National SCIENCE Textbook

Grade 5

Papua New Guinea
Department of Education

JICA

'FREE ISSUE
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Acknowledgements

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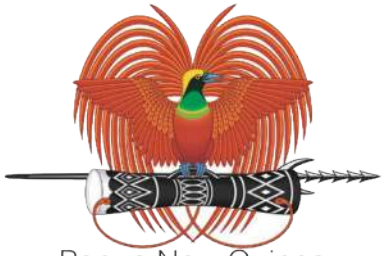
National Science Textbook

Grade 5



Minister's Message

Dear Grade 5 Students,

I am honoured to give you my message in this National Science Textbook. The Government of Papua New Guinea through the National Department of Education has been giving priority to improve standards of learning in the area of Science for many years. A big thank you to the Government and the people of Japan for the continuous support in improving the quality of education in Papua New Guinea.

Students, this Science Textbook was developed by our very own Textbook Writers, Pilot teachers and Curriculum officers who have worked together with the Japanese specialists for three years to complete this Textbook. This is the first of its kind and also the best National Textbook for Grade 5 students in PNG. Do you know why? Because what you will learn from this textbook is comparable with international standards.

This textbook is exciting because it contains a lot of interesting student-centred topics and activities recommended for Grade 5 Science. The photographs, illustrations, charts and diagrams are based on PNG contexts and are interesting and exciting for learning. I am confident that this textbook will motivate you to explore more about Science.

Students, Science is a very important subject because it allows you to explore the things around you by using all your senses. You will have the opportunity to investigate scientific problems by yourself using the Science process skills; make predictions, test predictions and find solutions to the scientific problems.

I encourage you to be committed and to enjoy and love Science, because one day in future you will be a very resourceful person, participating in developing and looking after this very beautiful and resourceful country of ours and improving the quality of living.

I wish you a happy and fun learning experience with this Grade 5 Science Textbook.

Joseph Yopyyopy, MP
Minister of Education

Message from the Amassador of Japan

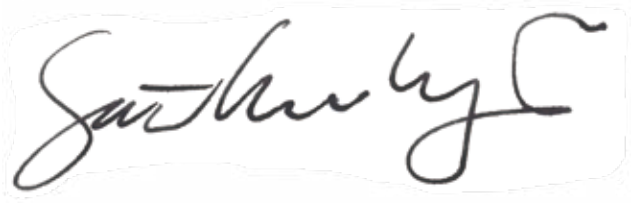
Greetings to Grade 5 Students of Papua New Guinea!

It is a great pleasure that the Department of Education of Papua New Guinea and the Government of Japan have worked together to publish the national textbooks on science for the first time.

The officers of the Curriculum Development Division of the Department of Education made full efforts to publish this textbook with Japanese science experts. To be good at science, you need to keep studying with this textbook. In this textbook, you will learn many things about science with a lot of fun and interest, and you will find it useful in your daily life. This textbook is made not only for you but also for the future students.

You will be able to think much better and smarter if you gain more knowledge on numbers and diagrams through learning science. I hope that this textbook will enable you to enjoy learning science and enrich your life from now on. Papua New Guinea has a big land mass with plenty of natural resources, and a great chance for a better life and progress. I hope that each of you will make full use of the knowledge you obtained and play an important role in realising such potential.

I am honoured that, through the publication of this textbook, Japan helped your country develop science education to improve your ability, which is essential for the future of Papua New Guinea. I sincerely hope that, through the teamwork between your country and Japan, our friendship will last forever.



Satoshi Nakajima
Ambassador of Japan to Papua New Guinea

SCIENCE...

It's exciting...

It's amazing...

It's fun...

It's Science

Secretary's Message

Dear students,

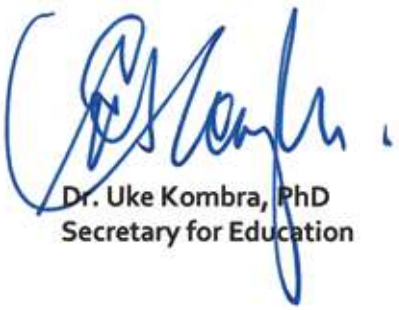
This is your Science Textbook that you will use in Grade 5. It contains a lot of very interesting and enjoyable activities that you will be learning in your daily Science lessons.

In our everyday lives, we come across many situations such as the use of electric circuits in different appliances, food rotting, iron rusting and the list goes on. These situations are real and they contribute to the way we live. By learning Science using this textbook, it will help to address such real-life problems.

This Textbook provides a variety of enjoyable and interesting science activities and ideas. It provides the opportunity for the learner to learn together with the class or as an independent learner. The activities are designed in a way that a scientific problem is identified and the learner will have to solve the problem using the different scientific skills like making predictions, measuring, recording data and communicating the results. These are the important skills needed in order to understand the concepts of the lessons. The use of science process skills will help you to make decisions that will benefit you, your family, your community, your province and the country to improve the standard of living in the 21st Century and beyond.

I encourage you to enjoy learning Science and use the scientific knowledge learned to solve problems and issues that are encountered in the community and country today.

I wish you all the best in studying Science using this Textbook.



Dr. Uke Kombra, PhD
Secretary for Education

Content

Strand

- Life
- Physical Science
- Earth and Space

How to learn SCIENCE

1 Wonder or Question

- Look carefully at things in nature around you and things in your daily life.
- Realise things that you wonder about.
- Identify the key question in the lesson.

2 Research

- Guess what will happen at the end of the activity.
- Understand the steps of the activity.
- Observe or conduct experiments in the activity.
- Record the result in your exercise book.
- Check if the result is the same with your guess.
- What do you find from the observation or experiment?

Symbols in this textbook

Each symbol gives you an attention about:

- : Key question of the lesson.
- : Activity that you will try.
- : Discussion question with your classmates.
- : Caution and warning.
- : Try it!

with this Textbook

Learn about nature, learn from nature

3 Findings

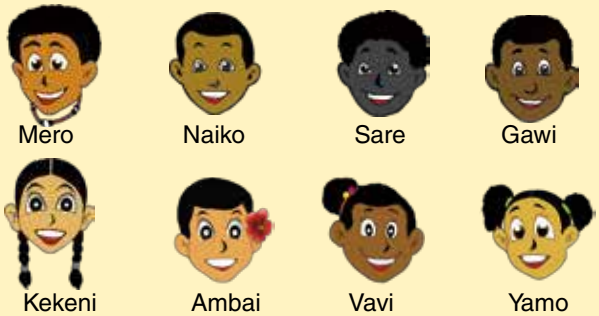
- Present and share your findings with your classmates.
- Discuss with your classmates to make sure if your findings are correct.
- Make conclusion to the key question.

4 Summary

- Read the textbook and confirm what you learnt in the lesson.
- Summarise what you did in the lesson.
- Let's try to use things you learnt in your daily life.

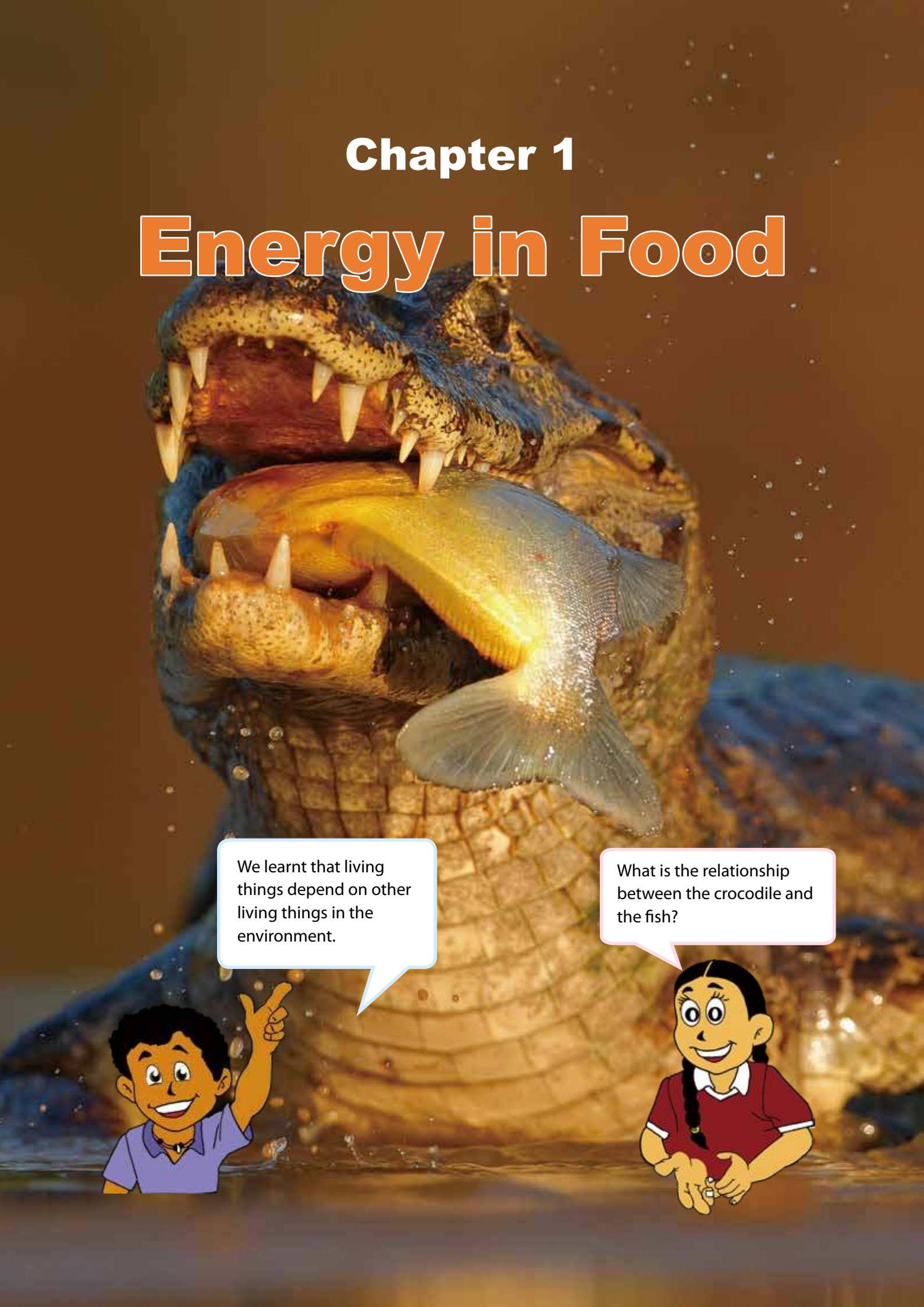
Friends learning together with you

Friends learning together in this textbook



Chapter 1

Energy in Food



1.1 Energy from Food

Lesson 1 Source of Energy in Food

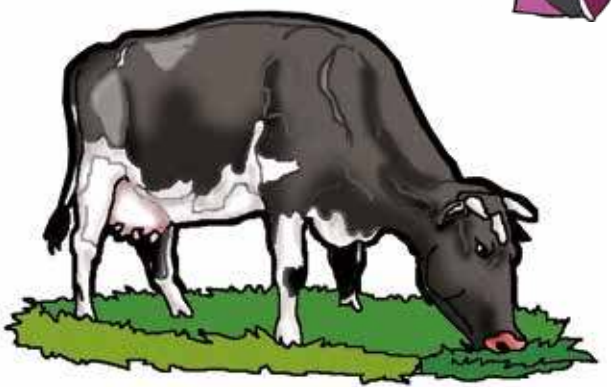
All living things need food. Food provides them with energy. Where does the energy in food come from?

What is the source of energy in food?

Activity : Finding the source of energy in food

What to Do:

1. Study the pictures below. A girl is drinking a glass of milk and is getting energy from the milk.
2. Think about the following questions:
   (1) Where does energy in the milk come from?
   (2) Where does a cow get its energy from?
   (3) Where does the grass get energy from?
3. Share your ideas with your classmates. Discuss where the energy in food comes from.



Summary

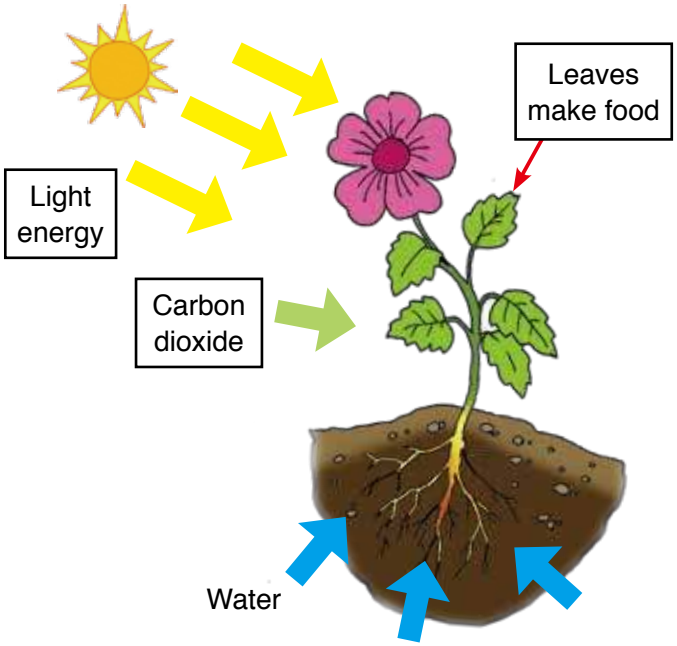
Almost all energy on Earth comes from the Sun.

Our food comes from plants. It is not only human beings who depend on plants directly or indirectly to get energy, but other animals too.

The Sun provides light and heat energy to the Earth. Almost all energy on Earth comes from the Sun.

Energy that comes from the Sun is called **solar energy**.

Plants do not eat food like animals. Plants make their own food by using water, carbon dioxide and light energy from the Sun. **Carbon dioxide** is a colourless and odourless gas produced by people or animals breathing out.



Plants make food by using water, carbon dioxide and light energy.

Plants use some energy in the food they make to survive and grow. Some are stored in the roots, stems and leaves.

Animals cannot make food like plants. They must eat food in order to get energy. Some animals get energy by eating plants as food. Some animals eat other animals that eat plants.

A horse eats plants.

A lion eats a zebra.

Plants get energy from the Sun. Some animals eat plants or animals as food to get energy. The source of energy in food comes from the Sun.

Lesson 2 Food Chains

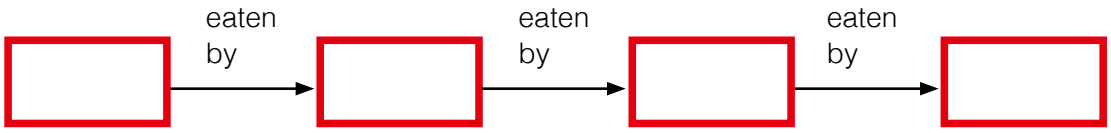
Plants make food by using sunlight. Animals eat the plants to get energy. How do living things depend on each other to get energy in nature?

How does energy flow through food?

Activity : Eat and eaten by

What to Do:

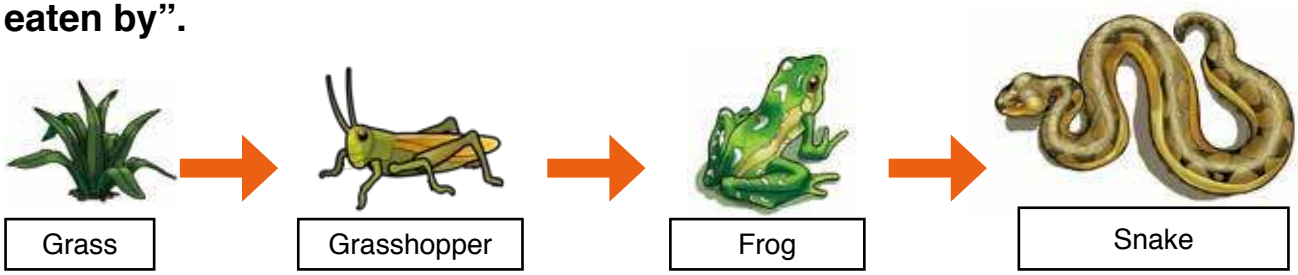
1. Draw a diagram like the one shown below.



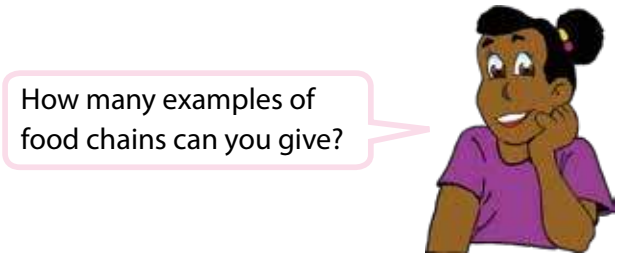
2. Study the picture below and write the name of a living thing in the box, in the order of which living thing is eaten by another living thing.
3. Share your ideas with your classmates. Discuss how living things depend on each other and how energy is transferred in living things.

Result

We found out that grass is eaten by the grasshopper. The grasshopper is eaten by the frog and the frog is eaten by the snake. The arrow means **"is eaten by".**

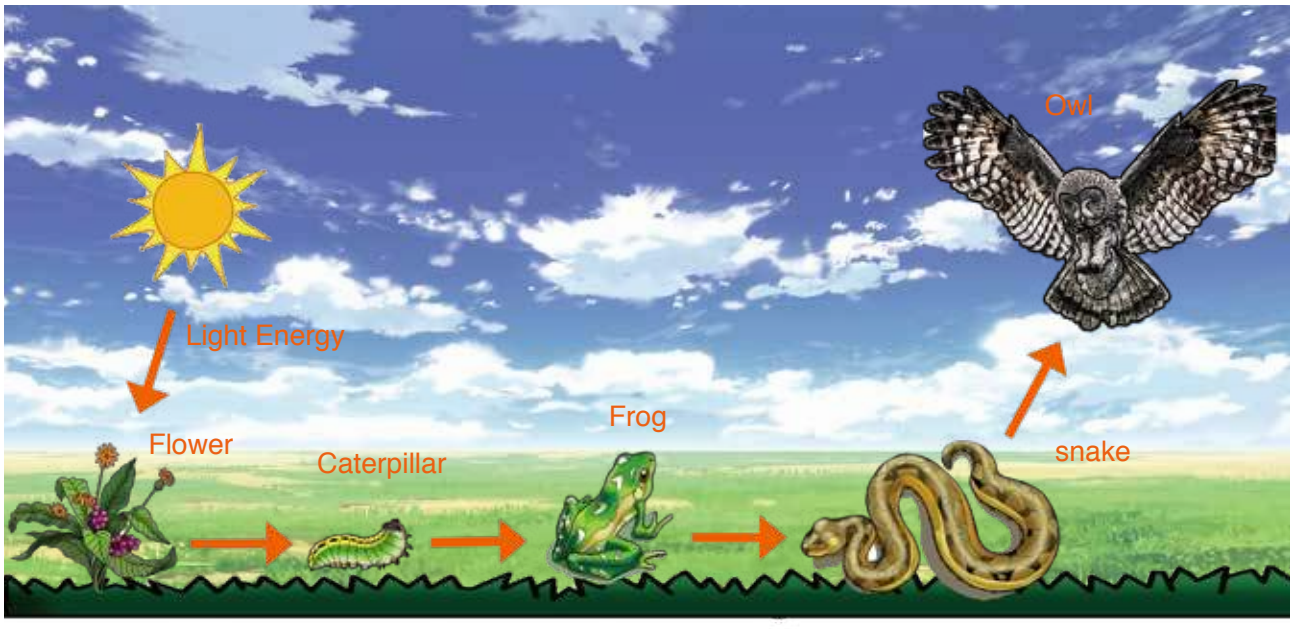


Energy in food is transferred from the grass, to the grasshopper, to the frog and to the snake.



Summary

Plants and animals are linked by the energy they need. For example, plants are eaten by insects. The insects are eaten by frogs and then finally the frogs are eaten by snakes. At each link, energy is being transferred from plants to animals. The path of food energy from the plants to animals is called a **food chain**. In a food chain, the energy flow begins with the Sun because plants get their energy by converting solar energy into food. Food chains only go in one direction. The arrow shows the direction of energy flow.



Lesson 3 Food Webs

A food chain only shows one path of food energy from plants to animals but an environment contains many different types of living things.

How do living things in an environment interact with each other?

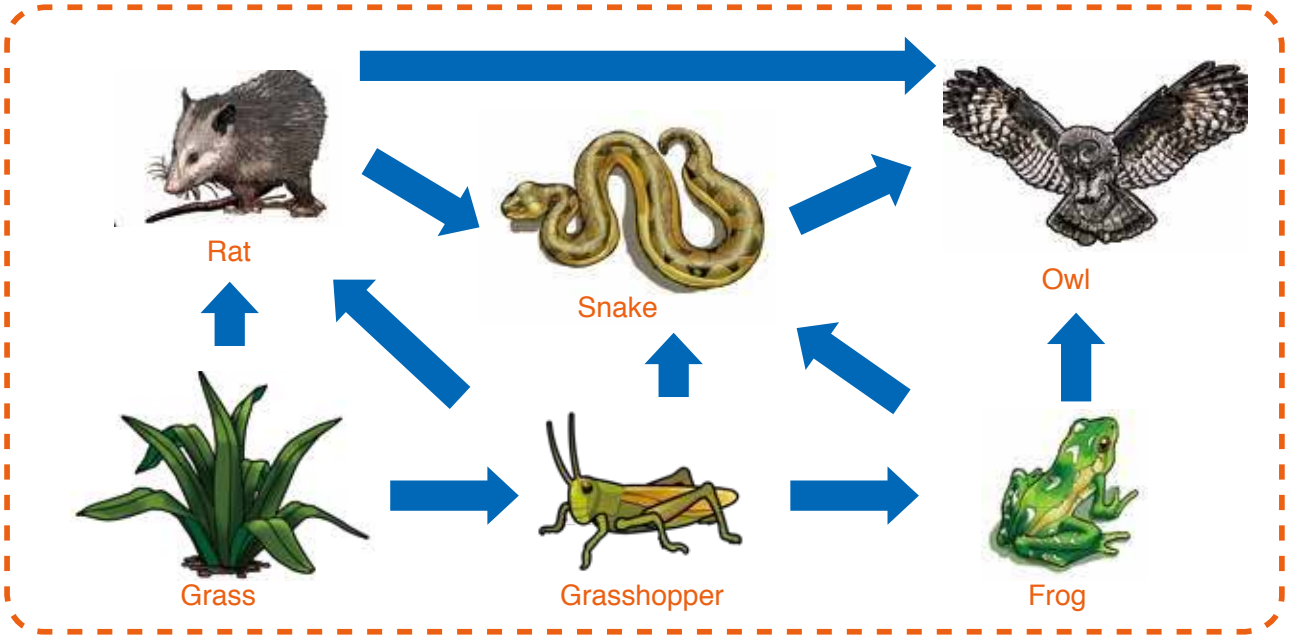
Activity : Who eats what?

What to Do:

1. Study the diagram below. Draw arrows to show how one living thing is consumed by another living thing.
2. Share your ideas with your classmates. Discuss how one living thing is interconnected with other living things.

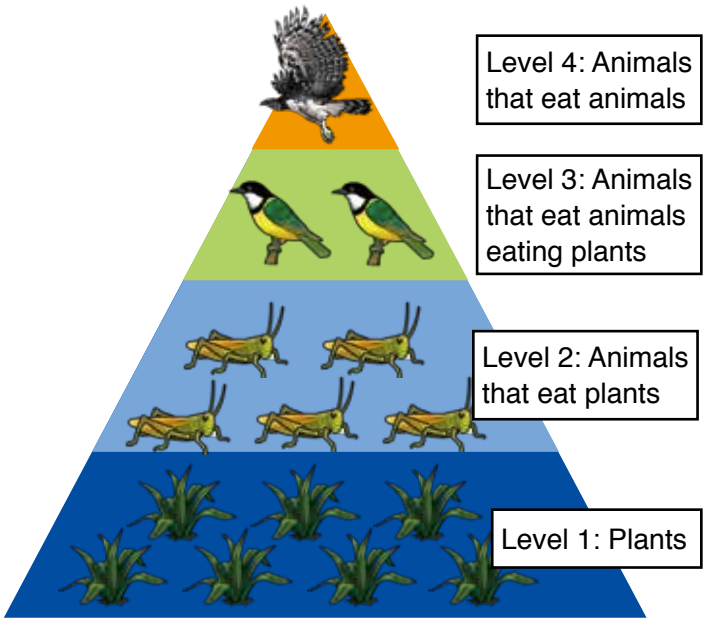
Summary

Most plants and animals are part of several food chains. For example, plants may be eaten by a caterpillar, a cow or some other animals. Snakes may eat a rat, a frog or some other animals. To represent these relationships we use a food web. A **food web** is made up of several food chains linked to each other. A food web shows how plants and animals are interrelated in an environment. It also shows how different food chains interact with one another and overlap.



The food web shows the plant and animals that interact with one another in an environment.

An **energy pyramid** shows the flow of energy from one level to another. Energy flows from the bottom to the top level of the pyramid. Only about 10 percent of the energy is transferred to the next level. Plants make up the base of the energy pyramid. The higher we go up the pyramid, the amount of energy available for use is less and the population of living things or organisms decreases.



Energy pyramid

Summary and Exercise

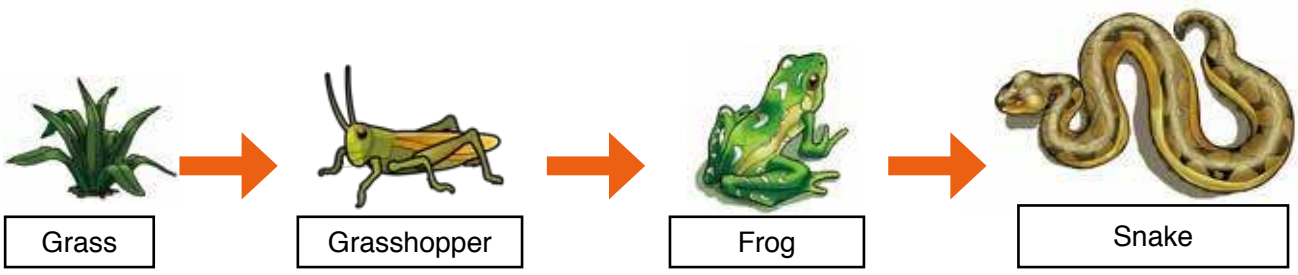
Summary 1.1 Energy from food

Sources of Energy in Food

- Food provides energy to all living things on the Earth.
- The Sun provides light and heat energy to the Earth.
- Plants do not eat food like animals do, but make their own food by using water, carbon dioxide and light energy from the Sun.
- Plants provide food directly or indirectly to animals and humans.
- Animals cannot make food like plants do, so they eat other animals and plants to get energy.

Food Chain

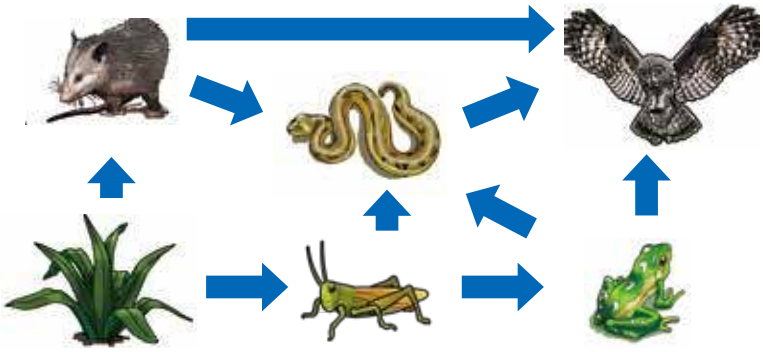
- A food chain is the path of food energy from plants to animals.
- For example, plants are eaten by insects. The insects are eaten by frogs and then finally the frogs are eaten by snakes.



- In a food chain, the path of energy begins with the sun because plants get their energy by converting light energy into food.

Food Web

- A food web is made up of several food chains linked to each other.
- A food web shows how plants and animals are interrelated in an environment. It also shows how different food chains interact with one another.



Summary and Exercise

Exercise 1.1 Energy from food

Q1. Complete each sentence with the correct word.

(1) Food provides _____ for all living things.

(2) Plants get energy from the _____.

(3) The path of food energy from plants to animals is a _____ _____.

(4) A _____ _____shows how plants and animals are interrelated in an environment.

Q2. Choose the letter with the correct answer.

(1) According to the diagram, what does the frog feed on?

A. Grass

B. Grasshopper

C. Snake

D. Snake and grass

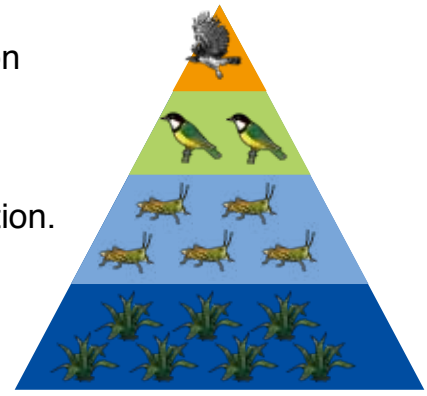
(2) Which of the following is not the correct explanation about an energy pyramid?

A. Plants make up the base of the pyramid.

B. The animals on higher levels are less in population.

C. Energy flows from the bottom to the top level of the pyramid.

D. Snakes are at the bottom level of the pyramid.



Q3. Draw arrows to show the flow of energy in the food chain.

Small birds

Hibiscus

Eagle

Butterfly

Frog

Q4. What is the difference between a food chain and a food web?

What happens if an organism was removed from a food chain?

If this was a food chain in an environment, where plants are eaten by grasshoppers and the grasshoppers are eaten by frogs and the frogs are eaten by snakes.

If frogs were to die because of some diseases caused by some pollution, there would be an increase in the amount of grasshoppers feeding on the producer or green plants.

This would cause a major problem because grasshoppers would be out of control. They would eat plants and the number of plants which are the basis of the food chain would severely decrease.

On the other hand there would be an effect on the consumers of frogs which are the snakes. They would lose an organism that they feed on which can cause their numbers to decrease.

In other cases there may be several interacting food chains in the environment where there are also other predators like birds. They would feed on grasshoppers but in such case if an organism primarily eats one type of organism which is the food source. They would die off and this would lead to the extinction of the consumer of the organism.

Chapter Test

1. Energy in Food

Q1

Complete each sentence with the correct word.

(1) The Sun provides light and _____ energy to Earth.

(2) Plants make their own food by using water, _____ _____ and light energy from the Sun.

(3) The flow of energy from one level to another is shown as a _____ _____ in which the energy flows from the bottom to the top.

(4) A _____ _____ is made up of several food chains linked to each other.

Q2

Choose the letter with the correct answer.

(1) In a food chain where do plants get the energy from?

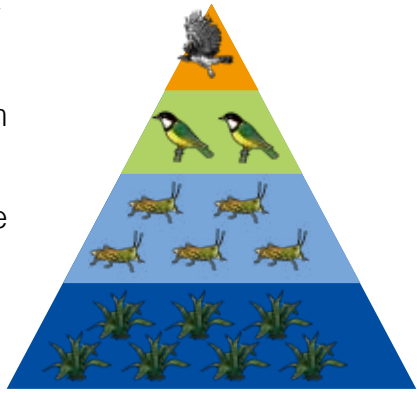
A. Solar energy

B. Animals

C. Insects

D. Other plants

(2) Study the pyramid on the right and identify which statement is true about it.



A. The energy flows from the top to the bottom level of the pyramid

B. Only 10% of the energy is transferred to the next level.

C. Animals make up the base of the pyramid.

D. Plants make up the top of the pyramid.

(3) Which part of the plant makes food for the plant?

A. Root

B. Stem

C. Leaves

D. Flower

(4) Which of the following shows a correct food chain?

A. peanut → rat → snake

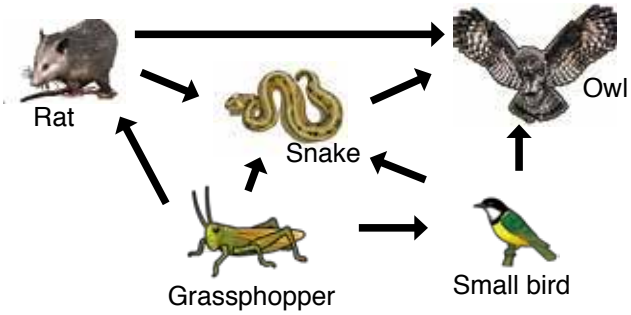
B. grass → snake → eagle

C. peanut → eagle → grasshopper

D. grass → snake → grasshopper

Q3

Study the food web below and answer the following questions.



(1) Which organism eats the snake?

_____

(2) Which organism in the picture would have the largest population?

_____

(3) Which organism in the picture would have the smallest population?

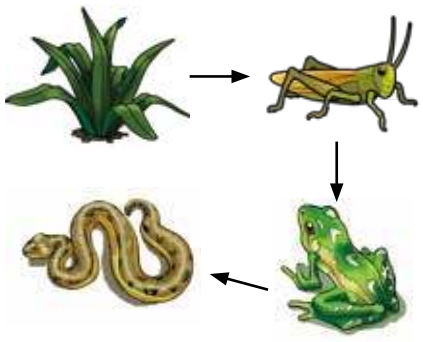
_____

(4) If you are to represent the organisms in the picture as an energy pyramid, what organism would be at the top of the pyramid?

_____

Q4

The picture on the right shows a food chain where a grasshopper feeds on the grass, a frog feeds on the grasshopper and a snake feeds on the frog.



What would happen to the population of grasshopper and snake if all the frogs in the area were killed by chemicals? Write the answer with your reason.

Grasshopper:_____

_____

_____

Snake:_____

_____

_____

Chapter 2

Force and Machine

2.1 Change in Motion

Lesson 1 Change in Speed

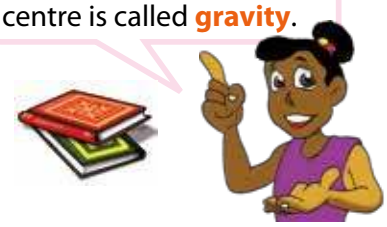
A force can change the speed of an object. How does the speed of an object change when a force is applied?

How does an applied force change the speed of an object?

Activity : Measuring a motion on an inclined plane

What We Need:

- 2 m rain water gutter, marble, stopwatch, books to stack, ruler

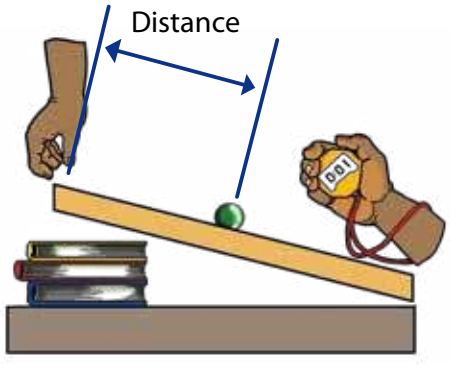


What to Do:

1. Draw a table like the one shown below.

Time (sec.)	Distance (cm) trial 1	Distance (cm) trial 2	Avg.distance (cm)	Speed (cm/sec)
1				
2				
3				

2. Set one side of the gutter on the stacked books to create a ramp.
3. Release the marble from 0 cm and start your stopwatch. Mark the position where the marble reaches for 1 second. Measure the distance and record it in the table.
4. Repeat Step 3. Then take the average of the two distances.
5. Repeat Steps 3 and 4 for 2 seconds and 3 seconds.



6. Calculate the speed of the marble at 1, 2 and 3 seconds.
7. Share your results with your classmate.

Result

We found out that as the marble rolled down the ramp, it speeds up.

Example: Results of activity

Time (sec.)	Distance (cm) trial 1	Distance (cm) trial 2	Avg. Distance (cm)	Speed (cm/sec)
1	19	21	20	20
2	82	78	80	40
3	185	175	180	60

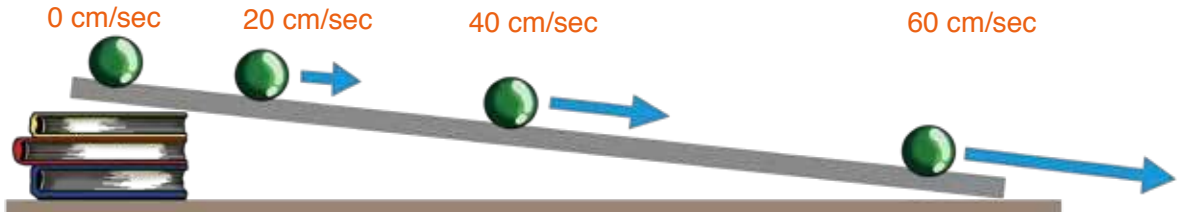
Discussion

Think about the following questions based on your results.

1. What type of force is exerted on the rolling marble?
2. How does the speed of the marble change when the force was applied?

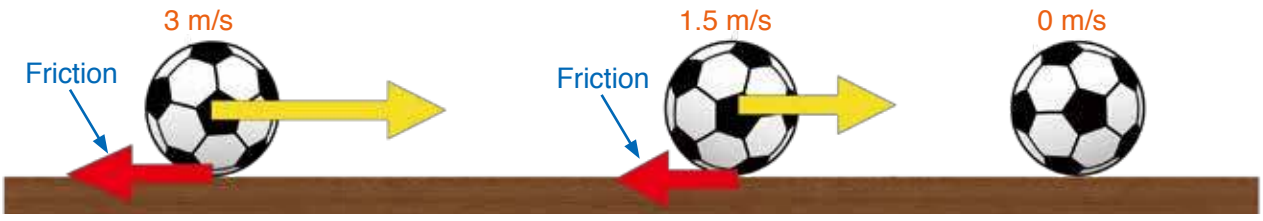
Summary

A force can cause an object to speed up (**accelerate**) or slow down (**decelerate**). For example, **gravity** is the force that pulls one object toward another. When the marble rolls down the ramp, the force (gravity) is always exerted on the rolling marble. As the marble rolls down, it speeds up or increases speed (accelerate).



A marble increases speed as it rolls down the ramp.

Friction is also a kind of force. Friction happens when two surfaces of objects rub against each other. When a ball is rolling on the ground, the force (friction) acts in the opposite direction to the movement of the rolling ball. The ball then decreases speed (decelerate) and finally stops.



A friction makes a moving ball slow down.

Lesson 2 Change in Direction

A force can cause an object to speed up or slow down. What would happen to the direction of a moving object when a force is applied to it?

How does a force change the direction of a moving object?

Activity : Throwing a ball up straight

What We Need:

- a ball

What to Do:

1. Draw a table like the one shown below.

	How does it change?	
	Your prediction	Your observation
Speed		
Direction		

2. Predict how the speed and the direction of the ball change when you throw it up straight into the air.
3. Throw the ball up straight in the air. Observe how the speed and the direction of the ball changes. Record your observations in the table.
4. Share your observations with your classmate. Discuss how a force changes the direction of an object in motion.

Result

We found out that as a ball went up in the air, the ball slowed down and its direction was upward. And then the ball stopped in the air. After that, the ball speeded up and its direction was downward as it fell toward the ground.

Example: Results of activity

	How does it change?
Speed	The speed decreases when the ball goes up. Then it stops (Speed is 0). And then the speed increases.
Direction	The direction is upward when the ball goes up. The direction is downwards when the ball falls towards the ground.

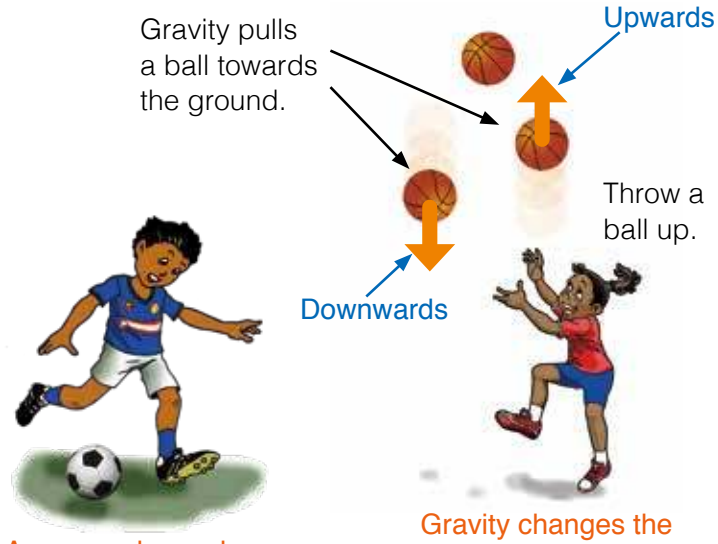
Discussion

Think about the following questions based on your results.

1. What type of force was exerted on the ball after throwing it?
2. How does the direction of the ball change when the force was applied?

Summary

A force can make a moving object change direction. When we throw the ball up in the air, its direction is upward.
But the gravity changes the direction of the ball to be downwards and the ball falls to the ground.
A good soccer player can control the motion of a soccer ball by applying a force that changes the ball's direction.
If we have a yoyo tied to a thread and we just spin it in a circle, the direction of the yoyo changes.



A soccer player changes the ball's direction by kicking the ball.

Gravity changes the direction of a ball.

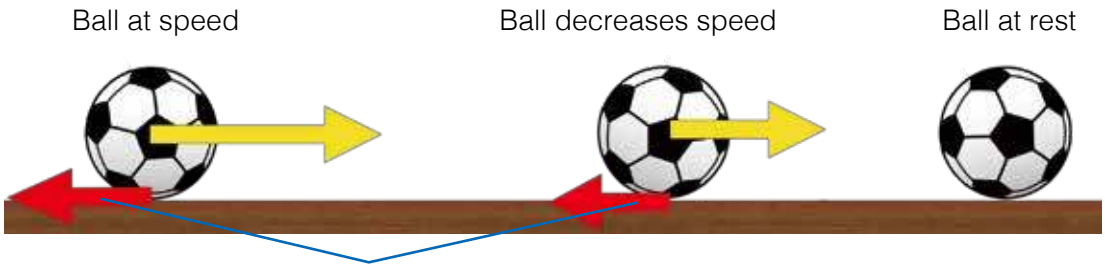
A spinning yoyo tied to a thread changes direction.

Summary and Exercise

Summary 2.1 Change in Motion

Change in Speed

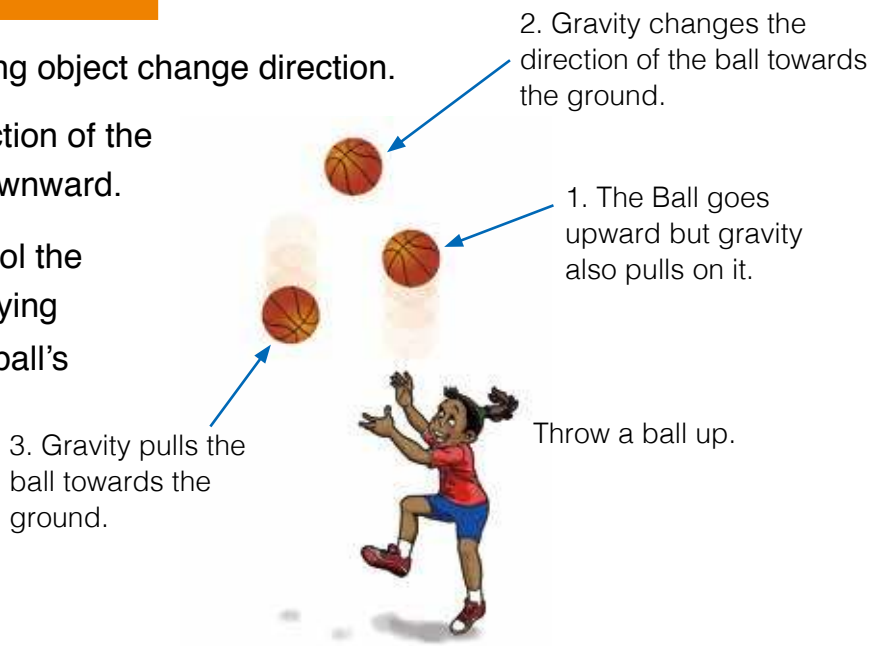
- A force can cause a moving object to speed up (accelerate) or slow down (decelerate).
- Gravity is a force that pulls one object towards another object.
- As an object rolls down a ramp, it increases speed due to gravity.
- Friction is a force that happens when two surfaces of two objects rub against each other.
- Friction always acts in the opposite direction of the moving object. When an object is rolling on the ground, the object decreases speed and finally stops due to friction.



Friction occurs and acts in the opposite direction of the moving ball.

Change in Direction

- A force can make a moving object change direction.
- Gravity changes the direction of the ball moving upward to downward.
- A soccer player can control the motion of the ball by applying a force that changes the ball's direction.



Summary and Exercise

Exercise 2.1 Change in Motion

Q1. Complete each sentence with the correct word.

(1) The force that pulls one object towards another is called _____.

(2) Force that happens when two surfaces rub against each other is called _____.

Q2. Choose the letter with the correct answer.

(1) What happens when the marble rolls down a ramp?

A. It accelerates in speed.

B. It decelerates in speed.

C. Its speed remains the same.

D. It decreases the speed.

(2) Which sentence is true when we throw a ball into the air?

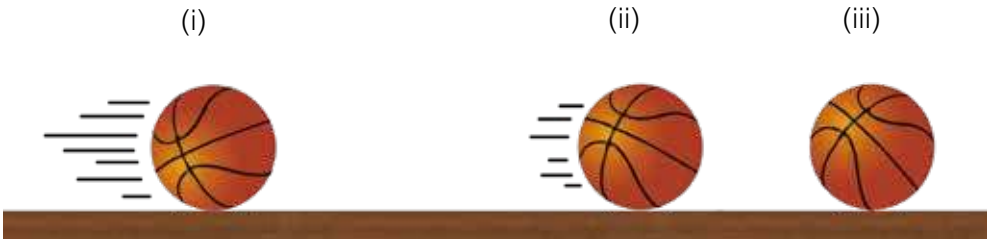
A. The ball does not change its direction when thrown in the air.

B. The ball decreases speed as it falls back to the ground.

C. The speed of the ball is the same when it was thrown in the air.

D. The ball changes direction when gravity acts on it and falls downwards.

Q3. Study the picture and answer the question.



The ball was rolling on the rough ground at position (i) and finally stopped its motion at position (iii). How can you describe the motion of the ball from position (i) to (iii)?

Q4. Mero measured the speed of a moving car every 5 seconds. Look at his record shown in the table on the right. Identify whether the car accelerated or decelerated and explain the reason of you answer.

Time (sec.)	Speed (m/s)
5	10
10	20
15	30

2.2 Regularity of Levers

Lesson 1 Lifting a Load Using a Lever: 1

A **lever** is a simple machine that makes an object move with less force. How can we lift a heavy sand bag with a lever?

How can we lift an object by using a lever with less force?

Activity : Find ways to lift the sand bag easily using a lever

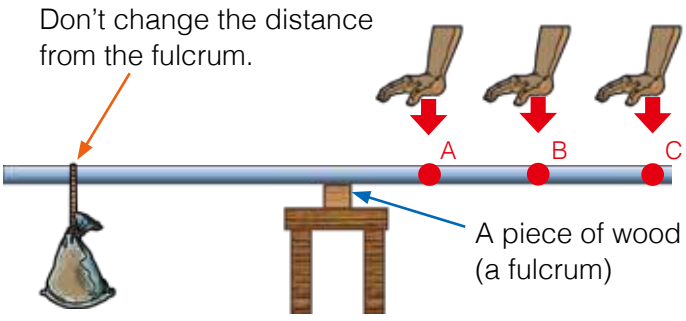
What We Need:

- pole (1.5 - 3 m long), plastic bag with sand, a piece of wood, stool

What to Do:

1. Draw a table like the one on the right in your exercise book.
2. Set up the pole on the piece of wood. Hang the sand bag on one side of the pole as shown in the picture. The distance from the fulcrum to the sand bag should not be changed.
3. Apply force on position A to lift the sand bag.
4. Record how you felt about the amount of force needed to lift the sand bag.
5. Repeat Steps 3 and 4 by applying force at positions B and C.
6. Share your results with your classmates. Discuss the relationship between the distance from the fulcrum and the amount of force applied to lift the sand bag.

