ask students to present their results from their activity. (Continue)

Lesson 5: "Float or Sink?"

- 1 When we place matter in water, some float and others sink.

- 2 **?** Which matter float or sink in water?

- 3 **Activity : Matter that float or sink**

What We Need:

- water, container, wood stick, stone, iron nail, clay ball, aluminium foil ball, eraser, marble, plastic cap

Can you guess which matter float or not?

**What to Do:**

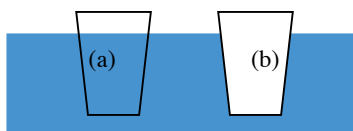
1. Make a table like the one shown on the right.
2. Guess which matter will float or sink and write your prediction in the table.
3. Place each matter on water.
4. Write your observation in the table and group the matter into two: the matter that float on water and the matter that sink in water.
5. Share your ideas with your classmates. Talk about which matter float or sink in water and how you grouped the matter.

Matter:	Your prediction: (Float or Sink)	Your Observation
Wood		
Stone		
Iron nail		
Clay ball		
Aluminium ball		
Eraser		
Marble		
Plastic cap		

**Teacher's Notes**

Why does an object sink or float? (This knowledge is for teachers only. Teacher should not teach this as it is too difficult for students.)

- Students commonly believe that heavy objects sink and light objects float regardless of their size, shape or the type of material used to make them. But ships made of iron which may be known as a heavy object can float. Why?
- An object which has a greater mass than an equal volume of water sinks and an object which has a smaller mass than an equal volume of water floats. The way to compare a mass per a unit volume is called 'density', that is to say, an object more dense than water sinks and less dense than water float, scientifically.
- For instance, the cup (a) which is filled with water will sink because the mass of the objects equal;
 mass of the object (a) = mass of the cup + mass of water
 mass of the object (b) = mass of the cup + mass of air
 Therefore, the object (a) will sink since it has a greater mass than an equal volume of water and the object (b) will float as it has a smaller mass than an equal volume of water.
- The size, shape and material of objects determine if they sink or float. Teachers need to prepare various types of objects to guide students to understand that there are objects which can both sink and float.



Lesson Objectives

Students will be able to:

- Recognize that float and sink are properties of matter.
- Observe the different types of matter that can float or sink in water.

Assessment

Students are able to:

- Identify matters that can float and sink in water.
- Group objects according to their ability to float and sink.
- Actively participate in the investigation.

Result

Wood and a plastic bottle cap can float on water. A stone, iron nail, clay ball, aluminium foil ball, eraser and marble sink in water.

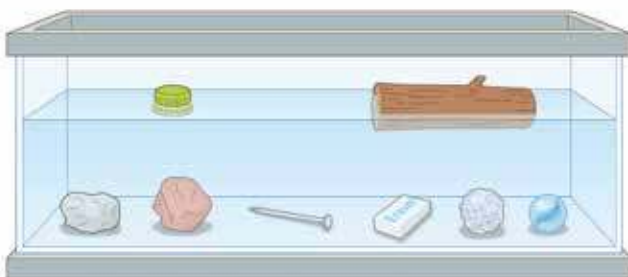
Matter that float on water	Matter that sink in water
Wood	Stone
Plastic bottle cap	Iron nail
	Clay ball
	Aluminium foil ball
	Eraser
	Marble

Summary

Floating and sinking is a property of matter. Float means to stay on or near the surface of water. Sink means to go down below the surface or to the bottom of water.

Some matter such as wood, some kinds of plastic and even oil usually float on water. Matter such as stone, metal, rubber and glass sink in water. We can compare and describe matter by observing whether it floats on or sinks in water.

Can you give other examples of matter that float on or sink in water?



Some matter can float on water and some sink in water

- Write students' results on the blackboard.
- Confirm the results with students.
- Let the students compare their prediction to the result and confirm.
- **Based on their observation**, ask these questions as points of discussion.

Q: Which matter can float on water or sink in water? (Wood and plastic cap floated on water.)

Q: How can you group the matter you tested from this activity? (They can be grouped into two groups, Matter that floats on water and Matter that sinks in water.)

- Conclude the findings.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How can we compare and describe matter when we place matter on water?
Q: What are some examples of matter that float on water and sink in water?
- Ask students to copy the notes on the blackboard in their exercise book.

Sample Blackboard Plan

Title:

"Float or Sink?"

Key question

Which matter float or sink in water?

Activity Matter that floats or sinks.

Matter	Your Prediction: Float or sink?	Your observation
Wood	Float	Float
Stone	Sink	Sink
Clay ball	Sink	Sink
...	...	...

Discussion

Q: Which matter can float on water?

Wood and plastic cap floated on water.

Q: Which matter sinks in water?

Stone, iron nail clay ball, aluminum ball, eraser and marble sank in water.

Q: How can you group the matter you tested from this activity?

They can be grouped into two groups, Matter that floats on water and Matter that sinks in water.

Summary

- Float and sink are a property of matter.
- Float means to stay on or remain on the surface of water.
- Sink means to go down below the surface or bottom of water.
- Matter that can float are wood, plastic cap, leaves,
- Matter that can sink are stone, iron nail, clay ball etc.

Lesson
6 / 17**Lesson Title****What Matter Do We Use?****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q: How can we compare and describe matter when we place matter on water?

- Explain what an object is and ask the question by showing an object:

Q: What is it made from? What matter is used to make it?

2 Introduce the key question

What kinds of matter do we use to make objects?

3 Activity (25 min.)

- Organise students in some groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise book.
- Advise students to refer to the picture in the activity and character's talking for their investigation.
- Have students do the activity and ask them record their findings in the table.
- Ask students to discuss what kinds of matter are used to make the object based on their findings in a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from their activity. (Continue)

Lesson 6: "What Matter Do We Use?"

- 1 Objects around us are made up of matter. An **object** is a thing that we can see or touch. A chair, stone, tree and water are examples of objects. Some objects are made by people.

- 2 ? What kinds of matter do we use to make objects?

3 Activity : What are objects made from?**What to Do:**

1. Make a table like the one shown on the right.
2. Look at the picture below, and find the objects.
3. Write the names of the objects and what the objects are made from in the table.
4. Share your ideas with your classmates. Talk about the objects you found and what kinds of matter are used to make the objects.

Object	What is the object made from?

**Teacher's Notes**

Properties of matters introduced in the textbook are summarised as below for additional knowledge for teachers.

Wood	Wood is made of trees, more specifically, trunks and branches of trees. Their colour is generally brown. Some of their scent is notably odorous or aromatic. They are normally less dense than water thus, they float. However, some woods such as Ebony, Desert Ironwood and Lignum Vitae are more dense than water and they sink.
Glass	Glass is composed mainly of a certain kind of sand (silicate) and an alkali. It is a hard material normally fragile and transparent. It is 100% recyclable. Its density is approx. 2.5 g/cm ³ and thus it sinks in water. It is an excellent insulator against heat, electricity and electromagnetic radiation.
Rubber	As shown in the textbook, natural rubber is made of latex which is a milky sap oozes from a rubber tree (Hevea brasiliensis). Rubber is one of the main crops for export in PNG. The major property of rubber is elasticity. It is also used to erase pencil marks by rubbing markings on paper. Its density is 0.92 g/cm ³ and thus it floats on water.
Plastic	Plastic is a synthetic material created from naphtha (distilled product of oil). It can be manufactured inexpensively and mass produced. It is lightweight, water and shock resistant and, thermally and electrically insulating. Since it is artificially made in industries, there are numerous types of plastics. Some are denser and some others are less dense than water.

Lesson Objectives

Students will be able to:

- Define what a material is.
- Identify the different kinds of materials.

Assessment

Students are able to:

- Explain the differences among matters, objects and materials.
- Describe what materials are used to make an object.
- Listen to the opinions from others with respect.

Summary

Objects are all made from matter. The kind of matter that is used to make an object is called material. There are different kinds of materials. Wood, glass, rubber, metals and plastics are examples of materials. We use different kinds of materials to make different objects.

Wood

Wood comes from tree. It can be used to make furniture, house and even paper.



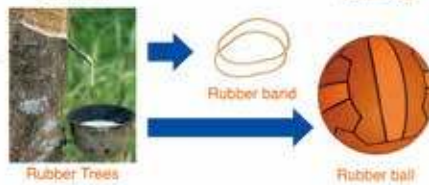
Glass

Glass is used for making window panes, glass cups and pairs of glasses.



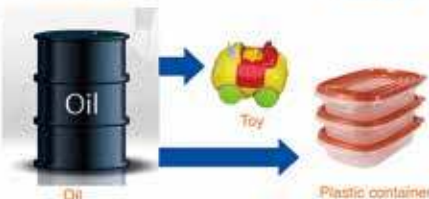
Rubber

Rubber is made from the sap of rubber trees. Rubber bands, erasers and balls are made of rubber.



Plastic

Plastic is made from oil. People use plastic to make objects in many ways. Toys, containers and cutleries are made of plastic.



5

- Write students' findings on the blackboard.
- Confirm the results with students.
- **Based on their findings**, ask these question.

Q:What kinds of matter are used to make objects? (Wood, glass, rubber, plastic, metal, paper, etc)

Q: Why is a glass used to make a window? (Because the glass is transparent.).

Q:Why is ball made from rubber? (Because the rubber is elastic and bouncy.)

Q:How do we choose matter when we make an object? (We choose the best matter for the object based on its properties.)

- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the day's lesson on the black board.
- Ask the questions for assessment:
Q:What is the meaning of objects?
Q:What is the meaning of materials?
Q:What is an object made of?
Q:Give some examples of different kinds of materials.
- Ask students to copy the notes on the blackboard into their exercise books

42

Sample Blackboard Plan

Title:

"What Matter Do We Use?"

Key question What kinds of matter do we use to make objects?

Activity What are objects made from?

Object	What is the object made from?
Chair	Plastic, steel
Table	Wood
Window	Glass
Ball	Rubber
....	...

Discussion

Q:What kinds of matter are used to make objects? **Wood, glass, rubber, plastic, metal, paper, etc**

Q:Why is a glass used to make a window? **Because the glass is transparent.**

Q:Why is ball made from rubber? **Because the rubber is elastic and bouncy.**

Q: How do we choose matter when we make an object? **We choose the best matter for the object based on its properties.**

Summary

- An **object** is a thing that we can see or touch.
- A chair, stone, tree and water are examples of objects.
- A kind of matter that used to make an object is called a material.
- Wood, glass, rubber and plastic are examples of **materials**
- We use different kinds of materials to make different objects.

Lesson
7 / 17**Lesson Title****Summary and Exercise****Tips of lesson****1 Summary (20 min.)**

- Begin by asking the students with a question;
Q:Can someone guess what key word is learned in all the lessons so far? (Matter)
- Explain to students that in all our lessons covered we have discovered what matter is and are able to describe matter by their properties.
- Recap the main learning contents with the students.
- Based on the main learning contents, ask students some questions and verify their understanding with the summary points. For example:
Q:What are some properties of matter you have learned throughout the lessons? (Weight, size, float, sink, shape, colour etc.)

2 Exercise & Explanation (30 min.)

- Go through with students the instructions of the exercise.
- Provide enough time for students to attend to the questions in response to their understanding
- After the exercise, give them the answers to the questions and explain how to solve them using their scientific knowledge.
- After the exercise, provide the answers of the questions to students and explain to justify the answers along with students' answers.

1

Summary and Exercise

Summary 2.1 Describing Matter

Matter around us

☐ Matter is what everything around us is made of.

Examples of Matter			Examples of Non-matter		
					
House	Ball	Books	Fire	Light	Sound

Properties of Matter

☐ Matter has different properties; color, size, shape and texture are examples.

☐ Different properties of matter can be described using the senses.

Heavy or Light

☐ Weight is how heavy or light a matter is.

☐ A balance is a tool used to weigh matter.

Big or Small

☐ Size is how big or small a matter is.

Float or Sink

☐ Floating and sinking are properties of matter.

☐ Objects that can float are; leaf, pencil, empty can and plastic cap.

☐ Objects that can sink are; stone, nail and iron metal.

Types of Materials

☐ Matter is made up of different kinds of materials.

☐ Wood, glass, rubber, metal and plastic are kinds of materials used to make different objects.

43

2

Summary and Exercise

Exercise 2.1 Describing Matter

Q1. Complete each sentence with the correct word.

(1) _____ is everything around us.

(2) We use our senses to compare and describe the _____ of matter.

(3) A _____ is used to measure weight of matter.

Q2. Choose the letter with the correct answer.

(1) Which one of the following objects is made of glass?

A. Rubber band

B. Table

C. Plastic container

D. Glass bowl

(2) Colour is a property of matter. Which sense is used to observe the color of matter?

A. Touch

B. Taste

C. Sight

D. Smell

Q3. Answer the following question.

Look at the picture shown on the right.

Which object is heavier than the other?



Q4. Tom wants to compare the size of two objects using a cup of water. How could he tell that one object is bigger than the other object?

44

Exercise answers

Q1.

(1) **Matter**

Student might give the answer as environment.

Environment is everything that makes up our surroundings and those things are referred to as matter.

(2) **Properties**

It is through the senses that we are able to describe the size, shape, colour, smell, weight and taste of matter.

(3) **Balance**

Q2.

(1) **D**

(2) **C**

Five senses	Types of Properties
Sight	Shape, size, colour
Touch	Texture, hardness, smoothness
Smell	Smell, odour
Hearing	Sound
Taste	Sweet, sour

Q3. **Object B**

When the two objects were placed on the balance, the balance tilt towards the heavier side.

Q4. Example of the answer

By placing the objects at a time into the cup of water and observing the increase of the size of water in the cup.

Lesson
8 / 17**Lesson Title****Taking up Space
(Volume)****Preparation**

•Cups, Pebbles, Water

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson on 'Properties of Matter' Topic 2.1 by asking:

Q:How can we describe matter?

Q:Give some examples of the properties of matter.

- Motivate students to think about the common property of matter by asking:

Q:Matter has different properties, but does matter have a common property?

2 Introduce the key questionWhat is a common property of matter?**3 Activity (20 min.)**

- Organise students into groups.
- Explain the steps of of the activity
- Have students do the investigation.
- Ask them to record their observations in their exercise book.
- Check students' activity in each group. If necessary, facilitate their investigation.

4 Discussion for findings (25 min.)

- Ask students to present their results from their activity.
- Write down students' findings on the blackboard.
(Continue)

2.2 Measuring Matter

Lesson 1: "Taking Up Space"

- 1 Different matter have different properties. Size, colour and shape are the properties of matter. But, what is a common property of matter?
- 2 **? What is a common property of matter?**
- 3 **Activity : Space in a cup**

What We Need:
cups, pebbles, water

What to Do:

 1. Put as many pebbles as possible into an empty cup. Observe the space inside the cup. Record your observations.
 2. Fill an empty cup half-full with water. Observe the space inside the cup. Keep on pouring water into the cup. Observe the space inside the cup. Record your observations.
 3. Share your ideas with your classmates:

If we keep on putting pebbles and water into a cup, can you guess what will happen?
- 4

45

Teacher's Notes

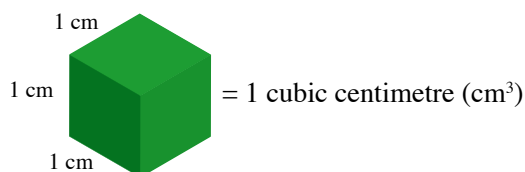
- As described before, a matter or an object physically exists. It occupies the space. Two objects cannot occupy the same space at the same time. An object must move before another object can occupy that space.
- The amount or capacity of space that an object or shape occupies is called a volume. It is the three-dimensional quantity often measured in cubic meter (m^3) or cubic centi-meter (cm^3). The superscript '3' in the unit means three-dimension which is a multiplication of distance times distance times distance, i.e. ' $\text{m} \times \text{m} \times \text{m}$ ' or ' $\text{cm} \times \text{cm} \times \text{cm}$ '. For example, volume of cuboid is calculated length times width times height.
- Litre (L) is often used as a unit of volume particularly for liquid, too. One litre is the volume of a 10-centimetre cube, thus

$$1 \text{ litre(L)} = 1000 \text{ cubic centi-metres}(\text{cm}^3) = 0.001 \text{ cubic metres}(\text{m}^3)$$

$$1 \text{ cubic metre}(\text{cm}^3) = 1000 \text{ litres(L)}.$$

- Millilitre (mL) is also used for measuring small amounts of liquid;

$$1 \text{ millilitre}(\text{mL}) = 0.001 \text{ litres(L)} = 1 \text{ cubic centimetre}(\text{cm}^3).$$



Lesson Objectives

Students are able to:

- Define what volume is.
- Describe the common property of matter. (Matter takes up space.)
- Demonstrate how matter takes up space.

Assessment

Students are able to:

- Explain the meaning of volume.
- Find the common property of matter ('Matter takes up space') based on the results of the activity through discussion.
- Actively participate in group work..



Discussion

Think about the following questions based on your observation:

- When an empty cup is filled with pebbles, what happens to the space in the cup?
- Can you add more pebbles into the cup? Why?
- When you fill an empty cup half-full with water, what happens to the space in the cup?
- When you keep on pouring water into the cup, what happens to the water? Why?

Summary

All matter take up space. When a matter takes up space, nothing else can take up the same space at the same time. The amount of space that a matter takes up is called the **volume**. All matter have volume.

When a cup is filled with pebbles, more pebbles cannot be added into the cup. This is because the pebbles take up space in the cup. Other pebbles cannot take up the same space in the cup. When we keep on pouring water, water is spilled out of the cup. This is because the space in the cup is occupied by water. No water can take up the same space at the same time.



Other pebbles cannot take up the same space in the cup.



No water can take up the same space at the same time.

5

- **Based on their findings**, ask these questions.

Q:What happened to the space in the cup when it was filled with the pebbles and half-full with water? (They took up the space in the cup.)

Q:Can you add more pebbles into the cup? No, Why? (Because the space had already been taken up and nothing else could take up the same space at the same time.)

Q:What happened when you kept pouring water into the cup? The water spilled out of the cup. Why? (Because the space in the cup was already occupied by water.)

- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the day's lesson on the blackboard.
- Ask these questions as assessment:

Q:What is volume?

Q:What common property does matter have?

Q:Why does water spill out of a cup when we keep pouring water?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Taking Up Space"

Key question

What is a common property of matter?

Activity

Space in a Cup

1.Putting pebbles in a cup

Observation: When the cup was filled with pebbles they took up the space in the cup.

2. Filling cup with water

Observation: When the water was filled half-full with water, it took up the space in the cup.

Discussion

Q:What happened to the space in the cup when it was filled with the pebbles and half- full with water?

They took up the space in the cup.

Q: Can you add more pebbles into the cup? No, Why?

Because the space had already been taken up and nothing else could take up the same space at the same time.

Q:What happened when you kept pouring water into the cup? The water spilled out of the cup. Why? **Because the space in the cup was already occupied by water.**

Summary

- **Matter takes up space.**
- The amount of space it takes up is called the **volume**.
- Volume is a common property in all matter.
- When matter takes up space, nothing else can take up the same space at the same time

Lesson
9 / 17**Lesson Title****Measuring Volume of Water****Preparation**

- Measuring cup
- Water
- Drinking Cup, small bowl,

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson by asking:

Q:What is a common property of matter?

Q:What is the meaning of volume?

- Motivate students to think about measuring the volume of water by asking:

Q:Matter has its volume. Water also has its volume, but how can we measure the volume of water?

2 Introduce the key question

How can we measure the volume of water?

3 Science Toolbox (20 min.)

- Ask students to open their textbook and to read through 'Science Toolbox'.
- Explain 'Measuring Volume of Water' step by step.
- Note: The most important points for measuring the volume of water is that:
 - Position eyes at the level with the top of the water.
 - Look at the lowest point of the curved water surface.

4 Activity (25 min.)

- Organise students into some groups.
- Explain the steps of the activity. (Continue)

Lesson 2: "Measuring Volume of Water"

- 1** All matter have their own volume. Water also has its volume.

- 2** How can we measure the volume of water?

4 Activity : Measuring volume of water**What We Need:**

- measuring jar, water

What to Do:

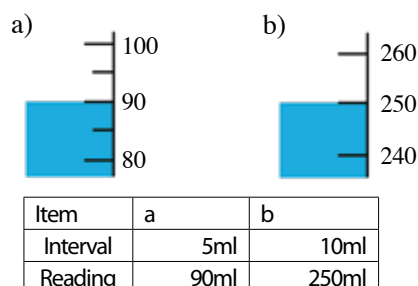
1. Pour some water into a measuring jar.
2. Measure the volume of water.
3. Share your ideas with your classmates. Talk about the measurement of the volume of the water.

**5 Summary**

Measuring cylinder, beaker, and measuring jar are used to measure the volume of water. Volume of water is often measured in millilitre (mL) or in litre (L).

**Teacher's Notes**

- Measuring cylinders and beakers are pieces of laboratory ware and measuring cups is generally a piece of kitchen ware. Measuring cylinders are specially designed to measure the accurate volume of an object or amount of liquid, whereas beakers are often used for stirring, mixing and heating liquids rather than for measuring the volume.
- The top curve surface of the liquid in measuring apparatus is called 'meniscus'. Take your measurement at the centre point of the meniscus (curve).
- Scales labelled on those measuring apparatuses are used to find out the volume of an object or amount of liquid. Scales are like number lines. It is read up from the bottom and goes upwards. They have numerous different scales. To determine the volume, you must know the scale interval of the apparatus you use before the measurement. These intervals are usually 1, 2, 5 or 10.



Lesson Objectives

Students will be able to:

- Explain how to measure the volume of water.
- Measure the volume of water using different equipment.

Assessment

Students are able to:

- State the measuring tools to measure the volume of water.
- Record the volume of water using an appropriate unit.
- Listen to opinions from classmates with respect.

Science Toolbox

Measuring Volume of Water

STEP 1:
Pour some water into a measuring container.

STEP 2:
Position your eyes at the level with the top of the water. Read the scale line that is closest to the surface of the water.
If the surface of the water is curved up on the sides, look at the lowest point of the curved water surface.

STEP 3:
Read the measurement on the scale.
The volume of water in the figure on the right is 43 mL.

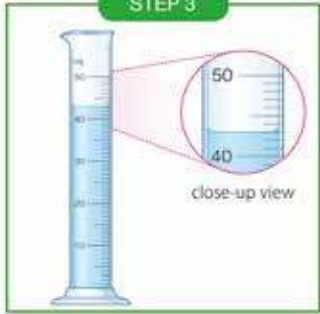
STEP 1



STEP 2



STEP 3



- Have students carry out the investigation.
- Guide students during the activity to consider accuracy as important when reading the volume of water.
- After measuring the volume of water, ask students to present their result from their activity.
- Write down students' answer on the blackboard.
- Confirm the findings with students.
- **Based on their results**, ask these following questions:

Q:What are the important things to do when reading the volume of water? (Position the eyes correctly at the level with the top of the water. Look at the lowest point of the curved water surface.)

Q:What kinds of unit for the volume of water or any liquid have you ever seen? (L, mL, etc)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the day's lesson on the black board.
- Ask these questions as assessment:
Q:How can we measure the volume of water?
Q:What tools and unit is used in measuring the volume of water?
Q:What are the important things used when we read the volume of water?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Measuring Volume of water"

Key question

Q: How can we measure the volume of water?

Activity

Measuring the volume of water

The volume of water (in millilitres)

43 millilitres (Example)

Discussion

Q:What are the important things to do when reading the volume of water?

- Position the eyes correctly at the level with the top of the water.

- Look at the lowest point of the curved water surface.

Q:What kinds of unit for the volume of water or any liquid have you ever seen?

L, mL, etc

Summary

- Volume of water can be measured using
 - Measuring cylinder,
 - beaker
 - Measuring cup.
- A unit used for measuring volume of water is:
 - Millilitres (mL)
 - Litres (L)

Lesson
10 / 17**Lesson Title****Measuring Volume of Stone****Preparation**

- A stone, measuring container

- Water, piece of string

Lesson Flow**1 Introduction (10 min.)**

- Revise previous lesson on 'Measuring Volume of Water' and 'Big or Small' by asking:

Q:What do we use to measure the volume of water?

Q:What happened to the water lines when we placed a stone into the glass?

- Encourage students to think about measuring the volume of stone by asking:

Q:We can measure the volume of water by using a measuring cylinder, but how can we measure the volume of a stone?

2 Introduce the key question

How can we measure the volume of a stone?

3 Activity (25 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Help students to tie a stone with a string.
- Have students to do the activity and ask them to record their results in the table.
- Advise them to put the stone gently into the water.
- Provide enough time for students to find out their findings.
- Ask students to discuss their findings.

Lesson 3: "Measuring Volume of Stone"

- 1 All matter have their own volume. A stone also has its volume.

- 2 **?** How can we measure the volume of a stone?

3 Activity : Measuring the volume of a stone**What We Need:**

stone, measuring jar, water, string

What to Do:

1. Make a table like the one shown below.

Objects	Volume (mL)
(1) Water	
(2) Water and Stone	
(3) Stone	

2. Fill the measuring jar with some water and record the volume of water in column (1) in the table.

3. Tie the stone with string and put the stone gently into the water.

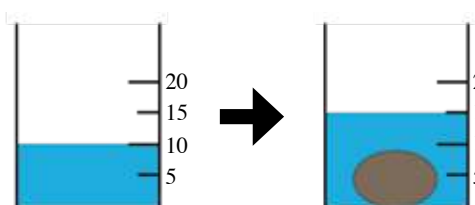
4. Record the volume of water and stone in column (2) of the table.

5. Find the volume of the stone and write it in column (3) of the table.

6. Share your ideas with your classmates. Talk about how you found the volume of the stone.

**Teacher's Notes**

- Refer to the 'Teacher's Note' on page 50 to see more details about the unit 'cubic centimetre (cm³)'
- Make sure the initial volume of water in the measuring apparatus is recorded. If the volume of the water is insufficient and the object (stone) cannot perfectly sink, you are unable to get accurate reading.
- Be careful when immersing (sinking) the stone into the measuring apparatus made of glass. Tie the stone firmly with the piece of string so it does not fall off.
- Remember to use a piece of cloth or tissue to rub off spills of water to prevent the equipment falling off.



- If it is difficult to arrange the activity or you need extra exercise, draw the diagram on the left on the blackboard.

Water (initial)	10 mL
Water & stone	15 mL
Stone	5 cm ³ (= 5 mL)

Lesson Objectives

Students will be able to:

- Measure the volume of an irregular shape of an object.
- Explain how to measure the volume of an irregular shape of an object.

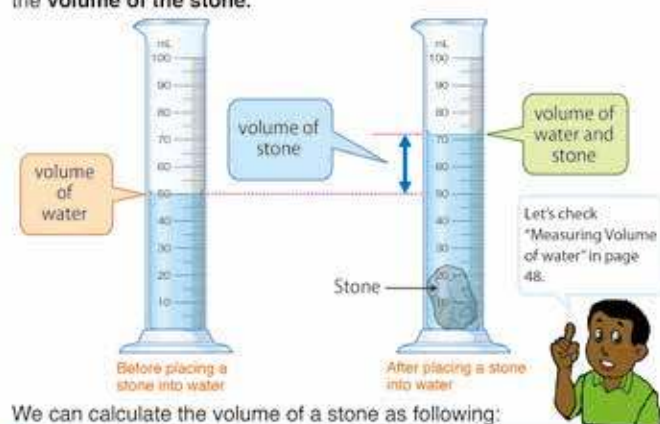
Assessment

Students are able to:

- Calculate the volume of the stone using the given formula.
- Record the volume of water and stone using an appropriate unit.
- Listen to opinions from classmates with respect.

Summary

We can measure the volume of a stone by using a measuring cup or cylinder, string and water. The volume of water in the measuring jar or cylinder increases when we place a stone into the water of the measuring jar or cylinder. The increase of the volume of water shows the **volume of the stone**.



We can calculate the volume of a stone as following:

$$\text{Volume of Stone} = (\text{Volume of Water and Stone}) - (\text{Volume of Water})$$

The volume of the stone is measured in **cubic centimetres (cm³)**.

The volume of the stone in the figure above is:

$$\begin{aligned} \left(\begin{array}{c} \text{Volume of} \\ \text{Stone} \end{array} \right) &= \left(\begin{array}{c} \text{Volume of} \\ \text{Water and Stone} \end{array} \right) - \left(\begin{array}{c} \text{Volume} \\ \text{of Water} \end{array} \right) \\ &= 72 \text{ mL} - 50 \text{ mL} \\ &= 22 \text{ mL} \\ &= 22 \text{ cm}^3 \\ \text{The volume of stone is } 22 \text{ cm}^3 \end{aligned}$$

Note:
1 mL = 1 cm³

4 Discussion for findings (20 min.)

- Ask each group to present their results from their activity.
- Write their results on the black board.
- Confirm the results with students
- **Based on their findings**, ask the following questions.

Q:What happened to the water lines when we placed a stone into the glass? (The level of water rose)

Q:What is the increase of the amount of water equal to? (It is equal to the volume of the stone)

- Explain how to calculate the volume of a stone and how to change the unit of volume.
- Have students to calculate the volume of a stone in groups ('Calculate the volume of a stone!').
- Ask each group to present their answers and conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the day's lesson on the blackboard.
- Ask these questions as assessment:

Q:How can we measure the volume of a stone?

Q:What unit is used in measuring the volume of a stone?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Measuring volume of stone"

Key question

How can we measure the volume of a stone?

Activity

Measuring the volume of a stone

Objects	Volume (mL)
Water	e.g. 72 mL
Water and stone	e.g. 50 mL
Stone	e.g. 22 cm ³

(Given as sample answers only)

Discussion

Q:What happened to the water lines when we place a stone into a glass?

The level of water rose.

Q:What is the increase of the amount of water equal to?

It is equal to the volume of the stone.

Calculate the volume of a stone!

$$\begin{aligned} \text{Volume of stone} &= \\ &(\text{Volume of Water and Stone}) - \\ &(\text{Volume of Water}) \end{aligned}$$

Summary

- Stone is a matter and takes up space or has volume.
- Volume of stone is measured in **cubic centimetre (cm³)**
- When a stone takes up space of water in a container, the increase of the volume of water is equal to the volume of a stone.
- We can measure the volume of a stone as:
(Volume of Stone) = (Volume of water and stone) – (Volume of Water)

Lesson
11 / 17**Lesson Title****Weight and Shape of Matter****Preparation**

- A balance
- Two clods of clay with equal weight

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson.

Q: Does a stone have volume?

Q: How can we measure the volume of a stone?

- Motivate students to think about the relationship between the weight and shape of matter by asking:

Q: Weight and shape are properties of matter.

Does the weight of the matter change if we change the shape of the matter?

2 Introduce the key question

What will happen to the weight of matter if its shape changes?

3 Activity (20 min.)

- Review how to use a balance. (Refer to 'Science Toolbox: how to use a balance' in the textbook)
- Organise students into some groups..
- Explain the steps of the activity.
- Ask students to draw the table in their exercise book.
- Let students predict what happen to the weight of clay if we change its shape and record their predictions.
- Have students do the activity and ask them to record their results in the table.
- Advise students to keep the shape of one ball and change the shape of another.
- Ask students to discuss their results in their groups.

Lesson 4: "Weight and Shape of Matter"

- 1** Weight and shape are properties of matter. If we change the shape of matter, does the weight of the matter also change?

- 2**  What will happen to the weight of matter if its shape changes?

3 **Activity : Comparing the weight of different shapes of clay****What We Need:**

- a balance, equal weight of two clay ball

What to Do:

1. Make a table like the one shown below.
2. Change the shape of one of the clays and write the name of the shape in the table.
3. Compare the weight of the clay ball and the different shape of the clay with a balance and record your observation in the table.
4. Continue steps 2 and 3 with other shapes and observe what happens.
5. Share your ideas with your classmates. Talk about the relationship between the weight and the shape of the clay.

Shape	Which is heavier?

Can you guess what will happen to the weight of clay if we change its shape?

4**Teacher's Notes**

- Some students believe that a weight of an object changes if its shape changes. This kind of typical misunderstanding is called 'a scientific misconception' in science education. It is a bias or a preconceived notion which doesn't depend on actual scientific fact.
- Teachers must check which students have such misconception before the activity by asking their prediction.
- Some students also believe that a weight of an object changes if the object is turned (i.e. upside down) on the balance. You may ask students to do it as an extra activity if you have enough time in this lesson.
- Prior to the lesson, teacher should prepare sets of clay balls which are the relevant size to be balanced (not too small and not too big) so that students are engaged in the activity.
- To compare the weight of different shapes of clay, keep one of the original clay balls to 'control' the fair experiment. Only the shape of the other clay ball can be changed. They are scientifically called 'variable'. In the picture on the textbook for this activity, the clay ball on the left is referred to as 'control', and the clay ball on the right side is dealt as 'variable'.

Lesson Objectives

Students will be able to:

- Find the relationship between the weight of matter and the changes in its shape.
- Compare the weight of the different shapes of matters using a balance.

Assessment

Students are able to:

- Explain that weight of matter does not change even though the clay changes in shape or is divided into small pieces.
- Record their observation on the weight and shape of matter in the table.
- Express students' own opinion during discussion.

Result

The weight of the clay did not change even when we changed the shape of clay into different shapes.



A balance is not tilted because the two clays have the same weight.



Discussion

Does the weight of clay change if it is divided into small pieces?

1. Think about the following question by yourself:

- "If clay is divided into some small pieces, does the weight of the clay change?"



2. Share your ideas with your classmates.

Summary

The weight of matter does not change even if the shapes of matter changes or it is divided into some small pieces.



4 Discussion for findings (25 min.)

- Ask each group to present their results from the activity.
- Write their results on the blackboard.
- **Based on their finding**, ask the following questions.

Q:What happened to the weight of the clay when its shape was changed? (The weight of the clay did not change when it was changed into different shapes.)

- Encourage students to think more by asking:

Q:What if we divide the clay into smaller pieces?

- Have students discuss the question above in groups.
- Teacher can also demonstrate.
- Ask each group to present their answers and confirm their answers. (The weight of the clay would still remain the same.)
- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the day's lesson on the blackboard
- Ask these questions as assessment:
Q:What happens to the weight of matter if its shape is changed?
Q:What happens to the weight of matter if it is divided into small pieces?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Weight and Shape of Matter"

Key question

What will happen to the weight of matter if its shape changes?

Activity

Comparing weight of different shapes of clay

Shape	Which is heavier?
A & B	Both weight are the same.
A & C	Both weight are the same.
A & D	Both weight are the same.

Discussion

Q:What happened to the weight of the clay when its shape was changed?

The weight of the clay did not change when it was changed into different shapes

Q:What if we divide the clay into smaller pieces?

The weight of the clay would still remain the same.

Summary

- Matter has shape and weight which are its properties.
- The weight of matter does not change even though matter changes its shape or it is divided into small pieces.

Lesson
12 / 17**Lesson Title****Weight and Volume of Matter****Preparation**

- A balance
- Three empty plastic bottles (500ml)
- Water, sand

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q: What happens to the weight of matter if its shape is changed or divided into small pieces?

- Arouse students to think about the relationship between weight and volume of matter by asking:

Q: Weight and volume is the properties of matter. Do different matter have the same volume if they have the same weight?

2 Introduce the key question

How can we compare the weights of different matter?

3 Activity (30 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Ask students to draw the table into their exercise books.
- Demonstrate and explain how to use a balance.
- Ask students to guess which matter is heavier or lighter and to record their predictions in their exercise book.
- Have students do the activity based on their predictions and record their results in the table.
- Ask students to discuss which matter is the heaviest or lightest based on their findings in their groups.

Lesson 5: "Weight and Volume of Matter"

- 1 There are different kinds of matter around us. If different matter have the same volume, do they also have the same weight?

- 2 ? How can we compare the weights of different matter?

3 Activity : Comparing weight of matter**What We Need:**

- a balance, three same empty plastic bottles (500ml), water, sand

What to Do:

1. Make a table like the one shown on the right.
2. Fill each plastic bottle with water, sand and air.
3. Compare the weight of the three plastic bottles with the balance. Record your observation in the table.
4. Share your ideas with your classmates.

Comparing weights between:	Which is heavier?
Water and Sand	
Sand and Air	
Air and Water	



How about the volume of water, sand and air if you fill the same size of plastic bottles with them?

**Teacher's Notes**

- Weight is one of the major properties of matter. Each matter contains different amount of atoms/molecules. Each atom/molecule also has different weight. Therefore, weight varies by matters. Comparison of weight helps people to identify the matter.
- For fair comparison of the weight, we need to use the same shape and size of container to 'control' the volume so that students can fairly compare the weights of matters when they have the same volume. This experience of comparison will help students to understand the concept of density (mass per unit volume) in later study.
- For example, the result of this activity implies that the density of sand is bigger than that of water. Because sand is heavier than water if they have the same volume. It means sand sinks in water, as you experience in daily life. Conversely, the density of air is smaller than that of water and thus the air bubbles in water floats (moving upwards).

Lesson Objectives

Students will be able to:

- Describe how to compare the weight of the different matter.
- Compare the weight of the different kinds of matter.

Assessment

Students are able to:

- Explain that the same volume of different matter have different weight.
- Identify which matter is the heaviest or lightest among air, sand and water with the same volume.
- Show eagerness towards investigation.

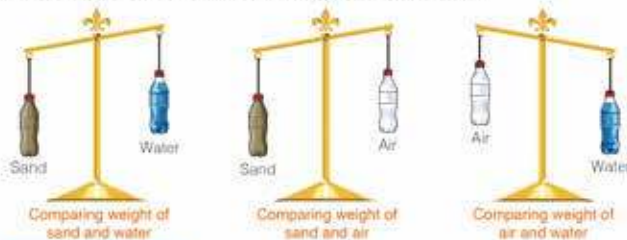
Result

Water, sand and air have the same volume. Sand is heavier than water.

Sand is heavier than air.

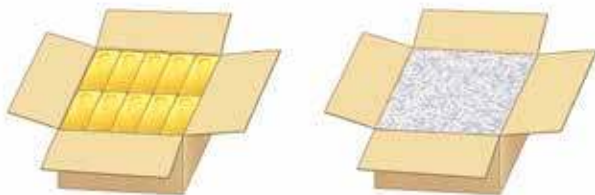
Water is heavier than air. From these results, we found that the same volume of water, sand and air have different weights.

Comparing weights between:	Which is heavier?
Sand and Water	Sand
Sand and Air	Sand
Air and Water	Water



Summary

Different kinds of matter with the same volume have different weights. For example, the two boxes below have the same volume. If we filled one with gold and another with feathers, the box filled with feathers would be much lighter because the feathers are not as compact as the gold. We can compare the weights of different matter if their volume is the same.



The gold would be heavier than the feathers in the same box.

4 Discussion for findings (15 min.)

- Ask each group to present their results from the activity.
- Write down their results on the blackboard.
- Confirm the results with students.
- **Based on their result**, ask the following questions.

Q: Which material is the heaviest among air, water and sand? Why? (Sand is the heaviest because sand is heavier than air and water.)

Q: Which material is the lightest among air, water and sand? Why? (Air is the lightest, because air is lighter than air and water.)

Q: Is the volume of air, water and sand different or same? Why? (The volume is the same, because they are bottled in the same size of a plastic bottle.)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (refer to Blackboard sample)
- Ask these questions as assessment:
 Q: Do different kinds of matter with the same volume have the same weight?
 Q: How can we compare the weight of different matters?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Weight and Volume of Matter"

Key question

How can we compare the weights of different matter?

Activity

Comparing weight of matter s

Comparing weights between:	Which is heavier?
Water and Sand	Sand
Sand and Air	Sand
Air and Water	Water

Discussion

Q: Which material is the heaviest among air, water and sand? Why?

Sand is the heaviest because sand is heavier than air and water.

Q: Which material is the lightest among air, water and sand? Why?

Air is the lightest, because air is lighter than sand and water.

Q: Is the volume of air, water and sand different or same? Why?

Their volume is the same, because they are bottled in the same size of a plastic bottle.

Summary

- Weights of different matters can be compared when they have the same volume.
- Different kinds of matter with the same volume have different weight.

Lesson
13 / 17**Lesson Title****Summary and Exercise****Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents to capture students' understanding on the Topic 'Measuring Matter'
- Based on the main learning contents, ask students some questions, For example:

Q:What are some properties of matter which can be measured? (Weight, volume,)

- Verify their understanding with the summary points.
- Allow students to read aloud the main ideas of the topic and then copy into their exercise books.

2 Exercise & Explanation (30 min.)

- Go through with students the instructions of the exercise.
- Provide enough time for students to attend to the questions in response to their understanding
- After the exercise, give them the answers to the questions and explain how to solve them using their scientific understanding and ideas.
- After the exercise, provide the answers of the questions to students and explain to justify the answers along with students' answers.

1Summary
and
Exercise**Summary** 2.2 Measuring Matter**Measuring Volume**

- ☐ All matter take up space.
- ☐ The amount of space that matter takes up is called volume.

Measuring Volume of water

- ☐ Measuring cylinder, beaker and measuring cup are used to measure the volume of water.
- ☐ Volume of water is often measured in millimetres (mL) or litres (L).

Measuring Volume of Stone

- ☐ The volume of stone can be measured using a measuring cup, beaker or measuring cylinder, string and water.
- ☐ The volume of stone is often measured in cubic centimetre (cm³).

Weight and Shape of Matter

- ☐ The weight of matter does not change even though the matter changes its shape or is divided into small pieces.

**Weight and Volume of Matter**

- ☐ Different types of matter with the same volume have different weights.

55

2Summary
and
Exercise**Exercise** 2.2 Measuring Matter

Q1. Complete each sentence with the correct word.

- All matter take up _____.
- Volume of water is often measured in _____ or _____.
- The weight of matter does not change even though the matter changes its _____.
- Different kinds of matter with the same volume have _____ weights.

Q2. Choose the letter with the correct answer.

- (1) Which one of the following is used to measure the volume of water?



- (2) Which diagram shows the correct way of taking a reading from the given instrument?



Q3. Answer the following question.

Look at the objects shown below. Which one is likely to float?



Plastic bottle cap



Iron nail

- Q4. Mori wants to fill a cup with a lot of shells. As she is filling it up, she notices that she could no longer put in more shells. Explain why.

56

Exercise answers

Q1.

- (1) **space**
- (2) **millilitres, litres**
- (3) **Shape**

If matter is changed into different shapes, this does not affect the weight. The weight of matter still remained.

- (4) **Different**

Q2.

- (1) **A**
- (2) **B**

When reading the volume of water from a measuring tool, your eyes have to be fixed on the level of the water to take an accurate reading on the scale.

Q3. **Plastic bottle cap**

Q4 Example of the answer

Because the amount of space in the cup is being taken up by the shells; therefore nothing else can take up the same space at the same time

Lesson
14 / 17**Lesson Title****Observing a Mixture****Preparation**

- Small stones, nails, paper clips
- Dry beans, bowl

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lessons on 'Properties of Matter', Topic 2.2:

Q: What kinds of property does matter have?

- Encourage students to think about a mixture of matter by asking:

Q: Do the properties of different kinds of matter change when they are mixed together?

2 Introduce the key question

What will happen when we mix different kinds of matter?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Ask students to draw the table into their exercise book.
- Advise students to pay more attention to the properties of each matter carefully before and after mixing.
- Have students to do the activity and ask them to record their observation in the table.
- Ask students to discuss how matter changed when it was mixed based on their findings in their group.

4 Discussion for findings (15 min.)

- Ask each group to present their findings from their activity. (Continue)

2.3 Mixing Matter

Lesson 1: "Observing a Mixture"

- Matter has its properties. When we mix different kinds of matter together, do their properties change?
- ?** What will happen when we mix different kinds of matter?
- Activity : Let's mix different matter**

What We Need:
 small stones, nails, paper clips, dried beans, a bowl

What to Do:

 - Make a table like the one shown below.

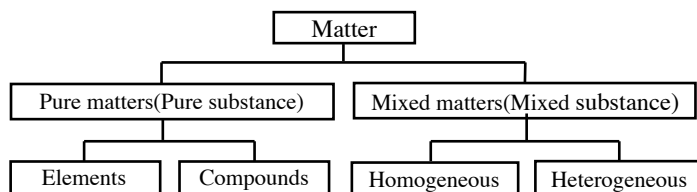
Matter	Properties before mixing	Properties after mixing
Stone		
Nails		
Paper clips		
Dried beans		

 - Observe the properties of each matter and write your observation in the table.
 - Pour all the objects above in the bowl and mix them together.
 - Observe the properties of each matter in the bowl and write your observation in the table.
 - Share your ideas with your classmates. Talk about how the properties of matter change before and after mixing.

Can you guess what will happen when you mix different matter?
-

Teacher's Notes

- Matter is classified as below. Matter is divided into two categories such as 'Pure matter' and 'Mixed matter'.
- 'Pure matters' are further divided into 'Element' and 'Compound' and 'Mixed matters' are broken into 'Homogeneous' and 'Heterogeneous' mixtures.



- Pure matters (often called 'pure substances') are composed of one type of atom or molecule and are again divided into 'elements' and 'compounds'.
- Elements contain only a single type of atom, whereas compounds are made up of two or more different types of atoms and molecules.

- Mixed matters (often called 'Mixed substance' or 'mixture') are composed of different kind of matters. Compounds are created when elements combine permanently, forming one substance like water (The chemical formula for water is H_2O , which consists of one oxygen atom chemically bonded to two hydrogen atoms). However, mixed matters are physically combined structures that can be separated into their original components. Thus, compounds are NOT mixed matters. Mixed matters are again divided into 'homogeneous' and 'heterogeneous' matters. Please refer to the next teacher's note for further information

Lesson Objectives

Students will be able to:

- Define a mixture.
- Observe the properties of matter in a mixture.

Assessment

Students are able to:

- Explain how matter changes when it is mixed.
- Identify the properties of matter before and after it is mixed.
- Investigate a mixture with interest.

Summary

When we put different matter together, we can make a mixture. A **mixture** is something made of two or more kinds of matter.

When we make a mixture, there is no new matter. Even though two or more matters are mixed together, the properties of each matter in the mixture do not change. When we mix stones, nails, paper clips and dried beans together in a bowl, the properties of each matter does not change. The nails in a mixture are still nails. The stones in a mixture are still stones.



Mumu is an example of a mixture. Corns and ferns in mumu are still corns and ferns.



Discussion

Mixtures around us:

1. Make a list of mixtures around us and find the different matter that make up the mixtures.
2. Share your ideas with your classmates.

58

5

- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their observation results**, ask these following questions.

Q:What kinds of properties did each matter have before mixing? (Colour, shape, size, texture, weight, etc.)

Q:What happened to the properties of each matter after mixing? (It did not change.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask students to copy the notes on the blackboard into their exercise books
- Ask these questions as assessment:
Q:What is a mixture?
Q:What happened to the properties of matter when different types of matter are mixed?
- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion (10 min.)

- Have students make a list of mixtures around them.
- Ask students to present their ideas and write them on the blackboard.
- Confirm their ideas with students.
- Conclude the discussion.

Sample Blackboard Plan

Title:

"Observing a Mixture"

Key question What will happen when we mix different kinds of matter?

Activity Let's mix different matter

Matter	Properties before mixing	Properties after mixing
Stone	Gray, hard, round, etc.	Gray, hard, round, etc.
Nails	Silver, hard, sharp, etc.	Silver, hard, sharp, etc.
Paper clips	Blue or red, lighter, etc.	Blue or red, lighter, etc.
Dry beans	Round, smooth, etc.	Round, smooth, etc.

Discussion

Q:What kinds of properties did each matter have before mixing?

Colour, shape, size, texture, weight, etc

Q:What happened to the properties of each matter after mixing?

It did not change.

Summary

- **Mixture** is something made of two or more kinds of matter.

- When we make a mixture, there is no new matter.
- When one or more kinds of matter are mixed together, the properties of each matter do not change.

Further Discussion

Q:What are some mixtures that can be found around us?

A cup of tea, mixture of raw rice grains with bean seeds and green leaves, etc

Lesson
15 / 17**Lesson Title****Separating a Mixture****Preparation**

- Nails, sand, woods, a bowl, water, magnet, strainer

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q:What is a mixture?

Q:What happen to the properties of each matter when different matters are mixed together?

- Motivate students to think about how to separate a mixture by asking:

Q:After making a mixture, can we separate the mixture into each matter?

2 Introduce the key question

How can we separate a mixture?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity
- Advise students to observe the properties of each matter and let them predict how to separate the mixture of nails, sand and woods.
- Have students do the activity based on their prediction and ask them to record their results in their exercise book.
- If necessary facilitate students' finding their answers.
- Ask students to discuss how a mixture can be separated based on their findings in their groups.

4 Discussion for findings (25 min.)

- Ask each group to present their findings from their activity. (Continue)

Lesson 2: "Separating a Mixture"

- 1** A mixture is made up of two or more kinds of matter. Each matter in a mixture is still there.

2 ? How can we separate a mixture?**3 Activity : Let's separate a mixture****What We Need:**

- nails, sand, piece of wood, a bowl, water, magnet, strainer

What to Do:

1. Make a table like the one shown below:

Matter	Properties
nails	
sand	
wood	

Can you guess how we can separate a mixture?



2. Observe each matter and write their properties in the table.
3. Pour these objects in the bowl and mix them together.
4. Think about the ways to separate the nails, sand and wood in the mixture by using water, a magnet and a strainer.
5. Separate the mixture based on your ideas.
6. Share your ideas with your classmates. Talk about how to separate a mixture.

**Teacher's Notes**

(Continues from previous teacher's note - The Difference Between Homogeneous and Heterogeneous Mixed matters)

- Homogeneous mixed matters - more commonly called as 'homogeneous mixtures' - is a mixture where the components of the mixed matter (mixture) uniformly distributed throughout it. Thus, the composition and property of the mixture is the same throughout. Well stirred sugar water, air and petrol are the example of the homogeneous mixtures.
- Heterogeneous mixed matters - more commonly called as 'heterogeneous mixtures' - is a mixture where the components of the mixture are not uniform and thus different samples from the mixture have different composition and properties. Mumu in the previous lesson is the typical example of heterogeneous mixtures. Soil and sand are other famous examples.
- There are many ways of separating a mixture. Simple separation methods which are applicable with G3 students are introduced in the textbook above. Scientists use some laboratory techniques such as filtration, evaporation and distillation.
 - ➔ **Filtration:** Common method which uses a filter paper placed in a filter funnel to trap an insoluble solid in a liquid.
 - ➔ **Evaporation:** It heat the solution until the solvent evaporates (turns into gas) leaving behind the solid residue.
 - ➔ **Distillation:** The concept is similar to evaporation, but in distillation, the vapor of a liquid is collected by condensation.
- Details of these techniques are described in later grade. Important notice here is that the techniques use solutions, 'Using water' in this lesson is a beginning step for further study.

Lesson Objectives

Students will be able to:

- Identify the different ways used in separating mixtures.
- Describe why a mixture can be separated.

Assessment

Students are able to:

- State how to separate matters in a mixture using eyes, magnet, strainer and water.
- Explain that a mixture can be separated by using the properties of matter.
- Develop eagerness towards separating a mixture.

Summary

The properties of each matter in a mixture do not change. So, a mixture can be separated into each matter by using the properties of each matter. We can separate a mixture of nails, sand and wood in different ways.

Using Sight

Each matter in a mixture has the same properties such as size, colour and shape. We can separate a mixture by seeing the properties of matter.

Using a Magnet

Some matter are attracted to a magnet. We can separate nails from the mixture by using a magnet as a nail is made of iron.



Using a Strainer

We can separate sand from the mixture by using a strainer. Strainers separate a mixture by the size of its matter. The size of sand is small enough to pass through a strainer.



Using Water

Some matter float in water, some sink in water. We can separate wood from the mixture by using water. Wood can float in water but nails and sand sink.



5

- Ask students to present the properties of nail, sand and woods and the ways to separate a mixture
 - Write down students' answers on the blackboard.
 - Confirm the answers with students.
 - **Based on their findings**, ask these following questions.
- Q: Why is a magnet useful in separating a mixture? (Because a magnet can attract the nails made of iron.)
- Q: What property of matter does a strainer uses to separate a mixture? (A strainer can separate a mixture by the size of matter.)
- Q: Why can we separate a mixture using water? (Because some matters can float on water and sink in water)
- Q: Why can a mixture be separated using eyes, magnets, strainers or water? (Each matter has different properties. It can be separated by using its property.)
- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
 - Q: What are the ways of separating mixtures?
 - Q: Why can a mixture be separated using eyes, magnets, strainers or water?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Separating a Mixture"

Key question

Q: How can we separate a mixture?

Activity

Let's separate a mixture

Matter	Properties
Nails	Size, shape, weight
Sand	Size, texture, colour
Wood	Colour, size, texture

Discussion

Q: Why is a magnet useful in separating a mixture? **Because a magnet can attract the nails made of iron.**

Q: What property of matter does a strainer uses to separate a mixture?

A strainer can separate a mixture by the size of matter.

Q: Why can we separate a mixture using water?

Because some matters can float on water and sink in water.

Q: Why can a mixture be separated using eyes, magnets, strainers or water?

Each matter has different properties. It can be separated by using its property.

Summary

- A mixture can be separated into each matter by their properties
- the ways to separate a mixture is:
 - Using sight
 - Using magnet
 - Using strainer
 - Using water

Lesson
16 / 17

Lesson Title

Summary and
Exercise

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic 'Mixing Matter'.

- Ask some questions and verify students understanding.

Q: What is a mixture? A mixture is made of two or more kinds of matter

Q: What happens to the properties of each matter when they are in a mixture? The properties do not change

Q: How can mixtures be separated? By using sight, magnets, strainer and water

- Explain and correct learning contents again if they still have misconception.
- Provoke students to explain an example of how a mixture can be separated, Example: a mixture of kidney beans and rice grains.

2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding
- Explain to students each question to the students.

Question 1: Completion item. Ask students to recall their lessons and think of a suitable word to write in the blank space.

Question 2: Multiple choice – 2 questions

Question 3: Short answer question- 1 question.

Question 4: Comprehension question. Allow students to think and answer the question in their own words.

- After the exercise, give them answers of the questions and explain how to justify the answers.

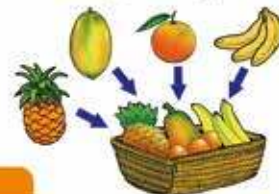
1

Summary
and
Exercise

Summary 2.3 Mixing Matter

Observing a Mixture

- ☐ A mixture is made up of two or more kinds of matter.
- ☐ When different kinds of matter are mixed together, the properties of each matter do not change.



Separating Mixtures

- ☐ A mixture can be separated by using its properties such as colour, size and shape.
- ☐ Mixtures can be separated in many different ways.

Using sight	Using magnet	Using strainer	Using water
Matter that have properties such as size, colour and shape in a mixture can be separated by using sight.	Such matter like nails in a mixture can be separated using a magnet.	Strainer can separate a mixture by the size of its matter.	Using water to separate matter that can float and those that can sink.

61

2

Summary
and
Exercise

Exercise 2.3 Mixing Matter

Q1: Complete each sentence with the correct word.

- A _____ is made up of two or more kinds of matter.
- When a mixture is made, no new _____ is formed.
- Mixture can be separated using the _____ of matter such as size, colour and shape.
- Shells and sand can be separated using a _____.

Q2: Choose the letter with the correct answer.

- Which of the following mixtures can be separated using a strainer?
 - Bean seeds and raw rice grains
 - Salt in water
 - Different fruits in a basket
 - Rice grains and water
- How can you separate a mixture of different fruits in a basket?
 - Using a strainer
 - Using a magnet
 - Using water
 - Using sight

Q3: Answer the following question.

What property is used to separate nails from sand in the picture?



Q4: A boy drops rice grains on the ground. The rice grains are mixed with small pieces of wood and sand. How can he separate the rice grains from the mixture?

62

Exercise answers

Q1.

- (1) **Mixtures**
- (2) **matter**
- (3) **properties**
- (4) **Strainer**

Q2.

- (1) **D**
- (2) **D**

The aim is for students to differentiate different ways of separating mixtures.

Q3.

Matter that are made from iron and can be attracted to magnet and in this situation the matter are nails.

Q4. Example of the answer

Step1. using strainer

He will use a strainer to separate sand, rice grain and pieces of wood.

Step2. using water

He will use water to separate rice grain from pieces of wood.

Students can answer by stating that separation can be a process in this situation firstly straining and then using water.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the column.

3

Chapter 2

«Science Extras»

Will an iron ship float in water?

Why does an iron ship float while an iron nail sink in water?



A ship has a large centre space filled with air. The air helps the ship and boat to float. If the ship fills the centre space with water, the ship will sink.

Let's make a boat using clay! Change its shape and try floating it in the water! How many stones can you put on your clay boat?



The clay boat is floating with stones!



Chapter Test

2. Properties of Matter

Q1

Complete each sentence with the correct word.

- (1) Matter is everything around us.
- (2) Matter can be described by their Properties such as colour, size and shape.
- (3) Weight is how heavy or light a matter is.
- (4) Volume is the amount of space matter takes up.
- (5) Volume of water is often measured in millilitre or litre.
- (6) A mixture is something made of two or more kinds of matter.

Q2

Choose the letter with the correct answer.

- (1) Which tool is used to measure the volume of water?
☒ A. A balance
B. A measuring cylinder
C. A thermometer
D. A magnet
- (2) Which sentence is not true about matter?
A. All matter has weight and takes up space.
B. Some matter like air cannot be seen.
C. Size, shape, color and texture are properties of matter.
☒ D. All matter sink in the water.
- (3) Which of the following would happen when you change the shape of a clay?
A. The weight of the clay becomes lighter.
B. The weight of the clay becomes heavier.
☒ C. The weight of the clay doesn't change.
D. The weight of the clay becomes zero.
- (4) Michael prepared two plastic bottles with the same volume. He filled each bottle with sand and water and compared the weights. Which of the explanations is correct about volume and weight?
A. The same volume of sand and water have the same weight.
☒ B. The same volume of sand and water have different weights.
C. The same volume of sand and water do not have weight.
D. The same volume of sand and water sometimes have the same weight.

Q3

- (1) Garry poured cooked spaghetti and water into a strainer to separate the two matters. How does the strainer separate the spaghetti from the water?

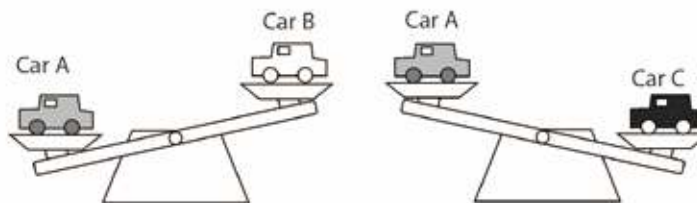
A strainer has holes that passes water. But it does not pass the spaghetti so that only the spaghetti remains on the strainer

- (2) A cup was placed under a dripping tap. After a while, water started spilling out. Why does the water spill out from the cup?

Because the space in the cup was already occupied by water.

- (3) A student compares the weight of three toy cars using a balance. His observation results are shown below. Which toy car is the heaviest?

Car C is the heaviest.



Q4

Kay filled a beaker with water up to 50 millilitres. She then put in a stone and the level of the water rose up to 75 millilitres.

- a) How many millilitres does the water level increase by?

25 mL

- b) Explain why the level of water rose when she put the stone into the beaker.

Because the stone took up some space in the beaker therefore, the level of water rose up.

- c) What is the volume of stone?

25 cm³

Chapter 3. Characteristics of Plants

Chapter Objectives

Students will be able to understand the characteristics of plants including their common parts by observing plants around them.

Students will be also able to classify plants according to a common feature of their roots, stems and leaves.

Topic Objectives

3.1 Observing Plants

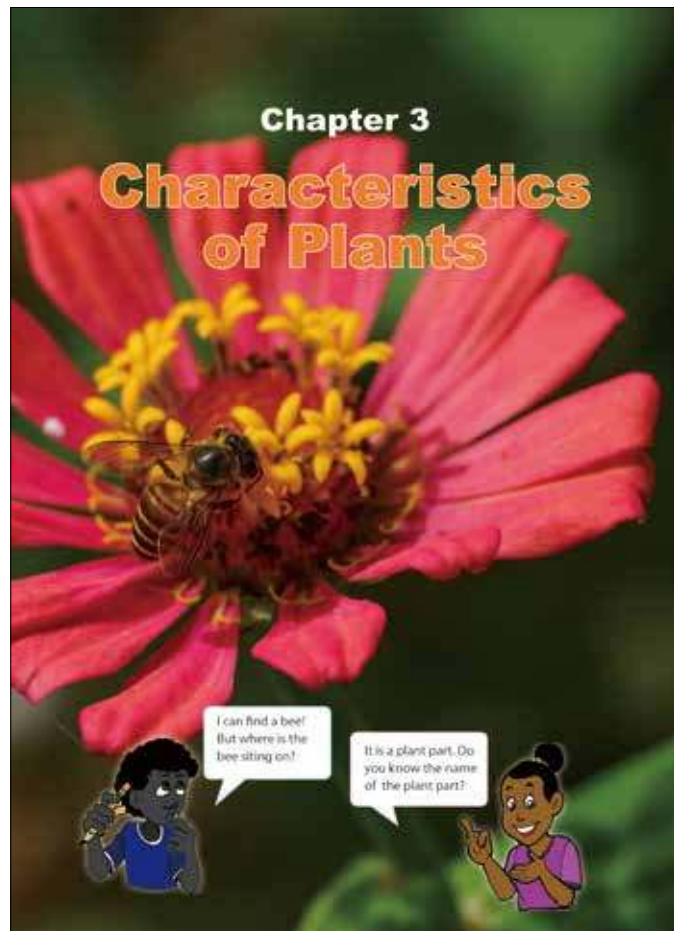
Students will be able to;

- Observe plants living in different places.
- Identify common parts of plants such as roots, stems, leaves and flowers.
- Describe how the plant uses its parts to meet their basic needs.

3.2 Grouping Plants

Students will be able to;

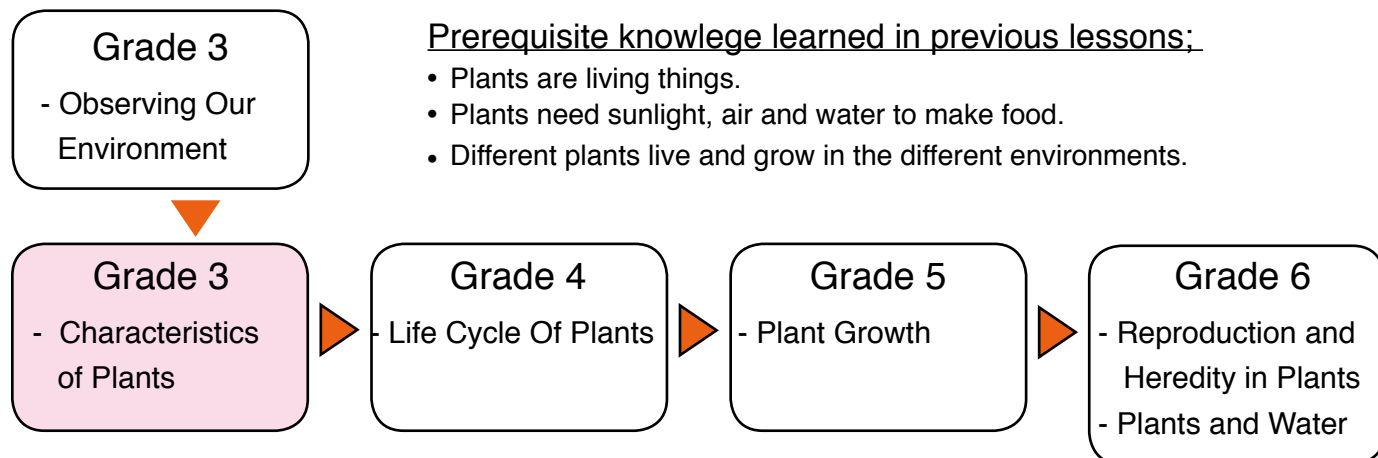
- Group roots into two types of roots, taproots and fibrous roots.
- Group stems by its colour, hardness and size
- Group leaves by shapes of its edge and blade and patterns of its vein.



Picture in the chapter heading in the textbook shows a flower that attracts a bee.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 9 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
3.1 Observing Plants	1	Plants around Us Where do plants live and grow?	3.1.1	67 - 68
	2	Observing Plant Parts How are the parts of plants common?		69 - 70
	3	Functions of Plant Parts How do plants use their parts?		71 - 72
	4	Summary and Exercise		73 - 74
3.2 Grouping Plants	5	How to Group Plants: Roots How can plants be grouped by their roots?		75 - 76
	6	How to Group Plants: Stems How can plants be grouped by their stems?		77 - 78
	7	How to Group Plants: Leaves How can plants be grouped by their leaves?		79 - 80
	8	Summary and Exercise		81 - 83
Chapter Test	9	Chapter Test		84 - 85

Lesson
1 / 9**Lesson Title****Plants around Us****Preparation**

- Chart paper, marker

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson on 'Living Things in the Environment' in Chapter 1.
- Show pictures about different environment as mentioned and ask;

Q: In what kinds of environment do living things live?

- Encourage students to think about the place where plants grow by asking;

Q: Where do plants live and grow?

2 Introduce the key question

Where do plants live and grow?

3 Activity (30 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw a school map in their exercise books.
- Remind students of safety rules.
- Have students observe around their school environment with the map and record the places where they find plants, the characteristics of the places and the name of the plants on the map.
- After observation, let students discuss and summarise findings in a group.
- Assist students to give correct names of plants.
- Give enough time for students to discuss their findings in groups

3.1 Observing Plants

Lesson 1: "Plants around Us"

- 1 Look around us! There are many different kinds of plants around us. Where can we find plants?
- 2 **? Where do plants live and grow?**
- 3 **Activity : Finding plants around us**

What to Do:

 1. Draw a school map like the one shown below.
 2. Go out of the classroom and find plants around your school.
 3. Record the place where you found the plants and also describe the characteristics of the place such as sunny, shady, wet or dry on the map.
 4. Share your ideas with your classmates. Talk about where the plants grow around your school.
- 4

The diagram shows a school map with the following labels: 'Pond' (with a note 'Wister sits on the water'), 'Garden' (with a note 'Hibiscus in sunny place'), 'School Building' (two locations), and 'More in shaded, moist place'. A hand is shown writing on the map, and a speech bubble says 'Let's record the name of the plants if you know!'.

Teacher's Notes**Important notes for outdoor activity**

- Make students to work in groups to find plants for safety reason and collaborative work.
- Let students to explore and names the plants (If students know local names only, other students or teacher can help them to know English names in the classroom.)
- Allocate different groups to different places, so that students can be able to identify different plants growing in various environments.
- Have ground rules for students for outdoor activity for safety purposes.
 - ➔ Plants are adapted to live in specific environments. They need certain temperatures to survive. Plants need the right amounts of rain and sunlight.
 - ➔ Plants are everywhere around us, but how do plants grow and what makes plants grow? There are many things plants need to grow such as water, nutrients, air, water, light, temperature, space and time.

Lesson Objectives

Students will be able to:

- Identify different kinds of plants in their surrounding environment.
- Describe the characteristics of the places where plants grow.

Assessment

Students are able to:

- Explain the types of the places where plants grow and their characteristics.
- Record the places where plants grow in a school map through their observation.
- Investigate cooperatively the plants around them.

Summary

Plants can be found in many places. Different plants grow and live in different places. They grow on the ground, in sunny places, in shady and moist places. Some plants grow in fresh or salt water.

Sunny Place

Many plants grow on the ground in sunny places. They get enough sunlight in these places.



Some plants grow in sunny places.

Shady and Moist Place

Some plants grow in shady and moist place. There is enough water for plants in shady and moist place.



Moss and fern grow in shady and moist places

Fresh and Salt Water

Many plants grow in water. There are two kinds of water; fresh and salt water. Some plants grow in or on fresh water and some live and grow in salt water.



Water lily grows in fresh water.



Seaweed grows in salt water.

4 Discussion for findings (15 min.)

- Draw a school map on a black board.
- Ask each group to present their findings.
- Write down their findings in the map on the blackboard.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q: In what kinds of place did you find plants?
(Sunny place, shaded place, moist place, water, etc)

Q: What kinds of plants did you find? (It depends on the school)

Q: Did you find different kinds of plants in the same place or different place? (Different kinds of plants live in different places.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard
- Ask these questions as assessment:
Q: In what places do plants live and grow?
Q: What are some examples of plants that live in water?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

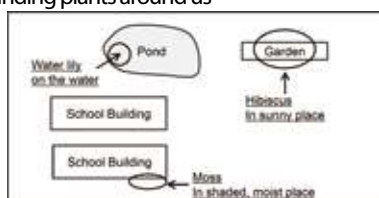
"Plants around us"

Key question

Where do plants live and grow?

Activity

Finding plants around us



Discussion

Q: In what kinds of place did you find plants?

Sunny place, shaded place, moist place, water, etc

Q: What kinds of plants did you find?

(It depends on school)

Q: Did you find different kinds of plants in the same place or different place?

Different kinds of plants live in different places.

Summary

- Different plants grow and live in different places.
- Plants grow in different places such as:
 - Sunny place e.g. Hibiscus, mango tree
 - Shaded and moist place e.g. moss
 - Fresh and Salt water: e.g. water lily

Lesson
2 / 9**Lesson Title****Observing Plant Parts****Preparation**

- Colours /crayons

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson.

Q: In what places do plants live and grow?

- Motivate students to think about the place where plants grow by asking;

Q: There are many different kinds of plants. How are the plants alike or different?

2 Introduce the key question

How are the parts of plants common?

3 Activity (25 min.)

- Organise students in some groups.
- Explain steps of activity.
- Let students go outside and find some plants with leaves, flowers and roots.
- Have students observe and sketch the plant.
- After drawing, let them label the parts of plant in their drawing.
- Ask students to discuss how the parts of plants look and summarise their findings on the chart in groups.

4 Discussion for findings (20 min.)

- Draw a picture of a plant on a black board.
- Ask each group to present their drawings and their findings. (Continue)

Lesson 2: "Observing Plant Parts"

- 1** Even though there are so many different kinds of plants, most plants have some parts that are common.

- 2** **? How are the parts of plants common?**

3 Activity : Observing parts of plants**What to Do:**

1. Go outside and bring a plant.
2. Observe the plant and sketch it in your exercise book.
3. Write the name of each plant part in your drawing.
4. Share your drawing with your classmates. Talk about the parts of plant and how plant parts are similar.

Let's observe a plant with flowers and roots!

**4**

What kinds of plant parts do you know? Flower, roots and mmm...

**Teacher's Notes**

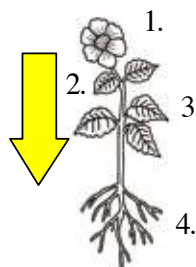
- Students bring various plants from homes and teacher must have own sample that consists of all plant parts.
- Remind students to select only one plant for this activity.
- There are flowering and non-flowering plants.
- This activity should use flowering plants which have roots, stem, and leaves.
- Scientific sketch is NOT an artwork. The sketch requires precise drawing. If the plant has two leaves, the sketch should have 2 leaves only as they are.

How to sketch drawing

Principle of sketch is 'top to bottom' and 'front side to back side'.

For instance, with the sample at right;

1. Start by drawing the flower of the plant.
2. Next draw the stem.
3. Next the leaf. Draw from front leaf to back.
4. Lastly draw the root.



Lesson Objectives

Students will be able to:

- Observe the parts of a plant.
- Identify the parts of a plant.

Assessment

Students are able to:

- Explain the common parts of a flowering plant as roots, leaves, stem and flowers.
- Draw and label parts of flowering plant.
- Develop eagerness towards observing different parts of plant.

Summary

Plants are made up of different parts. Most plants have the same parts, such as roots, stems and leaves. Some plants also have flowers.

Roots

Roots are the parts of the plants that are usually found under the soil. They hold the plants in the ground and keep them upright.

Stems

A **stem** connects the roots to other plant parts. Stems help hold the plant up.

Leaves

Many plants have flat and green **leaves**. A leaf is made up of a leaf stalk, veins and leaf blade.

Flowers

Some plants have flowers. Different plants have different shapes, sizes and colours of flowers.



Different parts of a plant



Roots hold a plant in the ground



A leaf stalk, a leaf blade and veins



Different shapes, sizes and colours of flowers

5

- Write down students' findings in the picture on the blackboard.
- Confirm the findings with students.
- **Based on their results**, ask the following question as discussion point.

Q:What kinds of plant parts did you find?

(Leaves, stem, roots, flowers, etc)

Q:How are the parts of plants different? (They are different in their shapes, colours, and sizes.)

Q:What are the common parts of all plants?

(Most plants have roots, leaves, flowers and stem in common.)

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard. (Refer to blackboard sample)
- Ask these questions as assessment:
Q:What are the common parts that make up a plant?
Q:Explain the characteristics of roots, leaves, flowers and stem.
Q:What makes plant parts different?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

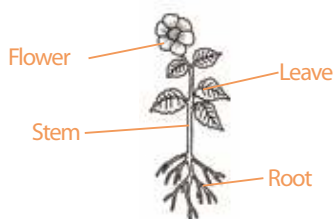
Title:

"Observing Plant Parts"

Key question

How are the parts of plants common?

Activity Observing Parts of plants



Discussion

Q:What kinds of plant parts did you find?

Leaves, stem, roots, flowers, etc

Q: How are the parts of plants alike or different?

The shape, colour, and size are different.

Q:What are the common parts of all plants?

Most plants have roots, leaves, flowers and stem in common.

Summary

- Most plants have roots, stems, leaves, and flowers in common.

1. Roots

They hold the plants in the ground and keep them upright.

2. Stems

Stems help hold a plant up.

3. Leaves

A leaf is made up of a leaf stalk, a leaf blade, and veins.

4. Flowers

Different plants have different shapes, sizes, and colours of flowers.

Lesson
3 / 9**Lesson Title****Function of Plant Parts****Preparation**

- Plant
- water,
- Food colouring,
- Glass
- container

Lesson Flow**1 Introduction (5 min.)**

- Review previous lesson

Q:What are the common parts that make up a plant?

- Arouse students to think about the place where plants grow by asking;

Q:How does each plant part help the plants?

2 Introduce the key question

How do plants use their parts?

3 Activity (25 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Have students observe two pictures of flowers in this activity and think about the reason why the colour of flower and leaves are changed.
- If possible, prepare the flowering plants and the coloured flowering plants with food colouring and show them to students.
- Advise students to refer to the character's talking for their investigation.
- Ask students to discuss the reason why the colour of flowers and leaves were changed and how a stem works based on their ideas in a group.

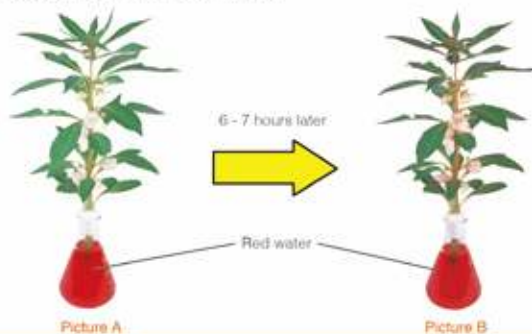
Lesson 3: "Function of Plant Parts"

- 1** Plants are made up of different parts. Each plant part helps the plant in different ways.

2 ? How do plants use their parts?**3 Activity : Function of a stem****What to Do:**

1. Look at the pictures below. A white flowered plant was placed into the red water (Picture A). After 6 - 7 hours, the colour of the flowers and leaves changed (Picture B).
2. Think about why the colour of the flowers and leaves changed to red.
3. Share your ideas with your classmates. Talk about why the colour of flowers and leaves have changed and how a stem works.

Look! The colour of flowers and leaves have changed to the same colour of the water. This means

**Teacher's Notes**Plant parts and its function

- The main parts of a plant are the roots, the stem and the leaves.
- The root takes in water and nutrients from the ground.
- The stem carries food, water and nutrient from the roots and leaves.
- A leaf uses sunlight and air to help the plant make food.
- This activity explains that those parts are connected and function together.

Facilitation Guide

- Prepare materials prior to lesson and try out.
- Red food coloring can be substituted to other water-soluble stains, however, the particles of those coloring is too big to be passed through the root and stem in most cases. Teachers are strongly suggested to find proper food color and plants prior to the lesson. Celery, Chinese cabbage and potato are good plants to use for this activity.
- The activity takes 6~8 hours and thus it cannot be covered in one lesson. The discussion and summary should be resumed in later lesson.

Lesson Objectives

Students will be able to:

- Identify the function of plant parts.
- Observe the changes in the colour of a plant parts.

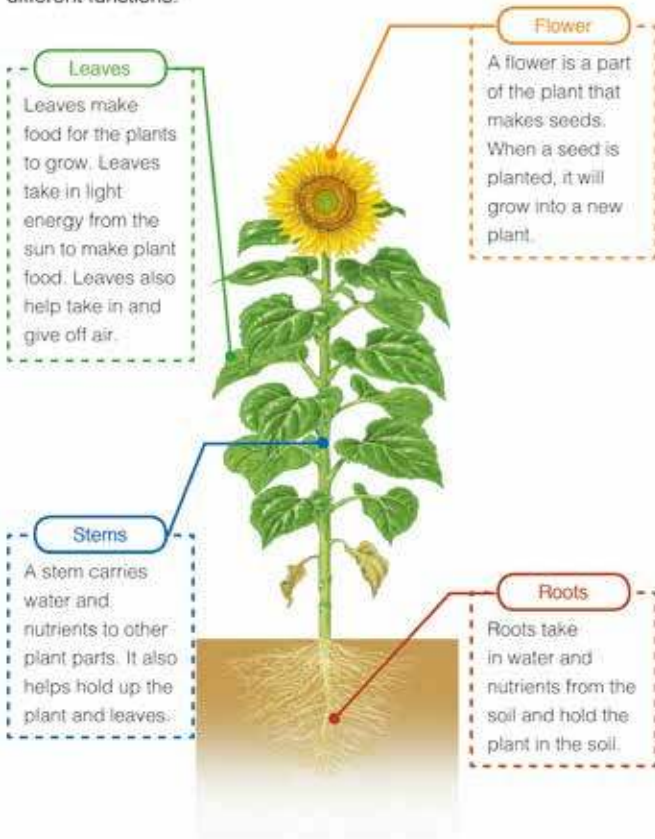
Assessment

Students are able to:

- Explain how each part of a plant works.
- Infer the reason why the colour of flowers and leaves were changed and how a stem works in the activity.
- Co-operate with others in conducting the experiment.

Summary

Plants use their parts to meet their basic needs. Each plant part has different functions.



4 Discussion for findings (20 min.)

- Ask each group to present their ideas.
- Write down students' ideas on the blackboard.
- Facilitate students taking part in the discussion actively.
- Confirm the ideas with students.
- **Based on their findings**, ask the following questions.

Q: Why did the flowers change colour from white to red, not blue or other colours? (Because the plant was placed into red coloured water)

Q: Which part of the plant helped the flowers and leaves change colour? (Stem)

Q: How does the stem work? (Stem carries water to the other parts of plants.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: Why do plants use their parts?
Q: What are the functions of plant parts such as roots, leaves, stems and flowers?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Function of plant parts"

Key question

How do plants use their parts?

Activity

Function of a stem.

Q: Why was the colour of flowers and leaves changed?

(Write down students' ideas here.)

Q: How did a stem work?

(Write down students' ideas here.)

Discussion

Q: Why did the flowers change colour from white to red, not blue or other colours?

Because the plant was placed into red coloured water and the red water came up to flowers and change the colour of the flowers to red.

Q: Which part of the plant helped the flowers and leaves change colour?

Stem

Q: How does the stem work?

Stem carries water to the other parts of plants.

Summary

Plants use their parts to meet their basic needs. Each plant part has different function.

1. Roots:

They take in water and nutrients from soil and hold the plant in the soil.

2. Stem:

It carries water and nutrients from roots to other parts.

3. Leaves:

They collect sunlight to make food to grow and help take in and give off air.

4. Flowers:

They are a part of plants that make seeds.

Lesson
4 / 9**Lesson Title****Summary and Exercise****Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents in this topic 'Observing Plants'.
- Ask some questions and verify student understanding.

Q:Where can we find plants? Sunny, shaded, moist, fresh and salt water.

Q:Were the plants same in different places? No

Q:What are the parts of plants? Roots, stem, leaves, flowers.

- Explain and correct learning contents again if they still have misconceptions.
- Provoke students to explain the basic needs of plants by asking.

Q:What do plants need in order to survive? Soil, water, air, sunlight and space.

- Ask students about plant parts and their functions in the growth and survival of a plant.

2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to their understanding.
- Question 1: Completion item. Ask students to recall their lessons and think of a suitable word to write in the blank space.
- Question 2: Multiple choice - 2 questions.
- Question 3: Short answer question - 2 questions.
- Question 4: Comprehension question. Allow students to think and answer the question in their own words.
- After the exercise, give them answers of the questions and explain the answers.

1**Summary and Exercise****Summary** 3.1 Observing Plants**Plants around us**

- ☐ Different plants grow and live in different places.
- ☐ Plants can be found in sunny places, shady and moist places and fresh and salt water.

**Parts of Plants**

- ☐ Most plants have parts that are common, such as roots, stem and leaves. Some plants also have flowers.

**Function of Plant parts**

- ☐ Each plant part has its function to help the growth of a plant.
 - Roots: Roots take in water and nutrients from soil and hold the plant in the soil.
 - Stem: A stem carries water and nutrients to the other plant parts. It also helps hold up a plant and its leaves.
 - Leaves: Leaves take in sunlight, make food for the plants and help take in and give off air.
 - Flower: A flower is the part of the plant that make seeds.

73

2**Summary and Exercise****Exercise** 3.1 Observing Plants

Q1. Complete each sentence with the correct word.

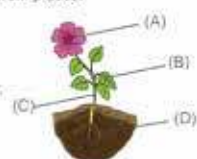
- _____ plants grow in different places.
- Most plants have parts that are common; roots, stem, flowers and _____.
- A _____ carries water and nutrient to plant parts.
- A _____ makes seeds and fruits.

Q2. Choose the letter with the correct answer.

- Why are plant roots under the soil?
 - To grow a flower in the ground.
 - To get sunlight in the ground.
 - Take in water from the soil.
 - To get air from the soil.
- Which of these sentences is correct about plants.
 - Different plants grow and live in different places.
 - All plants grow in sunny places.
 - No plants grow in fresh water.
 - Different plants cannot grow in different places.

Q3. Answer the following questions.

- Look at the picture on the right. Name the plant part beside each letter.
- What is the function of plant part (D)?



Q4. Which of the plant's needs would no longer be met if you cut off the roots?

74

Exercise answers

Q1.

- (1) **Different**
- (2) **leaves**
- (3) **stem**
- (4) **flowers**

Different plants are found in different places
Sunlight is one of the basic needs a plant needs.
Plant parts have different functions to perform in order to make the plant survive such as flower makes seeds and fruits.

Q2.

- (1) **C**
- (2) **A**

Roots take in water and nutrients from the soil and hold the soil and keep plants upright.

Q3.

- (1) (A) **flower**
- (B) **leaf(leaves)**
- (C) **stem**
- (D) **roots(root)**

- (2) **A stem transports water and nutrients to all parts of the plant.**

Q4. Example of the answer

Plants will have no water and nutrients taken from the roots and the plant would die

Explain that the function of plant's roots is to take water and nutrients from the soil.

Lesson
5 / 9**Lesson Title****How to Group Plants:
Roots****Preparation**

- A actual plant with its roots attached

Lesson Flow**1 Introduction (10 min.)**

- Review the lesson on 'Observing Plant Parts' in Topic 1 by asking:

Q: What are the common parts that make up a plant?

- Show the students a plant with its roots attached, ask:

Q: Do you think all plants have the same root like this one?

2 Introduce the key question

How can plants be grouped by their roots?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity.
- Instead of observing the pictures in this activity, teacher can also ask students to collect plants with roots for their observation. In this case, facilitate students to collect two kinds of plants that have taproots and fibrous roots.
- Have students record their findings in the table.
- Ask students to discuss how roots are alike or different based on their findings.

4 Discussion for findings (20 min.)

- Ask each group to present the findings from their activity. (Continue)

3.2 Grouping Plants

Plants are made up of different parts such as roots, stems, leaves and flowers. How can plants be grouped by their parts?

Lesson 1: "How to Group Plants: Roots"

- 1 Most plants have roots. Different plants have different roots. How can we group plants by their roots?
- 2 **?** How can plants be grouped by their roots?
- 3 **Activity : Comparing roots**

What to Do:

 1. Make a table like the one shown below.

How are they alike?	How are they different?

 2. Look at the pictures below. Observe the two kinds of roots and describe how they are alike or different in the table.
 3. Share your ideas with your classmates. Talk about how the roots are alike or different and how we can group plants by their roots.

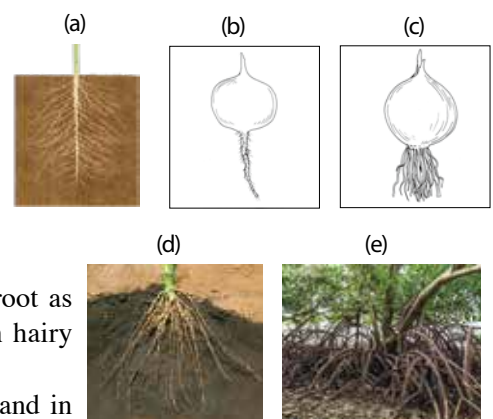
How can we compare two roots? Smell, size, colour and

Roots (A) Roots (B)
- 4

75

Teacher's Notes

- A taproot and a fibrous root are the major classification of the root system.
- Students may misunderstand a taproot has an edible root like a carrot, but the original definition is that it has a main dominant root with small roots (rootlets) shown as figure (a) regardless of the edibility.
- Students also may think a radish (b) and an onion (c) are the same root system because they look alike. But a radish (b) is a taproot composed of a main root and rootlets, conversely, an onion (c) is a fibrous root with many hairy roots.
- A root that expands large number of branches is called an adventitious root as shown in (d). A fibrous root is actually a type of adventitious root with hairy ones.
- An adventitious root can be found not only underground, but on surface and in air. Mangrove root (e) is a typical example of an aerial adventitious root.



Lesson Objectives

Students will be able to:

- Classify the plants into two groups based on the types of roots.
- Describe the differences between a taproot and a fibrous root.

Assessment

Students are able to:

- Explain how to group plants based on the shapes of roots.
- List the similarities and differences of taproots and fibrous roots in the table.
- Appreciate other student opinions and ideas.

Summary

Plants can be grouped by their roots. There are two major types of roots; taproots and fibrous roots.

Taproots

A **taproot** is a root that has one major root that grows very deep into the ground. Taproots can be long and thick. Smaller roots grow out from the main root. Plants like carrots have taproots.

Examples of Taproots



Fibrous roots

A **fibrous root** is a root that has many smaller roots that branch out in different directions. The roots tend to stay closer to the surface. Plants like onion, palm tree, corn and bamboo have fibrous roots.

Examples of Fibrous root



76

5

- Write down students' findings in the table on the blackboard.
- Confirm the findings with students.
- Students present their observation results from the activity.
- **Based on their findings**, ask questions as discussion points.

Q:What characteristics does Root (A) have?
(It has one thick and long part of root, small roots grow out from the thick and long root, etc.)

Q:What characteristics does Root (B) have?
(There are many smaller roots, many small roots branch out in different directions, etc)

Q:How can we group plants based on roots?
(We can group plants based on the shape of roots)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson.
- Ask these questions as assessment:
Q:What are the two main types of roots?
Q:What are the characteristics of taproots and fibrous roots?
Q:What are some examples of plants that have taproots and fibrous roots?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"How to group plants: Roots"

Key question

How can plants be grouped by their roots?

Activity Comparing roots

How are they alike?	How are they different?
Mainly hair like roots	Mainly a thick root in Root (A)
Roots spread out	Many small roots in Root (B)
etc	etc

Discussion

Q:What characteristics does Root (A) have?

It has one thick and long part of root, small roots grow out from the thick and long root, etc

Q:What characteristics does Root (B) have?

There are many smaller roots, many small roots branch out in different directions, etc

Q: How can we group plants based on roots?

We can group plants based on the shape of roots

Summary

There are two major types of roots.

1. Taproot

It is a root that has major root that grows very deep into the ground.

Taproots can be long and thick. Smaller roots grow out from the main root.

Plants like carrots have a taproot.

2. Fibrous root

It is a root that has many smaller roots that branch out in different directions.

The roots tend to stay nearer to the surface.

Plants like onion and corn have fibrous roots.

Lesson
6 / 9**Lesson Title****How to Group Plants:
Stems****Preparation**

• Nil

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lesson.

Q:What are the two main types of roots?

Q:What are the characteristics of taproots and fibrous roots?

- Encourage students to think about how to group plants by stems by asking;

Q:Plants can be grouped by the shape of roots.
Can we group plants based on the stem?

2 Introduce the key question

How can plants be grouped by their stems?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Have students do the activity.
- Instead of observing the pictures in this activity, teacher can also ask students to go outside and observe the stems of a tree and an herb. In this case, explain the ground rules for outside activity.
- Have students record their findings in the table.
- After that, ask students to discuss how stems are alike or different based on their findings in a group.

**Lesson 2: "How to Group Plants:
Stems"**

- 1** A stem is a plant part. How are stems alike or different?

- 2** **?** How can plants be grouped by their stems?

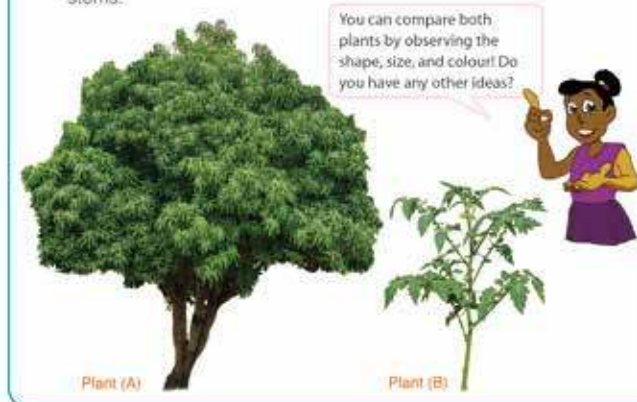
3 **Activity : Comparing stems****What to Do:**

1. Make a table like the one shown below.

How are they alike?	How are they different?

2. Look at the pictures below. Observe the stems of both plants and describe how their stems are alike or different in the table.

3. Share your ideas with your classmates. Talk about how stems are alike or different and how we can group plants by their stems.

4

77

Teacher's Notes

- Simple definition of
 - ➔ **Herbs** - any seed-bearing plant that does not have a woody stem and dies down to the ground after flowering.
 - ➔ **Shrubs** - a woody plant that is smaller than a tree and has several main stems arising at or near the ground.
 - ➔ **Trees** - a woody perennial plant, typically having a single stem or trunk growing to a considerable height and bearing lateral branches at some distance from the ground.
- Students should at least record 3 – 4 different plants stems in their table

	Tree	Herb
Shape		
Size/thickness		
Colour		
Hardness		
Texture		

Lesson Objectives

Students will be able to:

- Classify the plants into two groups based on the types of stems.
- Describe the differences between herbs, shrubs and trees.

Assessment

Students are able to:

- Explain how to group plants based on the colour, hardness and size of stems.
- List the similarities and differences of different stems of plants in the table.
- Respect each other's responses during discussion.

Summary

Plants can be grouped by their stems. We can group stems by their colour, hardness and size.

Soft, Thin and Green Stems

Some plants have soft, thin and green stems. Plants with soft and green stems are known as **herbs**. Plants like tomato, chilli and potato are herbs.

Hard and Woody Stems

Some plants have hard and woody stems. These stems are also taller and thicker than herbs. Plants with hard and woody stems may be **trees** or **shrubs**. Trees grow taller than shrubs. Plants like mango and coconut are trees. Bougainvillea, hibiscus and rose are shrubs.



Stem of Tomato

Examples of Trees



Mango trees



Coconut trees

Examples of Shrubs



Hibiscus



Bougainvillea

4 Discussion for findings (20 min.)

- Ask each group to present the findings from their activity.
- Write down students' findings in the table on the blackboard.
- Confirm the findings with students.

- **Based on their findings**, ask question as discussion points:

Q:What characteristics does the stem of the plant on the left have? (It is strong, thick, bigger, hard, etc.)

Q:What characteristics does the stem of the plant on the right have? (It is soft, thin, green, smaller, etc.)

Q:How can we group plants based on stems? (We can group plants based on the size, colour and hardness of stems.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask the following questions as assessment:
Q:What kinds of stems are there?
Q:How can we group the stems?
Q:What are the characteristics of herbs, trees and shrubs?
Q:What are some examples of herbs, trees and shrubs.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"How to group Plants: Stems"

Key question

How can plants be grouped by their stems?

Activity

comparing stems

How are they alike	How are they different
It is connected to roots.	Colour is different
It supports itself etc	Hardness is different. Size is different, etc

Discussion

Q: What characteristics does the stem of the plant on the left have?

It is strong, thick, bigger, hard, etc.

Q: What characteristics does the stem of the plant on the right have?

It is soft, thin, green, smaller, etc

Q: How can we group plants based on stems?

We can group plants based on the size, colour and hardness of stems.

Summary

- Plants can be grouped into herbs, trees and shrubs by their stems.

- We can group stems by their colour, hardness, and size.

1. **Herbs:** Plants with soft and green stems
e.g. tomato, rice, and potato
2. **Shrubs:** Plants with hard woody stems
e.g. roses, bougainvillea, etc
3. **Trees:** Plants with hard woody stems taller than shrubs
e.g. mango tree, coconut tree, etc

Lesson
7 / 9

Lesson Title

**How to Group Plants:
Leaves**

Preparation

- Different types of leaves

Lesson Flow

1 Introduction (10 min.)

- Review the last lesson:

Q:What kinds of stem are there?

Q:How can we group stems?

- Motivate students to think about how to group plants by their stems and ask:

Q:Plants can be grouped by the roots and stems.Can we also group plants based on the leaves?

2 Introduce the key question

How can plants be grouped by their leaves?

3 Activity (20 min.)

- Explain the ground rules for outside activity.
- Have students go outside and collect the different kinds of leaves as many as possible.
- After that organise students into some groups and explain the steps of the activity.
- Let students predict how to group leaves.
- Have students do the activity based on their prediction and ask them to record their findings in their exercise book.
- After that, ask students to discuss how plants can be grouped by their leaves based on their findings in a group.

**Lesson 3: “How to Group Plants:
Leaves”**

- 1** There are thousands of different plants. Different plants have different leaves.

- 2** **? How can plants be grouped by their leaves?**

3 **Activity : Comparing leaves**

What to Do :

1. Make a table like the one shown below.

How do you group leaves?

Can you guess how we can group leaves?

2. Go outside and collect different kinds of leaves.

3. Observe the leaves and group them.

4. Write how you grouped the leaves in the table.

5. Share your ideas with your classmates. Talk about how we can group plants by their leaves.

First, let's think about how you can group leaves.



Teacher's Notes

Facilitation Guide

- Variety of leaves enriches the activity. Teachers are requested to encourage students to collect various types of leaves within a limited time. It is highly recommended for teachers to check leaves around your classroom prior to the lesson for smooth facilitation.
- Leaves below are some example you may find in your school yard.



Mango



Hibiscus



Frangipani



Galip nuts



Taro



Tomato



Cassava



Bean

- Through this activity, students will learn the various ways of classification. Teachers should not limit the classification for only a few patterns but encourage them to discover various classification patterns.

Lesson Objectives

Students will be able to:

- Classify plants based on the leaves.
- Compare the properties of leaves.

Assessment

Students are able to:

- Identify the different properties of leaves.
- Describe how to group leaves based on their shape, size, colour and vein pattern.
- Listen to other's opinions with respect.

Summary

Plants can be grouped by their leaves in many ways. Different plants have different shape, size, colour and vein pattern of leaves. The following show some examples of how to group leaves.

Edges

Leaves can be grouped by the shape of their edges called the **leaf margin**. Some plants have smooth edges. Some plants have jagged edges.



Different Types of Leaf Margins

Blades

Leaves can be also grouped by the shape of their blades. Some plants have broad and flat blades. Some plants have needle-shaped or long blades.



Different Types of Blades

Veins

A **vein** is a tube that helps carry food, water and nutrients throughout the leaf. Different plants have different patterns of veins. Some plants have the veins that run parallel to each other. Some plants have netted veins that branch out from main veins.



Netted Veins



Parallel Veins

4 Discussion for findings (20 min.)

- Ask students to present how they grouped leaves.
- Write down students' findings in the table on the blackboard.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions as discussion points.

Q:What properties did you use when you grouped leaves? (Size, colour, shape, texture, smell, etc.)

Q:Which parts of leaves look different or alike? (Edges, blade, veins, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on a black board.
- Ask the following questions as assessment:
Q:What is a leaf margin?
Q: What is the meaning of vein?
Q: Give some examples of how to group leaves.
Q: How can we group plants based on veins?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"How to group Plants: Leaves"

Key question

Q: How can plants be grouped by their leaves?

Activity

Comparing leaves

How do group leaves?
Thin, thick, round
Size, Softness
Texture, smell
Hardness
Colour

Discussion

Q: What properties did you use when you grouped leaves?

Size, colour, shape, texture, smell, etc

Q: Which parts of leaves look different or alike?

Edges, blade, veins, etc

Summary

- Plant leaves can be grouped by their properties in many ways such as shape, size colour, texture and smell.

- Examples of how to group leaves:

- Edges:

An edge is called a **leaf margin**.

Leaves can be grouped by the shape of their edges.

- Blades:

Leaves can be grouped by the shape of their blade.

- Veins:

A **vein** is a tube that can help carry food, water, and nutrients throughout the leaf.

Some plants have the parallel veins.

Some plants have netted veins

Lesson
8 / 9**Lesson Title****Summary and Exercise****Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents in this topic
- Ask some focus questions to students and verify student understanding on;
 - How can we group plants?
 - How are plants be grouped by their stems?
 - What are three ways to group plants by their leaves?
- Explain the correct learning contents again if they still have misconceptions.
- Provoke students to give some examples of characteristics of plants that can be used to group plants.
- Ask students to describe some of these characteristics of plants.

1 Summary and Exercise **Summary** 3.2 Grouping Plants

How to Group Plants: Roots

- ☐ A **Taproot** is a root that has one major root with smaller roots.
- ☐ A **Fibrous** is a root that has many smaller roots.

How to Group Plants: Stems

- ☐ **Herbs** are plants with soft and green stems.
- ☐ **Trees** or shrubs are plants with hard and woody stems.

How to Group Plants: Leaves

- ☐ Leaves can be grouped by the shape of their **edges, blades and veins**.

81

2 Exercise & Explanation (30 min.)

- Explain to students that they will have to answer all the parts of four (4) questions in the exercise even if they are not completely sure of the answer(s).
- Allow student to try answering questions individually with enough time to respond.
- After the exercise, use student's answers to answer the questions.
- Explain how to solve the answer using the students' thoughts.

2 Summary and Exercise **Exercise** 3.2 Grouping Plants

Q1. Complete each sentence with the correct word.

- Roots, stems and leaves are plant _____ that can be used to group plants.
- The shape of the leaf's edge is known as the _____.
- A _____ has one major root that grows very deep into the ground.
- Herbs are plants that have soft and green _____.
- Plant leaves can also be grouped using netted and _____ veins.

Q2. Choose the letter with the correct answer.

- Which of the following plants does not have fibrous roots?
 - Coconut.
 - Grass.
 - Mango.
 - Corn.
- What does the 'blade' of a leaf refer to? It is referred to as:
 - Edges.
 - Colour.
 - Veins.
 - Flatness.

Q3. Answer the question below.
Study the pictures in the table. What is an example of a plant that has the leaf veins shown on the right.

Leaf Vein	Plant
(1) 	
(2) 	

Q4. How can you describe the difference between a tree and a shrub?

82

Exercise answers

Q1.

- (1) **parts**
- (2) **margin**
- (3) **taproot**
- (4) **stem**
- (5) **parallel**

- (1) Scientist use plants characteristics like the roots, stems and leaves to classify plants.
- (2) The shaped edges of a leaf is known as the margin.
- (5) When leaves are grouped by their veins, there will be two groups –netted and parallel veins.

Q2.

- (1) **C**
- (2) **D**

- (1) Mango has taproot while the others have fibrous roots.
- (2) The flatness or broadness of the leaf is known as the blade.

Q3.

Examples of the answers:

- (1) **Mango, guava, croton, hibiscus, rain tree, rose, bougainvillea**
- (2) **Grass, corn, lily, bamboo, coconut, betelnut, oil palm**

(1) All these plants have netted veins.

(2) All these plants have parallel veins.

Q4.

Example of the answers:

- **A tree is bigger than shrub.**
- **A shrub is smaller than a tree.**
- **A tree is big like a mango and shrub is small like a rose.**
- **A tree is bigger than shrub. An example of a tree is the mango and an example of the shrub is a rose.**

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the column.

3

Chapter 3
•Science Extras•

Plants can be also grouped by flowers into two: flowering plants and non-flowering plants.

Flowering Plants

Flowering plants are plants that make flowers. Flowering plants are the largest group of plants. About 90 percent of all types of plant make flowers. Rose, orchid, mango, banana and grass are examples of flowering plants.



Mango

Orchid

Rose

Non-flowering Plants

Non-flowering plants are plants that do not make flowers. Most of them live in shady or moist places. Ferns, mosses, fungus and seaweeds are examples of non-flowering plants.



Fern

Fungus

Moss

Seaweed

83

Chapter Test

3. Characteristics of Plants

Q1

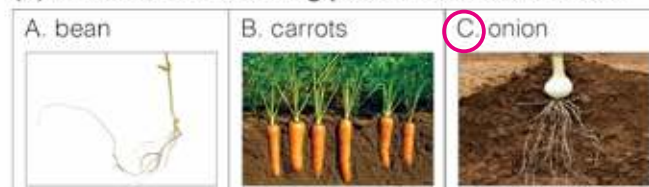
Complete each sentence with the correct word.

- (1) Most plants have the same parts in common; roots, leaves, flowers and stem.
- (2) Leaves are part of a plant that makes food for the plants to grow by taking light energy from the sun.
- (3) A fibrous root is a root that has many smaller roots that branch out in different directions.

Q2

Choose the letter with the correct answer.

- (1) Which part of a plant carries water and nutrients from the roots to the other parts of the plant?
A. vein **B. stem** C. leaf D. flower
- (2) Which of the following plants has fibrous roots?



- (3) Which of the statements is true about herbs, shrubs and trees?
A. Herbs have hard woody stems while shrubs and trees have soft green stems.
B. Herbs have soft green stems while shrubs and trees have hard woody stems.
C. Herbs and shrubs have small woody stems while trees have large woody stems.
D. Herbs have soft woody stems while shrubs and trees have hard woody stems.
- (4) Which statement is not true about different places where plants grow?
A. No plants grow in sea because of salt.
B. Plants can obtain enough sun light in sunny places.
C. Many plants grow on the ground in sunny places.
D. Moss and fern grow in shady and moist places because they need enough water.

Q3

- (1) A white flowered plant is placed into the red water as shown in the picture. What colour will the flowers be after 7 hours? Explain why.

The flower color changed to orange color, because stem of plant carries orange water to flower.



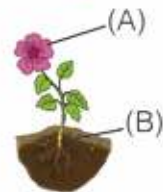
- (2) Look at the plant picture on the right. Name and state the function of the part of plant A and B.

A. Name Flower, which makes seeds to increase new plants.

Function _____

B. Name Roots, which takes in water and nutrients from soil, and hold the plant in the soil.

Function _____



- (3) Look at the picture of a plant leaf on the right. What do we call the type of veins in the picture?

Netted Veins



Q4

- (1) A part of a plant is removed as shown by the following pictures. Which of them is most likely to survive? State with your reason.

Without leaves	Without Flower	Without Roots	Without Stem

Plant without flower is the most likely to survive. If plants do not have leaves, stem and roots, they cannot make foods, take in water/nutrition, and carry these important things to whole parts of the plant.

- (2) Give an example of herbs and trees or shrubs found in your school, garden or at home.

Herb: Tomato, Cucumber, Onion, Banana, Corn, Grass etc

Tree or Shrub: Lemon, Guava, Hibiscus, Bougainvillea, Mango, Papaya, Pine etc

Chapter 4. Characteristics of Animals

Chapter Objectives

Students will be able to understand the characteristics of animals that are used to group animals into insects, fish, amphibians, reptiles, birds and mammals.

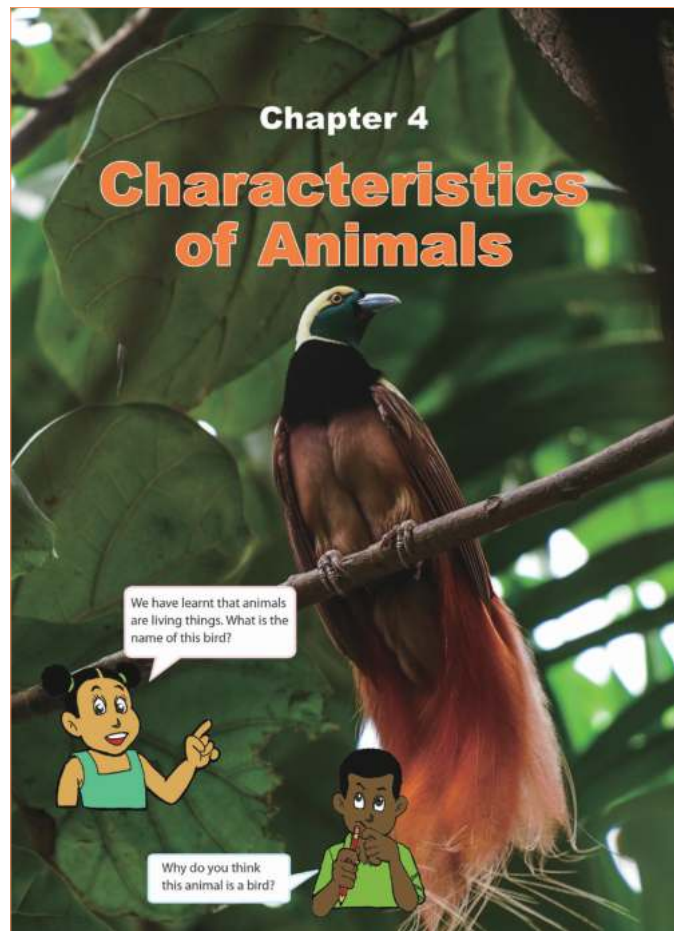
Students will be able to also observe animals and classify them into the groups according to the common characteristics of each animal group.