Position you applied the force	Amount of force to lift the sand bag (small, medium or large)
A	
B	
C	

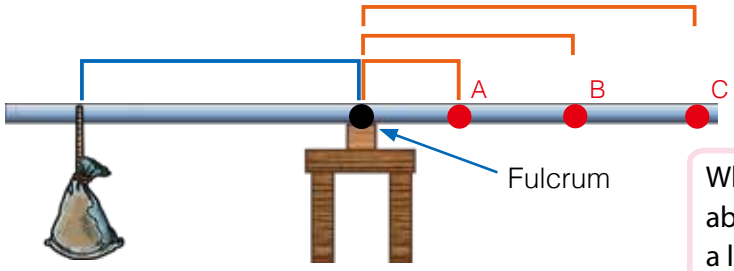


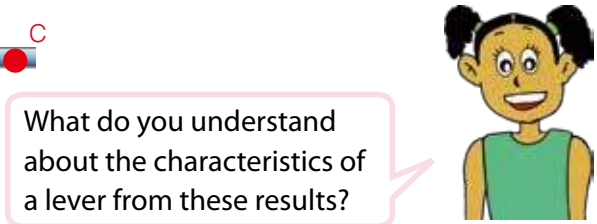
To avoid injury, do not release your hands from the pole suddenly!

Result

We found out that a larger force was needed to lift the sand bag at position A but less force was applied to lift the sand bag at position C when the distance from the fulcrum to the sand bag did not change.

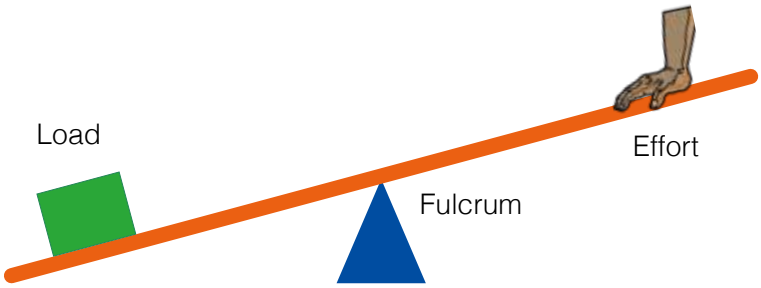
Position you applied the force	Amount of force to lift the sand bag
A	Large
B	Medium
C	Small





Summary

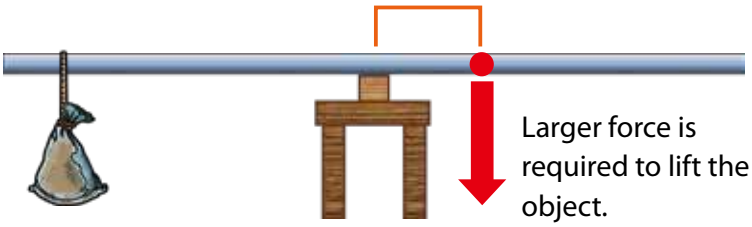
A lever can make our work easier. An **effort** is the force applied to a machine to do work. A **load** is the force applied on the lever by the object to be lifted. Amount of force as an effort required to lift an object depends on its distance from the fulcrum. If effort is applied at a longer distance from the fulcrum, the object is able to be lifted with less effort.



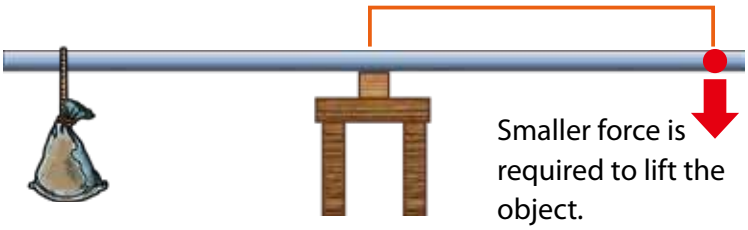
Load, effort and fulcrum of a Lever

Relationship between distance of applied force and load

Shorter distance from the fulcrum to effort point.



Longer distance from the fulcrum to effort point.



Lesson 2 Lifting a Load Using a Lever: 2

We can move an object with less force by applying the force at a longer distance from the fulcrum of a lever. What is another way to lift an object with less force?

How does the distance from a fulcrum to a load affect an effort?

Activity : Changing distance from fulcrum to a load

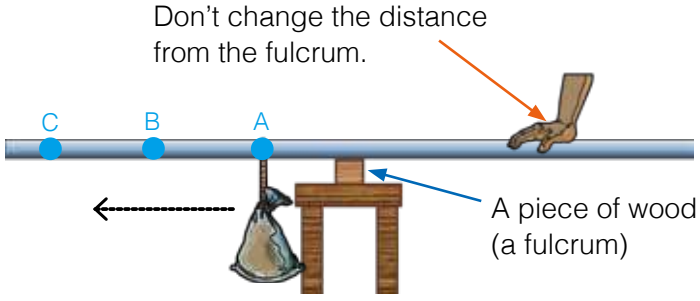
What We Need:

- pole (1.5 - 2 m long), sand bag as a load, stool, piece of wood as a fulcrum

What to Do:

1. Draw a table like the one on the right in your exercise book.
2. Write your prediction to describe the strength of the applied force when the sand bag is lifted at each position.
3. Set up the pole on a piece of wood.
4. Hang a sand bag on position A. Apply force to lift the sand bag.
5. The place where you apply force should not be changed. Record how you feel about the amount of applied force to lift the sand bag in the table.
6. Repeat Steps 3 and 4 by changing the positions of the sand bag from A to B and C.
7. Share your results with your classmates. Discuss how the distance from a fulcrum to a load affects the effort.

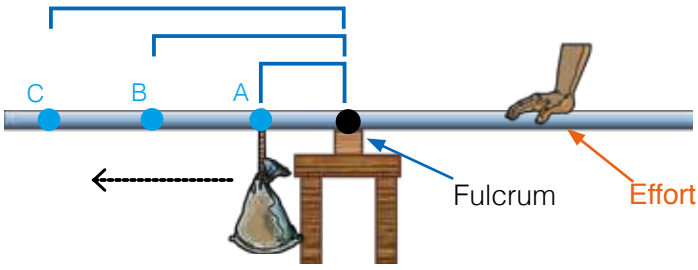
Position of a sand bag	Amount of applied force to lift the sand bag	
	Prediction	Result
A		
B		
C		



To avoid injury, do not release your hands from the pole.

Result

We found out that in position A, a smaller force was needed to lift the sand bag when the distance from the fulcrum to the effort did not change. But at position C, a larger force was applied to lift the sand bag when the distance from the fulcrum to the effort did not change.

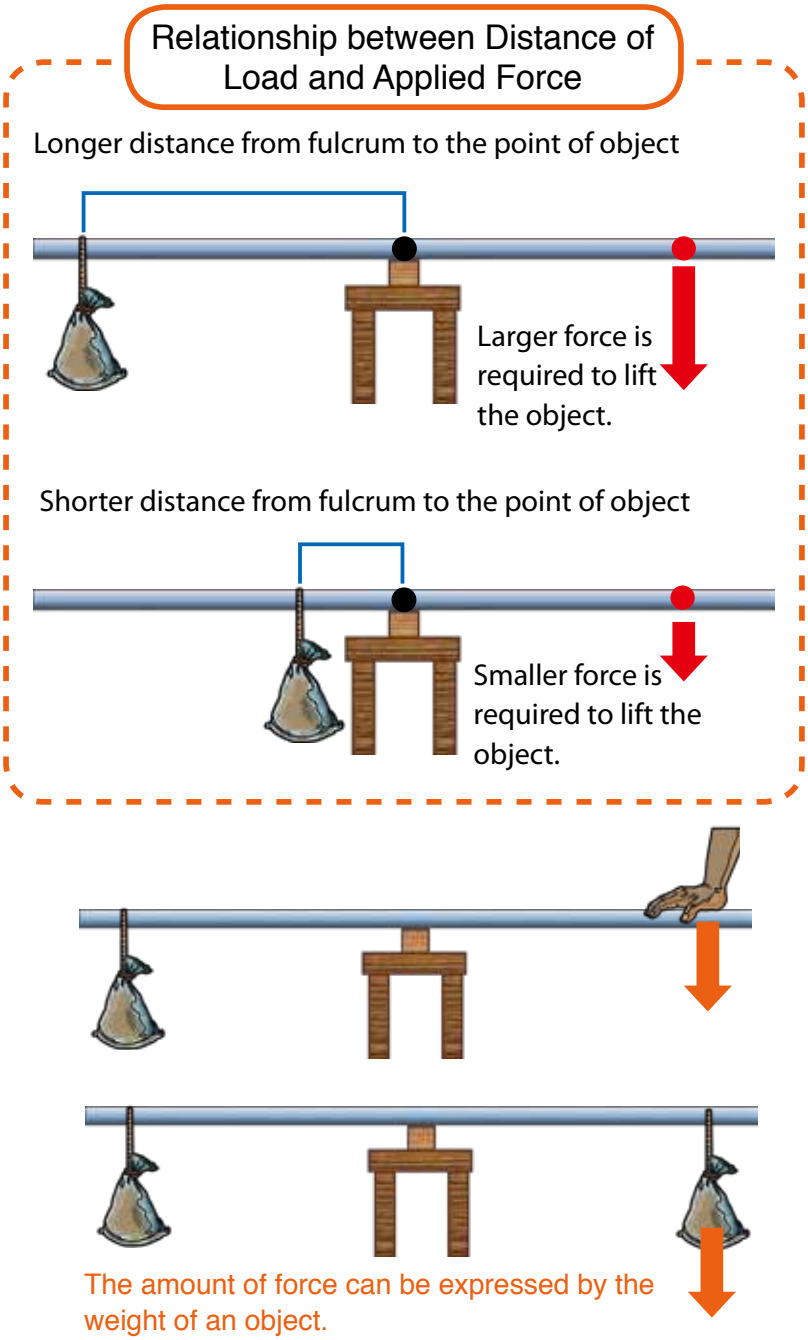


Position of the sand bag	Amount of force to lift the sand bag
A	Small
B	Middle
C	Large

Summary

The amount of force required to lift an object depends on the distance from the fulcrum to the position of the object. If the object is placed at a shorter distance from the fulcrum, the object would be able to be lifted with less effort.

As shown in the picture on the right, we can balance the lever by hanging another sand bag instead of the force applied by your hand. The amount of force can be also expressed by the weight of an object.



Lesson 3 Law of Lever to Balance

Look at the picture on the right. The lever is balanced. What will happen if the position of the weights change?

How can we balance a lever?

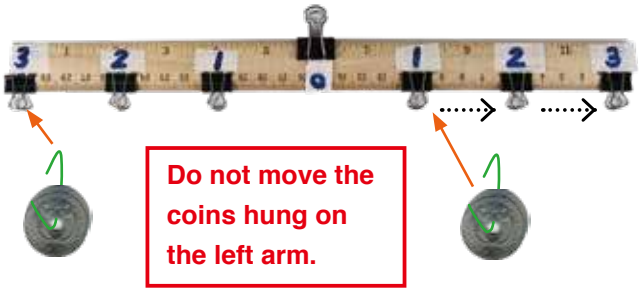
Activity : Finding the rule to make a lever balance

What We Need:

- 30 cm ruler, 7 bulldog clips, 2 paper clips, 8 one kina coins, pen

What to Do:

1. Make a lever by putting a bulldog clip at the centre of the ruler as shown in the picture on the right.



2. Put other bulldog clips on both ends at 5 cm, 10 cm and 15 cm from the centre. Check if the lever is balanced. Label each clip as shown in the picture.
3. Draw a table like the one below in your exercise book.

	Left arm	Right arm		
Distance from the fulcrum	3	1	2	3
Number of coins	2			

4. Hang two one kina coins on the left arm on distance 3.
5. Try to balance the lever by adding a one kina coin every time on the right arm on distance 1. Record the number of one kina coins on the right arm to balance the lever in the table.
6. Repeat Step 5 for distances 2 and 3 on the right arm.
7. Share your results with your classmates.

Result

	Left arm	Right arm		
Distance from the fulcrum	3	1	2	3
as weight	2	6	3	2

We found out that when we hung 6 coins at distance 1, 3 coins at distance 2 and 2 coins at distance 3 on the right arm, the lever was balanced, when we hung 2 coins at distance 3 on the left arm.

Discussion

Based on your results, think about the following question.

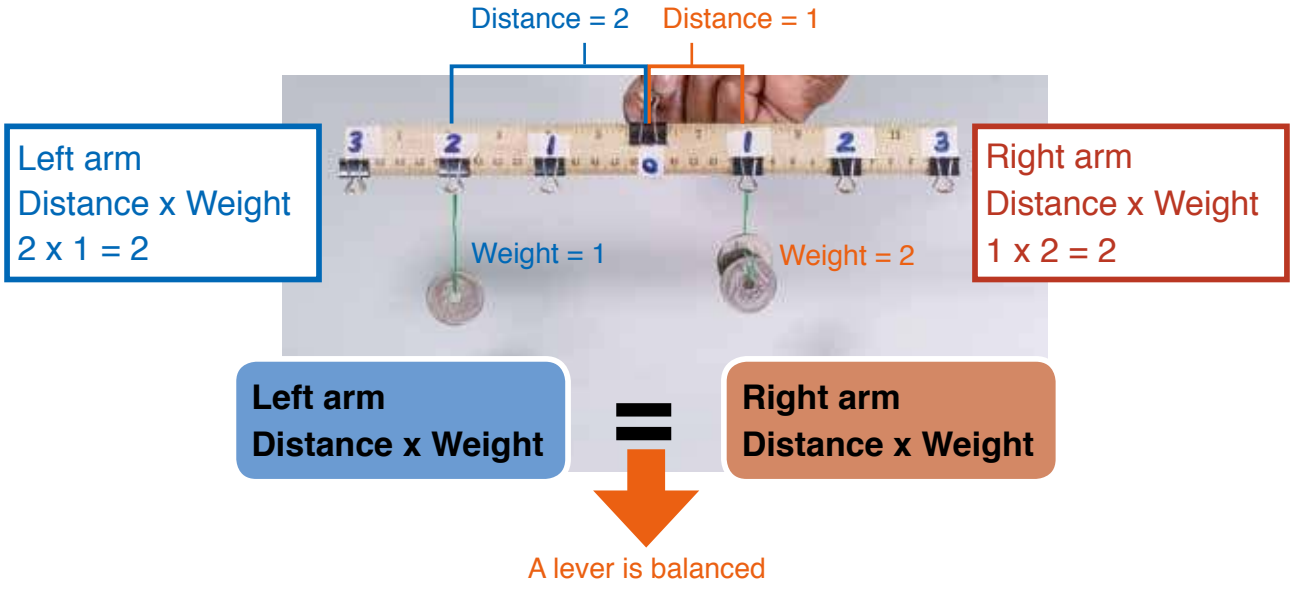
1. What relationship can you find between the distance from the fulcrum and the numbers of coins on the left and the right arm to make the lever balanced?

The sum of the numbers of coins and the distance on left arm (2+3=5) and the right arm (1+6=7) are not equal!

How about multiplying the numbers of coins by the distance from the fulcrum of the lever like….
Left arm: 3 x 2 = 6
Right arm: ????

Summary

A lever is balanced when the product of weights and distance from the fulcrum on the left is equal to the product of weights and distance from the fulcrum on the right arm.



Summary and Exercise

Summary 2.2 Regularity of Levers

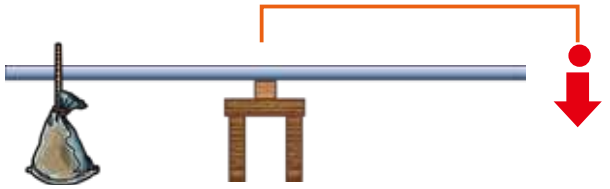
Lifting Load by Using Lever

- A lever is a simple machine that makes an object move with less force.
- The effort is the amount of force applied.
- The load is the force applied on the lever by the object to be lifted.

Lifting Load with Less Effort

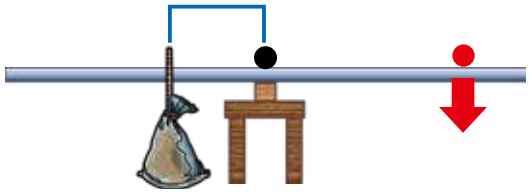
- The amount of force required to lift an object depends on;
  1. The distance from the fulcrum to the effort.
     Lesser effort is needed to lift the load, when the effort is applied further away from the fulcrum.
  2. The distance from the fulcrum to the load.
     Lesser effort is needed to lift the load, when the object is placed at a shorter distance from the fulcrum.

Distance of the effort from the fulcrum is longer



Smaller force is needed

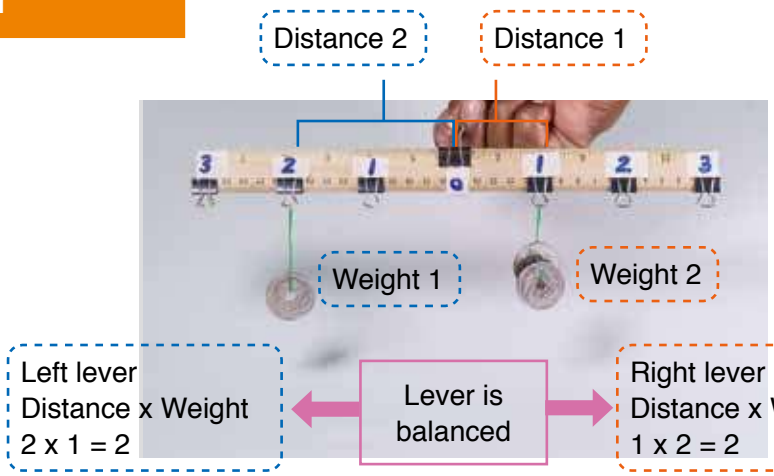
Distance of the load from the fulcrum is shorter



Smaller force is needed

Balancing the Lever

- A lever is balanced when the product of the weight and distance from the fulcrum on the left arm is the same as the one on the right arm.



Summary and Exercise

Exercise 2.2 Regularity of Levers

Q1. Complete each sentence with the correct word.

(1) A simple machine consisting of an arm with a fulcrum is called a _____.

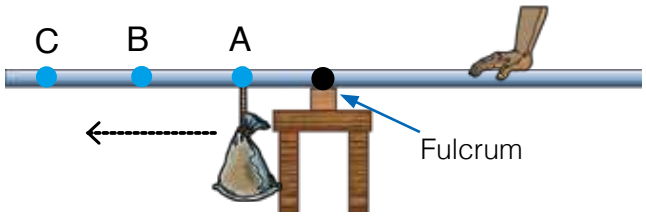
(2) The force applied to a machine to do work is called an _____.

(3) The force applied on the lever by the object to be lifted is called a _____.

Q2. Choose the letter with the correct answer.

(1) Which position of the load on the lever would require less force to lift the object ?

(2) Which position of the load on the lever would require more force to lift the object?



Q3. Answer the following questions.

	Left arm	Right arm			
Distance from the centre	4	1	2	3	4
Number of coins (K1.00 coin)	2				

(1) How many one kina coins would be hung on distance 1 of the right arm to balance the lever?

(2) Four one kina coins were hung on the right arm of the lever. At which distance were the four one kina coins hung to balance the lever?

Q4. Study the picture on the right. A girl and younger boy are playing on a see-saw. The see-saw is balanced. What did the boy and the girl do to balance the see-saw?

LEVERS IN OUR BODY

Levers can be identified by the way the joint and muscles attached to the bone are arranged.

Skull and neck - Nodding your head

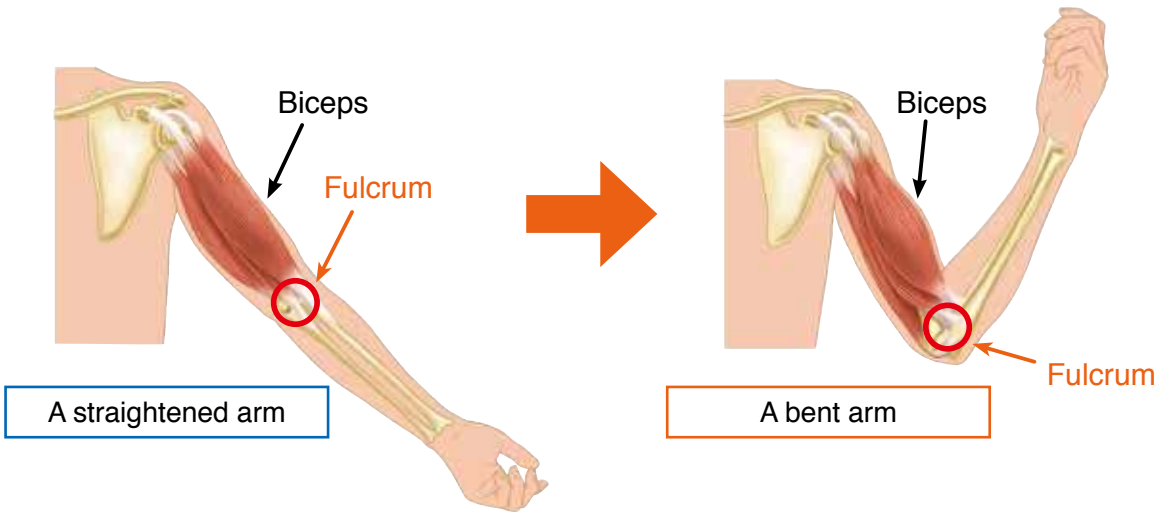
The place where your skull meets the top of your spine is fulcrum. Your skull is the lever arm and the neck muscles at the back of the skull provide the force (effort) to lift your head up against the weight of the head (load). When the neck muscles relax, your head nods forward.

Tip toes - Standing on tip toes

The fulcrum is at your toe joints and your foot acts as a lever arm. Your calf muscles and achilles tendon provide the effort when the calf muscle contracts. The load is your body weight and is lifted by the effort (muscle contraction).

Bent arm – Bending your arm

The fulcrum is at the elbow and the forearm acts as the lever arm. The biceps muscle provides the effort (force) and bends the forearm against the weight of the forearm and any weight that the hand might be holding.



Chapter Test

2. Force and Machine

Q1

Complete each sentence with the correct word.

(1) A force can cause an object to _____ up or slow down.

(2) A force can make a moving object change its _____ and _____.

(3) A force that slows down the movement of an object between two surfaces that touch each other is called _____.

(4) To _____ means that the motion of an object speeds up.

Q2

Choose the letter with the correct answer.

(1) What happens to the speed of an object as it rolls down a slope?
The speed of the object

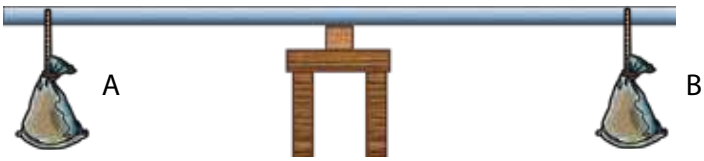
A. remains the same.

B. increases.

C. decreases.

D. decreases then speeds up.

(2) The lever shown below is balanced. The distance from load A to the fulcrum and the distance from load B to the fulcrum are same. Which of the following is true about the diagram?



A. A is heavier than B.

B. A is lighter than B.

C. A and B have different weights.

D. A and B have the same weights.

(3) What is the best reason to explain why a ball comes to a stop after rolling for some time?

A. Because there is no force acting on the ball.

B. Because the ball ran out of force to continue rolling.

C. Because the force of gravity is pulling the ball backwards.

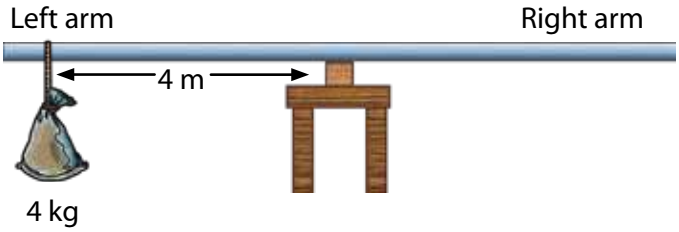
D. Because of the friction force acting between the ball and the ground.

Q3

(1) Study the diagram below.
The ball is moving in the direction to the right. It is decelerating due to friction and will come to a stop. In which direction is the friction force acting on the rolling ball?

_____

(2) If a 4 kg weight was placed on the left arm at a distance of 4 m from the fulcrum:



(i) What is the product of the weight and distance on the left arm of the lever? (Ignore its units)

_____

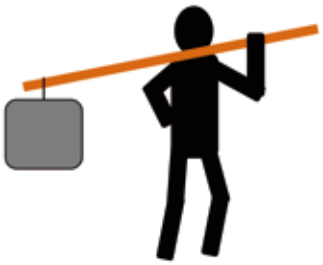
(ii) The lever is balanced when the other weight is hanging on the right arm at the distance of 2 m from the fulcrum. Calculate what would be the amount of weight on the right arm?
Your calculation: _____

_____

Answer: _____ kg

Q4

Kolo wanted to carry a bag of fruits but he struggled to balance the bag on the pole on his shoulder. What must he do to be able to carry the bag on the pole on his shoulder?



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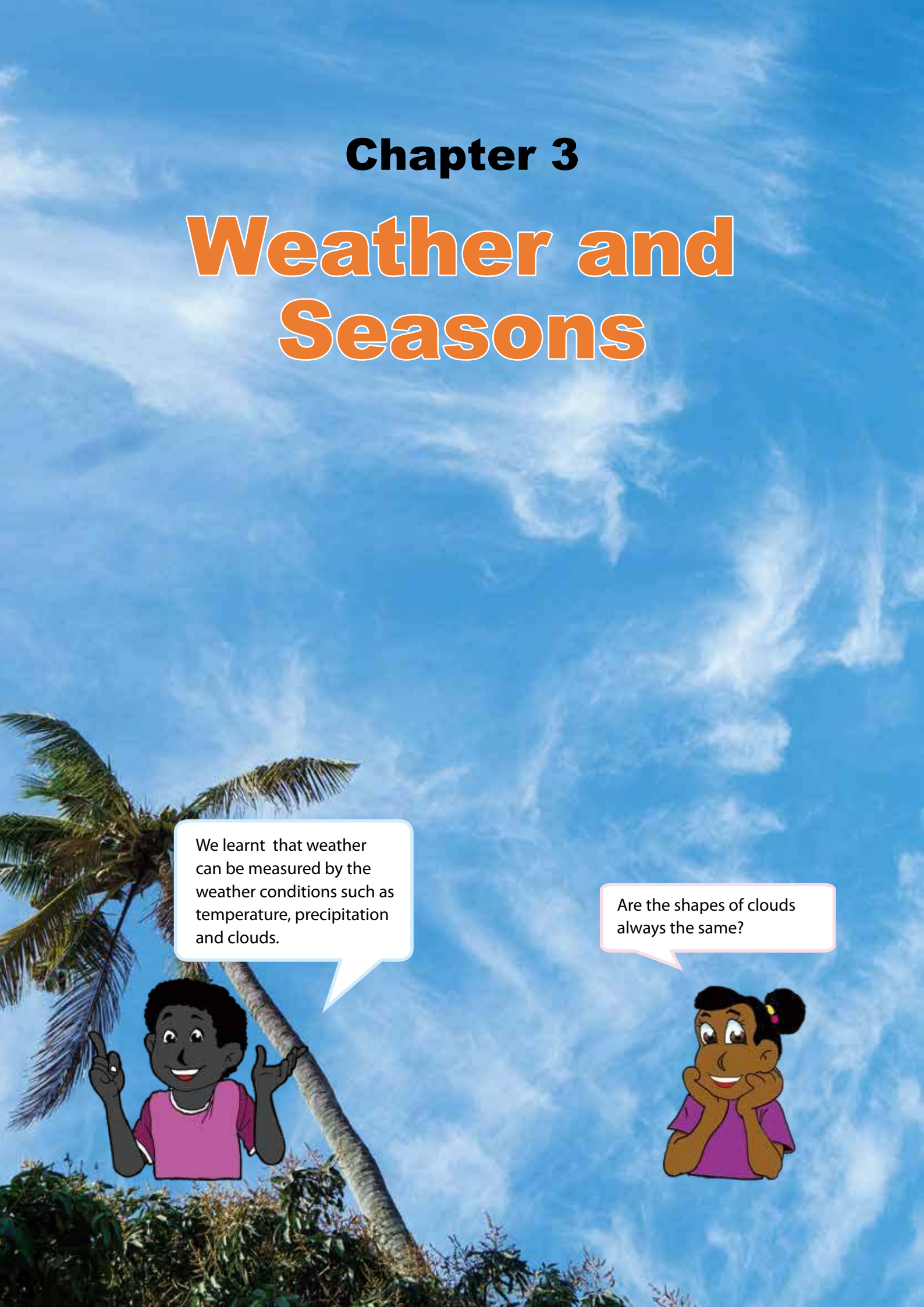
Chapter 3

Weather and Seasons



3.1 Observing Clouds

Lesson 1 Types of Clouds

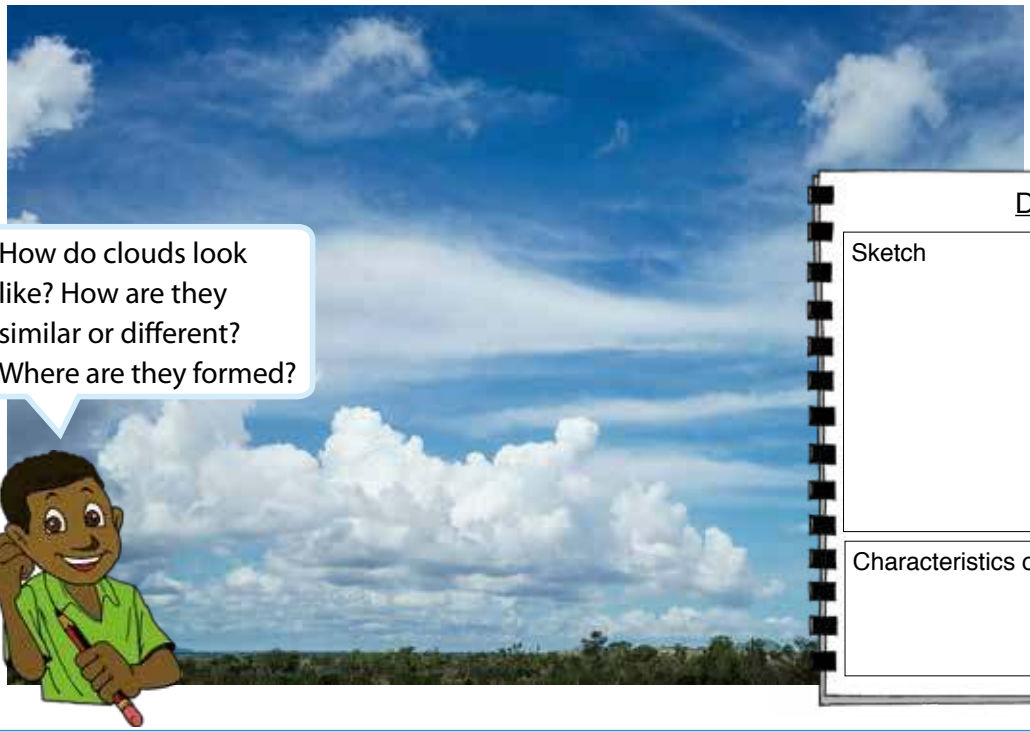
Look at the sky! We see clouds almost every day. Sometimes clouds are white and puffy. Sometimes they are dark and cover the entire sky.

What types of clouds can be observed?

Activity : Observing clouds

What to Do:

1. Go out of the classroom and observe the clouds in the sky.
2. Sketch the clouds in your exercise book.
3. Record the characteristics of clouds such as colour, size, shape and altitude.
4. Share your observations with your classmates. Discuss the types of clouds and their characteristics.

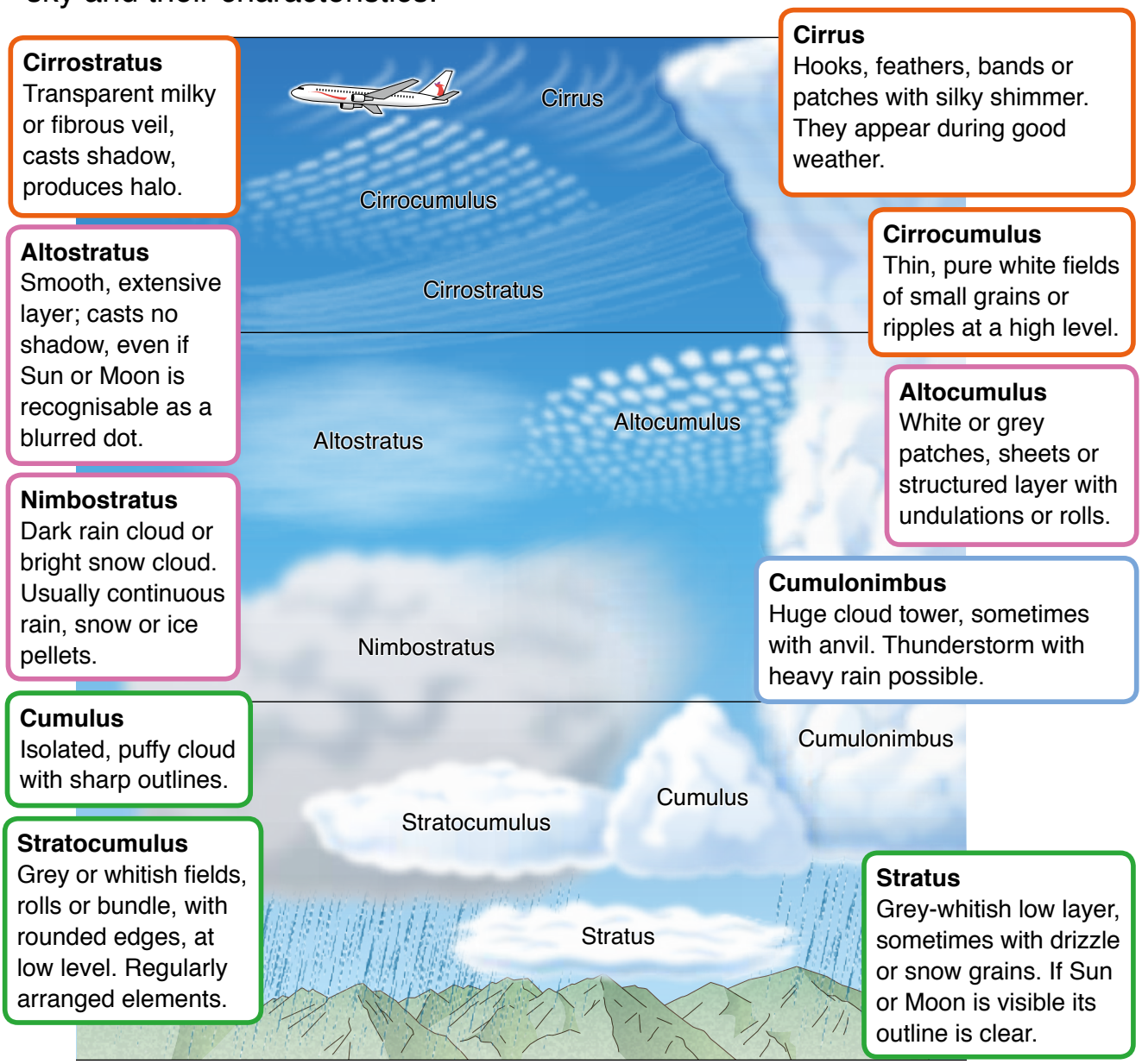


Summary

A **cloud** is made of water droplets or ice crystals floating in the sky. Clouds are classified by where they are formed in the sky. There are ten different types of clouds.

Where clouds are formed in the sky.	Types of Clouds
High Level	Cirrus, Cirrocumulus, Cirrostratus
Middle Level	Altocumulus, Altostratus, Nimbostratus
Low Level	Stratocumulus, Stratus, Cumulus
Range from Low to High Level	Cumulonimbus

The diagram below shows where different types of clouds are formed in the sky and their characteristics.



Lesson 2 Weather Forecast

Weather changes from day to day. It also changes throughout a day. Weather can be forecasted based on the cloud condition. **Weather forecast** predicts the upcoming weather.

How can we forecast weather?

Activity : Weather and clouds

What to Do:

1. Go out of the classroom and observe the sky on a sunny day and on a rainy day.
2. Sketch the clouds you observed in your exercise book.
3. Identify and name the types of clouds that you observed.
4. Share your observations with your classmates. Discuss the relationship between the types of clouds and the weather.

Clear sky

Cloudy sky

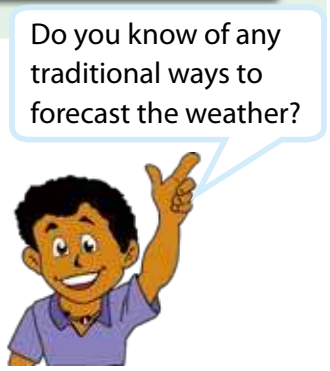
Summary

Clouds can help us to predict the weather. When we observe clouds, we can forecast the weather in the hours and days ahead. The types of clouds tell us about the weather. The table below describes the types of clouds that may cause bad weather such as rain, strong wind and lightning.

 **Cirrus:** Cirrus clouds can indicate that a change in the weather will occur within 2 or 3 days.	 **Cirrocumulus:** A storm may come. In tropical regions, that could be a hurricane.
 **Cirrostratus:** Cirrostratus clouds usually come 12-24 hours before a rainstorm.	 **Altostratus:** Altostratus clouds often form ahead of continuous rain.
 **Nimbostratus:** They often produce light to moderate rain. Rain can be long lasting.	 **Cumulonimbus:** These clouds mean thunderstorms, including lightning and heavy rain.

Try it!

Let's observe clouds to forecast tomorrow's weather based on the types of clouds using the information in the table above.

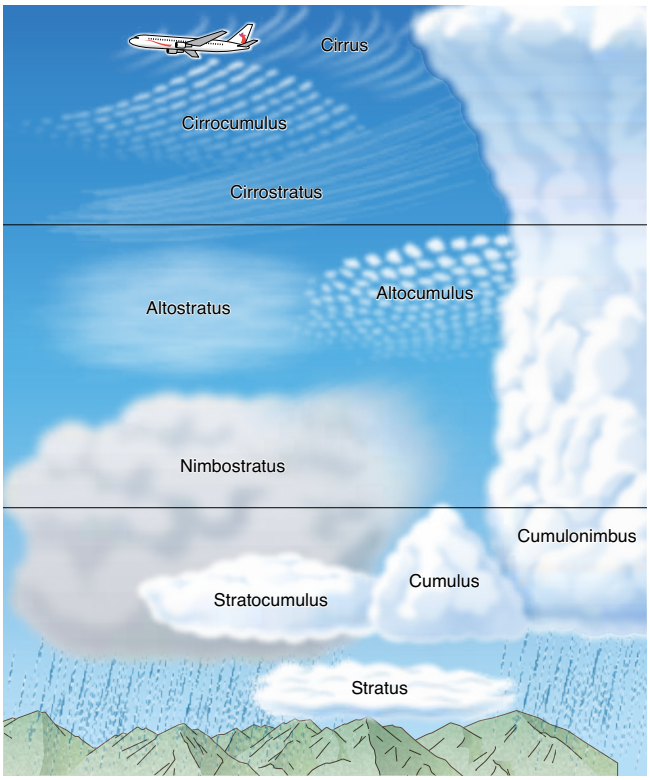


Summary and Exercise

Summary 3.1 Observing Clouds

Types of Clouds

- A cloud is made of water droplets or ice crystals floating in the sky.
- There are ten different types of clouds.
- Different types of clouds are located at different altitudes in the sky.



Weather Forecast

- Weather forecast predicts the upcoming weather.
- Clouds can help us predict the weather.
- When we observe the clouds, we would forecast the weather in the hours and days ahead.
- The types of clouds tell us about the weather.
  - Cirrus clouds can indicate that a change in the weather will occur within 2 or 3 days.
  - Cirrocumulus clouds suggest that a storm may come. In tropical regions, that could be a hurricane.
  - Cirrostratus clouds usually come 12-24 hours before a rainstorm.
  - Altostratus clouds often form ahead of continuous rain.
  - Nimbostratus clouds often produce light to moderate rain. Rain can be long lasting.
  - Cumulonimbus clouds mean thunderstorms, including lightning and heavy rain.

Summary and Exercise

Exercise 3.1 Observing Clouds

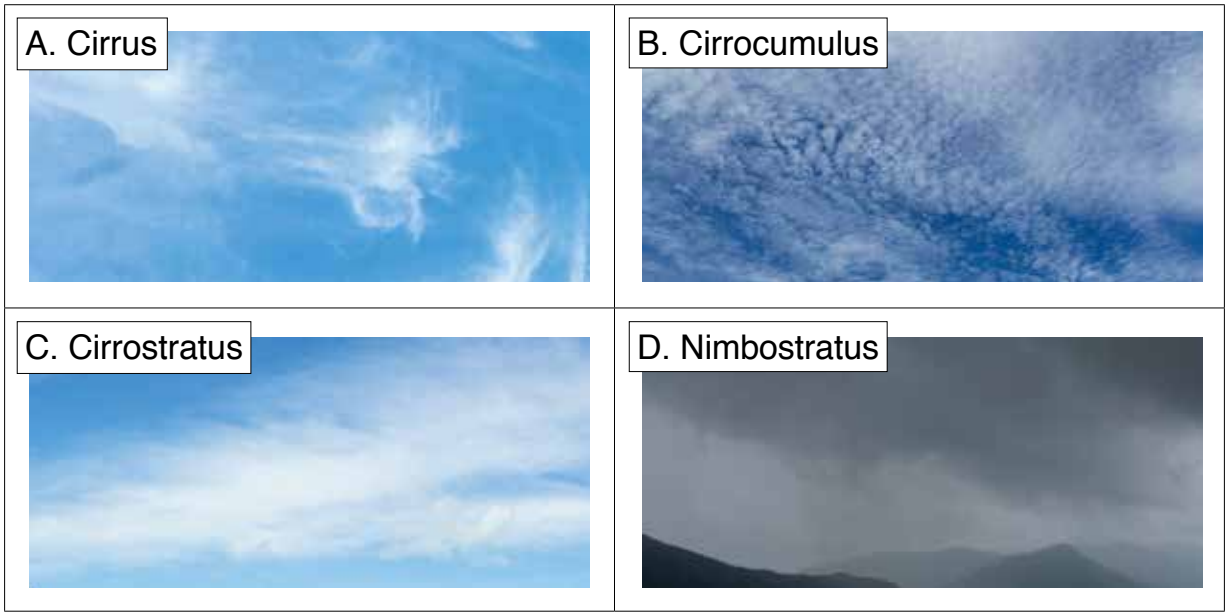
Q1. Complete each sentence with the correct word.

(1) A _____ is made of water droplets or ice crystals floating in the sky.

(2) Different types of clouds are located at different _____ in the sky.

(3) Clouds can help us predict the _____.

Q2. Choose the letter with the correct answer to answer (1) and (2).



(1) What type of clouds indicates that there would be a change in the weather within 2 or 3 days?

(2) Which of the given types of clouds mean there will be light rain to moderate and the rain can be long lasting?

Q3. Look at the picture on the right and answer the following questions.

(1) What is the name of the cloud?

(2) At what level of altitude is this cloud located?

Q4. Alice went outside the house and saw that the clouds looked like hooks and feathers high up in the sky. What do you think her prediction of the weather would be?

3.2 Seasons

Lesson 1 Seasons

It may be 'hot' and said to be a 'dry season' or it may be 'wet' and said to be a 'wet season'. Is season similar to or different from weather?

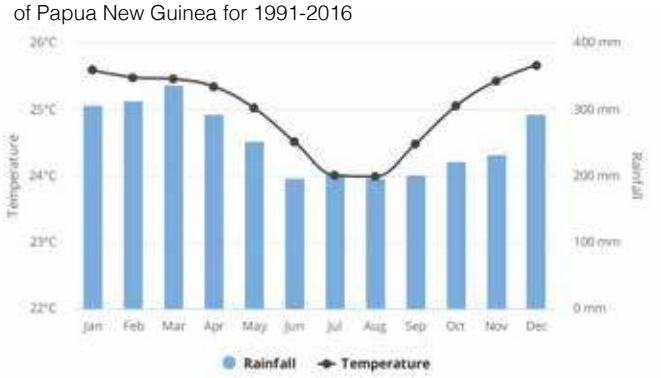
What is a season?

Activity : Seasons in Papua New Guinea

What to Do:

1. Study the graph below. This graph shows average monthly temperature and rainfall of Papua New Guinea from 1991-2016.

Average Monthly Temperature and Rainfall of Papua New Guinea for 1991-2016



(Source: Climate Change Knowledge Portal, THE WORLD BANK GROUP)

2. Think about the following questions.
   (1) Is the temperature the same all year around?
   (2) Which months are warmer with temperatures at 25°C and over?
   (3) Which months are cooler with temperatures below 25°C?
   (4) Does the rainfall occur all year around?
   (5) Which months are drier with less than 200 mm of rainfall?
   (6) How many months are wetter with more than 200 mm of rainfall?
   (7) What patterns of temperature and rainfall are there in PNG?
3. Share your ideas with your classmates. Discuss your answers and the seasons in Papua New Guinea.

Summary

Weather changes from day to day. When weather remains the same for a long period, we call it **season**. Season is a period of the year that is divided by typical weather conditions. Each season has its own weather pattern. There are some months that are very hot or cold. It rains heavily during some months. The seasons change in the same order every year.

In many places of the world, there are four seasons; spring, summer, autumn (fall) and winter. **Spring** is the season that follows winter. The weather begins to get warmer. It often rains in spring, too. **Summer** is the season that follows spring.

Summer is the warmest season of the year with long hours of sunlight. **Autumn (Fall)** is the season that follows summer. The weather slowly gets colder. **Winter** is the season that follows fall. Winter is the coldest season of the year with fewer hours of sunlight. In some places, the coldest weather causes snow, hail and sleet.

Do you know the seasons shown in these pictures?

Some places near the Equator have one hot season all year around or only two seasons; dry season and wet season. The seasons of Papua New Guinea are quite diverse from place to place, but in general Papua New Guinea has dry season and wet season.

The **dry season** is a time of year when little rain falls. The dry season in PNG is generally from May to October. The **wet season** is the time of year when most of the rain falls. The wet season in PNG is generally from November to April.

Wet season in Papua New Guinea

Lesson 2 Seasonal Changes and Living Things

Seasons change in the same order every year. Each season determines the types of clothes people wear. Do seasons also cause any changes in plants and animals pattern of living?

How do living things change with seasons?

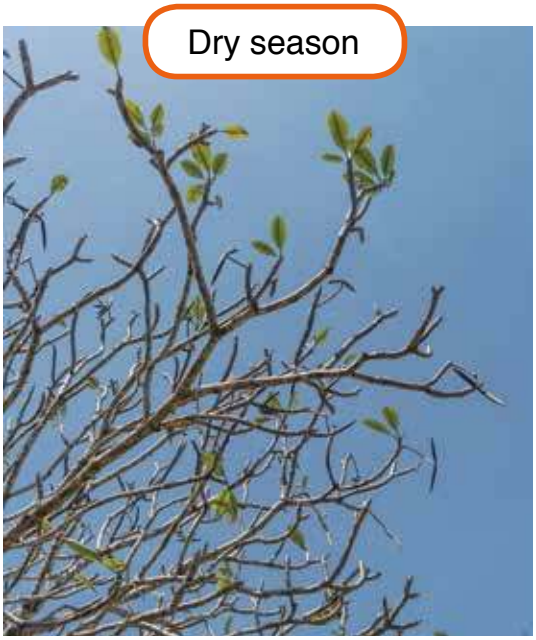
Activity : How are they different?

What to Do:

1. Draw a table like the one shown below.

Seasons	How does the tree change with the seasons?
During Dry season	
During Wet season	

2. Study the two pictures below of the same tree. The picture on the left was taken during a wet season and the picture on the right was taken during a dry season.
3. Observe how they look. Are they similar or different? Record your observations in the table.
4. Share your ideas with your classmates. Discuss how plants and animals change with the season.



Summary

Changes in seasons cause living things to change. Living things need to adjust with seasonal changes.

Spring

Plant seeds begin to sprout. Buds on trees and shrubs grow. Leaves grow and flowers bloom. Many animals have young in spring.

Plant seed begins to sprout.

A bird has young in spring.

Summer

In summer, many plants grow flowers. Fruits grow from the flowers. Young animals grow and become stronger.

In summer, fruits grow from the flowers.

Autumn (Fall)

Some trees drop their fruits. The leaves of trees change colour and fall to the ground. Some animals move to warm places and others gather and store food.

Winter

Many trees and bushes stop growing or grow slowly. Some animals go into a long, deep sleep. The fur on some animals may get thicker and change colour.

Dry and Wet Season

During dry season, trees lose their leaves and some plants die. Some amphibians and insects will burrow deep into the soil and go into a long sleep until the rains return. As the wet season begins, rain helps plants to bloom and turn green. Animals thrive and have their young.