Topic Objectives

4.1 Observing Animals

Students will be able to;

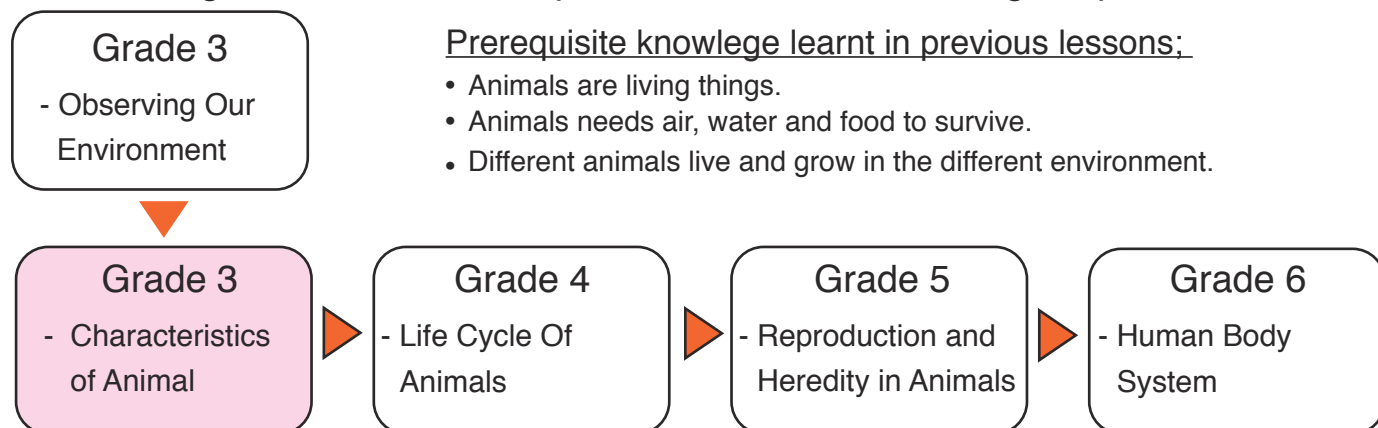
- Name the six animal groups; insects, fish, amphibians, reptiles, birds and mammals.
- Describe common characteristics of each animal group; insects, fish, amphibians, reptiles, birds and mammals.
- Identify how animals use their body parts for moving, protecting and using their senses.



Picture in the chapter heading on the textbook shows our national bird, 'Raggiana bird of paradise'.

Related Learning Content

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 10 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
4.1 Observing Animals	1	Animal Groups How can animals be grouped?	3.1.2	87 - 88
	2	Observing Insects What common characteristics do insects have?		89 - 90
	3	Observing Fish What characteristics do fish have in common?		91 - 92
	4	Observing Amphibians What characteristics do amphibians have in common?		93 - 94
	5	Observing Reptiles What characteristics do reptiles have in common?		95 - 96
	6	Observing Birds What characteristics do birds have in common?		97 - 98
	7	Observing Mammals What characteristics do mammals have in common?		99 - 100
	8	Animal Body Parts and Their Uses How do animals use their body parts?		101 - 102
	9	Summary and Exercise		103 - 105
Chapter Test	10	Chapter Test		106 - 107

Lesson
1 / 10

Lesson Title

Animal Groups

Preparation

Nil

Lesson Flow

1 Introduction (5 min.)

- Review the lessons in Topic 3-2: 'Grouping Plants':

Q:How can we group plants?

- Motivate students to think about how to group plants by their roots, stems and leaves and ask;

Q:Plants can be grouped by their roots, stems and leaves. Can we also group animals?

2 Introduce the key question

How can animals be grouped?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Identify the names of animals in the pictures with students.
- Have students do the activity and ask them to record their ideas in their exercise book.
- Advise students to refer to the character's talking for their investigation.
- After that, ask students to discuss how they grouped animals based on their findings in a group.

4 Discussion for findings (25 min)

- Ask students to present their ideas. (Continue)

4.1

Observing Animals

Lesson 1: "Animal Groups"

1 Look around you! There are many kinds of animals around us. What kinds of animals are there? How can we group animals?

2 ? How can animals be grouped?

3 🔍 **Activity : Grouping animals**

What to Do:

- Look at the pictures of different animals below.
- Group the animals based on your ideas. Record how you grouped the animals and the name of the animals in each group in your exercise book.
- Share your ideas with your classmates. Talk about how you grouped the animals and the name of animals in each group.

Let's observe the similarities of animals! How are they alike?



4

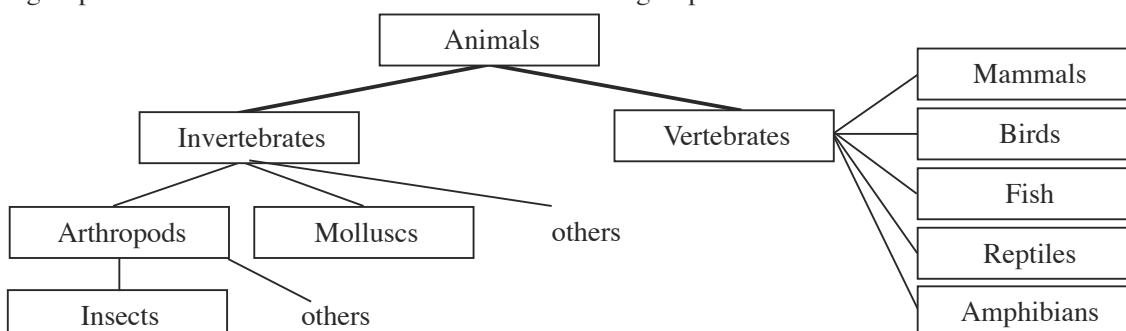
87

Teacher's Notes

Animals can be grouped into **vertebrates** and **invertebrates**.

Vertebrates are animals with **backbones**. Invertebrates are animals **without backbones**.

These groups of animals are further subdivided into smaller groups.



Lesson Objectives

Students will be able to:

- Classify the animals based on their characteristics.
- Describe how to classify animals.

Assessment

Students are able to:

- Group animals into insects, fish amphibians, reptiles, birds and mammals as animal groups.
- Explain how animals are alike or different.
- Co-operate in groups to find animals in their surroundings

Summary

We can group animals by their similarities. Some animals have similar body covering. Some have similar body parts. There are many ways to group animals but animals usually can be grouped as **insects**, **fish**, **amphibians**, **reptiles**, **birds** and **mammals**.



5

- Write down their ideas on the blackboard.
- Facilitate active students' discussion.
- Confirm the ideas with students.
- **Based on their ideas**, ask the following questions as discussion point.

Q:How many animal groups did you find? (It depends.)

Q:What did you base the groups on? (The number of legs, it can fly or not, it lives on land or in water, etc)

- Ask students to open their text book and explain how to group animals and different animal groups.

- Ask the question:

Q:How are the animals in each group similar? (It depends.)

- Have students group the animals in the activity into insects, fish, amphibians, reptiles, birds and mammals.
- Confirm their findings and conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson.
- Ask the following questions as assessment:
Q: What kinds of animal groups are there?
Q: How can animals be grouped?
- Ask students to copy the notes on the blackboard into their exercise books.

88

Sample Blackboard Plan

Title:

Animal Groups"

Key question

How can animals be grouped?

Activity

Grouping animals

	Name of animals
Group 1	Bee, butterfly, chicken
Group 2	Tilapia, shark
Group 3	Lizard, frog, crocodile
Group 4	Others, etc

Discussion

Q: How many animal groups did you find?

It depends on students' ideas.

Q: What did you base the groups on? The number of legs, it can fly or not, it lives on land or in water, etc

Q: How are the animals in each group similar?

Groups	Animals
insects	Six legs, can fly, etc.
Fish	No leg, fins, swim, etc
Reptiles	4 legs, scale, live on land
Birds	Fly, 2 legs, beak, etc
Amphibians	live in water and land, etc
Mammals	Fur, 4 legs, etc

Groups	Animals
insects	ant, bee, butterfly
Fish	tilapia, shark
Reptiles	snake, lizard, crocodile, turtle
Birds	chicken,
Amphibians	frog
Mammals	cat, horse

Summary

- Animals can be grouped by how they are alike.
- Usually, animals are grouped as **insects**, **fish**, **amphibians**, **reptiles**, **birds** and **mammals**.
- Each animal group has the similar characteristics.

Lesson
2 / 10**Lesson Title****Observing Insects****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q:What kinds of animal groups are there?

Q:How can we group animals?

- Encourage students to think about the characteristics of insects by asking:

Q:Insects are one of the animal groups. What characteristics do insects have?

2 Introduce the key question

What common characteristics do insects have?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity
- Remind students of safety rules
- Let students go outside with a jar and collect insects in the jar.
- Have students observe and sketch the insects.
- Instruct students to pay attention to the body parts when they draw the insects.
- Ask students to share their drawings and discuss the body parts of the insects.

4 Discussion for findings (15 min.)

- Ask each group to present their drawings and the body parts of the insects they found. (Continue)

Lesson 2: “Observing Insects”

- 1 Animals can be grouped by their similarities. All animals in the same group have some common characteristics.

- 2 **? What common characteristics do insects have?**

- 3 **Activity : Observing body parts of insects**

What to Do:

1. Go outside and fetch an insect.
2. Observe the body parts of the insect and sketch it in your exercise book.
3. Share your drawing with your classmates. Talk about the common characteristics of body parts of insects.

Do all insects have the same number of legs or not?

Let's observe the body parts of insects! What parts do insects have?

Grasshopper
Date: _____

Common characteristics: _____

Teacher's Notes

⚠ Caution: Some insects bite and sting, they should not be touched.

Below shows how to make and use quick trap made of plastic bottle to capture insects. Teachers should prepare and fix them one day before the lesson so that students can easily find insects within the given time.

- Use glass bottle, transparent plastic container or plastic bottle to keep insects for observation.
- Insects move and thus it may be difficult for students to observe. Using dead insects is good alternative.
- As described in teacher's note for topic “observing plants” scientific sketch is NOT an artwork. You must draw what you see. If you find the sample insect you catch misses one leg, you cannot add the missing leg, because it is different from the fact.

Lesson Objectives

Students will be able to:

- Identify the common characteristics of insects.
- Observe the common body parts of insects.

Assessment

Students are able to:

- Describe the common characteristics of insects such as legs, antennae, body covering and body parts.
- Illustrate the outline of insects with their parts labelled.
- Investigate the parts of insects with interest.

Summary

Butterfly, bees, dragonfly, grasshopper and ants are examples of insects. They have some common characteristics of body parts.

Legs

Insects have three pairs of legs (Six legs).

Body Parts

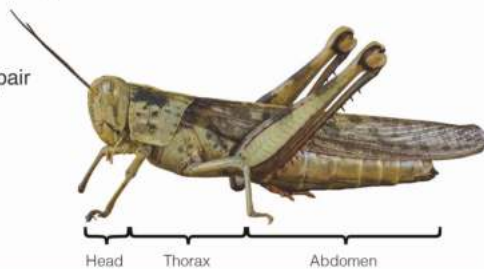
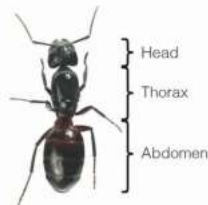
All insects have three parts; the head, the thorax and the abdomen.

Body Covering

Insects do not have bones like us. They have a hard outer covering. This covering protects insects and gives the insect its shape.

Antennae

Insects have a pair of antenna.



Discussion

Is a spider an insect?

1. Look at the picture of a spider on the right.
2. Think about the following questions:
 - "Is a spider an insect?"
 - Why do you think so?
3. Discuss your ideas with your classmates.



5

- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their observation**, ask the following questions:

Q:What kinds of the body parts did you find?
(Legs, wings, head, thorax, abdomen, antenna, etc)

Q:How many legs, bodies and antennas does the insect you observed have? (It has 6 legs, 3 body parts, and 2 antennas.)

Q:What body parts do the insects have in common? (6 Legs, 3 body parts, and 2 antennas)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarize today's lesson on the blackboard.
- Ask the following questions as assessment:
Q:What are the common characteristics of insects?

6

- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion(5 min.)

- Let students think about the questions in 'Discussion' in groups.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion

Sample Blackboard Plan

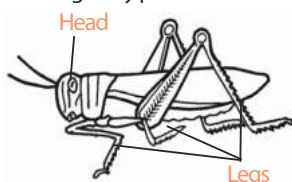
Title:

"Observing Insects"

Key question

What common characteristics do insects have?

Activity Observing body parts of insects



Discussion

Q: What kinds of the body parts did you find?

Legs, wings, head, thorax, abdomen, antenna, etc

Q: How many legs, bodies, and antennas does the insect you observed have?

It has 6 legs, 3 body parts, and 2 antennae.

Q: What body parts do the insects have in common?

6 Legs, 3 body parts, and 2 antennae

Summary

- Insects have some common characteristics:
 - 6 legs
 - 2 antennae
 - 3 body parts (head, thorax, abdomen)
 - Hard outer body covering
- Not all insects have wings e.g. An ant

Lesson
3 / 10**Lesson Title****Observing Fish****Preparation**

- A real fish
- Pictures of fish, hand lens,

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q:What are the common characteristics of insects?

- Encourage students to think about the characteristics of fish by asking:

Q:Insects have some similar characteristics. What about fish?

2 Introduce the key question

What characteristics do fish have in common?

3 Activity (25 min.)

- Organise students into groups .
- Explain the steps of the activity.
- Have students to do the activity and ask them to record their findings in the table.
- Refer students to the pictures of the fish and the characters' talking in the activity for their investigation..
- If possible, prepare different kinds of real fish for this activity.
- Ask students to discuss the common characteristics of fish based on their findings in their groups

4 Discussion for findings (20 min.)

- Ask each group to present their findings about the common characteristics of fish. (Continue)

Lesson 3: "Observing Fish"

- 1** Fish is one of the animal groups. How are fish similar?



What characteristics do fish have in common?

2

3



Activity : Characteristics of fish

What to Do:

1. Make a table like the one shown below.

Fish	Characteristics
What is it covered with?	
What parts does it use to move?	
What are other characteristics?	

2. Observe the pictures of the fish below and complete the table based on your observation.

3. Share your ideas with your classmates. Talk about the common characteristics of fish.



Let's think about how fish move or breathe and where they live!

How can we find the common characteristics of their body parts? ... the shape and colour of their bodies are different.....

**Teacher's Notes**

Fish is a vertebrate animal and its characteristics are summarised as follows.

- Live in the water
- Mostly lay eggs (*)
- Have a backbone
- Cold-blooded
- Breathe through gills
- Mostly have scales
- Have fins

Example: sharks, salmon, tuna, rays

*Some fishes apparently give birth to live young. However, they actually lay eggs and retain the eggs inside the body until the hatch to avoid risks. They are called 'livebearers'.

Dolphins and whales

Dolphins and whales are vertebrate animals that also live in water. However, they don't lay eggs and give birth to live young. They have mammary glands which in females produce milk for feeding (nursing) their young. They are warm blooded. Unlike fish, who breathe through gills, they breathe air through their lungs. Therefore, dolphins and whales must make frequent trips to the surface of the water to catch a breath.

Lesson Objectives

Students will be able to:

- Identify the common characteristics of fish
- Explain the functions of common characteristics of body parts of fish

Assessment

Students are able to:

- Describe that fish has fins, scales and gills as the common characteristics
- State the functions of fins, scales and gills
- Participate actively in investigating the common characteristics of fish

Summary

All fish have some similar characteristics.

Fins

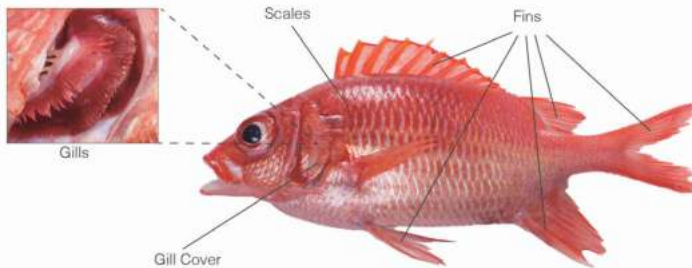
Fish live in fresh or salt water. Fish do not have legs, but they have **fins**. Fins help fish swim in water.

Body Covering

The body of fish is covered with **scales**. The scales help protect the fish.

Gills

Fish use their **gills** to help them breathe in water.



Discussion

Are dolphins fish?

1. Look at the picture of the dolphin shown on the right.
2. Think about the following questions:
 - Is dolphin a fish?
 - Why do you think so?
3. Discuss your ideas with your classmates.



5

- Write down students' findings on the blackboard
- Confirm their findings with students.
- **Based on the findings**, ask the following questions.

Q:What body parts do fish have in common?
(Fin, Scales, and Gills)

Q:Which part of the fish helps them to swim in water? (The fins)

Q:Which part of the fish helps them to breathe in water? (The gills)

Q:Which part of the fish helps to protect them?
(The scales)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions:

Q:What are the common characteristics of fish?

Q:What are the functions of fins, gills and scales?
- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion(5 min.)

- Let students think about the questions in 'Discussion' in their groups.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion.

Sample Blackboard Plan

Title:

"Observing Fish"

Key question

What characteristics do fish have in common?

Activity

Characteristics of Fish

	characteristics
What is it covered with?	Scales
What part does it use to swim?	Fins
Any other characteristics?	Fish has gills, no legs, no feather or fur, etc

Discussion

Q:What body parts do fish have in common?

Gills, scales and fins

Q: Which part of the fish helps them to swim in water?

The fins

Q: Which part of the fish helps them to breathe in water?

The gills

Q: Which part of the fish helps to protect them?

The scales help to protect the fish.

Summary

• Fish have similar characteristics:

- Fish live in fresh and salt water.
- Fish use **fins** to swim in water.
- A fish is covered with **scales** to protect its body.
- Fish use **gills** to breathe in water.

Further Discussion

Q: Is dolphin a fish? No

Q: Why do you think so?

This is because the dolphin is not covered with scales, it cannot breathe in water.

Lesson
4 / 10**Lesson Title****Observing Amphibians****Preparation**

- Live frog
- Pictures of frogs

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q: What are the common characteristics of fish?

- Arouse students to think about the characteristics of amphibians by asking:

Q: Fish have some similar characteristics. What about amphibians?

2 Introduce the key question

What characteristics do amphibians have in common?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity and ask them to record their findings in the table.
- Refer students to the pictures of a frog and the characters' talking in the activity for their investigation.
- If possible, prepare different kinds of live frog (amphibians) for this activity.
- Ask students to discuss the characteristics of frog (amphibians) based on their findings.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity (Continue).

Lesson 4: "Observing Amphibians"

- 1 Frogs are examples of amphibian. What characteristics do amphibians have?

- 2 **? What characteristics do amphibians have in common?**

3 Activity : Characteristics of a frog**What to Do:**

1. Make a table like the one shown below.

Frog	Characteristics
Where does it live?	
What is it covered with?	
What parts does it use to move?	
What are other characteristics?	

2. Observe the picture of a frog shown below and write its characteristics in the table.

3. Share your ideas with your classmates. Talk about the characteristics of a frog.

**Teacher's Notes**

- Amphibians are cold-blooded vertebrates. They live part of their lives in water and on land.
- Amphibians absorb water and undergo gas exchange through their skin.

Examples of amphibians

- common toad - Tailless nocturnal insectivorous amphibian usually found on land and not very adept at jumping; its body is covered with small outgrowths.
- Newt - Amphibian with a flat tail found mainly in freshwater and usually feeds on insects.
- Salamander- Nocturnal amphibian, mainly insectivorous, with a tail; they are land and aquatic species.
- Tree Frog- Small tailless, usually insectivorous amphibian found mostly in trees near water; its digits are fitted with suction cups.

⚠ Caution

- Organise a member of the class group who is able to catch a frog to catch one before this lesson and put in a clear jar.
- After the frog is caught, it must be kept in a clear jar with a lid with punched in holes for the frog to breathe.

Lesson Objectives

Students will be able to:

- Identify the common characteristics of amphibians.

Assessment

Students are able to:

- Describe the common characteristics of amphibians based on their living places, breathing and their body parts.
- Show curiosity to learn about frogs

Summary

All animals in the group of amphibians have similar characteristics. Frogs, newts and salamanders are examples of amphibians.

Living Places

Amphibians can live in water and on land.

Breathing

The body of an amphibian is covered with moist skin. Moist skin help amphibians breathe in water. They also breathe air on land.

Legs

Amphibians have four legs. Their legs help them to move in water and on land.



Newt



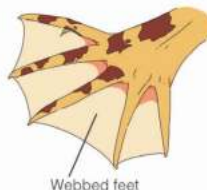
Salamander



Discussion

How do the webbed feet help frog?

- Look at the picture shown on the right.
- Think about the following question.
 - "Frogs have webbed feet. How do webbed feet help frogs?"
- Discuss your ideas with your classmates.



5

- Write down students' findings on the blackboard.
- Confirm the findings with students.
- Based on their findings**, ask the following questions.

Q:Where do frogs live? (Both on land and in water)

Q:What are frogs covered with? (They are covered with skins)

Q:How do frogs breathe? (They breathe through their lungs, etc)

Q:How do they move? (They move with their legs.)

- Conclude with discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the black board.
- Ask the following questions:

Q:What are the common characteristics of amphibians?

Q:Give some examples of amphibians.

- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion(5 min.)

- Let students think about the questions in 'Discussion' in their groups. Ask each group to present their answers and confirm them with students. Conclude the further discussion.

Sample Blackboard Plan

Title:

"Observing Amphibians"

Key question

What characteristics do amphibians have in common?

Activity Characteristics of a frog

Questions on the characteristics of frogs	Characteristics
Where it lives	Land and water
What is it covered with?	Moist skin
What part does it use to move with?	Four legs
Any other characteristics?	Lays eggs, etc

Discussion

Q: Where do frogs live?

Both on land and in water

Q: What are frogs covered with?

They are covered with skin.

Q: How do frogs breathe?

They breathe with lungs, etc

Q: How do they move?

They wail, jump and swim with their legs.

Summary

- Amphibians have similar characteristics:

- Living Places:

Amphibians can live in water and on land.

- Breathing:

Amphibian is covered with moist skins. Moist skins help amphibians breathe in water.

They also breathe air on land.

- Legs:

Amphibians have four legs. Their legs help them to move in water and on land.

- Frogs, newts, and salamanders are examples of amphibians.

Lesson
5 / 10**Lesson Title****Observing Reptiles****Preparation**

•NIL

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q:What are the common characteristics of amphibians?

- Motivate students to think about the characteristics of reptiles by asking:

Q:Amphibians have some similar characteristics. How are reptiles alike?

2 Introduce the key question

What characteristics do reptiles have in common?

3 Activity (15 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise book.
- Have students do the activity and ask them to record their findings in the table.
- Refer students to the pictures of a lizard and crocodile and the characters' talking in the activity for their investigation.
- Ask students to discuss the characteristics of the lizard and crocodile based on their findings.

4 Discussion for findings (25min.)

- Ask students to present their findings from their activity. (Continue)

Lesson 5: "Observing Reptiles"

- 1** Reptiles are one of the animal groups. Lizards, crocodiles and turtles are examples of reptiles. How are they alike?

- 2** **? What characteristics do reptiles have in common?**

3 **Activity : Observing lizard and crocodile****What to Do:**

1. Make a table like the one shown below.

Reptiles	Characteristics of Lizard	Characteristics of Crocodile
What is it covered with?		
What parts does it use to move?		
What are other characteristics?		

2. Observe the pictures of a lizard and a crocodile shown below.

Write their characteristics in the table.

3. Share your ideas with your classmates. Talk about the common characteristics of lizards and crocodiles.



Lizard



Crocodile



Let's observe their body parts! What parts do they use to move?



Sometimes we can find crocodiles in water. Can they breathe in water like fish?

Teacher's NotesAdditional information on reptiles

- Reptiles are vertebrate animals. Turtles, crocodilians, snakes, lizards, amphisbaenians and tuatara are the member of this group. Turtles have bony shell and live in water. Snakes don't have legs. They seem to be a different animal group, however, they have similarities; 1) mostly lay eggs, 2) covered with scales (small hard plates), 3) cold-blooded (taking body heat from surroundings) and 4) breathe through lungs
- Turtles are characterised by a special bony shell developed from their ribs which serves as a shield.
- Crocodilians are the largest reptiles which firstly appeared 95 million years ago (in the age of the dinosaurs).
- Lizards typically have four legs, feet and external ears. The adult length varies from a few centimetres to nearly 3 meters. The 'Papuan monitor', known as one of the longest lizards in the world, lives in the southern part New Guinea island (The world's largest lizard commonly recognized is 'Komodo dragon' which is much heavier and massive than the Papuan monitor but it is longer than Komodo dragon).
- Snakes are thought to have evolved from lizards. It had been specialised to live underground and lost its legs as a result.
- Amphisbaenians are also known as worm lizards characterised by long bodies, legless shape and rudimentary eyes.
- Tuatara lizard like reptiles are found only in New Zealand. They are considered to be the last survivors of reptiles that thrived in the age of the dinosaurs.

Lesson Objectives

Students are able to:

- Identify the common characteristics of reptiles.
- Compare the characteristics of reptiles.

Assessment

Students are able to:

- Describe the common characteristics of reptiles.
- List the similar characteristics of the lizard and the crocodile in a table.
- Co-operate actively with classmates during the investigation.

Summary

All animals in the group of reptiles have some similar characteristics.

Breathing

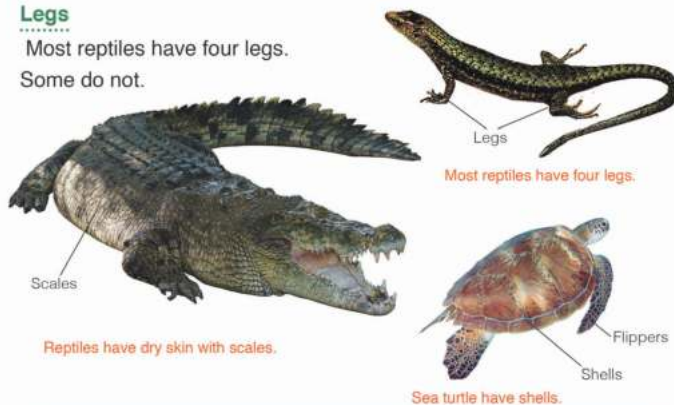
All reptiles breathe air. Some reptiles live in water but they cannot breathe underwater.

Legs

Most reptiles have four legs. Some do not.

Body Covering

Reptiles have **dry skins** that are usually covered with **scales**. Some reptiles have **shells**.



Discussion

How does a snake look different?

1. Think about the following question.
 - "Snakes are reptiles but they look different from other reptiles. How are snakes similar to or different from other reptiles?"
2. Discuss your ideas with your classmates.



5

- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q:How is a lizard and a crocodile alike? (They have legs, dry skin, live on land and lay eggs, etc.)

Q:What are other animals that have similar characteristics like lizards and crocodiles? (Turtle, gecko, snake, etc)

- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask the following questions:
 - Q:What are the common characteristics of reptiles?
 - Q:Give some examples of reptiles.
- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion (5 min.)

- Let students think about the question in 'Discussion' in their groups.
- Ask each group to present their answers and confirm them with students.

Sample Blackboard Plan

Title:

"Observing Reptiles"

Key question

What characteristic do reptiles have in common?

Activity Observing Lizard and Crocodile

Common characteristics	Characteristics of lizards	Characteristics of crocodiles
What is it covered with?	Scaled-like skin	Scaled-like skin
What parts do they use to move?	Use legs	Use legs
Any other?	Live on land, lay eggs, etc	Live on land, lay eggs, etc

Discussion

Q: How is a lizard and a crocodile alike?

They have legs, have dry skin, live on land, lay eggs, etc

Q:What are any other animals that have similar characteristics like lizards and crocodiles?

Turtle, gecko, snake etc

Summary

- Reptiles have some similar characteristics:

- Breathing:

All reptiles breathe air.

- Legs:

Most reptiles have four legs. Some don't have legs.

- Body Covering:

Reptiles have dry skins that are usually covered with scales. Some reptiles have shells

- Turtle, gecko, snake, crocodile, and lizard are examples of reptiles.

Lesson
6 / 10**Lesson Title****Observing Birds****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson

Q: What are the common characteristics of reptiles?

- Arouse students to think about the characteristics of reptiles by asking

Q: Reptiles have some similar characteristics. How about birds?

2 Introduce the key question

What characteristics do birds have in common?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise book.
- Have students do the activity and ask them to record their findings in the table.
- Refer the students to the pictures of the bird of paradise and the egret and the characters talking in the activity for their investigation.
- Ask students to discuss the characteristics of birds based on their findings.

4 Discussion for findings (25 min.)

- Ask students to present their findings from their activity. (Continue)

Lesson 6: "Observing Birds"

- The bird of paradise and the cassowary are examples of birds. How are they alike? What characteristics do they have?

- ? What characteristics do birds have in common?**

3 Activity : Observing birds**What to Do:**

- Make a table like the one shown below.

Birds	Characteristics
What are they covered with?	
What parts do they use to move?	
What are other common characteristics?	

- Observe the pictures of birds shown below. Find their common characteristics and write your findings in the table.

- Share your ideas with your classmates. Talk about the common characteristics of birds.



Bird of paradise



Egret

Let's observe the body parts of birds! How do they move? What part do they use for eating?

**Teacher's Notes****Additional information on birds**

- Birds are vertebrate animals adapted for flight.
- Many can also run, jump, swim and dive. Some, like penguins, have lost the ability to fly but have retained their wings.
- Everything about the anatomy of a bird reflects its ability to fly. The wings, for example, are shaped to create lift. The leading edge is thicker than the back edge and they are covered in feathers that narrow to a point. Airplane wings are modelled after bird's wings.
- The tail feathers are used for steering.
- Even the way a bird reproduces is related to flight. Instead of carrying the extra weight of developing their young inside their bodies, they lay eggs and incubate them in a nest.
- They use their beaks to grab and swallow food. Birds use beaks for drinking, feeding their young and preening.
- Birds use beaks and feet as weapons to defend themselves, their nests and their chicks.

Lesson Objectives

Students are able to:

- Identify common characteristics of birds.
- Compare the characteristics of birds.

Assessment

Students are able to:

- Describe the common characteristics of birds based on breathing and body parts.
- List the similar characteristics of the bird of paradise and the egret in a table.
- Co-operate actively with classmates during investigation.

Summary

All animals in the group of birds have similar characteristics.

Breathing

All birds breathe air.

Wing and Feather

Birds have two **wings**. The wings help birds fly. Birds are covered with **feathers**. No other animal has feathers.

Leg and Beak

Birds have two legs and a **beak**. A bird's beak shows how the bird eats. Some birds have a curved beak that helps them to eat seeds or fruits. Some have a long beak that helps gather nectar from flowers.



5



Different Types of Beak



Discussion

How does a beak help birds?

1. Think about the following question:
 - "Ducks live in lakes or ponds. They have wide flat beak. How does the beak help ducks?"
2. Share your ideas with your classmates.



A duck has a wide flat beak.

6

- Write down students' findings on the blackboard.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q:How is a bird of paradise and an egret alike? (They have wings to fly, covered with feathers and a beak, etc)

Q:How do birds breathe? (They breathe air with their lungs, etc.)

Q:Why are the beaks of birds different in shapes? (It depends on the different kinds of food they eat, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask the following questions:
 - Q:What are the common characteristics of birds?
 - Q:Give some examples of birds?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion (10 min.)

- Let students think about the question in 'Discussion' in their groups.
- Ask each group to present their answers and confirm them with students.
- The beak helps to ladle small animals, insects and plants out of the water.
- Conclude the further discussion.

Sample Blackboard Plan

Title:

Observing Birds

Key question

What characteristics do birds have in common?

Activity

Observing birds

	Characteristics
What are they covered with?	Feathers
What parts do they use to move?	Wings and legs
Any other common characteristics?	Beak, lungs

Discussion

Q: How is a bird of paradise and an egret alike?

They have wings to fly, covered with feathers and have a beak, etc

Q: How do birds breathe?

They breathe air with lungs, etc

Q: Why are the beaks of birds different in shapes?

They eat different kinds of food, etc

Summary

- Birds have similar characteristics:

- Breathing:

All birds breathe air.

- Wing and Feather:

Birds have two wings.

Birds are covered with feathers.

- Leg and Beak:

Birds have two legs and a beak.

A bird's beak tells about how a bird eats.

Different birds have different shaped beaks.

Lesson
7 / 10**Lesson Title****Observing Mammals****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q:What are the common characteristics of birds?

- Encourage students to think about the characteristics of mammals by asking:

Q:Birds have similar characteristics. How about mammals?

2 Introduce the key question

What characteristics do mammals have in common?

3 Activity (15 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise book.
- Have students do the activity and ask them to record their findings in the table.
- Refer students to the pictures of some mammals in the activity for their investigation.
- Ask students to discuss the characteristics of mammals based on their findings.

4 Discussion for findings (25 min.)

- Ask students to present their findings from their activity.
- Write down students' findings on the blackboard. (Continue)

Lesson 7: "Observing Mammals"

- Human beings, pigs, dogs and tree kangaroos are some examples of mammals. How are they alike?

- ? What characteristics do mammals have in common?**

3 Activity : Common characteristics of mammals**What to Do:**

- Make a table like the one shown below.

Mammals	Common Characteristics
What are they covered with?	
What parts do they use to move?	
How do they breathe?	
What are other characteristics?	

- Observe the pictures of some mammals shown below.

- Find the common characteristics of the mammals and write your findings in the table.

- Share your ideas with your classmates. Talk about the common characteristics of mammals.



Wallaby



Tree Kangaroo



Cuscus

Teacher's Notes**Additional information on mammals**

- Mammals are vertebrate animals. They give birth to live young. They have mammary glands which in females produce milk for feeding (nursing) their young. That is why they are called mammals.
- All mammals are viviparous except for the platypus that lives in Australia. It lays eggs but has mammary glands.
- The young of mammals are carried within the mother's womb and grow to relatively advanced stage of development before birth. In the marsupials (e.g. kangaroos, cuscus and wallabies), the newborns are incompletely developed at birth and continue to develop in pouchlike shelters attached to the area around female's mammary glands.
- Bats have mammary glands and give birth to live young. Thus, they are mammals. They are the only mammals that are naturally capable of flying.
- Hair is a typical mammalian feature, although it has disappeared in many dolphins and whales.
- Mammals breathe air using their lungs.

Lesson Objectives

Students will be able to:

- Identify the common characteristics of mammals.
- Infer the common body parts of mammals by comparing some mammals

Assessment

Students are able to:

- Describe the common characteristics of mammals based on breathing and body parts.
- List the similar characteristics of the different kinds of mammals in a table.
- Respect other students' responses

Summary

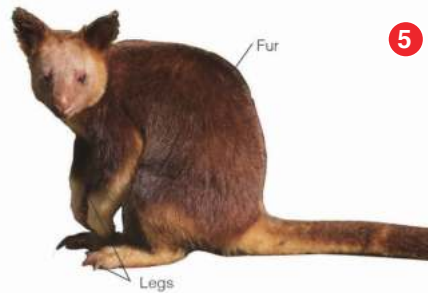
Animals in the group of mammals have some common characteristics.

Body Covering

Most mammals have fur.
Some mammals have hair.

Body Parts

Most mammals have legs.
Some mammals such as dolphins and whales have flippers and flukes instead of legs.



A tree kangaroo has fur and four legs.



A dolphin has flippers and fluke.



A whale is a mammal. It breathes air with lungs.

Breathing

All mammals use **lungs** to breathe air. Lungs are body parts used for breathing. Whales and dolphins come to the surface of the ocean to breathe air.



Discussion

Are sugar gliders birds?

1. Think about the following question:
 - "A sugar glider can fly like a bird. Is a sugar glider a bird or not? Why do you think so?"
2. Share your ideas with your classmates.



Sugar glider can fly!

100

- Confirm the findings with students.
- **Based on their findings**, ask the following questions.

Q:How are mammals alike? (They are covered with fur or hair, have 4 legs and they live on land, etc)

Q:A whale and a dolphin are similar to fish, but they are mammals. Why are they mammals and not fish? (They don't have gills. They breathe air with their lungs.).

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask the following questions:
 - Q:What are the common characteristics of mammals?
 - Q:Give some examples of mammals?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion (5 min.)

- Let students think about the question in 'Discussion' in their groups.
- Ask each group to present their answers and confirm their answers with students..

Sample Blackboard Plan

Title:

"Observing Mammals"

Key question

What characteristics do mammals have in common?

Activity Common characteristics of mammals

	Common Characteristics
What are they covered with?	Fur or hair
What parts do they use to move?	Legs
How do they breathe?	With their lungs
Any other characteristics?	Give birth to live young, etc

Discussion

Q: How are mammals alike?

They are covered with fur or hair, have 4 legs, they live on land, etc

Q: A whale and a dolphin are similar to fish, but they are mammals. Why are they mammals and not fish?

They don't have gills. They breathe air with lungs.

Summary

- Mammals have similar characteristics:
 - Body Covering: Most mammals have **fur**. Some animals have **hair**.
 - Body Parts: Most mammals have legs. Some mammals such as dolphins and whales have **flippers** and **flukes**
 - Breathing: All mammals use **lungs** to breathe air. Whales and dolphins come out the ocean to breathe air.

Lesson
8 / 10**Lesson Title****Animal Body Parts and Their Uses****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the last lesson:

Q: What are the common characteristics of mammals?

- Motivate students to think about the different uses of animal body parts by asking:

Q: All animals in each group have common body parts. How do animals use their common body parts?

2 Introduce the key question

How do animals use their body parts?

3 Activity (30 min.)

- Organise students to work in groups.
- Explain the steps of the activity.
- Ask students to draw the table into their exercise books.
- Refer students to the pictures and the character's talking in the text book.
- Have students do the activity, and ask them to record their findings in the table.
- After that, ask students to discuss how animals use their body parts based on their findings.

4 Discussion for findings (20 min.)

- Draw a table on the black board.
- Ask students to present their findings from the activity.
- Write down students findings in the table on the black board. (Continue).

Lesson 8: "Animal Body Parts and Their Uses"

- 1** Animals in each animal group have common body parts. Let's summarise animal body parts and study how animal body parts help animals.

2 ? How do animals use their body parts?**3 Activity : Animals using their body parts.****What to Do:**

1. Make a table like the one shown below.

	Fish	Amphibian	Reptile	Bird	Mammal
What parts do animals use to move with?					
How do animals move?					
What are animals covered with?					
How do animals use their body covering?					
What parts do animals use to eat with?					
Are there any other uses of animals' coverings?					

2. Think of what you have studied about animals and complete the table.

3. Share your ideas with your classmates.

Talk about how animals use their body parts.



Do you remember? Eyes, ears, nose and mouth are also body parts! How do animals use them?

101

Teacher's Notes

	Fish	Amphibian	Reptile	Bird	Mammal
What parts do animals use to move?	fins	legs	legs	wings, legs	legs, flippers
How do animals move?	swim	walk, swim	walk	fly, walk	walk, swim
What are animals covered with?	scale	moist skin	scale, shell	feather	fur, hair
How do animals use their body covering?	protection	Breathing in water	protection	keep warm	keep warm
What parts do animals use to eat?	mouth	mouth	mouth	beak	mouth
Any other parts and how do animals use them?	gills to breathe	---	---	---	---

- Some animal groups may have a variety of animals with different types of body parts used for a similar purpose.
- Likewise, some animal body coverings may be used for more than one purpose.

Lesson Objectives

Students will be able to:

- Identify how animals use their body parts.
- Explain the importance of animal body parts.

Assessment

Students are able to:

- Explain the different ways that animals use their body parts according to their movements, protections and senses.
- Describe the reason why animal body parts are important.
- Listen to the other students' opinions with respect.

Summary

Animals use their body parts in many ways to survive.

Moving

Animals use their body parts for moving. Most birds use their wings to fly. Fish use their fins to swim. Reptiles, amphibians and mammals have legs that help them walk, run, hop and hold on things.



Birds use wings to fly.



Frogs use legs to hop.



Fish use fins to swim.

Protections

Animals use their body parts to protect themselves. Some animals have scales or shells that help protect them from other animals. Some animals have feathers, furs or hairs that help keep them warm and dry.

Senses

Animals have senses that help them feel, smell, hear, see and taste things. These senses help keep animals safe. Animals use noses to smell, ears to hear and eyes to see. Animals use their mouth to taste and eat food. Some animals use antennae to feel.

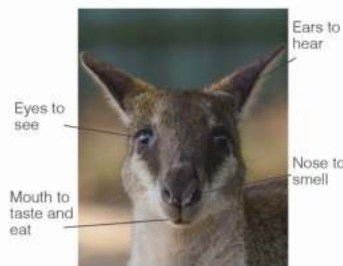
Can you give other examples of how animals use their body parts?



5



A shell protects turtles from other animals



Senses and body parts

- Facilitate active students' discussion.
- Confirm the findings with students.
- **Base on their findings** ask the following questions as discussion points:

Q:How do animals use their body parts to move? (They use their legs to walk or run, their wings to fly, their fins to swim in water, etc)

Q:How do animals use their body parts for protection? (They use their scales or shells to protect themselves from other animals, they use their feathers, furs, or hairs to help keep them warm, etc)

Q:How do animals use their eyes, ears, nose, and mouth? (Eyes to see, ears to hear, nose to smell and mouth to taste.)

Q:Why are animal's body parts important? (To survive)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions:
Q:How do animals use their body parts?
Q:Why are animals' body parts important?
Q:How are senses helpful to animals?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title: "Animal Body Parts and their Uses"

Key question

How do animals use their body parts?

Activity

Animals using their body parts.

	Fish	Amphibian	Reptile	Bird	Mammal
What parts do animals use to move?					
How do animals move?					
What are animals covered with?		Refer to Teacher's Note			
How do animals use their body covering?					
What parts do animals use to eat?					
Any other parts and how do animals use them?					

Discussion

Q: How do animals use their body parts to move?

They use legs to walk or run, they use wings to fly, etc

Q: How do animals use their body parts for protection? They use scales to protect themselves from other animals, they use feathers, furs, or hairs that help keep themselves warm. etc.

Q: How do animals use their eyes, ears, nose, and mouth? Eyes to see, ears to hear, nose to smell, mouth to taste.

Q: Why are animal's body parts important? To survive

Summary

Animals use their body parts to survive in many ways:

1. For moving
2. For protecting themselves and keeping them warm
3. Use their senses to keep them safe

Lesson
9 / 10**Lesson Title**
Summary and Exercise**Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents in this topic
- Ask some questions to students and verify student understanding. Explain and correct learning contents again if they still have misconceptions.
- Ask students the names of six main animal groups
- Provoke students to tell some animal names in each animal group with its common characteristics.
- Ask students what body parts animals use for moving, protection and their senses.

2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding.
- After the test, give them answers of the questions and explain how to solve the questions by asking student's answers and thought.
- Guide students well to understand the main ideas or concepts in response to their answers.
- If concept is still difficult for the students to understand, then do experiments again or demonstrate if necessary.

1Summary
and
Exercise**Summary** 4.1 Observing Animals**Animals around us**

- ☐ We can find many different kinds of animals around us. Animals can be grouped into insects, fish, amphibians, reptiles, birds and mammals.

Observing animals

- ☐ Animals in different groups have common characteristics.

	Insects	Fish	Amphibians
			
Breathing	(study later)	Gills	Moist skins and lungs
Legs	Six legs	No legs (fins)	Four legs
Body covering	Hard outer covering	Scales	Moist skins
Other common body part	A pair of antenna		

	Reptiles	Birds	Mammals
			
Breathing	Lungs	Lungs	Lungs
Legs	Four legs (turtles have flippers and snakes have no legs.)	Two legs and two wings	Four legs (dolphins have flippers and fluke.)
Body covering	Scales (some have shells)	Feathers	Fur and hair
Other common body part		A beak	

How animals use body part

- ☐ Animals use their body parts for moving, protection and for sensing.

103

2Summary
and
Exercise**Exercise** 4.1 Observing Animals

Q1. Complete each sentence with the correct word.

- Animals can be grouped into insects, fish, amphibians, reptiles, birds and _____.
- An _____ has three pairs of legs.
- The body of an _____ is covered with moist skin.
- Fish use _____ to swim.
- Turtles have shells for _____ from other animals.

Q2. Choose the letter with the correct answer.

Which of following characteristics is wrong about mammals?

- Most mammals have fur or hair.
- Most mammals have four legs.
- All mammals use lungs to breathe.
- Most mammals have dry scales.

Q3. Answer the following questions.

- Write the name of the animal group for each of the pictures below.

					
A. Butterfly	B. Frog	C. Cassowary	D. Crocodile	E. Shark	F. Dolphin

- What body parts do animals use for the following.

A. Hearing sound	B. Seeing objects	C. Smelling
D. Tasting and eating	E. Flying	F. Walking

Q4. Fill the blanks in the sentence below.

Pegasus (see picture on the right) is an imaginary creature.
It is not a bird because it has four _____ to run.
It is not a mammal too because it has two _____ with feathers to fly.



104

Exercise answers

Q1.

- (1) **mammals**
- (2) **insect**
- (3) **amphibian**
- (4) **fins**
- (5) **protection**

Some animals have shells to protect themselves from other animals.

Q2.

D

Common characteristics for mammals are A, B and C. Most reptiles have dry scales.

Q3.

- (1) A. **Insects**
- B. **Amphibians**
- C. **Birds**

Cassowary is one of the biggest birds in the world.

- D. **Reptiles**
- E. **Fish**

Shark use gills to breathe in the water.

- F. **Mammals**

Dolphin is a mammal. Dolphin use lungs to breathe air and have fins instead of legs.

- (2) A. **Ear**
- B. **Eyes**
- C. **Nose**
- D. **Mouth**
- E. **Wings**
- F. **Legs**

Q4.

It is not a bird because it has four **legs** to run. It is not a mammal, too, because it has two **wings** with feathers to fly.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Introduce unique animals in Papua New Guinea which are the world's biggest butterfly and world's smallest frog. Both animal species are discovered only in Papua New Guinea.
- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the column.
- Provoke students to think about how our land has unique and precious natural environment for animals

3

Chapter 4
• Science News •

Biggest and Smallest in the World

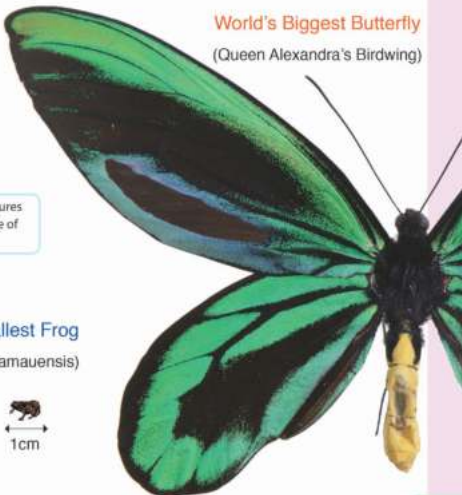
Various kinds of animals live in the forest of our country, Papua New Guinea. The **world's biggest butterfly** is found in Oro Province. The **world's smallest frog** was discovered in Abau in Central Province.

The world's biggest butterfly's wingspan can reach up to 28cm, which would be larger than your face. On the other hand, the world's smallest frog is less than 1cm, the same size as your finger nail. Both animals are only found in our country.



The size of this pictures is near to actual size of the animals.

World's Biggest Butterfly
(Queen Alexandra's Birdwing)



World's Smallest Frog
(Paedophryne amauensis)



1cm

105

Chapter Test

4. Characteristics of Animals

Q1

Complete each sentence with the correct word.

- (1) Animals can be grouped as insects, fish, reptiles, birds, mammals and Amphibians.
- (2) An animal that has skin covered with dry scales is called Reptiles.
- (3) An animal that has hair or fur and four legs is called Mammals.
- (4) An animal that has wings, feathers and beak is called Birds.
- (5) Toads belong to Amphibians because they have moist skin.

Q2

Choose the letter with the correct answer.

- (1) Which of the following characteristic is wrong about fish?
 - A. Covered with scales on their body for protection.
 - ☒ B. Use their lungs to help them breathe in water.
 - C. Live in fresh and salt water.
 - D. Has fins instead of legs.
- (2) Which of the following characteristic is correct about Amphibians?
 - ☒ A. Their soft moist skins help them breathe in water and on land.
 - B. Tortoise is amphibian because it lives in water and on land.
 - C. Amphibian has fins to swim in water.
 - D. Frog, salamander and snake are Amphibians.
- (3) Which of the following characteristic is correct about birds?
 - A. Birds breathe air by gills.
 - B. Birds have a pair of antenna to fly.
 - ☒ C. Shape of bird's beak varies depending on how a bird eats.
 - D. Sugar glider is a kind of bird because it can fly in the sky.
- (4) Which of the following groups of animals would come under insects?
 - A. turtle, crocodile, cuscus, frog
 - B. grasshopper, butterfly, mosquito, spider
 - ☒ C. sardine, snake, prawn, crab
 - D. ants, beetle, bees, dragonfly

Q3

Study the animals shown in the box below and answer the questions.



A. Parrot



B. Anemone fish



C. Cat



D. Dolphin



E. Shark



F. Crocodile



G. Frog



H. Cuscus



I. Bird of Paradise



J. Bees

- (1) Name the animals that belong to "Fish" and "Amphibian" from the picture above and describe the differences between them.

Fish are "B. Anemone fish" and "E. Shark". Amphibian is "G. Frog". Fish has gills to breathe in water, but amphibian breathe on land and water. Fish body is covered by scale but amphibian skin is dot and moist. Amphibian uses legs to move, while fish uses fins.

- (2) A dolphin has been under water for a long time. Predict what will happen.

Dolphin will come out water to breathe air by lungs.

- (3) Classify the above animals into 3 groups according to their way of moving. Use the table below to classify them.

Way of moving and used body parts	Name of Animals
Using wings to fly	Parrot, Bird of paradise, Bees
Using fins/flippers to swim	Anemone fish, Dolphin, Shark,
Using legs to walk, run, hop etc	Cat, Crocodile, Frog, Cuscus

Q4

- (1) Look at the picture of a crab on the right:

Is a crab an insect? Give your reason.

Crab is not insect, because the body parts are not separated as the head, the thorax and the abdomen. The number of legs are also more than three pairs.



- (2) What would you need to think about to care for a pet frog?

Amphibian lives both in water and on land, thus we should provide both water and land area in their aquarium.

Strand : PHYSICAL SCIENCE

Unit : ENERGY

Chapter 5. Energy

Chapter Objectives

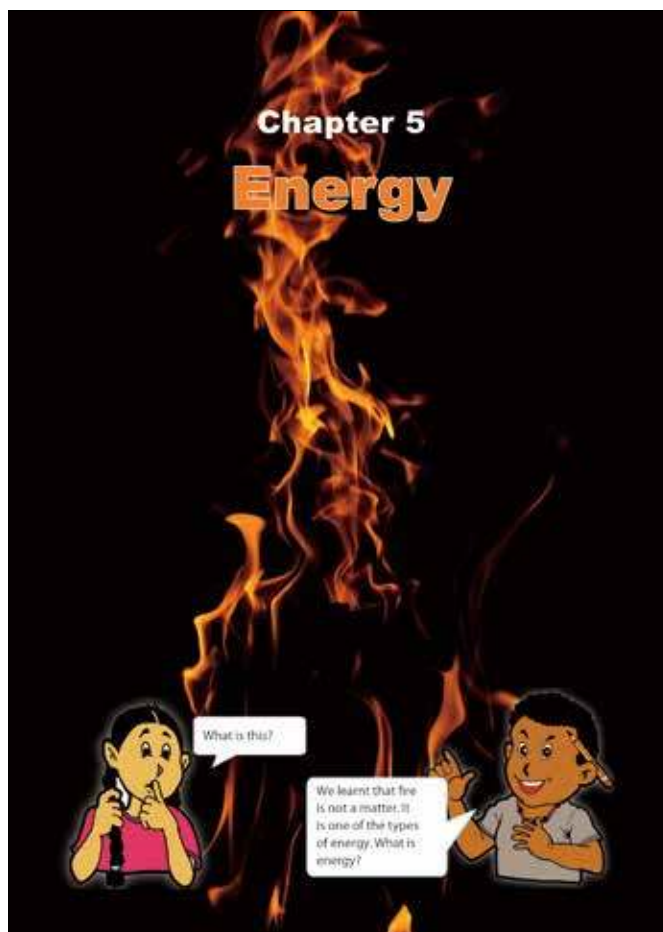
Students will be able to recognise types of energy around us as light, electrical, heat and sound energy and their uses in our lives.