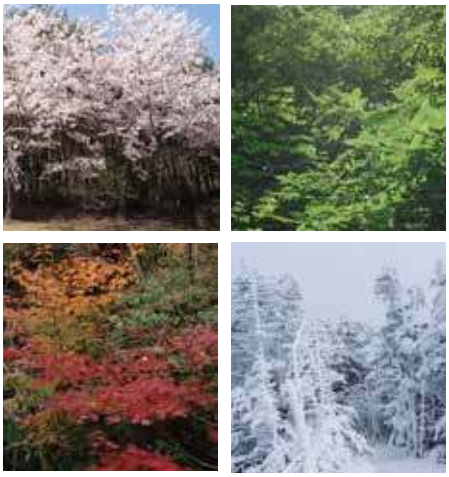
Rain helps plants to bloom and turn green in wet season.

Summary and Exercise

Summary 3.2 Seasons

Seasons

- A season is a period of the year that is divided by typical weather conditions.
- In many places in the world there are four seasons:
  1) Spring: the weather begins to get warmer.
  2) Summer: the warmest season of the year due to the long hours of sunlight.
  3) Autumn (Fall): the weather gets colder.
  4) Winter: the coldest season of the year due to the fewest hours of sunlight.



- Papua New Guinea and some other tropical countries have only two seasons: Dry and Wet.

Seasonal Changes and Living Things

- Changes in seasons cause living things to change. Living things need to adjust with seasonal changes.

Spring	• Leaves grow and flowers bloom. • Many animals have their young.
Summer	• Fruits grow from the flowers. • Young animals grow and become stronger.
Autumn (Fall)	• Leaves of the trees change colour and fall to the ground. • Some animals move to warm places, others gather and store food.
Winter	• Many trees and bushes stop growing or grow slowly. • Some animals go into a long, deep sleep.
Dry and Wet seasons	• During the dry season, trees lose their leaves and some plants die. • During the wet season, rain helps plants to bloom and turn green.

Summary and Exercise

Exercise 3.2 Seasons

Q1. Complete each sentence with the correct word.

(1) A period of the year that is divided by typical weather conditions is called _____.

(2) Living things need to adjust with seasonal changes in temperature and _____.

(3) Papua New Guinea has _____ season and wet season.

(4) Summer is the _____ season of the year due to the long hours of sunlight.

Q2. Choose the letter with the correct answer.

(1) Which of the following list shows the correct order of seasons?

A. Spring → summer → autumn → winter

B. Summer → autumn → spring → winter

C. Spring → autumn → winter → summer

D. Summer → spring → winter→ autumn

(2) During which season do some animals hibernate or go into a deep sleep?

A. Spring

B. Summer

C. Autumn (Fall)

D. Winter

Q3. Study the picture on the right and answer the question.

What will happen to this plant during dry season?

Q4. Explain why seeds of many plants in Papua New Guinea germinate during wet season.

Why do animals go into a very long sleep during winter?

You are probably aware that some animals fall into a very long sleep during winter, this is called Hibernation. Hibernation is an adaptation that helps many animals conserve energy by remaining inactive and reducing their body temperature for days, weeks or even months at a time.

Typically, animals hibernate in order to survive long periods when food is scarce. Hibernating animals will generally eat a lot of food before hibernation and then survive off the energy stored in their fat.

Hibernating animals can sense seasonal changes. The moment they sense autumn (fall) approaching, they get busy preparing by eating more than usual, the animal builds up extra layers of fat. During hibernation, the animal's body will feed on this fat to keep itself alive. Extra fat also helps the animal to stay warm when they are asleep. They then find a shelter where they will be safe while they are asleep if they want to survive.

Only warm-blooded animals can truly hibernate because cold-blooded animals cannot regulate their own body temperatures. Bears, ground squirrels, woodchucks and groundhogs all hibernate during winter.

This animal has gone into a deep sleep during winter.

Chapter Test

3. Weather and Seasons

Q1

Complete each sentence with the correct word.

(1) Different types of clouds are located at different _____of the sky.

(2) The types of clouds tell us about the upcoming_____.

(3) Some places near the_____have one hot season all year round or only two seasons, dry and wet.

Q2

Choose the letter with the correct answer.

(1) Papua New Guinea has two seasons, what are they?

A. rainy and winter

B. wet and dry

C. spring and dry

D. summer and winter

(2) Which cloud is formed at a range from low to high level altitude and like a huge cloud tower?

A. cirrocumulus

B. cumulonimbus

C. cirrostratus

D. cumulus

(3) What can clouds tell us about? They can tell us about

A. what the upcoming weather will be like.

B. when it will be full moon.

C. what time the sun rises.

D. how many seasons there are.

(4) In which season do leaves of trees start to change their colours and drop to the ground and the nights begin to get colder?

A. Spring

B. Summer

C. Autumn

D. Winter

Q3

(1) What would be the expected weather when the clouds are thin, pure white fields of small grains or ripples at a high alttitude as shown in the picture on the right?

_____

_____

_____

(2) How are plants different in wet and dry season?

_____

_____

(3) The graph on the right shows monthly rainfall in a city. Is it dry season or wet season from July to October?

_____

Q4

(1) What do animals do in Autumn (Fall) to get ready for winter?

_____

_____

(2) Farahlyn observed the sky one day and saw that the clouds looked like hooks, feathers and patches with silky shimmer.

(i) What type of cloud did she see?

_____

(ii) What do you think the weather would be like by looking at those clouds?

_____

_____

_____

Chapter 4

New Matter

4.1 Common Chemical Changes

Lesson 1 How to Tell a Chemical Change

When we burn wood, the wood changes into ash. Burning wood is a chemical change.

How can we tell if a chemical change has taken place?

Activity : Hammering and heating sugar

What We Need:

- 2 sugar cubes, tablespoon, candle, match, hammer, aluminium foil

What to Do:

1. Draw a table like the one shown below.

	Texture	Colour	Smell	Others
Sugar cubes				
Crushed sugar				
During & after heating sugar				

2. Crush the sugar cube with the hammer. Observe the properties of the sugar cube and the crushed sugar.
3. Wrap the spoon with an aluminium foil. Put the crushed sugar onto the spoon and heat the sugar on a lit candle until it changes colour. Observe what happens to the sugar.
4. After cooling down the spoon, observe the properties of the sugar. Record your observations in the table.
5. Share your findings with your classmates.

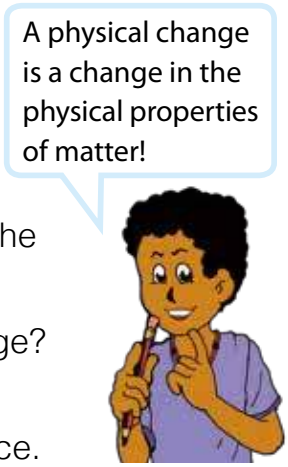
Wrap the bowl of the spoon with an aluminium foil.

Use a piece of cloth to hold the spoon when heating sugar!

Discussion

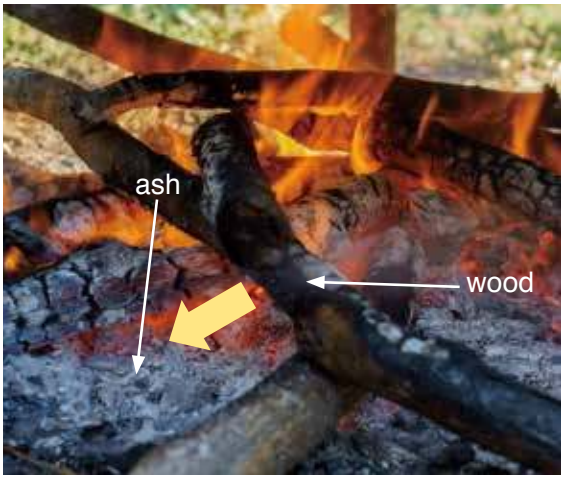
How do we tell a physical change from a chemical change?

1. Think about the following questions based on your results.
   (1) Do the sugar cube and the crushed sugar have the same or different properties?
   (2) Is the crushed sugar a physical or a chemical change?
   (3) Does the sugar after heating have the same properties as the sugar cube?
   (4) Is the heated sugar a physical change or a chemical change? Why do you think so?
2. Talk about how we can tell if a chemical change has taken place.

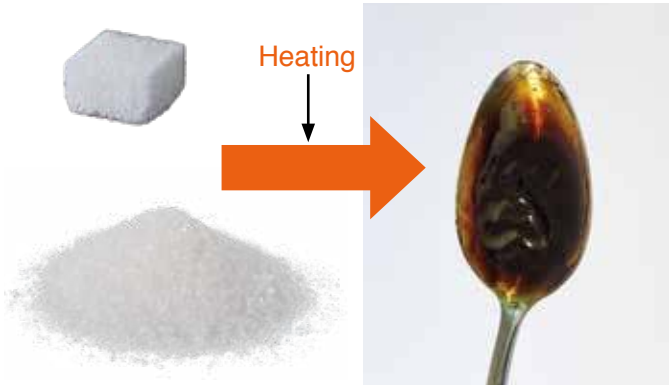


Summary

A **chemical change** produces new kinds of matter. A physical change does not produce new matter. New matter has different properties. For example, burning is a chemical change. After burning wood, the wood changes into ash. The wood and ash have different properties. Burning wood produces new kind of matter such as ash. Ash is no longer wood.
A chemical change produces gas, odour, heat, light, and changes in colour and state. For example, when sugar is heated, odour is produced, its colour and state changes. Therefore, heating sugar is a chemical change.



Burning wood is a chemical change. It produces ash.



Heating sugar produces melted sugar (caramel) and the colour changes.

Lesson 2 Rusting

When we leave an iron nail outside for some time, it will rust. Why does an iron nail rust? What is rust?

Is rusting a chemical change?

Activity : Properties of rust

What We Need:

- a piece of dry steel wool, a piece of steel wool dipped in salt water for a week, scissors, hand lens, magnet, A4 paper

What to Do:

1. Draw a table like the one shown below.

Material	Texture	Colour	Magnet
Dry steel wool			
Wet steel wool			

2. Cut the dry steel wool onto the piece of paper. Use a hand lens to observe the properties of the pieces of steel wool. Hold the magnet close to the pieces.
3. Record your observations in the table.
4. Repeat Steps 2 and 3 for the pieces of steel wool that was dipped in salt water for a week.
5. Share your findings with your classmates. Discuss how they are similar or different.

Result

We found out that properties of a dry steel wool were glossy, glory and silver in colour while the properties of a rusted steel wool were rough, dull and reddish brown in colour. The pieces of dry steel wool were attracted by the magnet. Some pieces of wet steel wool were not attracted by the magnet. These results show that a dry steel wool and a wet steel wool have different properties.

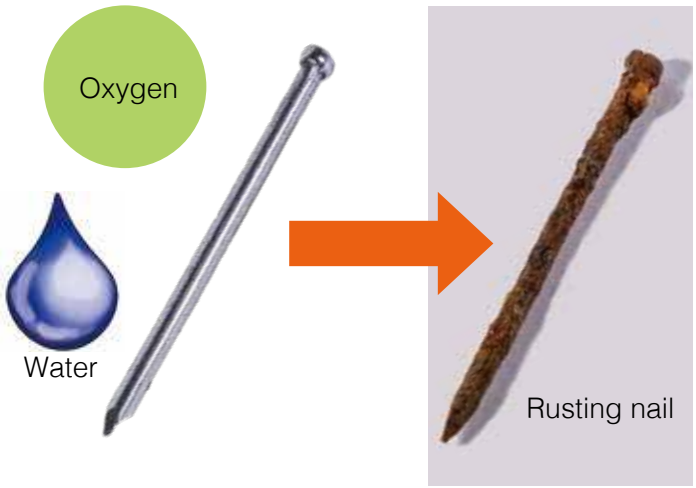
	Texture	Colour	Magnet
Dry steel wool	glossy, glory	silver	attracted
Wet steel wool	rough, dull	reddish brown	some attracted but some are not

Summary

Rusting is a type of chemical change. It usually happens slowly. When iron or steel comes into contact with water and oxygen in the air, rusting happens. We may find brownish patches on the metal parts of cars or ships. Rust is a coating that forms on the surface of iron or steel.

Rust on the surface of a ship

When we leave an iron nail outside in the rain, rust will form on the surface of the nail. Rust has a different property from iron. It is a different kind of matter. Rust is no longer iron. Rusting produces new matter.



Rust has a different property from iron. Iron and rust are different kinds of matter.

Lesson 3 Chemical Changes in Daily Life

When a chemical change occurs in matter, what happens to matter?
What kind of chemical changes take place around us?

How does a chemical change take place in daily life?

Activity : Finding chemical change around us!

What to Do:

1. Draw a table like the one shown below.

	How do properties of matter change?	Is new matter produced?	Chemical change or Physical change
Burning paper			
Boiling water			
Boiling egg			
Dissolving sugar			
Cutting papaya			
Rotting banana			

2. Study the pictures below. Observe the change in the properties of the matter and record your observations in the table.
3. Share your ideas with your classmates. Discuss where a chemical change occurs and how chemical and physical changes are different.


Burning paper


Boiling water


Boiling egg

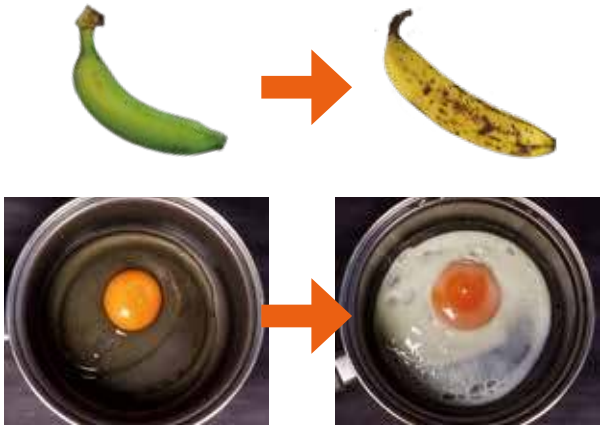

Dissolving sugar in water


Cutting papaya


Rotting banana

Summary

Chemical changes take place all around us. Burning wood, rusting iron nails, cooking food and ripening and rotting fruits are chemical changes. Chemical change also happens in our body. Our body changes food chemically into new matter that it can use as energy.



Rotting and cooking are chemical changes.

Our body changes food chemically into energy that our body can use.

Energy is always involved in a chemical change. Chemical changes take in or give off energy in the form of heat, light, electricity, sound or motion. For example, heat energy can be added when we light a fire or cook food to produce a new kind of matter. Energy is often released when a chemical change takes place. Burning paper gives off energy in the form of heat and light. An explosion of fireworks is a chemical change. When fireworks explode, they produce many loud sounds and lights.

Heat energy is added when cooking food.

An explosion of fireworks gives off sounds and lights.

Summary and Exercise

Summary

4.1 Common Chemical Changes

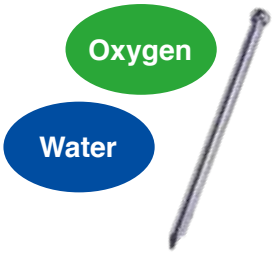
How to Tell a Chemical Change

- Chemical change produces new kinds of matter that has different properties.
- Burning paper or wood is an example of a chemical change. Ash is the new matter formed after burning.
- A chemical change produces gas, odour, heat or light and changes in colour and state.

Burning paper is a chemical change.

Rusting

- Rusting is a type of chemical change that usually occurs slowly.
- Rusting comes in brownish colour on objects that are made of iron or steel.
- Rust is formed when iron or steel comes in contact with water and oxygen in the air.
- Iron and rust are different kinds of matter because they have different properties.



Chemical Changes in Daily Life

- Chemical change often takes place in our daily lives.
- Chemical change takes in or gives off energy in the form of heat, light, electricity, sound or motion.
- Burning wood, rusting iron nails, cooking food, ripening and rotting of fruits are chemical changes.
- Chemical change occurs in our body by changing food into new matter that can be used as energy.

Summary and Exercise

Exercise

4.1 Common Chemical Changes

Q1. Complete each sentence with the correct word.

(1) Energy is always involved in a _____ change.

(2) The new matter formed after burning wood is _____.

(3) Chemical change produces _____ kind of matter.

(4) Iron and rust have different _____ such as colour and texture.

Q2. Choose the letter with the correct answer.

(1) Which of the following is a chemical change?

A. Boiling water.

B. Tearing of a paper.

C. Sharpening a pencil.

D. Rotting banana.

(2) What happens to an iron nail when it is left outside in the rain for a while?

A. Rust would form on the surface of the nail.

B. The iron nail would not change but remain as iron nail.

C. The nail would go missing.

D. The surface of the nail would become shinny.

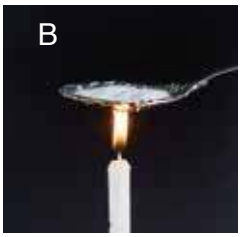
Q3. Answer the following questions.

(1) Which of these pictures shown on the right is a chemical change?

(2) What things were produced when the sugar was burnt?

(3) Explain why it is a chemical change.

Crushing a sugar cube



Burning sugar

Q4. Plants take in water and gas called carbon dioxide and absorb sunlight. Then plants make sugar as their own food and give off oxygen gas. What can you conclude about the kind of changes that take place inside a plant to produce sugar and oxygen? Explain your answer.

Change of leaf colours during autumn

In many places of the world there are four seasons; spring, summer, autumn (fall) and winter. During autumn, falling temperatures prompts trees to prepare for winter. In these preparations, some kinds of trees change colour of their leaves dramatically.

Leaves change thier colour during autum.

Most leaves of trees look green because of the pigment they contain which is the chlorophyll. Chlorophyll absorbs sunlight and the light energy is converted to chemical energy through the process of photosynthesis. In addition to the chlorophyll, there are other pigments present in the leaves, which are carotene and anthocyanin. While carotene is yellow, anthocyanin is red. The change in temperature during autumn(fall) causes the trees to cut off supply of water to the leaves. In the absence of water, photosynthesis stops, and the chlorophyll breaks down through chemical change. Therefore, the leaves take the colour of the other pigments, and we can see a change in colour from green to red and yellow.

Chemical change takes place in leaves of trees.

Chapter Test

4. New Matter

Q1

Complete each sentence with the correct word.

(1) Cooking food, rotting banana, burning paper, and rusting iron are some _____ changes in daily life.

(2) Rust is a coating that forms on the surface of iron or _____.

(3) _____ energy is added when cooking food.

(4) A new solid matter produced after burning paper is callled _____.

Q2

Choose the letter with the correct answer.

(1) Which list contains chemical changes only?

A. baking cake, boiling water, tearing paper, cutting mango

B. rotting banana, burning wood, rusting iron, cooking food

C. breaking glass, burning paper, slicing bread, popping pop corn

D. crushed can, squeezing a paper, spoilt milk, rotting mango

(2) Which of the following statements is <u>not</u> true about rust?

A. Rust occurs when iron or steel comes in contact with water and oxygen.

B. Rust has the same property as iron.

C. Rust is a kind of chemical change.

D. Rust comes in brownish colour.

(3) A pair of metal scissors left outdoor was rusted. What evidence shows that a chemical change has taken place?

A. It had a deep scratch.

B. The sunlight has warmed it.

C. The soil has stuck on its surface.

D. It changed to a brownish colour.

Q3

(1) Sandy wants to experiment with some sugar cubes. What should she do to change the sugar cube chemically?

_____

_____

(2) An explosion of fireworks is a chemical change. What three forms of energy does it produce when it explodes?

_____

_____

(3) Think about how an egg changes when it is cooked. Is this a physical change or a chemical change? Explain your answer.

_____

_____

_____

Q4

(1) A silver spoon that has turned black can be made shiny again by rubbing off the black tarnish with silver polish. Is polishing a physical change or a chemical change? Explain your answer.

_____

_____

_____

(2) Explain why the melting ice is not a chemical change.

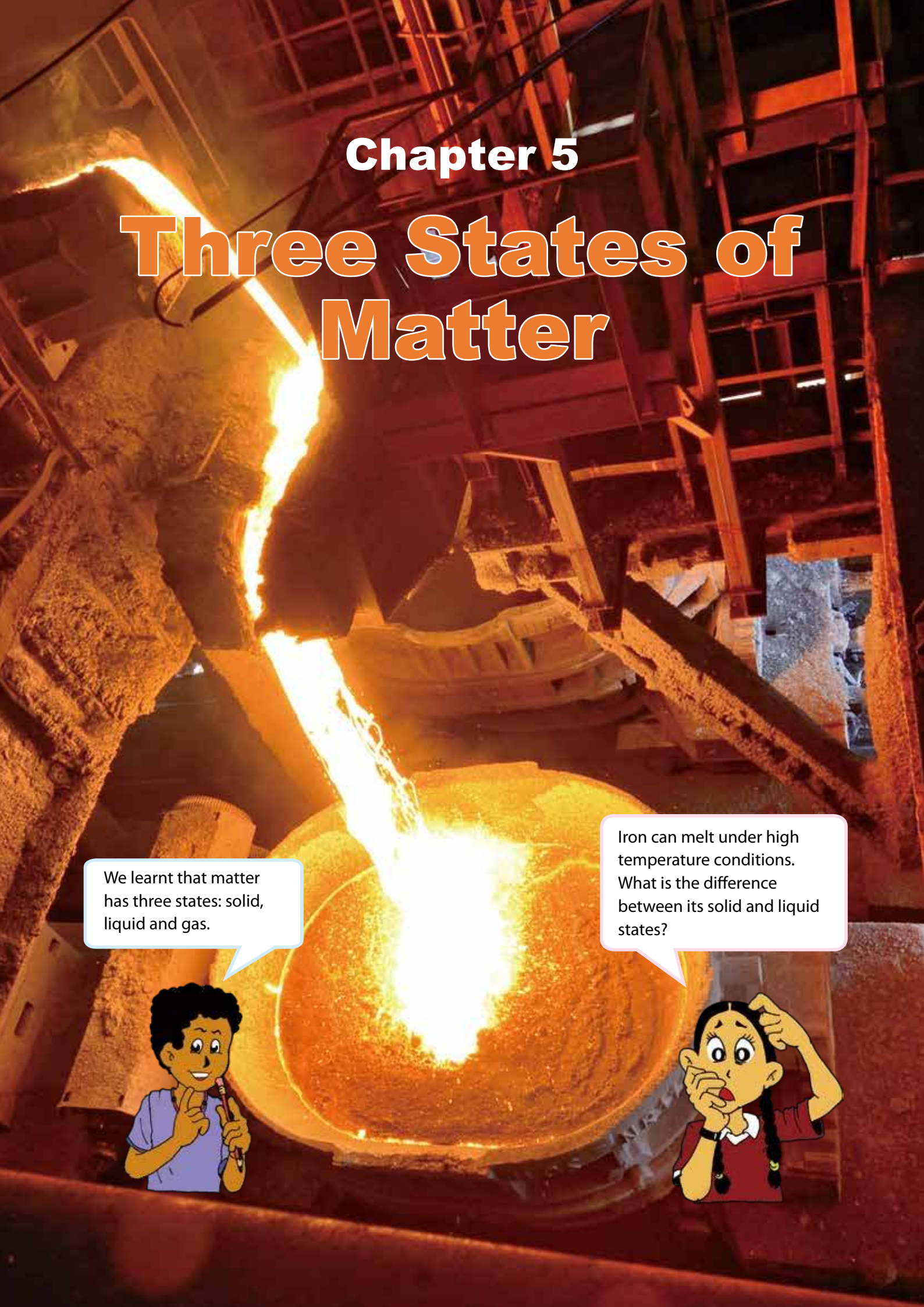
_____

_____

_____

Chapter 5

Three States of Matter



5.1 Properties of Three States of Matter

Like water, all matter can exist in three states: solid, liquid and gas. What kinds of properties do these three states of matter have?

Lesson 1 Shape of The Three States of Matter

Shape is one of the properties of matter. Is the shape of solid, liquid and gas similar or different?

How is the shape of the three states of matter similar or different?

Activity : Observing the shape of a stone, water and air

What We Need:

- a stone, water, three balloons

What to Do:

1. Put the stone into the balloon and tie the top of the balloon. Fill the second balloon with water and blow up the third balloon. Tie the mouth of the balloons.

2. Press the stone, water and air in the balloons and observe the changes in their shape.
3. Based on your observations, think about the following questions:
   (1) What happened to the shape of the stone, water and air when you pressed them?
   (2) What shape do solid, liquid and gas have?
   (3) How similar or different is the shape of the three states of matter?

4. Share your findings with your classmates. Discuss how the shape of the three states of matter is similar or different.

Summary

Solid, liquid and gas have specific characteristics in terms of their shape.

1. Solid

A solid has **a definite shape**. The shape of solid remains the same whether it is pressed or placed into different containers. For example, a stone will keep its shape wherever we press it or put it on a desk, in a glass or in a box. This means that the shape of a solid does not change. A solid has a definite shape.

A solid does not change its shape wherever it is placed in different place.

2. Liquid

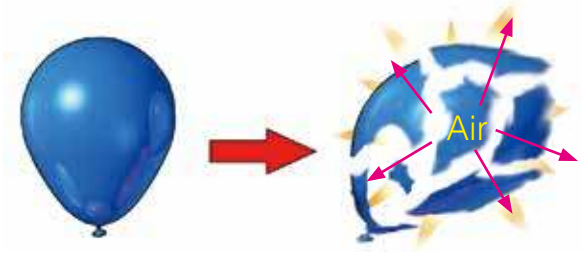
Liquid has **no definite shape**. Liquid changes its shape when it is pressed. Liquid also changes its shape to match the shape of the containers. For example, liquid takes the shape of the glass when it is poured into a glass. Liquid also changes its shape when it is spilled on a table. A liquid has no definite shape.

A liquid changes its shape to match the shape of the containers.

3. Gas

Gas has **no definite shape**. Gas changes its shape as it takes the shape of the container. If we fill the different shaped balloons with air, the air expands to fill the balloons and takes on different shapes. If the balloons burst, air will escape and spread out.

A gas expands to fill the balloons and takes on the different shapes.



If the balloon bursts, the air will escape.

Lesson 2 Volume of Three States of Matter

Solid has a definite shape but liquid and gas have no definite shape. How about the volume of solid, liquid and gas?

What characteristics of volume do the three states of matter have?

Activity : Heating and cooling water and air

What We Need:

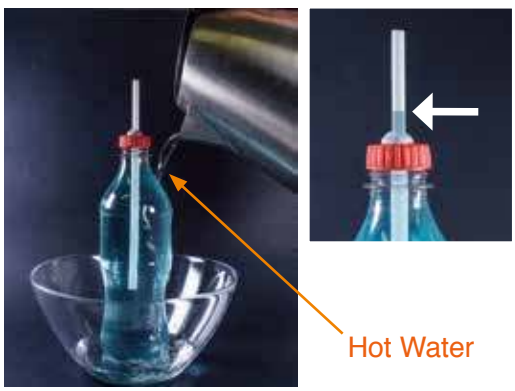
- cold water, hot water, plastic bottle with its cap, straw, balloon, two bowls, removable adhesive

What to Do:

1. Stretch the mouth of the balloon over the top of an empty bottle. Place the bottle in the bowl of hot water for a minute and observe the size of the balloon. Then place the same bottle into a bowl of cold water for a minute and observe the size of the balloon. Record your observations.

2. Next, make a hole on the top of the bottle cap, big enough for a straw to fit through. Put a straw through the cap and seal around the hole in the cap using removable adhesive. Fill the bottle with water and screw on the bottle cap. Put the bottle in the bowl and pour hot water onto the bottle. Observe the water in the straw and record your observations.

3. Share your results with your classmates.



Be very careful when handling hot water!

Discussion

Based on your results, think about the following questions.

1. What happened to the size of the balloon when the empty bottle was heated and cooled? Explain why.
2. What happened to the water in the straw when hot water was poured on the bottle? Explain why.

Metal parts allow the bridge to change length.

Summary

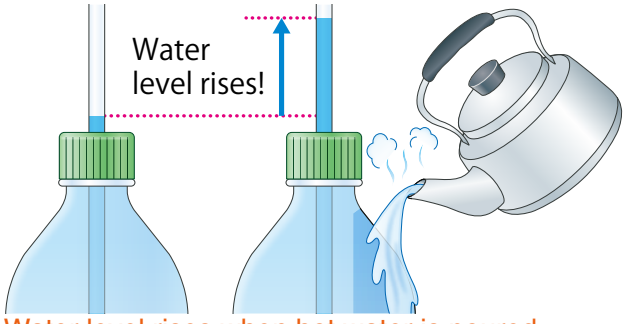
Solid, liquid and gas expand when heated. They contract when cooled. The increase in volume of matter due to an increase in temperature is called **thermal expansion**.

1. Solid

Solid expands very little when heated. Most large bridges include metal parts which look like two metal combs. There are spaces between these metal parts that allow the bridge to change length without breaking. If the bridge material expands and the bridge gets longer, the parts move closer together. If it contracts, they move further apart.

2. Liquid

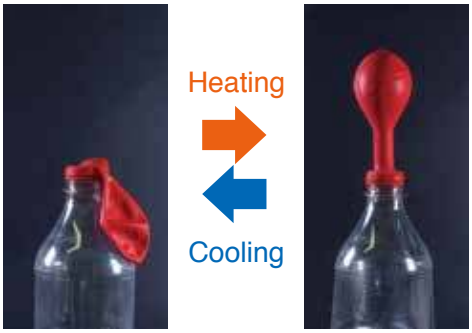
Liquid expands a little more than solid. When hot water is poured on the bottle filled with water, the water inside the bottle becomes warmer and expands. As a result of this the water level in the straw rises. The volume of water increases.



Water level rises when hot water is poured.

3. Gas

Gas expands a lot more when heated. As the air inside the bottle heats, the balloon begins to expand. This is because the air inside the bottle expands and it spreads out into the balloon.



As the air inside the bottle is heated, the balloon begins to expand.

Lesson 3 Change in State of Matter 1: Solid and Liquid

Water can change its state by heating and cooling. How about other matter?

How does matter change its state from a solid to a liquid?

Activity : Heating and cooling a candle

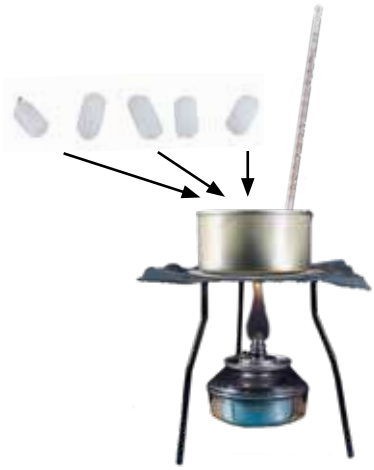
What We Need:

- thermometer, candle, burner, empty tin can, bowl with water

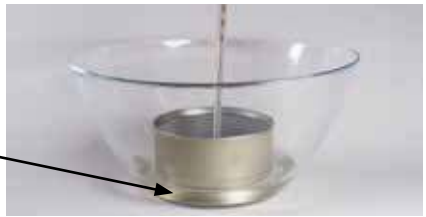
What to Do:

1. Draw a table like the one on the right.
2. Break up the candle into small pieces and put them in the empty tin can.
3. Place the thermometer in the tin and take the first reading. Heat the tin can using the burner as shown in the picture below.
4. Measure the temperature of the candle every two minutes and observe the candle until it melts completely.
5. Record the temperature and your observations in the table after every two minutes.
6. After melting, place the tin can in the bowl of water. Measure the temperature of the candle every two minutes and observe its hardness until all the candle wax hardens completely.
7. Record the temperature and your observations in the table.
8. Share your results with your classmates.

Time (mins)	Temperature (°C)	Conditions of Candle
0		
2		
4		
6		
8		
10		
12		
...		



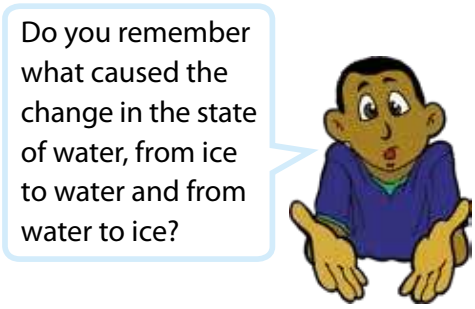
Be careful when using the hot burner and water!



Discussion

Think about the following questions based on your results.

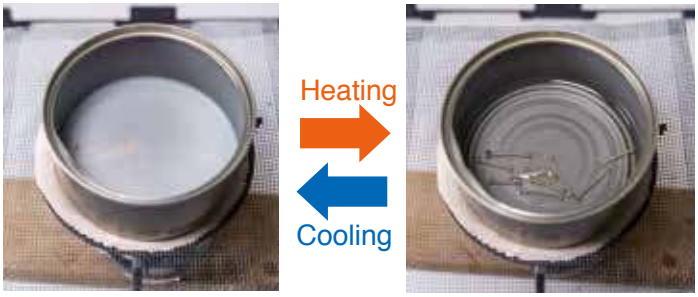
1. What was the state of the candle before and after heating?
2. How did the state of the candle change after placing it in the bowl?
3. What was the temperature of the candle when it completely melted and hardened?
4. How does the candle change its state from a solid to a liquid and from a liquid to a solid?



Summary

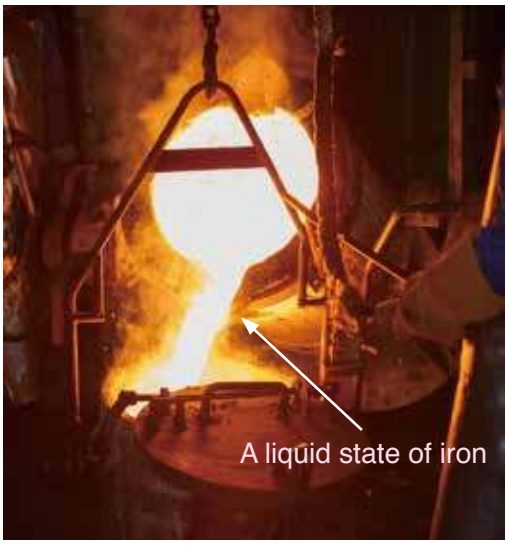
Matter can change its state from a solid to a liquid and from a liquid to a solid when it is heated or cooled. For example, a candle is a solid because it has a definite shape. When a candle is heated, it starts to melt.

A candle changes its state from a solid to a liquid by heating. When the melted candle is cooled, it hardens. A candle changes its state from a liquid to a solid when it is cooled.



A candle changes its state by heating and cooling.

When heat is added to a solid, its temperature will rise to a certain point where the solid starts to melt. This point is called the **melting point**. When heat is removed from the liquid, its temperature drops to a certain point where the liquid starts to freeze. This point is called the **freezing point**. The melting and freezing point of water is 0°C.



Iron starts melting at about 1 500°C.

Lesson 4 Change in State of Matter 2: Liquid and Gas

Water can change its state from water to water vapour by heating and from water vapour to water by cooling. How about other matter?

How does a matter change its state from a liquid to a gas?

Activity : Change in state of ethanol

What We Need:

- ethanol, zip lock bag, tray, hot and cold water

What to Do:

1. Draw a table like the one shown below

	What is happening to the zip lock bag and ethanol?
Before pouring the hot water	
After pouring the hot water	
After pouring the cold water	

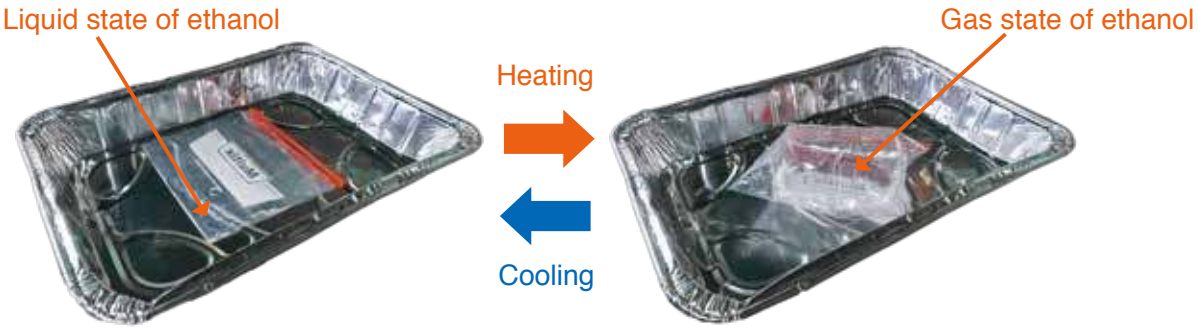
2. Pour 5 mL of ethanol into the zip lock bag, zip it firmly and observe.
3. Place the zip lock bag in the tray and pour hot water onto it. Observe the zip lock bag and the ethanol in it. Record your observations in the table.
4. Pour cold water onto the zip lock bag. Observe the zip lock bag and the ethanol. Record your observations in the table.

5. Think about the following questions based on your observations:
   (1) What happened to the zip lock bag and the ethanol after pouring the hot water? Explain why.
   (2) What happened to the zip lock bag and the ethanol after pouring cold water? Explain why.
   (3) How did the ethanol change its state?

6. Share your findings with your classmates.

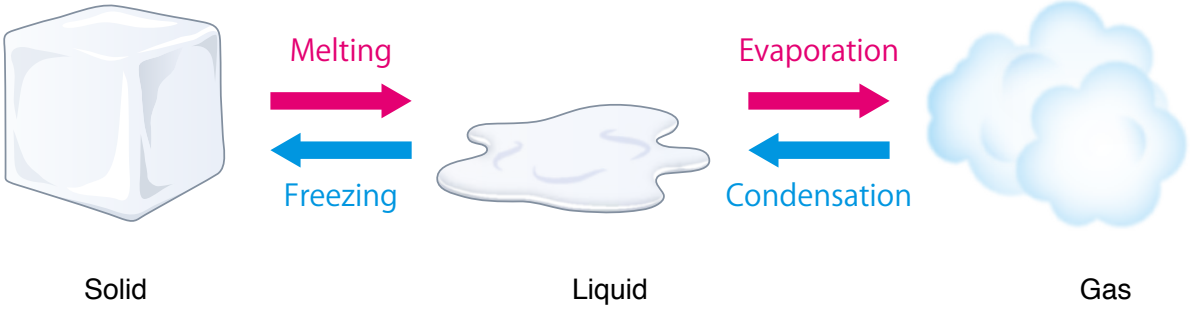
Summary

Matter can change its state from a liquid to a gas and from a gas to a liquid when it is heated or cooled. For example, ethanol is a liquid. When ethanol in a zip lock bag is heated, the zip lock bag expands and the amount of liquid ethanol decreases. This means that the ethanol changes its state from a liquid to a gas. The temperature at which a liquid changes into a gas is called the **boiling point**. When a gas state of ethanol in the zip lock bag is cooled, the zip lock bag shrinks and the amount of liquid ethanol increases. This means that the gas state of ethanol changes its state from a gas to a liquid.



Ethanol changes its states by heating and cooling.

All matter can be solid, liquid or gas depending on their temperature. Matter changes its state by heating or cooling. When heat is added to matter, it changes its state from a solid to a liquid or from a liquid to a gas. The process that causes a matter to change from a solid to a liquid is called **melting**. The change of state from a liquid to a solid is called **freezing**. When heat is removed from matter, it changes its state from a gas to a liquid or from a liquid to a solid. The change of state from a liquid to a gas is called **evaporation**. The change of state from a gas to a liquid is called **condensation**.



Matter can be a solid, liquid or gas depending on its temperature.

Summary and Exercise

Summary

5.1 Properties of Three States of Matter

Shape of the Three States of Matter

		
Solid has a definite shape which does not change even if it is pressed or placed anywhere.	Liquid has no definite shape. It changes its shape when pressed or placed in different kinds of container.	Gas has no definite shape. It changes its shape as it takes the shape of the container.

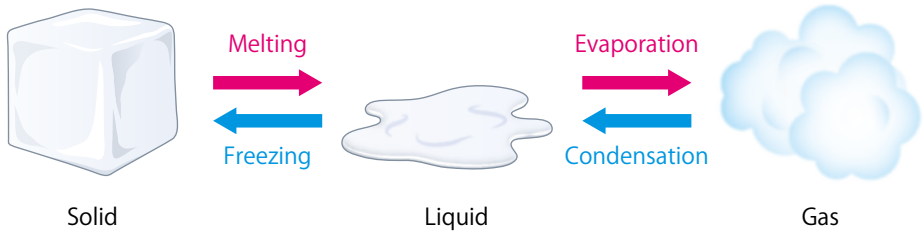
Volume of Three States of Matter

- ☑ Solid, liquid and gas expand when heated and contract when cooled.
- ☑ Thermal expansion is the increase in volume of matter due to the increase in its temperature.

Volume of Matter when Heated		
Solid	Liquid	Gas
Solid expands very little.	Liquid expands a little more than solid.	Gas expands greater than liquid and solid.

Changes in States of Matter: Solid and Liquid, Liquid and Gas

- ☑ Matter can change from one state to another by heating and cooling.
- ☑ All matter can be solid, liquid or gas depending on their temperature.



- ☑ The melting point is the point in which solid starts to melt when the temperature rises.
- ☑ The freezing point is the point in which liquid starts to freeze when the temperature drops.
- ☑ The melting and freezing point of water is 0°C.
- ☑ The boiling point is the temperature at which a liquid changes into a gas.

Summary and Exercise

Exercise

5.1 Properties of Three States of Matter

Q1. Complete each sentence with the correct word.

(1) The three _____ of matter are solid, liquid and gas.

(2) Unlike liquid and gas, _____ has a definite shape.

(3) Gas changes its _____ as it takes the shape of different kind of containers.

(4) The melting and freezing point of water is _____ °C.

Q2. Choose the letter with the correct answer.

(1) Solid, liquid and gas _____ when they are heated.

A. contract

B. expand

C. disappear

D. burst

(2) Which of the following is a property of liquid?

A. All liquids have colour.

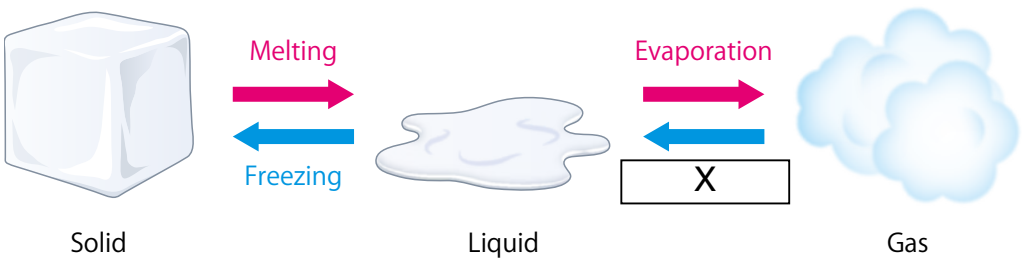
B. Liquid never expand when it is heated.

C. Liquid has a definite shape.

D. Liquid increase its volume when its temperature increases.

Q3. Answer the following question.

What process of change in the state of matter is marked **X**?

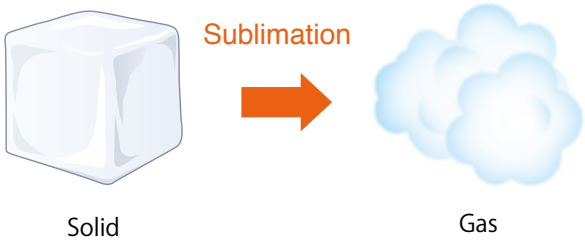


Q4. Benny wanted to open the top of a cough mixture bottle but it was too difficult to open. The top is made of metal and the bottle is made of glass. He poured some hot water over the bottle top and then he was able to open it. What made it easier for him to open the top of the cough mixture bottle?

Do all substances change their state from solid to liquid and liquid to gas?

All substances mainly have three different states at various temperatures. The change from solid state to gas state requires the change of solid state to liquid state and liquid state to gas state.

If solids have enough vapour pressure at a particular temperature then they can change directly into air. The direct change of state from solid to gas is called **sublimation**.



Examples of Sublimation

One of the example of sublimation is dry ice. It is a solid form of carbon dioxide. Its temperature is less than -78°C. When dry ice gets exposed to air, it directly changes its state from solid to gas. When dry ice is placed in water, sublimation is accelerated and smoke like fog is created.The most common use of dry ice is to preserve food to keep it cool.This is because the temperature of dry ice is lower than ice and it does not make the food wet due to its sublimation process.

Another well-known example of sublimation is a substance known as naphthalene. Naphthalene is usually found in pesticides such as mothball. When mothballs sublime, they give off a pleasant fragrance which is also irritating to pests like cockroaches. For this reason they are used in drawers, shelves, wardrobes and suitcases in homes.

Solid state of carbon dioxide

Sublimation of carbon dioxide

Chapter Test

5. Three States of Matter

Q1

Complete each sentence with the correct word.

(1) Solid, liquid and gas increase its _____ when heated.

(2) A solid has a definite _____.

(3) The point at which solid starts to melt is called _____ _____.

(4) A change of state from a liquid to a gas is called _____.

(5) Gas expands much more than solid and _____.

Q2

Choose the letter with the correct answer.

(1) What happens when hot water is poured on a bottle filled with water?

A. The volume of the water will decrease.

B. The water in the bottle becomes warmer and expands.

C. The water in the bottle cools and contracts.

D. All water in the bottle evaporates.

(2) Which of the following matter has no definite shape?

A. Oxygen and candle

B. Stone and water

C. Sand and sugar

D. Air and water

(3) Which term best describes the process of change from solid to liquid?

A. Freezing

B. Evaporation

C. Melting

D. Condensation

(4) Which of the following is the correct statement about the volume of matter?

A. The volume of liquid increases when it is heated.

B. The volume of solid decreases when it is heated.

C. Gas never expands when it is heated.

D. All matter do not change their volume when heated.

Q3

(1) Danny observed and sketched the state of the candle as shown in the picture on the right. Classify the state of the candle near the flame as a solid, liquid or gas.

_____

A burning candle

(2) Study the diagram below.

← Bowl of hot water

What will happen to the balloon when the bottle is placed into the bowl of hot water?

_____

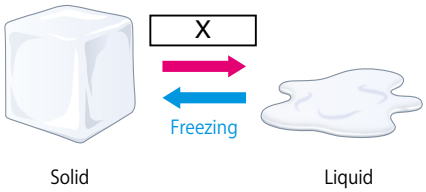
(3) Explain your answer for (2).

_____

_____

(4) Study the diagram shown on the right. What process is marked 'X'?

_____



Q4

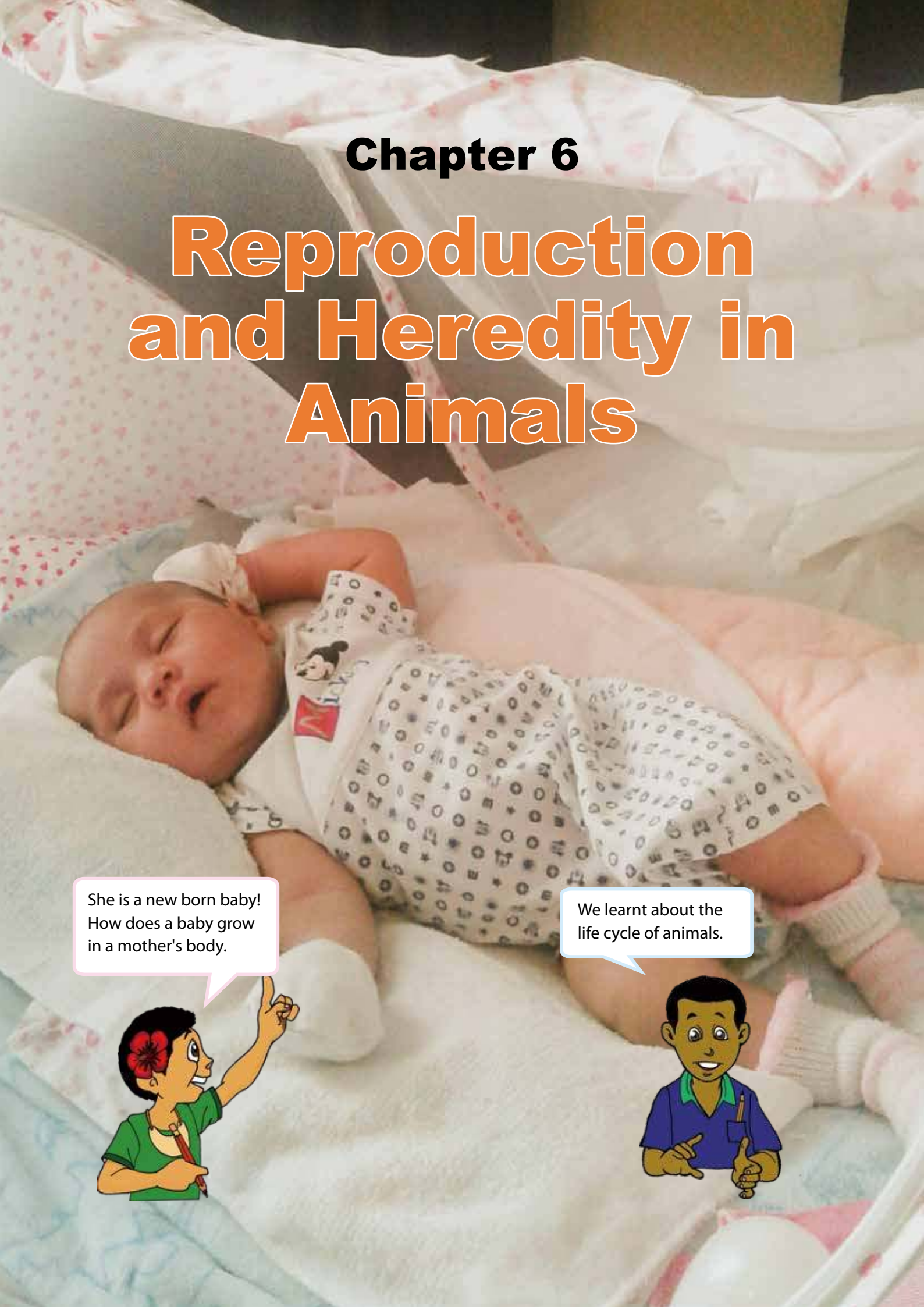
Kim placed a cup of water in a warm place. One week later, there was no water left in the cup. What happened to the water in the cup?