Topic Objectives

5.1 Energy around Us

Students will be able to;

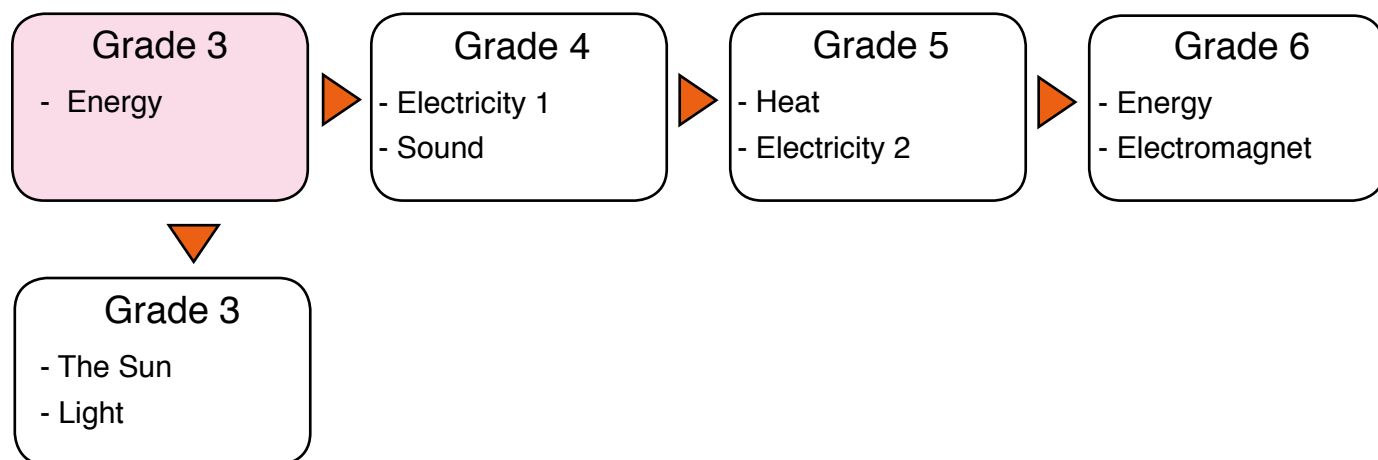
- Identify different types of energy in daily life such as light, electricity, heat and sound.
- List the uses of light, electrical, heat and sound energy in our daily lives.



Picture in the chapter heading on the textbook shows a fire from burning wood as one of the sources of heat energy.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 4 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
5.1 Energy around Us	1	Energy What is Energy?	3.2.1	109 - 110
	2	Uses of Energy How do we use energy in our daily life?		111 - 112
	3	Summary and Exercise		113 - 115
Chapter Test	4	Chapter Test		116 - 117

Lesson
1 / 4**Lesson Title**
Energy**Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Encourage students to think about energy by asking this question.

Q: Have you ever heard about energy?

Q: What do you imagine what energy is?

2 Introduce the key question

What is Energy?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity and ask them to record their findings in the table.
- Advise students to refer to the pictures in the activity and the character's talking for their investigation.
- After that, ask students to discuss how light, electricity, heat and sound help us based on their findings as a group.

4 Discussion (20 min.)

- Ask students to present their findings from the activity.
- Write students finding on the blackboard.
- Facilitate active student discussion. (Continue)

5.1 Energy around Us

Lesson 1: "Energy"

1 Have you heard about energy? Energy is everywhere around us. When we play rugby, watch television or cook food, energy is happening all around us.

2 **? What is energy?**

3 **Activity : What if there is no energy?**

What to Do:

1. Think about the following questions:

- What will happen if we cannot use light?
- What will happen if we do not have electricity?
- What will happen if we cannot use heat?
- What will happen if we cannot hear sound?

2. Share your ideas with your classmates. Talk about how light, electricity, heat and sound energy help us.

What will happen if there is no light, electricity, heat and sound?

Where are you? I cannot see you... I am here!

I cannot use a electric jar... why??

I am feeling cold...

What are you saying? I cannot hear your voice,...

Teacher's Notes

Energy is a word with more than one meaning. In **science** it is mostly used to describe how much potential a physical system has to change. In physics, energy is a property of matter. It can be transferred between objects and converted in any form but it cannot be created or destroyed.

Demonstrating the definition of energy

Students use energy every day of their lives but do not realise that energy enables things to work.

- The definition "energy is the ability to do things" could be demonstrated by using a flashlight. Students know that a flashlight only works (lights up) when it has batteries in it. Demonstrate by switching on the flashlight without the battery. At this point students will know that it needs something to make it light therefore you should ask "what does the flashlight need to make it work?" The answer would be battery obviously.
- You carefully explain that the battery has energy and that this energy enables the flashlight to do something which is to "light up" when it is switched on. Teacher should demonstrate now with the battery in the flashlight.

Lesson Objectives

Students will be able to:

- Define energy.
- Identify the different types of energy around them.

Assessment

Students are able to:

- Explain what energy can do.
- Describe how different types of energy such as light, electrical, heat and sound help people.
- Investigate the different kinds of energy with interest.

Summary

Energy is the ability to do work. Energy can change and move things. It can also make things happen. For example, heat is energy. When we light a candle, heat from the flame melts the candle. Light is also energy. When we turn on the room light, the light makes the room bright.

There are many different types of energy around us. The following are some examples of energy.

Light Energy

Light is energy that we can see. Without light, we cannot see the things around us. We get the powerful light energy from the sun.



Electrical Energy (Electricity)

Electricity is energy that we use to run electric appliances. Electricity comes from batteries or power points in a house.



Heat Energy

Heat is energy that makes things warm. We get heat energy from burning something or rubbing two things together such as our hands. The powerful heat energy also comes from the sun.



Sound Energy

Sound is energy that we hear. Sound is all around us. We make sound when we talk or sing. Music is made of sounds that are produced.



5

- Confirm the findings with students.
- **Based on their findings**, asks the following questions as discussion points.

Q:How can light help us? (Light helps us to see the things around us, etc.)

Q:How can electricity help us? (Electricity helps us run electrical appliances, move something, etc.)

Q:How can heat help us? (Heat makes things warm, cook food, etc.)

Q:How can sound help us? (Sound helps us to listen to music, talk or sing, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
 - Q: What is energy?
 - Q: What types of energy are there?
 - Q: What are light, electrical, heat and sound energy?
 - Q: Explain how light, electrical, heat and sound energy work.
- Ask students to copy the notes on the blackboard into their exercise books.

110

Sample Blackboard Plan

Title:

"Energy?"

Key question

What is energy? (Write students answers)

Example: heat energy

Activity

What if there is no energy?

- We wouldn't see anything without light
- We wouldn't watch television without electricity
- We wouldn't keep warm without heat
- We wouldn't hear anything or talk with each other.

Discussion

Q: How can light help us?

Light helps us to see the things around us, etc.

Q: How can electricity help us?

Electricity helps us run electric appliances, move something, etc.

Q: How can heat help us?

Heat makes things warm, cook food, etc.

Q: How can sound help us?

Sound helps us to listen to music, talk or sing, etc.

Summary

- **Energy** is the ability to do work.
- Energy can change and move things. It can also make things happen.
- There are different types of energy such as light, electrical, heat, and sound.
- **Light** is energy that we can see.
- **Electricity** is a form of energy that we can use to run electrical appliances.
- **Heat** is energy that makes things warm.
- **Sound** is energy that we can hear.

Lesson
2 / 4**Lesson Title****Uses of Energy****Preparation**

• Nil

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson

Q: What is energy?

Q: What types of energy are there?

- Encourage students to think about the uses of energy by asking the question:

Q: We need energy for our daily lives. How do we use energy?

2 Introduce the key question

How do we use energy in our daily life?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Have students do the activity and ask them to record their findings in the table.
- Advise students to refer to the picture in the activity and the character's talking for their investigation.
- After that, ask students to discuss how people use energy in daily life based on their findings as a group.

4 Discussion (20 min.)

- Ask students to present their findings from the activity.
- Write students finding on the blackboard.
- Facilitate active student discussion. (Continue)

Lesson 2: "Uses of Energy"

- 1** Energy is everywhere around us. We need energy for our daily life.

- 2**  How do we use energy in our daily life?

- 3**  **Activity : How people use energy**

What to Do:

- Look at the picture below. Find light, heat, sound and electric energy in the picture.
- Write the name of the energy you found and the ways that people use the energy in your exercise book.
- Share your ideas with your classmates. Talk about how people use the energy in their daily life.

Do you have any other ideas on how people use energy?

**Teacher's Notes**

Here are some examples to provoke students' thinking of how energy is used.

- When we are cold what type of energy do we need to keep warm? Ask students to describe examples of how to keep warm. Possible answers: We rub of hands together, make a fire and sit next to it or wear warm thick clothing to trap our body heat.
- If you were walking back after a feast at night from the next village. What kind of energy would you use to make it easy for you to walk safely to your village?
Possible response: Use a solar flashlight, a mobile phone flashlight, dry cell (battery) flashlight, use a burning wood or tied coconut fronds.
- What kind of energy is used when a little baby wants to let the mother know that it is hungry or is uncomfortable?
Possible answers: the baby will use sound energy when it cries to alert the mother.
- What kind of energy is used to light up the street lights? Possible answer: electrical energy

Lesson Objectives

Students will be able to:

- Identify the ways to use different types of energy in daily lives.

Assessment

Students are able to:

- Explain how people use light, electrical, heat, and sound energy in their daily life.
- Investigate the uses of energy with interest.

Summary

Energy is important for us. We use energy in many ways.

Light Energy

We use light energy to make a room bright. Light energy is also used in traffic lights to control the flow of traffic and to guide airplanes taking off and landing.



Electrical Energy (Electricity)

We use electricity almost everywhere. Electricity is used to turn on the light bulb, watch Television, listen to the radio and play with a toy car.



Heat Energy

Heat energy makes us warm or hot. We use heat energy to cook food, dry clothes and keep us warm.



Sound Energy

Sound is used to communicate with others. An ambulance uses a siren to warn us of an emergency. We make sound as music when we sing or when musical instruments are played.



5

- Confirm the findings with students.
- **Based on their findings**, asks the following questions as discussion points.

Q:How do we use light energy? (To make a room bright, to control the flow of traffic and to guide airplanes taking off and landing, etc.)

Q:How do we use electrical energy? (To turn on the light bulb, watch television, listen to the radio, and play with a toy car, etc.)

Q:How do we use heat energy? (To cook food, dry clothes and keep warm, etc)

Q:How do we use sound energy? (to communicate with others, use a siren to warn us of an emergency, make sound for music, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How do we use light, electrical, heat and sound energy in daily life?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Uses of energy"

Key question

How do we use energy in our daily life?

Activity

How people use energy?

Light energy: To make room bright

Sound energy: To play a guitar

Heat energy: To cook food

Electrical energy: To watch television, etc

Discussion

Q: How do we use light energy?

To make a room bright, to control the flow of traffic and to guide airplanes taking off and landing, etc

Q: How do we use electrical energy?

To turn on the light bulb, watch television, listen to the radio, and play with a toy car, etc

Q: How do we use heat energy?

To cook food, dry clothes and keep warm, etc

Q: How do we use sound energy?

To communicate with others, use a siren to warn us of an emergency, make sound for music, etc

Summary

• We use energy in many ways:

1. Light energy:

To make a room bright, control the flow of traffic and guide airplanes taking off and landing, etc

2. Electrical energy:

To turn on the light bulb, watch television, listen to the radio, and play with a toy car, etc

3. Heat energy:

To cook food, dry clothes and keep warm, etc

4. Sound energy:

To communicate with others, make sound for music, etc

Lesson
3 / 4**Lesson Title**
Summary and Exercise**Tips of lesson****1 Summary (15 min.)**

- Recap main learning contents covered in the topic on energy.
- Ask the students questions and verify student's understanding. Explain and correct the learning contents again if they still have some misconceptions.
- Provoke students to give examples of different forms of energy.
- Ask students to describe some examples of how energy is used in their life.

2 Exercise & Explanation (35 min.)

- Allow enough time for students to answer the question in their own understanding.
- After the exercise, give the answers to the questions and explain how to solve the questions of the exercise based on student's answers and thoughts

1
Summary and Exercise

Summary 5.1 Energy around Us

Energy

☐ Energy is the ability to do work.
☐ Energy can make things move and change.
☐ There are many different types of energy around us.

Light	Electricity	Heat	Sound
 Light is energy that we can see.	 Electricity is energy that we use to run electric appliances.	 Heat is energy that makes things warm.	 Sound is energy that we can hear.

Uses of energy

☐ Energy is used in many ways:

- Light energy is used to make a room bright and is used in traffic lights to control the flow of traffic.
- Electrical energy is used to make electrical appliance work.
- Heat energy is used to cook food, dry clothes and keep us warm.
- Sound energy is used to communicate with others.






113

2
Summary and Exercise

Exercise 5.1 Energy around Us

Q1. Complete the sentence with the correct word.
 (1) _____ is the ability to make things work.
 (2) Energy comes in different _____.
 (3) A fire made to keep us warm gives off _____ energy.
 (4) _____ energy helps us to see in the dark.

Q2. Choose the letter with the correct answer.
 (1) Which of the following does not use electrical energy?
 A. Torch B. Traffic lights C. Candle flame D. Mobile phone






(2) Which sentence is not true about energy?
 A. Heat is energy that makes things warm.
 B. Heat energy can be produced from rubbing our hands together.
 C. The heat energy also comes from the sun.
 D. Fire is the only source of heat energy.

Q3. Answer the following question.
 What form of energy is used to cook food?



Q4. The ambulance during an emergency produces a large volume of sound as a siren. What would happen if there was no sound from the ambulance?

114

Exercise answers

Q1.

(1) **Energy**

(2) **Forms**

Light, electricity, heat and sound energy are learnt but there are also other forms energy that will be learnt in higher grades.

(3) **Heat**

Heat and light are given off from fire, but heat is needed for warmth.

(4) **Light**

Students may state device that gives light but emphasise that the energy that is used is light energy.

Q2.

(1) **C**

The candle flame does not use electrical energy. Students may state that flashlight does not use electricity but it does. Energy from the dry cell is changed to electrical energy which then converts to light energy.

(2) **D**

Make students understand that there are many sources of heat and fire is one of them.

Q3. **Heat and electrical energy**

In case students state light, accept the answers.

Explain that the food cooks from heat from the stove element that uses electrical energy.

Q4. Sample of the answer

An ambulance uses the siren to warn drivers and people to get out of the way. If there was no sound the other drivers would not know and not make way for the ambulance.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extras.

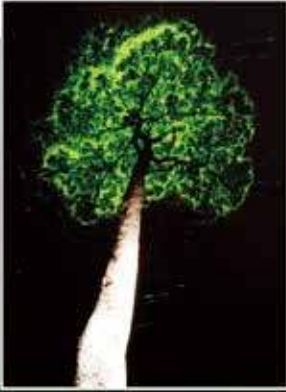
3

Chapter 5
•Science Extras•

Animals producing light energy inside their body

Can any part of your body produce light? It is impossible for human to do that. But some animals are able to light up their body parts using the light energy produced inside their bodies.

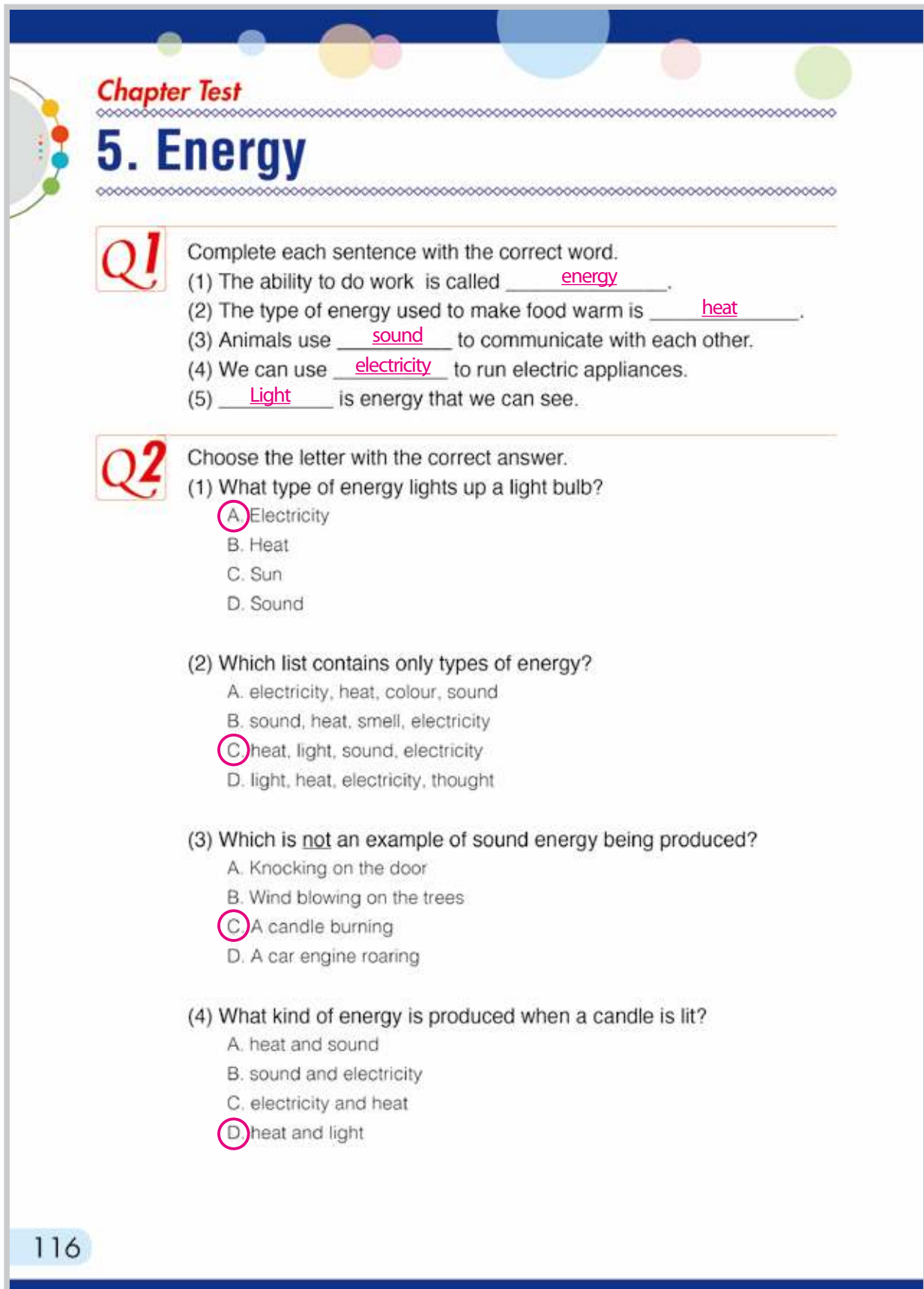
Fireflies are insects that can light up their body part. Why do fireflies light up? They use their light to signal and communicate with each other in the dark.



Tree illuminated with fireflies (Oro Province, Pico de la Neblina, Ecuador area).

Fireflies produce light energy inside their body to light up their body part.

115



Chapter Test

5. Energy

Q1 Complete each sentence with the correct word.

- (1) The ability to do work is called energy.
- (2) The type of energy used to make food warm is heat.
- (3) Animals use sound to communicate with each other.
- (4) We can use electricity to run electric appliances.
- (5) Light is energy that we can see.

Q2 Choose the letter with the correct answer.

- (1) What type of energy lights up a light bulb?
☒ A. Electricity
B. Heat
C. Sun
D. Sound
- (2) Which list contains only types of energy?
A. electricity, heat, colour, sound
B. sound, heat, smell, electricity
☒ C. heat, light, sound, electricity
D. light, heat, electricity, thought
- (3) Which is not an example of sound energy being produced?
A. Knocking on the door
B. Wind blowing on the trees
☒ C. A candle burning
D. A car engine roaring
- (4) What kind of energy is produced when a candle is lit?
A. heat and sound
B. sound and electricity
C. electricity and heat
☒ D. heat and light

116

Q3

(1) Identify types of energy that the sun provides to us.

Light and heat energy

(2) Write two examples of how to get electricity in our daily life.

(i) By battery

(ii) From the outlet, etc

(3) Explain two ways we can get heat energy.

(i) By burning things

(ii) By rubbing our hands together, By the Sunlight, etc

Q4

(1) What would happen if there was no light energy in the world?

(example) Our surrounding would be dark and we would not see anything.

(2) The picture shows a storm. What types of energy are produced during a thunder storm? Write your answer with a reason.



(example) Light energy is produced because we can see the flushlight when the lightning appears. In addition, sound energy is also produced because we can hear loud sound after the lightning.

Strand : EARTH AND SPACE

Unit : SPACE

Chapter 6. The Sun

Chapter Objectives

Students will be able to understand the properties of the Sun, and the difference between the temperature of a sunny and shady place by measuring their temperatures using a thermometer.

Students will be able to also explain the movement of the Sun in the sky.

Topic Objectives

6.1 Properties of the Sun

Students will be able to;

- Recognise that the Sun is a big burning ball of hot gases that gives off energy.
- Identify the temperatures of the ground that are different between a sunny place and a shady place.
- Explain the importance of the Sun for living things on the Earth.

6.2 Movement of the Sun

Students will be able to;

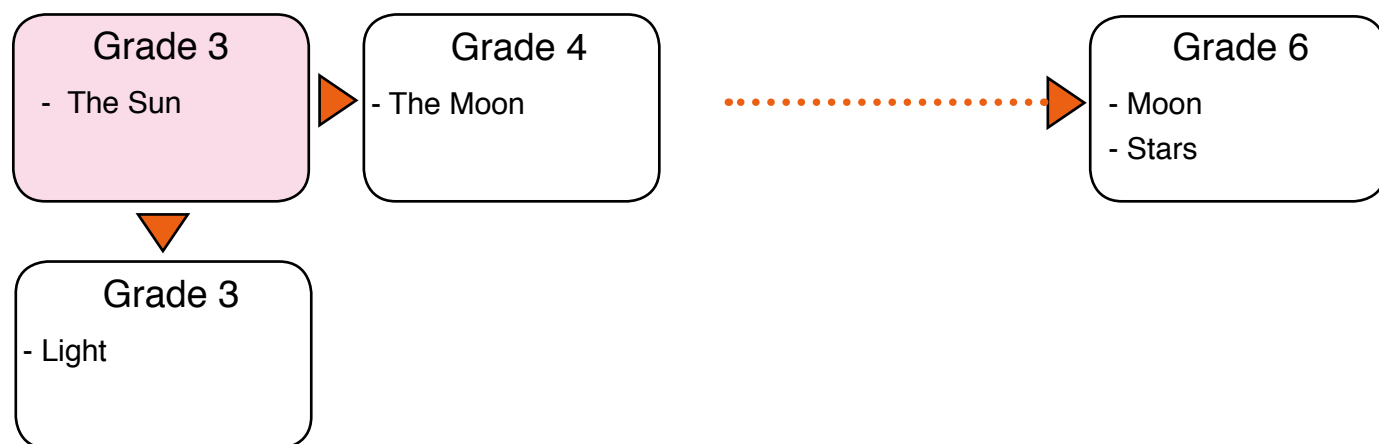
- Recognise that the position of the Sun is opposite to the direction of the shadow.
- Describe that the Sun rises into the sky in the East, moves across the sky and sets in the West.
- Explain that the part of the Earth that is facing the Sun has day while the part of the Earth that is facing away from the Sun has night.



Picture in the chapter heading in the textbook shows the sun in the sky at its lowest position.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 8 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
6.1 Properties of the Sun	1	The Sun in the Sky What is the Sun?	3.3.5	119 - 120
	2	Sunny Place and Shady Place How is a sunny place and a shady place different?		121 - 122
	3	Summary and Exercise		123 - 124
6.2 Movement of the Sun	4	Sun and Shadow What is the relationship between the Sun and a shadow?		125 - 126
	5	Movement of the Sun How does the Sun move in the sky?		127 - 128
	6	Day and Night What causes day and night?		129 - 130
	7	Summary and Exercise		131 - 133
Chapter Test	8	Chapter Test		134 - 135

Lesson
1 / 8**Lesson Title****The Sun in the Sky****Preparation**

• Nil

Lesson Flow**1 Introduction (10 min.)**

- Encourage students to think about the Sun by asking this question;

Q:What do you find when you look at the sky in the daytime?

Q:We find the Sun in the sky, but what do you know about the Sun?

2 Introduce the key question

What is the Sun?

3 Activity (20 min.)

This is an individual activity for students

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw the table in their exercise books.
- Have students do the activity and ask them to record their findings in the table.
- Advise students to refer to the character's talking for their investigation.
- After that, ask students to discuss what they know about the Sun and how the Sun helps our earth based on their findings as a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity. (**Continue**)

6.1 Properties of the Sun

Lesson 1: "The Sun in the Sky"

- When we look at the sky in the daytime, we find the Sun in the sky. But what is the Sun? Do you know the Sun?
- ? What is the Sun?**
- Activity : What do you know about the Sun?**

What to Do:

 - Make a table like the one shown below in your exercise book.

What do you know about the Sun?	What if there is no Sun?

 - Think about the following questions and write your ideas in the table.
 - What do you know about the Sun?
 - If it were not for the Sun, what would happen to our Earth?

When it is a sunny day, what do people or animals do?
 - Share your ideas with your classmates. Talk about what you know about the Sun and how the Sun helps our earth.
-

119

Teacher's Notes

- The sun is very important to the Earth. We can not live on Earth without the sun. It is the largest supplier of energy to the Earth's surface. The sun provides solar energy in the forms of light and heat energy. The sun's energy warms the Earth, heating the surfaces (land and oceans) and the atmosphere. Parts of the Earth absorb the sun's energy differently.
- The sun provides all the necessary energy for a plant to perform photosynthesis and make food that we eventually use by eating a plant directly or by eating an animal that ate the plant directly.
- The sun can influence the Earth's environment in a variety of ways. Climate is affected by how much energy the sun gives off and how much energy is absorbed and retained by the land.

Lesson Objectives

Students will be able to:

- Understand the properties of the Sun.
- Describe the effects of the Sun on our Earth and living things.

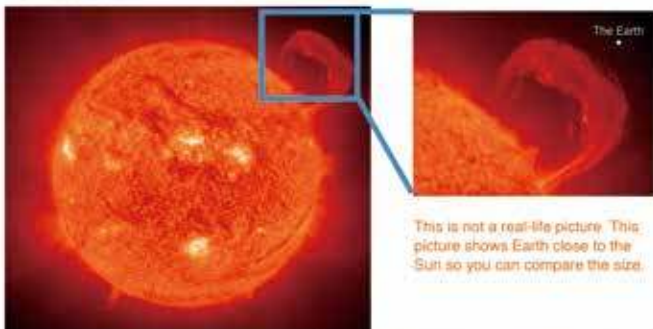
Assessment

Students are able to:

- Discuss what they know about the Sun with their classmates.
- Explain how the Sun helps our Earth and living things on the Earth.
- Investigate the properties of the Sun with interest.

Summary

The Sun is the brightest object in the sky during the day. The Sun is much larger than the Earth. It looks small because it is very far away from the Earth.



The Sun is a big burning ball of hot gases that gives off energy. The Sun's energy reaches the Earth as light and heat. Heat from the Sun warms the land, water and air on the Earth. The Sun keeps people and animals warm. Light from the Sun helps people and animals see objects on the Earth. It also helps plants to grow and survive. Without the Sun, the Earth would be frozen and no living thing would be able to survive.



The Sun warms the animals.



Without the Sun, the Earth would be frozen.

5

- Write students finding on the blackboard.
- Facilitate students to take part in the discussion actively.
- Confirm the findings with students.
- **Based on their findings**, teacher asks questions as discussion points.

Q:What do you know about the Sun? (It depends on students' findings. e.g. It's big, it's bright, we feel warm, etc.)

Q:What would happen to our Earth if it was not for the Sun? (We cannot see anything around us, we cannot dry clothes, everything would be frozen, etc.)

Q:Why do you think so? (The Sun gives light and heat, etc.)

Q:How does the Sun help our Earth and living things on the Earth? (The Sun keeps living things warm. The Sun helps us see objects on Earth, etc.)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask the following questions as assessment:
Q:What kinds of energy does the Sun give off?
Q:How does the Sun help our Earth and living things on the Earth?
- Ask students to copy the notes on the blackboard into their exercise books.

120

Sample Blackboard Plan

Title:

"The Sun in the Sky"

Key question

What is the Sun?

Activity: What do you know about the Sun?

What do you know?	What if there is no Sun?
It's bright	We cannot see anything
We feel warm	We cannot dry clothes
We can see it in the daytime	

Discussion

Q: What do you know about the Sun?

It depends on students' findings. e.g. it's bright, we feel warm, etc.

Q: What would happen to our Earth if it was not for the Sun?

We cannot see anything around us, we cannot dry clothes, everything would be frozen, etc.

Q: Why do you think so?

The Sun gives light and heat, etc.

Q: How does the Sun help our Earth and living things on the Earth?

The Sun keeps living things warm. The Sun helps us see objects on Earth, etc.

Summary

- The Sun is a big burning ball of hot gases.
- The Sun gives off **light and heat energy**.
- Heat from the Sun warms the Earth, people and animals.
- Light from the Sun helps people and animals see objects on Earth.
- It also helps plants to grow and survive.

Lesson
2 / 8**Lesson Title****Sunny Place and Shady place****Preparation**

- Select sunny day for this lesson
- Thermometer
- Carton

Lesson Flow**1 Introduction (5 min.)**

- Before this lesson, "How to Use a Thermometer" in "Science Toolbox" shown as appendix must be taught.
- Review the last lesson:

Q:What kinds of energy does the Sun give off?

- Encourage students to think about a sunny and shady place by asking:

Q:We can find the sunny and shady place.

What is the difference between a sunny place and a shady place?

2 Introduce the key question

How is a sunny place and a shady place different?

3 Activity (30 min.)

- Review how to use a thermometer. (Refer to "Science Toolbox: Thermometer" in the textbook)
- Organise students into some groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise book.
- Let students predict the results of this activity, and write their prediction in the table.
- Go outside and have students do the activity. Assist students to measure the temperature of the ground.
- Ask students to discuss how the temperatures of the ground are different between a sunny place and a shady place based on their results.

Lesson 2:**"Sunny Place and Shady Place"**

- 1** Let's go outside. We can find a sunny place and a shady place.

- 2** **? How is a sunny place and a shady place different?**

- 3** **Activity : Measuring the temperature of the ground**

What We Need:

- Thermometer, A4 paper

What to Do:

1. Make a table like the one shown below.

Place	Temperature of Ground (Your Prediction)	Temperature you measured
Sunny place	°C	°C
Shady place	°C	°C

2. Guess the temperature of the ground in a sunny and a shady place and write your prediction in the table.
3. Place the bulb of the thermometer into the ground in a sunny and a shady place. After 10 minutes, measure the temperature of the ground in both places. Record your measurements in the table.
4. Share your ideas with your classmates. Talk about how the temperatures of the ground are different between a sunny and a shady place.

When we place our hands on the ground in a sunny place and a shady place, how are they different?



A sunny place



A shady place

Let's review "How to Use a Thermometer" on page 220.

**Teacher's Notes**

- This activity should be done on a bright sunny day for good results.

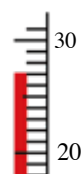
How to measure ground temperature using a thermometer

- Make a 1 cm deep hole in the ground.
- Put the tip of thermometer into the ground, and put a little soil on it.
- Look how high the coloured liquid is. What number is the closest? That is the temperature of the ground.

Safety

- At the time of measurement, the teacher must pay attention to the children so that they will not beat a thermometer against a hard object or dig up the soil with the thermometer when they put it in the ground.
- Remind students never to look at the sun directly. If one looks at the Sun directly, he/she would get permanent damage to their eyes.

Thermometers have different scales. To determine the temperature, you must know the scale interval before the measurement. The intervals are usually 1 or 2. See below for examples.



Lesson Objectives

Students will be able to:

- Understand what causes the changes in the temperature of a sunny and shady place.
- Observe the different temperatures between a sunny and shady place by using a thermometer.

Assessment

Students are able to:

- Describe the ground of a sunny place that is warmed by the sunlight
- Compare the temperature between a sunny and shady place.
- Show responsibility in group activity.

Result

The temperature of the ground in a sunny place is higher than that of a shady place.

Place	Temperature you measured
A sunny place	25°C
A shady place	17°C

Example of the ground temperature result

Let's think about the reason why the temperature of a sunny place is higher than a shady place!



Summary

Temperature is how warm or cool something is. A thermometer is used to measure the temperature. Temperature is measured in **degrees Celsius [°C]**.

The temperatures of the ground are different between the sunny place and the shady place. The temperature of the ground in a sunny place is higher than that in a shady place because the ground of the sunny place is warmed by sunlight.

For example, we feel warm or dry when we place our hands on the ground of a sunny place. But we feel cool and damp when we place our hands on the ground in a shady place.



Comparing a sunny and a shady place

4 Discussion for findings (15 min.)

- Ask students to present their results from the activity.
- Write down their results in a table on a black board.
- Confirm the results with students.
- Based on their results, ask the following questions.

Q:What do you find from the results in the table? (The temperature of the ground in a sunny place is higher than that of a shady place.)

Q:Why do you think that the temperature of a sunny place is higher than a shady place? (The ground of a sunny place is warmed by sunlight, but sunlight cannot reach the ground of a shady place.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:

Q:What is a temperature?

Q:What is the unit of measurement for temperature?

Q:Why is the temperature of a sunny place higher than a shady place?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Sunny and Shady place"

Key question

How is a sunny and a shady place different?

Activity: Measuring the temperature of the ground

Place	Temperature (prediction)	Temperature you measured
A sunny place	40 °C	25 °C
A shady place	10 °C	17 °C

(Result depends on the time and place)

Discussion

1. What do you find from the results in the table? **The temperature of the ground in a sunny place is higher than that of a shady place.**

2. Why do you think that the temperature of a sunny place is higher than a shady place? **The ground of a sunny place is warmed by sunlight, but sunlight cannot reach the ground of a shady place.**

Summary

- A **thermometer** is used to measure a temperature.
- A **temperature** is how warm or cool something is.
- Temperature is measured in **degrees Celsius (°C)**.
- Temperature in a sunny place is higher than temperature in a shady place.
- Sunny place is warmed by sunlight.

Lesson
3 / 8**Lesson Title**
Summary and Exercise**Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents in this topic
- Ask some questions to verify students' understanding. Explain and correct learning contents again if they still have misconceptions.
- Have students to give examples of the forms of energy produced by the sun.
- Provoke students to describe how living things rely on the sun as the major source of energy.
- Ask students what kind of place would give a higher temperature.

2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time to response.
- After the test, give the answer to the questions and explain how to solve the questions with asking student's answers and thoughts.
- Guide students well to understand the main ideas or concepts in response to their answers.
- If the concept is still difficult for the students to understand then do the experiments again or demonstrate if necessary.

1Summary
and
Exercise**Summary** 6.1 Properties of the Sun**The Sun in the Sky**

- ☐ The Sun is the brightest object in the sky during the day. The Sun is much larger than the Earth but looks smaller because it is very far away from us.
- ☐ The Sun gives off energy in the form of heat and light. The Sun is the major source of energy.

Sunny and Shady places

- ☐ Temperature is how warm or cool something is.
- ☐ A thermometer is used to measure temperature.
- ☐ Temperature is measured in degrees Celsius [$^{\circ}\text{C}$].
- ☐ The temperature of the ground in a sunny place is higher than that of a shady place because the ground of the sunny place is warmed by sunlight.



123

2Summary
and
Exercise**Exercise** 6.1 Properties of the Sun

Q1. Complete each sentence with the correct word.

- (1) The _____ is the brightest object in the sky during the day.
- (2) The Sun is a burning ball of hot gases that gives off _____.
- (3) The Sun's energy reaches the Earth as light and _____.
- (4) _____ from the Sun helps people and animals to see.
- (5) Plants use light from the Sun to make _____ and grow.

Q2. Choose the letter with the correct answer.

- (1) What is the temperature reading shown on the thermometer below?



- A. 18°C B. 20°C C. 17°C D. 19°C

- (2) Why is the temperature of the sunny place higher than the shady place?

- A. The sunny place is not warmed by sunlight
B. The sunny place is warmed by sunlight
C. The shady place is warmed by sunlight
D. Both the sunny and shady places are warmed by sunlight

Q3. Answer the following questions.

- (1) The Sun is much larger than the earth. Why does the Sun look smaller?
- (2) How do living things use the sun's energy?

Q4. If there is no Sun what will happen to living things on Earth? Share your ideas and reasons.

124

Exercise answers

Q1.

(1) **Sun**

The Sun makes the sky so bright during the day that some objects in the sky are not seen like stars.

(2) **energy**

(3) **heat**

(4) **Light**

(5) **food**

Q2.

(1) **C**

Explain how to read the temperature from the thermometer by first identifying the scale division of each interval. The scale for each interval is counting by one and the unit to measure temperature is in degrees Celsius (°C)

(2) **B**

Because there is direct sunlight to the sunny place without a shade to block it. The sunny place is warmed by the Sun.

Q3. Sample of answer

(1) **The Sun looks smaller because it is very far away from the earth.**

Provoke students to think about the distance the earth is from the Sun.

(2) **The Sun keeps animals warm./Light from the Sun helps animals to see objects./The sunlight helps plants to grow.etc.**

Q4. Sample of answer

If there is no Sun the following things would happen:

- **There will be darkness everywhere**
- **The earth will be so cold**
- **Plants and animals will certainly die.**
- **There will be no life on earth**

Explain that the sun is the source of all energy, heat and light. Plants need sunlight to make food and grow. Sunlight is also vital for all animals to help them see and keep warm.

Lesson
4 / 8**Lesson Title****Sun and Shadow****Preparation**

- Select sunny day for this lesson
- Object to be observed

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lesson:

Q: Why is the temperature of a sunny place higher than a shady place?

- Encourage students to think about the relationship between Sun and shadow by asking:

Q: We can find shadow on the ground on sunny day. Where can we find shadow? How is the shadow made?

2 Introduce the key question

What is the relationship between the sun and a shadow?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Instruct students not to look directly at the Sun during the activity.
- Go outside and have students do the activity.
- Ask students to record their findings in their exercise book.
- After that, ask students to discuss the relationship between the direction of a shadow and the position of the Sun based on their results as a group.

Discussion for findings (20 min.)**4** Ask students to present their findings from the activity. (Continue)

6.2 Movement of the Sun

Lesson 1: "Sun and Shadow"

- 1 When we play outside in the sun, we can find shadows on the ground. Where can we find the shadow? How is a shadow made by the Sun?
- 2 **? What is the relationship between the Sun and a shadow?**
- 3 **Activity : Observing sun and shadow**
What to Do:
 1. Find a shadow in the school yard.
 2. Observe the direction of the shadow and the position of the Sun. Record your observation in your exercise book.
 3. Repeat steps 1 and 2 several times.
 4. Share your ideas with your classmates. Talk about the relationship between the direction of the shadow and the position of the Sun.

Do not look directly at the Sun!

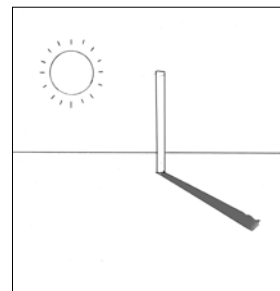
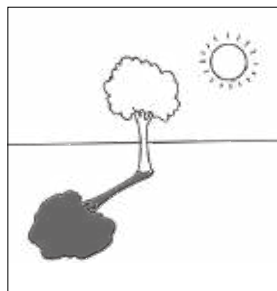
Let's compare the direction of the shadow of objects and your shadow.

Look! All shadows are in the same directions! Where is the Sun?
- 4

125

Teacher's Notes

- **What is a shadow?** A shadow is created by the absence of light falling on a particular place. Light travels in a straight line. So, an object coming in the way of light blocks it and doesn't allow to fall on a surface behind it. When the position of source of light or the object obstructing the path of light is changed, the shadow's position will change.
- **Due to change in the position of the sun,** the direction of the rays falling on you changes and therefore the direction of your shadow will also change.



Be sure to let student NOT to watch the Sun directly.

Lesson Objectives

Students will be able to:

- Relate the direction of a shadow to the position of the Sun.
- Observe the direction of the shadow and the position of the Sun.

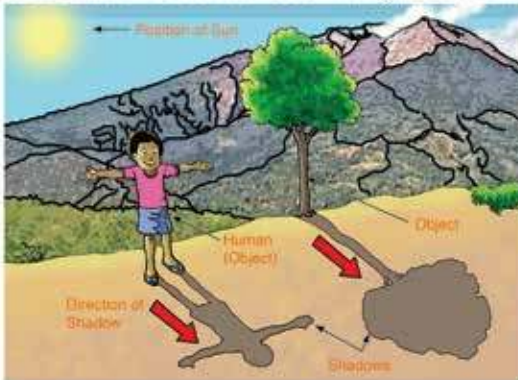
Assessment

Students are able to:

- Explain the relationship between the direction of the shadow and the position of the Sun.
- Investigate the Sun and shadow with interest.

Summary

When a shadow is made, the position of the Sun is opposite to the direction of the shadow. If light from the Sun is blocked by objects, the shadows are made in the same direction with light of the sun.



Discussion

Let's discuss the following question:

- 'Look at the pictures below. The direction of the shadow changes. Why does the direction of the shadow change?'



126

5

- Write down their results in a table on a black board.
- Confirm the results with students.
- **Based on their findings**, ask the following questions.

Q: In which direction are the shadows of objects made? (The shadows of objects are made in the same direction, etc.)

Q: What relationship do you find between the direction of a shadow and the position of the Sun? (The position of the Sun is opposite to the direction of the shadow, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions:

Q: What is the relationship between the Sun and a shadow?

- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion (5 min.)

- Let students think about the questions in 'Discussion' in a group.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion.

Sample Blackboard Plan

Title:

"Sun and Shadow"

Key question

What is the relationship between the Sun and a shadow?

Activity: Observing sun and shadow

Where did you find shadows?

On the ground, sunny place, etc

Is the direction of shadows of objects the same or not?

The direction of shadows is all same, etc.

Where did you find the Sun?

Behind the object, opposite to the shadow, etc

Discussion

Q: In which direction are the shadows of objects made?

The shadows of objects are made in the same direction, etc

Q: Where is the position of the Sun when a shadow is made?

It is opposite to the direction of the shadow.

Q: What relationship do you find between the direction of a shadow and the position of the Sun?

The position of the Sun is opposite to the direction of the shadow, etc

Summary

- When a shadow is made, the position of the Sun is opposite to the direction of the shadow.

Further Discussion

Q: Why does the direction of the shadows change?

(Write down students answers here.)

- When the Sun changes its position, the direction of the shadow also changes.

Lesson
5 / 8**Lesson Title****Movement of the Sun****Preparation**

- A compass, a stick, a tape measure or a ruler

Lesson Flow**1 Introduction (10 min.)**

- Before this lesson, "How to Use a Compass" in "Science Toolbox" must be taught.

- Review the last lesson:

Q:What is the relationship between the position of the Sun and the direction of a shadow?

- Encourage students to think about the movement of the Sun by asking:

Q:The Sun rises and sets every day. How does the Sun move?

2 Introduce the key question

How does the Sun move in the sky?

3 Activity (20 min.)

- Review how to use a compass. (Refer to 'Science Toolbox: Compass' in the textbook)
- Organise students into some groups.
- Explain the steps of the activity.
- Remind students not to look directly at the sun.
- Go out of classroom and set up a stick on the ground with students.
- Let students check the direction of east and west with a compass and record it.
- Have students do the activity and ask them to record their observations in their exercise book.
- Ask students to observe the shadow every hour.
- If there is no time, implement Step 4 "Discussion" in the next lesson.

Lesson 2: "Movement of the Sun"

- 1 The Sun rises in the morning and sets in the evening every day.

- 2 **? How does the Sun move in the sky?**

3

**Activity : Observing the movement of shadow****What We Need:**

- a stick, compass, tape measure

What to Do:

1. Go out of the classroom and set up a stick on the ground.
2. Check the east and west directions with a compass.
3. Observe the shadow of the stick on the ground and draw a sketch of the shadow in your exercise book.
4. Measure the length of the shadow with a tape measure. Record the length and the time you observe in your exercise book.
5. Repeat steps 3 and 4 every hour during the day.



Stick

Can you guess how a shadow on the ground moves as time goes by?



Do not look directly at the Sun!

**Teacher's Notes****Note:**

1. An observation site with an excellent view of the sun must be selected.
2. Do not look directly at the Sun. If one looks at the Sun directly, he/she will get PERMANENT DAMAGE TO THEIR EYES.

The movement of shadows and the Sun

- Based on the fact that shadows are made when the sun is coming out and the Sun it is on the opposite side of the shadows, an idea to relate shadows to the Sun.
- Students know that the Sun moves. The teacher will try to develop students rough ideas and thoughts by making them think about the movement of shadows in connection with the movement of the Sun they have already know.
- The teacher will make students clearly understand that shadows move when people or objects move and shadows move as time proceeds even when people or objects do not move, while trying not to confuse them.

Lesson Objectives

Students will be able to:

- Observe the movement of the Sun.
- Relate the movement of the shadow to the movement of the Sun.

Assessment

Students are able to:

- Measure the length of the shadow with a tape measure.
- Record the movement of the shadow.
- Infer how the Sun moves based on the results of their observation.
- Investigate the movement of the Sun in cooperation with others.



Discussion

Let's discuss the following questions:

- How has the length of the shadow changed?
- How has the shadow moved? Why?
- How has the Sun moved?

Do you remember the relationship between the position of the Sun and the direction of the shadow?



Summary

A shadow changes its length and direction as the Sun moves across the sky. In the morning and in the evening, shadows are longer and the Sun is lower in the sky. At midday, the length of the shadow is shortest and the Sun is at its highest position in the sky. Shadows move from west to east depending on the time of the day. This is because the Sun rises in the east, moves across the sky and sets in the west.



People developed the device to tell time by observing the Sun and shadows.



This device is called "Sun Clock". A sun clock uses a shadow's position to tell the time.



4 Discussion for findings (20 min.)

- Ask students to present their results from the activity.
- Write down their results in a table on a black board.
- Confirm the results with students.
- Based on their results, ask the following questions.

Q: How has the length of the shadow changed?

(In the morning, it's longer. And then, it's getting shorter until noon. After that, it's getting longer until evening.)

Q: What causes the changes in the length of the shadow during the day? (It's caused by the changes in the height of the Sun.)

Q: How has the shadow moved? Why? (From West to East. It is because the Sun moved.)

Q: How did the sun move across the sky? (From East to West)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions:

Q: How does the Sun move in the sky?

Q: How do we investigate the movement of the Sun?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Movement of the Sun"

Key question

How does the Sun move in the sky?

Activity

Observing the movement of shadow.

Refer to the sample shown in the textbook

Discussion

Q: How has the length of the shadow changes?

In the morning, it's longer. And then, it's getting shorter until noon. After that, it's getting longer until evening.

Q: What causes the changes in the length of the shadow during the day? It is caused by the changes in the height of the Sun.

Q: How has the shadow moved? Why?

From West to East. It is because the Sun moved.

Q: How did the sun move across the sky?

From East to West

Summary

- A shadow changes its length and position as the sun moves through the sky.
- Shadows are longer in the morning and in the evening because the sun is lower in the sky.
- At noon the shadows are shortest because the sun is at its highest position in the sky.
- The sun rises in the East, moves across the sky and sets in the West.
- The shadow moves from West to East.
- A Sun clock uses a shadow's position to tell the time.

Lesson
6 / 8**Lesson Title****Day and night****Preparation**

- Globe or anything that is round, a sticker, a flashlight

Lesson Flow**1 Introduction (10 min.)**

- Review the last lesson:

Q:How does the Sun move in the sky?

- Encourage students to think about day and night by asking:

Q:We get up in the morning and sleep at night every day. Why does day and night occur every day?

2 Introduce the key question

What causes day and night?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Tell students that the globe represents the earth and the torch is the sun.
- Make sure the torch must not move.
- Instruct students to spin the globe anticlockwise slowly and observe the movement of the sticker.
- Have students do the activity and ask them to record their observation in their exercise book.
- Ask students to discuss which part of the globe is day or night based on their findings as a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity. (Continue)

Lesson 3: "Day and Night"

- 1 We get up in the morning. We are active during the day and sleep at night.

2 ? What causes day and night?**3 Activity : Which part is day or night?****What We Need:**

- globe, sticker, flashlight

What to Do:

1. Put a sticker on where Papua New Guinea (PNG) is on the globe.
2. Make the classroom dark and shine the flashlight on the globe.
3. By spinning the globe anticlockwise slowly as shown below. Try to place PNG in the position of "Day", "Night", "Sunrise" and "Sunset".
4. Share your ideas with your classmates. Talk about which part of the globe is day or night.

A globe represents the Earth and a flashlight represents the Sun.

Spin the globe this way

Sticker (PNG)

Sun

You can use a ball instead of a globe!

Teacher's Notes**The movement of shadows and the sun**

- Earth spins around on its axis. This motion is called a 'rotation'. In addition to the rotation, Earth also travels around the sun in a path called an orbit. The motion around the sun along its orbit is called a 'revolution'.

The movement of shadows and the Sun

- The rotation of the Earth causes day and night. It is not the Sun's movement that causes days, as the Earth rotates, only one-half of the Earth faces the sun at any given time. The half facing the sun is light (day) and the half facing away from the sun is dark (night).
- When viewed above the North Pole, the Earth rotates counterclockwise, from West to East. This is why the Sun 'rises' in the East and 'sets' in the West.
- The Earth's axis is not at a right angle with the sun. It is slightly tilted at an angle of 23.5°.

Lesson Objectives

Students will be able to:

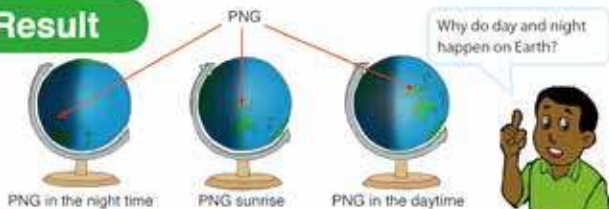
- Explain the cause of day and night.
- Identify which part of the Earth is day or night.
- Understand why the Sun seems to move.

Assessment

Students are able to:

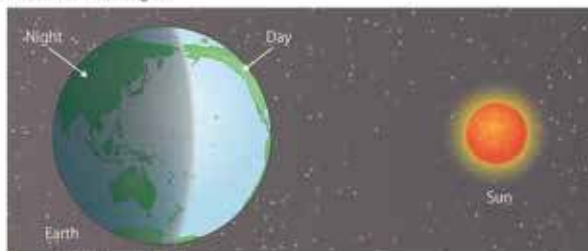
- Describe how the movement of the earth causes day and night.
- Observe the causes of day and night using a globe.
- State the reason why the Sun seems to move.
- Create curiosity to discover the causes of day and night.

Result



Summary

Day and night occur because the Earth is spinning on its axis once every 24 hours. An **axis** is an imaginary line that runs through the Earth centre from the north to the south poles. The part of the Earth that is facing the Sun is day. The part of the Earth that is facing away from the Sun is night.



Day and Night on the Earth

The Sun actually does not move around the Earth. Why does the Sun seem to move across the sky? This is because the Earth is spinning on its axis. For example, a girl standing outside seems to move when we see the girl from the moving car. The Sun also seems to move when we see the Sun from the spinning Earth.



A girl seems to move across the window when a boy in a moving bus sees the girl.

- Write down their results in a table on a black board.
- Confirm the findings with students.
- **Based on their findings**, ask the following questions as discussion point or ask each group to demonstrate.

Q: Which part of the earth is day or night? (The part lit up by the flashlight (Sun) is day. The part that is not lit by the flashlight (Sun) is night.)

Q: Which part of the earth is sunrise or sunset? (The parts between the shaded and the lit part.)

Q: Why does day and night occur every day? (This is because the globe (Earth) is spinning.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- If it is difficult for students to understand that the Sun seems to move, demonstrate the relative motion by letting them spin themselves slowly and observe how something around them looks.
- Summarise today's lesson on the blackboard.
- Ask the following questions:
Q: Why does day and night occur?
Q: Why does the Sun seem to move?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

“Day and Night”

Key question

What causes day and night?

Activity: Which part is day or night?

Your findings:

Drawing:

Refer to the diagram shown in the textbook

Discussion

Q: Which part of the earth is day?

The part lit up by the flashlight (Sun).

Q: Which part of the earth is night?

The part is not lit by the flashlight (Sun).

Q: Which part of the earth is sunrise or sunset?

The parts between the shaded and the lit part

Q: Why does day and night occur every day?

This is because the globe (Earth) is spinning.

Summary

- Day and night occur because the Earth is spinning on its axis once every 24 hours.
- An axis is an imaginary line that runs through the Earth's centre from the north to the south poles.
- The part of the Earth that is facing the Sun has day.
- The part of the Earth that is facing away from the sun has night.
- The Sun actually does not move around the Earth
- The Sun seems to move across the sky because the Earth is spinning on its axis.

Lesson
7 / 8**Lesson Title**
Summary and Exercise**Tips of lesson****1 Summary (20 min.)**

- Recap main learning contents in this topic
- Ask some questions to verify students' understanding. Explain and correct learning contents again if they still have misconceptions.
- Have students to tell how the change of position Sun cause the direction of the shadow to change.
- Provoke students to describe how long or short the shadow formed in the morning, noon and afternoon.
- Ask students what really causes night and day.

2 Exercise & Explanation (30 min.)

- Allow students to try answering questions individually with enough time in response to students understanding.
- After the test, give the answer of the questions and explain how to solve the questions with asking student's answers and thoughts.
- Guide students well to understand the main ideas or concepts in response to their answers.
- If the concept is still difficult for the students to understand then do the experiments again or demonstrate if necessary.

1
Summary and Exercise

Summary 6.2 Movement of the Sun

Sun and Shadow

☐ When a shadow is made, the position of the Sun is opposite to the direction of the shadow.

☐ The change in the position of the Sun causes the direction of the shadows to change.



Movement of the Sun

☐ A shadow changes its length and position as the Sun moves across the sky.

☐ Shadows are long in the morning and afternoon because the Sun is at a lower position in the sky.

☐ At midday the shadows are shortest because the Sun is at its highest position in the sky.

☐ The Sun rises in the east and sets in the west. The shadow of an object moves from west to east.

Day and Night

☐ The part of the Earth that is facing the sun is the day.

☐ The part of the Earth that is facing away from the sun is the night.

☐ The Earth rotates or spins on its axis once every 24 hours, causing day and night on earth.

☐ The Sun actually does not move around Earth. The Sun seems to move when we see the Sun from the spinning Earth.



131

2
Summary and Exercise

Exercise 6.2 Movement of the Sun

Q1. Complete each sentence with the correct word.

(1) The change in the position of the Sun causes the direction of the _____ to change.

(2) Shadows are long in the morning and afternoon because the Sun is _____ in the sky.

(3) The Sun rises in the _____ and sets in the west.

(4) The shadows move from west to _____.

(5) The part of the earth facing away from the Sun is _____.

Q2. Choose the letter with the correct answer.

(1) William conducted an experiment with sticks. The pictures below were drawn from his observations of the Sun's movement across the sky. Which picture shows the time of the day when the Sun was highest in the sky?



(2) How many hours does it take for the earth to spin on its axis?

A. 12 hours
B. 24 hours
C. 26 hours
D. 48 hours

Q3. Answer the following questions.

(1) What causes the shadow during a sunny day to change?

(2) Where does the shadow from an object that blocks the sunlight appear?

Q4. What causes day and night to happen on earth?

132

Exercise answers

Q1.

- (1) **Shadow**
- (2) **low**
- (3) **East**
- (4) **East**

The shadows move from West to East depending upon the time of day. This is because the sun rises in the East moves across the sky and sets in the West. The position of the of the Sun must be opposite to the direction of the shadow.

- (5) **Night**

It is night when the part of the Earth where you live faces the sun. The sky is dark.

Q2.

- (1) **C**

Explain that in the morning and afternoon the shadows are long and the sun is low in the sky. At noon the shadow is shortest and the sun is at its highest position in the sky.

- (2) **B**

It takes 24 hours for the Earth to rotate one time. The Earth keeps rotating.

Q3.

- (1) **The movement of the Sun across the sky.**
- (2) **The shadows is made in the same direction as the Sun.**

Q4. **The rotation or spin of the earth.**

Tell students each day the Sun seems to move across the sky. But the Sun does not move. Earth rotates or spins around an imaginary line. The line is called an axis. The rotation of the earth's axis produces the night and day cycle.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extras.

3

Chapter 6
•Science Extras•

Where are the stars during the day?
Can we find stars in the sky during the day?
Do the stars escape from the sky during the day?
In fact, stars are always in the sky. During the day the Sun makes the sky too bright to see other stars. Therefore we cannot see them. After the Sun sets, the Sun does not shine in the sky and darkness comes in. We can see the light from other stars during the night.

During the day



During the night



133

Chapter Test

6. The Sun

Q1

Complete each sentence with the correct word.

- (1) The ground of a sunny place is warmed by the sunlight.
- (2) The measure of how warm or cool something is, is called temperature.
- (3) A thermometer is used to measure temperature.
- (4) The Sun rises in the east and sets in the west.

Q2

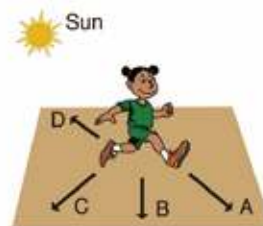
Choose the letter with the correct answer.

- (1) What makes the day sky bright?
 - A. The moon
 - B. The stars
 - ☒ C. The sun
 - D. The planets
- (2) Which of the following is the correct explanation about the shadow of an object on a sunny day.
 - ☒ A. Direction of the shadow is opposite to the position of the Sun.
 - B. Direction of the shadow is always west.
 - C. Direction of the shadow is same to the position of the Sun.
 - D. Direction of the shadow never moves.
- (3) The pattern of day and night is caused by Earth's _____ on its axis.
 - A. earthquake
 - B. gravity
 - C. revolution
 - ☒ D. spin
- (4) Temperature is measured in _____.
 - A. centimeters
 - B. millimeters
 - C. grams
 - ☒ D. degree Celsius

Q3

- (1) Look at the picture on the right. Suggest which direction the shadow of the girl would appear? Choose a letter and write your reason?

Answer is A. Direction of the shadow must be opposite to the position of the Sun.



- (2) What is the temperature reading shown on the thermometer?

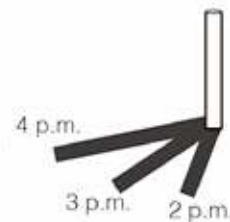
27 °C



Q4

- (1) Dave observed the direction of the shadow beside a pole at 2p.m., 3p.m. and 4p.m. The drawing of the shadows are shown in the diagram on the right. What is the reason why the direction of the shadow moves as time goes by?

The shadow changes its position as the Sun moves through the sky.



- (2) When you watch the Sun setting, what is happening on the other side of the Earth ? Explain your reason.

The other side of the world, sun is rising into its day time. When the part of Earth that is facing away from the Sun, the other side of the world is facing the Sun.

Strand : PHYSICAL SCIENCE

Unit : ENERGY

Chapter 7. Light

Chapter Objectives

Students will be able to understand properties of light, paths of light, formation of shadow, reflection and gathering light.

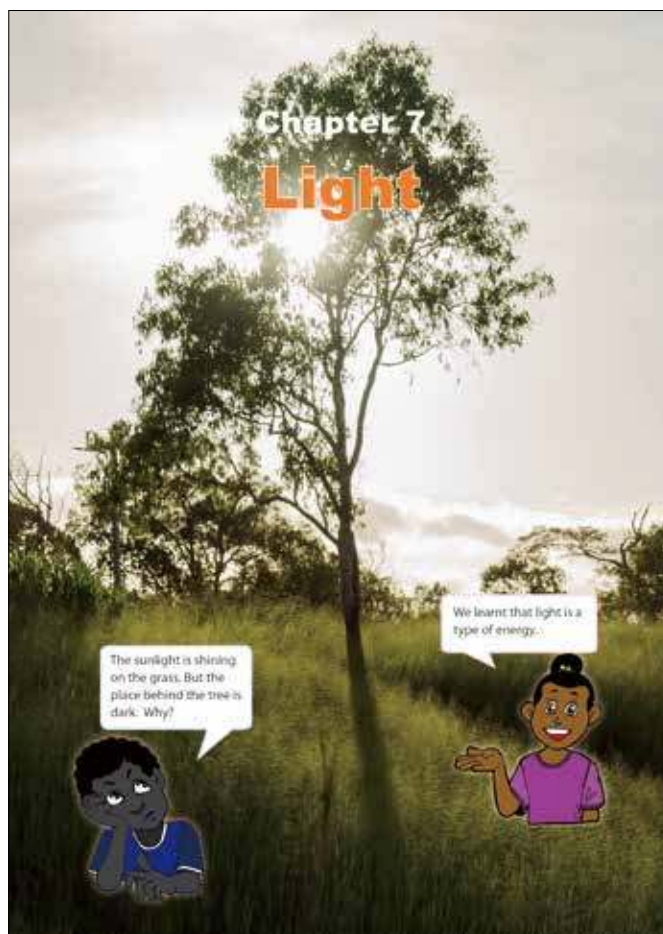
Students will be able to also infer that the size and shape of a shadow of an object changes if the object is moved or turned.

Topic Objectives

7.1 Properties of Light

Students will be able to;

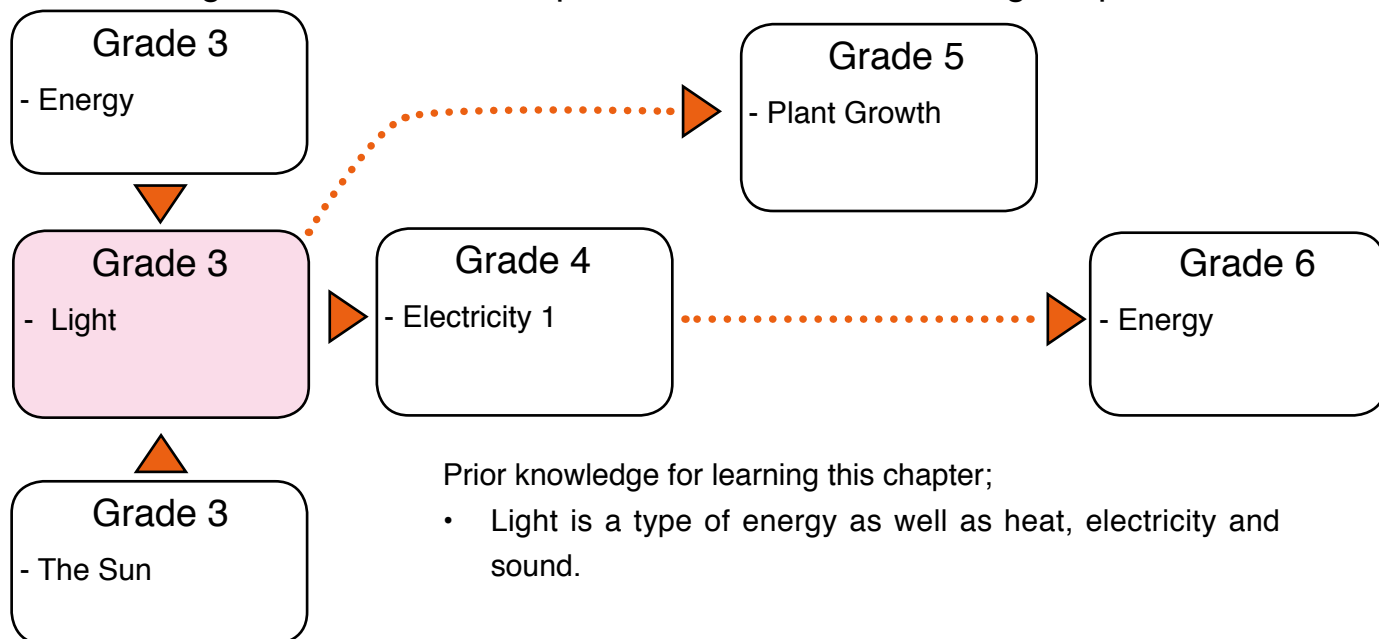
- Recognise that light helps us to see objects around us.
- Infer that light travels in a straight line from the activity result that light can be seen through the several card board holes arranged in a straight line.
- Group objects into transparent, translucent and opaque objects in line with how they allow light to pass through.
- Explain that a shadow is made when light is blocked by objects.
- Explain shape and size of a shadow can be changed by moving a source of light or the object.
- Explain that the reflected light from an object travels in a straight line and enters our eyes so that we can see the object.
- Describe that the size and brightness of the light on a piece of paper changes and the paper becomes hot when light is gathered by a lens.



Picture in the chapter heading on the textbook shows that the sunlight makes the shadow of the tree on the ground.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 9 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
7.1 Properties of Light	1	What makes us See Objects? Why can we see objects during the day but not at night?	3.2.2	137 - 138
	2	How Does Light Travel? How does light travel?		139 - 140
	3	Light Passing Through Objects Why can we see through a window but not a concrete wall?		141 - 142
	4	Formation of Shadow How is a shadow made?		143 - 144
	5	Shape and Size of Shadow How can we change the shape and size of a shadow?		145 - 146
	6	Light Reflection Why can we see the objects around us?		147 - 148
	7	Gathering Light What will happen if light is gathered?		149 - 150
	8	Summary and Exercise		151 - 153
Chapter Test	9	Chapter Test		154 - 155

Lesson
1 / 9**Lesson Topic:**
What makes us See Objects?**Preparation**

- Cardboard box with a pin hole, flashlight, any things

Lesson Flow**1 Introduction (10 min.)**

- Encourage students to think about energy by asking the questions:

Q: Why can we see objects during the day? Why cannot we see objects at night?

Q: What helps us see objects?

2 Introduce the key question

Why can we see objects during the day but not at night?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity and ask them to record their observation in their exercise book.
- Advise students to refer to the character's talking for their investigation.
- Ask students to discuss what makes them see an object in a box based on their observation as a group.

4 Discussion for findings (20 min.)

- Ask students to present their results of observation from the activity.
- Write students results on the blackboard.
- Facilitate active students' discussion. (Continue)

7.1 Properties of Light

Lesson 1: "What makes us See Objects?"

1 During the day we can see objects around us. At night we cannot see objects. Why can we see objects during the day?

2 **? Why can we see objects during the day but not at night?**

3 **Activity : What is in the box?**

What We Need:
• cardboard box with a pin hole, flashlight, any object

What to Do:

1. Place an object in the cardboard box and close the box firmly.
2. Peep through the hole in the box and record what you observe in your exercise book.
3. Switch on a flashlight and place it next to the object in the box. Close the box firmly.
4. Peep through the hole in the box again and record what you observe in your exercise book.
5. Share your ideas with your classmates. Talk about what helps you see the object in the box.

If the flash light is switched off in the box, What will happen?

137

Teacher's Notes

- In this lesson you will basically define light through the activity by identifying the property of light which is; light allows us to see things and identify the source of light or objects that produce light.

Preparation:

- Preparation of box: the box must be painted with dark colour both inside and outside. Then check that no light from outside enters. It should be pitch black by viewing through pin hole before conducting the activity.
- Prior the lesson classroom environment should be made dark by blocking off some light into the room.
- Suppose one set-up is for the whole class, be sure to place the pen or pencil away from student view. You can use different objects as well

Misconceptions of sources of light

- There are some objects that seem to give off light but are not sources of light because they do not make light on their own. These objects only reflect light, such as the moon, mirrors, reflectors on a jacket, road cones or road signs and sign boards.

Lesson Objectives

Students will be able to:

- Explain the reason why we can see objects.
- Identify the different types of sources of light.

Assessment

Students are able to:

- State that light helps us to see objects.
- Describe how different types of energy sources such as light, electrical, heat and sound energy help people.
- Investigate the properties of light with interest.

Summary

Light is an energy that we can see. Light helps us to see objects around us. Without light, we cannot see anything around us.



We cannot see anything without light.



We can see things with light.

Some objects give off light.

Objects that give off light are called **sources of light**. The sun is our major source of light. Candles, fire, torches and lamps are also sources of light. People, water and rocks are not sources of light because they do not give off light.

During the day, the sun makes our environment bright and allows us to see objects. At night, there is no light from the sun. We need light to see objects. Fire and lamps help us see objects at night.



Different sources of light



The sun helps us see objects.



Light from lamps help us see objects.

5

- Confirm their results with students.
- **Based on their results**, asks the following questions as discussion points.

Q: Why did you not see anything in the box without a flashlight? (No light, light cannot come into the box, it's dark, etc)

Q: Why did you see the object in the box with a flashlight? (It's bright in a box, inside the box is lit, etc)

Q: What condition was different in the box before and after you put on and off the flashlight? (Dark or bright, there is light or not, etc)

Q: What helped us to see the object? (Light helps us to see the thing, etc)

Q: From where did the light come from? (It came from a torch)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the board.
- Ask these questions as assessment:
Q: What makes us see objects?
Q: What is a source of light?
Q: What are some examples of sources of light?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"What makes Us See Objects?"

Key question

Why can we see objects during the day but not at night?

Activity: What is in the box?

	Your observation
Without a torch	We cannot see anything, etc
With a torch	We can see something, etc

Discussion

Q: Why did not you see anything in the box without a torch?

No light, light cannot come into the box, its dark, etc

Q: Why did you see the object in the box with a torch?

It's bright in a box, inside the box is lit, etc

Q: What condition was different in a box before and after you put on and off the flashlight?

Dark or bright, there is light or not, etc

Q: What helped us to see the object?

Light helps us to see the thing, etc

Q: From where did the light come from?

It came from a torch.

Summary

- **Light** is energy that we can see. Light helps us to see objects around us.
- Objects that give off light are called **sources of light** such as Sun, candles, fires, torches and lamps.
- During the day, the Sun makes our environment bright and allows us to see objects.
- At night, there is no light from the Sun. We cannot see.
- Fires and lamps help us see objects at night.

Lesson
2 / 9**Lesson Topic:****How Does Light Travel?****Preparation**

- Clay, flashlight, three pieces of card boards with a hole

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson by asking.

Q:What is light?

Q:What are some sources of light?

- Encourage students to think about how light travels by asking:

Q:Light helps us to see objects. What path does the light travels?

2 Introduce the key question

How does light travel?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to set up their activity with your assistance.
- Ask students to predict how light travels.
- Have students do the activity based on their prediction and ask them to record their findings in their exercise book.
- For step 4, instruct students to place a hand between the cards and record what they observe.
- After that, ask students to discuss 'what path light travels' based on their observation as a group.

Discussion for findings (25 min.)

- 4** Ask students to present their results of observation from the activity. (Continue)

Lesson 2: “How Does Light Travel?”

- 1** Light helps us to see objects. Without light we cannot see anything around us. But, what path does light take when it travels?

2 How does light travel?

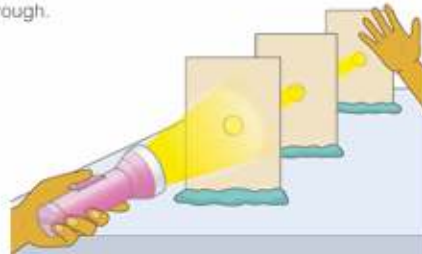
3 **Activity : Light Travelling**

What We Need:

clay, flashlight, three pieces of cardboard with a hole each.

What to Do:

1. Place three cardboards on a table as shown in the figure below.
2. Place the flashlight at one end of the row of cardboards and switch on the flashlight. Adjust the cardboards so that you can see the light from the flashlight through all the holes.
3. Observe how the light can be seen through all holes and record your observation.
4. Next, place a hand between two cardboards and observe what happens to the light. Record your observations.
5. Share your findings with your classmates. Talk about what path light travels through.

**Teacher's Notes**Light travels

- When you get up in the morning, sunlight makes your room bright. When the Sun sets, your room is so dark you might trip over something. Without light, you cannot see. So you flick a light switch and electric light makes your room bright again.
- Light travels in a straight line until it runs into something. What happens then depends on what the light runs into.
- Light rays go right through transparent substances. Clear window glass is transparent, so sunlight goes right through. That is why you can see through a windowpane.

 SAFETY:

-  Do not flash the flashlight into others eyes.

Lesson Objectives

Students will be able to:

- Describe the way light travels.
- Relate the results of activity to the way of how light travels.

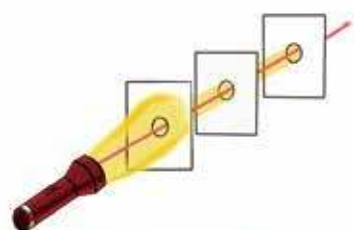
Assessment

Students are able to:

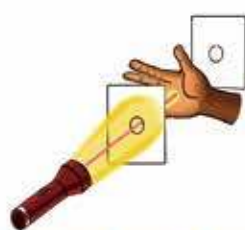
- Explain that light travels in a straight line.
- State the reason why light travels through the holes in the card boards.
- Respect others discussion.

Summary

When all the holes in the cardboards are arranged in a straight line, light can be seen through the holes. But the light stops and cannot travel through all holes when the holes are not arranged in a straight line. This means that light travels in a straight line. When we place a hand in the path of light, the light is blocked and cannot pass through the hand.

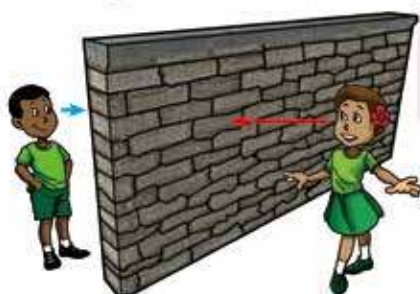


Light can travel through all the holes when the holes are in a straight line.



When a hand is placed in the path of the light, the light cannot pass through it.

We cannot see objects hidden behind another object because light travels in a straight line and it cannot pass through the object.



We cannot see each other because light travels in straight lines and the wall is in the path of the light!

5

- Write students results on the blackboard.
- Confirm their results with students.
- **Based on their results**, asks the following questions as discussion points.

Q:How did you arrange the card boards so that you saw the light from the flashlight through all the holes? (We arranged the all holes on the card boards in straight line, etc)

Q:What happened to light when you placed your hand between the cardboards? (We could not see the light from the flashlight.)

Q:Can you guess how light travels? (Light travels in a straight line, light cannot travel when it is blocked by an object (hand), light cannot pass through objects (hand), etc)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: How does light travel?
Q: Why can't we see objects hidden behind other objects?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"How does light travel?"

Key question

How does light travel?

Activity: Light travelling

1. How can the light be seen through all holes?

The light is travelling straight, etc.

2. What happens to the light when you place a hand between two card boards?

The light could not be seen, etc

Discussion

Q: How did you arrange the card boards so that you saw the light from the flashlight through all the holes?

We arranged the all holes in card board in straight line, etc

Q: What happened to light when you placed your hand between the cardboards?

We could not see the light from the flashlight.

Q: Can you guess how light travels?

Light travels in a straight line, light cannot travel when it is blocked by an object (hand), light cannot pass through objects (hand), etc

Summary

- Light travels in a **straight line**.
- When light is blocked by objects, light cannot travel.
- Light cannot pass through the objects.
- We cannot see objects hidden behind other object because light travels in a straight line and it cannot pass through an object.

Lesson
3 / 9**Lesson Topic:**
Light Passing Through Objects**Preparation**

- Water, glass cup, tissue paper, plastic bag, stone, book, flashlight

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lessons:

Q:How does light travel?

Q:Why cannot we see objects hidden behind other objects?

- Encourage students to think about Light Passing Through Objects by asking the questions:

Q:We cannot see objects behind a concrete wall, but why can we see through objects behind a glass window?

2 Introduce the key question

Why can we see through some objects and not others?

3 Activity (25 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Ask students to draw a table in their exercise books.
- Ask students to predict which objects light can pass through.
- Have students do the activity and record what they observe in the table
- After that, ask students to discuss which objects allow light to pass through or not based on their observation as a group.

4 Discussion for findings (20 min.)

- Ask students to present their results from their activity. (Continue)

Lesson 3: “Light Passing Through Objects”

- 1** Light travels in a straight line. That's why we cannot see objects behind a concrete wall. But, we can see objects through a glass window.

- 2** **?** Why can we see through a glass window but not a concrete wall?

3 **Activity : Can light pass through?****What We Need:**

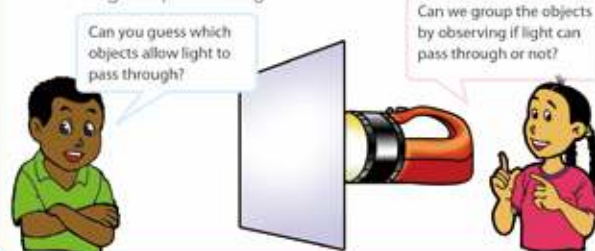
- water, glass cup, tissue paper, plastic bag, stone, book, other objects you want to check, flashlight

What to Do:

1. Make a table like the one shown below.

Objects that light can pass through	Objects that some light can pass through	Objects that light cannot pass through

2. Switch on a flashlight and place each object in front of it.
3. Observe whether or not light passes through the object and write your observation in the table.
4. Share your ideas with your classmates. Talk about which objects allow light to pass through or not.



141

Teacher's Notes

Transparent	Description
• Glad wrap	• Sold in the shops (don't need to write this info.)
• Pet bottles	• From fizzy drinks or juice bottles
• Plastic bags	• Used for packaging bail of rice or sugar, popcorn plastic bag
Translucent	Description
• Pet bottles	• Small size Orchy pet bottle
• Plastic bags	• White shopping plastic bag
• Waxed paper	• Pour one lid of baby oil, hair oil or cooking oil on clean white paper then dry. (do not use engine oil)

- !** Do consider using other transparent or translucent objects that are available.
• Safety: 'Do not flash the light into your eyes or others eyes.'

Lesson Objectives

Students will be able to:

- Define transparent, translucent and opaque objects.
- Classify objects into transparent, translucent and opaque objects.

Assessment

Students are able to:

- Explain the differences between transparent, translucent and opaque objects.
- List the name of transparent, translucent and opaque objects in a table.
- Participate in a group discussion actively.

Summary

Objects vary in how they allow light to pass through.

Transparent Objects

Transparent objects allow light to travel through them. We can see clearly through them. Air, water and clear glass are transparent objects. When light strikes on the transparent objects, almost all of it passes directly through them.

Translucent Objects

Translucent objects allow some light to travel through them. We cannot see clearly through them. Frosted glass and some plastics are translucent objects. When light strikes on the translucent objects, only some of the light passes through them.

Opaque Objects

Opaque objects do not let any light to travel through them. We cannot see through them. Wood, stone, concrete and books are opaque objects.



Translucent glass



Glass bowl and water are transparent.

Leaves and the fish are translucent.

Stones are opaque.

5

- Write students results on the blackboard.
- Facilitate students to take part in the discussion actively.
- Confirm the results with students.
- **Based on their results, ask** the questions as discussion point.

Q:How can we classify objects according to light passing through? (The objects can be classified into Objects that light can pass through, Objects that some light can pass through and Objects that light cannot pass through)

Q:What are examples of objects that light can pass through, objects that some light can pass through and objects that light cannot pass through? (It depends on students' answers.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What are transparent, translucent and opaque objects?
Q: How are transparent, translucent and opaque objects different?
Q: What are some examples of transparent, translucent and opaque objects?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Light passing through objects"

Key question

Why can we see through a window but not a concrete wall?

Activity Can light pass through?

Objects light pass through	Objects some light pass through	Objects light cannot pass through
Water	Plastic bag	book
Glass cup	paper	stone
.....		

Discussion

Q: How can we classify objects according to light passing through?

The objects can be classified into Objects that light can pass through, Objects that some light can pass through, and Objects that light cannot pass through.

Q: What are examples of objects that light can pass through, objects that some light can pass through, and objects that light cannot pass through? Write students' answers here

Summary

- Objects can be classified into transparent, translucent and opaque objects by how they allow light to pass through.
- 1. Transparent object
 - It allows light to travel through it. We can see clearly through it.
- 2. Translucent object
 - It allows some light to travel through it. We cannot see clearly through it.
- 3. Opaque object
 - It doesn't let any light travel through it. We cannot see through it.

Lesson
4 / 9**Lesson Title****Formation of Shadow****Preparation**

- Transparent, translucent, opaque objects, flashlight

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lessons:

Q: What are transparent, translucent and opaque objects?

Q: How are transparent, translucent and opaque objects different?

- Encourage students to think about the formation of shadow by asking the question:

Q: We can find shadows in many places. How do transparent, translucent and opaque objects make shadows?

2 Introduce the key question

How is a shadow made?

3 Activity (25 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Ask student to predict which objects can make a shadow.
- Have students do the activity based on their predictions and record their observations in their exercise books.
- Then, ask students to discuss how a shadow is made by a transparent, translucent and opaque object based on their results in groups.

4 Discussion for findings (20 min.)

- Ask students to present their results from their activity. (**Continue**)

Lesson 4: "Formation of Shadow"

- There are three kinds of objects; transparent, translucent and opaque. How are shadows made when light is blocked by these objects? Are all shadows alike or different?

2 ? How is a shadow made?**3 Activity : Shadows made by different objects****What We Need:**

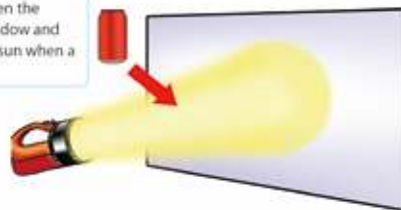
- transparent objects, translucent objects, opaque objects, flashlight

What to Do:

1. Switch on the flashlight and place it in front of a wall.
2. Place the transparent object between the flashlight and the wall. Observe how the shadow of the object is made and record your observation in your exercise book.
3. Repeat step 2 using a translucent and an opaque object.
4. Share and talk about how a shadow is formed using a transparent, translucent and an opaque object.

Can you guess how shadows made by different objects are alike or different?

Do you remember the relationship between the direction of the shadow and the position of the sun when a shadow is made?



143

Teacher's Notes

- Prior the lesson it is better to block of access light. This will enable students to view the shadows created by the different types of objects.
- Let students focus on the darkness of shadows formed from the different objects in the discussion.



Opaque object



Translucent object



Transparent object

**Safety:**

Do not flash the light from flashlight into someone's eyes.

Lesson Objectives

Students will be able to:

- Describe the formation of a shadow.
- Identify how opaque, translucent and transparent objects make a shadow.

Assessment

Students are able to:

- Explain how a shadow is formed by a source of light, an object and a screen.
- Explain how the shadows made by opaque, translucent and transparent objects are alike or different.
- Investigate the formation of a shadow with interest.

Result

Opaque and translucent objects make shadows. But transparent objects cannot make shadows.

Examples of Results



An opaque object

A translucent object

A transparent object

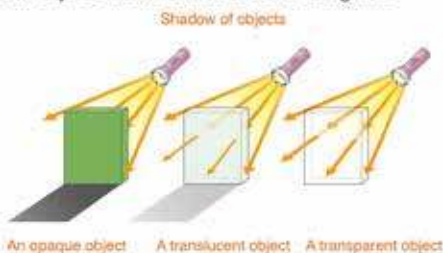
Summary

A shadow is made when light is blocked by objects. A source of light, an object and a screen such as a wall and the ground are necessary for a shadow to form.



Both opaque and translucent objects make shadows. Opaque objects make clear dark shadows because they cannot allow light to pass through them. Translucent objects make faint shadows as light is able to pass partially through them.

Transparent objects cannot make any shadow as they let light pass straight through them.



An opaque object

A translucent object

A transparent object

- Write students' results on the blackboard.
- Confirm the results with students.
- **Based on their results**, ask the questions as discussion point.

Q:How are the shadows of opaque, translucent and transparent objects are different? (Opaque objects make clear dark shadows. Translucent objects make faint shadows. Transparent objects cannot make any shadow.)

Q:Can you guess why opaque and translucent objects can make shadows? (Opaque objects cannot allow light pass through them. Light is able to pass through them partially.)

Q:Can you guess why transparent objects cannot make shadows? (Transparent objects let light pass straight through them.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: How is a shadow made?
Q: Which object makes a shadow; transparent, translucent or opaque objects?
Q: Why can opaque and translucent objects make shadows?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

" Formation of shadow"

Key question

How is a shadow made?

Activity: Shadow made by different objects

1. Shadow of Opaque object
clear, dark, black colour, etc
2. Shadow of Translucent object
not clear, gray colour, etc
3. Shadows of Transparent object
no shadow, etc

Discussion

Q: How are the shadows of opaque, translucent and transparent objects are different?

Opaque objects make clear dark shadows. Translucent objects make faint shadows. Transparent objects cannot make any shadow.

Q: Can you guess why opaque and translucent objects can make shadows?

Opaque objects cannot allow light pass through them. Light is able to pass only partially through them.

Q: Can you guess why transparent objects cannot make shadows?

Transparent objects let light pass straight through them.

Summary

- A **shadow** is made when light is blocked by objects.
- Opaque objects can make shadows because opaque objects cannot allow light pass through them.
- Translucent objects can make shadows as light is able to pass only partially through them.
- Transparent objects cannot make any shadow as they let light pass straight through them.

Lesson
5 / 9**Lesson Title****Shape and Size of Shadow****Preparation**

- tin can, flashlight

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lessons by asking.

Q: How is a shadow made?

Q: Which object makes a shadow, transparent, translucent or opaque objects?

- Encourage students to think about shape and size of shadow by asking the question:

Q: We can find the different shape and size of shadows. Can we change the shape and size of shadows?

2 Introduce the key question

How can we change the shape and size of a shadow?

3 Activity (25 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Ask students to predict how they can change the shape and size of the shadow.
- Have students do the activity based on their prediction and record their results in their exercise books.
- Then, ask students to discuss how they can change the shapes and size of the shadow based on their results as a group.

4 Discussion for findings (20 min.)

- Ask students to present their results from their activity. (Continue)

Lesson 5: "Shape and Size of Shadow"

- 1** When we observe a shadow on the ground during the day its shape and size changes. The shape and size of a shadow is not always the same.

- 2** **? How can we change the shape and size of a shadow?**

3 Activity : Changing the shape and size of a shadow**What We Need:**

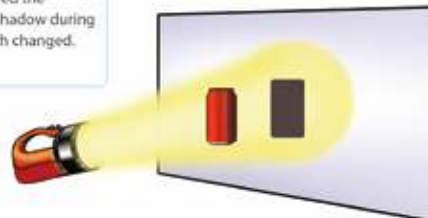
- tin can, flashlight

What to Do:

1. Think of how you can change the shape and size of a shadow.
2. Switch on the flashlight and place it in front of a wall.
3. Try to change the shape and size of a tin can's shadow based on your ideas.
4. Record how you changed the shape and size of the shadow in your exercise book.
5. Share your ideas with your classmates. Talk about how you can change the shape and size of the shadow.

Can you guess how you can change the shape and size of a shadow?

When we observed the movement of a shadow during the day, its length changed. Why?

**Teacher's Notes**

Prior to the lesson it is better to block off access light. This will enable students to view the shadows created by from the object. DO NOT GIVE THE ANSWERS during the activity. Allow the students to find the result and discuss amongst themselves. The answer to the activity will be catered for in the Discussion.

The size of shadow depends on the distance of the object from the flashlight.

The shape of shadow depends on the position of the object in light.



Lesson Objectives

Students will be able to:

- Describe the relationship between the shape of a shadow and the shape of an object.
- Relate the change in the size of a shadow to the distance of an object from a source of light.

Assessment

Students are able to:

- State that the shape of a shadow is similar to the shape of the object.
- Explain how the size of a shadow changes according to the distance of an object from a source of light

Summary

We can change the shape and size of a shadow by moving the source of light or the object.

Shape of Shadow

A shadow of an object usually has the same shape as the object. An object can make shadows of different shapes if we move or turn the object, as the light is shining at different parts of the object.



The shadow of an object has the same shape as the object.



We can change the shape of the shadow by turning the object.

Size of Shadow

We can change the size of a shadow if we change the distance between the object and the source of light. The size of the shadow becomes bigger if the object is moved closer to the source of light or the source of light is moved closer to the object. The size of a shadow becomes smaller if the object is moved further from the source of light or the source of light is moved further from the object.



A flashlight closer to a can

Starting position of the flashlight

A flashlight further from a can

- Write students results on the blackboard.
- Confirm the results with students.
- **Based on their results**, ask the questions as discussion point.

Q:How did you change the shape of a shadow? (We move or turn the can, etc)

Q:How is the shape of a shadow and the can alike or different? (The shape of a shadow is similar to the shape of the can, etc)

Q:How did you change the shape of a shadow? (We changed the distance between the can and the flashlight, etc)

Q:How did you make the size of a shadow bigger or smaller? (The size becomes bigger if the object is moved closer to flashlight, etc. The size becomes smaller if the object is moved closer to flashlight, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: How did you change the shape of the shadow?
Q: How did you change the size of the shadow?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Shape and Size of Shadow"

Key question

How can we change the shape and size of a shadow?

Activity: Changing shape and size of shadow

1: How can you change the shape of a shadow?

By moving, turning, changing the direction, etc

2: How can you change the size of a shadow?

By moving the can close to or far away from flashlight, etc

Discussion

Q: How did you change the shape of a shadow? (We move or turn the can, etc)

Q: How is the shape of a shadow and the can alike or different? (The shape of a shadow is similar to the shape of the can, etc)

Q: How did you change the shape of a shadow? (We changed the distance between the can and the flashlight, etc)

Q: How did you make the size of a shadow bigger or smaller?

The size becomes bigger if the object is moved closer to flashlight, etc. The size becomes smaller if the object is moved closer to flashlight, etc.

Summary

1. Shape of Shadow

- A shadow of an object usually has the same shape as the object.
- When an object is moved or turned, the shadow of the object change.

2. Size of Shadow

- We can change the size of a shadow by changing the distance between the object and the source of light.
- The size becomes bigger if the object is closer to a source of light or a source of light is closer to the object.
- The size becomes smaller if the object is closer to a source of light or a source of light is further from the object.

Lesson
6 / 9**Lesson Topic:**
Light Reflection**Preparation**

- Mirrors

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson by asking students;

Q:How did you change the shape of the shadow?

Q:How did you change the size of the shadow?

- Encourage students to think about light reflection by asking the question:

Q:Some objects cannot give off light but we can see the objects. Why?

2 Introduce the key question

Why can we see the objects around us?

3 Activity (20 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Explain the safety use of mirrors. 'Do not aim the reflected light at your friends!'
- Let student predict how light travels after it bounces off the mirror and record their prediction in their exercise books.
- Go out of the classroom. Have students do the activity and ask them to record their observations in their exercise books.
- Then, ask students to discuss how the reflected light, travels based on their observation in their groups.

Lesson 6: "Light Reflection"

- 1** We can see a source of light because it gives off light. Some objects cannot give off light, but we can see the objects.

- 2** **? Why can we see the objects around us?**

3 **Activity : Light reflected by Mirror**

What We Need:

- mirror

What to Do:

1. Think about what will happen to the light after it is reflected off a mirror.
2. Go out of the classroom with a mirror.
3. Reflect the sunlight using the mirror and aim it at the wall.
4. Decide targets on the wall and shine the reflected light on the targets by moving the mirror.
5. Observe how the reflected light travels and record your observation in your exercise book.
6. Share your ideas with your classmates. Talk about how the reflected light travels.

Can you guess what happens to the light when it hits a mirror?

Light travels in a straight line. How about the reflected light?

Do not aim the reflected light at your friends' faces!

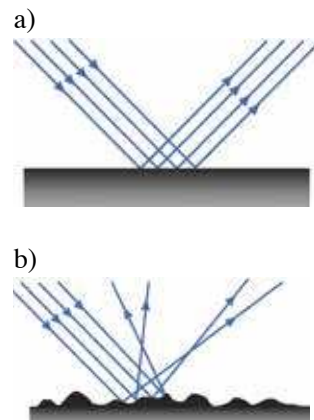
147

Teacher's Notes

- When light rays hit the smooth surface like a mirror, they bounce off in a straight line as shown in (a). It is called 'specular reflection'. Surface of a mirror is very smooth and almost perfectly reflects light so that you can see a clear image in a mirror.
- Light rays bounce off everywhere when they hit rough surfaces as shown in (b). It is called 'diffused reflection'. That is why you cannot see your face in your palm.
- On a cloudy day you may have an indoor lesson using a flashlight. Use new batteries for the torch and darken the room to observe better the reflection of light.

Safety

- Do not pass the mirror by tossing or throwing to a friend.
- Try not to aim the reflected light to other students.



Lesson Objectives

Students will be able to:

- Observe how light acts when it is reflected by a mirror.
- Describe why all objects can be seen.

Assessment

Students are able to:

- State that reflected light travels in a straight line.
- Explain the reason why they can see all objects around them.
- Participate in group activity with interest.

Summary

Light travels in a straight line. When the light from the sun hits the surface of a mirror, the light will be reflected by the mirror. The reflected light also travels in a straight line. **Reflection** is when light bounces off an object.



The reflected light also travels in straight lines.



We can see a book because the light reflected by the book enters our eyes.

Apart from mirrors, there are other objects that reflect light. For example, when the light hits the surface of a book, the light will be reflected by the book. The reflected light will travel in a straight line and enter our eyes. That is why we can see a book even though the book does not give off light. The surface of water, glass and metal also reflect light.



4 Discussion for findings (25 min.)

- Ask students to present their results from their activity.
- Write students results on the blackboard.
- Confirm the results with students.
- **Based on their results**, ask the questions as discussion point.

Q:What happened to the sunlight when it hit the mirror? (The light bounced off the mirror.)

Q:How did the light travel after it hit the mirror? (The light travelled in a straight line)

Q:Can you guess what the properties of light are? (Light can bounce off the surface of an object, bounced light can travels in a straight line, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How does the reflected light travel?
Q: Why do we see objects around us?
Q: What are some examples of light reflection around us.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

“Light reflection”

Key question

Why can we see the objects around us?

Activity: Light reflected by mirror

Prediction:

(Write students prediction here)

Example:

The sunlight will show everywhere

Your Observation:

(Write students prediction here)

Discussion

Q: What happened to the sunlight when it hit the mirror?

The light bounced off the mirror.

Q: How did the light travel after it hit the mirror?

The light travelled in a straight line

Q: Can you guess what the properties of light are?

Light can bounce off the surface of an object, bounced light can travels in a straight line, etc

Summary

- When the light hits the surface of a mirror, the light will be reflected by the mirror.
- The reflected light travels in a straight line.
- **Reflection** is when light bounces off an object.
- Most objects also reflect light.
- When the light hits the surface of an object, the light will be reflected by the object. The reflected light will travel in a straight line and enter our eyes. That's why we can see an object.

Lesson
7 / 9**Lesson Topic:**
Gathering light**Preparation**

- Hand lens, black paper

Lesson Flow**1 Introduction (5 min.)**

- Review previous lesson:

Q:How does reflected light travel?

Q:Why can we see other objects around us?

- Encourage students to think about gathering light by asking the question:

Q:If we gather light, what will happen to light?

2 Introduce the key question

What will happen if light is gathered?

3 Activity (25 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Ask students to draw a table in their exercise books.
- Explain the safety rules of using the hand lens.
- Ask students to predict what will happen to the light and the paper when the light is gathered.
- Have students do the activity based on their prediction and record their results in the table.
- Then, ask students to discuss the relationship between the brightness and warmth of light based on their results as a group.

Lesson 7: "Gathering Light"

- 1** When light hits the surface of an object, it is reflected by the object. If we gather the light, what will happen?

- 2** **? What will happen if light is gathered?**

3 Activity : Observing brightness and warmth of Light**What We Need:**

- hand lens, black paper

What to Do:

1. Make a table like the one shown on the right.
2. Gather the light from the sun on the paper with the hand lens.
3. Make the biggest size of the light on the paper by moving the hand lens up or down.
4. Observe the brightness of the light and see what happens to the paper. Record your observation in the table.
5. Make the smallest size of the light on the paper. Observe the brightness of the light and see what happens to the paper. Record your observation in the table.
6. Share your observation with your classmates. Talk about the relationship between the brightness and warmth of the light.



Do not look at the Sun through the lens.

Size of Light	Brightness	Change in Paper
Biggest		
Smallest		



Moving hand lens up or down.



The light gathered by a hand lens

Do not place your hand between the lens and the paper.

Teacher's Notes

Develop students' ideas by explaining that as the hand lens moves further from the paper. Light passing through the lens is concentrated on a small area that becomes hot and eventually burns which means that heat is produced.

Examples of answers in the table

Light	How does the light change when you move a hand lens?	Safety - o Do <u>not</u> look at the sun through the lens - o Do <u>not</u> place your hand between the lens and the paper. - o Place the black paper on the ground and conduct the experiment.
Brightness	The brightness changes when we move a hand lens closer to or away from the paper.	
Hotness	The brighter the light is, the hotter the light is.	

Improvise:

Cut A4 papers into halves then colour the halves with a black marker. Dark surfaces absorb heat rapidly therefore in this experiment the concentrated light spot from the lens creates heat and burns the paper for students to observe.

Lesson Objectives

Students will be able to:

- Observe what happens to the light when it is gathered.
- Describe the way to gather light.

Assessment

Students are able to:

- State that gathered light becomes brighter and hotter.
- Manipulate a hand lens to gather light.
- Explain how to gather light with a hand lens.
- Take part in the group discussion actively.

Result

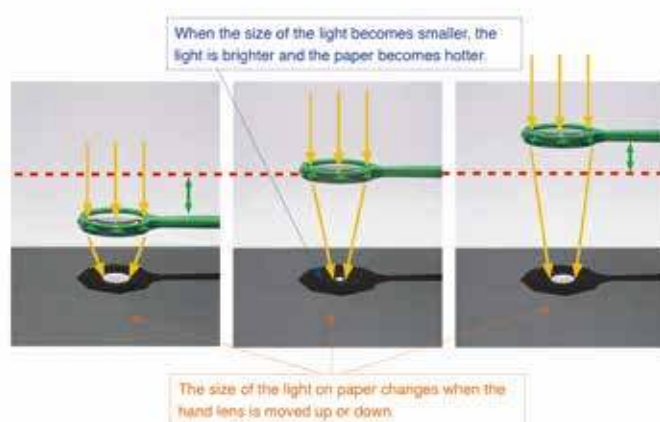


Size of light	Brightness	Change in paper
Bigger	It is brighter.	It doesn't change.
Smallest	It is brightest.	Smoke goes up from paper then it burns.

When the size of the light is smaller, the light becomes brighter and smoke goes up from the paper.

Summary

We can gather light with a hand lens. The size of the light on the paper changes when we move the hand lens up or down. The smaller the size of light on the paper is, the brighter the light is and the hotter the paper becomes.



4 Discussion for findings (20 min.)

- Ask students to present their results from their activity.
- Write students results in the table on the blackboard.
- Confirm results with students.
- **Based on their results**, ask the questions as discussion point.

Q:What relationship do you find between the size of light and the brightness of the light?
(The smaller the size, the brighter the light.)

Q:What happened to the paper when the light on the paper is the smallest?
(Smoke rose up from the paper, the paper got burned, etc)

Q:Why did the paper burn?
(This is because the smallest size of light on the paper was hotter, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How can light be gathered?
Q: Explain the relationship between the size of light and the brightness/hotness of light.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Gathering Light"

Key question

What will happen if light is gathered?

Activity

Observing brightness and warmth of light

Result:

Size	Brightness	Change in paper
Bigger	Brighter	Don't change, etc
Smaller	Brightest	very hot and burnt the paper

Discussion

Q: What relationship do you find between the size of light and the brightness of the light?

The smaller a size is, the brighter the light is, etc

Q: What happened to the paper when the light on the paper is the smallest?

Smoke rose up from the paper, the paper got burned, etc

Q: Why did the paper burn?

This is because the smallest size of light on the paper was hotter, etc

Summary

- We can gather light with a **hand lens**.
- The size of the light on the paper change when we move a hand lens up and down.
- The smaller the size of light on the paper is, the brighter the light is and the hotter the paper becomes.

Lesson
8 / 9

Lesson Title
Summary and Exercise

Tips of lesson

1 Summary (15 min.)

- Recap main learning contents in 'The Properties of Light'.
- Ask students some questions and verify their understanding. Explain and correct learning contents again if they still have misconceptions.
- Ask students to differentiate sources of light
- Provoke students to state some properties of light and describe their properties.

2 Exercise & Explanation (35 min.)

- Allow student to answer questions individually and give enough time to responded to the questions based on their understanding.
- After the exercise, give the answer of the questions and explain how to solve them based on student's answers and thoughts on them.
- Make reference to the textbook or provide clear examples in daily life to strengthen the learnt concept in this topic.

1 Summary and Exercise 7.1 Properties of Light

Light

- ☐ Light is a form of energy that helps us to see things.
- ☐ Light comes from a light source.

Properties of Light



Light travels in a straight line.



Light can be reflected by the surface of objects.



Light can be gathered using a lens.

Formation of Shadow

- ☐ A shadow is made when light is blocked by an object.
- ☐ Different objects allow different amounts of light to pass through.



Transparent objects allow light to travel through them.



Translucent objects allow some light to travel through them.



Opaque objects do not allow light to pass through them.

- ☐ Size and shape of the shadow can be changed by moving the source of light or the object.

151

2 Summary and Exercise 7.1 Properties of Light

Exercise

Q1. Complete the sentence with the correct word.

- _____ enables us to see things around us.
- Light is a form of _____.
- A _____ is made when light is blocked by an object.
- _____ objects allow only some light to pass through.
- Light can be gathered using a _____.

Q2. Choose the letter with the correct answer.

- Which of the following has the correct explanation about light?
 - Light travels in a wavy line.
 - Light does not pass through opaque objects.
 - Light does not reflect off objects.
 - Light is energy that can be heard.

Q3. Answer the following questions.

- Which of the following are sources of light?
 Sun Mirror Diamond Flashlight




- Look at the picture below. Can you name two ways to increase the size of the shadow?


Q4. A plant, book or dog do not make light for themselves but we are able to see them. Can you explain how we are able to see them?

152

Exercise answers

Q1.

- (1) **Light**
- (2) **energy**
- (3) **shadow**
- (4) **Translucent**

Differentiate clearly for the students a transparent and translucent

- (5) **lens**

Q2.

- (1) **B**

Objects that are opaque do not allow light to pass through them.

Q3.

- (1) **Sun and Torch**
- (2) **1. By moving the object closer to the light source**
2. By moving the light source closer to the object

There are two ways to increase the size of the shadow.

Q4. Sample of the answer

Because when light hits these objects the light is reflected off from these objects and travels straight to our eyes which enables us to them.

Answer should be mentioned that light reflects on the object and the reflected light travels into our eyes.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extras.

3

Chapter 7

•Science Extras•

What is a rainbow?

We sometimes can see the rainbow if the sun is shining and while the rain is falling or immediately after the rain stops.

A rainbow is a light that is caused by sun's light reflected and separated into different colours on a screen of many water droplets in the sky. The red ribbon of colour will always be on the outer edge of the rainbow. The blue will always be on the inside edge of the rainbow.



Rainbow in the sky

We can make a rainbow of our own. We will need; a sunny day and a garden hose with a fine mist nozzle. While standing in a sunny spot, point the hose in the direction of your shadow and turn it on. We can see a rainbow.



Chapter Test

7. Light

Q1

Complete each sentence with the correct word.

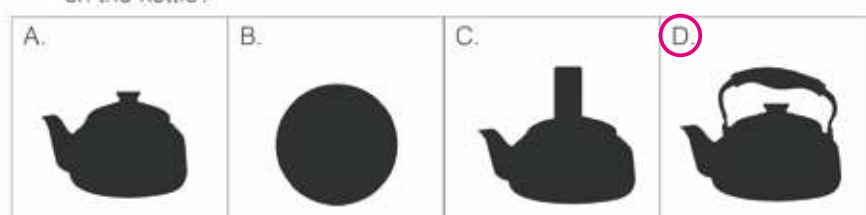
- (1) An object that produces light is called Source of light.
- (2) The Sun provides both heat and light for the earth.
- (3) A Shadow is formed when objects block the light path.
- (4) Opaque objects cannot allow light to pass through them.

Q2

Choose the letter with the correct answer.

- (1) How does light travel?
☒ A. Light travels in a straight line.
B. Light travels in a wavy line.
C. Light travels around corners.
D. Light travels in a zigzag line.
- (2) Which one of the following objects allows light to pass through?
A. Mirror
B. Books
C. Blackboard
☒ D. Water
- (3) What happens to the light when it hits a flat mirror?
A. The light passes through the mirror.
☒ B. The light is reflected off the mirror.
C. The light gathers at one place.
D. The light disappears.

- (4) Study the kettle shown on the right.
Which shadow will be possibly made if light is shone on the kettle?



Q3

(1) Write two examples of sources of light.

Sun, fire, torch, light bulb, etc

(2) Write two examples of transparent and opaque objects.

Transparent objects: Water, air, clear glass etc.

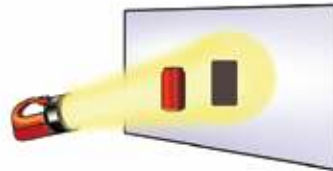
Opaque objects: Wood, stone, books etc.