_____

_____

Chapter 6

Reproduction and Heredity in Animals



6.1 Reproduction and Heredity

All animals have life cycles. Different animals have different life cycles, they all are born, grow and die. All living things produce young ones similar to themselves. This process is called **reproduction**.

How do animals reproduce?

Lesson 1 Reproduction in Fish

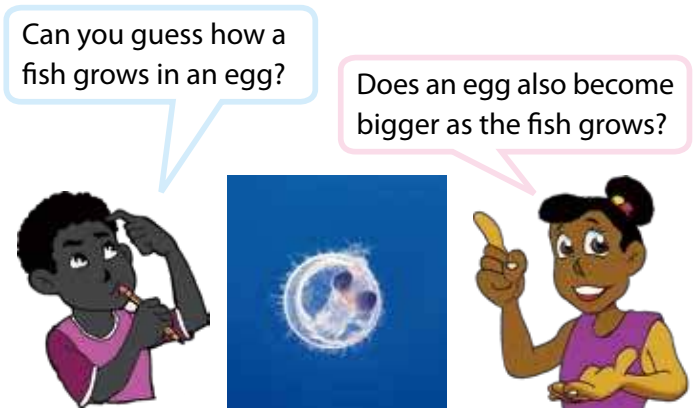
Fish are animals. They have their own life cycles which begin with eggs.

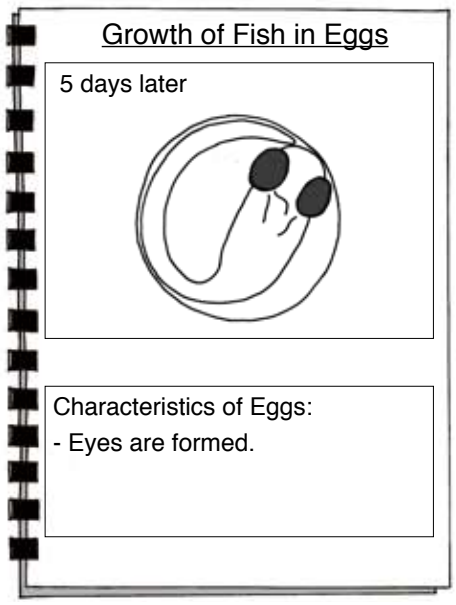
How does the life of a fish begin with eggs?

Activity : The growth of fish in an egg

What to Do:

1. Study the pictures on the next page. The pictures show the growth process of a fish in an egg.
2. Observe the inside of the egg in the pictures carefully. Sketch the inside of the egg and write the characteristics in each stage.
3. Based on your observations, summarise the changes in the growth of fish in an egg.
4. Share your ideas with your classmates. Discuss how a fish grows in an egg.

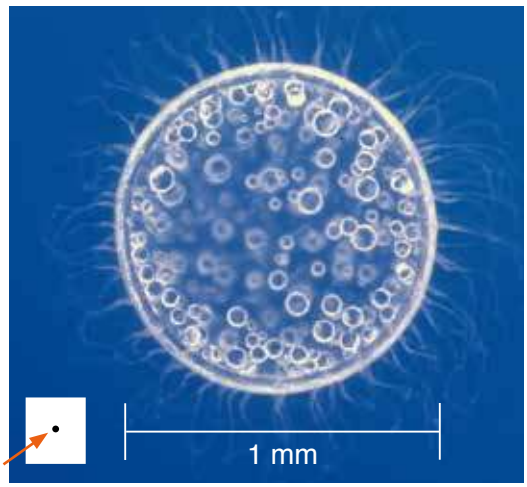




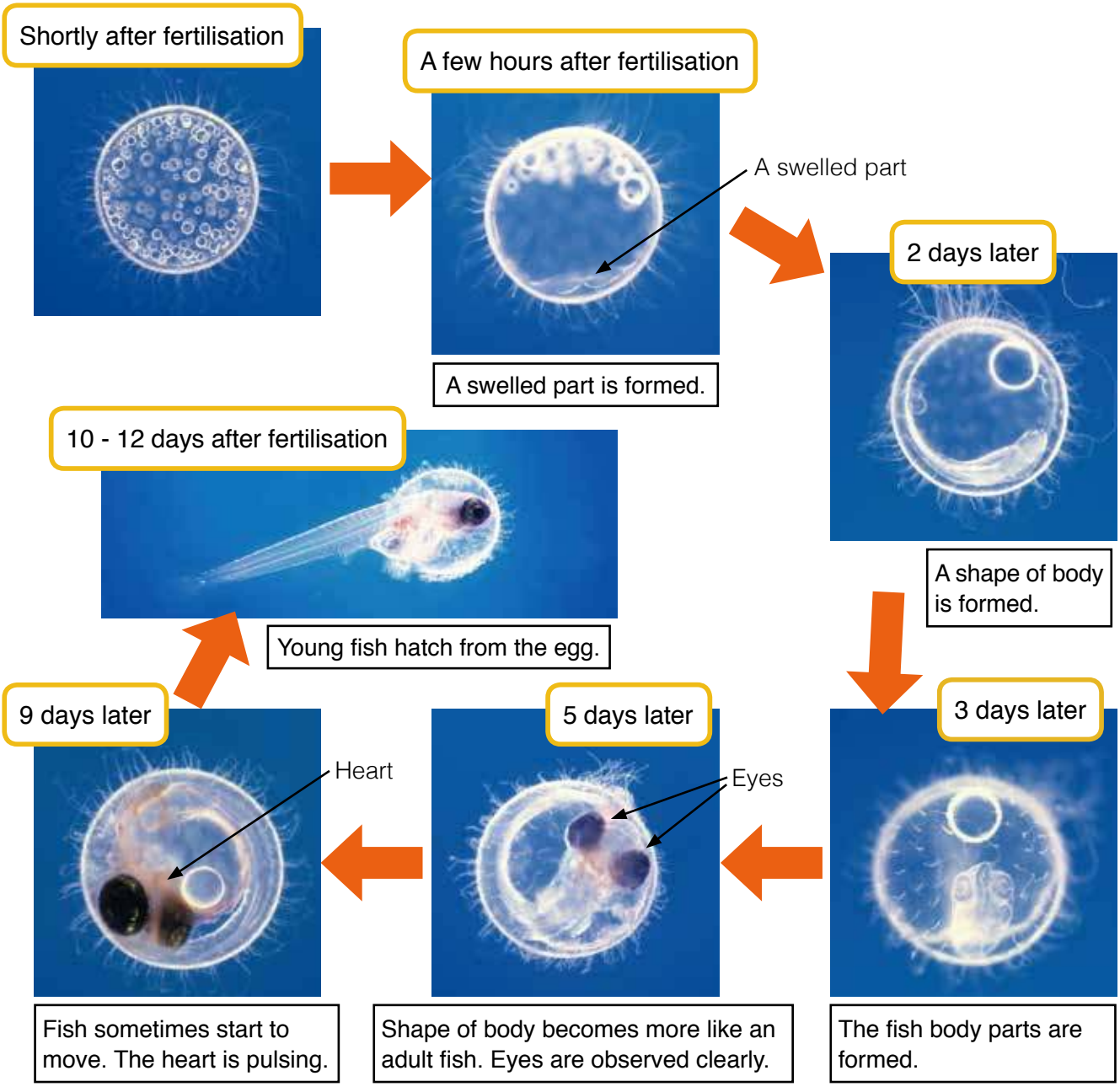
Summary

The life of a fish starts when a sperm meets with an egg and joins with it. This process is called **fertilisation**. The **egg** is made inside a female's body and the **sperm** is made inside a male's body.

After fertilisation, a fish grows in a fertilised egg. The inside of the egg changes its appearance day by day and becomes more like a fish. Young fish hatches from the egg about two weeks after fertilisation.



A fertilised fish egg



Stages of fish egg development

Lesson 2 Human Reproductive System

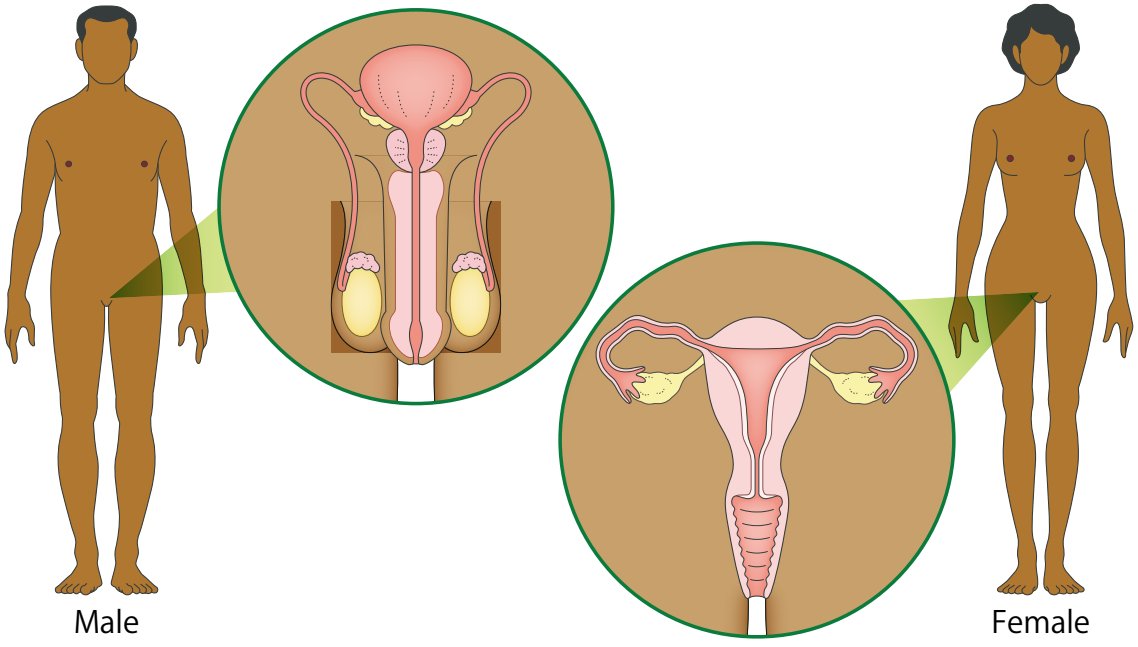
Humans use their eyes to see. They breathe air using their nose, but which body parts do humans use to reproduce?

Which body parts are used for human reproduction?

Activity : Comparing reproductive body parts

What to Do:

1. Study the pictures below. These pictures show the reproductive body parts of a male and a female.
2. Observe the pictures carefully and think about the following questions.
   (1) Name the male and female reproductive parts.
   (2) How are the reproductive parts of a male and a female different?
   (3) Can you guess in which body part is an egg and sperm produced?
3. Share your ideas with your classmates. Discuss which body parts humans use to reproduce.

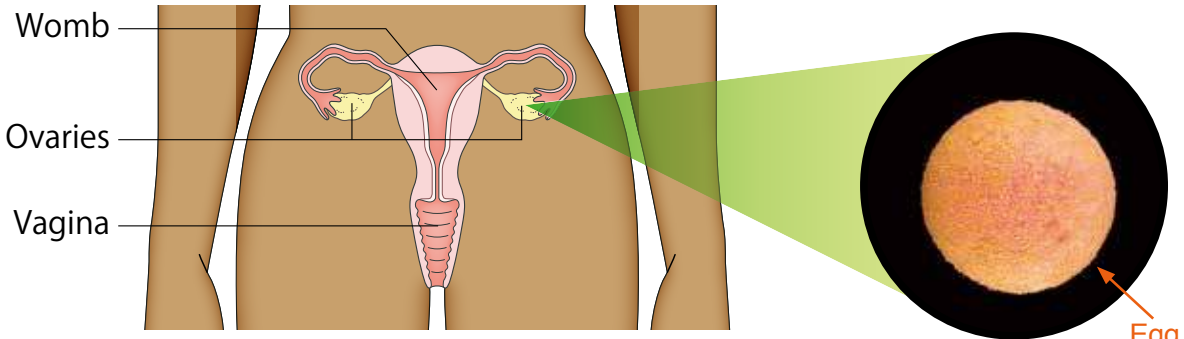


Summary

The **reproductive system** is the group of the body parts that work together for the purpose of reproduction. Males and females have different reproductive systems.

1. Female Reproductive System

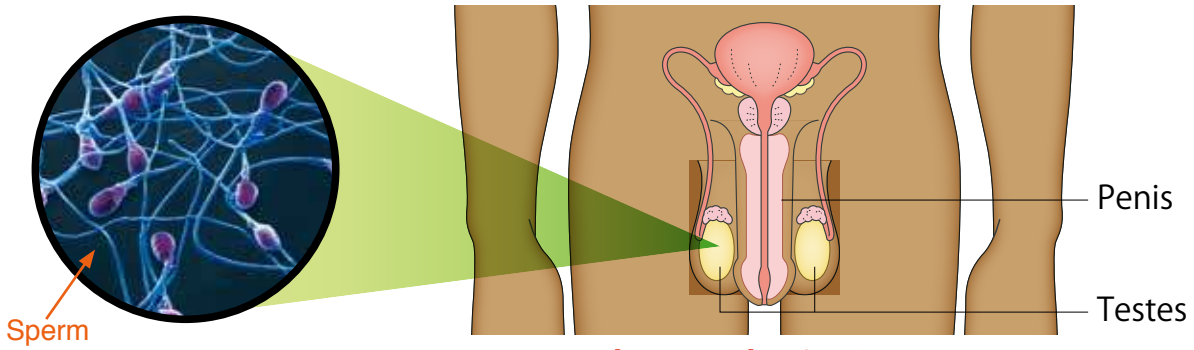
The female reproductive system is made up of the ovaries, womb and vagina. The **ovary** is a body part that contains thousands of eggs. Two ovaries are located inside the female body. The **womb** is the place where a baby grows until its birth. The **vagina** is a muscular tube that connects the womb to the outside of the body. It is the opening at the end of the path that the baby takes to leave a female body during birth.



Female Reproductive System

2. Male Reproductive System

The male reproductive system includes the testes and penis. The testes and penis are located outside of the body. The **testes** produce millions of sperms. There are two testes that are contained in a bag of skin. The **penis** is a body part that passes semen out of the man's body. **Semen** is a mixture of sperm and fluids.



Male Reproductive System

Lesson 3 Reproduction in Human

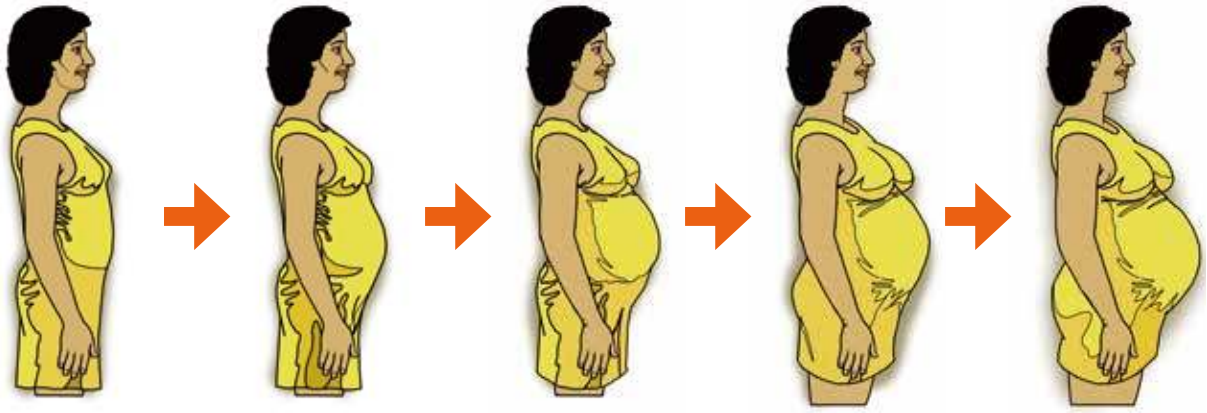
Life cycle of fish begins when fertilisation occurs. How about humans? Is human reproduction similar to or different from fish? How do humans begin their life cycle?

How does human life begin?

Activity : Growing baby in a mother's body

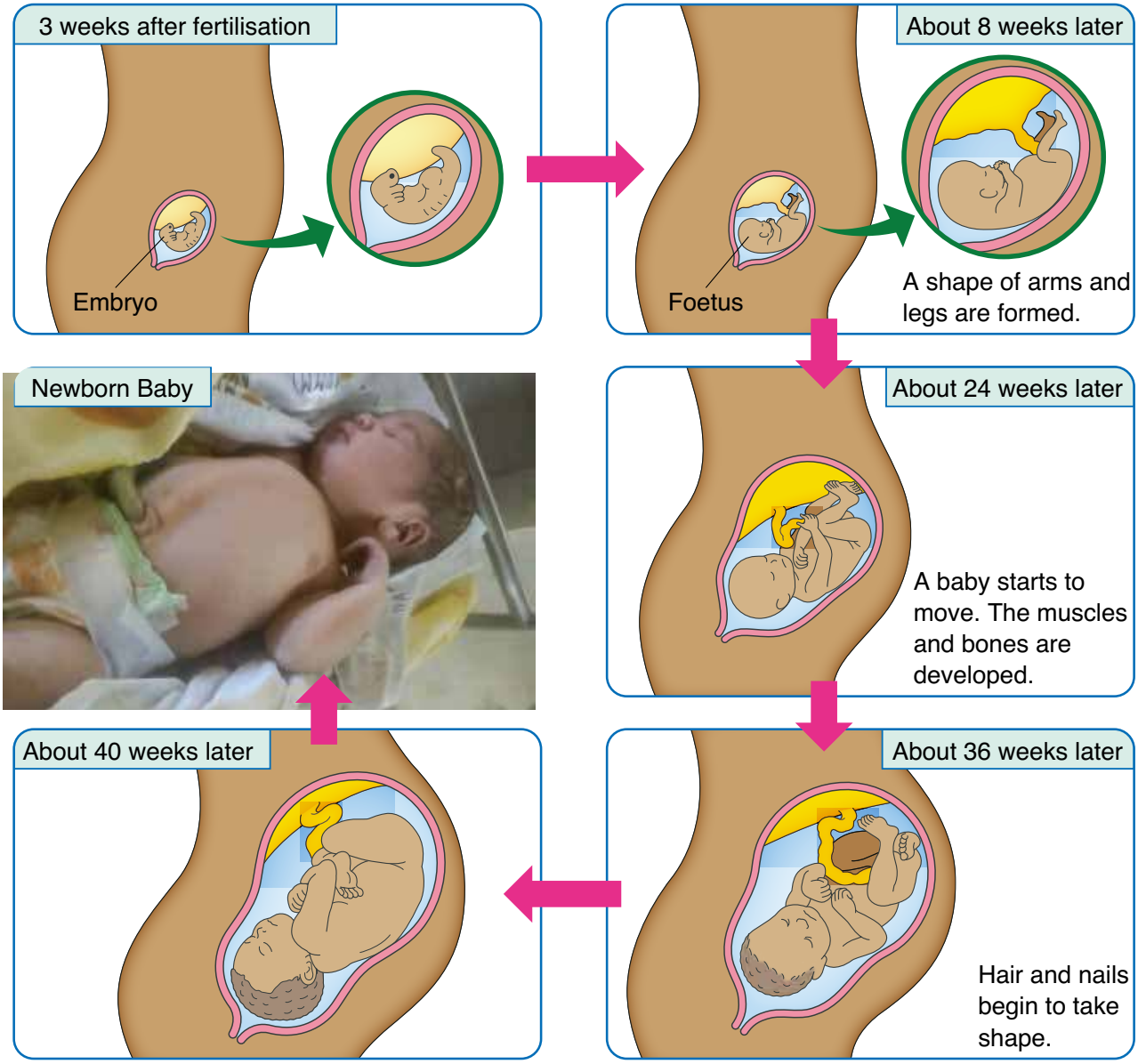
What to Do:

1. Study the pictures on the next page. The pictures show the stages of baby growth in the mother's womb.
2. Observe the pictures carefully and think about the following questions.
   (1) How does a baby change its size and shape?
   (2) How long does a baby grow in the mother's womb?
   (3) How similar or different is reproduction between humans and fish?
3. Share your ideas with your classmates. Discuss how human life begins and how a baby grows.



Summary

When a sperm meets with an egg, the egg becomes a fertilised egg. Human life begins with a fertilised egg. In humans, fertilisation takes place inside the body of the female, unlike fish. The fertilised egg develops and grows in the mother's **womb** (uterus) and becomes an **embryo**. The embryo gradually turns into the shape of a human being eight weeks after fertilisation. This is called the **foetus**. As the foetus grows into a baby, organs such as the spine and heart, hair and nails begin to take shape. After about thirty-seven to forty weeks in the mother's womb, the baby is born.



Growth of a baby in a mother's womb

Lesson 4 From Parents to Young

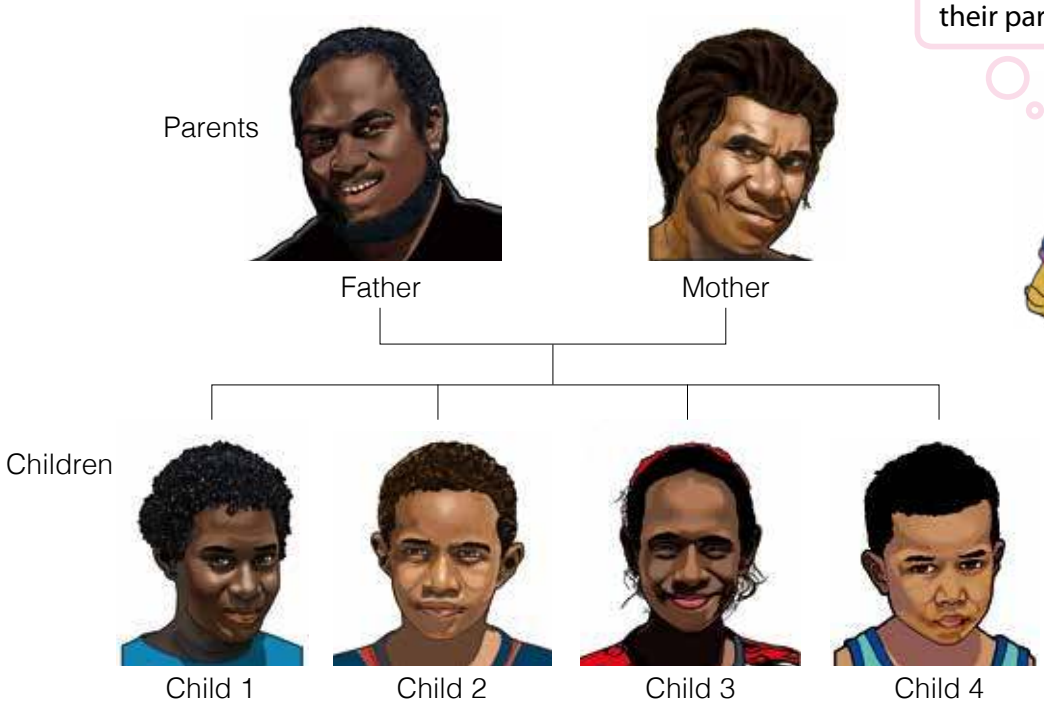
Most animals look like their parents. Humans also look like their parents.

Why do young animals look like their parents?

Activity : Similarities and Differences

What to Do:

1. Study the picture below. The picture shows the members of a family.
2. Observe the picture and think about the following questions.
   (1) Which children have curly hair? From which parent did the children inherit curly hair?
   (2) Which children inherit skin colour from their father?
   (3) Which children inherit the dimple from their mother?
3. Share your ideas with your classmates. Discuss what features or characteristics children inherit from parents and why they look similar to their parents.



Summary

Young animals look like their parents because parents pass traits to their children when they reproduce. This process is called **heredity**. A **trait** is a feature or characteristic of a living thing. The eye colour, hair colour, blood type and the shape of the nose and ears are examples of the traits of humans that are inherited by the children from their parents. Traits of animals include the colour of fur and the shape of their ears or beaks.

Examples of Human Traits


Curly hair


Straight hair


Dimples


No Dimples


Cross right thumb over left


Cross left thumb over right


Widow's peak hairline


Straight hairline


Can roll tongue


Cannot roll tongue


Detached earlobe


Attached earlobe

Young animals inherit many traits from both parents. For example, a child with curly hair has a parent or parents with curly hair. A child may have long nose if their father or mother has long nose. A kitten with striped pattern of fur usually has a parent with striped fur. If puppies have floppy ears, their parents may also have floppy ears.


A puppy and its parent have floppy ears.


Children have traits similar to their mother or father.

Summary and Exercise

Summary

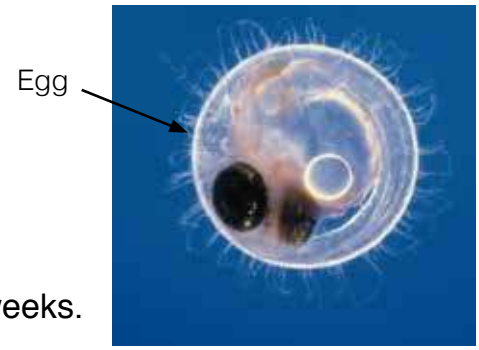
6.1 Reproduction and Heredity

Reproduction

- Reproduction is the process by which living things produce young ones similar to themselves.
- Fertilisation is the process by which joins a sperm with an egg.
- An egg is produced inside a female's body and the sperm is produced inside the male's body.

Reproduction in Fish

- After fertilisation, fish grows in the fertilised egg.
- The inside of the egg becomes more like a fish.
- Young fish hatch from the egg after about a few weeks.



Shape of body becomes more like adult fish in the egg.

Reproduction in Humans

- Sexual reproduction takes place in humans between a male and a female.
- Male reproductive organs are the testes and penis.
- Female reproductive organs are the ovaries, womb and vagina.
- A fertilised egg develops and grows in the mother's womb and becomes an embryo.
- The embryo turns into the shape of the human body eight weeks after fertilisation and becomes a foetus.
- A foetus grows into a baby and after about thirty-seven to forty weeks the baby is born.

The fertilised egg develops and grows in the mother's womb and becomes a foetus.

From Parents to Young

- Heredity is the process of parents passing traits to their children.
- A trait is a feature or characteristic of a living thing.
- Some examples of human traits are; eye colour, hair colour, blood type, the shape of the nose and ears.
- Young animals also inherit many traits from both parents.

Summary and Exercise

Exercise

6.1 Reproduction and Heredity

Q1. Complete each sentence with the correct word.

(1) The process that all living things produce young ones similar to themselves is called _____.

(2) The process of sperm joining with the eggs is _____.

(3) In human, a fertilised egg develops in the mother's _____.

(4) The passing of traits from parents to young is called _____.

Q2. Choose the letter with the correct answer.

(1) The picture shows a stage in the reproduction of a fish, where the egg starts to swell up. When does the swelling part of the egg form?

A. Before the egg is about to hatch.

B. After the egg is already fertilised.

C. Before the egg is ready to be fertilised.

D. When the egg is in the male fish body.

(2) In the life cycle of a fish, where does fertilisation take place?

A. In the female fish body.

B. In the male fish body.

C. Outside in the water.

D. On the land.

Q3. Answer the following questions.

(1) What makes children look like their parents?

(2) Write any two examples of human traits.

Q4. In humans, how does fertilisation occur?

How do Birds of Paradise reproduce

It is believed that Birds of Paradise are independent birds and some species defend territories. Female birds of paradise reach sexual maturity at around one year old and males at around two to three years old. Females enter the males' territories when they are interested to breed and choose the most suitable mate. After the female chooses her mate, she will lay between one depending on the species she admires.

Males build large, elaborate displays for females, perform acrobatic dances or sing long and complicated songs. The males take part in various dance rituals where they will display their additional coloured feathers. They may do this type of dance for many hours before they give up if a female isn't responsive to them. If a female does respond they will mate and then the male quickly runs off. He will try to find several other females he can mate with before the season ends.

Once mating has occurred the female will lay 2-3 eggs. They are small and brownish orange in colour. She will do her best to hide them from predators. She will only fly away from them when she has to get food. They will hatch after about 20 days of development.

Most eggs will hatch within two to four weeks. The newly hatched chicks develop quickly and will begin to learn to fly at around one month old.

Chapter Test

6. Reproduction and Heredity in Animals

Q1

Complete each sentence with the correct word.

(1) The womb, ovaries and vagina are organs found in the _____ reproductive system.

(2) Young fish hatch from the egg about two weeks after _____.

(3) Eye colour, hair colour, blood type and the shape of the nose are some examples of the _____of human that are inherited.

(4) The female body part that contains thousands of eggs is called _____.

Q2

Choose the letter with the correct answer.

(1) Which of the following is <u>not</u> part of a male reproductive system?

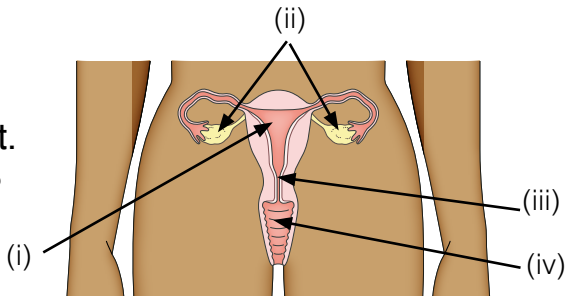
A. Testes

B. Uterus

C. Penis

D. Sperm

(2) Study the picture of the female reproductive organs on the right. Where are the eggs produced?



A. (i) B. (ii)

C. (iii) D. (iv)

(3) Which of the following is <u>not</u> a trait inherited from parents?

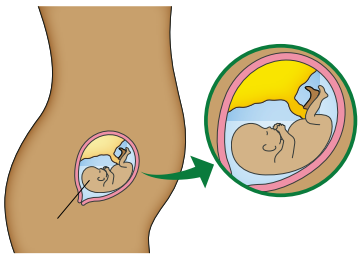
A. Scratches

B. Spots on fur

C. Shape of beak

D. Eye colour

(4) Study the picture of a foetus in a female's body. The foetus's arms and legs have been formed. How old is the baby?



A. 3 days

B. 1 week

C. 8 weeks

D. 36 weeks

Q3

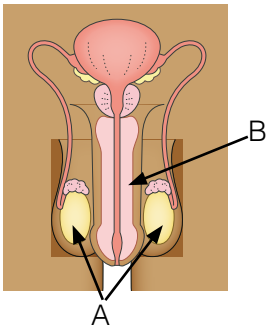
(1) Explain the work of the parts labeled A and B of the male reproductive system?

A._____

_____

B._____

_____



(2) What is the difference between the ovary and the testes?

_____

_____

_____

(3) Where are the testes located?

_____

(4) What is the name of the process in which a sperm joins with an egg?

_____

Q4

(1) Explain the process of heredity.

_____

_____

_____

(2) Study the two pictures on the right. Explain how the growths of fertilised eggs are different between fish and human.

_____

_____

_____

_____

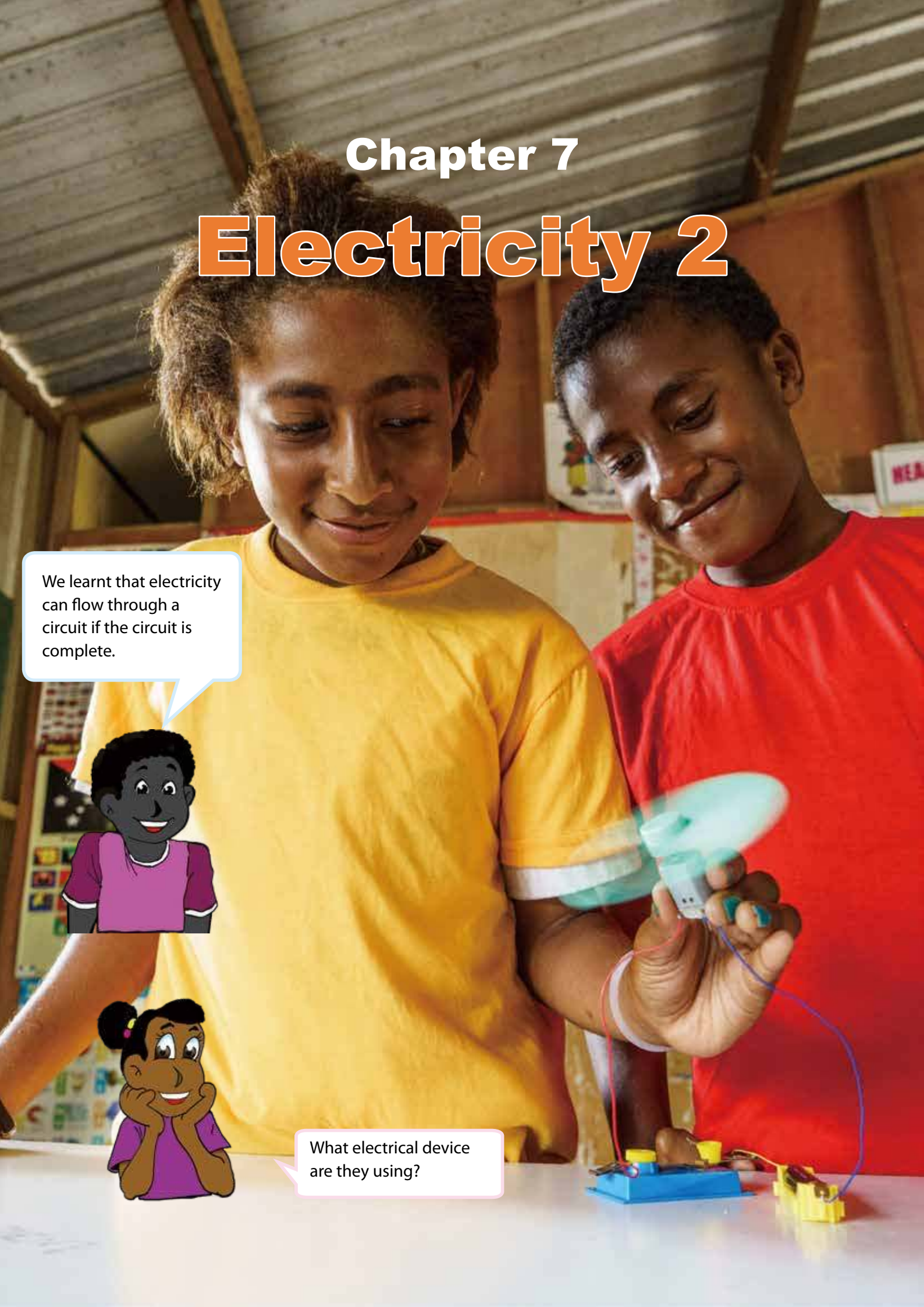
_____

Fertilised eggs of fish

Foetus of human

Chapter 7

Electricity 2



7.1 Electrical Circuit

Lesson 1 Direction of Electric Current

Electricity can make a light bulb glow when electric current flows through a complete circuit. A **motor** is an electrical device that produces power to rotate things using electricity. What happens when electric current flows through a motor?

How does electric current work in a circuit?

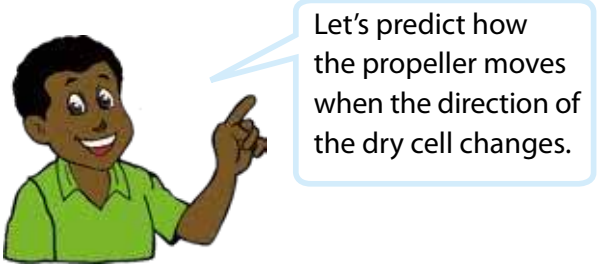
Activity : Rotating a propeller with a motor

What We Need:

- motor, propeller, dry cell, switch, cell holder, pieces of electrical wire and pieces of paper

What to Do:

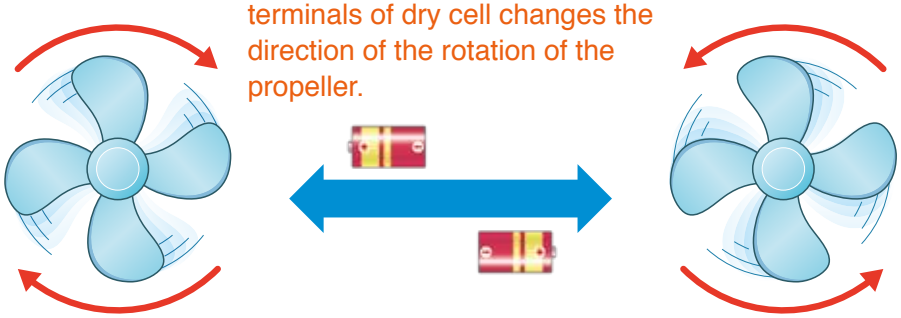
1. Cut a paper into thin strips and stick them onto the propeller. Attach the propeller to the motor.
2. Make the electric circuit as shown in the picture below.
3. Switch on and observe how the propeller moves.
4. Repeat Step 3 by changing the direction of the dry cell.
5. Share your results with your classmates.



Do not touch the propeller when it's spinning.

Result

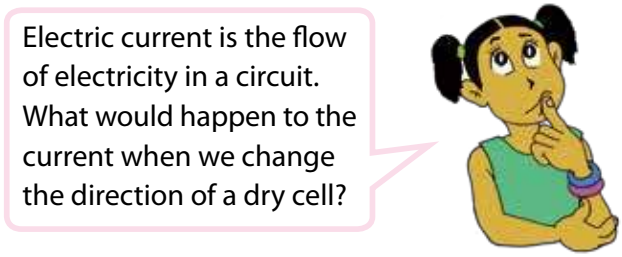
We found out that when we reversed the direction of the dry cell, the propeller rotated in the opposite direction.



Discussion

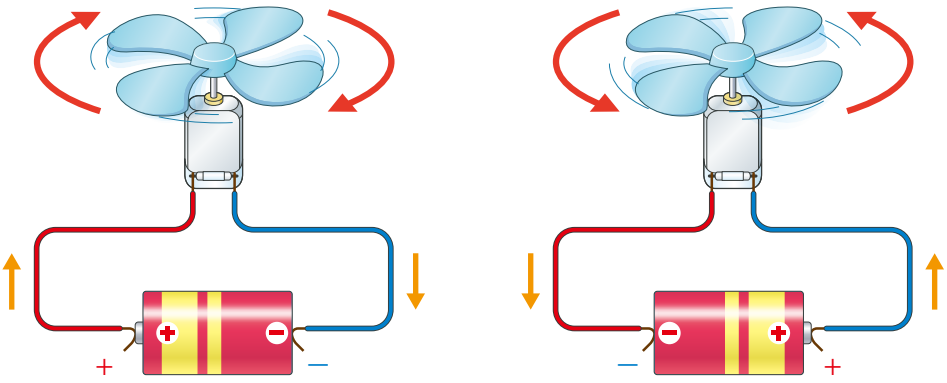
Based on your results, think about the following questions.

1. Why did the propeller rotate in the opposite direction when the direction of the dry cell was reversed?
2. What did you find out about the characteristics of electric current?



Summary

The flow of electricity is called **electric current**. Electric current has a definite direction. In the circuit with the dry cell, the electric current flows from the positive terminal to the negative terminal. When positive and negative terminals of the dry cell are reversed in the circuit, the electric current flows in the opposite direction.



Electric current flows from the positive to the negative terminal.

Lesson 2 Series and Parallel Circuit

Electric current flows from the positive to the negative terminal in dry cells. When we use two dry cells, how should we connect them to make a motor rotate?

How can we connect two dry cells to make a motor rotate?

Activity : Spinning a motor using two dry cells

What We Need:

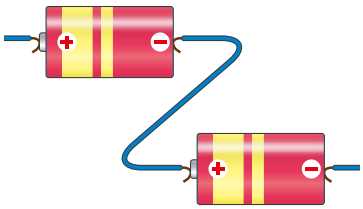
- 2 dry cells, switch, motor, propeller, electrical wire

Electric current flows from the positive to the negative terminal. If we connect two dry cells, what would happen to the direction of electric current?

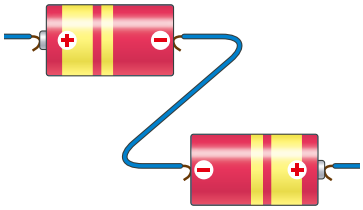
What to Do:

1. Study the diagrams below. Predict which connections of two dry cells will make a motor rotate. Record your prediction.

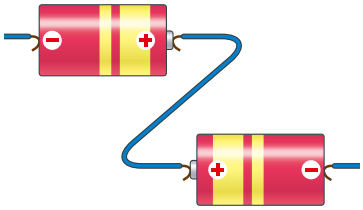
1) Connecting + and - terminals



2) Connecting - and - terminals

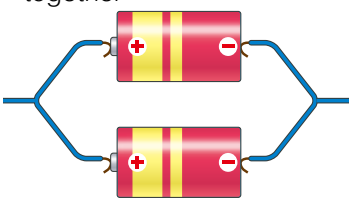


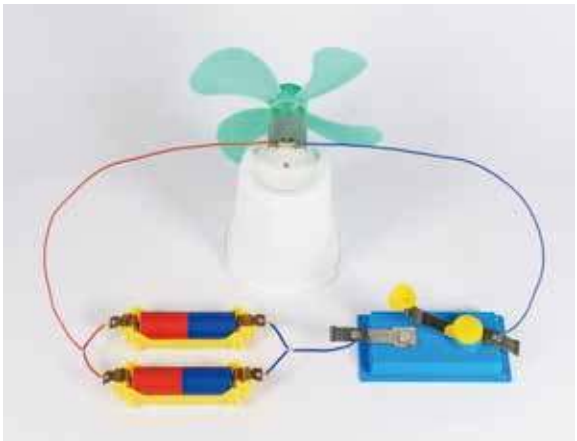
3) Connecting + and + terminals

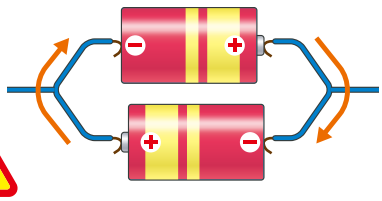


2. Connect two dry cells according to the diagrams and try to rotate the motor.
3. Record your results in your exercise book.
4. Share your results with your classmates.

4) Connecting same terminals together





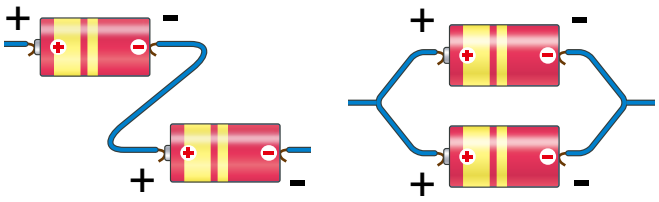


The connection in this picture is called a short circuit that would make cells and wire hot. In this case, disconnect the wire.

Result

We found out that the correct ways of connecting two dry cells to make the motor rotate are shown in the diagrams on the right.

Connection of two dry cells which can make motor rotate



Discussion

Based on your results think about the following question.

1. How does the electric current flow in a circuit?

Summary

The ways to connect two dry cells where electric current flows in a circuit are classified as series circuit and parallel circuit. Electric current always flows from positive to the negative terminal in both the series and parallel circuit.

Series circuit

A **series circuit** is a circuit in which the electric current flows in one path. When we connect two dry cells in series, the positive terminal on one dry cell is connected to the negative terminal on the other dry cell.

Parallel circuit

A **parallel circuit** is a circuit in which the electric current flows in two or more paths. The current can split into several paths at the junction and then join again together at the other junction. When we connect two dry cells in parallel, positive terminals of both dry cells connect together as well as the negative terminals.

Lesson 3 Comparing Series and Parallel Circuits

The path of electric current in a series and parallel circuit is different. What would be the difference between the connections of two dry cells in series and parallel circuits?

How is the amount of electric current different between series and parallel connection of two dry cells?

Activity : Comparing brightness of bulbs

What We Need:

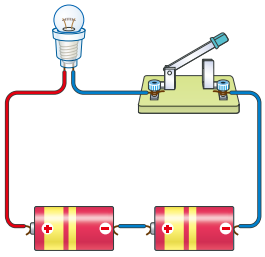
- 2 light bulbs, 4 dry cells, 4 cell holders, 2 switches, electric wire

What to Do:

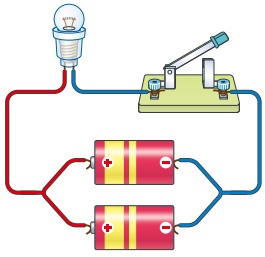
1. Draw a table like the one shown below in your exercise book.

Comparison of brightness of bulbs	Which one is brighter?
(1) and (2)	
(1) and (3)	
(2) and (3)	

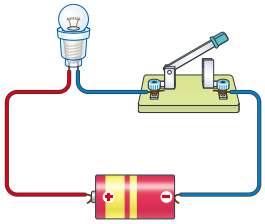
2. Make circuits (1) and (2) as shown in the diagrams below by connecting a bulb and dry cells and compare the brightness of the bulbs. Record your observations in the table.
3. Make circuit (3) and compare the brightness of the bulb between (1) and (3), (2) and (3).
4. Record your observations in the table.
5. Share your results with your classmates. Discuss the difference in the brightness of the bulbs in the different circuits.



(1) Two dry cells in series



(2) Two dry cells in parallel



(3) Single dry cell

Result

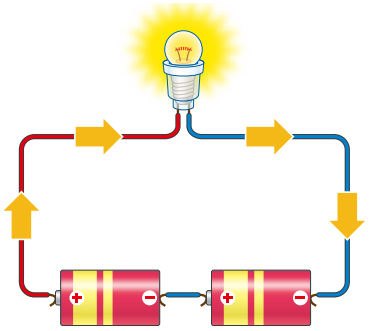
	Which one is brighter?
(1) and (2)	(1) is brighter
(1) and (3)	(1) is brighter
(2) and (3)	The brightness is same

We found out that the bulb in the circuit using two dry cells connected in series is brighter than that in parallel or in the connection using a single dry cell. The brightness of the bulb in the circuit using two dry cells in parallel and the one connected with a single dry cell is the same.

Summary

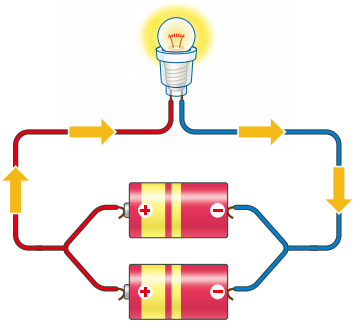
Series Connection

Compared to a single dry cell, a series connection of two dry cells increases the electric current in the circuit. Therefore the bulb glows brighter.



Parallel Connection

Compared to a single dry cell, a parallel connection of two dry cells does not change the amount of electric current in the circuit. Therefore the brightness of the bulb does not change.

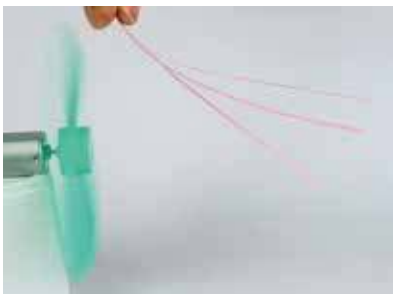


When you connect dry cells in parallel, it lasts longer than those connected in series.

Try it!

Think about the following question.

How would the motor rotation be different when two dry cells are connected in series and parallel?



Series connection

Parallel connection

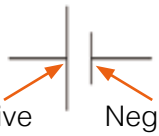
Lesson 4 Circuit Components and their Symbols

To draw an electric circuit, you have to draw the **electric circuit components** such as dry cell, bulb, switch and motor. Electric circuit components are basically made of various parts and are very difficult to draw.

How can an electric circuit be represented?

1. Symbols of circuit components

Using symbols of components helps us to simply draw within a shorter time. Each component that is used in an electrical circuit can be drawn as a symbol as shown in the table.

Component	Symbol	Examples
Bulb		
Dry cell (Battery)		
Open Switch		
Close Switch		
Wire		

(1) Bulb

A bulb is represented as a circle with an 'X' in the middle and two lines connecting on either side.

(2) Dry cell

The long line on the symbol of dry cell represents the positive terminal and the short line represents the negative terminal.

(3) Switch

An open switch is generally represented by providing a break in a straight line by lifting a part of the line upward.

(4) Wire

A straight line is used to represent a connecting wire between any two components of the circuit, even if wires in actual circuit are bending.

2. How to draw a circuit diagram

A diagram representing an electrical circuit drawn with symbols is called a **circuit diagram**. The following are some tips to draw a circuit diagram.

(1) All components in an actual circuit such as a dry cell, a switch and a light bulb are shown in a circuit diagram.

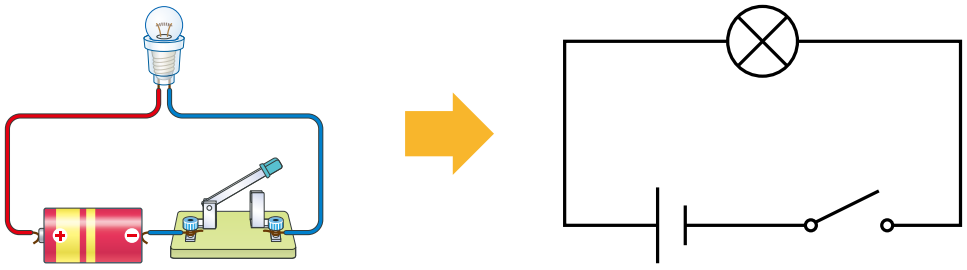
(2) Check the direction of the dry cells. It should be the same as the actual circuit.

(3) Corners in a circuit diagram are drawn as right angles.

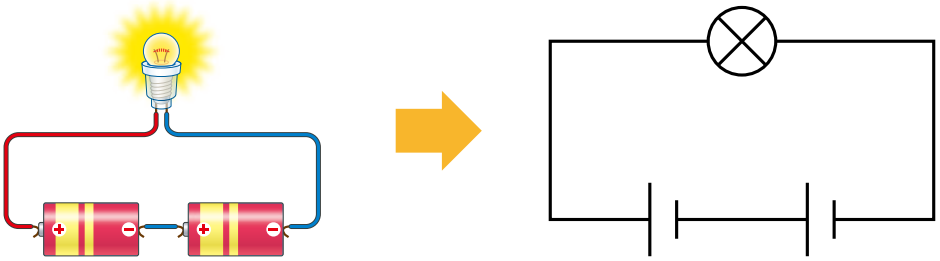
(4) Number of junctions in a circuit diagram should be the same as the one in the actual circuit.

Actual Circuit | Circuit Diagram

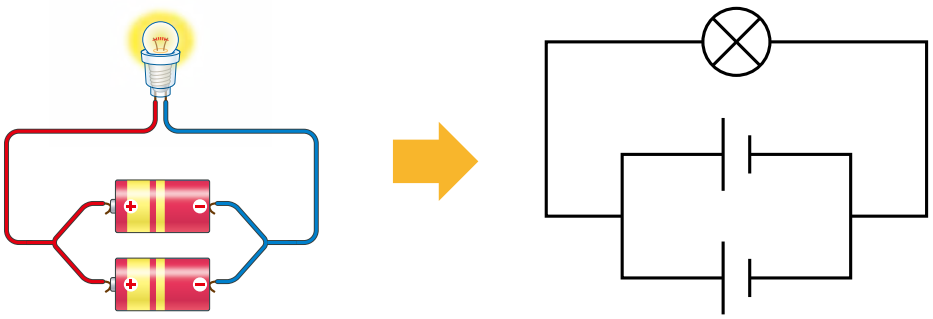
(a) Single dry cell circuit



(b) Series circuit



(c) Parallel circuit



Lesson 5 Daily Use of Electric Circuit

We learnt about electric circuit but where can we find electric circuit in our daily lives?

Where are electric circuits used in our daily lives?

Activity : Let's investigate an electric circuit of a flashlight

What We Need:

- flashlight with dry cells

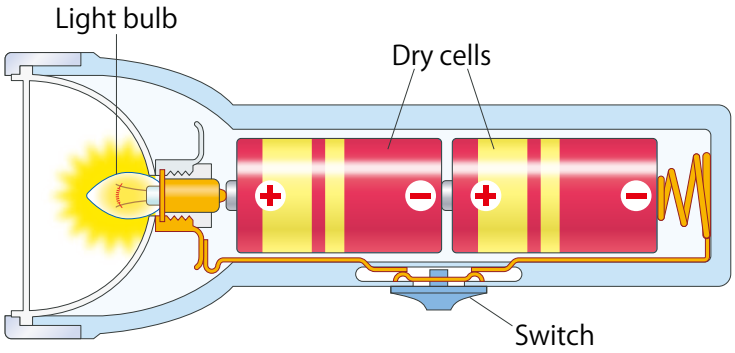
What to Do:

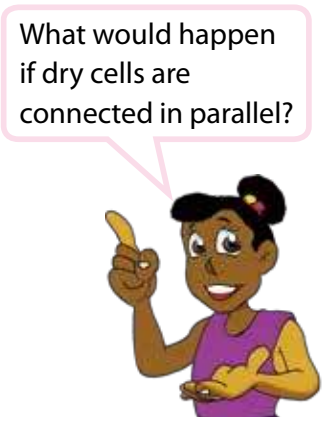
1. Predict the components of a flashlight and how they are connected to each other.
2. Take apart the components of the flashlight.
3. Observe and investigate how each component connects with the other components to make the bulb light up. Pay attention to:
   (1) What components do you find in the flashlight?
   (2) How does electric current flow in a bulb?
   (3) Are the dry cells connected in series or parallel?
4. Draw a circuit diagram of the flashlight in your exercise book.
5. Share your ideas about the circuit in the flashlight with your classmates.

Summary

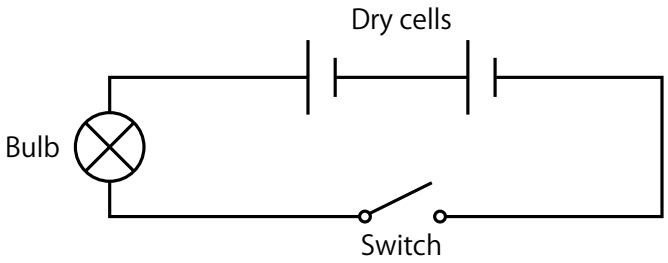
A flashlight has a simple electric circuit connecting the main components such as light bulb, switch and dry cells. We can turn the light on and off by using a switch to control the flow of electric current in the circuit. Connecting several dry cells in series can provide brighter light because more electric current flow through the bulb.

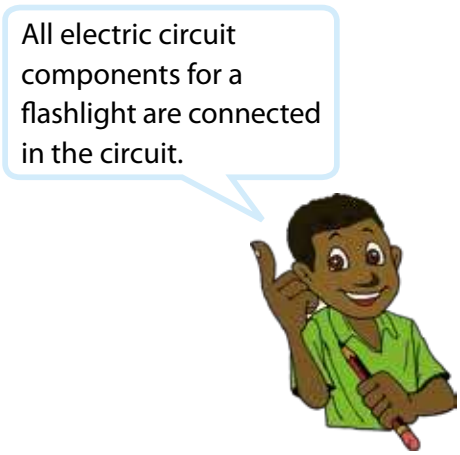
Cross section of a flashlight





Circuit diagram





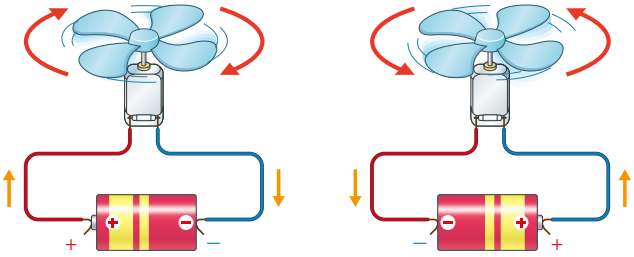
All electrical appliances used in our daily lives such as a flashlight, radio, cell phone, television, computer and refrigerator contain electric circuits. Room lights on the ceiling in a house are also parts of a large electric circuit. All components are connected in series or parallel in the circuit according to their own purpose.

Summary and Exercise

Summary 7.1 Electrical Circuit

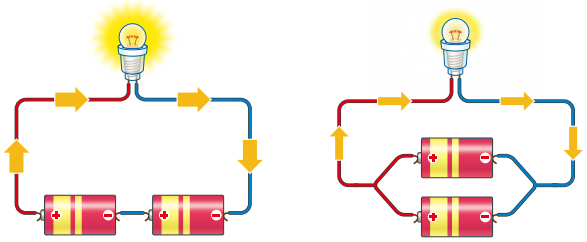
Electric Current

- In the circuit with the dry cell, the electric current flows from the positive terminal of the dry cell to the negative terminal.



Series and Parallel Circuits

- A series circuit is a circuit in which the electric current flows in one path.
- A parallel circuit is a circuit in which the electric current flows in two or more paths.

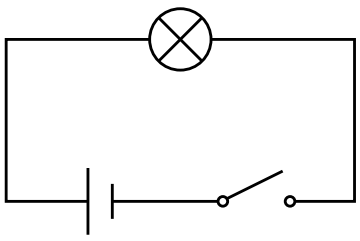


Comparing Series and Parallel Circuits

- Series connection of two dry cells increases the electric current in the circuit, causing the bulb to light up brightly.
- Parallel connection of two dry cells does not change the amount of electric current in the circuit and therefore the brightness of the bulbs does not change.

Circuit Components and their Symbols

- Each component that is used in the electrical circuit can be drawn as a symbol.
- Circuit diagram is a diagram representing an electrical circuit drawn using circuit symbols.



Daily Use of Electric Circuit

- All electrical appliances used in our daily lives contain electric circuit. Some examples are flashlight, radio and room lights on the ceiling in a house.

Summary and Exercise

Exercise 7.1 Electrical Circuit

Q1. Complete each sentence with the correct word.

(1) A _____ circuit is a circuit in which the electric current flows in one path.

(2) Each component that is used in the electrical circuit can be drawn as a _____.

(3) All electrical _____ used in our daily lives contain electric circuit.

(4) The electric current flows from the _____ terminal of the dry cell to the negative terminal.

Q2. Choose the letter with the correct answer.

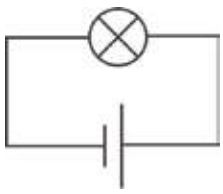
(1) If we connect two dry cells with a motor and a propeller to an electric circuit, which connection would make the motor rotate?

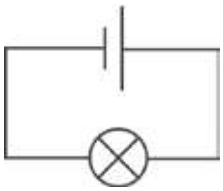
A. Connecting + and – terminals of dry cells

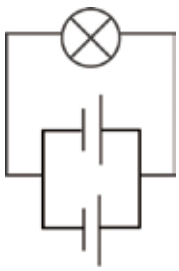
B. Connecting – and – terminals of dry cells

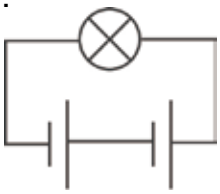
C. Connecting + and + terminals of dry cells

(2) In which circuit is the bulb brighter than others?

A. 

B. 

C. 

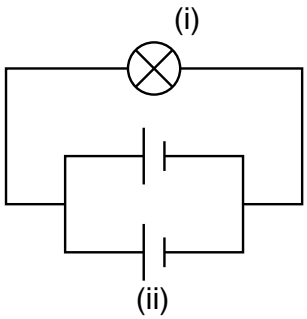
D. 

Q3. Study the circuit diagram on the right and answer the following questions.

(1) What type of circuit is shown in the diagram?

(2) What is the symbol labeled (i)?

(3) What is the symbol labeled (ii)?

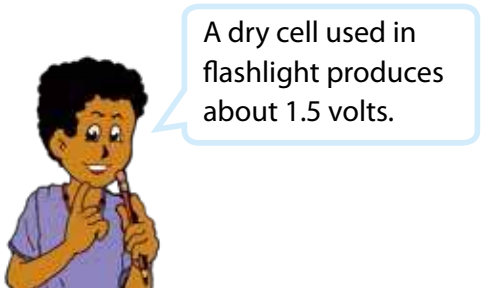


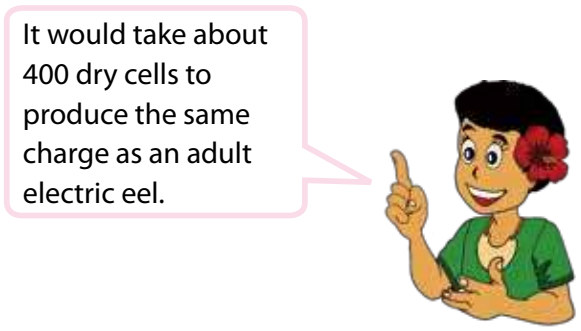
Q4. Ahmed set up three circuits. He connected one dry cell in a circuit, then two dry cells in series and two dry cells in parallel. His aim is to compare the brightness of the three connections. Which circuit has the brightest light?

Nature's Living Battery

You wouldn't want to bump into an electric eel while swimming. It can jolt other animals with over 600 volts of electricity! That's more than enough to stun or even kill its prey.

The electric eel uses thousands of specialised muscles to produce its charge. These muscles cause a powerful electric current to flow from the eel's body through the water and through whatever it wants to zap. Electric eels use their electrical power to hunt small fish, shrimps, frogs and water birds.





The head of the eel is the positive terminal and the long tail is the negative terminal.

Chapter Test

7. Electricity 2

Q1

Complete each sentence with the correct word.

(1) Electric current flows from the positive to the _____ terminal of the battery.

(2) Electric circuits can be classified as _____ and parallel circuits.

(3) A straight line is used to represent a connecting _____ in a circuit diagram.

(4) A flashlight generally has a simple _____ circuit.

Q2

Choose the letter with the correct answer.

(1) From which direction does the electric current flow?

A. Negative to positive terminal

B. Negative to negative terminal

C. Positive to negative terminal

D. Positive to positive terminal

(2) How would a motor's rotation be different when connected in series and parallel with two dry cells? The motor in

A. series will be faster than the one in parallel.

B. series will be slower than the one in parallel.

C. parallel will be faster than the one in series.

D. both connections will turn with the same speed.

(3) Which of the following symbol represents a bulb?

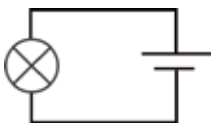
A. 

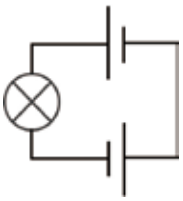
B. 

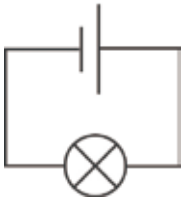
C. 

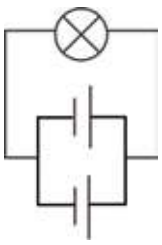
D.

(4) Which of the following connection has a much brighter light bulb?

A. 

B. 

C. 

D. 

Q3

(1) Stefan took apart a flashlight to investigate how the electric circuit components are connected in it. What are the four components he would find in the flashlight?

_____

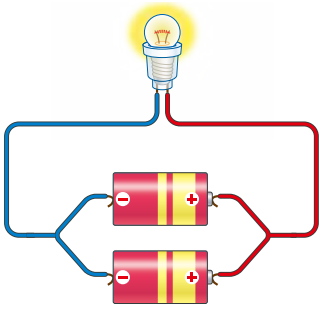
(2) Why are symbols and circuit diagrams used?

_____

_____

_____

(3) Study the picture on the right.
Draw the circuit diagram of the electrical circuit below.



Q4

(1) What is the difference between a series and a parallel circuit?

_____

_____

_____

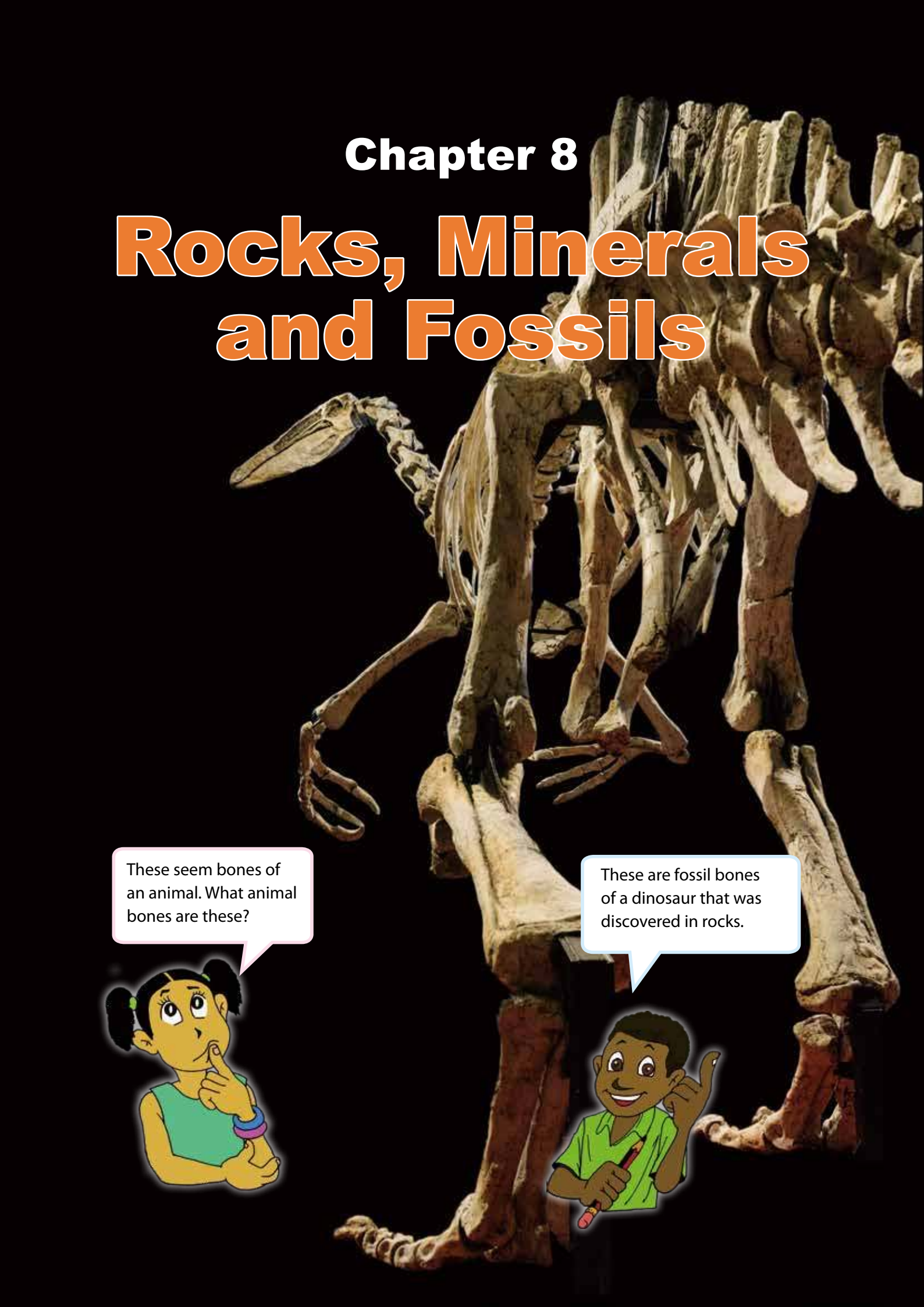
(2) What happens when more dry cells are added in a series circuit?

_____

_____

Chapter 8

Rocks, Minerals and Fossils



8.1 Rocks and Minerals

Lesson 1 Rocks

We can find different kinds of rocks around us. Why do rocks look different? What are rocks made up of?

What is a rock?

Activity : Grouping rocks

What We Need:

- hand lens, different types of rocks, markers

What to Do:

1. Draw a table like the one shown below.

Properties	Rock 1	Rock 2	Rock 3	Rock 4	Rock 5
Colour					
Texture					
Pattern (regular or irregular)					
Property of grains					
Others					

2. Go out of the classroom and collect 5 different rocks. Number the rocks using the marker.
3. Observe the properties of each rock with your eyes first. Record your observations in the table.
4. Observe the properties of grains in the rocks again using the hand lens. Record your observations in the table.
5. Classify the rocks into some kinds of groups based on their properties.
6. Share your findings with your classmates. Discuss the properties of rocks and how you can tell rocks apart.

Summary

A **rock** is a naturally formed, non-living material of the Earth. A rock is made up of one or more minerals. A **mineral** is a material that is found in nature such as gold and copper. Some rocks may be made of one mineral type. Other rocks may be made of a mixture of different mineral types.

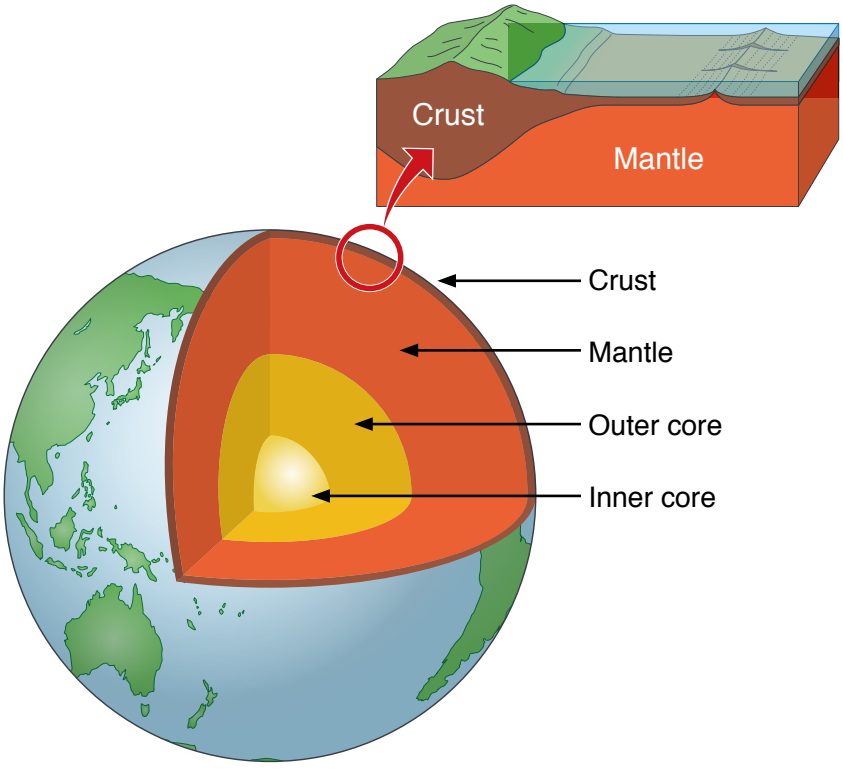
There are many kinds of rocks. Limestone and sandstone are examples of rocks. Rocks can be identified by the types, size and colour of mineral grains they contain. The mineral grains in a rock may be white and tiny or they may be red and as big as your fingernail.

Rocks form within the Earth and make up a large part of our Earth. Earth is made of three layers; crust, mantle and core. The **crust** is the thinnest outer layer of the Earth. The **mantle** is the thick, hot layer of the Earth. The **core** is the hottest, innermost layer of the Earth. The crust is made of rocks.

Quartz is made of one mineral.

This rock contains several different colours and textures of minerals.

Inside the Earth



Lesson 2 Minerals

Rocks are made up of one or more types of minerals. What types of minerals are there? What properties do minerals have?

How can we classify minerals?

Activity : Properties of minerals

What We Need:

- rock that includes different types of minerals, hand lens, steel nail

What to Do:

1. Draw a table like the one shown below.

Properties	Mineral 1	Mineral 2	Mineral 3	…
Colour				
Glitter				
Texture				
Hardness				

2. Observe the rock with the hand lens and find different types of minerals.
3. Record the colour, glitter and texture of each mineral in the table.
4. Test each mineral to see if you can scratch it with a steel nail. Record the results in the table.
5. Share your findings with your classmates. Discuss how you can tell minerals apart.

Summary

A **mineral** is a solid non-living material that is found in nature. Minerals make up rocks.

There are many kinds of minerals on the Earth. Salt that we put on food is a mineral. Metals such as gold and copper are also minerals. The graphite in our pencil is a mineral too. Each mineral has its own properties such as colour, lustre and hardness. We can use the properties to identify minerals.

Colour - Minerals come in many colours. Most minerals come in just one colour. Some minerals such as quartz come in many colours.

Lustre - Lustre describes how light reflects off the surface of a mineral. Some minerals are shiny like silver. Some are dull.

Hardness - The hardness of a mineral describes how easy it is to scratch the surface of a mineral. Some minerals are soft and others are much harder. Diamond is the hardest mineral on the Earth.

Gold

Rock salt

Copper

Graphite

There are many kinds of minerals.

Different colours of quartz

Some minerals are shiny and others are dull.

Diamond is the hardest mineral on the Earth.

Lesson 3 Types of Rock

Look around us. We can find many different types of rocks. What types of rocks are there on the Earth? How can we tell them apart?

What types of rock are there?

Activity : How rocks are formed

What We Need:

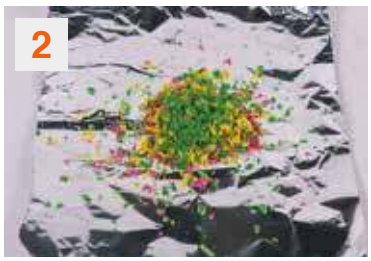
- three different colours of crayons, cutter, aluminium foil, mug, boiling water

What to Do:

1. Make crayon shavings with the cutter.

To shave the crayons with the cutter, be careful with its sharp blade.

2. Sprinkle a layer of each colour crayon on the aluminium foil. Fold up the foil and press down on it very hard. Unfold the foil and observe the crayon to represent a rock.



3. Wrap the crayon that you made in Step 2 with the aluminium foil. Put it in very hot water for 15 to 20 seconds until the crayon starts to melt. Remove it from the hot water and squeeze it. Let it cool and observe the crayon to represent a rock.
4. Wrap the crayon that you made in Step 3 with aluminium foil. This time put it in the very hot water for the crayon to melt completely. Remove it and let the crayon cool. Observe the crayon that represent a rock.

5. Share your findings with your classmates. Discuss how they are formed and their appearance.

Be careful when using hot water

Summary

A rock can be grouped according to how it is formed. There are three kinds of rocks on the Earth; Sedimentary, Metamorphic and Igneous rocks.

Sedimentary Rock

A **Sedimentary rock** is formed when sediments are glued together and become hard. **Sediment** is sand particles of rock and small bits of soil. It is piled up over time, usually as layers at the bottom of lakes and oceans. Sandstone, limestone and conglomerate are examples of sedimentary rocks.

Sediment piled up as layers.

Limestone

Metamorphic Rock

A **Metamorphic rock** is formed when a rock inside the Earth has been changed by heat and pressure. Metamorphic rocks are often made from other types of rocks. For example, limestone can be changed into marble. Slate and soapstone are examples of metamorphic rocks.

Marble

Igneous Rock

An **Igneous rock** is formed when melted rock from inside the Earth cools and hardens. Melted rock is called **magma**. This can happen in many different places on the Earth but one of the most common places is at a volcano. Granite and basalt are examples of igneous rocks.

Granite

Lesson 4 Uses of Rocks and Minerals

We have learnt about the properties of rocks and minerals. Each rock and mineral has its own properties. How are rocks and minerals useful for our lives?

How do we use rocks and minerals in daily life?

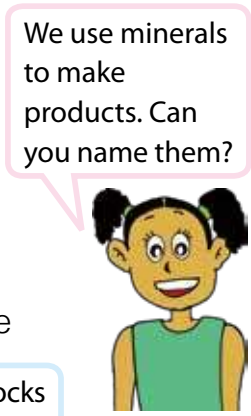
Activity : Finding uses of rocks and minerals

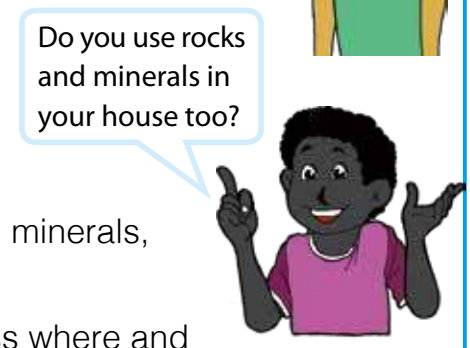
What to Do:

1. Draw a table like the one shown below.

Location	How are rocks and minerals used?
In classroom	
Outside classroom	
Others	

2. Look at your classroom and find how rocks and minerals are used in the classroom.
3. Go out of the classroom and find how rocks and minerals are used.
4. Record your findings in the table.
5. If you have any ideas on the uses of rocks and minerals, write your ideas in the table.
6. Share your ideas with your classmates. Discuss where and how we use rocks and minerals.





Summary

Rocks and minerals are used to make products in many ways. The properties of rocks and minerals help us decide how they can be used to make products.

Uses of Rocks

We use rocks in many ways. Rocks are used for building roads, houses and statues. Rocks are also used for cooking. Limestone is used to make cement. Coal is burnt for heat. We use marble for building, sculpture and manufacture.

Stone is used for cooking.

Limestone is used for making cement.

Marble is used for building and sculpture.

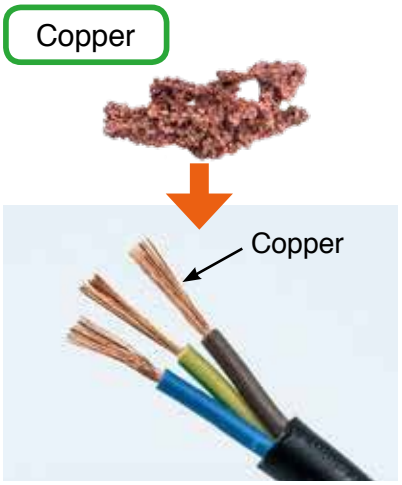
Uses of Minerals

Minerals are also useful for us. Papua New Guinea is rich in gold, silver, copper and nickel. We use gold and silver for jewellery and coins. Copper is used in electric cables and wires. Nickel is mainly used in making alloys such as stainless steel. An **alloy** is a mixture of two or more metals. Quartz is used in making glasses, watches, radios and electrical instruments.

Gold

Gold is used for jewellery and coins.

Copper



Wires made from copper.

Quartz

Quartz is used in the glass that covers the watch.

Summary and Exercise

Summary 8.1 Rocks and Minerals

Minerals

- There are many kinds of minerals on the Earth such as salt, gold and granite.
- Each mineral has its own properties such as colour, lustre and hardness.

Colour	Lustre	Hardness
Different colours of minerals.	Some minerals are shiny others are dull.	Some minerals are hard such as diamond.

Rocks

- A rock is made up of one or more minerals.
- Rocks can be identified by the types, size and colour of mineral grains they contain.
- The Earth is made of three layers; crust, mantle and core. The crust is made of rocks.

Types of Rocks

- Rocks can be grouped according to how they are formed.
- The three types of rocks are sedimentary, metamorphic and igneous.

Sedimentary rock	Metamorphic rock	Igneous rock
		
It is formed when sediments are glued together and become hard.	It is formed when a rock inside the Earth has been changed by heat and pressure.	It is formed when melted rock from inside the Earth cools and hardens.

Uses of Rocks and Minerals

- Rocks are used for building roads, house, statues, for cooking and making cement.
- Minerals are used to make jewellery, coins, electric cables and wires, glasses, watches, radios and electrical instruments.

Summary and Exercise

Exercise 8.1 Rocks and Minerals

Q1. Complete each sentence with the correct word.

(1) The thinnest outer layer of the Earth made of rock is _____.

(2) A melted rock inside the Earth is called _____.

(3) The three types of rocks are; igneous, sedimentary and _____ rock.

(4) A _____ rock is formed when sediments are glued together and become hard.

Q2. Choose the letter with the correct answer.

(1) Which of the following lists contains the correct order of the Earth's layers.

A. Crust, inner core, outer core, mantle

B. Mantle, outer core, inner core, crust

C. Outer core, mantle, inner core , crust

D. Crust, mantle, outer core, inner core

(2) Which of the following is <u>not</u> a correct explanation about minerals?

A. Minerals can be identified by its properties such as colour, lustre and hardness.

B. Salt and gold are examples of minerals.

C. All minerals have the same colour.

D. Minerals make up rocks.

Q3. Study the picture below. What type of mineral was used to make the wires in the electric cables?

Q4. What type of rock is formed when hot magma cools and hardens?

8.2 Fossils

Lesson 1 A Fossil

Look at the picture of the fossil on the right.
What does it look like? How was it formed?

What is a fossil?

Activity : Make a fossil

What We Need:

- clay, plate, objects such as shell, candle, tin-can

What to Do:

1. Flatten clay on a plate and press an object into the clay.

Be careful when you pour melted candle onto the clay. It is very hot.

2. Slowly and carefully pull the object out of the clay.
3. Put some candle into the-tin can and heat it until the candle melts completely. Pour the melted candle over the imprint of the object in the clay.

4. Let it cool and dry. Remove the candle from the clay carefully. The candle is your fossil.
5. Observe the imprint in the clay and the fossil and think about how they are similar or different.
6. Share your findings with your classmates. Discuss how fossils are formed.

Summary

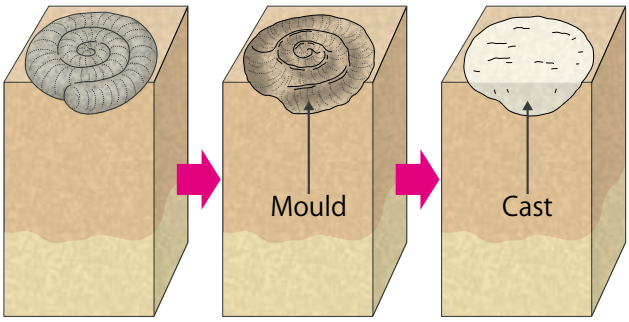
A **fossil** is the remains of a once living thing. Studying fossils helps scientists learn about the past history of life on Earth. Most fossils are found in sedimentary rocks such as shale, limestone and sandstone.

Tyrannosaurus

Trilobite

Plant fossil

Fossils form in different ways. When a living thing dies, it is buried in sediments such as sand and soil. The living thing presses down in sediment and it leaves a shape in the sediment. The sediment turns into a rock. The hard parts of the living thing dissolves completely and the shape is left in the rock. The shape of a living thing found in a rock is called a **mould**. If sediments or minerals fill the mould's empty space, a cast forms. A **cast** is the opposite of its mould.



Formation of fossil

Mould and cast of ammonite

Some fossils are hard parts of living things such as bones, teeth, shells and leaves. After living things die, sediments cover them. The soft parts rot away and the hard parts turn into rocks.

Bone fossil

Shark tooth fossil

Lesson 2 Learning from Fossils

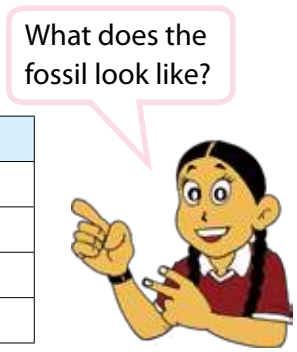
Scientists study about fossils. What do they learn from fossils? What kind of information do fossils give us?

What do fossils tell us?

Activity : Getting information from fossils

What to Do:

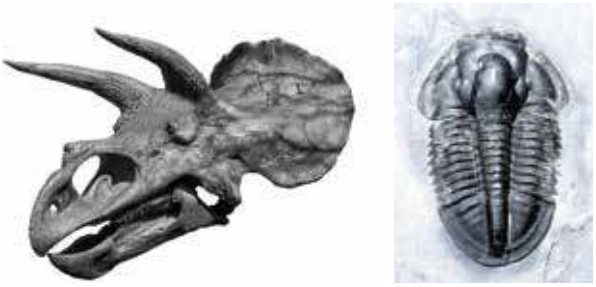
1. Draw a table like the one shown below.



Information	Your answer
Types of animal	
Its food	
Its habitat	
Other ideas	

2. Study the picture of the animal fossil below.
3. Think about the following questions.
   (1) What kind of animal is it? Is it a mammal, bird, fish, amphibian or reptile?
   (2) What did it eat?
   (3) Which habitat did it live in?
   (4) What else can you infer from this fossil?
4. Write your answers in the table.
5. Share your ideas with your classmates. Discuss what kinds of information a fossil gives us.

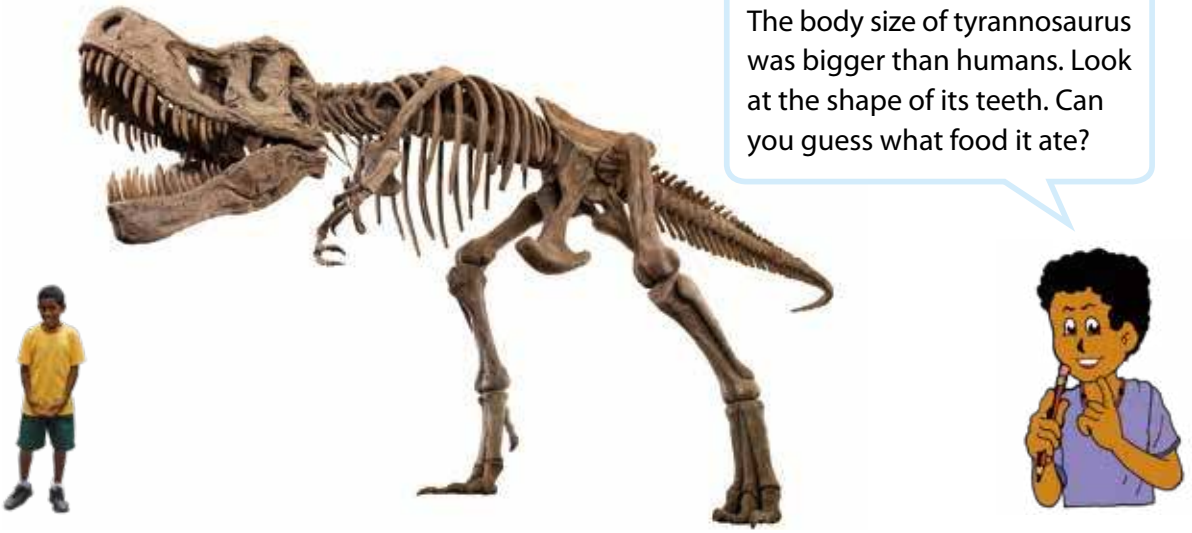
Summary



Some animals no longer live on the Earth.

Fossils give us so many clues. Studying fossils helps us to learn about the past history of life and environments on Earth. Fossils give us information about organisms that lived long ago. Moulds and casts show what kinds of plants and animals might have lived and how they looked. Some fossils look like animals and plants that are living today. Most of them such as dinosaurs no longer live on the Earth. Fossil bones tell us about how large animals were. Fossil teeth show what they ate.

Some fossils are similar to ferns alive today.



Fossils also tell us about the environments in which they lived. For example, an ammonite lived in the sea. When a fossil of an ammonite is found in the mountains, we can infer that the mountains were once covered by the sea.

Long Ago

Ammonite is found in the Himalaya Mountains.

Now

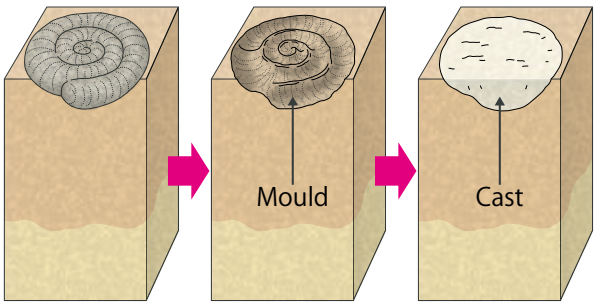
The mountains were once covered by the sea.

Summary and Exercise

Summary 8.2 Fossils

What is a fossil?

- Fossils are the remains of a once living thing.
- Most fossils are found in sedimentary rocks such as shale, limestone and sandstone.
- A mould is an empty shape of a living thing found in rocks.
- A cast is formed when sediments fill the mould's empty space.
- Mould and cast are both fossils.



- Some fossils are the hard part of living things such as bones, teeth, shells and leaves.

Learning from Fossils

- Studying fossils help scientists learn about the past history of life on Earth.
- Fossil bones tell us about how large animals were.
- Fossil teeth show what they ate.
- Fossils also tell us about the environment which the animal once lived in.

Summary and Exercise

Exercise 8.2 Fossils

Q1. Complete each sentence with the correct word.

(1) The remains of a once living thing is called a _____.

(2) An empty shape of a fossil found in rocks is called a _____.

(3) Fossil _____ tells us about how large animals were.

(4) Fossil _____ show what type of food animals ate.

Q2. Choose the letter with the correct answer.

(1) What type of rocks often contain fossils?

A. Sedimentary

B. Metamorphic

C. Igneous

D. Basalt

(2) Why do scientists study fossils? It helps scientists learn about

A. living things that live on Earth today.

B. the past history of life on the Earth.

C. sedimentary rocks.

D. the environment of today.

Q3. Answer the following questions.

(1) What type of fossil is shown in the picture on the right?

(2) Study the picture showing the fossil bones on the right. What is the name of this type of animal that no longer lives on Earth?

(3) Explain how a mould is formed.

Do rocks float?

We know that heavy objects sink and light objects float. Rocks of course, do not float on water. They sink into water. But there is a special type of igneous rock that floats on water. This rock is called Pumice. It is typically light coloured rock that is formed during volcanic eruptions when lava and water mix, which causes a rapid change in the material's pressure. As it hardens, gases dissolve into the lava and leave behind small air pockets (holes) in the pumice structure. This caused the rock to have a low density due to the air bubbles inside of it. The less dense air offsets the more dense rock, causing it to float. This makes pumice very light. It usually floats for a while but when water gets into it, it starts to sink.

It is ground up and is used today in soaps, polishes, pencil erasers and abrasive cleaners.

The pumice rock from Mount Pago in West New Britian Province.

A Pumice rock with small air pockets

Floating Pumice in the water

A pumice rock has a lighter weigh than other rocks.

Chapter Test

8. Rocks, Minerals and Fossils

Q1

Complete each sentence with the correct word.

(1) A rock that is formed inside the Earth that has been changed by heat and pressure is called _____ rock.

(2) Granite and basalt are examples of _____ rock.

(3) The remains of a once living thing is called a _____.

(4) The rock that is used for building and making sculpture is called _____.

Q2

Choose the letter with the correct answer.

(1) Which type of rocks are formed when sediments are pressed and cemented together?

A. Igneous
B. Metamorphic
C. Sedimentary
D. Fossils

(2) Which of these is <u>not</u> a mineral property?

A. Colour
B. Lustre
C. Temperature
D. Hardness

(3) Which of the following is formed when a fossil mould is filled?

A. Bones
B. Fossil cast
C. Tar pit
D. Plants

(4) Which of the following animal parts would most likely form a fossil?

A. Blood
B. Fur
C. Bones
D. Skin

Q3

Study the diagram on the right.

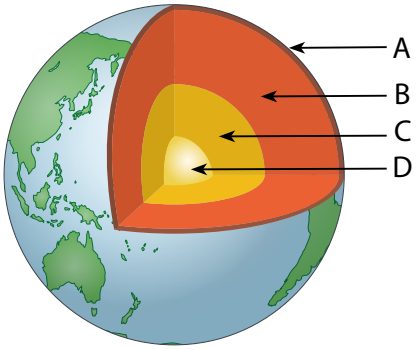
(1) Write the letter A, B, C or D for the correct layer of the Earth in the space provided.

Mantle _____

Inner core _____

Crust _____

Outer core _____



(2) Which part of the Earth layers is made of rocks?

_____

Q4

(1) Scientists found fossils of shellfish in rocks on the land. What can we infer about the place?

_____

_____


Shellfish

(2) A group of students oberved five rocks samples with magnifying hand lens. Study the table below and answer the following questions.

Sample	Lustre	Hardness	Colour	State	Grain
1	Shiny	Hard	White	Solid	Cannot be seen
2	Shiny	Hard	Gold	Soild	Cannot be seen
3	Dull	Hard	Several colours	Solid	Can be seen with different colour
4	Shiny	Hard	Transparent	Solid	Cannot be seen
5	Dull	Hard	White	Solid	Cannot be seen

Which of the above samples would not be classified as minerals? Explain your answer.

_____

_____

_____

_____

Chapter 9

Habitat and Adaptation

Photo of the Pygmy Seahorse hiding in the environment

9.1 Habitats

Lesson 1 Habitats

The environment is everything around us. Plants and animals live in the environment.

What kinds of environment do living things live in?

Activity : Place where plants and animals live

What to Do:

1. Draw a table like the one shown below.

Name of living thing	Place where it lives	Conditions of the place where it lives

2. Study the pictures of plants and animals below. Think about where they live and the conditions of the place. Complete the table.
3. Share your ideas with your classmates. Discuss the place where plants and animals live.


Bird of Paradise


Sea turtle


Water lily


Beetle


Seaweed

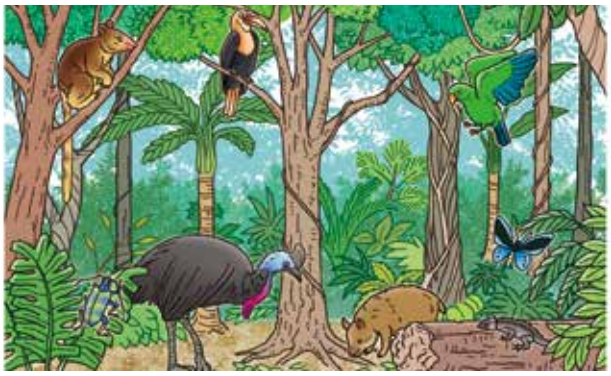

Frog

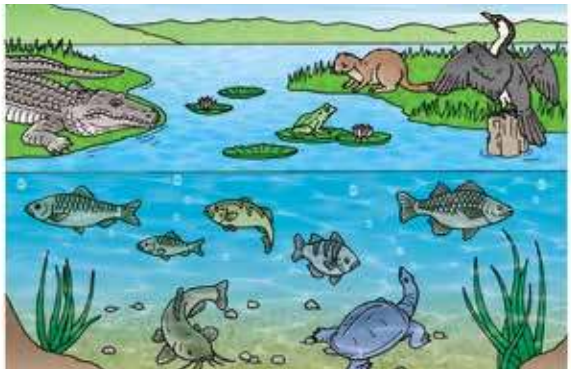

Cuscus


Crab


Crocodile

Summary





Different living things live in different habitats.

Different living things live in different environments. The part of an environment where a plant or an animal lives is called its **habitat**. The habitat provides plants and animals with food, water, shelter and space to live. Rainforests, grasslands, rivers and oceans are different kinds of habitats. Each habitat has different conditions such as temperature, light and moisture. Some habitats are hot and dry. Other habitats are cold and wet. Plants and animals live in the conditions that best meet their needs.

Grassland habitat

Freshwater habitat

Rainforest habitat

Ocean habitat

Lesson 2 Freshwater Habitat

Even though freshwater covers only 3 percent of the Earth's surface, it is also a habitat for many kinds of plants and animals.

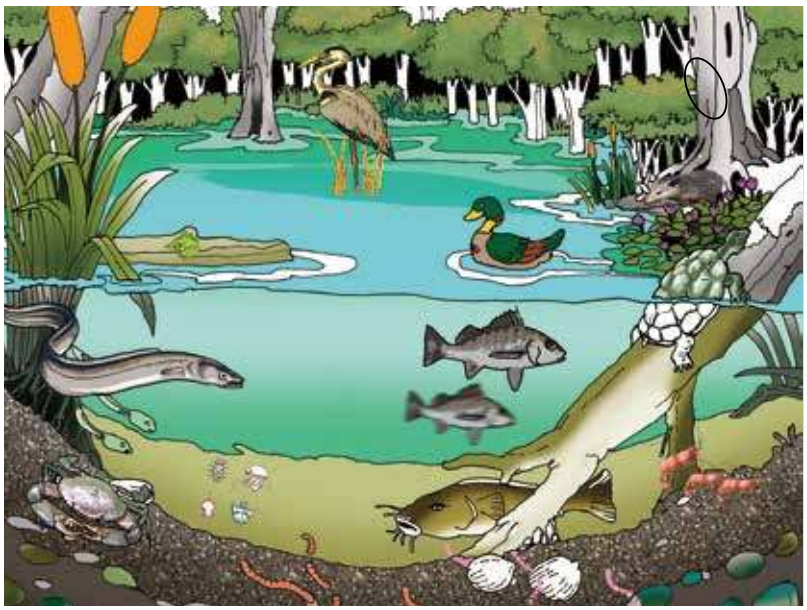
What is a freshwater habitat?