(3) State what hand lens can do with light?

Hand lens can gather light that pass through it.

Q4

(1) Ketsin made a shadow of a can on a wall. Explain how he can change the shape of the shadow.



Ketsin can change the shape of shadow by turning the can.

(2) A'alia tries to burn a piece of black paper using a hand lens on a sunny day. But the paper did not burn. Suggest your idea on how to improve her experiment to burn the paper using a hand lens.

(example) She should change the distance between hand lens and the paper to gather more light at the one point and make the paper hotter.

Strand : PHYSICAL SCIENCE

Unit : ENERGY

Chapter 8. Magnet

Chapter Objectives

Students will be able to understand the properties of magnets, by exploring their functions and the objects that are attracted to them.

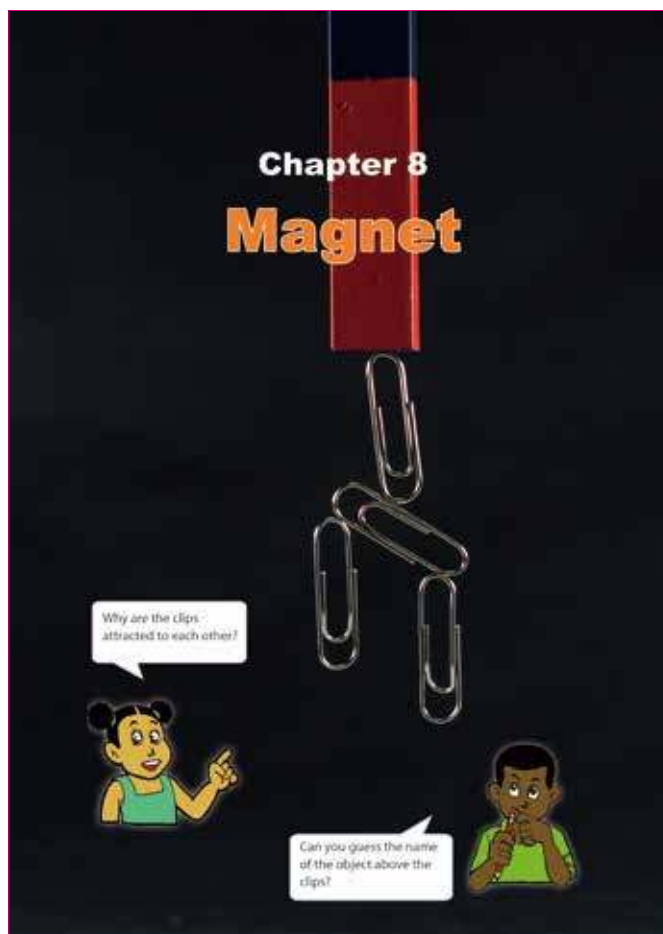
Students will be able to also classify objects that are used in daily life into those attracted to a magnet and those not attracted to a magnet.

Topic Objectives

8.1 Properties of Magnet

Students will be able to;

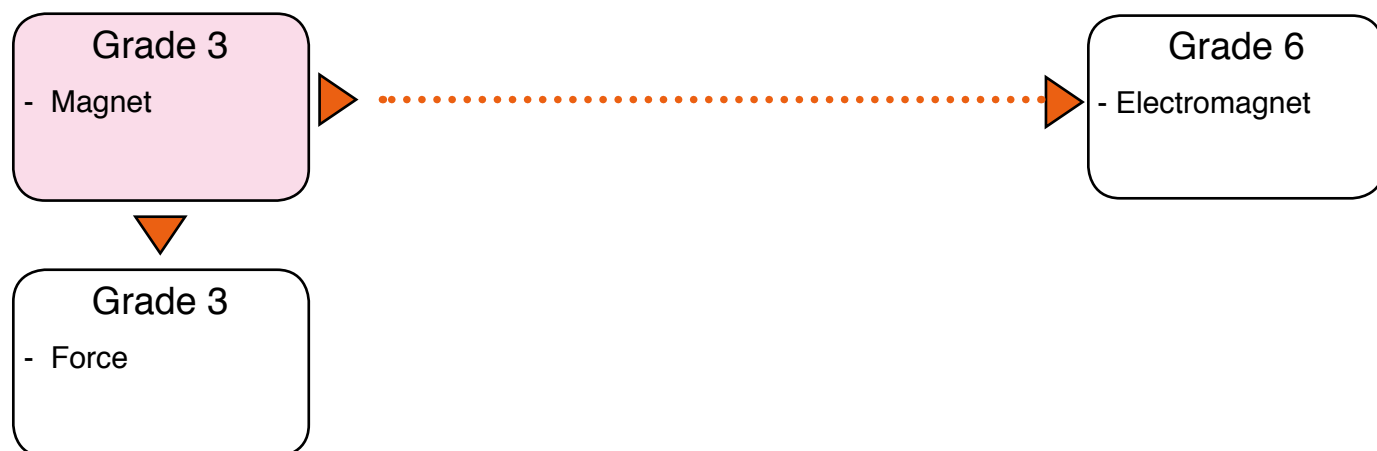
- Describe the function of magnets.
- Group objects into magnetic and non-magnetic object.
- Examine the difference in strength of force at the different parts of a bar magnet.
- Compare the behaviour of two poles when unlike and like poles come together.
- Explain that an iron object becomes a magnet once the object is attracted to a magnet.
- Explain the reason why a compass always points to the same direction.



Picture in the chapter heading in the textbook shows four clips attracted on the bar magnet and balancing their position without a glue because of magnetism.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 8 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
8.1 Properties of Magnet	1	Magnet around Us What is a magnet?	3.2.3	157 - 158
	2	What is Attracted to a Magnet? What things are attracted to a magnet?		159 - 160
	3	Force of Attraction between Magnet and Object Which part of the magnet can attract more magnetic objects?		161 - 162
	4	Properties of Poles of Magnets What happens if the poles are placed near each other?		163 - 164
	5	Making a Magnet Does an object attracted by a magnet become a magnet?		165 - 166
	6	Which Way? How can we find the direction using a magnet?		167 - 168
	7	Summary and Exercise		169 - 171
Chapter Test	8	Chapter Test		172 - 173

Lesson
1 / 8**Lesson Title****Magnet around Us****Preparation**

- 2 bar magnets, paper clips, card board, sewing thread, sticky tape

Lesson Flow**1 Introduction (5 min.)**

- Begin the lesson by asking the questions:

Q: Have you seen a magnet before?

Q: What do you know about a magnet?

- Tell students that today's lesson we are going to explore the wonders of a magnet.

2 Introduce the key question

What is a magnet?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise book.
- Ask students to predict what a magnet can do.
- Have students do the activity based on their prediction and record their findings in the table.
- Advise students to refer to the pictures and the characters' talking in the activity for their investigation.
- Check students' activity. If necessary, guide students to do their findings.
- After the investigation, ask students to discuss what magnets can do as a group

4 Discussion for findings (15 min.)

- Ask students to present the findings from their activity. (Continue)

8.1 Properties of Magnet

Lesson 1: "Magnet around Us"

1 We can find magnets around us. But what are magnets? Let's investigate the wonders of magnets!

2 **? What is a magnet?**

3 **Activity : What can magnets do?**

What We Need:

- two bar magnets, clips, thread, cardboard

What to Do:

1. Make a table like the one shown below.

What you observed

2. Think about what magnets can do. Try to find what magnets can do by using two magnets, clips and cardboard based on your ideas.
3. Record your observations in the table.
4. Share your ideas with your classmates. Talk about what magnets can do.

Think about how you can investigate magnets by yourself.

Do you have other ideas on how to investigate magnets?

157

Teacher's Notes

- A magnet is anything that carries a static magnetic field around with it. There are two types of magnets, a permanent magnet and a temporary magnet. A static magnetic field (magnetism) can pass through papers.
- A permanent magnet is an object which keeps its magnetism longer. It is artificially produced in industries (thus various shapes and sizes can be formed). It is a compound of elements. A popular permanent magnet like used in this lesson is called a ferrite magnet which is a compound of iron oxide and a slight amount of other metals.
- A permanent magnet is demagnetised if heated or sharp impacts are applied. It also gradually loses its magnetism by age. Place two magnets with the north pole of one touching the south pole of the other to preserve its strength while in storage.
- A temporally magnet is an object which cannot keep its magnetism permanently. An electromagnet is a typical example of this and will be taught in Gr.6, please refer to Gr.6 textbook and teachers guide for further information.
- Do not put magnets near computers or electronic devices as the magnetic force will damage parts inside.

Lesson Objectives

Students will be able to:

- Investigate the properties of a magnet.

Assessment

Students are able to:

- Describe what a magnet can do.
- Participate in the activity with interest.

Summary

A **magnet** is an object. Some magnets are made of iron. There are different shapes and sizes of magnets. Some magnets are flat, straight, round and some are in the shape of a horseshoe.

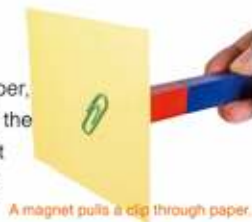


All magnets can push or pull some objects. When a magnet is near nails or clips, the magnet pulls them. When two magnets are placed near each other, they push or pull each other.



A magnet pushes another magnet.

A magnet can also pull objects through paper, glass, plastic, water or air without touching the magnet. If paper comes between a magnet and an object, the magnet pulls the object.

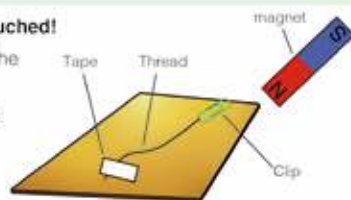


A magnet pulls a clip through paper.

Try it!

Let's lift a clip without being touched!

- Prepare a clip and thread like the picture shown on the right.
- Can you use a magnet to pull a clip without touching it?



5

- Write students findings on the blackboard.
- Facilitate active student' discussions.
- Based on their findings**, ask the question as discussion points.

Q:How does a magnet work? (A magnet pulled some clips, it pushed or pulled other magnet when placed closer to them, it has N and S signs, it pulled clips through paper, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How does a magnet work on other magnets?
Q: How does a magnet work on objects?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Try it! (10 min.)

- Explain the steps of the activity.
- Let students lift a clip without being touched by using a magnet.
- Advice students to use a short length of thread as this will produce a good result.

6

158

Sample Blackboard Plan

Title:

"Magnet around Us"

Key question

What is a magnet?

Activity

What can magnets do?

What I observed

- A magnet pulls the paper clips when it is place closer to it.
- A magnet pulls the paperclip on the card board when moved beneath.
- A magnet push each other, etc

Discussion

Q: How does a magnet work?

A magnet pulled some clips.

It pushed or pulled other magnet when placed closer to them.

It has N and S signs,
It pulled clips through paper, etc

Summary

- A magnet is an object made of iron.
- There are different shapes and sizes of magnets.
➤ Bar, Horseshoe, Ring, Circular

- Magnets can push and pull some objects.
- When two magnets placed near each other, they push or pull each other.
- A magnet can also pull objects through paper, glass, plastic and air without being touched.

Lesson
2 / 8**Lesson Title****What is Attracted to a Magnet?****Preparation**

- Magnet, coin, iron nail, clip, Exercise book, steel can, aluminium can

Lesson Flow**1 Introduction (10 min.)**

- Review previous lesson:

Q: How does a magnet work on other magnets and objects?

- Encourage students to think about the things that are attracted to a magnet by asking:

Q: A magnet attracts clips, but can a magnet attract everything?

2 Introduce the key question

What things are attracted to a magnet?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise book.
- Explain that 'attract' means 'pull' according to the previous lesson.
- Let students guess/predict which objects will be attracted/not attracted by a magnet.
- Have students do the activity and record their results in the table.
- Check students' activity. If necessary, guide the students to do their findings.
- After investigation, ask students to discuss what things are attracted to a magnet based on their results as a group.

Lesson 2: "What is Attracted to a Magnet?"

- 1 You observed that magnet can attract clips. But can it attract everything?

2 ? What things are attracted to a magnet?**3 Activity : Finding things attracted to a magnet****What We Need:**

- magnet, coin, iron nail, clip, exercise book, steel can, aluminium can and objects you want to investigate

What to Do:

1. Make a table like the one shown below.

Objects	Prediction	Objects attracted or not attracted to magnet

2. Think about what objects are attracted to the magnet or not.
3. Give it a try based on your ideas. Classify objects into two groups; objects attracted to the magnet and objects that are not attracted to the magnet.
3. Write the name of the objects in each group in the table.
4. Share your ideas with your classmates. Talk about what objects are attracted to the magnet.



159

Teacher's Notes

- Students may believe a magnet attracts all metals, however it only attracts iron, cobalt and nickel. Other metals such as aluminium, copper, brass, tin, gold and silver are not attracted to it. Thus, this activity should include some of these non-magnetic metals to guide students to understand that there are metals not attracted to a magnet.
- Iron is a common metal and steel is a major industrial product of iron in our daily life (more exactly, steel is an alloy of iron and carbon to reinforce its strength, but you can recognize steel is almost same as iron for children).
- Cobalt is rarely used in our daily life. Nickel is not easily found in our daily life, too. PNG coins used to use a copper-nickel alloy (cupronickel) but it loses its magnetic trait. Hence you can say most of the magnetic objects we can find in our daily life are made of iron.
- All non-metals in solid their state are not attracted to a magnet.
- As described above, objects will be classified as follows; (Note, some coins are attracted, and some others are not)
 - ➔ Magnetic objects: **toea coins**, iron nails, paper clips, steel can
 - ➔ Non-magnetic objects: **toea coins**, exercise book, aluminium can, tin can, rubber, plastic, pencil

Lesson Objectives

Students will be able to:

- Classify objects into magnetic and non-magnetic objects by using magnets.

Assessment

Students are able to:

- List the names of things that can be attracted and not attracted to a magnet in a table.
- Explain what magnetic and non-magnetic objects are made of.
- Respect other students' opinions on magnetic and non-magnetic materials.

Summary

Magnets can attract some objects. An object that is attracted to a magnet is called a **magnetic object**. Most magnetic objects are made of iron. A magnet attracts iron objects even though their shape, colour and size are different.



A magnet attracts magnetic objects



Magnetic objects

A steel can is attracted to a magnet, but an aluminium can is not attracted to a magnet. Why?

Some objects are not attracted to a magnet. An object not attracted to a magnet is called a **non-magnetic object**. Non-magnetic objects are made from paper, plastic, glass, or wood.



A magnet cannot attract non-magnetic objects



Non-magnetic objects

4 Discussion for findings (20 min.)

- Ask students to present their results from the activity.
- Write students results in the table on the blackboard.
- Based on their findings**, ask the following questions as discussion points.

Q: What are things that are attracted to a magnet made of? (They are made of iron (steel).)

Q: What are the things that are not attracted to a magnet made of? (They are not made of iron or steel, they are made of paper, glass, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
 - Q: What is a magnetic object?
 - Q: What is a non-magnetic object?
 - Q: If we change the shape or size of a magnetic object, is it still attracted to a magnet or not?
 - Q: Give some examples of magnetic and non-magnetic objects.
- Ask students to copy the notes on the blackboard into their exercise books.

160

Sample Blackboard Plan

Title:

"What is attracted to a Magnet?"

Key question What things are attracted to a magnet?

Activity: Finding things attracted to a magnet

Objects attracted to magnet	Objects not attracted to magnet
Coins Iron nail Steel can Paper clip	Coins Exercise book Aluminium can Biro Rubber

Discussion

Q: What are things that are attracted to a magnet made of?

They are made of iron (steel).

Q: What are the things that are not attracted to a magnet made of?

They are not made of iron or steel, they are made of paper, glass, etc.

Summary

- An object attracted by a magnet is called a **magnetic object**.
- Most magnetic objects are made of iron.
- A magnet attracts iron objects even though their shape, colour and size are different.
- An object which is not attracted by a magnet is called a **non-magnetic object**.
- Non-magnetic objects are made from paper, plastic, glass, wood, etc.
- An aluminium can is a metal but is not attracted by a magnet because it is a non-magnetic metal.

Lesson
3 / 8**Lesson Title****Force of Attraction between Magnet and Object****Preparation**

- Bar magnets
- Paper clips

Lesson Flow**1 Introduction (5 min.)**

- Review previous lesson:

Q: Which object does a magnet attract?

- Encourage students to think about the parts of a magnet that attract objects by asking:

Q: A magnet attracts clips, but do all parts of a magnet attract clips?

2 Introduce the key question

Which part of the magnet can attract more magnetic objects?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to draw diagrams in their exercise book.
- Ask students to predict which part of a magnet will attract the most clips and to record their predictions in the diagram.
- Have students do the activity and record their results in the diagram.
- After investigation, ask students to discuss which parts of a magnet attracts the most clips based on their results as a group.

4 Discussion for findings (25 min.)

- Ask students to present their results from the activity.
- Write students results in the table on the blackboard. **(Continue)**

Lesson 3: "Force of Attraction between Magnet and Object"

- 1 A magnet can attract magnetic objects. Do all parts of a magnet attract magnetic objects?

- 2 **? Which part of the magnet can attract more magnetic objects?**

3 Activity : Attracting as many clips as possible**What We Need:**

• bar magnet, clips

What to Do:

1. Draw a diagram like the one shown below in your exercise book.

Prediction		Result	
N	S	N	S

2. Predict which parts of the magnet attract the most clips. Draw your ideas in the diagram.
3. Place the bar magnet on the clips and lift the magnet slowly. Observe which parts of the magnet attract most clips and record your observation in the diagram.
4. Share your ideas with your classmates. Talk about which parts of the magnet attracts most clips.



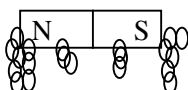
What do you feel when you move a clip on different parts of the bar magnet?

**Teacher's Notes**

- All magnets have two poles; One is called a north-seeking pole (abbreviated to just north pole or N). It is usually coloured red. The other is called a south-seeking pole (south pole or S) and coloured blue. These poles are present at each end of a magnet which produce the strongest magnetism. Detailed properties of poles will be taught in next lesson (*referring the next lesson guide prior to this lesson is recommendable*)
- What happens to a U-shape magnet?
A U-shape magnet (sometimes called a horseshoe magnet) is just a bar magnet bent around so that the N and S poles are near the same location. The strongest parts are present at each end (poles), so that it puts the strongest part of the magnet all in one location making it easier to pick up the clips or other magnetic objects.
- An example of Expected Result

If teachers allow students to freely do this activity, students may not test whether a middle part attracts clips or not. *Prompt students to attach clips to various part of a magnet.* Theoretically, the middle part along with centre line doesn't attract anything

The previous lesson explained, magnetic power passes through other objects thus clips got joined all the way to other parts of the bar magnet. Guide students to scientifically explain this concept.



Lesson Objectives

Students will be able to:

- Identify two kinds of pole on a magnet.
- Observe which parts of a magnet attracts more magnetic objects.

Assessment

Students are able to:

- Explain that a magnet has two kinds of poles; north and south.
- State that the poles of a magnet attract objects most strongly.
- Actively participate in the activity.

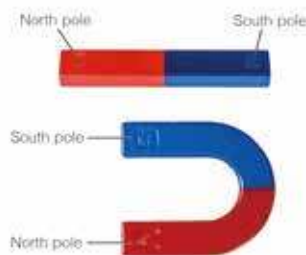
Summary

Two ends of the bar magnet attract more magnetic objects than the other parts of the magnet. The parts where the magnet attracts objects more strongly are called **poles**. The poles have stronger force of attraction than any other parts of the magnet.



The poles attract clips much more than the other parts of the magnet.

A magnet has two poles; the **north pole** and **south pole**. All magnets have two poles even though the shape or size of magnets are different. The poles are in different places on different magnets.



The different shapes of magnets have two poles.



Discussion

What happens to a horseshoe magnet?

- Look at the picture shown on the right. What will happen to the horseshoe magnet if we place the magnet horizontally near the clips?



5

- Confirm their results with students.
- **Based on their findings**, ask the following questions as discussion points.
Q: Which part of the magnet attracts most clips? (Ends of the magnet are the strongest to attract the most clips.)
Q: Which part of the magnet attracts the least clips? (The centre of a magnet attracts the least clips)
Q: Which part of the magnet has the strongest force to attract? (The ends of a magnet)
- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: What is a pole?
Q: What kinds of poles are there?
Q: Which parts of a magnet attract magnetic objects more strongly?
- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion (5 min.)

- Let students think about the question in 'Discussion' in a group.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion.

Sample Blackboard Plan

Title:

"Force of Attraction between Magnet and Object"

Key question

Q: Which part of the magnet can attract more magnetic objects?

Activity Attracting as many clips as possible

Prediction	Result
N S	N S

Discussion

Q: Which part of the magnet attracts most clips?

Ends of the magnet

Q: Which part of the magnet attracts the least clips?

The centre of a magnet

Q: Which part of the magnet has the strongest force to attract?

The ends of a magnet

Summary

- The parts where a magnet attracts objects most strongly are called **poles**.

- All magnets have two poles called a **north pole** and a **south pole**.
- The two ends attract the most magnetic objects and the centre is the weakest point where doesn't attract anything.
- All magnets have two poles even though the shapes or sizes of magnets are different.

Lesson
4 / 8**Lesson Title**
Properties of Poles of Magnets**Preparation**

- A pair of bar magnet

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q:What is a pole?

Q:What kinds of poles are there?

- Encourage students to think about the other properties of poles of a magnet by asking:

Q:Do the poles of magnets have other properties?

2 Introduce the key question

What happens if the poles are placed near each other?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise book.
- Ask students to predict what will happen to two bar magnets when the poles of two magnets are placed as shown in the pictures (1), (2), (3) and (4).
- Have students do the activity based on their prediction and ask them to record their results in the table.
- After the investigation, ask students to discuss the properties of poles based on their results as a group.

4 Discussion for findings (15 min.)

- Ask students to present their findings. (Continue)

Lesson 4: "Properties of Poles of Magnets"

- 1** The poles of a magnet attract more magnetic objects than the other parts of the magnet. Do the poles of magnets have other properties?

- 2** **? What happens if the poles are placed near each other?**

3 Activity : Testing the properties of the poles of a magnet**What We Need:**

- 2 bar magnets

What to Do:

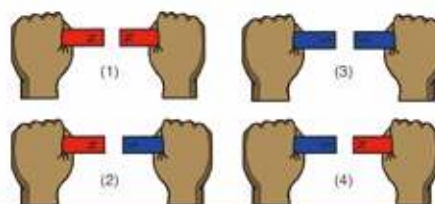
1. Make a table like the one shown below.

Poles	What happened
(1) North pole and North pole	
(2) North pole and South pole	
(3) South pole and South pole	
(4) South pole and North pole	

2. Hold two bar magnets and place the poles near each other as shown below.

3. Observe and record what happens to the magnets in the table.

4. Share your ideas with your classmates. Talk about the properties of poles of magnets.



Can you guess what will happen if we place two magnets near each other?



You can test this activity when you place two magnets on the desk!

**Teacher's Notes**

- Expected results for the test in the students' tables are as follows;

Test	Your Prediction	What happens?
(1)North pole and North pole		Push each other away
(2)North pole and South pole		Pull/stuck together
(3)South pole and South pole		Push each other away
(4)South pole and North pole		Pull/stuck together

- 'Repel (push away)', 'Like poles (same poles)' and 'Unlike poles (different poles)' may be new words for students. hence teacher should carefully explain the meaning and concept of these terminologies.
- Teachers can easily demonstrate the attraction of unlike poles and the repulsion of like poles by placing two magnets on the paper to reduce their friction. When you put two magnets like (1), (2), (3) and (4), gradually move one magnet closely to the other, the other magnet will be either pushed or pulled.

Lesson Objectives

Students will be able to:

- Identify the properties of poles between two magnets.

Assessment

Students are able to:

- Describe how two magnets move when unlike and like poles are put close to each other.
- Show eagerness to find out the properties of poles between two magnets.

Summary

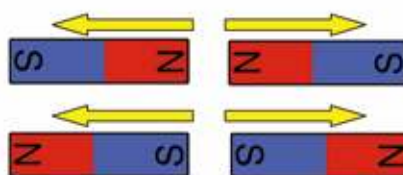
All magnets **attract** or **repel** other magnets.

If the north pole of one magnet is placed near the south pole of another magnet, the magnets attract each other. When a magnet **attracts** an object, it **pulls** the object towards itself. **Unlike poles of magnets attract each other.**



Unlike poles attract each other.

If the north pole of one magnet is near the north pole of another magnet, the magnets repel. If two south poles of magnets are near each other, the magnets also repel. When a magnet **repels** an object, it **pushes** the object away from itself. **Like poles repel each other.**



Like poles repel each other.



Discussion

What happens to a magnet?

- Look at the picture shown on the right. A magnet is hang by a thread.
- What will happen to the magnet if we place another magnet near it?



5

- Write students results in the table on the blackboard.
- Confirm their results with students.
- Based on their findings**, ask the following questions as discussion points.

Q:What happened when the same poles of the magnet are placed closer to each other?
(They push each other away, bounced away from each other, etc.)

Q:What happened when different poles of the magnet are placed closer to each other?
(They pull towards each other, etc.)

- Conclude the discussion.

5 Summary (5 min.)

- Ask the students to open their textbooks to the summary page and explain it..
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: What happens when like and unlike poles are put close together?
Q: What happens when unlike poles are put close together?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion (15 min.)

- Let students think about the question in 'Discussion' in a group.
- Have students do the activity if possible.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion.

6

Sample Blackboard Plan

Title:

"Properties of Poles of Magnet"

Key question What happens if the poles are placed near each other??

Activity Testing the properties of poles of a magnet.

Result:

Poles	What happened
(1) N-N	Push each other away
(2) N-S	Pull/stuck together
(3) S-S	Push each other away
(4) S-N	Pull/stuck together

Discussion

Q: What happened when the same poles of the magnet are placed closer to each other?

They push each other away, bounced away from each other, etc.

Q: What happened when different poles of the magnet are placed closer to each other?

They pull towards each other , etc.

Summary

- All magnets **attract** or **repel** other magnets.
- Unlike poles (N&S poles) of magnets attract each other.
- Like poles (N&N poles or S&S poles) of magnets repel each other.

Lesson
5 / 8**Lesson Title****Making a Magnet****Preparation**

- Bar magnet, iron nails, and paper clips

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson:

Q:What happens when like and unlike poles are put close together?

Q:What happens when unlike poles are put close together?

- Encourage students to think about how an iron becomes a magnet by asking:

Q:A magnet is usually made of iron and can attract magnetic objects, but the iron nail cannot attract magnetic objects. Why?

2 Introduce the key question

Does an object attracted by a magnet become a magnet?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise book.
- Ask students to predict whether a nail becomes a magnet or not.
- Have students do the activity based on their prediction and ask them to record their results in the table.
- After the investigation, ask students to discuss a nail becomes a magnet or not based on their results as a group.

4 Discussion for findings (15 min.)

- Ask students present their results. (Continue)

Lesson 5: "Making a Magnet"

- 1** A magnet is usually made of iron and can attract magnetic objects. But the iron nail cannot attract magnetic objects even though it is made of iron.

- 2** **? Does an object attracted by a magnet becomes a magnet?**

3 Activity : Can a nail become a magnet.**What We Need:**

- bar magnet, iron nails, clips

What to Do:

1. Make a table like the one shown below.

	Your observations
When the nail is attached to the paper clip	
When the nail is attached to the magnet	
After the nail is attached to the magnet	

2. Bring the nail close to the clips and observe whether the clips will be attracted to the nail or not. Record your observations in the table.

3. Place the nail on the magnet and then attach another nail to the first nail. Observe what happens to the nails. Record your observations in the table.

4. Take the first nail from the magnet and repeat Step 2.

5. Share your observation with your classmates. Talk about whether the nail becomes a magnet or not.

Teacher's Notes

- A magnetic object has a similar characteristic with a magnet. Thus, it easily reacts to a magnet and once it is attached to a magnet, it becomes a temporally magnet (See teacher's note of lesson one 'Magnets around us' in page 162 for more information on a temporally magnet). This phenomenon is called a 'Magnetisation'. A magnetic object cannot keep its magnetism permanently.

- **Note for the activity – the activity to make a magnet requires sensitive operation.**

1. The magnets should never contact the paper clips at all in the preparation of this lesson because they are also eventually magnetised will defeat the purpose of this lesson.
2. Students should not mingle with magnets and paper clips unless they told to do so by the teacher.
3. Students groups should be given only about 5 paper clips
4. Students should be instructed to used 1-2 paper clips at a time and others must be kept away from a magnet to avoid magnetisation.

Lesson Objectives

Students will be able to:

- Realise a magnetic object can become a magnet.
- Understand a way to make a magnet.

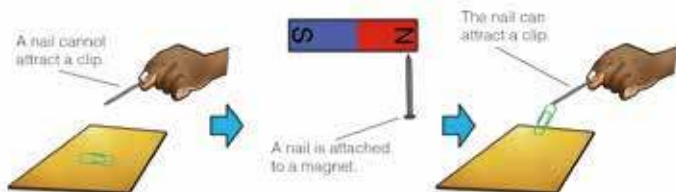
Assessment

Students are able to:

- Infer that the nail attached to a magnet becomes a magnet based on the results of activity.
- Describe how to make a nail becomes a magnet
- Work co-operatively in group activity.

Result

Before the nail is attached to the magnet, the nail cannot attract a clip.
After the nail is attached to the magnet, the nail can attract a clip.



Once a nail is attached to a magnet, it can attract a clip.

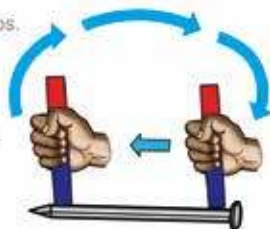
Summary

A nail is made of iron. Once an iron object is attached to a magnet, the object becomes a magnet.

Try it!

Let's make a magnet!

- Prepare a bar magnet, an iron nail and clips.
- Rub the magnet against the iron nail. Move it in the same direction, rather than back and forth.
- Continue rubbing the nail with the magnet 50 times as quickly as you can.
- Place the nail near the clips and see if it becomes a magnet!



- Write students' results in the table on the blackboard.
- Confirm their results with students.
- **Based on their results**, ask the following questions as discussion points.

Q: Before a nail was attached to the magnet, did the nail become a magnet? (No, it's because the nail didn't attract the clips.)

Q: During the time a nail was attached to a magnet, did the nail become a magnet? (Yes, it's because the nail attracted the clips.)

Q: After a nail was attached to the magnet, did the nail become a magnet? (Yes, it's because the nail attracted the clips.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
Q: How does a magnet become a magnet?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Try it! (10 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity.
- Conclude 'Try it!'.

Sample Blackboard Plan

Title:

"Making a Magnet"

Key question

Does an object attracted by a magnet become a magnet?

Activity A nail becomes a magnet?

	Your observation
Before a nail attracted to a magnet	Clips not attracted, etc
During a nail being attracted to a magnet	Clips attracted, etc
After a nail attracted to a magnet	Clips attracted, etc

Discussion

Q: Before a nail was attached to the magnet, did the nail become a magnet?

No, it's because the nail didn't attract the clips.

Q: During the time a nail was attached to a magnet, did the nail become a magnet?

Yes, it's because the nail attracted clips.

Q: After a nail was attached to the magnet, did the nail become a magnet?

Yes, it's because the nail attracted the clips.

Summary

- A nail is made of iron.
- Once an iron object is attached to a magnet, the object becomes a magnet.

Lesson
6 / 8**Lesson Title****Which Way?****Preparation**

- A bar magnet, water, medium size bowl/dish, polystyrene tray, compass

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lessons so far:

Q:What kinds of poles does a magnet have?

Q:What properties do the poles of a magnet have?

- Encourage students to think about how to find the direction by asking:

Q:How can we find the direction when we lose our way? Can a magnet help us to find the direction?

2 Introduce the key question

How can we find the direction using a magnet?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Advise students to refer to the characters' talking for their activity.
- Ask students to predict which direction a magnet points to.
- Have students do the activity and ask them to record their results in their exercise book.
- After the investigation, ask students to discuss which direction a magnet points to as a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings. (Continue)

Lesson 6: "Which Way?"

- 1** We use magnets in many ways. Sometimes, we use a magnet to find the direction of where we should go.

- 2**  How can we find the direction using a magnet?

3 **Activity : The direction a magnet points to**

What We Need:

• bar magnet, water, plastic basin, plastic tray

What to Do:

1. Place the magnet on the plastic tray.
2. Float the tray on the water in the basin.
3. Rotate the tray slowly and wait until it comes to rest.
4. Observe the direction the magnet points to and record your observation.
5. Repeat steps 3 and 4 several times and record your observations.
6. Share your ideas with your classmates. Talk about the direction the magnet points to.

Do all magnets always point to the same direction?

We know four directions, North, South, East and West. Can you guess which direction the magnet will point to?

Teacher's Notes**• Why does a compass always point North and South?**

The earth itself is a huge permanent magnet. The poles of that huge magnet are located near geographic north pole and south pole (though not exactly the same location as the geographic poles).

Thus, north/south-seeking poles of a magnet always point to the geographic north/south poles.

Note, unlike poles attract each other, so the south pole of 'earth magnet' is located at north and vice versa. Many people misunderstand the north pole of earth magnet corresponds to the geographic north pole of the earth. Be careful.

• Notes for the activity

1. Make sure the polystyrene tray is always in the centre of the bowl of water
2. Plastic plate and small plastic bowls can be used instead of the polystyrene tray
3. Remind students not to touch the tray while in the bowl of water (keep the condition steady)
4. You can identify the north and south at your school from direction of sunrise (east) and sunset (west)

Lesson Objectives

Students will be able to:

- Describe the direction of a magnet that points to.
- Realise that the Earth is a big magnet.
- Identify the properties of a compass.

Assessment

Students are able to:

- Explain the direction that a magnet always points to.
- State the reason why the north pole of a magnet points to north and the south pole of a magnet points to south.
- Explain how a compass helps people to identify the direction.
- Participate in the activity in co-operation with classmates.

Summary

A magnet always points to the same direction. The north pole of a magnet always points to North. The south pole of a magnet always points to South.

This characteristic of the magnets is used in compasses.

A **compass** always points north. We use a compass when we are hiking. A compass helps us find the direction. It can keep us from getting lost.

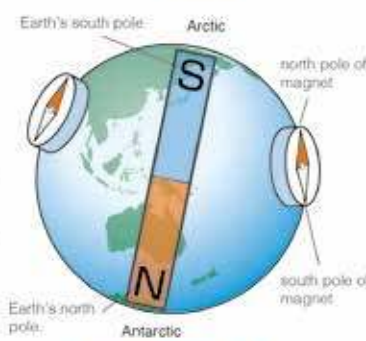
A compass always points to the same direction because the Earth is like a big magnet. The Earth's south pole is near the Arctic pole and the Earth's north pole is near the Antarctic pole. The North pole of the magnet is attracted to the Earth's south pole and the south pole of the magnet is attracted to the Earth's north pole.



The north pole of the magnet always points North



A compass



The Earth is like a big magnet

5

- Write students results on the blackboard.
- Confirm their results with students.
- **Based on their results**, ask the following questions as discussion points:
Q: Does a magnet always point to the same direction? (Yes)
 • By showing a compass, ask a question:
Q: Do you know how a compass helps us? (A compass helps us find the direction, North and South.)
 • Put a compass near the bar magnet on a tray floating on water and let students compare the direction of the bar magnet and the compass. Ask a question:
Q: Which direction does the bar magnet point to? (North pole points to North and south pole points to South.)
Q: What is the needle of a compass made of? (Magnet)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the following questions as assessment:
 Q: Which direction does the N and S poles of a magnet points to?
 Q: Why do the poles of a magnet point to the same direction?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Which Way?"

Key question

How can we find the direction using a magnet?

Activity

The direction a magnet points to

TESTS	What happened
Test 1	Students' Answers
Test 2	Students' Answers
Test 3	Students' Answers

Discussion

Q: Does a magnet always point to the same direction? **Yes**

Q: Do you know how a compass helps us? **A compass helps us to find the direction, North and South.**

Q: Which direction does the bar magnet point to?

North pole points to North and south pole points to South.

Q: What is the needle of a compass made of? **Magnet**

Summary

- A magnet always points to the same direction.
- The north pole of a magnet always points to North.
- The south pole of a magnet always points to South.
- This characteristic of a magnet is used as a **compass**. A compass always points North.
- A compass always points the same direction because the **Earth is a big magnet!**

Lesson
7 / 8Lesson Title
Summary and
Exercise

Tips of lesson

1 Summary (15 min.)

- Recap main learning contents in this chapter.
- Demonstrate and show the phenomena again in this lesson by using magnets and some objects as needed.
- Ask some questions to students throughout the lesson and verify student's understanding if they don't have any misconceptions.
- Ask students the meaning of the words 'unlike' and 'like' poles and what will happen by placing the poles of magnets close to each other.

Summary 8.1 Properties of Magnet

Properties of Magnet

Bar magnet, Horseshoe magnet, Circular magnet

☐ Magnets can attract magnetic objects that are made of iron.

☐ Objects not attracted to a magnet are called non-magnetic objects.

Magnetic objects			Non-magnetic objects		
Nail	Safety pin	Steel can	Plastic spoon	Glass cup	Pencil

☐ The parts where a magnet attracts objects more strongly are called poles.

☐ All magnets have two poles, the north pole and south pole.

Attracting and Repelling

☐ Unlike poles of magnets, North - South, attract each other.

☐ Like poles of magnets, South - South, North - North repel each other.

Making a Magnet

☐ Once an iron object is attracted to a magnet, the object becomes a magnet.

Use of Magnet

☐ A compass always points north so that it helps us find the direction.

☐ The Earth is a big magnet. The earth's south pole is near the Arctic, and the earth's north pole is near the Antarctic.

Arctic, Antarctic, Compass

169

2 Exercise & Explanation (35 min.)

- Go through the instructions of the exercise with the students.
- Provide enough time for students to attend to the questions in response to their understanding
- After the exercise, give them the answers of the questions and explain how to solve the questions using their scientific knowledge.
- After the exercise, provide the answers to the questions and explain to justify the answers along with students' answers.

Exercise 8.1 Properties of Magnet

Q1. Complete each sentence with the correct word.

- A magnetic object is made of _____.
- A magnet has north pole and _____ pole.
- The north pole and _____ pole of magnets attract each other.
- The north pole and north pole of magnets _____ each other.

Q2. Choose the letter with the correct answer.

- Which of the following is the correct explanation about magnets?
 - Some kind of magnets have only one pole.
 - All metals are magnetic objects.
 - An iron nail will become a magnet once the nail is attracted to a magnet.
 - Unlike poles of magnets push away each other.
- Which place at the bar magnet will attract more steel clips?

 - Same at any place
 - At both ends
 - On one end only
 - At the centre of the magnet

Q3. Answer the following question.

Which of the following objects are attracted by a magnet?

A. Plastic bottle	B. Iron nail	C. Text book	D. Aluminum can	E. Steel clip
F. Wood ruler	G. Rubber band	H. Scissors	I. Glass bin	J. Staples

Q4. Explain why the north pole of a compass always points to the North.

170

Exercise answers

Q1.

- (1) **iron**
- (2) **South**
- (3) **South**
- (4) **repel**

Q2.

- (1) **C**
 - All kinds of magnet have both north and south pole.
 - Metals such as aluminium and copper are not magnetic substance
 - Unlike poles of magnets attract each other

(2) **B**

Edges of a bar magnet are north and south pole that attract magnetic objects most strongly than other parts.

Q3. **B, E, H, J**

Magnetic objects that attracted by a magnet contain iron.

Both aluminium and iron are kinds of metal but they are different substances.

Q4. Sample of the answer

The earth is big magnet whose south pole is placed at the North (Arctic). North pole on a compass is always attracted by south pole of magnet. Therefore, north pole of a compass always indicates to the North of the earth.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the Science Extras.

Chapter 8
•Science Extras•

3

What happens when you cut a magnet?

Let's guess what happens when you cut a magnet into two pieces?
Do you think the two pieces are still magnets?

When you cut a bar magnet into two pieces, the two pieces are still bar magnet. At the cutting edge, new poles are created, so that the piece has both the north and south poles. In addition, what will happen if the pieces are cut further? Interestingly, a magnet is still a magnet even if it is broken down into small pieces.

171

Chapter Test

8. Properties of Magnet

Q1

Complete each sentence with the correct word.

- (1) A magnet attracts objects made of iron.
- (2) Objects attracted by a magnet are called magnetic objects.
- (3) The two ends of a bar magnet are its poles.
- (4) The south and north poles of magnets attract each other.

Q2

Choose the letter with the correct answer.

- (1) Which part of a bar magnet attracts most magnetic objects?

- A. Centre of a bar magnet.
- ☒ B. Two ends of a bar magnet.
- C. All parts of a bar magnet.
- D. One end of a bar magnet.

- (2) Which of the following are non-magnetic objects?



- A. a ruler and an iron nail
- B. an iron nail and a tin can
- C. a plastic cap and a tin can
- ☒ D. a wooden ruler and a plastic cap

- (3) What happens when an iron object is attracted to a magnet?

- ☒ A. The iron object becomes a magnet.
- B. The iron object changes its colour.
- C. The iron object loses its strength.
- D. The iron object pushes the magnet away.

- (4) A compass needle always points to the _____.

- ☒ A. North
- B. South
- C. East
- D. West

Q3

- (1) What happens when you put the north pole of one magnet near the south pole of another magnet?



The north pole of one magnet and the south pole of another magnet attract each other.

- (2) How is a metal paper clip different from a plastic paper clip?

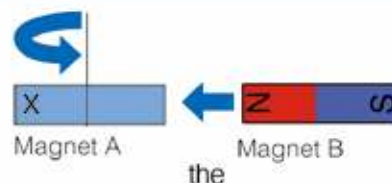
A metal paper clip is a magnetic object, while a plastic paper clip is a non-magnetic object.

- (3) How is a bar magnet similar to a horseshoe magnet?

The bar magnet and a U-shaped magnet both have two poles, the North Pole and the South Pole.

Q4

Mary hung magnet A as shown in the picture. She didn't know which side of magnet A is north or south pole. When magnet B was brought near to magnet A, magnet A rotated and side "X" faced north pole of magnet B.



From this experiment, explain which pole is side "X" in magnet A, north or south.

North pole in magnet B must attracts to south pole in magnet A so side X in magnet B should be south pole.

Strand : PHYSICAL SCIENCE

Unit : FORCE AND MOTION

Chapter 9. Force

Chapter Objectives

Students will be able to understand what force can do in an object and the types of simple machines.

Students will be able to also observe the difference in the motion of objects with large and small forces.

Topic Objectives

9.1 Objects in Motion

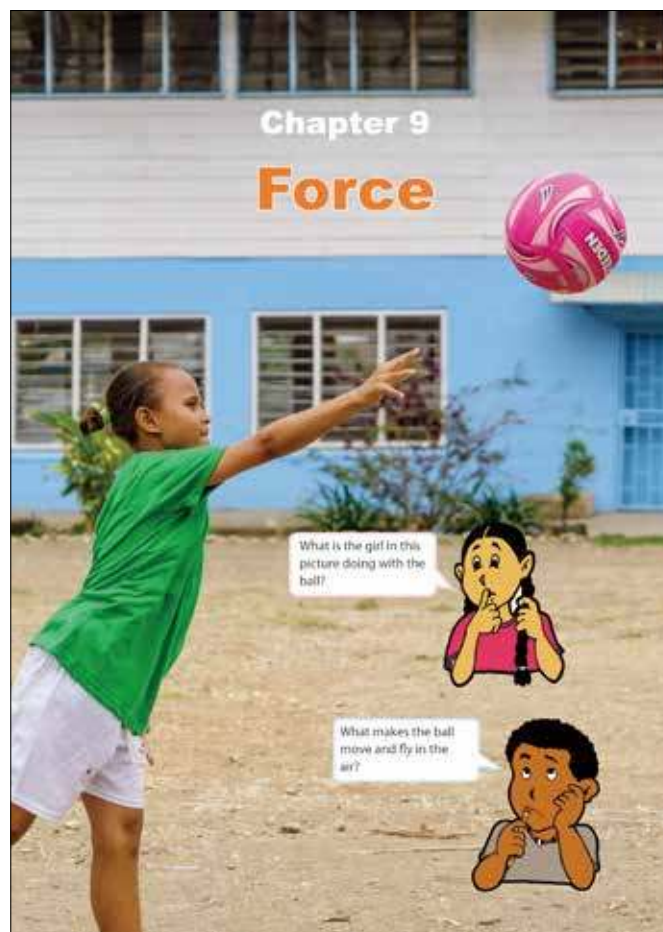
Students will be able to;

- Recognise that a force can make objects move.
- Describe difference between the forces that can move heavy and light objects.
- Explain that friction makes a moving object to slow down and stop.
- Observe the change in speed of an object through applying a force.
- Describe that force can change the direction of a moving object.
- Describe how a force works on shape and size of an object.

9.2 Simple Machine

Students will be able to;

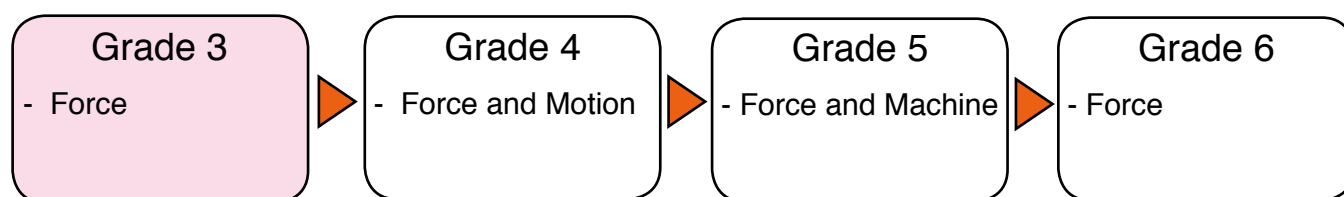
- Name the different types of simple machines.
- Explain the functions of an incline plane in our daily life.
- Explain the functions of a lever when we lift and move an object.
- Explain the functions of a pulley when we lift an object to a higher position.



Picture in the chapter heading on the textbook shows the ball released from the girl's hand with force.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 13 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
9.1 Objects in Motion	1	How Objects Move What make objects move?	3.2.4	175 - 176
	2	Push and Pull How do we push or pull a heavy or light object?		177 - 178
	3	Slower and Stop What makes things slow down and stop?		179 - 180
	4	Speed Up and Slow Down How can forces change the movement of things?		181 - 182
	5	The Way Objects Move What makes the direction of things change?		183 - 184
	6	More about Forces What else can force do?		185 - 186
	7	Summary and Exercise		187 - 188
9.2 Simple Machine	8	What is a Simple Machine? What tools help us do things easier?		189 - 190
	9	Inclined Plane How does an inclined plane work?		191 - 192
	10	Lever How does a lever work?		193 - 194
	11	Pulley How does a pulley work?		195 - 196
	12	Summary and Exercise		197 - 199
Chapter Test	13	Chapter Test		200 - 201

Lesson 1 / 13

Lesson Title

How Objects move

Preparation

- Pen, book, stone and other available materials.

Lesson Flow

1 Introduction (10 min.)

- 'Force' is a new learning concept for Gr.3 students. In order to build their curiosity, remind them of their experiences of force.

Q: Do you think a table can move by itself?

Q: How can you move a table?

2 Introduce the key question

What makes objects move?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Have students do the activity and ask them to record their findings in the table.
- Advise students to refer to the pictures and the character's talking in the activity for their investigation.
- After that, ask students to discuss what makes objects move based on their findings in a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
- Write students finding on the blackboard.
- Facilitate active students' discussion. (Continue)

9.1

Objects in Motion

Lesson 1: "How Objects Move"

1 Look around us! A lot of objects are moving. When we play basketball the ball bounces and rolls.

2 ? What makes objects move?

3 💡 **Activity : Making objects move**

What We Need:

- different objects such as pen, book, and stone

What to Do:

1. Make a table like the one shown below in your exercise book.

Name of Object	How you make it move?

2. Collect different types of objects around you and write the names of the objects in the table.
3. Try to make each object move in many ways, and make a list of how you moved it in the table.
4. Share your ideas with your classmates. Talk about what makes objects move.

Do you have any idea what makes objects move?

175

Teacher's Notes

- A force occurs when an object interacts with another object. When a force is applied to an object, the object changes its shape or changes its speed/direction of motion or both.
- A force can be found everywhere around us. In our daily life, we often use our muscles and our arm to pull up a glass of milk to get it to our mouth for instance, at that time, the shape of the muscle changes and the speed of motion of the glass changes. Because we use a force and the muscle, a glass interact with each other. When we walk, we use muscles and our legs push the floor to move forward. Again, the shape of the muscle changes and speed of legs changes, because we use a force. These interactions simply summarised as 'push' and 'pull' for children. When an object pushes or pulls another object, there must be a force.
- There are two types of forces;
 1. Contact forces are those that result when the two interacting objects physically contact with each other. e.g. applied force to kick a ball.
 2. Non-contact forces are those that result even when the two interacting objects are able to exert a push or pull despite, they are not in physical contact with each other. e.g. gravitational force (gravity) and magnetic force.

180

Lesson Objectives

Students will be able to:

- Define force.
- Identify push and pull in daily life.
- Observe how the object moves.

Assessment

Students are able to:

- Explain what a force is.
- State some examples of push and pull in their daily life.
- List how objects move on a table.
- Investigate force in cooperation with classmates.

Summary

We can move objects by pushing and pulling them. A push and pull is a **force**. When we move an object, we use a force. A force can make objects move. There are different types of forces around us. When we throw or kick a ball, we push the ball. When we zip our clothes, we pull the zipper. When we open a door, we push or pull the door.



Magnets can move objects because magnets have forces. Iron clip is attracted to a magnet because the magnet pulls the clip.

An object falls to the ground when we drop it because the Earth pulls the object. The force that pulls objects towards the Earth's centre is called **gravity**.



Objects fall down to the ground.



A magnet pulls an iron clip.

Can you give other examples of forces around you?



5

- Confirm their findings with the students.
- **Based on their findings**, ask the following questions as discussion points.

Q:How did you move the objects? (Pushing, pulling, flicking, dragging, kicking, throwing, etc)

Q:How do you move bigger or heavier objects such as a car? (Pushing, pulling, etc)

Q:What do you need to move bigger or heavier objects? (Force, power, etc)

Q:Do you have any idea of how to move objects without touching the objects? (We drop the objects, magnets attract or repels, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is a force?
Q: What can force do?
Q: What are some examples of push and pull forces in daily life.
Q: What is the force that pulls objects back down towards the Earth?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"How Objects Move"

Key question

What makes objects move?

Activity

Making objects move

Name of thing	How you make it move
Book	Push it, pull it, slide, throw it
Pen	Push it back and forth when writing, throw, pass
Book	Pull, push, slide, throw
Ball	Kick, throw, roll, bounce, spin

Discussion

Q: How did you move the objects?

Pushing, pulling, flicking, dragging, kicking, throwing, etc

Q: How do you move bigger or heavier objects such as a car?

Pushing, pulling, etc

Q: What do you need to move bigger or heavier objects?

Force, power, etc

Q: Do you have any ideas on how to move objects without touching the objects?

We drop the objects, magnets attract or repels, etc

Summary

- A **force** is a push or a pull.
- A force makes objects move.
- There are different types of forces:
 - Throwing or kicking a ball
 - Pulling up the zipper
 - Open and close a door, etc
- A magnet has forces. It can move objects by attracting or repelling.
- The Earth also pulls the objects.
- The force that pulls objects toward Earth's centre is called **gravity**.

Lesson
2 / 13

Lesson Title

Push and Pull

Preparation

- Tyres
- Ropes

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is a force?

Q:What can force do?

- Encourage students to think about how to push and pull a heavy or lighter objects by asking:

Q:If an object is lighter or heavier, how do we push or pull it?

2 Introduce the key question

How do we push or pull a heavy or light object?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Instruct students on the ground rules for outside activity.
- Go outside and have students do the activity.
- Have students record their findings in the table.
- After that, ask students to discuss how they pushed and pulled the tyre with or without friend based on their results in a group.

4 Discussion for findings (20 min.)

- Ask students to present their results from the activity.
 - Write students findings on the blackboard.
- (Continue)**

Lesson 2: "Push and Pull"

- 1** An object moves when we push or pull it. If an object is lighter or heavier, how do we push or pull it?

- 2** **?** How do we push or pull a heavy or light object?

3 **Activity : Pulling and pushing your classmate**

What We Need:

- tyres, ropes

What to Do:

1. Tie the tyre with the rope as shown on the right.
2. Push the tyre by hand and then pull the tyre by holding the end of the rope.
3. Ask one of your classmates to sit on the tyre. Push and pull the tyre.
4. Record how you push or pull the tyre with or without a friend.
5. Share your ideas with your classmates. Talk about how a force affects the movement of the tyre.



How can you make it easier to move the tyre with your classmate?