Activity : Living things in freshwater habitats

What to Do:

1. Go out of the classroom and find a freshwater habitat such as; a river, a pond, a wetland or a lake around you.
2. Observe the freshwater habitat and find the living things that live in or around it.
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss what kinds of living things that live in and around the freshwater habitat.

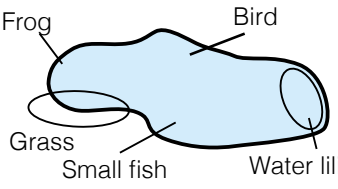
I found different kinds of living things in different places.



Living things in freshwater habitat

Date: _____

Place: pond



List of living things

1. frog
2. .....

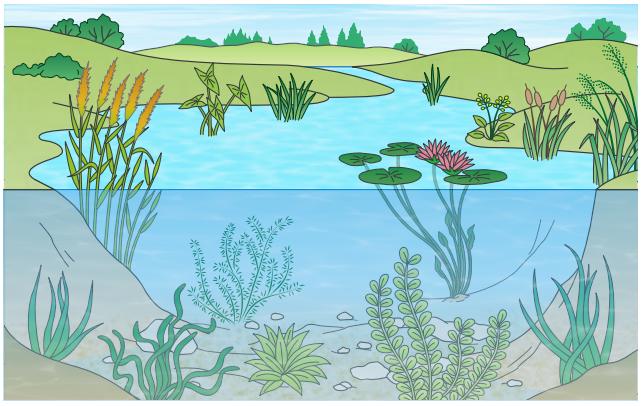
Summary

Freshwater habitats are natural water sources that do not contain salt. They include streams, rivers, ponds, lakes, wetlands and the area around them. Streams and rivers are flowing water. Ponds and lakes are still water. A wetland is a place where the land is covered by shallow water.

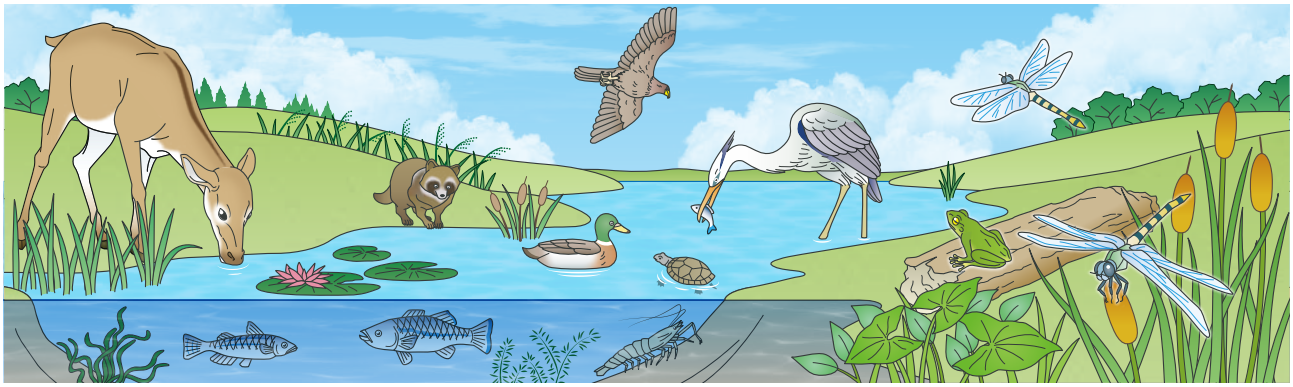

River


Lake


Wetland


Many kinds of plants live in freshwater habitats.

Many kinds of animals and plants live in or near freshwater habitats. They rely on the habitats to provide food, water and shelter. Freshwater habitats contain different kinds of plants such as grass, algae, reed and water lily but very few trees.
Some animals like frogs and dragonflies rely on water to complete their life cycles. Others such as fish and shrimps spend their entire life in the water. Many birds, reptiles and mammals visit freshwater habitats to feed.


Different kinds of animals rely on freshwater habitats.

Lesson 3 Ocean Habitat

An ocean is one of the habitats. Oceans cover about 70 percent of the Earth's surface.

What is an ocean habitat?

Activity : Living things in ocean habitats

What to Do:

1. Draw a table like the one shown below.

Area	Name of living things
Coast	
Top layer of open ocean	
Deep ocean	

2. Study the pictures of plants and animals below and think about the area of the ocean which they live in. Make a list of the living things in the table.
3. Share your ideas with your classmates. Discuss the types of living things and the area where they live in the ocean habitat.


Tuna


Sea turtle


Coral


Mangrove

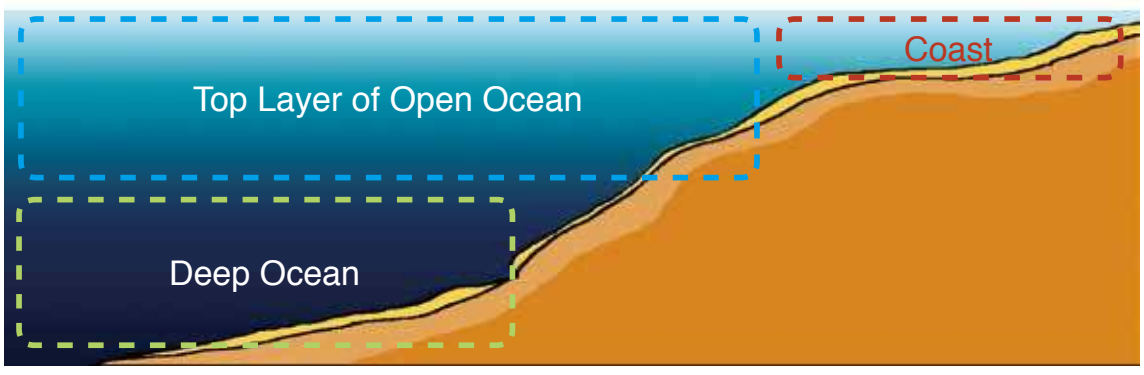

Frill Shark


Lobster


Starfish


Angler fish


Whale



Summary

An **ocean habitat** is a place with salty water. Each plant and animal lives in a certain ocean habitat depending on how much sunlight they receive. Ocean habitats can be divided into two: coastal and open ocean habitats.

Coastal Habitats

A coast is a place where the land meets the sea. Coastal habitats are shallow, sunny and warm. Coastal habitats include beaches, rock pools, coral reefs, estuaries and mangrove forests. Animals such as shore birds, fish, crabs, corals and starfishes can be found in the coastal habitats. Mangroves, algae and kelp are examples of plants found in the coastal habitats.

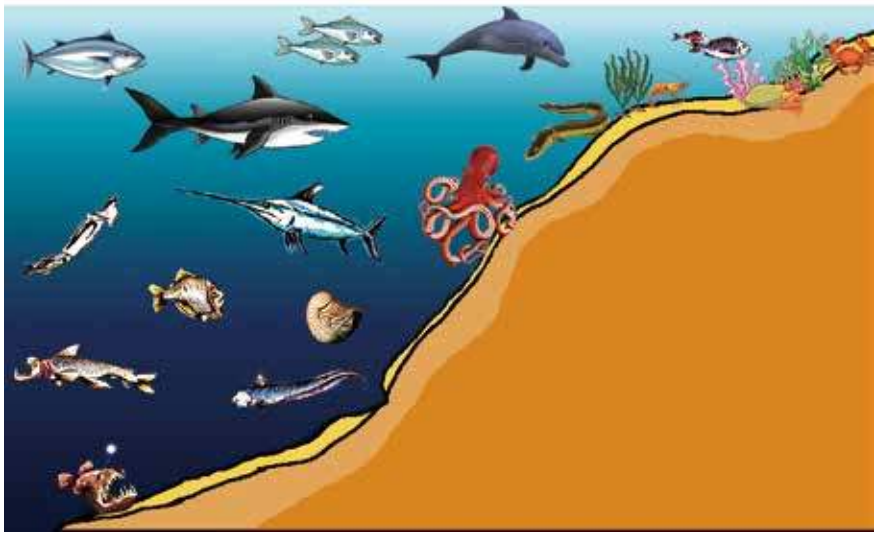
Coral reefs

Rock pools

Estuaries

Open Ocean Habitats

The open ocean is the area of the ocean outside of coastal areas. The top layer of the open ocean gets the most sunlight. Tiny algae floats near the surface. Dolphins can be found near the surface in the open ocean. The deeper the water, the less the sunlight reaches. So, the deepest parts of the ocean are very dark and cold. Many types of living things including fish, shrimps, worms, crabs and clams live in this habitat.



Living things in ocean habitats.

Lesson 4 Rainforest Habitat

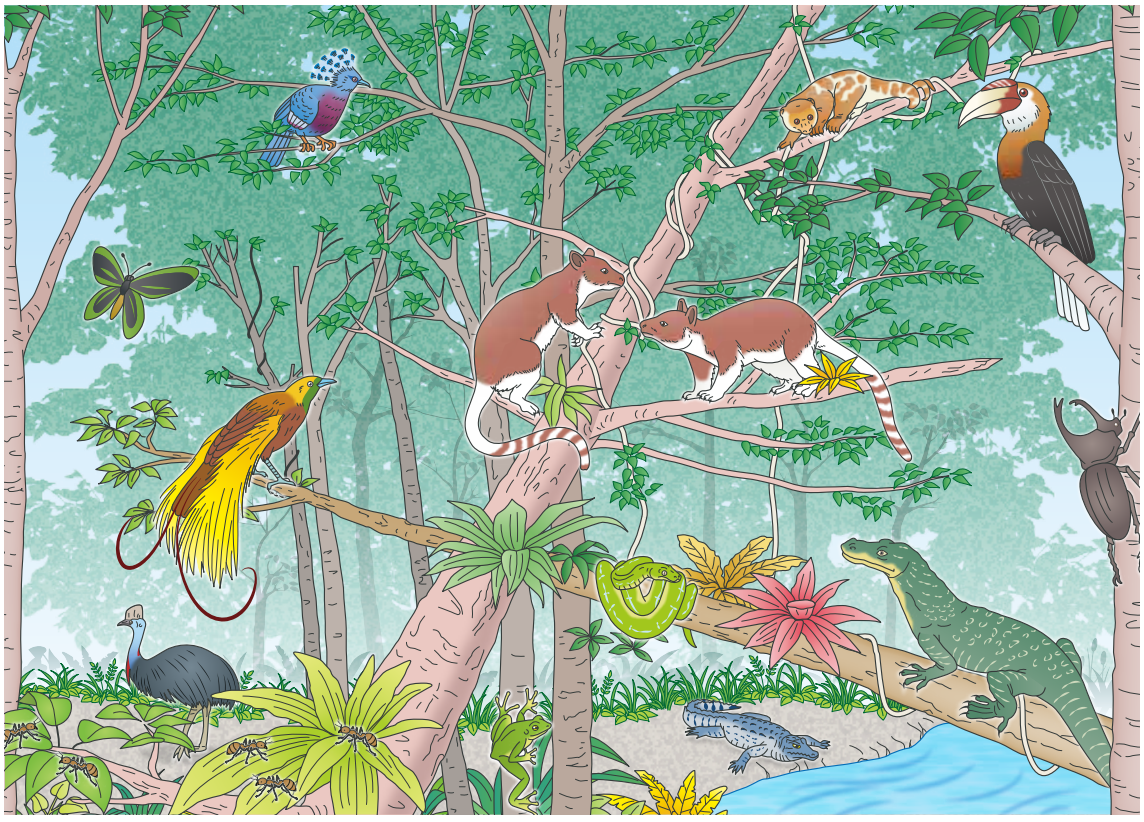
A rainforest is one of the habitats. Rainforests are found closer to the equator.

What is a rainforest habitat?

Activity : Living things in rainforest habitats

What to Do:

1. Study the picture of plants and animals below.
2. Think about the following questions:
   (1) What kinds of animals live in a rainforest?
   (2) How do different kinds of plants grow in a rainforest?
   (3) Where do different kinds of animals live in a rainforest?
   (4) Why do many kinds of animals live in a rainforest?
3. Share your ideas with your classmates.



Summary

A **rainforest habitat** is a place with a lot of rain, warm climates and tall trees. Though a rainforest covers less than 2 percent of the Earth's surface, about 50 percent of the Earth's plants and animals live in rainforests. It also produces 20 percent of the oxygen on the Earth.

Different kinds of plants in a rainforest tend to grow close together. Some plants grow taller than other plants. This dense forest has the different heights of branches and leaves and provide shelter and food for many kinds of animals to live.

A lot of animals get energy by eating plants or by eating other animals in a rainforest. Tree kangaroos, cuscus and many kinds of birds find their shelter among the branches of trees in the rainforest. Different kinds of insects also find their shelter in the rainforest.

Plants in rainforests grow densely and in different sizes.

A bird builds its nest among the branches of trees.

Bees make hives on trees.

Cuscus find shelter in trees.

Lesson 5 Grassland Habitat

Living things live in grassland. Grassland is an area mostly covered by grasses.

What is a grassland habitat?

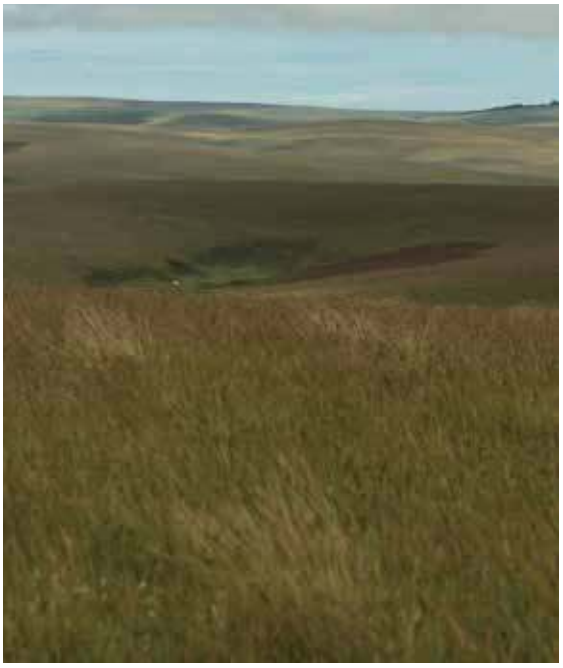
Activity : Living things in grassland habitats

What to Do:

1. Study the pictures below and think about the following questions:
   (1) What kinds of plants grow in grassland habitat?
   (2) What kinds of animals live in grassland habitat?
   (3) How do plants in rainforest and grassland look different?
   (4) Which habitat is easier for animals to hide themselves? Explain why.
   (5) Where can animals find their shelter in a grassland habitat? Explain why.
2. Share your ideas with your classmates.

Let's compare the types and heights of plants in a rainforest and a grassland.

Rainforest



Grassland

Summary

Most of the plants in grasslands are grasses.

A **grassland habitat** is a place with few or no trees. The grassland receives more rain than deserts but less than forests. Grasslands are too dry for many trees to grow. Most of the plants there are grasses. Grasslands are sometimes called prairies, savannahs or steppes. Most animals that live in a grassland feed on grasses and their seeds. Some animals feed on other animals to get energy. Grassland animals include wallabies, lizards, snakes, rats, a variety of birds and insects.

A wallaby lives in grassland.

A grasshopper feeds on grasses.

A grassland is a big open space, therefore provides limited places for animals to hide. Grassland animals find different ways to shelter and protect themselves from danger. For example, many grassland animals find shelter and make their homes underground.

A rat appearing from its home underground.

Lesson 6 Habitat Changes

Different plants and animals live in different habitats. Fish live in freshwater or ocean habitats. Tree kangaroos and cuscus live in rainforest habitats.

What happens to living things when habitats change?

Activity : Effects of habitat change

What to Do:

1. Draw a table like the one shown below.

Causes of habitat change	What will happen to the habitats and living things?
People cut down trees in a forest.	
It rains heavily and rivers flood.	
It does not rain for a long time and a pond dries up.	
A forest fire occurs and burns a large portion of a forest.	
People drain oil or harmful materials into rivers or land.	

2. Think about the relationship between the causes of habitat change and its effects on the habitats and the living things that live there.
3. Describe your ideas in the table.
4. Share your ideas with your classmates. Discuss the causes and effects of habitat change.

Summary

The habitat is the place where an organism lives. An **organism** is any living thing. Plants, animals and other living things are organisms. Organisms are affected in many ways when their habitats change. Habitats can be changed by natural events and people.

Natural Events

Natural events such as droughts, fire and floods can cause habitats to change. For example, the ponds or streams will dry up when a drought happens. Most plants that live in ponds will die. Many pond animals would not get the food and shelter they need. They would have to find other places to live or they will die, but new plants and animals may make the dried-up pond as their habitat.


Drought


Bush fire


Plants growing on ground after drought.

People

Habitats can also be changed by human activities. People cut down trees to build houses and roads, and change streams or rivers to build dams. In the process, people destroy the habitats of organisms. Pollution is also caused by human activities. People pollute the habitats by throwing away trash, emitting smoke in the air and allowing harmful materials to leak into the soil. Pollution kills plants and causes animals to get sick or die.


Human activities destroy the habitats.


Pollution causes organisms to get sick or die.

Summary and Exercise

Summary 9.1 Habitats

Habitat

- Habitat is the part of an environment where a plant and an animal live.
- The habitat provides plants and animals with food, water, shelter and space to live.
- Different kinds of habitats have different conditions such as temperature, light and moisture.

Different Kinds of Habitats

- Freshwater habitats are any natural water sources that do not contain salt including rivers, ponds, lakes, wetlands.
- Ocean habitat is a place with salty water. There are two main types of habitats; the coastal habitat and the open ocean habitat.
- A rainforest habitat is a place with a lot of rain, warm climate, and tall trees. The rainforest is always moist and warm, more kinds of plants and animals live in the rainforest than in any other habitats.
- A grassland habitat is a place with few or no trees. Grasslands are too dry for many trees to grow and most of the plants here are grasses.

Habitat Changes

- Habitats can be changed by natural events and people. The habitat changes have good and bad effects on organisms that live there.
- Natural events such as droughts, fires and floods can cause habitats to change.
- Human activities such as cutting down trees, building dams, throwing away trash, emitting smoke in the air and leaking harmful materials into the soil can cause habitats to change.

Summary and Exercise

Exercise 9.1 Habitats

Q1. Complete each sentence with the correct word.

(1) The part of an environment where a plant and animal live is called _____.

(2) Coastal and open ocean habitats make up the _____habitat.

(3) A _____ habitat is a place with a lot of rain, warm climates and tall trees.

(4) Most animals in the _____ habitat feed on grasses and their seeds.

(5) Rivers, lakes and streams are examples of _____ habitat.

Q2. Choose the letter with the correct answer.

(1) What is the cause of habitat change shown in the picture on the right?

A. Drought

B. Earthquake

C. Flood

D. Bush fire

(2) Which of the living things are found in the coastal habitat?

A. Coral and Mangrove

B. Turtle and Tuna fish

C. Seaweed and Angler fish

D. Whale and Nautilus

Q3. Answer the question below.

What is the name of the habitats for the living things labelled (1), (2), (3) and (4) in the pictures on the right?

Q4. Explain what will happen to the living things in the rainforest habitat if there is a bush fire.

9.2 Adaptations

Lesson 1 What is Adaptation?

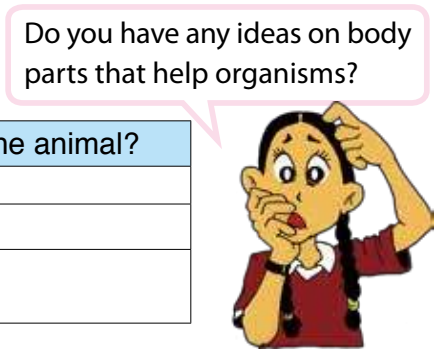
Different organisms live in different habitats. Organisms can survive in their habitats only if their needs are met.

How do adaptations help organisms?

Activity : Body parts of animals

What to Do:

1. Draw a table like the one shown below.



Body parts	How the body part helps the animal?
Long neck of a giraffe	
Thick fur of a polar bear	
Long and sharp spines of a echidna	

2. Study the pictures of the animals below. Think about how each of the body parts help animals to survive and write your ideas in the table.

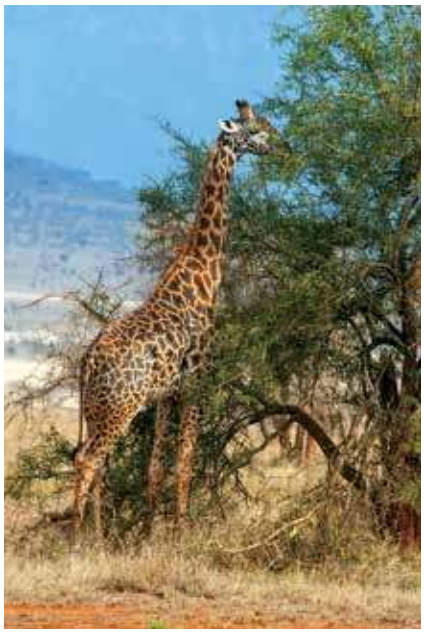
3. Share your ideas with your classmates. Discuss how the body parts help the animals.

Giraffe

Polar bear

Echidna

Summary



A long neck helps a giraffe to eat the leaves of a tree.

Adaptation is the use of body parts or a behaviour that helps an organism survive in its environment. **Behaviour** is the way organisms act in a certain situation. Adaptations help organisms survive in many ways.

Getting Food

Adaptations help organisms get food to survive. For example, giraffes have long necks. The long neck helps giraffes to eat leaves of trees that other animals cannot reach.

Surviving Severe Conditions

Some habitats have severe conditions. Some are very cold and snowy. Some are very hot and dry. Organisms living in severe conditions have adaptations that help them to survive. For example, some animals such as polar bears have thick fur. The thick fur helps keep them warm to survive in cold habitats.

The thick fur helps keep polar bear warm.

Self-Defence

Most organisms have adaptations for self-defence. For example, some organisms such as echidnas and cactus plant are covered with long sharp spines. The spines help keep organisms from being eaten by enemies. Some animals such as octopus change colour as their environment changes. Some adaptations help organisms hide in their surroundings.

Spines help keep echidna from being eaten.

Lesson 2 Adaptations to Habitats

Adaptations help organisms get food, hide from other animals and survive in conditions of their habitats.

How do organisms adapt to their habitats?

Activity : Turtles adaptation

What to Do:

1. Draw a table like the one shown below.

How are they similar?	How are they different?

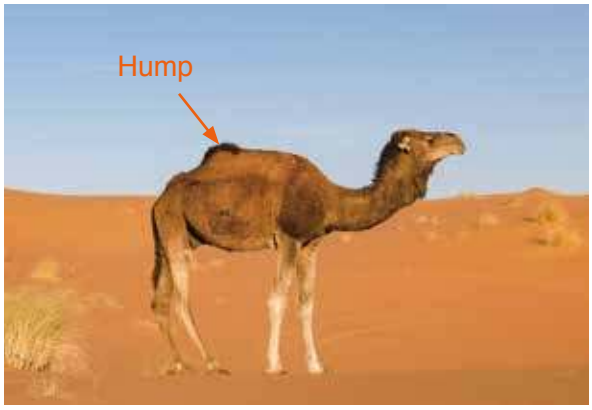
2. Study the pictures of the two turtles below.
3. Compare and describe how they are similar or different in the table.
4. Based on your results, think about the following questions.
   (1) Where do they live?
   (2) How do their body parts adapt to their habitats?
5. Share your ideas with your classmates.


Sea turtle


Freshwater turtle

Summary

Organisms need to adapt to their habitats to survive. Habitats are different, so organisms living in different habitats need different adaptations to survive. A **desert** is one of the habitats. The desert is a place with very little water. It can be hot and dry. It is hard for organisms to get food and water in a desert. Desert organisms have adaptations to desert habitats. A camel stores fat in its hump(s) that helps it to survive long periods without food and water. A cactus plant has thick stems and waxy skin that holds water for survival in a dry habitat.



A camel stores fat in its hump.

A cactus has thick stems and waxy skin that holds water.

Organisms living in water also have adaptations that help them to meet their needs. Some animals such as fish and dolphins have fins or flippers that help them swim through water. Animals living on land have different adaptations. They have legs that help them to walk easily on land. Some animals such as birds have wings that help them fly in the air.


Fins are adapted for swimming.


A pig has legs for walking.


Wings help birds to fly.

Lesson 3 Camouflage

Organisms need to adapt to their habitats to survive. What other kinds of adaptations do organisms have?

What is camouflage?

Activity : Can you find animals?

What to Do:

1. Study the pictures below carefully and find the animals.
2. Make a list of the animals you find.
3. Think about the following questions.
   (1) Which animals were easy or hard to find? Explain why.
   (2) How are the colours and patterns of the animal body parts helpful to them?
4. Share your ideas with your classmates.






Summary

An owl blends in with a tree.

Camouflage is a type of animal adaptation. It is the colours, patterns or shape of body parts of an animal that allows it to blend in with its surroundings. Camouflage helps animals to hide from enemies and to find their food.

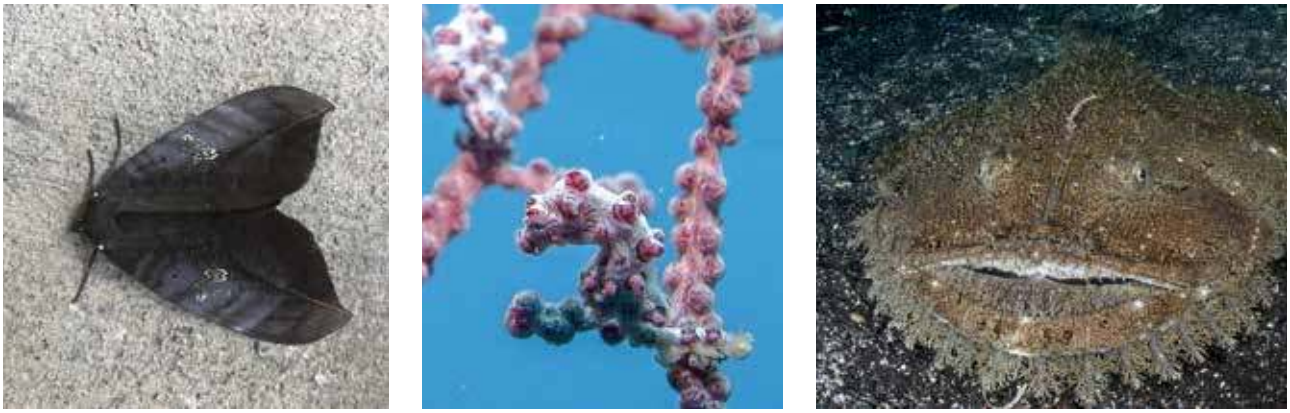
The colour and pattern of an owl's feathers helps it to blend in with trees, making it easier to stay hidden from other animals in the daytime. A tiger also uses camouflage. Its striped fur helps it to blend in with the tall grasses. The tiger can hunt without being seen.

Striped fur helps tigers blend in with the tall grasses.

Some insects use their body parts to camouflage. A stick insect uses camouflage to look like the branches or leaves of the trees where it lives. Its physical appearance helps the stick insect to blend in with its surroundings and hide from its enemies.

A stick insect looks like twigs.

The following pictures show examples of animals camouflaging.



Examples of animals camouflaging to blend in with their surroundings.

Lesson 4 Mimicry

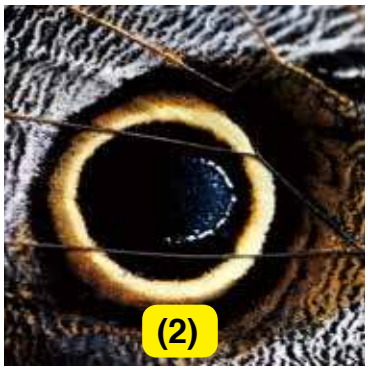
Organisms use their body parts to camouflage themselves. Do organisms use their body parts in different ways?

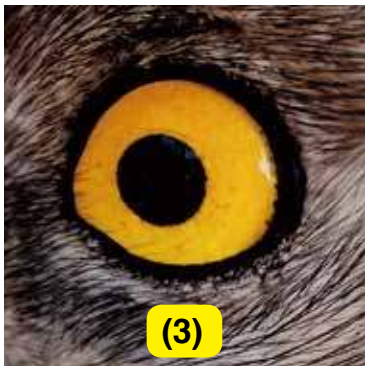
What is mimicry?

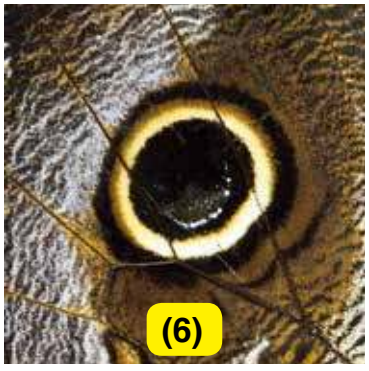
Activity : Which one is an owl's eye?

What to Do:

1. Study the pictures below carefully. Some are owls' eyes and others are the spots on butterflies' wings.
2. Think about the following questions.
   (1) Which pictures are the owls' eyes or the spots of butterflies?
   (2) How do the spots help the butterflies?
3. Share your ideas with your classmates.







Summary

Mimicry is a type of animal adaptation that allows an animal to look like another kind of animal. Mimicry can keep them from being eaten or it can help them get food.

Mimicry helps protect some types of butterflies from birds. Some butterflies have large eye-spots on their wings. These spots resemble the eyes of animals such as owls to scare away birds that want to eat the butterfly.

Some butterflies have large eye-spots to scare away birds.

Other animals use mimicry to behave like another animal. Some harmless snakes have colours and patterns that look like dangerous snakes. Birds see these colours and patterns and stay away.

How does mimicry help animals to survive?

A snake with poison (Coral snake)

A snake without poison (Scarlet king snake)

Some animals use mimicry for hunting. Angler fish has a lure that sticks out from its head. The lure looks like small animals such as worms, shrimps or smaller fish to attract a fish's attention. Once a fish gets closer to the lure, the angler fish eats it.

Angler fish has a lure to attract other fish.

Lesson 5 Behavioural Adaptation

Behaviour is also an adaptation. It is the way organisms behave to survive.

How do organisms behave to survive in their environment?

Activity : Animal Behaviour

What to Do:

1. Study the pictures below.
2. Think about the following questions.
   (1) Why do penguins come together?
   (2) Why does a rat live in a burrow?
   (3) How do their behaviour help them?
3. Record your ideas in your exercise book.
4. Share your ideas with your classmates.

The Antarctic is covered with ice and is the driest and coldest continent on the Earth. It is where penguins come together.

A rat lives in the desert. It stays in its burrow during the daytime. A burrow is a hole or tunnel in the ground made by animals for shelter.

Summary

Behaviour is a type of adaptation. It is the way that animals act or react to their environment. Behaviour helps animals to find food and water, move to safe places and protect themselves.

Some animals move from one habitat to another where the weather is warmer or where they can find food. This is called **migration**. For example, some birds move to another habitat during winter to be in a place where the habitat is warm.

Birds move to another habitat during winter.

Some animals have behavioural adaptations that help them to survive in cold winter. Bears go into a long deep sleep through the winter. This is called **hibernation**. They need little or no food during hibernation. So do frogs, snakes and even some insects. Emperor penguins gather together in the cold to keep warm.

A bear goes into a deep sleep during winter.

Other animals behave in different ways. Female turtles always return to the same beach where they hatched to lay their eggs. Some animals such as birds and fish travel in a large group that helps to protect the members of the group from enemies.

Sea turtles return to the same beach to lay eggs.

Fish travel in a large group for protection.

Summary and Exercise

Summary 9.2 Adaptations

What is Adaptation?

- An adaptation is the use of a body part or a behaviour that helps an organism survive in its environment.
- Behaviour is the way organisms act in a certain situation.

Adaptation to Habitats

- Adaptation helps organisms to get food, hide from other animals and survive in conditions of their habitats.
- Organisms living in different habitats need different adaptations to survive.

A camel stores fat in its hump to survive in a desert.

Camouflage

- Camouflage is the colour, pattern or the shape of the body parts of animals that allows them to blend in with their surroundings.
- Camouflage helps animals to hide from enemies and to look for food without being seen.

An owl blends in with a tree.

Mimicry

- Mimicry is a type of animal adaptation that allows an animal to look like another kind of animal.
- Mimicry can keep animals from being eaten or help them to get food.
- Some harmless animals have colours and patterns that look like those of dangerous animals.

A harmless snake taking on the colour and patterns of the poisonous snake.

Behavioural Adaptation

- Behaviour is a type of adaptation. It is a way that animals act or react to their environment. Migration and hibernation are examples of the behaviour.
- Behaviour helps animals find food and water, move to safe place and protect themselves.

Summary and Exercise

Exercise 9.2 Adaptations

Q1. Complete each sentence with the correct word.

(1) An animal body part or its behaviour helps the organism to survive in its environment is called _____.

(2) Organisms live in different _____ so they need to adapt in order to survive.

(3) An adaptation that allows an animal to look like another kind of animal is called _____.

(4) An adaptation that makes animals to act or react to its environment is called _____.

Q2 Choose the letter with the correct answer.

(1) What is the adaptation for cactus plant to have thick stems and waxy skin?

A. To hold water in dry environment.

B. To attract animals for pollination.

C. To poke animals that try to eat it.

D. To allow water to run out easily.

(2) Why do some insects blend in with their surroundings?

A. To hide from enemies.

B. To scare away enemies.

C. To be eaten other animals.

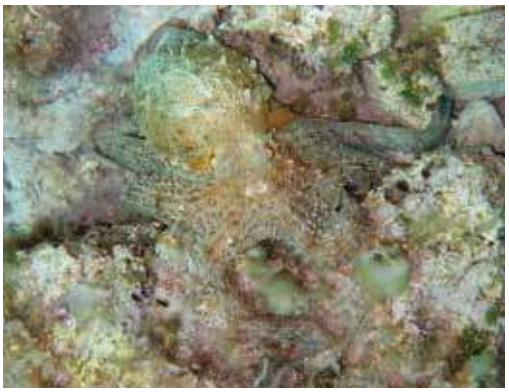
D. To be easy to be seen.

Q3. Some butterflies have large eye-spots on their wings. Why do the butterflies have such eye-spots?

Q4. How do some animals behave during cold winter to survive?

How does an octopus use camouflage, mimicry and change its colours?

Octopuses are masters in using camouflage to catch animals they want to eat and hide from animals that want to eat them. Octopuses have very good vision and they use it to better camouflage themselves.



The octopus blends in the rock.

An octopus can change the way its skin looks and feels. It controls the muscles under its skin by changing its skin to match the rock's or plant's bumpiness near to blend in it.

It can also change the way it moves. It mimics a rock, by not only folding its eight tentacles (legs) close to the body but changing the way its skin looks. It can also change the way it swims to mimic the way waves might push a rock through the ocean.

The octopus can change the colour of its skin. It can control the colour of its skin because it has special cells in its skin that are filled with different colours. If the octopus relaxes the muscles connected to its red colour cells, these cells will become really small and we would not be able to see red on the octopus' skin. However, if the octopus stretches the muscles connected to its red colour cells, these cells will also stretch and get bigger so that we would be able to see lots of red on the octopus' skin. By changing the sizes of all the different coloured cells, the octopus can very rapidly create complex patterns that allow it to better blend in with its surroundings.

The octopus can change the colour and patterns of its skin.

Chapter Test

9. Habitat and Adaptation

Q1

Complete each sentence with the correct word.

(1) The part of the environment where plants and animals live to get all their needs is called _____.

(2) Animals can camouflage themselves by blending in with their surroundings using their _____, patterns or shapes of body parts.

(3) Some butterflies use _____ by having two large eye-spots on their wings to imitate an owl's eye to scare birds away.

Q2

Choose the letter with the correct answer.

(1) Which animal lives in a freshwater habitat?

A. Whale
B. Tuna fish
C. Frog
D. Lobster

(2) What is the type of adaptation when geese fly away from winter to summer in other regions?

A. Mimicry
B. Behaviour
C. Acting
D. Camouflage

(3) Which statement best describes the rainforest habitat?

A. Trees and other plants tend to grow close together.
B. Most plants are grass which animals eat.
C. There are a few trees growing with fewer rainfalls.
D. Most plants grow in lots of water with areas of grass.

(4) If the sea turtle was living on the land, which of its body part would adapt to that environment to survive?

A. Eyes
B. Head
C. Flippers
D. Nose

Q3

(1) Observed the dried branches on the picture on the right. There is an insect among the branches. Explain what made the insect difficult to be spotted?

_____

_____

(2) Algae is a kind of plant. Why does it live and float near the top of the open ocean surface?

_____

_____

(3) What is the purpose of the lure on this fish?

_____

_____

_____

Q4

(1) The picture on the right is the result of drought causing a pond to dry-up. How is the habitat change good for the plants and animals?

_____

_____

_____

_____

(2) The giraffe lives in the savannah grassland of Africa. One of its main food is eating the leaves of a tree. How has the giraffe adapted to eat the leaves at the very top of the tree?

_____

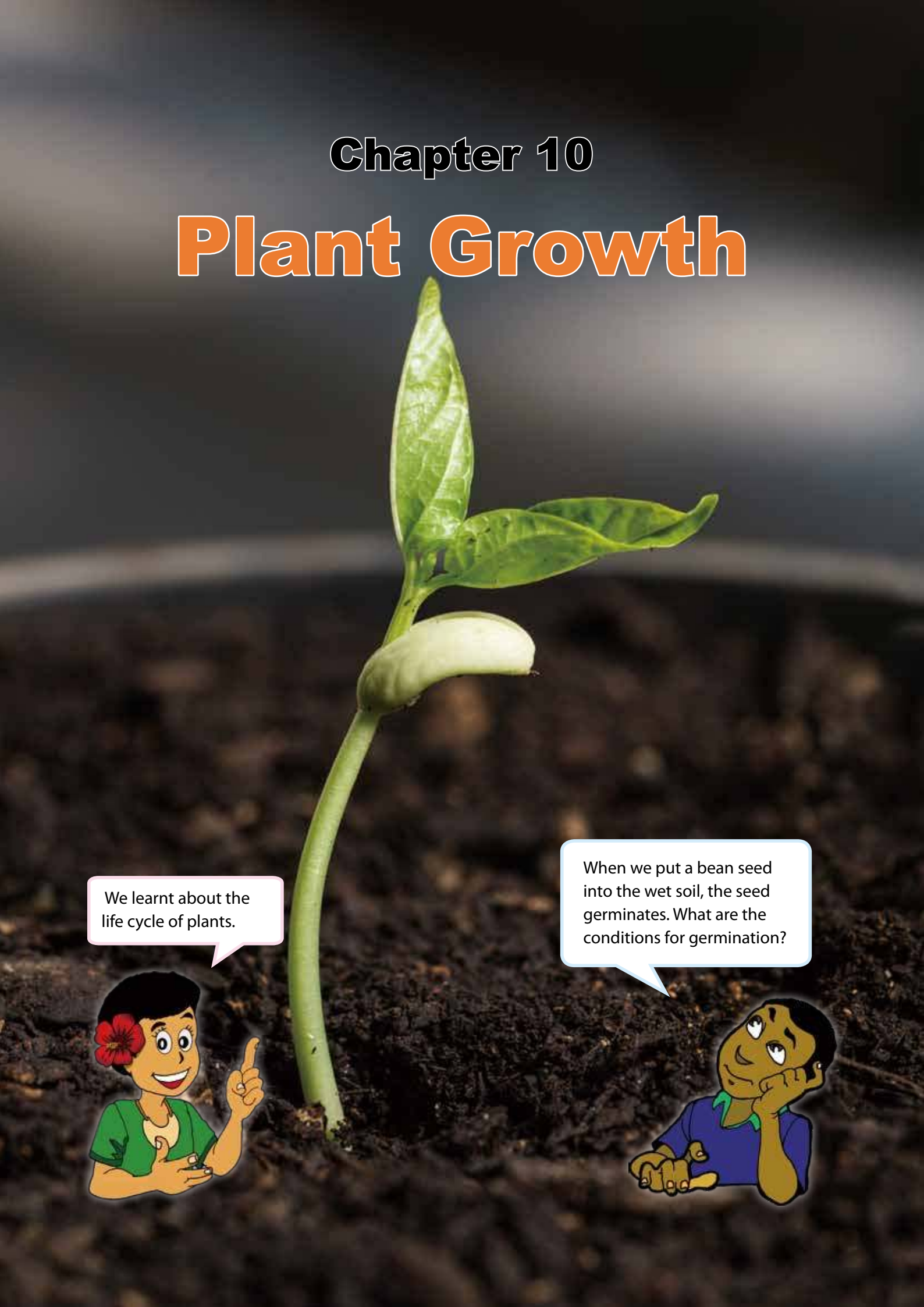
_____

_____

_____

Chapter 10

Plant Growth



10.1 Needs for Seed Germination

Lesson 1 Inside of a Seed

Plant life cycle starts from a seed. A young plant comes out from a seed. Is there a part inside a seed that grows into roots or leaves?

What is the structure of a seed?

Activity : Observing the inside of a seed

What We Need:

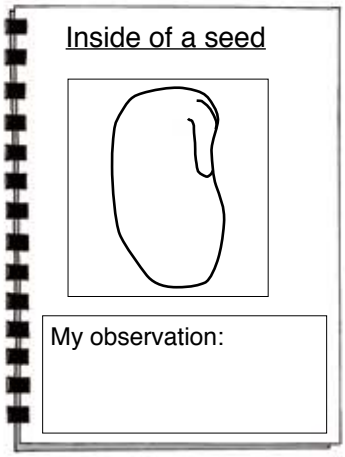
- bean seeds soaked in water overnight, cutter knife, hand lens




Be careful when you cut a bean seed with the knife.

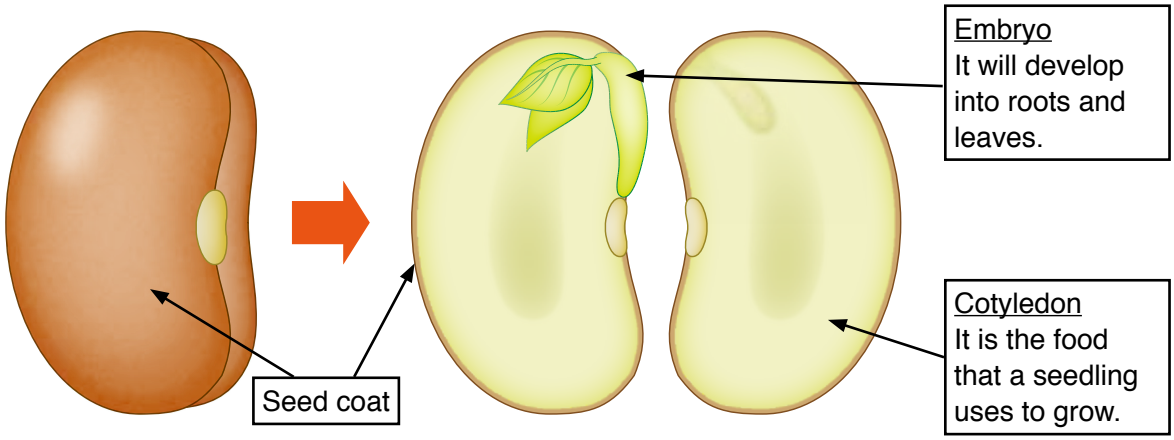
What to Do:

1. Remove the coat of the bean seed and cut it lengthwise with a knife.
2. Observe the inside parts of the bean seed using a hand lens. Sketch its structure.
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss which parts of the seed will grow into roots, stem and leaves.

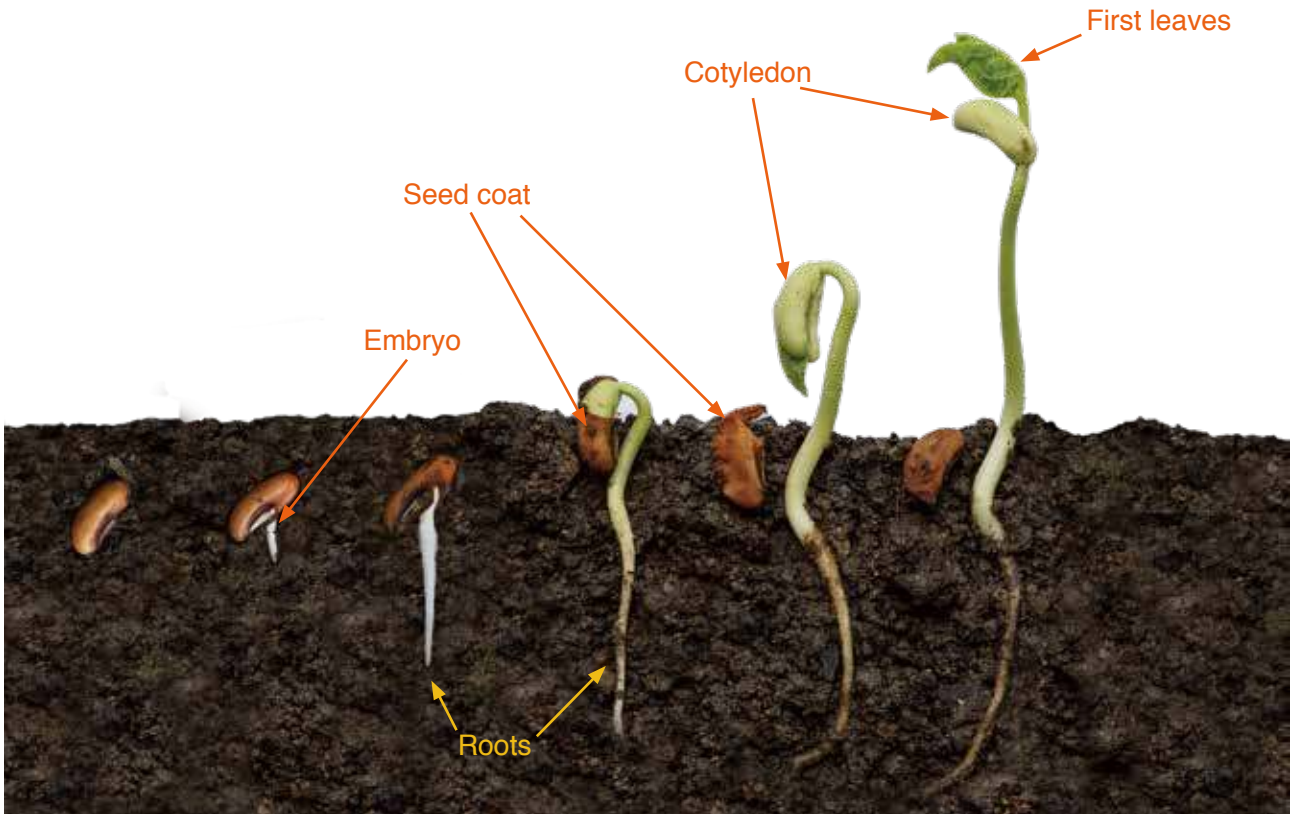



Summary

There are three main parts of a seed: seed coat, embryo and cotyledon. **Seed coat** is the hard outer layer of the seed covering around the embryo and the cotyledon. It protects the embryo and the cotyledon. **Embryo** is the tiny plant inside the seed. It will develop into roots and leaves. The embryo rests inside the seed until the conditions are right for it to start to grow. **Cotyledon** is the part that stores food, known as **starch**. A young plant uses the starch until it is big enough to make its own food.



Structure of a seed



Stages of seed germination.

Lesson 2 Conditions for Germination 1: Water

Plant life cycle starts from a seed. The seed sprouts and a seedling grows. The process of the seed growing into a seedling is called **germination**. What conditions do seeds need to germinate?

Do seeds need water to germinate?

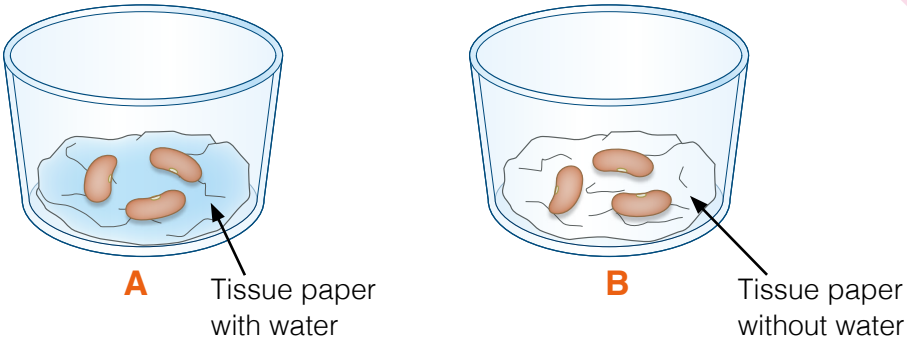
Activity : With and without water

What We Need:

- bean seeds, water, tissue paper, two cups

What to Do:

1. Fold the tissue paper so that it will fit inside the cups A and B as shown below.
2. Wet the paper in the cup labelled A until it is completely moist.
3. Place the bean seeds on top of the paper in each cup and put the two cups at the same location. Always keep Cup A moist.
4. Observe the seeds for a week. Record your observations in your exercise book.
5. Share your ideas with your classmates. Discuss which beans germinated and why.



Result

What conditions were same or different?

We found out that the seeds placed on wet tissue paper germinated but the seeds placed on dry tissue paper did not germinate.

With water

Without water

Different conditions

The seeds were given water or not given water.

Same conditions

The seeds were exposed to air.
The seeds were placed at the same location with the same amount of light and at the same temperature.

Summary

From this result, what did you find out? What does a seed need to germinate?

The germination happens inside the seed. Seeds need the right conditions to germinate. Water is one of the important conditions for seed germination. Seeds need water to germinate.
Seeds are usually dry. They might have to wait for years to start growing. When a seed comes into contact with water, water allows the seed to swell up until the seed coat splits apart and the seed embryo absorbs water. Water makes the embryo 'wake up' from its hibernation and starts growing.

When a seed comes into contact with water, the seed coat will absorb water.

Once the seed coat splits, the embryo starts to grow.

Lesson 3 Conditions for Germination 2: Air

When a seed comes into contact with water, the seed germinates. Are there any other conditions for seed germination?

Do seeds need air to germinate?

Activity : With and without air

What We Need:

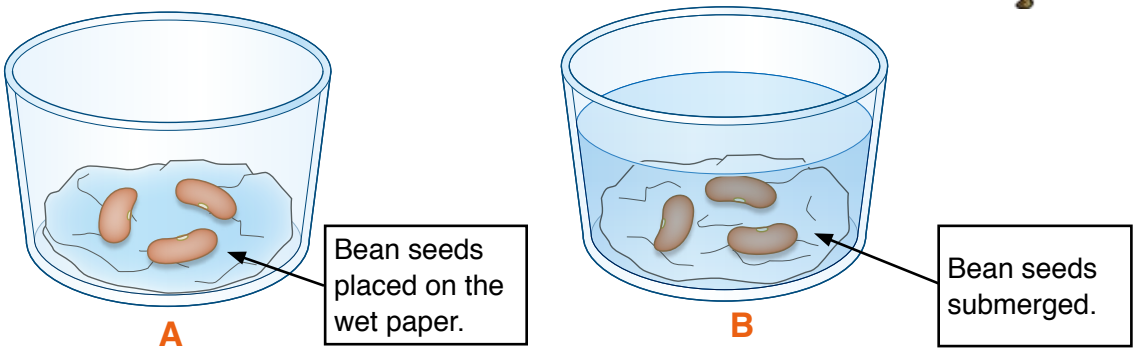
- bean seeds, water, tissue paper, two cups

What to Do:

1. Fold the tissue paper so that it will fit inside the cup.
2. Place the paper in each cup and then place bean seeds on top of the paper.
3. Wet the paper in Cup A until it is completely moist. Pour water in Cup B until the bean seeds are submerged.
4. Place both cups at the same location.
5. Observe the seeds for a week. Record your observations in your exercise book.
6. Share your ideas with your classmates. Discuss which beans germinated and why.

To investigate how seeds grow with and without access to air, what conditions should we control?

We must place both cups at the same place so that all the conditions should be the same EXCEPT access to air.



Result

We found out that the bean seeds placed on wet tissue paper germinated but the bean seeds that were submerged did not germinate.

Bean seeds placed on wet tissue paper

Bean seeds submerged

Different conditions

The seeds were exposed to air or not exposed.

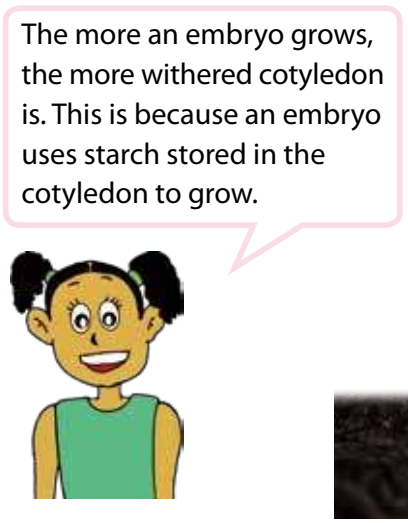
Same conditions

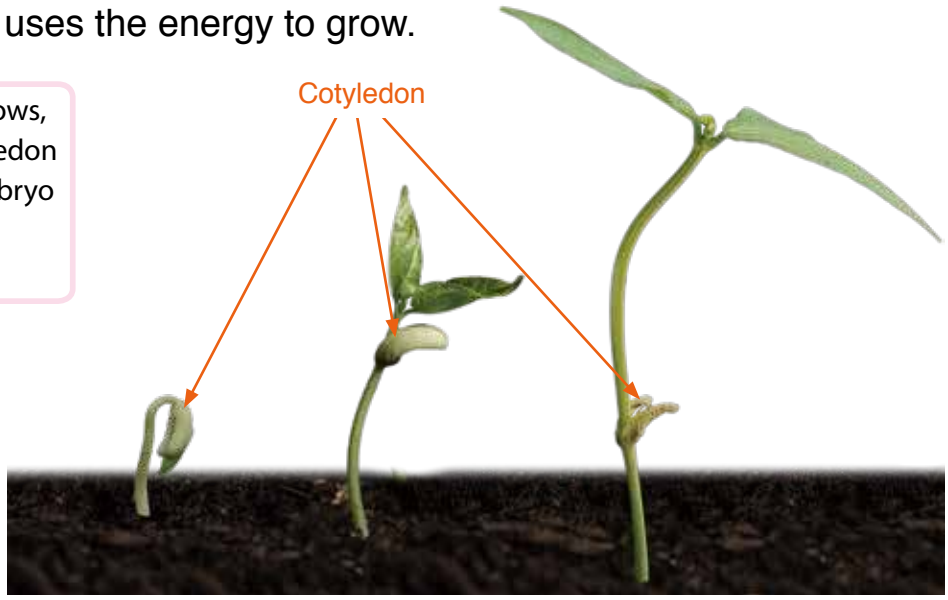
The seeds were given water.
The seeds were placed at the same location with the same amount of light and at the same temperature.

Summary

A bean seed placed on wet tissue paper is exposed to air. On the other hand, a bean seed submerged is not exposed to air because it is covered with water. From this result, we find that seeds need air to germinate.

Seeds need oxygen in the air for germination. Seeds cannot make food like adult plants do. Instead, they use the oxygen together with starch stored in seeds to make energy. When oxygen gets to the seeds, the oxygen helps the embryo burn the starch stored in the cotyledon. Burning the starch produces energy. The embryo uses the energy to grow.





Stages of seed germination.

Lesson 4 Conditions for Germination 3: Temperature

Seeds need water and air to germinate. How about temperature? Does seed germination have a relationship with temperature?

Do seeds need proper temperature to germinate?

Activity : Warm or cold temperature

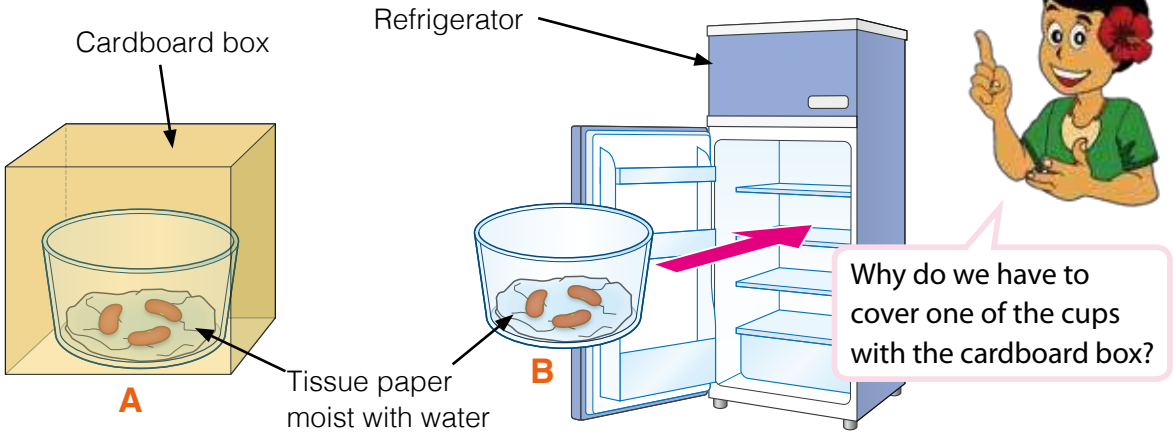
What We Need:

- bean seeds, water, tissue paper, two cups, cardboard box

What to Do:

1. Fold the tissue paper so that it will fit inside the cup.
2. Place the paper in each cup and wet the paper in both cups until it is completely moist. Put the bean seeds on top of the paper in each cup.
3. Put one of the cups in a refrigerator. Place another cup in a classroom and cover it with the cardboard box.
4. Observe the seeds for a week. Record your observations in your exercise book.
5. Share your findings with your classmates. Discuss how temperature affects seed germination.

All the conditions for seeds should be the same EXCEPT the difference in temperature. What conditions should be the same?



Why do we have to cover one of the cups with the cardboard box?

Result

It is dark inside a refrigerator, so we covered a bean seed placed in a classroom with a box in order to make it dark.

We found out that the bean seeds placed in a refrigerator did not germinate but the bean seeds placed in a classroom germinated.

Different conditions

The seeds were placed at different temperatures.

Same conditions

The seeds were given water.
The seeds were exposed to air.
The seeds were not exposed to light (dark place).

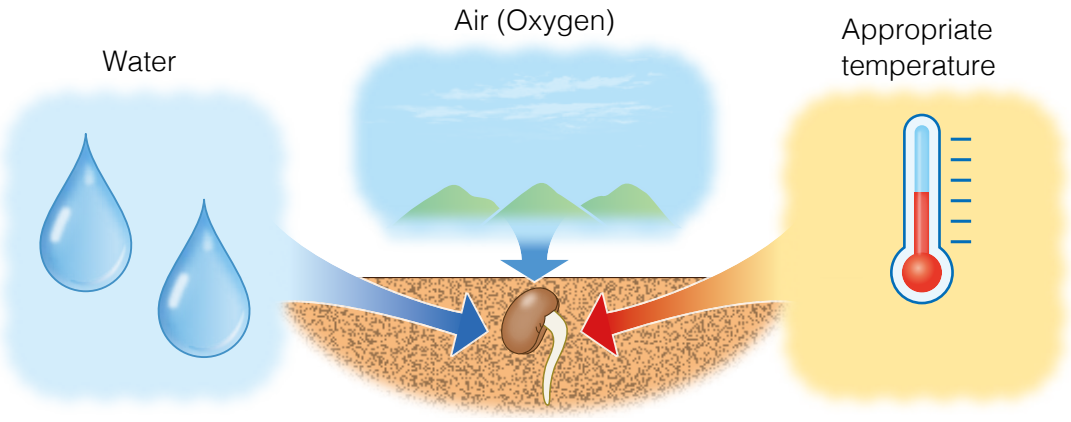
At room temperature

At cold temperature

Summary

From this result, what does a seed need to germinate?

The temperature in a classroom is warmer than that in a refrigerator. This means that seeds need an appropriate temperature for germination. Without the proper temperature, the seeds will not germinate. In general, most seeds will germinate at temperatures between 10°C and 35°C. Warmth speeds up and improves the process of germination. Seeds seem to have a system that makes them wait for warmer temperatures before sprouting. Through the three activities, we find that seeds need three conditions for germination: water, air (oxygen) and appropriate temperature.



Seeds need water, air and appropriate temperature to germinate.

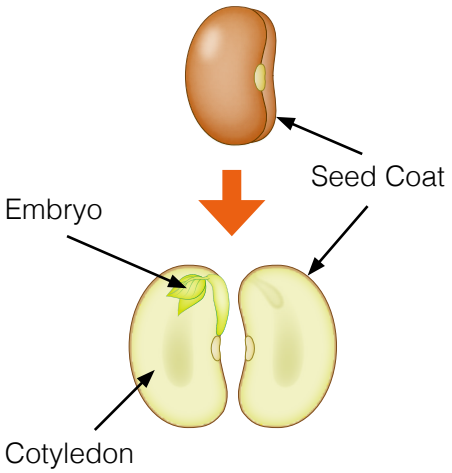
Summary and Exercise

Summary

10.1 Needs for Seed Germination

Inside of a Seed

- There are three main parts of a seed: seed coat, embryo and cotyledon.
- The seed coat is the hard outer layer of the seed covering around the embryo and the cotyledon. It protects the embryo and the cotyledon.
- The embryo is the tiny plant inside the seed. It will develop into roots and leaves.
- The cotyledon is the part that stores food known as starch for the young plant.



Conditions for Seed Germination 1: Water

- Water is one of the important conditions for seed germination. Seeds need water to germinate.
- When a seed comes into contact with water, it allows the seed to swell up until the seed coat splits apart, and the seed embryo absorbs water.


Germination of bean

Conditions for Seed Germination 2: Air

- Seeds need oxygen in the air for germination.
- When oxygen gets to the seeds, the oxygen helps the embryo to burn the food stored in the cotyledon. Burning the food produces energy to germinate and grow.

Conditions for Seed Germination 3: Temperature

- Seeds need proper temperature for germination.
- Warmth speeds up and improves the process of germination.
- Seeds seem to have a mechanism that makes them wait for warmer temperature before sprouting.

Summary and Exercise

Exercise

10.1 Needs for Seed Germination

Q1. Complete each sentence with the correct word.

(1) The cotyledon and embryo are covered by the _____.

(2) The _____ causes the seed to swell up and split the seed coat apart allowing the embryo to come out.

(3) The _____ from the air helps embryo burn the food stored in cotyledon.

(4) Warm _____ speed up the process of germination.

Q2. Choose the letter with the correct answer.

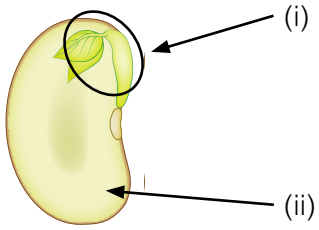
(1) What is the correct combination of the name of seed parts (i) and (ii)?

A. (i) is pollen and (ii) is cotyledon.

B. (i) is cotyledon and (ii) is embryo.

C. (i) is seed coat and (ii) is embryo.

D. (i) is embryo and (ii) is cotyledon.



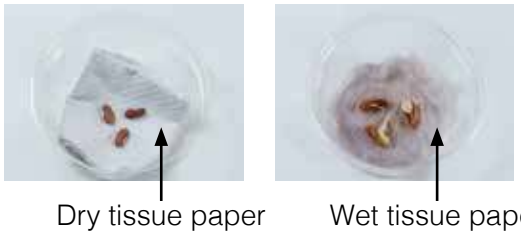
(2) According to the experiment shown below, what is needed for seed germination?

A. Water

B. Water and sunlight

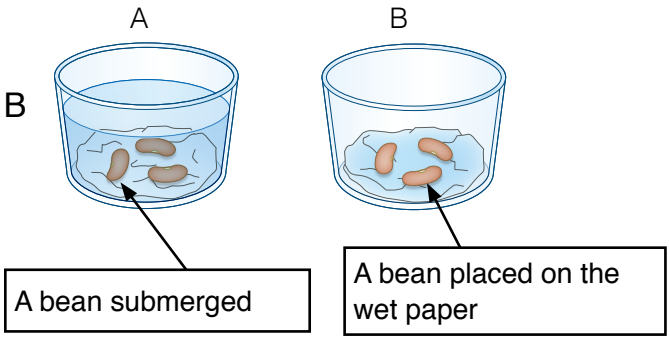
C. Air

D. Darkness and air.



Q3. Answer the question below.

What are the conditions in cup A and B that are same and different?



Q4. Greg got some dry corn seeds and planted them in his garden. After five days, he did not see any plants growing from the spot he planted the seeds. What could be the two possible reasons for this?

10.2 Needs for Plant Growth

Lesson 1 Conditions for Plant Growth 1: Water

After germination, a seedling grows and changes into an adult plant. What does a plant need in order to grow well? What types of conditions are necessary for plant growth?

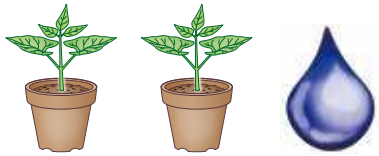
Seeds need water, air and appropriate temperature to germinate. How about young plants? What conditions do they need to grow? Let's predict!

? Do plants need water to grow?

Activity : With and without water

What We Need:

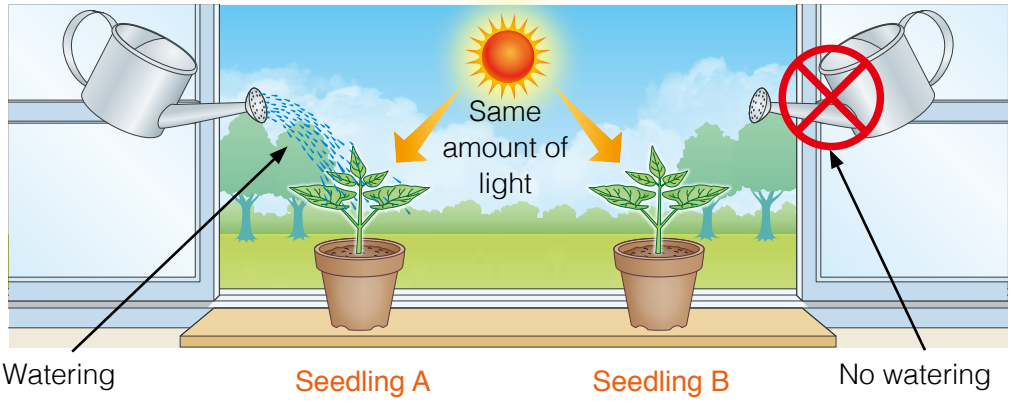
- two same sized seedlings in plant pots, water



What conditions should be the same or different in order to see if plants need water for growth?

What to Do:

1. Place seedlings A and B near the classroom window.
2. Water seedling A every day, but do not water seedling B.
3. Observe the seedlings for a week. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss what happened to the seedling with or without water added and what it needs to grow.



Result

Why do we have to control conditions?

We found out that the plant that was watered grew well but the plant that was not watered did not grow well.

Without water

With water

Different conditions

With and without water.

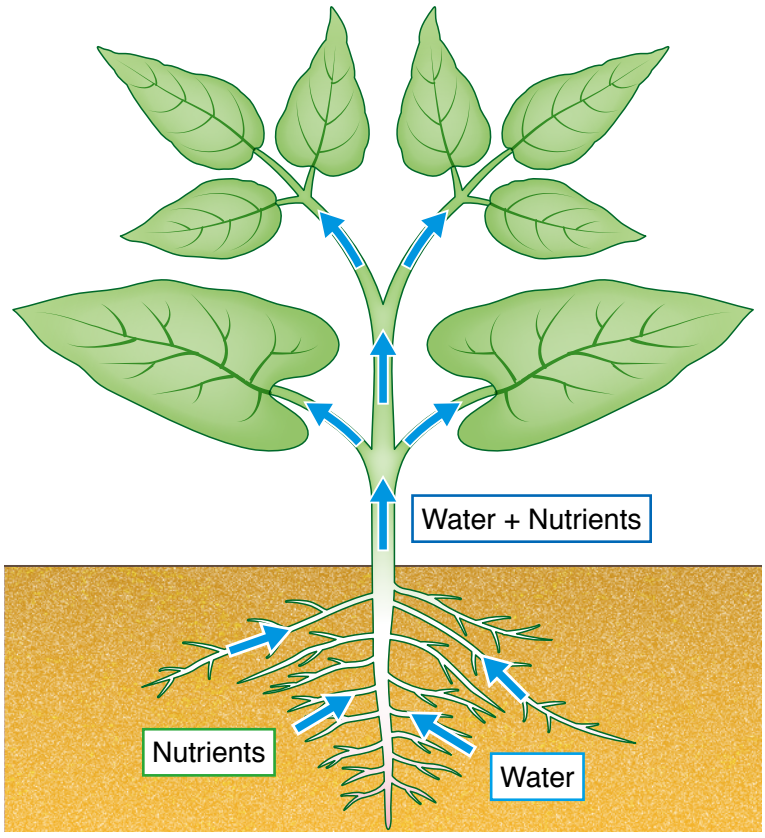
Same conditions

The same amount of light.
The same temperature.

Summary

From this result, what do plants need to grow?

Plants need water to grow. Water is the main component in plants. Without water, plants cannot grow and survive. Water can be absorbed through the roots in the soil. Water helps the plants to move nutrients from the soil up its stems and leaves. Water keeps the plant moist and flexible. Plants also use water to lower their temperature. Water also helps the plant to make its own food. The moving water inside the plant helps carry food to all parts of the plant.



Lesson 2 Conditions for Plant Growth 2: Light

Plants need water to grow. Are there any other conditions for plants to grow?

Do plants need light to grow?

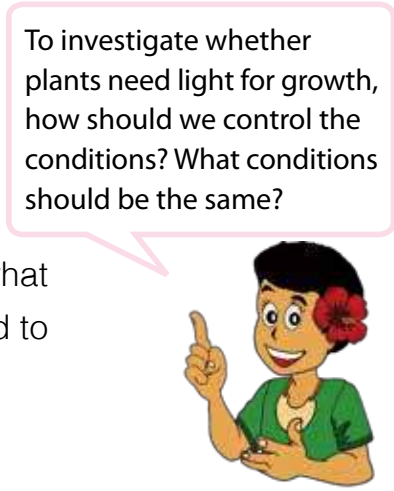
Activity : With and without light

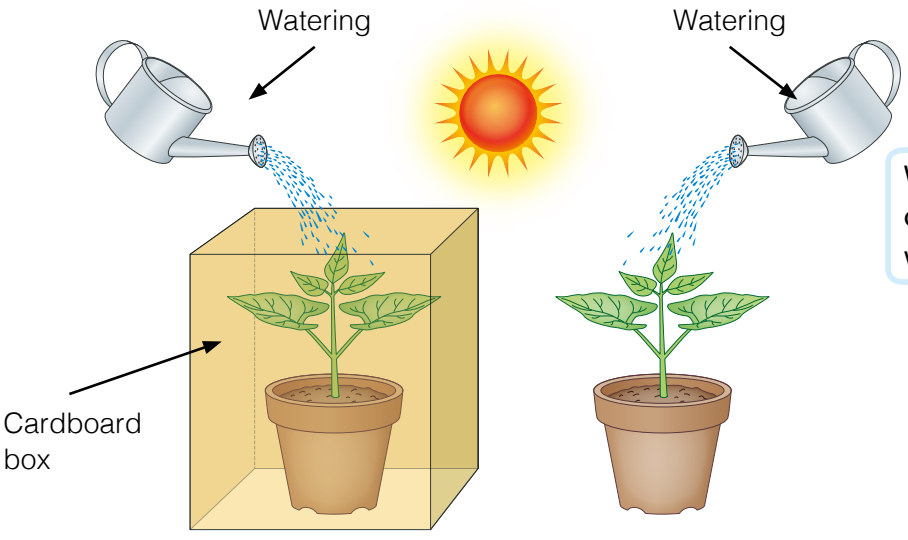
What We Need:

- two same sized seedlings in plant pots, water, cardboard box

What to Do:

1. Place both seedlings in a sunny place but cover one of the seedlings with a cardboard box.
2. Water both seedlings every day.
3. Observe the seedlings for a week. Record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss what happened to both seedlings and what plants need to grow.





Result

If the plant is covered with the cardboard box, it is dark inside the box. Why is it dark inside the box?

We found out that the plant covered with the cardboard box did not grow well but the plant that was not covered with the cardboard box grew well.

A plant covered with a box.

A plant without a box.

Different conditions

With and without light.

Same conditions

With water.

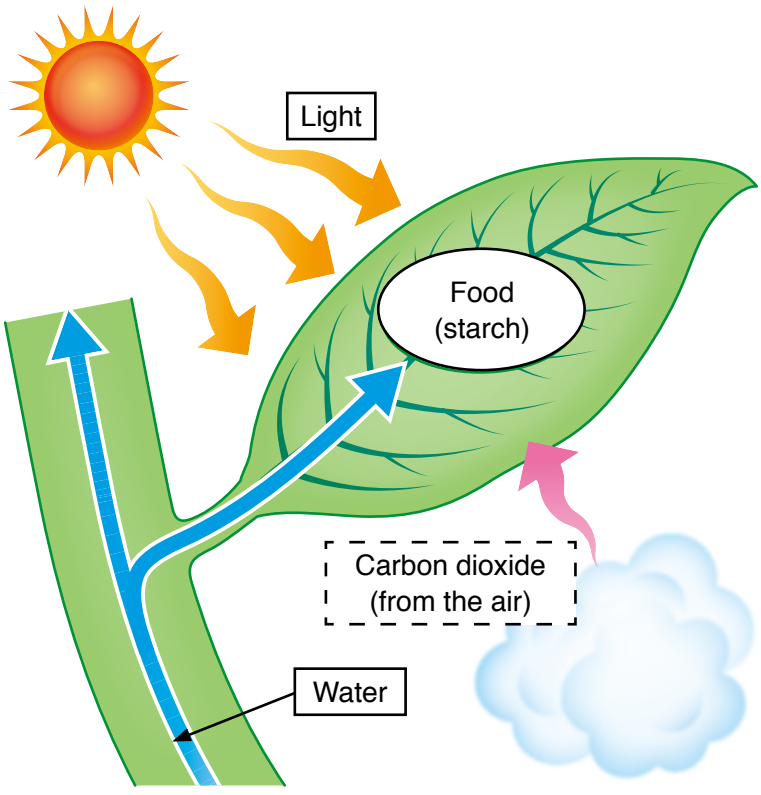
The same temperature.

Summary

From this result, what do plants need to grow?

Light is very important for plants to grow. Plants are able to make some of their own food by using light. Plants use the food as the energy for their growth.

Plants need not only water and light but also air (carbon dioxide) to make their own food for their growth. The process by which plants make their own food (starch) from carbon dioxide and water by using light is called **photosynthesis**. Photosynthesis usually takes place in the leaves.



Process of photosynthesis

Lesson 3 Conditions for Plant Growth 3: Fertiliser

Plants need water and light to grow. How can we make plants grow well? Can fertilisers work on plant growth?

Do plants need fertiliser to grow well?

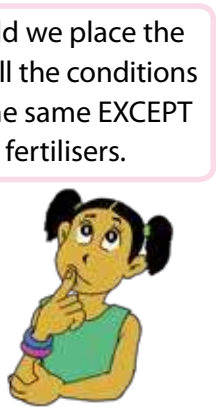
Activity : With and without fertiliser

What We Need:

- two same sized seedlings in plant pots, water, fertiliser

What to Do:

1. Form a group with your classmates and predict:
   (1) What conditions should be different or same in order to see if plants need fertilisers to grow well?
   (2) How can you investigate whether your predictions are correct or not?



2. Based on your predictions, make a plan for your investigation and try it out.
3. Observe the seedlings for a week and record your observations in your exercise book.
4. Share your ideas with your classmates. Discuss the conditions you controlled, your investigation plan and the results of your investigation.

Result

How did you control the conditions? Is your prediction correct or not?

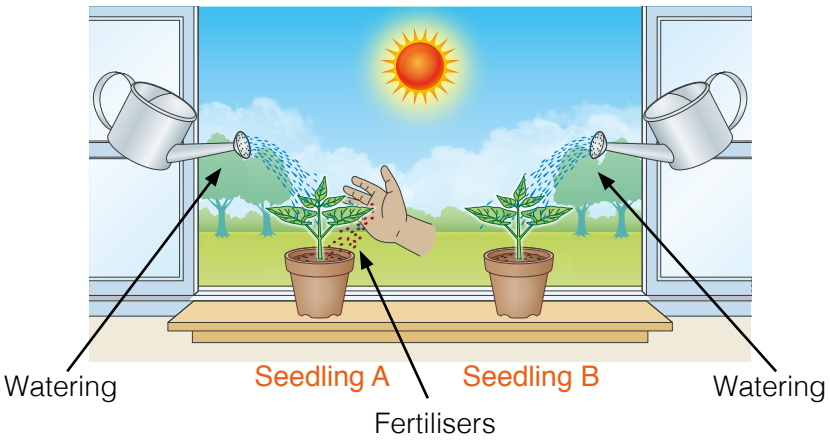
We found out that both seedlings were put in the same place and had access to water, light and temperature. Seedling A had fertiliser and Seedling B did not. The seedling with fertiliser grew very well. On the other hand the seedling without fertiliser did not grow well.

Different conditions

With and without fertilisers.

Same conditions

With water.
Same amount of light.
Same temperature.



With fertiliser

Without fertiliser

If your prediction is not correct, think about what was wrong?

Summary

Fertilisers help plants grow well. They provide nutrients such as nitrogen and potassium to plants to help boost their growth. Plants need nutrients to maintain their growth. The nutrients are necessary for producing green leaves, big flowers and strong roots.

From the three experiments we found out that plants need **water, air (carbon dioxide)** and **light** to grow. The **nutrients** also help plants grow well.

Summary and Exercise

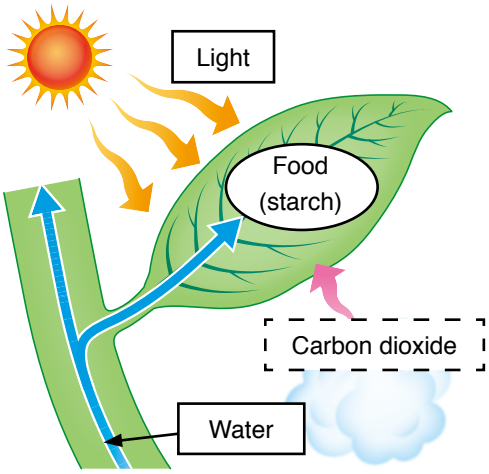
Summary 10.2 Needs for Plant Growth

Conditions for Plant Growth: Water

- Without water plants cannot grow and survive.
- Water can be absorbed through the roots from the soil and helps to move nutrients from the soil up its stems and leaves.
- Water keeps the plant moist, flexible and lowers its temperature.
- Water also helps the plant make its own food.
- The moving water inside the plant helps carry food to all parts of the plant.

Conditions for Plant Growth: Light

- Light is important for plants to grow.
- Plants are able to make their own food by using light.
- Photosynthesis is the process by which plants make their own food (starch) from carbon dioxide and water by using light.



Conditions for Plant Growth: Fertiliser

- Fertilisers help plants grow well.
- Fertilisers provide nutrients to plants and give plants an additional growth boost.
- Plants need nutrients to maintain their growth. The nutrients are necessary for making green leaves, big flowers and strong roots.

With fertiliser Without fertiliser

Summary and Exercise

Exercise 10.2 Needs for Plant Growth

Q1. Complete each sentence with the correct word.

(1) Water helps the plant move _____ from the soil up its stems and leaves.

(2) Plants can get nutrients from _____ for growth.

(3) Plant use _____ to keep itself moist and flexible.

(4) Plants need water, _____ and nutrients to grow.

(5) The process by which plants make their own food from carbon dioxide and water by using light is called _____.

Q2. Choose the letter with the correct answer.

(1) Which of the following sentences is <u>not</u> correct about the ways that plants use water? Plants use water to

A. move nutrients from the soil to its parts.

B. make their own food by using sunlight.

C. keep them growing big and tall in a short time.

D. keep them cool in hot temperature.

(2) What do plants make as their own food in the process of photosynthesis?

A. Water

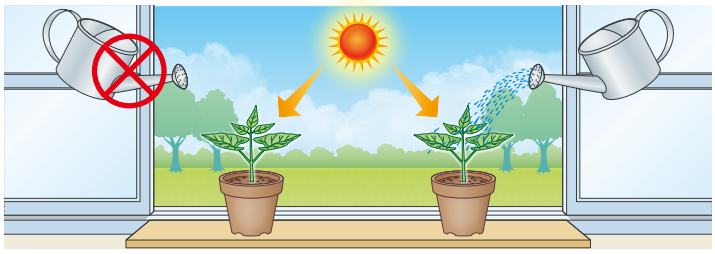
B. Starch

C. Carbon dioxide

D. Sunlight

Q3. Answer the question below.

What are the conditions in plants A and B that are similar and different?



A B

Q4. Explain what the nutrients from the fertiliser would do to the plant when applied?

How long does it take to germinate and grow Mango from a seed? What are things that affect its growth?

The pulp of the seed of a mature mango fruit must be removed. Store the seed in an open container of water at room temperature and place it in a warm place. The water must be changed every two days during this time.

After 7 to 14 days the seed will start to germinate. Once the seed begins to produce shoots, it must be planted in a pot of compost. If the seed does not sprout within this time, plant the seed in a 10 cm pot of compost and seal the pot in a plastic bag. The plant must be watered frequently and keep it sealed in a warm place for up to 60 days or until shoots appear.
After planting, it takes mango trees about one year to reach 90 to 120 cm tall. It must be transplanted. Between two to four years mango tree will produce fruit. Once the fruit appears, it takes 3 to 6 months to mature.
Mature mango trees can reach heights and spreads of more than 12 m. Temperature is the main factor in a mango tree's growth. Warmth makes them grow faster and mature more quickly. The variaties of mangoes also have certain influences. If the pulp is removed from the mango seed, it may take the seed up to 7 weeks to germinate.

Chapter Test

10. Plant Growth

Q1

Complete each sentence with the correct word.

(1) The process of the seed growing into a seedling is _____.

(2) The _____ of the seed will develop into roots and leaves.

(3) Plants need nutrients to maintain their _____.

Q2

Choose the letter with the correct answer.

(1) Water and fertiliser were given to both plants shown below. Which condition was <u>not</u> given to the plant on the right?

A. Salt

B. Sunlight

C. Oil

D. Electricity

(2) What conditions do seeds need to germinate?

A. Water, air and appropriate temperature.

B. Water, light and air.

C. Water, soil and appropriate temperature.

D. Air, appropriate temperature and light.

(3) Which of the following statements does not describe a function of water in plants? Water helps the plant

A. make its own food.

B. get rid of the nutrients into soil.

C. moves the nutrients to all parts of the plant.

D. keep moist and flexible.

(4) Which of the following is the correct explanation about cotyledon?

A. Cotyledons make the plant body cool.

B. Cotyledons provide light to make food.

C. Cotyledons develop into the leaves.

D. Cotyledons store and provide food to the seed.

Q3

(1) After germination, what three conditions do plants need in order to grow well?

1._____

2._____

3. _____

(2) What is the process by which plants make their own food from carbon dioxide and water by using sunlight?

_____

(3) What is the name of the food that the plant makes in the process (2)?

_____

(4) A seed has a hard covering that covers its inside parts. What could be the reason for the seed coat to be hard?

_____

Q4

(1) Irene prepared two set-ups as shown on the right in order to investigate the condition of seed germination. Bean seeds are placed on wet paper in setup A while bean seeds in set-up B are submerged in the water. Explain why she prepared the two set-ups in the experiment.

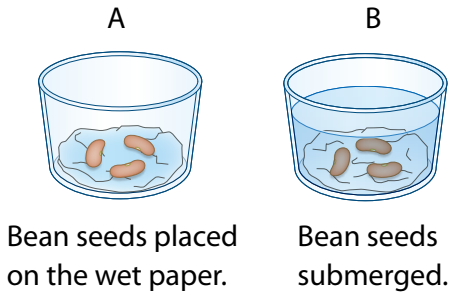
_____

_____

_____

_____

_____



Bean seeds placed on the wet paper.

Bean seeds submerged.

(2) Ambai observed that the seeds that were moisted and placed in an appropriate temperature and exposed air germinated. If she wants to keep the remaining seeds for the following year, how should she store the seeds? Write two ways to prevent the seeds from germinating.

_____

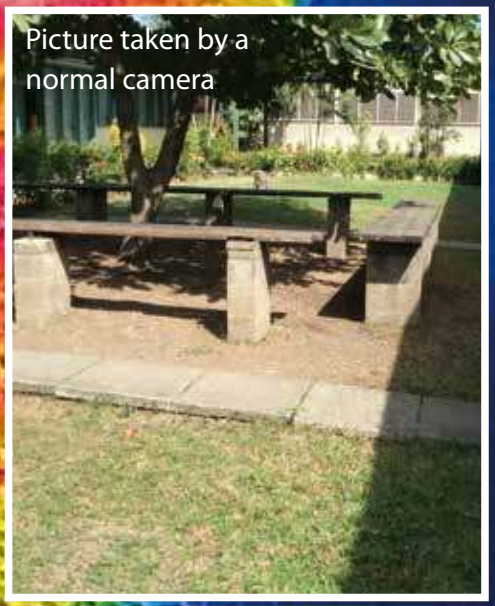
_____

_____

Chapter 11

Heat

Let's compare this image taken by 'thermography camera' with the picture on the right.



Red coloured areas show the areas of higher temperature and blue coloured area shows the areas of lower temperature.

11.1 Properties of Heat

Lesson 1 What is Heat?

When we are outside, cold wind makes our body cold. Then we might make a fire so that the fire will make our body warm.

What makes objects hot or cold?

Activity : Making something hot or cold

What We Need:

- cup of warm water, ice cubes

What to Do:

1. Draw a table like the one shown below.

	How do you feel?	Does your palm become warm or cold?
Place an ice cube on your palm		
Hold a cup of warm water		

2. Place an ice cube on your palm. Record in the table how your palm feels and whether your palm becomes hot or cold.
3. Hold the cup of warm water in both palms. Record in the table how you feel and whether your palms become hot or cold.
4. Share your findings with your classmates.

Do not use hot water.

Result

Become cold

Your palm becomes cold when you place an ice cube on it.

Become warm

Your palms become warm when you hold a cup of warm water.

Summary

Heat is a form of energy. We feel heat energy as heat. Heat always moves from warmer objects to cooler objects. For example, we feel warm when we are close to a fire because heat comes from the fire to us.

Why does our palm become cold when we hold an ice cube? This is because heat moves from our palm to the ice cube. In other words, your palm loose heat, while the ice cube gains the heat.

On the other hand, our palm becomes warm when we hold a cup of hot water. This is because heat moves from the cup of hot water to our palms.

Heat comes from the fire to the hand.

Heat moves from our palms to the ice cube.

Heat moves from the cup of warm water to our palms.

Lesson 2 Sources of Heat

Burning wood gives off heat that makes our body warm.

What are the sources that produce heat?

Activity : Find sources and the ways they produce heat

What to Do:

1. Draw a table like the one shown below.

Sources that produce heat	The ways that produce heat
wood	burning the wood

2. Write the names of things that produce heat and how they produce heat.
3. Share your ideas with your classmates. Discuss the sources of heat and the ways they produce heat.

Do you remember how you made fire by using the magnifying lens?

You eat food every day to get energy and keep your body warm. How does your body use food?

Summary

There are many kinds of sources of heat such as; the Sun, electrical appliance and fire wood. These heat sources basically change energy such as electrical energy and chemical energy into heat energy. The following are some examples of sources of heat.

The Sun

We feel warm or hot when we stand in a sunny place. This is because the Sun gives off heat energy.

Electrical Appliance

When we cook food we might use an electrical cooker. It can produce heat by changing electrical energy into heat energy.

Rubbing Your Hands Together

When we rub our hands together they get warm. This is because friction between the two hands produce heat energy.

Burning Wood

When wood is burnt, the chemical energy stored in the wood changes to heat energy.

Eating Food

Our body temperature is normally kept between 36 °C to 37°C. It means our body is also producing heat. How can our body produce heat? Our body changes food we eat into heat energy.

Lesson 3 Uses of Heat

We use heat in many ways. How do we use heat in our daily lives?

What is heat used for?

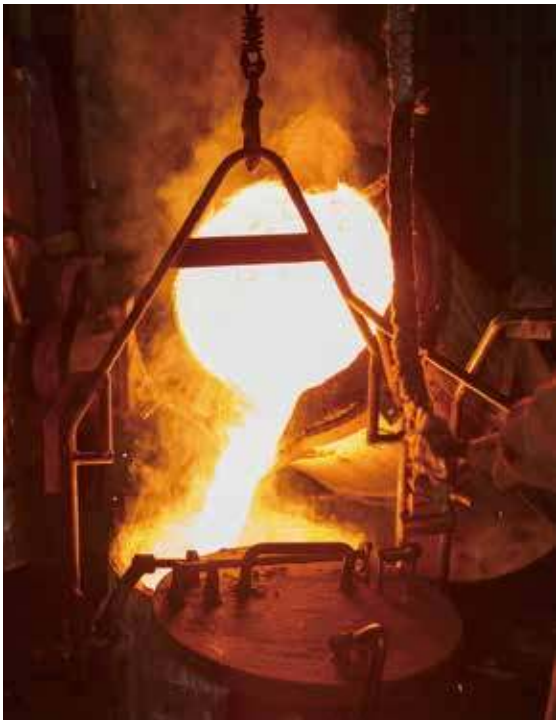
Activity : What can heat do?

What to Do:

1. Draw a table like the one shown below in your excise book.

What is heat used for in your daily life?	What is heat used for in factory and thermal power plant?

2. List what heat can do in our daily lives.
3. Refer to the pictures below and list how heat is used in factories and plants to make our daily lives convenient.
4. Share your ideas with your classmates.



Summary

We use heat for many purposes in daily lives.

Making things warm

Heat is used to warm your body on a cold morning. Heat can make things warm.

Causing a change in matter

Heat is used to cook food such as boiling water and frying eggs. When a lot of heat is added, even metal will melt. In a car factory, heat is used to melt metal so that it can be shaped to build cars.

Generating electricity

At a thermal power plant, heat is used to generate electricity which is used in our daily lives.

Heat used for making things warm

Heat is used for cooking

Heat is used for boiling water

Heat used for generating electricity

Heat is used for melting steel

Try it!

How does a refrigerator work to keep food cold?

Does 'coldness' move to food?

We studied that 'heat' can move from a warm place to a cold place.

Refrigerator can take heat away from food. The food inside the refrigerator loses its heat so that it can keep cold. Where does the heat go? The heat goes away from the refrigerator into the air.

Lesson 4 Temperature

We shiver when it is cold and sweat when it is hot. What is the temperature outside? How can we measure the temperature?

What is temperature?

Activity : Measuring temperature

What We Need:

- thermometer, warm water, cold water

What to Do:

1. Draw a table like the one shown below.

	Your prediction (°C)	Temperature (°C)
Warm water		
Cold water		
Mixture of cold and warm water		

2. Predict the temperatures of warm water, cold water and record your predictions in the table.
3. Place the thermometer in warm water. Observe how the liquid in the thermometer changes and measure the temperature.
4. Repeat Step 3 using cold water.
5. Mix warm and cold water. Predict the temperature of the mixture and repeat Step 3.
6. Based on your results, think about the following questions:
   (1) How does the liquid in the thermometer change?
   (2) What is the relationship between hotness, coldness and temperature?
7. Share your ideas with your classmates.

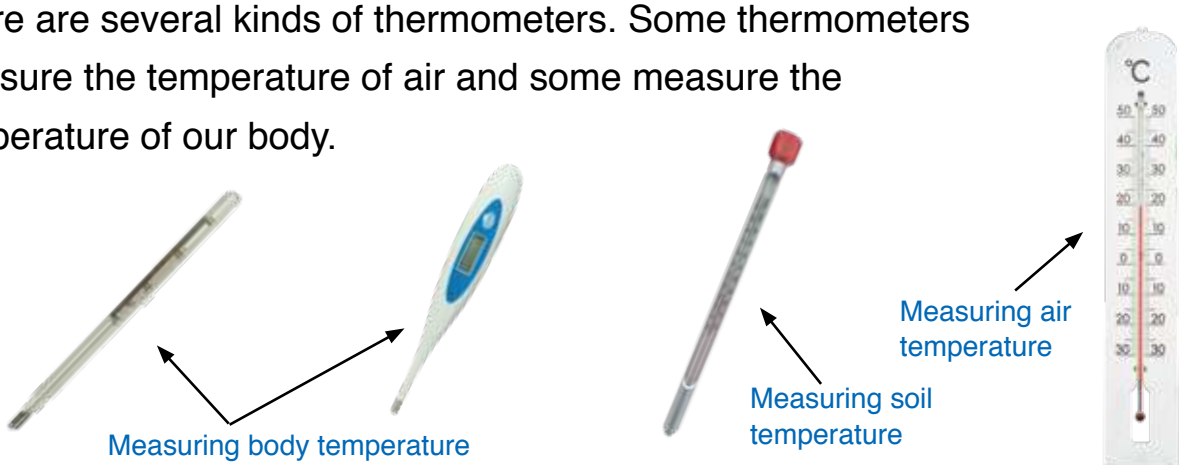
Summary

Temperature and heat are related to each other but they are different. Heat is the form of energy that is transferred from hot area to cold area.

Temperature is a measure of how hot or cold matter is. In other words, it is a measure of heat.

Temperature can be measured using a **thermometer**. A thermometer consists of a glass tube filled with a liquid, usually alcohol or mercury. The hotter the temperature, the higher the liquid rises in the tube. When it is cold, it moves down.

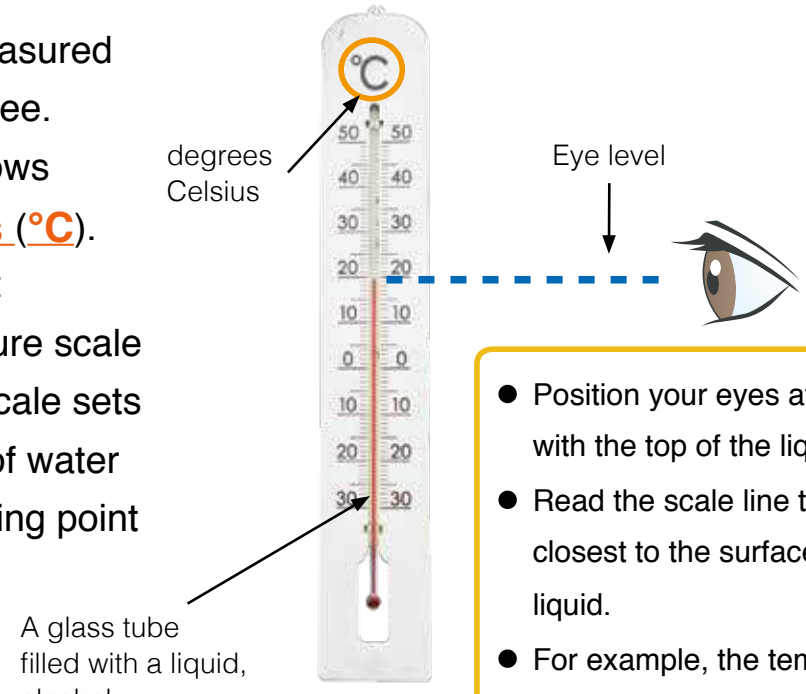
There are several kinds of thermometers. Some thermometers measure the temperature of air and some measure the temperature of our body.



Different types of thermometer

Temperature is measured in units called degree.

A thermometer shows **degrees Celsius** (**°C**). Celsius is the most common temperature scale in the world. The scale sets the freezing point of water at 0°C and the boiling point of water at 100°C.



- Position your eyes at the level with the top of the liquid.
- Read the scale line that is closest to the surface of the liquid.
- For example, the temperature on the thermometer is 20°C.

Summary and Exercise

Summary 11.1 Properties of Heat

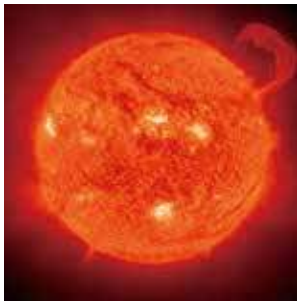
Properties of Heat

- Heat energy moves from warmer places to cooler places.
- Heat energy never travels from cool objects to warm objects.

Heat moves from the cup to the palms

Source of Heat

- Examples of sources of heat energy are the Sun, electrical appliances, burning wood, eating food and friction.
- Some forms of energy can be changed to produce heat energy.