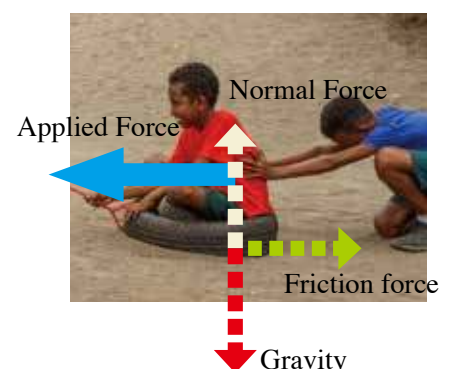


177

Teacher's Notes

Note: In case of no tyre, use a heavy box or any heavy objects in-order for students realise that more force is needed to move the heavy box or heavy object.

- (For teachers only - should NOT teach this information) For those who firstly learn about 'force', the lesson only talks about 'push' and 'pull' though, there are four forces acting around the object as shown on the right.
- Gravity (gravitational force) pulls the students on the tyre downwards but the student does not fall down. Because he is supported by ground. The force supporting is called normal force. Rough surface of the ground resist to move the student forward. This resistance is called frictional force. Frictional force is studied in the next lesson.
- Normal force and frictional force are a contact force, whereas gravitational force is a non-contact force (see previous page for more information).



Lesson Objectives

Students will be able to:

- Explain what a push and a pull is.
- Realise the relationship between the amount of force to use and the heaviness of objects to move.

Assessment

Students are able to:

- State that a push is a force moving something away while a pull is a force moving something towards us.
- Explain how they push and pull a heavy or lighter object.
- Participate in the activity with interest.

Summary

A push or a pull is a force.

A **push** is a force moving something away from us.

A **pull** is a force moving something towards us.

We can move heavy object when we push or pull harder. When we move a lighter object, we need a smaller push or pull. A larger force is needed to move a heavy object. A smaller force is needed to move lighter objects.



A push and a pull is a force.



A small force can move a light object.



A large force is needed to move a heavy object.

A kick is a pushing action. If we kick a ball with a lot of force, the ball goes further. If we kick a ball with a small force, the ball does not go far.



A large force can move a ball further.



Discussion

Which force is stronger?

"Look at the picture shown on the right. They are pulling on the rope, but the rope doesn't move. Which student is using larger force?"



5

- Confirm their results with students.
- **Based on their findings**, ask the questions as discussion point.

Q: How did you push and pull the tyre with and without a friend on it? (With a friend we needed more force. Without a friend we needed less force to move.)

Q: Which was heavier, the tyre without a friend on it or the tyre with a friend on it? (The tyre with a friend was heavier.)

Q: How much force do you need to push and pull a heavier or lighter object? (A larger force is needed to move a heavier object. A smaller force can move lighter objects.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the lesson on the blackboard.
- Ask these questions:
Q: What is a push and a pull?
Q: How much force is necessary to move a heavier or a lighter object?
- Ask students to copy the notes on the blackboard into their exercise books.

6 Further Discussion (5 min.)

- Let students think about the questions in 'Discussion' in a group.
- Ask each group to present their answers and confirm them with students.
- Conclude the further discussion.

6

178

Sample Blackboard Plan

Title:

"Push and Pull"

Key question

How do we push or pull a heavy or light object?

Activity

Pulling and pushing your classmate

Results:

	How did you move?
A tyre without a friend	We didn't need more force, we need smaller force, etc
A tyre with a friend	We push and pulled it with more or larger force, etc

Discussion

Q: How did you push and pull the tyre with and without a friend on it?

With a friend we needed more force.

Without a friend we needed less force to move.

Q: Which was heavier, the tyre without a friend on it or the tyre with a friend on it?

The tyre with a friend was heavier.

Q: How much force do you need to push and pull a heavier or lighter object?

A larger force is needed to move a heavier object. A smaller force can move lighter objects.

Summary

- A **push** is a force moving something away from us.
- A **pull** is a force moving something towards us.
- A **larger force** is needed to move a **heavy object**.
- A **smaller force** can move **lighter objects**.

Further Discussion

- Two students are using the same amount of force to pull each other.

Lesson
3 / 13**Lesson Title****Slower and Stop****Preparation**

- Textbook, note book, Books, cardboard, a toy car, ruler

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lesson.

Q: What is a push and a pull?

Q: How much force is necessary to move a heavier or a lighter object?

- Encourage students to think about a friction by asking:

Q: When we kick a ball, it will move, slow down and finally stop. Why?

2 Introduce the key question

What makes things slow down and stop?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Ask students to draw a table in their exercise books.
- Ask students to guess on which surface the toy car will travel further and record their prediction in their exercise book.
- Have students do the activity based on their prediction and record their results in the table.
- Ensure that the students measure from the end of the cardboard to the back of the car.
- Ask students to discuss which surface the toy car travelled the furthest and its reasons based on their findings in a group.

Lesson 3: "Slower and Stop"

- 1 When we kick a ball, it travels then slows down and stops. A car slows down and stops when we step on the brake.

2 ? What makes things slow down and stop?**3 Activity : Moving things on surfaces****What We Need:**

- toy car, books, ruler and cardboard.

What to Do:

1. Make a table like the one shown below.

	How you feel the surface	How far a car travelled (cm)
Concrete Floor		
Ground		

2. Touch the surfaces of the concrete floor and ground and write how it feels in the table.

3. Put two books on the concrete floor and place the cardboard on the edge of the two books.

4. Let the car off from the top of the cardboard.

5. Measure how far the car travelled using the ruler and record it in the table.

6. Repeat steps 3, 4 and 5 on the ground.

7. Share your observation with your classmates. Talk about which floor the car travelled the furthest and provide reasons.

Measure how the car travels with a ruler.

Teacher's Notes

- Facilitation notes: The result will depend on the type of toy car and the surfaces. Hence this manual does not provide expected figure of the result. Teachers are requested to test the activity prior to the lesson so that teachers can know possible results with your toy and your classroom condition.
- If it is difficult to prepare car toy like in textbook, you can use small balls, cans and bottles instead.



- Friction happens when two things rub against each other. The magnitude of the frictional force is determined by the roughness of the contact surface and weight of the object put on the surface. The rougher surface and heavier object generate more frictional force.
- Friction makes things slow down or fix. You can find friction everywhere that objects come into contact with each other. For example, a nail fixed on wall because of frictional force. It can be easily removed if there is no frictional force. Liquids such as oil reduce frictional force when they lay on the contact surface.

Lesson Objectives

Students will be able to:

- Define friction.
- Identify the function of friction.
- Observe the movement of an object on a rough and smooth surface.

Assessment

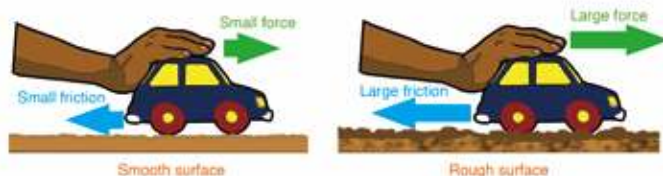
Students are able to:

- Explain what a friction is.
- State the reason why an object slows down and stops.
- Measure how far a toy car travels on a smooth and a rough surface.
- Share their opinions with respect.

Summary

Moving objects slow down and stop because of forces.

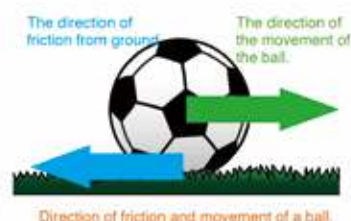
A force that makes an object slow down and stop when two surfaces of objects are rubbed against each other is called **friction**. Friction acts in the opposite direction to the movement of an object. The rougher the surface, the more friction is produced. When we try to push an object on the rough surface, friction makes this more difficult than on smooth surfaces.



A liquid makes the surface smoother and reduces its friction. We easily slip and fall if we walk across a wet floor because the wet floor reduces friction.



Without friction, we cannot grip a cup.



Friction can be useful. Without friction, we cannot grip a pen. If you run down the road, you can stop quickly because of the friction between your shoes and the ground.

4 Discussion for findings (20 min.)

- Ask each group to present their results from the activity.
- Write down students' results in a table on the blackboard.
- Confirm findings with students.
- **Based on their findings**, ask the questions as discussion point.

Q: How are the surfaces of the concrete and ground different? (Concrete floor is smooth, but ground is rough.)

Q: On which floor did the toy car travelled the furthest? (Concrete floor)

Q: Can you guess why the toy car travelled further on the concrete floor and shorter on the ground? (This is because the smoothness or roughness of the surface is different, etc.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:

Q: What is a friction?

Q: Why does a ball on the floor slow down and stop at last when we kick it?

Q: What would happen if there were no friction?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Slower and Stop"

Key question

What makes things slow down and stop?

Activity

Moving a thing on surfaces

Results:

	How do you feel?	How far a car travelled (cm)
Concrete floor	Smooth	e.g. 80 cm
Ground	Rough	e.g. 40 cm

Discussion

Q: How are the surfaces of the concrete and ground different?

Concrete floor is smooth, but ground is rough.

Q: On which floor did the toy car travelled the furthest?

Concrete floor

Q: Can you guess why the toy car travelled further on the concrete floor and shorter on the ground?

This is because the smoothness or roughness of the surface is different, etc.

Summary

- Moving objects slow down and stop because of friction.
- A force that makes an object slows down and stops when two surfaces of objects are rubbed together are called friction.
- Frictions act in the opposite direction to the movement of an object.
- The rougher the surface, the more friction is produced.
- Without friction,
 - We cannot grip a pen.
 - We cannot stop quickly on the ground.
 - We cannot grip a cup.

Lesson
4 / 13**Lesson Title****Speed Up and Slow Down****Preparation**

- A ball

Lesson Flow**1 Introduction (5 min.)**

- Review the previous lesson.

Q:What force makes things to slow down and stop?

Q:What is a friction?

- Encourage students to think about friction by asking:

Q:Force can move, slow down and stop things. What else can force do?

2 Introduce the key question

How can force change the movement of things?

3 Activity (20 min.)

- Organise students into some groups.
- Explain the steps in the activity.
- Let students guess what will happen if a rolling ball is kicked and record their prediction in their exercise book.
- Have students do the activity based on their prediction and record their results in the table.
- 'Kick a rolling ball' means 'kick the rolling ball to the same direction as the rolling ball is moving'.
- Ask students to discuss how a force changes the movement of a ball based on their results in a group.

4 Discussion for findings (25 min.)

- Ask students to present their results from the activity. (Continue)

Lesson 4: "Speed Up and Slow Down"

- 1 Force makes things move. If we apply a force on a moving object, what will happen to the object?

- 2 **?** How can force change the movement of things?

3 Activity : Kicking and catching a ball**What We Need:**

- Balls

What to Do:

1. Make a table like

the one shown below in your exercise book.

	How does the ball move?
Place the ball on the ground	
Kick the ball slowly	
Kick the rolling ball	
Catch the rolling ball	

2. Go out of the classroom and place the ball on the ground.

Observe how the ball moves and record your observations in the table.

3. Kick the ball slowly and then kick the rolling ball again. Observe how the ball moves and record your observations in the table.

4. Catch the rolling ball with your foot. Observe how the ball moves and record your observations in the table.

5. Share your findings with your classmates. Talk about how force changes the movement of the ball.

Can you guess what will happen to a ball if you kick a rolling ball?

Kicking and catching the ball are examples of force!

Teacher's Notes

- Facilitation note: Students may be enthusiastic about playing football rather than learning the scientific concepts. Teachers must guide students to pay attention when observing the motion of the ball and tell them to record their findings in their notebook.
- As described in the teacher's note for the first lesson, when a force is applied to an object, the object can change its speed of motion. Force changes the speed.
- The magnitude of the force applied to an object determines its speed. The larger force increases the speed of the object and vice versa.
- Force changes the motion of body that is already in motion, too. For example, when we push again on a moving toy car, its speed increases. Similarly, we can apply force in opposite direction of the motion to slow down the speed of the toy car. The action applying a force can cause an object to move or speed up (accelerate), to slow down (decelerate), to stop, or to change direction.

Lesson Objectives

Students will be able to:

- Define speed.
- Describe how force affects the speed of objects.

Assessment

Students are able to:

- State what speed is.
- Explain that a force can change the speed of objects
- Cooperate with classmates in group activity.

Summary

A force can start, move, speed up, slow down and stop an object. In other words, a force can change the speed of an object. **Speed** is a measure of how fast or slow an object is moving.

Kicking and catching are examples of forces.

When we place a ball on the ground, the ball is at rest. The ball at rest does not have speed.

When we kick the ball slowly, it starts to move and has speed.

A ball at rest does not have speed.



We kick the rolling ball again, it moves faster and speeds up.



When we catch the rolling ball, it stops and does not have speed.



5

- Write down students' results in the table on the blackboard.
- Confirm the findings with students.
- **Based on their findings**, ask the questions as discussion point.

Q:What happened to the ball when you kicked the ball slowly? (It started to move or roll slowly.)

Q:What happened to the rolling ball when you kicked the ball again? (It moved faster.)

Q:What happened to the rolling ball when you caught the ball again? (It stopped moving, it didn't move etc.)

Q:Kicking and catching are forces. How can force change the movement of an object? (Force can change the speed of objects, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions in order to check students understanding.
Q: What is speed?
Q: How can a force change the movement of an object?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Speed Up and Slow Down"

Key question

How can force change the movement of things?

Activity: Kicking and catching a ball

	How does the ball move?
Place a ball on the ground	Does not move
Kick a ball slowly	Moves slowly
Kick a rolling ball	Moves faster
Catch a rolling ball	Stops moving

Discussion

Q: What happened to the ball when you kicked the ball slowly?

It started to move or roll slowly.

Q: What happened to the rolling ball when you kicked the ball again?

It moved faster.

Q: What happened to the rolling ball when you caught the ball again?

It stopped moving, it didn't move etc.

Q: Kicking and catching are forces. How can force change the movement of an object?

Force can change the speed of objects, etc

Summary

- **Speed** is a measure of how fast or slow an object is moving.
- A force can start to move, speed up, slow down, and stop an object.
→ **a force can change the speed of an object.**
- A force also changes the speed of an object.

Lesson
5 / 13**Lesson Title****The Way Objects Move****Preparation**

- Marbles, large table, wood block

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lesson by asking:

Q:What is speed?

Q:How can a force change the movement of an object?

- Let students imagine when playing ball and ask:

Q:What happens to the ball when we bounce a ball?

2 Introduce the key question

What makes the direction of things change?

3 Activity (20 min.)

- Organise the students into groups.
- Explain the steps of the activity.
- Ensure that each student uses a wood block to pass the marble from one friend to another till it falls off the table.
- Have students do the activity.
- Encourage students to focus on the change in the direction of the moving marble and how the direction changes.
- After playing, let students think about the questions in the activity.
- Ask students to discuss their ideas in a group.

4 Discussion for findings (20 min.)

- Ask students to present their ideas from the activity. (**Continue**)

Lesson 5: “The Way Objects Move”

- 1** When we bounce a ball, the ball keeps moving down until it hits the ground and it bounces back up. The ball changes the direction from up to down and from down to up.

2 **What makes the direction of things change?**

3 **Activity : Passing a marble to friends**

What We Need:

- marble, large table, wooden blocks

What to Do:

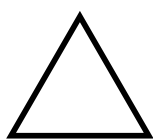
1. Form a group and sit around a table.
2. Hold the wooden block and place the marble on the table.
3. Pass the marble to a friend slowly by using the wooden block.
4. When the marble comes to you, try to pass it to another friend.
5. Continue this play until the marble falls off the table.
6. Think about the following questions:
 - Did the direction of the moving marble change when you passed it to your friends?
 - How did you change the direction of the moving marble?
7. Share your ideas with your classmates. Talk about what makes a moving marble change its direction.



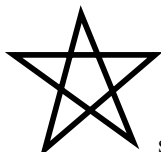
183

Teacher's Notes

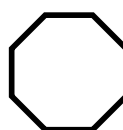
- Facilitation note: In case of no marble, a small rubber ball can be used. Teachers must carefully facilitate this activity for **NOT** just having fun. Moreover, teachers need to have all students to be engaged in the activity. To do that, teachers can ask student to complete specific tasks, for example, form polygons such as;



equilateral triangle



star



octagon

- When a force is applied at an angle to a moving object, the force changes the direction of the moving object. For example, in a game of football, player changes the direction of moving football by hitting the ball with his foot at an angle.

Lesson Objectives

Students will be able to:

- Define direction.
- Describe how a force affects the direction of objects.

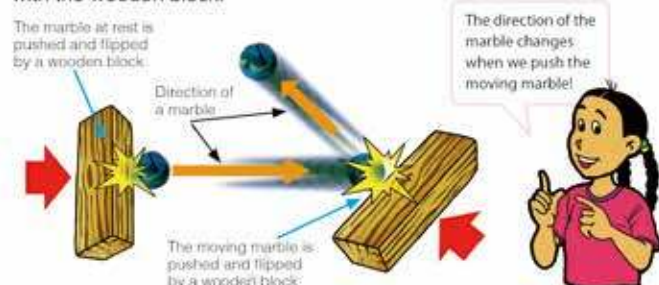
Assessment

Students are able to:

- State what direction is.
- Explain that a force can change the direction of a moving object.
- Co-operate with classmates in the activity.

Result

When we pushed and flipped the marble at rest with a wooden block, the marble started to move straight. The marble moved straight in the different direction when we pushed and flipped the moving marble with the wooden block.



Summary

Pushing and flipping are example of forces. When we push and flip a moving marble, we can change the direction of the moving marble.

This means that **a force can change the direction of a moving object.**

Direction is the path that an object takes. The direction tells us where the object is going. A force makes the direction of a moving object change.



- Write down students' results in a table on the blackboard.
- Confirm the findings with students.
- **Based on their findings, ask the questions as discussion point.**

Q:How did you pass the moving marble to your friend? (Pushing, flipping, etc)

Q:What happened to the moving marble when you pushed or flipped the marble? (The direction of the moving marble changed, speed changed, etc.)

Q:Pushing and flipping are forces. How can a force change the moving object? (Force can change the direction of objects, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is direction?
Q: What does direction tell us?
Q: How can a force change a moving object?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

“The Way Objects Move”

Key question

What makes the direction of things change?

Activity: Passing a marble to friends

1. Did the direction of a moving marble change when you passed it to your friends?

Yes, the direction changed.

2. How did you change the direction of the moving marble?

By pushing and flipping it with the wood block.

Discussion

Q: How did you pass the moving marble to your friend?

Pushing, flipping, etc

Q: What happened to the moving marble when you pushed or flipped the marble?

The direction of a moving marble was changed, speed changed, etc.

Q: Pushing and flipping are forces. How can a force change the moving object? **Force can change the direction of objects, etc**

Summary

• A **direction** is the path that an object takes.

• The direction tells us where the object is going.

• When we push and flip a moving marble, we can change the direction of the moving marble.

→ **A force can change the direction of a moving object.**

Lesson
6 / 13

Lesson Title

More about Forces

Preparation

- Empty plastic bottles without caps, clay,

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is direction?

Q:How can a force change a moving object?

- Encourage students to think more about force by asking:

Q:A force can move, speed up, slow down, and stop a thing. It also changes the direction of things. What else can force do?

2 Introduce the key question

What else can force do?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps in the activity.
- Ask students to draw a table in their exercise books.
- Ask students to guess what will happen to an object when force is applied to it and to record their prediction in their exercise book.
- Have students do the activity based on their prediction and record their results in the table.
- Ask students to discuss what forces can do based on their results in a group.

4 Discussion for findings (20 min.)

- Ask students to present their results from the activity. (**Continue**)

Lesson 6: “More about Forces”

- 1 A force can make things move, speed up, slow down and stop. A force also changes the direction of things.

2 ? What else can force do?

3 Activity : Use your force!

What We Need:

- empty plastic bottles without a cap, clay

What to Do:

1. Make a table like the one shown below.

What happened to the things?

2. Apply different types of forces to the empty plastic bottle and clay.
3. Record what happened to the plastic bottle and clay in the table.
4. Share your findings with your classmates. Talk about what forces can do.

What types of force can you apply to these things?

Can you guess what will happen to these things when we apply different forces?

Teacher's Notes

- The changes in the shape of an object is due to an applied force called 'deformation'.
- There are two types of deformations;
 - 1 Elastic deformation is the temporary change in the shape of an object produced in elastic substances by a force. Once a force is released, the original shape of an object is restored. When we pull rubber bands, its shape is deformed (expand). When we release the rubber band, its shape is recovered. When an inflated balloon is pressed, the shape of the balloon is deformed, and the original shape of the balloon is restored if a force is released. These are examples of elastic deformation.
 2. Plastic deformation is the permanent change in the shape of an object without fracture produced by a force. The undeformed shape of an object does not recover, even after a force is released. As mentioned in the textbook, pushed clay, crushed PET bottle and can are the example of the plastic deformation.
- A broken glass is the example of change in the shape of an object when a force is applied. However, we don't call it as plastic deformation. Because it is divided into several pieces. The change is not only in shape, but also in weight, hence it doesn't keep original property. Elastic or plastic deformation keep the property except for the shape.

Lesson Objectives

Students will be able to:

- Describe how a force works on the shape and size of objects.

Assessment

Students are able to:

- Explain that a force can change the shape and size of an object.
- Participate in the activity with interest.

Summary

A force can change the shape of an object. For example, we create new shapes of clay when we push, press or pull clay. When we pull a rubber band, we change its shape.



A force changes the shape of rubber band and clay.

A force can also change the size of an object. Size tells us how big or small an object is. For example, an empty bottle shrinks when we crush it. Sometimes we see crushed cans on the road because cars press the cans.



A force changes the size of the bottle and can.



Discussion

More about forces?

1. Give examples from daily life where forces may change the shape and size of things.
2. Talk about your ideas with your classmates.



5

- Write down students' results in a table on the blackboard.
- Confirm the results with students.
- Based on their findings, ask the following questions as discussion point.

Q: What types of force did you apply to the objects? (Push, press, pull, crush and squeeze, etc.)

Q: What happened to the clay and the plastic bottle when you applied force to it? (It changed its shape, it became smaller, it separated into small pieces, it shrunk, etc.)

Q: Can you guess how a force can change objects? (It can change the shape and size of objects.)

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise the lesson on the blackboard.
- Ask these questions as assessment:
Q: How can a force change an object?
- Ask students to copy the notes on the blackboard into their exercise books.

6

6 Further Discussion

- Let students think about the questions in 'Discussion'.
- Ask students to present their answers and confirm them with students.
- Conclude the further discussion.

Sample Blackboard Plan

Title:

“More about forces”

Key question

What else can force do?

Activity

Use your force!

What happened to things

1. Plastic bottle- it went small and changed shape, it shrunk, etc
2. Clay- changed into circle, flat, long, into small pieces, etc

Discussion

Q: What types of force did you apply to the objects?

Push, press, pull, crush and squeeze, etc

Q: What happened to the clay and the plastic bottle when you applied force to it?
It changed its shape, it became smaller, it separated into small pieces, it shrunk, etc.

Q: Can you guess how a force can change objects?

It can change the shape and size of objects.

Summary

- A force can change the shape of an object.
- A force also can change the size of an object.
- Size tells us how large or small an object is.

Further Discussion

Examples:

(Write down the ideas from students here!)

Lesson 7 / 13

Lesson Title Summary and Exercise

Tips of lesson

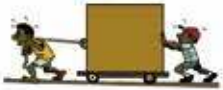
1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify student understanding. Explain and correct learning contents again if they still have misconceptions.
- Recap by defining the term force and ask them to differentiate between a push and pull.
- Ask students what force can do.

1
Summary
and
Exercise

Summary 9.1 Objects in Motion

Forces

A force is a push or a pull. - A push is a force moving something away from us. - A pull is a force moving something towards us.	
A force can make an object slow down and stop. A force that makes an object slow down and stop when two surfaces of objects are rubbed against each other is called friction.	
A force can change speed. - A force can change the speed of an object. - Speed is a measure of how fast or slow an object moves.	
A force can change direction. - A force can change the direction of a moving object. - A direction is the path that an object takes.	
A force can change shape and size. - A force can change the shape of an object. - A force can also change the size of an object.	

187

2 Exercise & Explanation (30 min.)

- Allow student to try answering questions individually to check their understanding.
- After the exercise, give them the answers of the questions and explain to justify the answers.

2
Summary
and
Exercise

Exercise 9.1 Objects in Motion

Q1. Complete the sentence with the correct word.

- How fast or slow an object moves is called _____.
- A _____ is a push or a pull.
- The path a moving object follows is called _____.
- A force can change the _____ and size of an object.

Q2. Choose the letter with the correct answer.

- Which of the following is not correct about force?
 - It makes objects slow down and stop.
 - It can change the speed and direction of a moving object.
 - It can change the shape and size of an object.
 - It can change the weight of an object.
- Which action is not a pull force?
 - Kicking a ball
 - Raising a flag up a flagpole
 - Combing hair
 - Dragging a heavy bag

Q3. Answer the following questions.
Look at the picture on the right. What force is applied by the kids to move the car backward?



Q4. John pushes a box across a rough concrete floor. Mary pushes a box across a smooth tile floor. The boxes have the same weight. Which box will slide more easily? Why?

188

Exercise answers

Q1.

(1) **speed**

(2) **force**

We can move objects by pushing and pulling using force.

(3) **direction**

The direction tells us where the object is going.

(4) **shape**

Q2.

(1) **D**

Force makes things move, slow down and stop, it changes the speed and direction of a moving object, it also changes the shape and size of an object.

(2) **A**

Kicking is not a pull, it is a push action. When you kick a ball, you push it forward.

Q3. **The force applied is push**

The picture shows that the children are pushing the car by applying force.

Q4. Sample of answer

The box Mary pushes across a smooth tile floor.

Because on a smooth tile floor has less friction

The smooth tile floor has less friction unlike the rough concrete floor which has more friction.

Therefore, it was easier to push the box across the smooth tile surface.

Lesson
8 / 13**Lesson Title**
What is a Simple Machine?**Preparation**

- Some simple machines

Lesson Flow**1 Introduction (5 min.)**

- Remind students of their daily experiences of simple machines by asking:

Q:What types of tools do you use at home?

Q:Why do we use the tools in daily life?

- Explain the introductory statement in the textbook and ask:

Q:Do you know any other tools that help us make work easier?

2 Introduce the key question

What tools help us do things easier?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Guide the students to think about their experiences where different types of tools have being used.
- Ask students to draw a table in their exercise books.
- Have students do the activity and record their findings in the table.
- Advise students to refer to the pictures of tools and the characters' talking in the activity for their investigation.
- Ask students to discuss name of tools and how they help us to do things based on their findings in a group.

9.2 Simple Machine

Lesson 1: "What is a Simple Machine?"

1 Think of your home. We can find a lot of tools that help us do things easier. For example, we use an axe to cut down a tree. An axe makes it easier to cut a tree.

2 **What tools help us do things easier?**

3 **Activity : Finding tools that help us**

What to Do:

1. Make a table like the one shown below in your exercise book.

Name of Tool	How do we use it?
e.g. axe	e.g. We use it to cut a tree.

2. Make a list of tools that help us do things easier and how we use them in the table.

3. Share your ideas with your classmates. Talk about how these tools help us to do things.

Everyday we use things that makes work easy. Can you find them?

189

Teacher's Notes

- Simple machine is a mechanical device to move heavy objects and to change direction of a force. They use 'mechanical advantage' to multiply force.
- The key features of a simple machine are summarized as follows;
 - They do not use electricity.
 - They have one or fewer moving parts.
 - They give us mechanical advantage.
 - Even though they make work easier for us, they still need input (force or effort) from a person.
 - They make tough jobs easier by changing the force, direction or speed of a movement.
 - There are usually six basic simple machines which have been used from the antient time - 1) lever, 2) wheel and axle, 3) pulley, 4) inclined plane, 5) wedge and 6) screw.
- In Gr.3, you will teach three of them such as inclined plane, lever and pulley as for the introduction of the study of the simple machine. In Gr.4, student will learn all six simple machines together.

Lesson Objectives

Students will be able to:

- Identify the simple machines in daily life.
- Define simple machines.

Assessment

Students are able to:

- List the tools that help make work easier and their uses.
- Explain what a simple machine is.
- Value and appreciate each other's ideas in discussion.

Summary

We use many tools to do things easier. When we cut papers, we use scissors. Scissors can help us cut papers easily. We turn a doorknob to open the door. A wheelbarrow can make it easier to carry an object. A tool that helps us do things easier is called a **simple machine**. There are different types of simple machines such as lever, pulley and ramp.



A doorknob makes it easier to open the door.

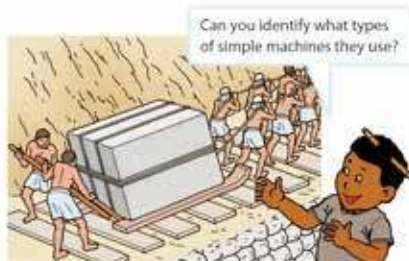


A wheelbarrow makes it easier to carry objects.



Scissors helps to cut papers easily.

Simple machines have been used for a very long time. Early people began using them to push, pull, lift, divide and crush things. Today there are many types of simple machines in every place and all around us.



Can you identify what types of simple machines they use?

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
- Facilitate active students' discussion.
- Write down the findings on the blackboard.
- **Based on their findings**, ask the following questions as discussion point.

Q:What kinds of tools did you find? (Scissors, knife, wheelbarrow, screw driver, hammer, etc)

Q:How do we use these tools? (Cut paper, carry things, pull up things, etc)

Q:Why do we use these tools? (To make work easy, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is a simple machine?
Q: What are some examples of simple machines that we use in daily life.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"What is a Simple Machine?"

Key question

What tools help us do things easier?

Activity

Finding tools that help us

Name of tool	How do we use it?
Axe	We use it to cut trees
Knife	Used to cut food
Hammer	Used to remove nail
.....	

Discussion

Q: What kinds of tools did you find?

Scissors, knife, wheelbarrow, screw driver, hammer, etc

Q: How do we use these tools?

Cut paper, carry things, pull up things, etc

Q: Why do we use these tools?

To make work easy, etc

Summary

- A tool that helps us do some things easier is called a **simple machine**.
- There are different types of simple machines such as lever, pulley, and ramp.
- Examples of simple machines are: door handles, a hammer, bottle openers, stairs, ladders, nail, doorstop, screw, faucet, knife, scissors, etc.

Lesson
9 / 13

Lesson Title
Inclined Plane

Preparation

- Tyre, a flat wooden board

Lesson Flow

1 Introduction (10 min.)

- Review the previous lesson by asking:

Q:What is a simple machine?

Q:Give some examples of simple machines that we use in daily life.

- Explain the introductory statement in the textbook and encourage students to think about an inclined plane by asking:

Q:How do you move a heavy object to a higher place?

Q:How can we move a heavy object to a higher place easily?

2 Introduce the key question

How does an inclined plane work?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps in the activity.
- Inform students on the ground rules for outside activity.
- Go outside with students and set up this activity.
- Have students do the activity and record their results in their exercise books.
- Ask students to discuss how an inclined plane helps them by comparing with or without a board based on their results in a group.

Lesson 2: “Inclined Plane”

- 1** An inclined plane is one of the simple machines. It has a flat surface connecting a lower place to a higher place.

2 ? How does an inclined plane work?

3 Activity : Lifting up a tyre

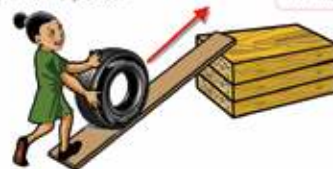
What We Need:

- tyre, a flat wooden board

What to Do:

1. Place the tyre on the ground, and try to lift it straight up onto a step.
2. Place the board on the edge of a step. Try to move the tyre from the ground onto a step using the board.
3. Record which way is easier to move the tyre from the ground onto the step.
4. Share your ideas with your classmates. Talk about how an inclined plane helps us.

Let's think of how we can move a tyre to a higher place easily!



Which way do we need less force to move the tyre to a higher place?

inclined

Teacher's Notes

Additional information

Some examples of inclined planes are children's slide, dump trucks, slanted road or hill, stairs, ladder, ramps at the hospital for wheel chairs, ramps at the shops and on vehicles.

- Teacher can refer to the teacher's notes on the previous lesson in the 'features of a simple machine'.
- Specify type of tyre to be used?
- Tyre can also be substituted with other materials that have weight such as box of books, log, others.
- Include safety rules of lifting and dropping weights of objects.

Options:

If there are no stairs, use a desk or a table and place the long board to make an incline plane.

If there are no tyres you can use something heavy; example a heavy box of books, a log, half fill 20 litre container of water etc. You should improvise with anything that has weight but not too heavy for the students to move it.

Lesson Objectives

Students will be able to:

- Define an inclined plane.
- Explain the function of an inclined plane.

Assessment

Students are able to:

- Explain what an inclined plane is.
- State how an inclined plane helps people to make work easier.
- Co-operate and participate well in the activity.

Summary

An **inclined plane** is a simple machine made up of a flat and slanted surface. An inclined plane can help move heavy objects easier from one level to another.



Inclined plane: Ramp

A ramp or a wheelchair ramp are examples of inclined planes. If we need to move a heavy object from the ground onto the truck, we could use less force to move the object up a ramp than to lift it straight up.



A stronger force is used to lift boxes straight up.



A ramp helps move boxes easier.

A ramp is also used as a wheelchair ramp. A ramp makes it easier to push a wheelchair up or down.



A ramp makes it easier to push the wheelchair up.

4 Discussion for findings (20 min.)

- Ask students to present their results from the activity.
- Facilitate active students' discussion.
- Write down their findings on the blackboard.
- **Based on their findings**, ask the following questions as discussion point.

Q: Which way did you need more force to move the tyre to a higher place? (The way without the ramp needs more force.)

Q: Which way did you need less force to move the tyre to a higher place? (The way with the ramp needed less force.)

Q: How did the board make the work easier? (The board helped us to move a tyre easily to a higher place.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is an inclined plane?
Q: How does an inclined plane make work easier?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Inclined Plane"

Key question

How does an inclined plane work?

Activity:

Lifting up a tyre

Without a board	With a board
It is hard because the tyre is heavy to lift up, etc	It is easy because we just roll the tyre up, etc

Discussion

Q: Which way did you need more force to move the tyre to a higher place?

The way without the ramp needs more force.

Q: Which way did you need less force to move the tyre to a higher place?

The way with the ramp needed less force.

Q: How did the board make the work easier?

The board helped us to move a tyre easily to a higher place.

Summary

- An **inclined plane**:
➤ Is a simple machine made up of a flat and slanted surface
➤ Helps make it easier to move a heavy object from one level to another.
- Some examples of inclined planes: Stairs, ladder and ramp

Lesson
10 / 13

Lesson Title
Lever

Preparation

- Pencil (or thin marker), stiff ruler(or wooden bar), book

Lesson Flow

1 Introduction (5 min.)

- Review the previous lesson by asking:
Q:What is an inclined plane?
Q:How does an inclined plane make work easier?
- Explain the introductory statement in the textbook and encourage students to think about a lever by asking:
Q:Have you ever heard about a lever? How does a lever help us to make work easier?

2 Introduce the key question

How does a lever work?

3 Activity (25 min.)

- Organise students into groups.
- Explain the steps in the activity.
- Ask students to make a table in their exercise book.
- Have students do the activity and ask them to record their results in the table.
- Advise students to refer to the pictures and the characters' talking in the activity for their investigation.
- After investigation, ask students to discuss how a lever works based on their results in a group.

4 Discussion for findings (25 min.)

- Ask students to present their results from the activity. (**Continue**)

Lesson 3: "Lever"

- 1** Lever is another simple machine. A lever has a bar that moves around a fixed point. We can find levers everywhere in our daily life.

2 **? How does a lever work?**

3 **Activity : Making a simple lever**

What We Need:

- pencil (or thin marker), wooden ruler (or wooden bar), book

What to Do:

1. Make a table like the one shown below.

Which direction does the book move?	Where did you put the pencil to lift the book easily?

2. Make a lever with the pencil and the ruler as shown on the picture on the right.

3. Put the book on one end of the ruler. Press the other end of the ruler down and observe which direction the book moves.

4. Move the pencil to different places on the ruler and find how to lift the book easily.

5. Record your findings in the table.

6. Share your ideas with your classmates. Talk about how a lever works.

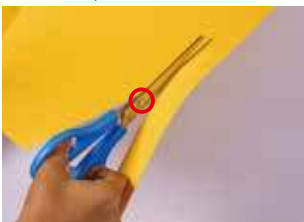
We can make a simple lever with a ruler and a pencil!

Let's move the pencil closer to or further away from the book!

Teacher's Notes

Some examples of levers used everyday and where to identify the fulcrum.

scissors, wheelbarrow and claw hammer



- Fulcrum is the support on which a lever moves when it is used to lift something.
- Other examples of levers are crowbar, tweezers, pliers and tongs.
- Use a real can drink to identify the fulcrum on the flip top.

Lesson Objectives

Students will be able to:

- Define a lever.
- Identify the functions of a lever.
- Observe the relationship between the position of the fulcrum and the amount of force required for to life an object.

Assessment

Students are able to:

- Explain what a lever is.
- State how a lever helps people make work easier.
- Describe how a force necessary for lifting a book is different when the position of a pencil changes.
- Participate in the discussion actively.

Summary

A **lever** is a simple machine made up of an arm and a fulcrum. The bar or handle of the lever is called the **arm**. The **fulcrum** is the point on which the lever turns or balances. A lever makes it easier to lift and move objects.

When we push down one end of a lever, the other end will go up in the opposite direction. A lever can change the direction of the force. The closer the fulcrum to an object on one side of the lever, the easier it is to lift the object. The further the fulcrum is from the object, the greater the force needed to lift the object.



A lever is a very useful simple machine. We can find levers everywhere. Examples of levers are flip top and shovel.



5

- Write down their findings on the blackboard.
- **Based on their findings**, ask the following questions as discussion point.

Q: Which way did the book move when you pressed the end of the ruler? (The book moved upward, it moved to the opposite direction of the force, etc)

Q: What is the difference when you put the pencil closer to or further away from a book? (Less force is needed when the pencil is closer to the book. More force is needed when the pencil is far from the book.)

Q: Do you have a good idea on how we should arrange a lever to lift the book easier? (We should put the pencil closer to the book, etc)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:

Q: What is a lever?

Q: What is a lever made up of?

Q: How does a lever work?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Lever"

Key question

How does a lever work?

Activity

Making a simple lever

Which direction does a book move?	Where did you put a pencil to lift the book easier?
It goes up, upward, etc	closer to the book, far from hand, etc

Discussion

Q: Which way did the book move when you pressed the end of the ruler?

The book moved upward, it moved to the opposite direction of a force, etc

Q: What is the difference when you put the pencil closer to or further away from a book? Less force is needed when the pencil is closer to the book. More force is needed when the pencil is far from the book.

Q: Do you have a good idea on how we should arrange a lever to lift the book easier? We should put the pencil to closer to the book, etc

Summary



- A **lever** is a simple machine made up of an arm and a fulcrum.
- A lever makes it easier to lift and move objects.
- A lever can change the direction of a force.
- The closer a fulcrum to an object, the easier it is to lift the object.
- The further a fulcrum from an object, the greater force need to lift up the object.

Lesson
11 / 13**Lesson Title****Pulley****Preparation**

- Pulley, rope (2-3 metres), a bottle of water (1L)

Lesson Flow**1 Introduction (10 min.)**

- Review the previous lesson by asking:

Q:What is a lever?

Q:What is a lever made up of?

Q:How does a lever work?

- By showing a pulley, explain the 'Introduction' part in the textbook and encourage students to think about a pulley by asking:

Q:Have you ever seen a pulley? How does it help us?

2 Introduce the key question

How does a pulley work?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps in the activity.
- Ask students to make a table in their exercise book.
- Have students do the activity and ask them to record their results in the table.
- Advise students to focus on which direction you pulled and which direction the bottle moved.
- After investigation, ask students to discuss how a pulley works based on their results in a group.

4 Discussion for findings (20 min.)

- Ask students to present their results from the activity. (**Continue**)

Lesson 4: "Pulley"

- 1 A pulley has a wheel and a rope. We use pulleys in different ways in our daily lives.

2 ? How does a pulley work?**3 Activity : Lifting up objects****What We Need:**

- pulley, string, a bottle of water

How We Do:

1. Make a table like the one shown below.

	In which direction does it move?	
	Bottle of Water	Your Pulling
Without a pulley		
With a pulley		

2. Tie one end of the string around the bottle of water and lift up the bottle by pulling the string without the pulley.
3. Set up the pulley like the picture on the right and then pull another end of the string to lift the bottle.
4. Record which direction you pulled the string and which direction the bottle moves with and without the pulley.
5. Share your ideas with your classmates. Talk about how a pulley works.

If you don't have a pulley, you can use a bar or a hand rail instead!

**Teacher's Notes****WHAT IS A PULLEY?**

A pulley is a simple machine made with a rope, belt or chain wrapped around a wheel. The pulley is usually used to lift a heavy object (load).

WHAT DOES A PULLEY DO?

A pulley changes the direction of the force, making it easier to lift things.

A pulley changes the direction of the lifting force. For example, if you are lifting a heavy object with a single pulley anchored to the ceiling, you can pull down on the rope to lift the object instead of pushing up. The same amount of effort is needed as without a pulley, but it feels easier because you are pulling down.

Lesson Objectives

Students will be able to:

- Define a pulley.
- Identify the functions of a pulley.
- Observe how a pulley changes the direction of force.

Assessment

Students are able to:

- Explain what a pulley is.
- State how a pulley helps people make work easier.
- Record the direction in which the bottle of water is moved with and without using a pulley.
- Investigate the pulley with interest.

Summary

A **pulley** is a simple machine made up of a wheel through which a rope moves. A pulley helps us to lift an object.

When we lift up an object to a higher position, we use a pulley. If we pull down one end of the rope, the object goes up. A pulley changes the direction of a force.



A Simple Machine: Pulley



A pulley changes the direction of force.

Examples of uses of pulleys are flagpole, well and crane.



Flagpole

Water well

Crane

5

- Write down the findings on the blackboard.
- Facilitate active students' discussion.
- Confirm their findings with students.
- **Based on their findings**, ask the following questions as discussion point.

Q: Which way did the bottle move when you pulled the rope with or without a pulley? (Without a pulley, the book moved to the same direction with pulling. With a pulley, the book moved to the opposite direction to pulling.)

Q: Which is easier for you to move a bottle to a higher place, with or without a pulley? (With a pulley)

Q: How does a pulley help? (It helps us to move an object to a higher place.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:

Q: What is a pulley?

Q: What is a pulley made up of?

Q: How does a pulley work?

Q: Where are pulleys used?

- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Pulley"

Key question

How does a pulley work?

Activity

Lifting up objects

	In which direction does it move?	
	Bottle of water	Your pulling
Without a pulley	Straight up	Up wards with more force
With a pulley	Straight up	downwards with less force

Discussion

Q: Which way did the bottle move when you pulled the rope with or without a pulley?

Without a pulley, the book moved to the same direction with pulling. With a pulley, the book moved to the opposite direction to pulling.

Q: Which is easier for you to move a bottle to a higher place, with or without a pulley?

With a pulley

Q: How does a pulley help?

It helps us to move an object to a higher place.

Summary

- A **pulley**:
 - Is a simple machine made up of a wheel through which a rope moves.
 - Helps to lift an object to a higher position.
- A pulley changes the direction of a force.
- Pulleys are used in flagpoles, wells and cranes.

Lesson
12 / 13

Lesson Title
**Summary and
Exercise**

Tips of lesson

1 Summary (20 min.)

- Recap main learning contents in this topic.
- Ask some questions to students and verify students understanding. Explain and correct learning contents again if they still have misconceptions.
- Provoke student to define what simple machine is and list the different type of simple machines. Define each of them.
- Ask students to give examples of each of the different type of simple machine.

2 Exercise & Explanation (30 min.)

- Allow student to try answering questions individually to check their understanding.
- After the exercise, give them the answers of the questions and explain to justify the answers.

1 Summary and Exercise **Summary** 9.2 Simple Machine

What is a Simple Machine?

- ☐ A tool that helps us do things easier is called a simple machine.
- ☐ There are different types of simple machines such as inclined plane, lever and pulley.

Inclined Plane - It is a simple machine made up of a flat and slanted surface. - It can help move heavy objects easier from one level to another.	
Lever - It is made up of an arm and a fulcrum. The arm is a bar or handle of the lever and the fulcrum is the point on which the lever turns or balances. - It can help to lift and move heavy objects easily.	
Pulley - It is made up of a wheel through which a rope moves. - It helps to lift objects to a higher position. - It changes the direction of the force.	

197

2 Summary and Exercise **Exercise** 9.2 Simple Machine

Q1. Complete each sentence with the correct word.

- A tool that makes do things easier is called a simple _____.
- A simple machine made up of an arm and a fulcrum is a _____.
- A simple machine that is made up of a rope and a wheel is a _____.
- A simple machine that has a slanted surface is an _____.

Q2. Choose the letter with the correct answer.

- Which of the following is an example of an inclined plane?

A. 	B. 	C. 	D. 
scissors	ramp	door knob	pulley
- What type of simple machine is a scissors?
 - Inclined plane
 - Pulley
 - Lever
 - Wedge

Q3. Answer the following questions.
Look at the picture on the right.

- What type of simple machine is it?
- What is it used for?



Q4. A student wants to look under a heavy rock. Which simple machine would be BEST used to lift the rock?

198

Exercise answers

Q1.

(1) **machine**

(2) **lever**

The bar or handle of the lever is the arm and the fulcrum is the point on which the lever turns or balances.

(3) **pulley**

The pulley helps us to lift an object to a higher position.

(4) **inclined plane**

An incline plane can help move heavy objects easier from one level to another.

Q2.

(1) **B**

Scissor and wheelbarrow are levers and knife is a wedge which will be learnt in grade 4, and a ramp is an incline plane.

(2) **C**

Scissor is a lever because it has handles (arm) and a balance in the middle (fulcrum).

Q3.

(1) **Pulley**

(2) **It is used to lift objects such as containers and bigger objects.**

The picture shows a crane. A crane is a pulley used to lift objects such as containers or bigger objects to a higher position. This is seen at construction sites or at the wharf.

Q4. **lever**

To lift a heavy rock, you will need a crowbar or iron stick which acts as a lever to easily lift the rock.

Explanation of Science Extras

3 Science Extras (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the science extras.

3

Chapter 9

• Science Extras •

How do we travel into space?

When you throw an apple up, the apple must fall back to the ground. Is it possible to send objects into the space? Using rocket is a way to send objects into space! The rocket can create a large upward force by burning up the fuel and the force makes its heavy body lift off the ground. The rocket can fly upward and straight into the space!



Large force makes the rocket lift off the ground!

Chapter Test

9. Force

Q1

Complete each sentence with the correct word.

- (1) A push or a pull is called a force.
- (2) A force that makes an object slow down and stop when two surfaces of objects are rubbed against each other is called friction.
- (3) There are different types of simple machine such as lever, pulley and inclined plane.
- (4) How fast or slow an object moves is called speed.

Q2

Choose the letter with the correct answer.

- (1) What must be applied to make objects move?
☒ A. Direction
B. Force
C. Speed
D. Distance
- (2) When you release a ball from your hand, which force causes the ball to fall back to the ground?
☒ A. Friction
B. Gravity
C. Magnetism
D. Electricity
- (3) How does a simple machine make work easier?
☒ A. Takes less force to move something heavy.
B. Changes the weight of something heavy.
C. Improves the way something looks.
D. Makes something become a different shape.
- (4) A slide and a ramp are examples of what type of simple machine?
A. Lever
B. Pulley
C. Wedge
☒ D. Inclined plane

(5) Which of the followings is not an explanation about force?

- A. A force can make an object slow down.
- B. A force can start to move an object.
- ☒ C. A force can change the colour of an object.
- D. A force can change the direction of a moving object.

Q3

(1) Look at the picture on the right. Paul pulls down on the rope of the pulley. In which direction does the bottle move?

the bottle moves in an upward direction



(2) Samuel is pushing a wheelbarrow. When he puts some heavy objects on it, does he need to apply larger force or smaller force to move the wheelbarrow?

larger force is needed to move a heavy object.

Q4

(1) How does an inclined plane make work easier?

An inclined plane can help move heavy objects easier from one level to another

(2) Friction can be useful for our life. Suggest two examples of what would happen if there is no friction in our daily life?

(example) We cannot grip a pen.

We cannot stop quickly on the ground.

We cannot grip a cup, etc.

Strand : EARTH AND SPACE

Unit : OUR EARTH

Chapter 10. The Earth

Chapter Objectives

Students will be able to understand the components of the Earth surface such as water and land structures and properties of rock and minerals.

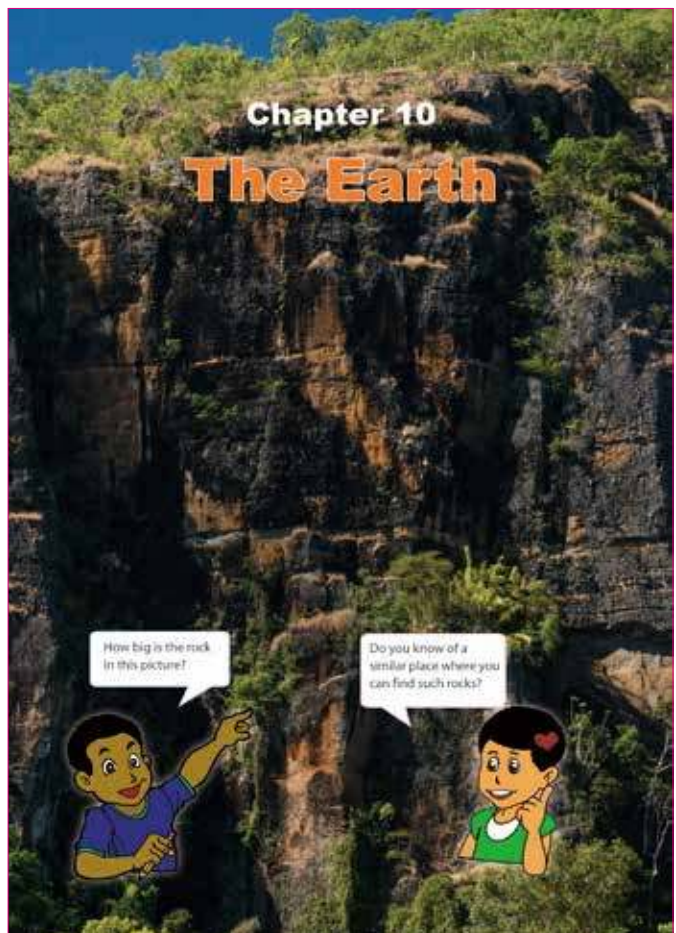
Students will be able to observe the different components in the soil.

Topic Objectives

10.1 Surface of the Earth

Students will be able to;

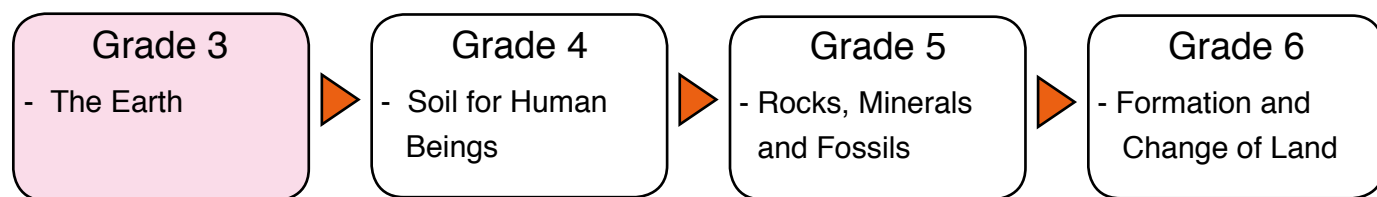
- State that water and land cover the Earth's surface.
- Describe rocks in the appearance and the hardness.
- List the components of soil such as sand, clay, water, pieces of dead parts of plants and animals.
- Compare the properties of sandy, loamy and clay soil.
- Describe the importance of soil for plants and animals to live and grow.



Picture in the chapter heading in the textbook shows a cliff of a mountain area exposing large rocks.

Related Learning Contents

The learning contents in this chapter connect to the following chapters.



Teaching Overview

This chapter consists of 7 lessons, each lesson is a double period.

Topic	Lesson No.	Lesson Title and Key Question	Content standard in syllabus	Textbook page number
10.1 Surface of The Earth	1	Covering the Earth What is the surface of the Earth covered with?	3.3.1 3.3.2 3.3.3	203 - 204
	2	Rocks What is a rock?		205 - 206
	3	Soil around Us What is soil made of?		207 - 208
	4	Properties of Soil What properties do soils have?		209 - 210
	5	Importance of Soil for Plants and Animals Why is soil important for plants and animals?		211 - 212
	6	Summary and Exercise		213 - 215
Chapter Test	7	Chapter Test		216 -217

Lesson
1 / 7

Lesson Title

Covering the Earth

Preparation

Nil

Lesson Flow

1 Introduction (10 min.)

- Encourage students to think about the Earth by asking the questions:

Q: Where do all living things live?

Q: What do you know about our Earth?

Q: What is the Earth? Today we're going to study about the earth.

2 Introduce the key question

What is the surface of the Earth covered with?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students do the activity.
- Advise students to refer to the pictures below the activity and the characters' talking for their investigation.
- Check students' activity in each group.
- Give enough time for the students to do their findings.
- After investigation, ask students to discuss what the surface of the Earth is covered with based on their findings in a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
 - Write students findings on the blackboard.
- (Continue)

10.1 Surface of The Earth

Lesson 1: "Covering the Earth"

1 We live on the Earth. Plants and animals also live on the Earth. It is important for living things. What is Earth? Let's study the Earth.

2 ? What is the surface of the Earth covered with?

3 Q **Activity : Earth's surface**

What to Do:

- Look at the picture below. The picture shows our Earth taken from space.
- Think about the following questions when observing the Earth carefully:
 - We can see different colours of different parts on the Earth. The white parts show the clouds. What do the green and brown parts show?
 - What is the blue part on the Earth?
 - Which part covers the surface of the Earth more, the green and brown parts or the blue part?
- Share your ideas with your classmates. Talk about what the surface of our Earth is covered with.

Can you find where Papua New Guinea is?





PNG is the green part and is surrounded by the blue part! What is the blue part?



203

Teacher's Notes

Definitions:

- Canyon**- Two steep cliffs with a valley that runs through it.
- Plateau**- is a **flat**, elevated landform that rises sharply above the surrounding area on at least one side.
- Basin**- A basin landform consists of an area of land, usually like a smaller prairie, enclosed by higher land such as **hills** and **mountains**.
- Tributary**- a river or stream flowing into a larger river or lake.
- A mountain range** or **hill range** is a series of **mountains** or hills ranged in a line and connected by high ground.
- Glacier**- is an accumulation of snow and ice that has grown sufficiently so that it can move downhill by the force of gravity. Pressure generated at the bottom of a glacier is high enough to cause ice to melt, even in very cold freezing temperatures. This permits a glacier to move very slowly downhill.

Lesson Objectives

Students will be able to:

- Identify what covers the Earth's surface.
- Describe the different kinds of water and the different features of land.

Assessment

Students are able to:

- Explain that the Earth's surface is covered by water and land.
- State the different kinds of water on the Earth such as salt and fresh water.
- State the different features of land such as mountains, hills and valleys.
- Active participation and discussion with classmates.

Summary

The Earth's surface is covered with water and land. Almost three quarters of the Earth's surface is water.

Water

Water covers most of the Earth's surface. Most of the Earth's water is salt water. We can find salt water in the oceans and seas. A different kind of water is fresh water. Fresh water can be found in streams, rivers, or lakes.



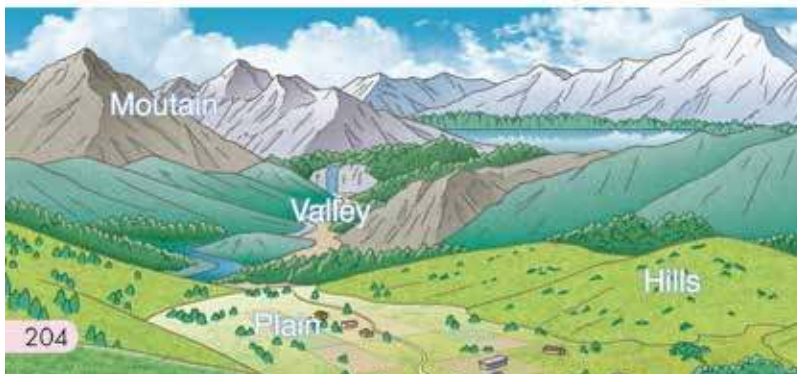
Salt Water: Ocean



Fresh Water: River

Land

Earth's surface is also covered by land. Land has several different features. Mountains, hills, valleys and plains make up the land.



5

- Facilitate active students' discussion.
- Confirm findings with students.
- **Based on their findings**, asks the following questions.

Q:What covers the Earth's surface? (Water and land)

Q:What covers most of the Earth's surface? (Water. That includes salt water and fresh water.)

Q:Where can we find fresh water? (In rivers, streams and lakes)

Q:Where is salt water found? (In oceans and seas)

Q:What do you find on land? (Mountains, forests, hills, valleys and flat places)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is the surface of the Earth covered with?
Q: What kinds of water can we find on the Earth?
Q: What are different features of land?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Covering the Earth"

Key question

What is the surface of the Earth covered with?

Activity: Earth's Surface

1. What are the green and brown parts?

Green parts is land covered with plants, Brown parts is land not covered by plants.etc

2. What is the blue part on the Earth?

Water, oceans, sea, etc

3. Which part covers more of the Earth's surface?

The blue part covers most of the Earth's surface.

Discussion

Q: What covers the Earth's surface?

Water and land

Q: What covers most of the Earth's surface? Water. That includes salt water and fresh water.

Q: Where can we find fresh water?

In rivers, streams and lakes

Q: Where is salt water found?

In oceans and seas

Q: What do you find on land?

Mountain, forest, hill, valley, flat places etc.

Summary

• Earth's surface is covered with land and water.

• Water:

➤ Water covers most of the earth's surface.

➤ There are two kinds of water; salt and fresh water.

➤ Most of Earth's water is salt water.

➤ Salt water can be found in oceans and sea.

➤ Fresh water can be found in river or lake

• Land

➤ Land has different features such as:

Mountains, hills, valleys and flat places make up land.

Lesson
2 / 7

Lesson Title
Rocks

Preparation

- Different kinds of rock samples, Hand lens, coloured pencils

Lesson Flow

1 Introduction (10 min.)

- Review previous lesson by asking:

Q: What is the surface of the Earth covered with?

Q: What kinds of water can we find on the Earth?

Q: What are different features of land?

- By showing two different rocks, encourage students to think about the rocks by asking:

Q: What are these? How are they different or alike? What are they made of?

2 Introduce the key question

What is a rock?

3 Activity (30 min.)

- Organise students into some groups.
- Explain the steps of the activity.
- Inform students on the ground rules for outside activity.
- Let students go outside and fetch some different kinds of rocks.
- Ask students to sketch the rocks and record the properties of rocks.
- Check students' activity in each group.
- After observation, ask students to discuss what properties each rock has and how they are alike or different based on their findings in a group.

Lesson 2: "Rocks"

- 1** We can find rocks around us, but do you know what rocks are? What are rocks made of? Are there different kinds of rocks? What properties do rocks have?

2 **What is a rock?**

3 **Activity : Observing rocks**

What to Do:

1. Make a table like the one shown below.
2. Go out of your classroom and fetch two different rocks.
3. Sketch each rock in the table.
4. Observe the rocks carefully and write the properties of each rock in the table.
5. Share your ideas with your classmates. Talk about the properties of each rock and how they are alike or different.

Do you remember what properties are? How can we observe the properties of rocks?



	Rock A	Rock B
Sketch		
Properties of rock		

Teacher's Notes

- Refer to teacher's guide for Grade 5, Chapter 'Rocks, Minerals and Fossils' for more information.
- Students may use 'stone' when they call objects introduced in the textbook. Generally, the word 'stone' is used for both rocks and minerals. However, they should be distinguished scientifically, the textbook uses 'rock' and 'mineral' to clearly differentiate them.
- A rock is a mixture of naturally occurring substance made up of two or more minerals in general.
- A mineral is a pure substance meaning it is composed of the same substance throughout.
- Note for minerals introduced in the textbook
 - ➔ Copper is a typical common metal used in our daily life. It is one of the major exports in PNG.
 - ➔ Gold is known as the most valuable metal being used 5,000 years ago. It was used as currency, but about a half of total annual production of gold is used for jewellery now a day. It is the top export-product in PNG.
 - ➔ Diamond is a crystal of carbon which has the highest hardness among substance in nature. Diamonds are used in jewellery. A diamond in a jewellery shown in the textbook is a polished one. It is also used as a grinder or a cutter in industries because of its hardness.

Lesson Objectives

Students will be able to:

- Observe the properties of rocks using their senses.
- Identify the different kinds of minerals.

Assessment

Students are able to:

- List the properties of rocks such as colour, texture and the size of minerals in a table.
- State the different kinds of minerals.
- Investigate the properties of rocks with interest.

Summary

There are many kinds of rocks. Limestone, sandstone and granite are examples of rocks. Conglomerate and marble are also rocks. Each rock is different from other rocks. Some rocks are dark coloured and some are light coloured. Some rocks are harder or softer than others.



A rock is made of one or more **minerals**. A mineral is a non-living thing found in nature. There are many different kinds of minerals on the Earth. Gold, diamond and copper are examples of minerals.



4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
- Write students findings on the blackboard.
- Facilitate active students' discussion.
- **Based on their findings**, ask the following questions as discussion points.

Q:How are Rock A and Rock B different?

(They look different in terms of texture, colour, size and weight, etc)

Q:Are Rock A and Rock B the same kind of rocks or not? Why do you think so? (They are different rocks. Texture, hardness, colour, size of particles are different, etc)

Q:How can we group rocks? (We can group rocks based on their properties, etc)

- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask the these questions as assessment:
Q: How can we group rocks?
Q: What are rocks made of?
Q: What is a mineral?
Q: What are examples of minerals?
- Ask students to copy the notes on the blackboard into their exercise books.

206

Sample Black board Plan

Title:

"Rocks"

Key question

What is a rock?

Activity: Observing rocks

	Rock A	Rock B
Properties of Rocks	Smooth Heavy Brown Big Contain small particles	Rough Light White Small

Discussion

Q: How are Rock A and Rock B different?

They look different in terms of texture, colour, size and weight, etc

Q: Are Rock A and Rock B the same kind of rocks or not? Why do you think so?

They are different rocks. Texture, hardness, colour, size of particles are different, etc

Q: How can we group rocks?

We can group rocks based on their properties, etc.

Summary

- There are many kinds of rocks.
- Rocks can be grouped based on their properties such as colour, hardness and the size of particles.
- Examples of rocks: Limestone, sandstone, granite, conglomerate and marble
- A rock is made of one or more minerals.
- A **mineral** is a non-living thing found in nature.
- There are many different kinds of minerals on the Earth such as Gold, diamond and copper.

Lesson
3 / 7

Lesson Title

Soil around Us

Preparation

- Clear plastic bottle, Soil, Water

Lesson Flow

1 Introduction (10 min.)

- Review previous lesson:

Q:How can we group rocks?

Q:What are rocks made of?

Q:What is a mineral?

Q:What are examples of minerals?

- By showing soil, encourage students to think about soil and ask.

Q:Rocks are made of minerals but what is soil made of?

2 Introduce the key question

What is soil made of?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Have students to do the activity.
- Let them observe carefully what happens when water is poured into the plastic bottle before shaking it. (Bubbles represent air in soil can be observed.)
- After shaking, leave the bottle for about 10-15 minutes until the components settle down.
- Let students predict what makes up a soil while they are waiting for the settling of soil.
- Have students observe the mixture and record what they find in it.
- Ask students to discuss what makes up soil in a group.

Lesson 3: "Soil around Us"

- 1** Look outside. We can see soil around us. What do you know about soil? Rocks are made of minerals but what is soil made of?

2 ? What is soil made of?

3 Activity : Observing soil

What We Need:

- a clear plastic bottle, soil, water

What to Do:

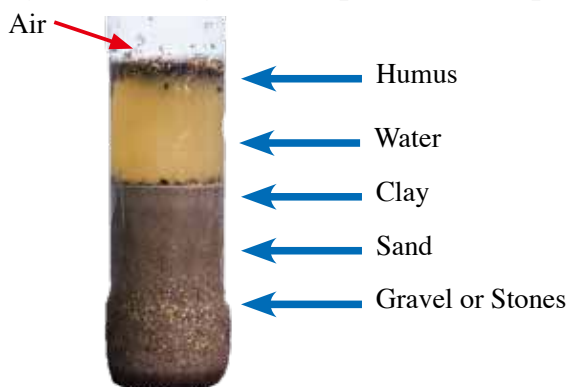
1. Go out of the classroom and collect some soil.
2. Put the soil into the plastic bottle and pour water into the bottle.
3. Screw on the cap tightly and shake the plastic bottle well.
4. After a while, sketch the mixture of soil and water in your exercise book.
5. Observe the mixture carefully and record what you found in the mixture.
6. Share your ideas with your classmates. Talk about what makes up soil.



We can see different things on the surface, in the middle and at the bottom of the bottle! What are they?

Teacher's Notes

A diagram showing an example of the components of soil



Components of soil

Soil is a mixture of weathered (grounded up and chemically changed) rock and organic matter. Living and dead plant material, manure, etc. This mixture is not solid, but contains many holes or pores. These holes contain air or water, depending upon the type of soil and the weather. In clay soil after rain many holes are full of water, but in sandy soil the water drains away leaving most holes full of air.

Lesson Objectives

Students will be able to:

- Identify the components of soil.
- Observe a mixture of soil and water.

Assessment

Students are able to:

- Describe what soil is made from such as stones, gravels, sand, clay, air, water and small pieces of dead insects' bodies, pieces of a leaves, wood and bark.
- Record what makes up soil based on observation in a table.
- Eager to investigate the components of soil.

Summary

Soil is the top layer that covers the Earth's surface. Soil is made of stones, gravels, sand and clay. Soil also has air, water and small pieces of things such as the dead insects bodies and pieces of leaves, wood and bark.



The small pieces of things in the soil have broken down, mixed together and changed into something over time. This is called **humus**. Humus is usually black or dark brown colour. Humus helps plants grow well.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
- Write students findings on the blackboard.
- Facilitate active students' discussion.
- **Based on their findings**, ask the following questions as discussion points.

Q:What happened when water was added to the soil? (Bubbles were seen, bubbles came from the soil, etc)

Q:What did you find on or near the surface of the water? (Dead plants and animals, etc)

Q:What did you find at the bottom of the water? (Gravels, stones, clay, sand, etc)

Q:What is soil made of? (Air, stones, sand, clay, dead plants and animals, etc)

- Conclude the discussion

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: What is soil?
Q: What is soil made of?
Q: What is humus?
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Soil around us"

Key question

What is soil made of?

Activity

Observing Soil

What did you observe?

1. Bubbles

2. stones

3. Dead plants

4. Water

5. Dead animals, etc

Discussion

Q: What happened when water was added to the soil?

Bubbles were seen, bubbles came from the soil, etc.

Q: What did you find on or near the surface of the water?

Dead plants and animals, etc.

Q: What did you find at the bottom of the water?

Gravels, stones, clay, sand, etc.

Q: What is soil made of?

Air, stones, sand, clay, dead plants and animals, etc.

Summary

- A **soil** is the top of layer that covers Earth's surface.

- Soil is made of the following things:
Sand, clay, pebbles, stones, water, air, dead insects bodies and pieces of a leaf, wood, bark

- **Humus** is small pieces of things broken down, mixed together and changed into something over time.

Lesson
4 / 7**Lesson Title****Properties of Soil****Preparation**

- 3 types of soil, water, 3 plastic bottles, cloth and rubber bands

Lesson Flow**1 Introduction (10 min.)**

- Review previous lesson by asking:

Q:What is soil?

Q:What is soil made of?

- By showing three kinds of soil, encourage students to think about the properties of soil and ask:

Q:These are sandy soil, loamy soil and clay soil. How are they alike or different?

2 Introduce the key question

What properties do soils have?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Instruct students to pay attention to the cut edge of the bottle during activity.
- Have students do the activity and record their observations in their exercise books.
- Advise students to refer to the illustrations and the character talking in the activity for their investigation.
- Water must be poured into three funnels at the same time in order to compare how fast water can pass through the soils.
- After investigation, ask students to discuss the properties of each soil and how they are alike or different in a group.

Lesson 4: "Properties of Soil"

- 1 There are different types of soil. Sandy soil, loamy soil and clay soil are examples of different types of soil. How are they alike or different?

2 ? What properties do soils have?**3 Activity : Comparing soils****What We Need:**

- sandy soil, loamy soil, clay soil, water, three plastic bottles, cloth, rubber bands

What to Do:

1. Observe three kinds of soils and record the properties of each soil.
2. Cut off the top of the plastic bottles and make three funnels with the rubber band and a piece of cloth. Place the funnels on the bottom part of the plastic bottles.
3. Pour one type of soil into each funnel and then pour water into the funnels.
4. Observe how fast water can pass through each soil. Record your observation in your exercise book.
5. Share your ideas with your classmates. Talk about the properties of each soil and how they are alike or different.



How can we compare three kinds of soil? Let's think about the properties of soil!

Teacher's Notes

Table showing properties of the three types of soil

Properties	Sandy	Loamy	Clay
Colour	White or light grey	Black	White, brown, red or yellow
How it feels	Dry	Soft and dry	Sticky and smooth
Size of particles	Large	Different sizes (medium)	Small
If any	Drains out water very quickly	- Made up of humus - More fertile - Has a tight hold on water, but let water pass through well	Holds a lot of water. Water passes slowly.

- Soil colour is produced by the minerals present and by the organic matter content.
- Loamy soil retains a moderate (average) amount of water because of its medium size particles.

Lesson Objectives

Students will be able to:

- Identify the properties of sandy, clay and loamy soil.
- Observe how fast water passes through each type of soil.

Assessment

Students are able to:

- Describe the properties of sandy, clay and loamy soil based on colour, texture, the size of particles and how fast water can pass through them.
- Compare the speed of water that can pass through sandy, clay and loamy soil.
- Investigate the properties of soil with interest.

Summary

Different types of soil have different properties such as colour, texture, size of particles, the substances it contains and how fast water can pass through the soil. Sandy soil, loamy soil and clay soil also have different properties.

Sandy Soil

The colour of sandy soil is often tan or light grey. The size of sandy soil particles is larger than clay soil. It feels dry and gritty. Water can pass through sandy soil quickly.

Loamy Soil

Loamy soil is dark in colour. It feels coarse, soft and dry. Loamy soil contains various sizes of particles. Loamy soil holds onto water, but it lets water pass through well.

Clay Soil

The colour of clay soil is often brown, red or yellow. The particles of clay soil are the smallest among the three types of soils. It feels sticky when wet but smooth when dry. Water can pass through clay soil slowly.



Sandy soil



Loamy soil



Clay soil

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity.
- Write students findings on the blackboard.
- **Based on their findings**, ask the following questions as discussion points.

Q: How are three kinds of soil different?

(The colour, texture and the size of particles are different.)

Q: Which soil can water pass through fastest or slowest? (Fastest: Sandy soil, Slowest: Clay soil)

Q: Can you guess why water can pass through sandy soil faster than clay soil? (This is because the size of particles are different. Sandy soil particles are larger than clay soil particles.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: How can we classify different types of soil?
Q: Explain the properties of sandy, clay and loamy soil.
- Ask students to copy the notes on the blackboard into their exercise books.

Sample Blackboard Plan

Title:

"Properties of Soil"

Key question

What properties do soils have?

Activity: Comparing Soils

Results:

1. The properties of each soil:

Sandy soil: **White or light grey, rough, dry, etc**

Loamy soil: **Black, Soft and dry, different size, etc**

Clay soil: **brown, red or yellow, wet, small, etc**

2. How fast did water pass through?

Sandy soil: **Water can pass through fastest.**

Loamy soil: **Water can pass through, but slower.**

Clay soil: **Water cannot pass through.**

Discussion

Q: How are three kinds of soil different?

The colour, texture and the size of particles are different.

Q: Which soil can water pass through fastest or slowest?

Fastest: Sandy soil, Slowest: Clay soil

Q: Can you guess why water can pass through sandy soil faster than clay soil?

This is because the size of particles are different. Sandy soil particles are larger than clay soil particles.

Summary

- There are different kinds of soil such as sandy, loamy and clay soil.
- Soils can be classified based on their properties such as:
 - Colour
 - Size of particles
 - Texture
 - Substances it contains
 - How fast water can pass through

Types of Soil	Properties
Sandy	(Write the properties)
Loamy	(Write the properties)
Clay	(Write the properties)

Lesson
5 / 7

Lesson Title

**Importance of Soil
for Plants and Animals**

Preparation

• Nil

Lesson Flow

1 Introduction (10 min.)

- Review previous lesson by asking:
Q:How can we classify different types of soil?
Q:Explain the properties of sandy, clay and loamy soil.
- Encourage students to think about the importance of soil and ask:
Q:Soil is a non-living thing. How do living things depend on soil?

2 Introduce the key question

Why is soil important for plants and animals?

3 Activity (20 min.)

- Organise students into groups.
- Explain the steps of the activity.
- Ask students to make a table in their exercise books.
- Have students do the activity and ask them to record their findings in the table.
- Advise students to refer to the pictures in the activity for their investigation.
- After investigation, ask students to discuss why soil is important for plants and animals based on their findings in a group.

4 Discussion for findings (20 min.)

- Ask students to present their findings from the activity. (**Continue**)

Lesson 5:

**“Importance of Soil for
Plants and Animals”**

- 1** Soil is very important for plants and animals to survive. How does soil help plants and animals to survive?

2 ? Why is soil important for plants and animals?

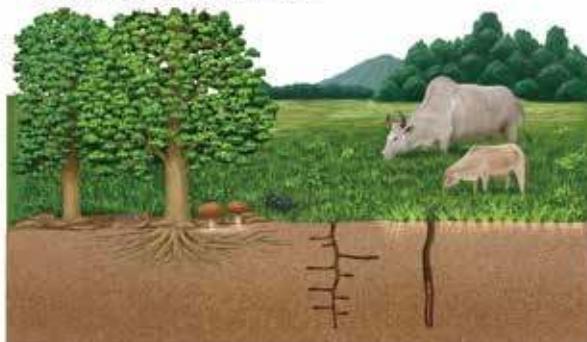
3 Activity : How plants and animals use soil

What to Do:

1. Make a table like the one below.

Living things	How do plants and animals use soil?
Plants	
Animals	

2. Look at the picture below and think about how plants and animals use the soil to survive. Write your ideas in the table.
3. Share your ideas with your classmates. Talk about why soil is important for plants and animals.



211

Teacher's Notes

Soil is abiotic component of plant's and animal's environment (habitat). Importance (Functions) of soils are summarized as follows;

- Medium for plant growth:
 - Soils provide plants with essential minerals and nutrients.
 - Soils provide air for gaseous exchange between roots and atmosphere.
 - Soils protect plants from erosion and other destructive physical, biological and chemical activities.
 - Soils hold water (moisture) and maintain adequate aeration.
- Habitat for many insects and other organisms:
 - Insects and microbes (very tiny single cell organisms) live in the soils and depend on soils for food and air.
 - Soils are homes to a diverse range of organisms such as worms and termites. They provide the needed moisture and air for breakdown of organic matter.
 - They provide a home for many organisms such as insects to lay and hatch eggs and rodents to give birth to new off spring.

Lesson Objectives

Students will be able to:

- Describe how plants and animals depend on soil to survive.

Assessment

Students are able to:

- Explain the different ways that plants and animals depend on soil.
- List how plants and animals use soil in a table.
- Value the importance of soil for living things.

Summary

Plants and animals depend on the soil to live and grow in many ways.

Plants

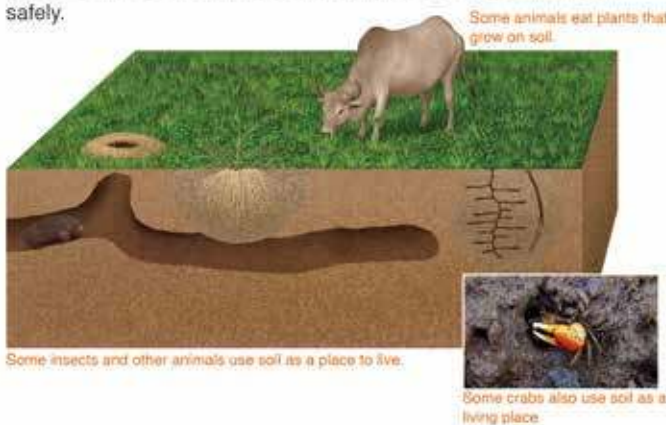
Soil helps plants grow and live. Plants depend on soil for space to live. Soil supports roots and keeps plants upright for growth. Soil contains water and humus in it. Plants use the water to live and the humus to grow well.

Animals

Soil is important for animals too. Animals depend on soil for food. Plants grow in soil. Some animals eat the plants grown on the soil. Soil provides many animals with a place to live. Some animals such as insects or moles live in soil safely.



Plants depend on soil in many ways.



Some insects and other animals use soil as a place to live.

Some animals eat plants that grow on soil.

Some crabs also use soil as a living place.

5

- Write students findings on the blackboard.
- Facilitate active students' discussion.
- **Based on their findings**, ask the following questions as discussion points:

Q:How do plants use soil? (They use soil for support, getting water or nutrients, etc.)

Q:How do animals use soil? (They use soil for food by eating plants that grow in soil, for living places to stay safe, etc.)

Q:Why is soil so important for plants and animals? (This is because they depend on soils to live, grow and survive.)

- Conclude the discussion.

5 Summary (10 min.)

- Ask the students to open their textbooks to the summary page and explain it.
- Summarise today's lesson on the blackboard.
- Ask these questions as assessment:
Q: Why is soil important for plants and animals?
Q: How do plants depend on soil?
Q: How do animals depend on soil?
- Ask students to copy the notes on the blackboard into their exercise books.

212

Sample Blackboard Plan

Title:

"Importance of soil for plants and animals."

Key question

Why is soil important for plants and animals?

Activity

How plants and animals use soil?

Living Things	How do Plants and Animals depend on soil?
Plants	For food, and space to live
Animals	For food and shelter

Discussion

Q: How do plants use soil?

They use soil for support, getting water or nutrients, etc.

Q: How do animals use soil?

They use soil for food by eating plants that grow in soil, for living places to stay safe, etc.

Q: Why is soil so important for plants and animals?

This is because they depend on soils to live, grow and survive.

Summary

- Plants and animals depend on soils to live and grow in many ways.
- Plants depend on soil for:
 - 1.Space to live
 - 2.Supporting roots and keeping plants upright for growth.
 3. Water to live and the humus to grow well.
- Animals depend on soil for:
 1. Food
 2. Shelter and safety.

Lesson
6 / 7**Lesson Title**
Summary and Exercise**Tips of lesson****1 Summary (15 min.)**

- Recap main learning contents in this chapter.
- Ask some questions to students and verify student understanding. Correct their misconception if they still have, by explain the learning contents again.
- Recap that land has various structures such as mountain, valley and plateau that is mainly masses of rocks and minerals.
- Recap different kind of soil have different properties such as colour, texture and size of its particles.

2 Exercise & Explanation (35 min.)

- Go through with students the instructions of the exercise.
- Provide enough time for students to attend to the questions in response to their understanding.
- After the test, give them the answers of the questions and explain how to solve using their scientific understanding and ideas.
- After the test, provide the answers of the questions to students and explain to justify the answers along with students' answers.

1 Summary and Exercise 10.1 Surface of the Earth

Surface of the Earth

- ☐ The Earth's surface is covered with water and land.
- ☐ Water covers most of the Earth's surface. Land covers the rest of it.
- ☐ There are two types of water covering the Earth's surface, salt water and fresh water.

Rocks

- ☐ There are many kinds of rocks and minerals. They are non-living things. A rock is made of one or more minerals.

Rocks			Minerals		
					
Granite	Sandstone	Marble	Copper	Gold	Amethyst

Characteristics of Soil

- ☐ There are different types of soil.

Type	Sandy soil	Loamy soil	Clay soil
Example			
Colour	Tan or light grey	Dark colour	Brown, red or yellow
Particle size	Larger than clay soil	Various sizes	Smallest in all soils
Texture	Gritty and dry	Coarse, soft and dry	Sticky (wet) / smooth (dry)

- ☐ Use of soil for plants and animals.

Plants	Animals
- Plants grow root into soil and the soil supports it to keep it upright. - Plants use water and humus in soil.	- Some animals eat plants that grow on the soil. - Soil provide animals with safe homes.

213

2 Summary and Exercise 10.1 Surface of the Earth

Q1. Complete each sentence with the correct word.

- The Earth's surface is covered by water and _____.
- _____ is the top layer material covering the Earth's surface and is made of stones, gravels, sand, clay, air and water.
- _____ is small pieces of dead plants and animals in soil.
- A rock is made of one or more _____.

Q2. Choose the letter with the correct answer.

Which of the following is the correct explanation about soil?

- All kinds of soil have the same colour.
- The size of clay soil particles are larger than sandy soil.
- Water can pass through clay soil more quickly than sandy soil.
- When clay soil is wet, it feels sticky.

Q3. Answer the following questions.

Look at the picture on the right. What features can you find? Choose the correct answers from the list.

Desert	Ocean	River
Lake	Valley	Plain



Q4. What might happen to the plants if the soil is removed from where they grow?

214

Exercise answers

Q1.

- (1) **land**
- (2) **soil**
- (3) **humus**
- (4) **minerals**

Q2.

- (1) **D**
 - Different soils have different colours. For example, light colour soil contains more amount of light coloured grains than dark coloured grains. While dark coloured soil contains more amount of dark coloured grains than light coloured grains.
 - Clay soil particles are smaller than sandy soil particles.
 - Sand particles are larger than clay particles. Large particles that are loosely spaced, such as sand, allow water to move through the soil quickly.

Q3. **River, Valley**

Let students focus on the land structures.

Q4. Sample of the answers

Plants are not able to keep upright without soil because soil supports plant's roots.

Plants would die without soil because plants get water and nutrients to survive from soil.

Explanation of column

3 Column (10 min.)

- Give opportunities to students to closely observe the nature and its phenomena in the world.
- Allow students to ask questions that demonstrate curiosity about the content in the column.

3

Chapter 10
•Science Extras•

Why does the Earth's surface looks different at different places?

Look at the picture showing the surface of the Earth. Around 80 percent of land in Papua New Guinea is covered by forest and therefore looks green.

How does the African continent look like? The middle part of the continent looks green and is covered by deep forest, while the northern part seems light brown and is covered by desert sands. The area of the desert is larger than Papua New Guinea.

Let's look at the Antarctic Continent located at the most southern part of the Earth. The continent is covered with ice and snow without growing plants, so it looks white.



Papua New Guinea is covered by forest.



The Earth's surface.

215

Chapter Test

10. The Earth

Q1

Complete each sentence with the correct word.

- (1) The surface of the Earth is covered by water and land.
- (2) A rock is made of one or more minerals.
- (3) Soil is mainly classified as loamy, sandy and clay soil.
- (4) Soil can be classified by its colour, size of particles and the substances it contains.
- (5) Mountains, hills, valleys and flat places make up the land.

Q2

Choose the letter with the correct answer.

- (1) Which of the following is not a component of soil?
A. Humus
B. Rocks
C. Minerals
☒ D. Plastic
- (2) Which of the following is not provided by soil for plants?
A. Space to take root in
B. Water to survive
C. Humus to grow well
☒ D. Sunlight to make food
- (3) What kind of soil has the largest particle size?
☒ A. Sand
B. Loam
C. Clay
D. All have the same particle size
- (4) What do all rocks have in common? They have the;
A. Same size.
B. Same colour.
☒ C. One or more minerals.
D. Same shape.

Q3

- (1) A student observed a mixture of soil and water as shown on the right. What are the things floating on the water?

Humus (dead plants and animals)



- (2) There are three main types of soil; sand, loam and clay. Sticky soil holds a lot of water. Which type of soil mostly makes sticky soil?

Clay

Q4

- (1) How do animals help soil?

They help the soil by digging in it and breaking it into small pieces. This keeps air in the soil and makes space for water to get into the soil.

- (2) Look at the two rocks shown below.

Are Rock A and Rock B the same kind of rock? Write your answer with reasons.



Rock A



Rock B

Rock A and B are different kind of rocks. Both have different colour patterns and their texture looks different.

Science Tool Box

1. How to use a Balance
2. How to use a Thermometer
3. How to use a Compass
4. How to draw a sketch



I would like to use the science tools in the lesson!

Let's check and learn how to use the science tools here.



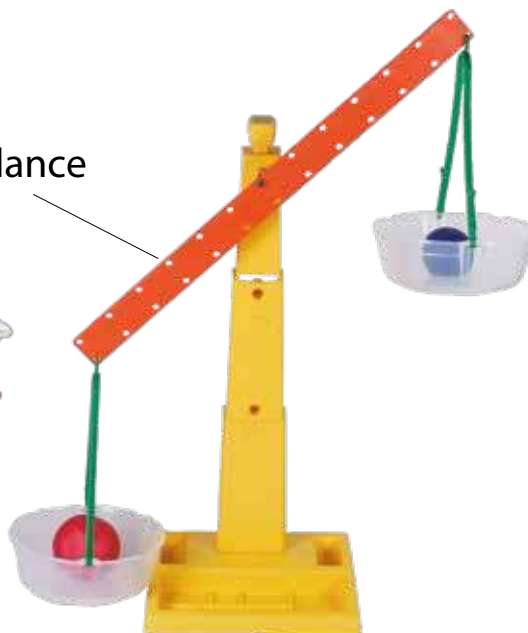
Thermometer



Compass



Balance



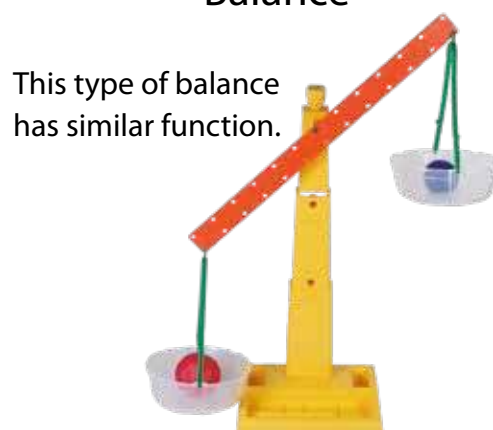
How to use a Balance

1. What is a balance?

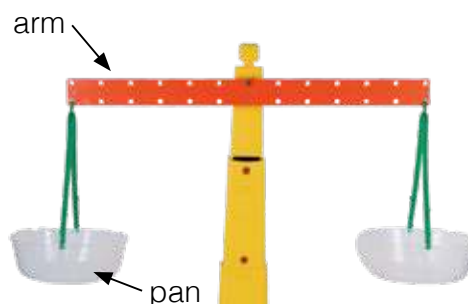
A balance is an instrument that is used to compare weight. Weight is a property of matter in an object. A balance has two pans, on the left and right of the arm. To compare the weight of two objects, place an object on the left and another on the right pan. The arm tilts down to the heavier side. If two objects have equal weight, then the left and right pans are balanced.



Balance



This type of balance has similar function.



2. Comparing the weight of coins

STEP 1:

Check that the empty pans are balanced. If it needs to be adjusted, move the slider or adjuster until the pans are balanced.

STEP2:

Place a coin on the left pan and another coin on the right pan. When the arm tilts down to the right, then it means the coin on the right pan is heavier than the left side. If the left and right pans are balanced, the two coins have the same weight.



How to use a Thermometer

1. What is a thermometer?

A thermometer is an instrument we can use to measure temperature. A thermometer consists of a glass tube with marks on it. When the liquid in the glass tube gets heated, it expands and begins to rise up the tube. Temperature is measured in degree Celsius [$^{\circ}\text{C}$].



2. Measuring temperature

STEP 1:

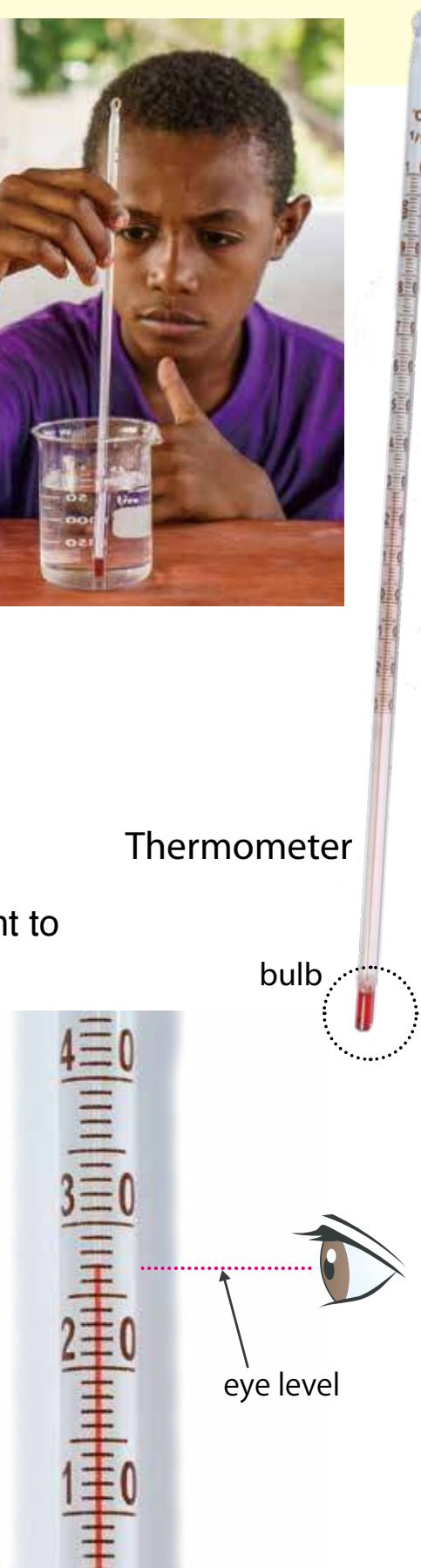
Place the bulb in the place where you want to measure the temperature. Make sure that there are no bright lights or direct sunlight shining on the bulb.

STEP 2:

Wait for a few minutes until the liquid in the tube stops moving. Position your eyes at the same level with the top of the liquid in the tube.

STEP 3:

Read the scale line that is closest to the top of the liquid. The thermometer as shown on the right shows 27°C .



How to use a Compass

1. What is a compass?

A compass is an instrument you use for finding directions (North, South, East and West). It has a dial and a magnetic needle that always points to the north/south. This helps you to locate your position on a map and to set the direction you wish to travel.



Compass

2. Finding directions

STEP 1:

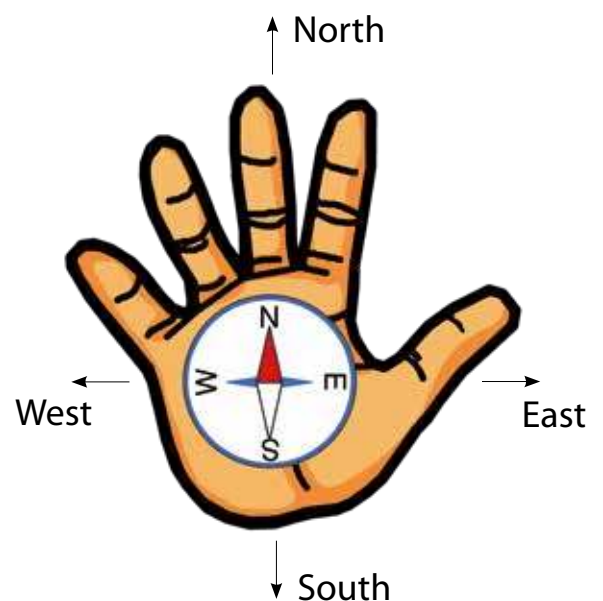
When you want to face North, place a compass flat on your palm and hold in front of your chest as shown in the picture on the right.

STEP2:

Turn your body until the magnetic needle comes to the sign of North on the dial. When the needle overlaps the North sign on the dial, you are facing North.

STEP3:

Find other directions when you are facing North. Your right side points to East and left side points to West and your back is facing the South when you are facing North.



How to draw a sketch

Scientific sketch is NOT an artwork. The sketch requires precise drawing. If the plant has two leaves, the sketch should have two leaves only as they are.

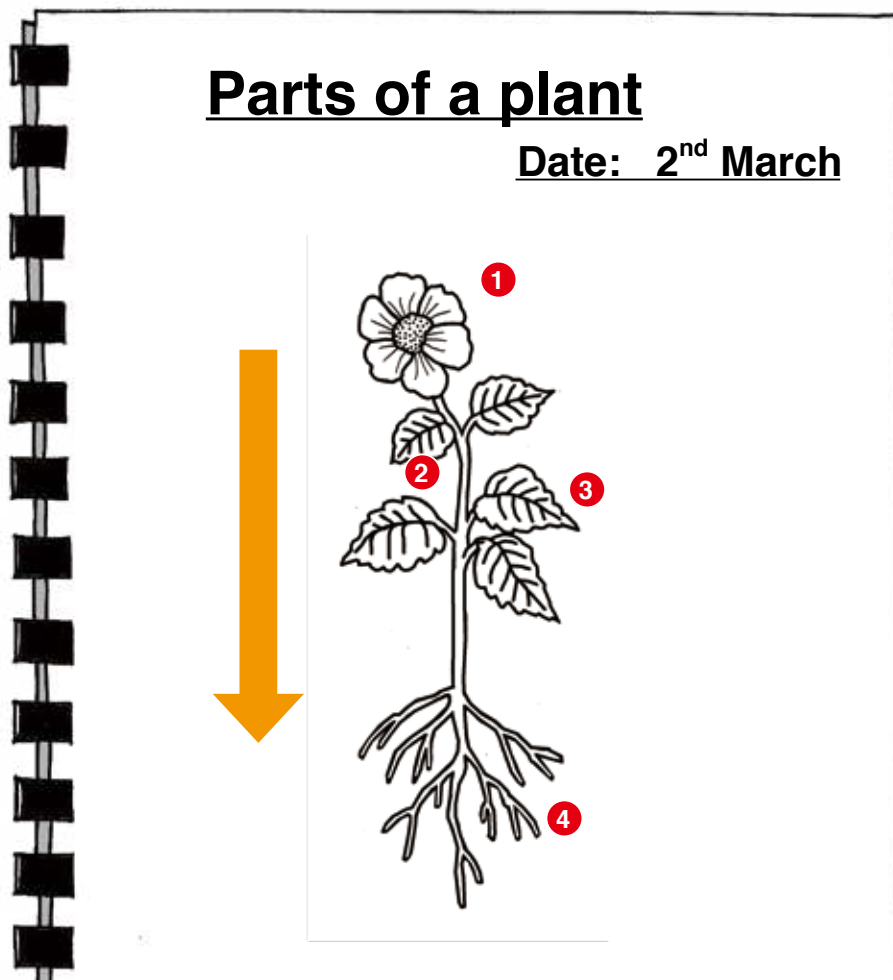
The principle of sketch is “top to bottom” and “front side to back side”. For example, look at the sample below;

STEP 1: Start by drawing the flower of the plant.

STEP 2: Next draw the stem.

STEP 3: Next the leaf. Draw from front leaves to back.

STEP 4: Lastly draw the root.



Write down a title and date when you are drawing a sketch.



Amphibian is an animal whose body is covered with moist skin.	88
Axis in the Earth is an imaginary straight line that passes through the North pole and South pole of the Earth.	130
Balance is a tool to compare the weight of matters.	36
Bird is an animal that has feathers and wings.	88
Compass is an instrument you use for finding directions.	168
Direction is the path that an object takes. The direction tells us where the object is going.	184
Energy is the ability to do work. Energy can change and move things. ...	110
Environment is everything that makes up our surroundings.	12
Man-made environment is the environment that is made of man-made things.	14
Natural environment is the environment made of natural things.	14
Nonmagnetic object is an object that is not attracted by a magnet.	160
Fibrous root is a root that has many smaller roots that spread out in different directions.	76
Fish is an animal that lives in water and has scales and gills.	88
Force is a push or a pull.	176
Forest is a place with many trees that grow close together.	22
Friction is force that makes an object slow down and stop when two surfaces of objects are rubbed against each other.	180
Fulcrum is the point on which the lever turns or balances.	194
Gravity is the force that pulls objects toward Earth's centre.	176
Herbs are plants that have soft and green stems.	78
Humus is tiny bit of dead plants and animals in soil.	208
Inclined plane is a simple machine made up of a flat and slanted surface.	192
Insect is an animal that has 6 legs and hard outer covering.	88
Leaf is a part of plants made up of a leaf stalk, a leaf blade, and veins.	70

Leaf blade is the main flat area of the leaf.	80
Leaf margin is shape of leaf edges.	80
Leaf vein is a tube that can help carry water and nutrients throughout the leaf.	80
Lever is a simple machine made up of arm and fulcrum.	194
Light is energy that we can see.	138
Living things are things that grow, change and breathe, can move by themselves and produce new living things.	16
Magnet is an object that attracts magnetic object.	158
Magnetic object is made of iron and attracts to a magnet.	160
Magnetic poles are the parts where a magnet attracts objects most strongly. All magnets have north and south pole.	162
Mammal is an animal that has fur or hair and breathe by lungs.	88
Man-made things are things made by people.	14
Matter is everything around us.	32
Mineral is a non-living thing found in nature such as gold, diamond and copper.	206
Mixture is something made of two or more kinds of matters.	58
Natural things are things that come from nature and not made by people. Plants, animals, soil, air and water.	14
Non-living things are things that do not grow, change, breathe and cannot produce new ones.	16
Nutrient is a material in the soil that living things need to grow	72
Object is a thing that we can see and touch.	41
Ocean is the vast body of salt water.	22
Opaque objects do not let any light travel through them.	142
Property is anything that we learn about a matter such as weight, size, colour, and texture.	34

Pulley is a simple machine made up of a wheel through which a rope moves.	196
Reflection is what occurs when light bounces off an object.	148
Reptile is an animal whose skin is covering with dry scales.	88
Rock is made of one or more minerals.	206
Roots are a part of plants that are usually found under the soil.	70
Shrubs are small to medium sized plants with hard and woody stems.	78
Simple machine is a tool that helps us do some things easier.	190
Soil is the top layer that covers Earth's surface.	208
Speed is a measurement of how fast or slow an object is moving.	182
Stem is a part of plants that connects the roots to other plant parts.	70
Sun is the brightest object in the day sky.	120
Taproot is a root that has one major root that grows very deep into the ground.	76
Temperature is how warm or cool something is. Temperature is measured in degrees Celsius(°C)	122
Thermometer is an instrument we use to measure temperature.	122
Translucent objects allow some light to travel through them.	142
Transparent objects allow light to travel through them.	142
Trees are plants that have hard and woody stems.....	78
Volume is the amount of space that a matter takes up.	46
Weight is a measure of how heavy an object is.....	35
Wetland is a place that is very wet.	22

Basic Science Instruments

Basic science instruments introduced in the textbook are listed below.



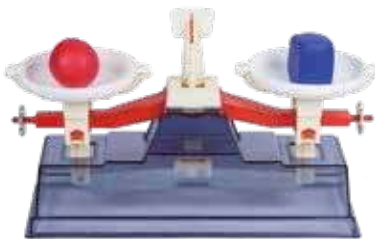
1



2



3



4 -1



4 -2



5



6



7



8

- 1 Magnifying lens
- 2 Measuring cylinder
- 3 Beaker
- 4 Balances
- 5 Thermometer
- 6 Compass
- 7 Bar magnet
- 8 Horseshoe magnet

Science Grade 3 Teacher's Manual Development Committee

The Science Teacher's Manual was developed by Curriculum Development Division (CDD), Department of Education in partnership with Japan International Cooperation Agency (JICA) through the Project for Improving the Quality of Mathematics and Science Education (QUIS-ME Project). The following stakeholders have contributed to manage, write, validate and make quality assurance for developing quality Textbook and Teacher's Manual for students and teachers of Papua New Guinea.

Joint Coordinating Committee members for QUIS-ME Project

Dr. Uke Kombra, Secretary for Education - Chairperson, Mr. Walipe Wingi, Deputy Secretary - Deputy Chairperson, Mr. Baran Sori, Mr. Samson Wangihomie, Mr. Titus Romano Hatagen, Dr. Eliakim Apelis, Mr. Godfrey Yerua, Mrs. Annemarie Kona, Mr. Camilus Kanau, Mr. Joseph Moide, Mr. Peter Kants, Mr. Maxton Essy, Mr. Steven Tandale, Ms. Hatsie Mirou, Mr. Paul Ainui, Mr. Packiam Arulappan, Mr. Allen Jim, Mr. Nopa Raki, Mr. Gandhi Lavaki, Mr. John Kakas, Ms. Philippa Darius, Mr. Alex Magun, Ms. Mary Norrie, Mr. James Namari, Ms. Kila Tau, Mr. Moses Hatagen Koran, Ms. Colette Modagai, Ms. Dorothy Marang, Mr. Dan Lyanda, Representatives from Embassy of Japan and JICA PNG Office, Mr. Akinori Ito, MPS, Mr. Chiko Yamaoka and other Project Experts

Steering Committee members for QUIS-ME Project

Mrs. Annemarie Kona, First Assistant Secretary - Chairperson, Mr. Steven Tandale - Assistant Secretary, CDD - Deputy, Chairperson, Ms. Hatsie Mirou, Mr. Paul Ainui, Mr. Gandhi Lavaki, Mr. John Kakas, Ms. Philippa Darius, Mr. Alex Magun, Ms. Mary Norrie, Mr. James Namari, Ms. Kila Tau, Mr. Moses Hatagen Koran, Ms. Mary Phillips, Mr. Nopa Raki, Mr. Geoff Gibaru, Ms. Jean Taviri, Mr. Akinori Ito, MPS, Mr. Chiko Yamaoka, Mr. Satoshi Kusaka, Mr. Ryuihi Sugiyama, Mr. Kenichi Jibutsu, Ms. Masako Tsuzuki, Dr. Kotaro Kijima, Ms. Kyoko Yamada and Representatives from Textbook writers and JICA PNG Office

Curriculum Panel

Mr. Steven Tandale, Mr. Gandhi Lavaki, Ms. Philippa Darius, Mr. Alex Magun, Mr. John Kakas, Ms. Mirou Avosa, Ms. Mary Norrie, Mr. Gilbert Ikupu, Mr. John Wek, Ms. Betty Bannah, Mr. Vitus Witnes, Ms. Clemencia Dimain and Ms. Celine Vavetaovi

Editorial Supervisors

Mr. Ryuichi Sugiyama, Mr. Kenichi Jibutsu, Prof. Masakazu Kita, Dr. Kotaro Kijima, Mr. Susumu Komazawa, Mr. John Kakas and Mr. Moses Hatagen Koran

Content Supervisors

Prof. Hiroaki Ozawa, Ass. Prof. Kazuyuki Tamura and Prof. Yasuhiko Makino

Writers & Proofreaders (Curriculum officers & Textbook writers - Science Working Group)

Mr. John Kakas - Science Working Group Leader, Ms. Collette Modagai, Mr. Moses Hatagen Koran, Mr. Emmanuel Ragu, Mr. Jimmy Pulpulis, Mr. Michael Kwadogi, Ms. Sandra Uramani, Ms. Brenda Kautu, Ms. Raphaella Barau and Ms. Aalia Nissar

Chief Proofreader, Illustrations, Photos & Desktop Publishing

Mr. Alex Magun (Chief Proofreaders), Mr. Micheal John, Ms. Atsuko Yano, Mr. Fumihiko Kobori, Nihon Graphics Co.,Ltd. (Illustrations), Mr. Angus Fraser, Mr. Rocky Roe, Wildlife Conservation Society, Piku Biodiversity Network Inc., Mr. Chiko Yamaoka, Dr. Kotaro Kijima, Mr. Masaki Kubo, JICA Volunteers, Aflo, amana images, ARTEFACTORY, CORVET, Getty Images, NaRiKa, NASA, NICT, NNP, OASIS, PIXTA, PPS (Photos), Mr. David Gerega, Mr. Vitus Witnes (Graphic designers), HIZU INC., Mr. Haruo Yoshida, Ms. Ayako Sakano (Desktop Publishing) and Gakko Toshō Co.,Ltd. (Photos and illustrations)

Validation Team (Science working group & Teachers from pilot schools)

Mrs. Anne Afaisa, Ms. Esther Yambukia, Mr. Freeman Kefoi, Ms. Heidi Supa, Ms. Ikai Koivi, Ms. Jill Koroi, Ms. Kila Vela Ymana, Ms. Lino Eaki, Ms. Louisa Kaekae, Ms. Lucy Paul, Ms. Margaret Ito, Ms. Martha Dimsock, Mr. Tom Ovia and Mrs. Wilfreda Efi

Cooperation

Japan International Cooperation Agency (JICA), Department of National Planning & Monitoring (DNPM), PNG Conservation & Environment Protection Authority (CEPA-JICA Biodiversity Project), PNG Forest Authority (PNGFA-JICA, PNG-FRIMS Project), Piku Biodiversity Network Inc., Okayama University, Naruto University of Education, Gakko Toshō Co.,Ltd., Bank of Papua New Guinea, Gaire Primary School, Iobuna Kouba Primary School, Koki Primary School, Koiari Park Primary School, St. John Primary School, St. Peter Primary School, St. Therese Primary School, Soger Primary School, Tubuseria Primary School and Wardstrip Primary School