Sun is a source of heat

Example:

1. Sunlight is changed to heat energy.
2. Electricity is changed to heat energy.
3. Chemicals in food and wood are changed to heat.
4. Rubbing of two objects cause friction to produce heat energy.

Use of Heat

- Heat is used to make things warm, to boil water and fry eggs and to melt metal to build cars.
- Heat is used to generate electricity at a thermal power plant for our daily lives.

Heat used to melt steel

Temperature

- Temperature is the measure of how hot or cold matter is.
- Temperature is measured in units called degrees Celsius (°C).
- Thermometer is the instrument used to measure temperature.
- Thermometer consists of a glass tube filled with a liquid alcohol or mercury.

Summary and Exercise

Exercise 11.1 Properties of Heat

Q1. Complete each sentence with the correct word.

(1) A form of energy that moves from warm to cool places is _____.

(2) A measure of how hot or cold something is called _____.

(3) The boiling point of water is _____ degrees Celsius.

Q2. Choose the letter with the correct answer.

(1) Which sentence is <u>not</u> true about heat energy?

A. Heat can only move from warm to cool place.

B. Heat energy can be felt as warmness.

C. Heat moves from cool to warm place.

D. Heat can change states of matter.

(2) What does a thermal power plant provide for our daily use? It provides

A. light energy.

B. sound energy.

C. heat energy.

D. electricity.

Q3. Answer the following questions.

(1) What is the instrument used to measure how hot or cold an object is?

(2) How is fire used in daily life? Give two examples of how fire is used as heat energy.

(3) Give two sources of heat energy.

Q4. Our hands become cold when we hold a cold drink, ice block or an ice cube. Why do our hands become cold when we hold cold things for sometime?

11.2 Heat Transfer

Lesson 1 Heat Transfer 1: Conduction

Heat moves from warmer to cooler places. When you cook food using a frying pan with the burner, the food gets hot. How does the heat from the burner transfer to the food on the frying pan?

How does heat transfer?

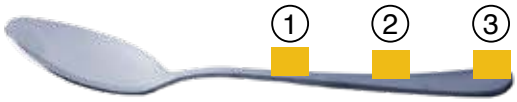
Activity : Melting margarine on a spoon

What We Need:

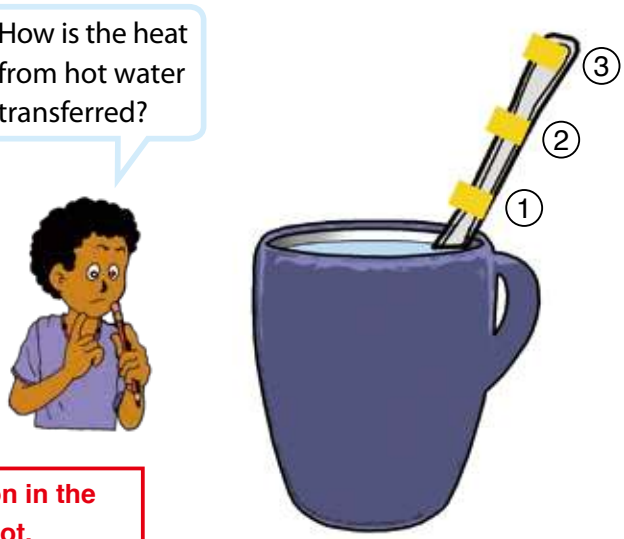
- a metal spoon, margarine, a cup of hot water (~60°C)

What to Do:

1. Place three small pats of margarine on the spoon handle at equal distances.
2. Predict what will happen to three pats of margarine at these three spots. Record your predictions in your exercise book.



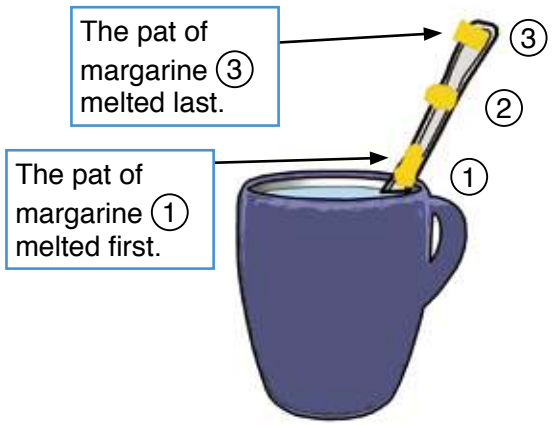
3. Place the metal spoon into hot water and observe the three pats of margarine.
4. Record your observations in your exercise book.
5. Share your results with your classmates.



Be careful when you touch the spoon in the cup of hot water because it will be hot.

Result

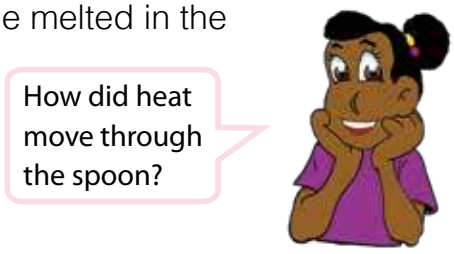
We found out that the pats of margarine on a spoon handle melted in the order of ①, ② and ③.



Discussion

Think about the following questions based on your results.

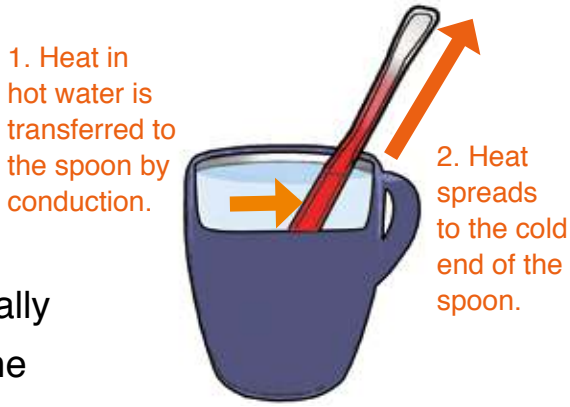
1. What is the source of heat in this activity?
2. Which pat of margarine is closest to or furthest from the source of heat?
3. Why did the pats of margarine on the spoon handle melted in the order of ①, ② and ③?



Summary

The transfer of heat from one place to another through matter is called **conduction**. Conduction occurs mainly in solids. Heat is transferred from warmer places to colder places through conduction until they are both at the same temperature.

For example, in the activity, heat from the hot water is transferred to one end of the spoon by conduction and the heat is gradually transferred to the cold end of the spoon. The spoon in a cup of hot water becomes warmer. When we cook food, heat from the burner is transferred to the bottom of the pan through conduction. The heat is transferred throughout the pan and into the food. So, the pan and the food become warmer and hotter.



Conduction

Cooking is an example of conduction.

Lesson 2 Heat Transfer 2: Convection

Conduction occurs mainly in solids. How about liquids and gases? What type of heat transfer would occur in liquids and gasses?

How does heat transfer in liquids and gases?

Activity : Observing how warmed water moves

What We Need:

- transparent plastic cup, water, dye, candle, dropper or straw

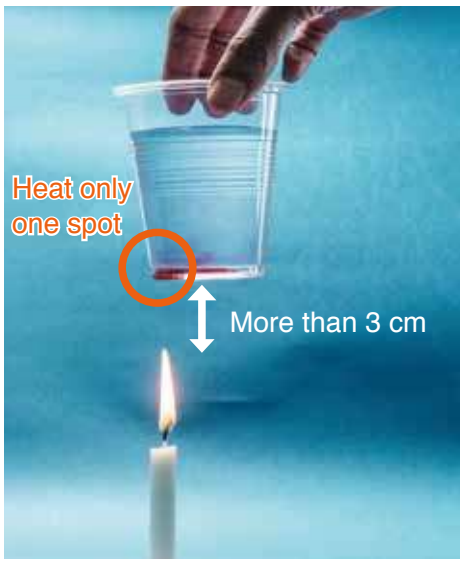
What to Do:

Hold the plastic cup as shown in the picture when heating the cup to avoid getting burnt.

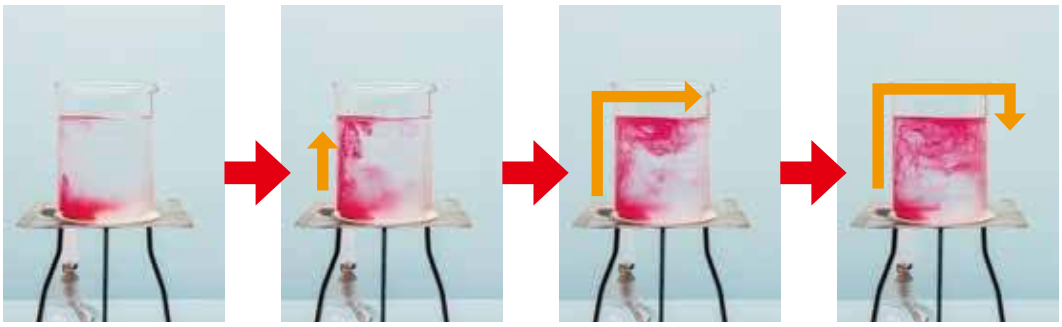
1. Predict how heat is transferred in water and record your predictions in your exercise book.
2. Put some drops of dye at the bottom of water in a plastic cup using a dropper or a straw as shown in the picture on the right.

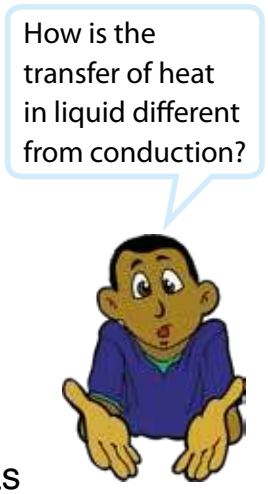
A dye makes it easier to observe the movement of heat in the water.

3. Bring the cup close to a flame and heat the cup of water at the spot where you put some drops of dye. Keep it more than 3 cm away from the top of the flame.
4. Observe and sketch how the dye moves inside the cup.
5. Share your results with your classmates. Discuss how heat is transferred in water.



Result





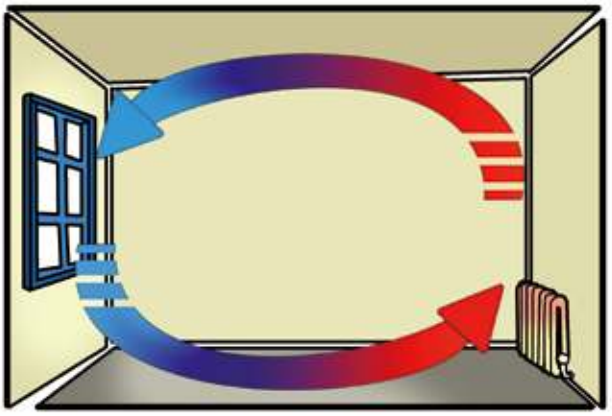
We found out that when we heated water, the warmed part of water rises upward. Water near the surface of water went down. This process continues until all the water in the cup was heated.

Summary

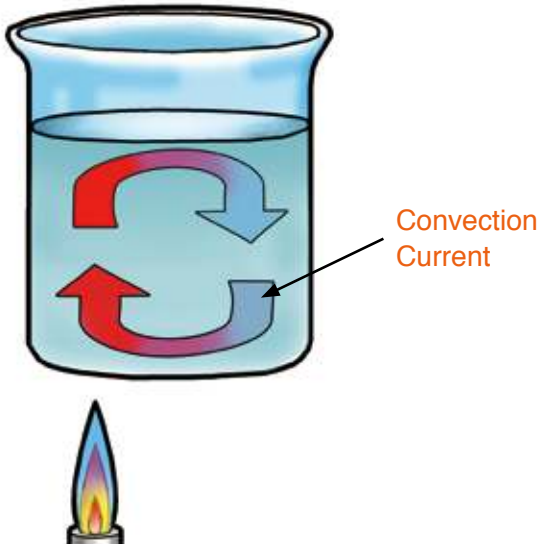
The transfer of heat through liquids and gases such as water and air is called **convection**. Convection occurs when heat is transferred by the movement of liquids or gases.

For example, the picture on the right shows the convection of air. Air is warmed by the stove and the warm air rises. As the air cools, it goes down. The cool air is warmed by the stove again and rises. This process continues until all the air in the room has been heated.

The movement of water or air created by the process of convection is called **convection current**.



Convection of air



Heat is transferred in liquids through convection.

Lesson 3 Heat Transfer 3: Radiation

When we stand in the sunlight, we feel the warmth of the Sun. Why are we warmed by the Sun even though it is millions of kilometres away in space?

What is another way of heat transfer?

Activity : Inferring how heat transfers

What to Do:

1. Draw the table below:

Situation	Is heat transferred?	Why did you choose the option?
(1) Heat from a fire to people		
(2) Heat from the Sun to the Earth		

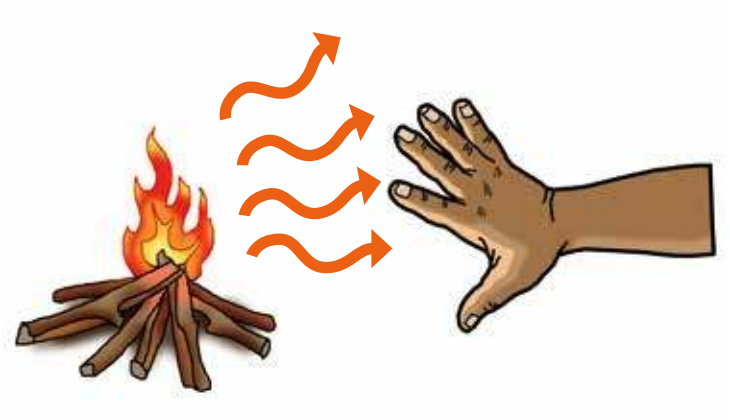
2. Study the pictures below in situations (1) and (2).
3. Think about how heat is transferred from a heat source and choose the best choice from the options: a) conduction, b) convection and c) other ways.
4. Write down your choice in the table with your reasons.
5. Share your ideas with your classmates. Discuss how heat is transferred in each situation.

(1) Heat from a fire to the people.

(2) Heat from the Sun to the Earth.

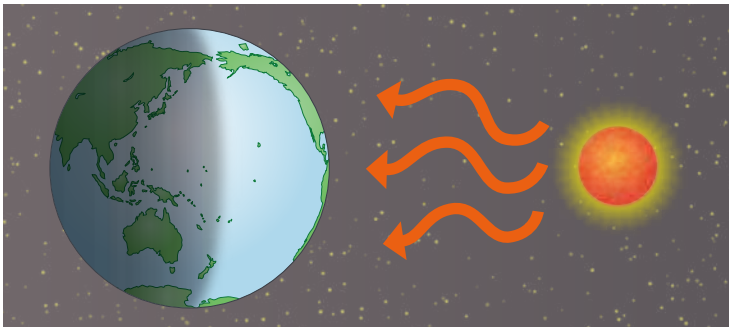
Summary

The transfer of heat in the form of waves through air or empty space is called **radiation**.
When we are near a fire, we receive and absorb radiation from the fire. Then we feel the warmth.



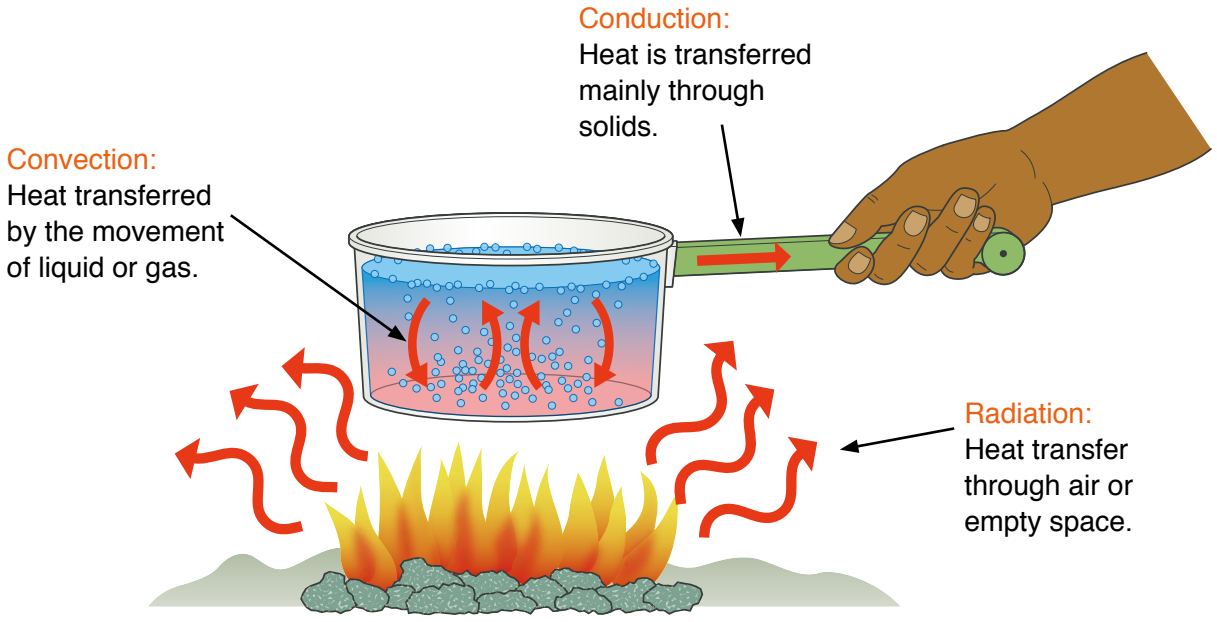
Radiation from the fire.

Both conduction and convection need matter such as solids, liquids and gases to transfer energy but radiation does not require matter.
There is no air in the space.
The Space is an empty space.
The Sun give off heat. The heat is transferred through space to the Earth by radiation.



The heat is transferred through empty space.

Heat can be transferred in three ways: conduction, convection and radiation. The following diagram shows an example of the three ways in which heat is transferred.



Three ways of heat transfer.

Summary and Exercise

Summary 11.2 Heat Transfer

Heat Transfer

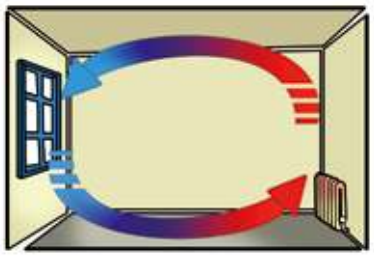
- Three ways of heat transfer to receive or give off heat are; conduction, convection and radiation.

(1) Conduction

- Conduction is the transfer of heat from one place to another through matter.
- Heat is transferred from warmer places to colder places through conduction until they are both at the same temperature.

  Example: Heat from the burner is transferred to the pan. The heat is transferred throughout the pan and into the food.

(2) Convection



- Convection is transfer of heat through liquids and gases such as water and air.
- Convection occurs when heat is transfered by the movement of liquids or gas

  Example: Air is warmed by the stove and the warm air rises and as the air cools it moves down. The cool air is warmed again by the stove and rises. This process continues until all the air in the room has been heated.

(3) Radiation

- Radiation is the transfer of heat in the form of waves through air or empty space.

  Example: We recieve and absorb radiation when we are near the fire. This makes us feel warm.

Exercise 11.2 Heat Transfer

Q1. Complete each sentence with the correct word.

(1) The transfer of heat through liquids and gases is called _____.

(2) Heat from the Sun travels through space and reaches the Earth by _____.

(3) The transfer of heat from one place to another through matter is called _____.

Q2. Choose the letter with the correct answer.

(1) When you put a metal spoon into the hot water, the spoon gradually becomes warm. Which type of heat transfer is occurring?

A. Conduction

B. Absorption

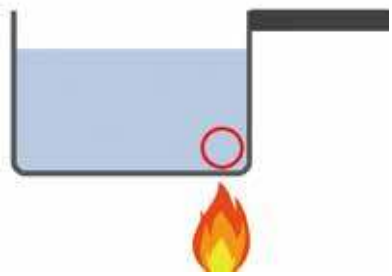
C. Radiation

D. Convection

Q3. Answer the following.

(1) When you sit near a fire you can feel the heat. What type of heat transfer is this?

(2) Study the picture on the right. Water in the pot is heated by the fire. Draw an arrow on the picture to show how the heated water moves by convection.



Q4. Study the picture of the frying pan on the right. Infer the reason why the pan has a handle, using the word 'conduction'.

How is heat produced? Can heat be absorbed?

What do you notice when lighting a candle? The beginning energy causes oxygen and wax to react which produces carbon dioxide, water and heat. When you put a laundry detergent powder in your hand and add water you can feel the heat. This type of change gives off heat.

There are changes that give off heat while other changes take in or absorb heat. Changes that release energy into the environment in the form of heat cause the reaction products and its surroundings to become hotter. It feels warm or hot or may even explode. Some examples of heat been given off are; lighting a match and burning wood.

Heat can also be taken in or absorbed. It is a change in which heat energy is absorbed from its environment. The absorbed energy provides the beginning energy for the change to occur. An example of heat taken in includes dissolving salt. When salt is dissolving into water, the temperature of the water decreases. Other examples include melting ice cubes and evaporating liquid water.

An example of change in which heat is given off.

A burning candle

Examples of change in which heat is taken in.

Dissolving salt

Melting ice cube

Chapter Test

11. Heat

Q1

Complete each sentence with the correct word.

(1) We feel warm when we are near a fire because _____ energy from the fire is transferred to us.

(2) The transfer of heat mostly in liquids and gases is called _____.

(3) The transfer of heat by _____ occurs mainly in solids.

(4) The measure of how cold or hot an object is called _____.

Q2

Choose the letter with the correct answer.

(1) Which is <u>not</u> a source of heat energy?

A. A lit kerosene lamp

B. Cooling a metal with water

C. Burning a wood

D. Burning newspapers

(2) What is radiation? It is the transfer of heat

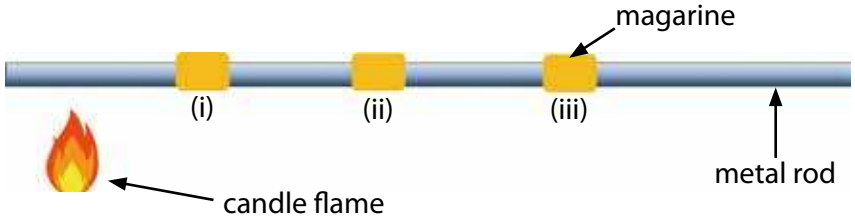
A. in a form of waves through air or an empty space.

B. by movement of liquid and gases.

C. through one solid to another that are touching.

D. that occurs in solid only.

(3) Placed at different parts of the metal rod were pats of magarine at (i), (ii) and (iii). What is the correct order of the pats of magarine that would melt when heated as shown below?



A. (i) → (ii) → (iii)

B. (ii) → (iii) → (i)

C. (iii) → (i) → (ii)

D. All places at the same time

Q3

(1) Study the diagram on the right.

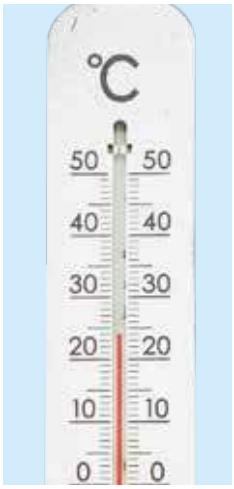
(i) What is this instrument? _____

(ii) What is the unit used in this instrument?

_____

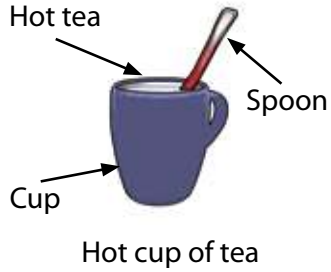
(iii) What is the reading shown on the instrument?

_____



(2) Study the diagram below. The hot cup of tea is held by hand and cold metal spoon dipped in the tea.

(i) Identify the object losing heat and gaining heat in the picture.

Example	Object that is losing heat	Object that is gaining heat
 Hot cup of tea		

(ii) How does the heat move from one part of the object to another in the picture?

_____

_____

Q4

Moses says that ice cube cools a drink because the cold from the ice gets into the drink. Evaluate his statement and explain your idea.

_____

_____

_____

Science Tool Box

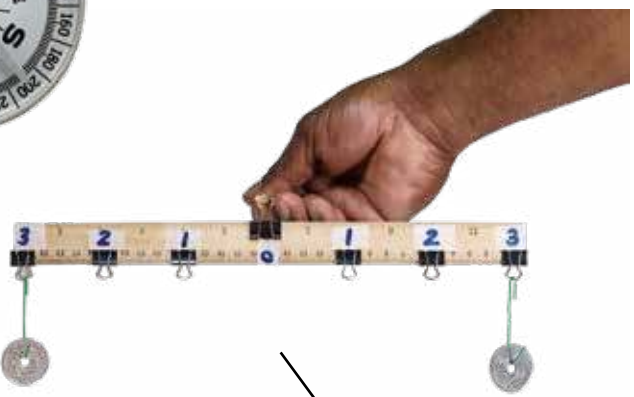
1. How to use a Thermometer
2. How to use a Compass
3. How to use a Tape measure
4. How to make a Beam balance
5. How to read a Bar Graph

Let's check and learn how to use the science tools here.

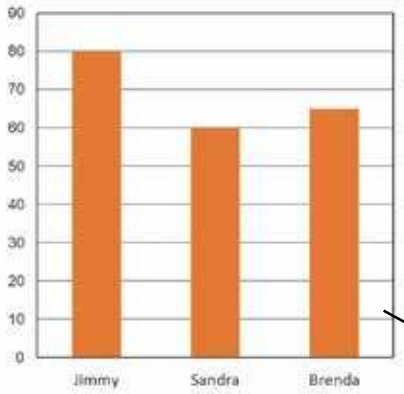
Tape measure

Thermometer

Compass



Beam balance



Bar Graph

How to use a Thermometer

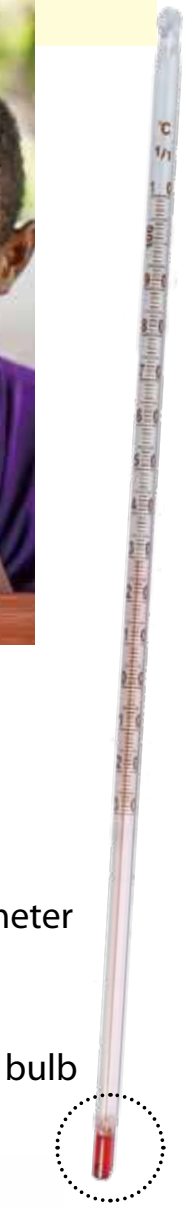
1. What is a thermometer?

A thermometer is an instrument used to measure temperature. A thermometer consists of a glass tube with marks on it. When the liquid in the glass tube is heated, it expands and begins to rise up the tube. Temperature is measured in degree Celsius [°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.

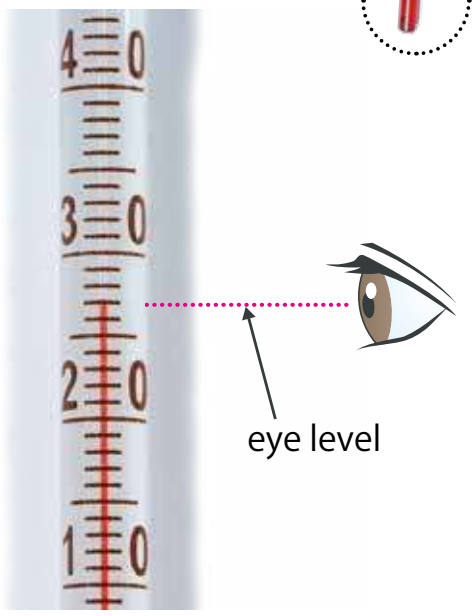


STEP 2:

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

Compass

1. What is a compass?

A compass is an instrument used 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.

2. Finding directions

STEP 1:

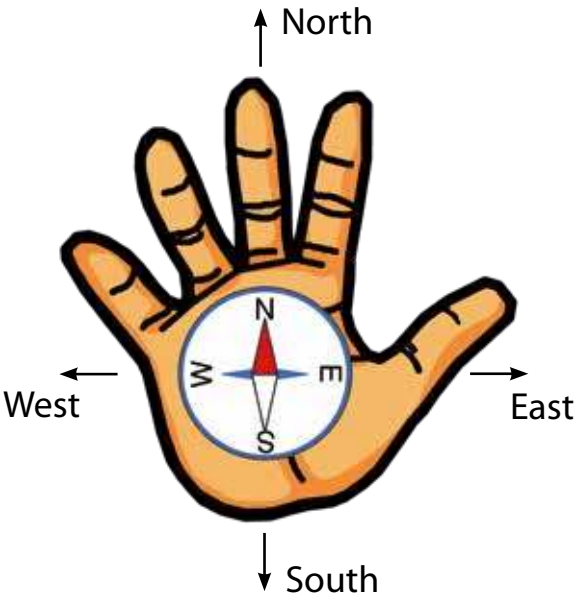
When you want to face North, place the compass flat on your palm and hold your palm in front of your chest as shown in the picture on the right.

STEP 2:

Turn your body until the magnetic needle comes to the North sign on the dial. When the needle overlaps the North sign on the dial, you are facing North.

STEP 3:

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 use a Tape measure

1. What is a Tape Measure?

A tape measure is also called a measuring tape. It is a type of flexible ruler. Tape measures may be in metric (centimetres and metres) and imperial units (Inches and feet).

2. Finding the circumference around your partners head

STEP 1:

Have your partner to stand in front of you with head up straight.

STEP 2:

Hold on one end of the tape that begins with 0 and wrap the tape around your partner's head just above the top of the ears.

STEP 3:

Find the line where the tape measure begins to wrap over itself or the end of the length of the object.

STEP 4:

Record the circumference of your partner's head to the nearest centimetre.

How to make a Beam Balance

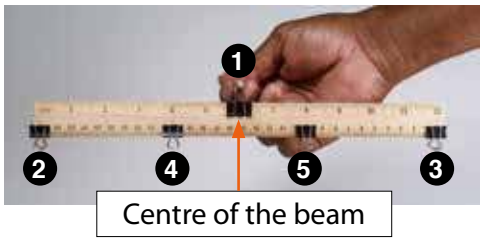
1. What is a Beam Balance?

A beam balance is a type of lever that can be used to compare weights of two objects. It has an arm or bar with a centre point, called a fulcrum. If one side of the lever is pushed down, the other side is pushed up.

2. Making a Beam Balance

STEP 1:

Use a 30 cm ruler as the beam balance. Put the 1st bull dog clip approximately in the centre of the ruler. Put a round stick through the clip to check if the beam is balanced properly. If it is not balanced, adjust the position of the 1st bulldog clip to the left or right sides.



STEP 2:

(1) From the centre on the beam, measure and mark every 5 cm to the right end and to the left end. On the opposite edge of the 1st clip, put the 2nd and the 3rd clips at both ends of the ruler with their centres on the marks. Check if the beam is balanced.

(2) On the marks on either sides of the centre, put the 4th clip and the 5th clip with their centres on the marks and also on the same edge as the 2nd and 3rd clips. Check if the beam is balanced.

(3) Between the two clips on the right side and on the left side, put the 6th clip and the 7th clip with their centres on the marks and on the same edge as the 2nd, 3rd, 4th and 5th clip. Check if the beam is balanced.

STEP 3:

Label the centre clip '0' with a sticker. From '0', label the clips on the left side and right side of the beam as '1', '2' and '3' with stickers.

STEP 4:

Use paper clips as 'hooks' to hang and balance 1 Kina coins on distance 3 on both the left side and right side of the beam.

How to read a Bar Graph

1. What is a Bar Graph?

A bar graph helps to compare data. The bar graph below shows the weight of three students.

2. Reading a Bar Graph

STEP 1:

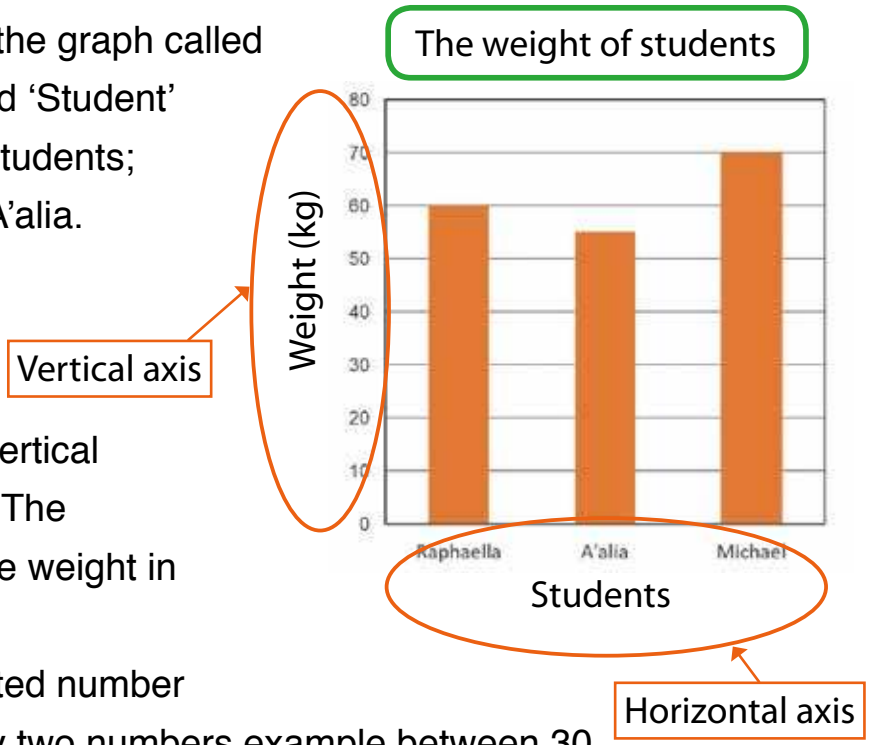
Read the title of the bar. What is the bar graph about?

STEP 2:

Study the bottom part of the graph called the horizontal axis labeled 'Student' that shows the name of students; Michael, Raphaella and A'alia.

STEP 3:

(1) Study the numbers on the left side of the graph called the vertical axis labeled 'Weight'. The number represents the weight in kilograms.



(2) The highest represented number is 80 kg. Between any two numbers example between 30 and 40 the interval amount is 10 kg.

STEP 4:

(1) Study the bar graph. Look at the bar on label as 'Raphaella' and move across to the vertical axis to identify the weight in numbers. The bar shows that the weight of Raphaella is 60 kg.

(2) Read the question asked. Example: Which student is the heaviest? Compare all the heights of the bars. Follow the highest bar down to identify the name of the student on the horizontal axis. Michael is the heaviest among the students and his weight is 70 kg.

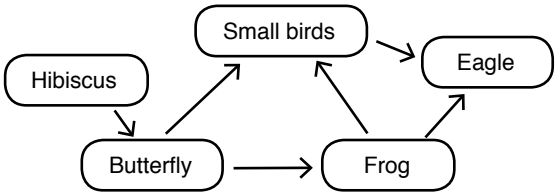
Answer of Exercise

Chapter 1. Topic 1. Page 18

Q1. (1) energy (2) Sunlight (3) food chain (4) food web

Q2. (1) B (2) D

Q3.



Q4. In a food chain the energy begins from the sun and the arrow showing the transfer of energy is only in one direction. However, in a food web which is made up of several food chains more arrows connect more animals and is more complex.

Chapter 2. Topic 1. Page 28

Q1. (1) gravity (2) friction

Q2. (1) A (2) D

Q3. The ball decelerates or decreases the speed due to friction between surface of the ground and the ball.

Q4. (Expected answers) The car accelerated because the speed of the car increased as the time went by on his record.

Chapter 2. Topic 2. Page 36

Q1. (1) lever (2) effort (2) load

Q2. (1) A (2) C

Q3. (1) Eight (8) one kina coins should be hanged on 1 of the right arm.
(2) Distance 2

Q4. (Expected answers) By the girl moving to sit closer to the fulcurm and the boy sits at the far end of the see-saw.

Chapter 3. Topic 1. Page 46

Q1. (1) cloud (2) altitude or height (3) weather

Q2. (1) A (2) D

Q3. (1) Cumulonimbus (2) It ranges from low level to high level attitude.

Q4. (Expected answer) Her prediction would be bad weather with precipitation/ rain

Chapter 3. Topic 2. Page 52

Q1. (1) season (2) rainfall (3) dry (4) warmest or hottest

Q2. (1) A (2) D

Q3. The leaves turn brown and drop to the ground.

Q4. (Expected answer) The seeds get enough water to germinate and grow well in the wet season.

Chapter 4. Topic 1. Page 64

Q1. (1) chemical (2) ash (3) different (4) properties

Q2. (1) D (2) A

Q3. (1) The burning sugar (2) Caramel
(3) Heating sugar produces a caramel that has different preperties as a new kind of matter.

Q4. The chemical change takes place inside plant because new matter are produced.

Chapter 5. Topic 1. Page 78

Q1. (1) states (2) solid (3) shape (4) 0°C

Q2. (1) B (2) D

Q3. Condensation

Q4. The hot water that was poured over

the top of the bottle made the bottle expand and he was able to open the bottle easily.

Chapter 6. Topic 1. Page 92

Q1. (1) Reproduction (2) Fertilisation (3) Womb (4) Heredity

Q2. (1) B (2) C

Q3. (1) Heredity (2) Eye colour, hair colour, blood type, shape of nose, types of hair (curly or straight), etc.

Q4. When an egg meets with a sperm, the egg becomes a fertilised egg. Human life begins with a fertilised egg. In human, fertilisation takes place inside the body of the female

Chapter 7. Topic 1. Page 108

Q1. (1) series (2) symbol (3) appliances (4) positive

Q2. (1) A (2) D

Q3. (1) parallel circuit (2) bulb (3) dry cell/ battery

Q4. (Expected answer) Series connection has the brightest light while the parallel and the single dry cell the brightness of the bulbs were the same.

Chapter 8. Topic 1. Page 122

Q1. (1) crust (2) magma (3) metamorphic (4) sedimentary

Q2. (1) D (2) C

Q3. (Expected answer) The mineral used to make electrical wires is copper.

Q4. (Expected answer) Igneous rock is formed when melted rock in the earth cools and hardens. Examples of Igneous rocks formed when melted rocks cool and harden are basalt and granite.

Chapter 8. Topic 2. Page 128

Q1. (1) fossil (2) mould (3) bones (4) teeth

Q2. (1) A (2) B

Q3. (Expected answer) (1) Plant fossil (2) Dinosaur (or Tyrannosaurus) (Expected answer) (3) When living thing dies, it is buried in sediments. The sediments turn into a rock. The hard parts of the living thing dissolve completely and the shape is left in the rock. The shape of a living thing found in a rock is called a mould.

Chapter 9. Topic 1. Page 146

Q1. (1) habitat (2) ocean (3) rainforest (4) grassland (5) freshwater

Q2. (1) C (2) A

Q3. (1) grassland (2) rainforest (3) freshwater (4) ocean

Q4. (Expected answer) If there is a big bush fire in the forest some animals will run away from their habitat while the others will be burnt to death./ If there is a big bush fire in the forest habitat most of the plants will be burnt death.

Chapter 9. Topic 2. Page 158

Q1. (1) Adaptation (2) Habitat/Environment (3) Mimicry (4) Behaviour

Q2. (1) A (2) A

Q3. To scare away birds that want to eat them.

Q4. The animals such as bears go into a long deep sleep through the winter to survive with little or no food.

Chapter 10. Topic 1. Page 172

Q1. (1) seed coat (2) water (3) oxygen (4) temperature

Q2. (1) D (2) A

Q3. (Expected answer) (1) Same conditions - Seeds are given water/ Seeds are exposed to light and brightness/ Seeds are exposed to same temperature (2) Different conditions - A. Seeds are not exposed to air / B. Seeds are exposed to air.

Q4. (Expected answer) Seeds germinate because they are exposed to water, air and proper temperature./ Seeds germinate because they are given water, air and left in good temperature./ Seeds can germinate because they have water, air and good temperature.

Chapter 10. Topic 2. Page 180

Q1. (1) Nutrients (2) Fertiliser (3) Water (4) Sunlight (5) Photosynthesis

Q2. (1) C (2) B

Q3. (Expected answers) (1) Same conditions - light and brightness, air, temperature and fertiliser(soil) (2) Different conditions - Water

Q4. (Expected answers) The nutrient from the fertiliser makes the plant leaves green, the flowers big, and the roots strong./ Nutrients from fertiliser makes plant leaves green, big flowers and strong roots.

Chapter 11. Topic 1. Page 194

Q1. (1) Heat (2) Temperature (3) 100 / Hundred

Q2. (1) C (2) D

Q3. (1) Thermometer (2) Fire can be used to keep us warm at night or during cold weather. / Fire is used to cook food, etc. (3) The Sun / fire / electrical appliance, etc.

Q4. Our hands become cold because heat in the hands is transferred to the cold ice cubes.

Chapter 11. Topic 2. Page 202

Q1. (1) Convection (2) Radiation (3) Conduction

Q2. (1) A

Q3. (1) Radiation (2)

Q4. (Expected answers.) Because the handle does not get too hot to grab it. There is less conduction of heat on the handle due to far distance from the heat source.

Glossary

Accelerate is to increase in speed. 24

Adaptation is the use of body part or a behaviour that helps an organism survive in its environment or a new environment. 148

Alloy is a mixture of two or more metals. 120

Autumn (fall) is the season that follows summer. The weather slowly gets colder. 48

Behaviour is the way organisms act in a certain situation. 148

Boiling point is the temperature at which a liquid changes into a gas. ... 76

Camouflage is a type of animal adaptation that use the colours, patterns or shape of body parts of an animal that allows it to blend in with its surroundings. 152

Carbon dioxide is a colourless and odourless gas produced by people or animals when they breathe out. 12

Cast is the opposite of its mould. 124

Chemical change is a change that produces new kinds of matter..... 58

Circuit diagram is a diagram representing an electrical circuit drawn using symbols. 104

Cloud is made of water droplets or ice crystals floating in the sky. 42

Condensation is the process that causes a matter to change from gas to liquid. 76

Conduction is the transfer of heat from one place to another through matter. 196

Convection is the transfer of heat through liquids and gases such as water and air. 198

Convection current is the movement or flow of water or air created by the process of convection. 198

Core is the hottest, innermost layer of the Earth. 114

Cotyledon is the part of a plant that stores food. 164

Crust is the thinnest outer layer of the Earth. 114

Decelerate is to reduce in speed or slow down. 24

Glossary

Degrees Celsius is the unit of measurement used to measure temperature. 192

Desert is a large, hot, dry area of land with very little water and very few plants. 150

Dry season is a time of year when little rain falls. 48

Effort is the force applied to a machine to do work. 30

Egg is the female reproductive cell. 84

Electric current is the flow of electricity. 98

Electric circuit components are basically the various parts of circuit such as dry cells, bulb, switch and motor..... 103

Embryo in animals is an early developmental stage of an animal while it is within the mother's womb (uterus) or in the egg.... 88

Embryo in plants is the tiny plant inside the seed. 164

Energy pyramid is a representation of the flow of energy from one energy level to another. 16

Evaporation is the process that causes a matter to change from liquid to a gas. 76

Fertilisation is the process where the egg meets the sperm and joins it. 84

Foetus is the unborn offspring of an animal that develops from an embryo. 88

Food chain is the path of food energy from the plants to animals. 14

Food web consists of several food chains linked to each other. 16

Fossil is the remains of once a living thing. 124

Freezing is the process that causes a matter to change from a liquid to a solid. 76

Freezing point is the temperature at a certain point where liquids start to change to solid..... 74

Freshwater habitats are natural water sources that do not contain salt. 136

Friction is the force that occurs when two surface of objects rub against each other from opposite directions. 24

Germination is the process of the seed growing into a seedling. 165

Grassland habitats are an area mostly covered by grasses with few or no trees. 142

Habitat is the part of a natural environment where a plant or an animal lives. 134

Heat is a form of energy. 186

Heredity is the way in which traits are passed on from parents to young organisms..... 90

Hibernation is the state of inactivity where animals go to a deep sleep. 156

Igneous rock is a rock formed when melted rock from inside the Earth cools and hardens. 118

Lever is a type of simple machine that makes an object move with less force. 29

Load is the force applied on the lever by the object to be lifted. 30

Magma is melted rock form in the Earth or a result of volcanic eruption. 118

Mantle is the thick, hot layer of the Earth. 114

Melting is the process that causes a matter to change from a solid to a liquid. 76

Melting point is the temperature at a certain point where solids start to melt..... 74

Metamorphic rock is a rock formed when a rock inside the Earth has been changed by heat and pressure. 118

Migration is the movement of fish, bird and other animals from one place to another. 156

Mimicry a type of animal adaptation that allows an animal to look like another kind of animal. 154

Mineral is a valuable or useful substance that is dug out of the ground. 114

Motor is an electrical device that produces power to rotate things using electricity. 97

Mould is the shape of a dead living thing found in a rock. 124

Ocean habitat is the area with salty water. 138

Glossary

Organism is any living thing such as plant, animal and other living things..... 144

Ovary is the female body part that contains thousands of eggs. 86

Parallel circuit is a circuit in which the electric current flows in two or more paths. 100

Penis is the male body part that passes semen out of the man's body. ... 86

Photosynthesis is the process by which plants make their own food (starch) from carbon dioxide and water by using light. 176

Radiation is the transfer of heat in the form of waves through air or empty space. 200

Rainforest habitat is an area with a lot of rain, warm climate and tall trees. 140

Reproduction is the process where living things produce young ones similar to themselves. 83

Reproductive system is the group of the body parts that work together for the purpose of reproduction. 86

Rock is a naturally formed, non-living material as part of the Earth crust. 114

Rusting is the red or orange coating that forms on the surface of metal due to chemical change between metal surface and the environment. 60

Season is a period of the year that is divided by typical weather conditions. 48

Sediment is a collection of sand particles of rock and small bits of soil piled up over time. 118

Sedimentary rock is a rock formed when sediments are glued together and become hard. 118

Seed coat is the hard outer layer of the seed covering the embryo and the cotyledon. 164

Semen is a mixture of sperm and fluids. 86

Series circuit is a circuit in which the electric current flows in one path. 100

Sleet is a mixture of snow and rain. 48

Solar energy is the energy that comes from the Sun. 12

Sperm is the male reproductive cell. 84

Spring is the season that follows winter. The weather begins to get warmer. 48

Sublimation is the direct change of state from solid to gas. 79

Starch is a substance made by plants to store energy in foods such as rice, bread, kaukau and potato. 164

Summer is the season that follows spring. It is warmest season of the year with long hours of sunlight. 48

Temperature is a measure of how hot or cold a matter is. 192

Testes is the male body part that produces millions of sperm. 86

Thermal expansion is the increase in volume of matter due to an increase in temperature. 72

Thermometer is an instrument that is used to measure temperature in degrees Celsius. 192

Trait is a feature or characteristic of a living thing. 90

Vagina is a muscular tube that connects the womb to the outside of a female's body. 86

Weather forecast is to predict the upcoming weather. 43

Wet season is the time of year when most of the rain falls. 48

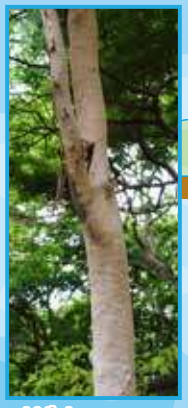
Winter is the season that follows autumn (fall). Winter is the coldest season of the year with fewer hours of sunlight. 48

Womb is the place where a baby grows until its birth. 86

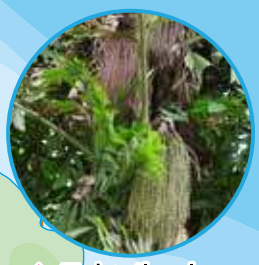
Plants in PNG


Kleinhovia


Maniltoa


White gum


Casuarina


◆ Fishtail palm


Harpullia


Rusty berries


Hoop pine

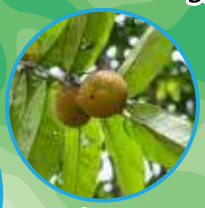

Sepik blue orchid


Blue ginger

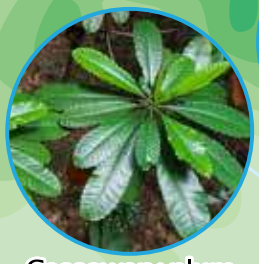

Coffee bush


◆ Yellow flame tree


Brown pine


Ebony


Big vine


Cassowary plum


◆ Galip nut


◆ Rain tree


Antelope orchid


Bird nest fern


Cycas palm


Coconut tree

Varirata National Park

◆ Plants found nationwide

Mangrove

Candle tree pendula

Family palm

Kerosene tree

Screw pine

Bougainvillea

Hibiscus

Leichhardt tree

Mango

Frangipani

Nutmeg

Manatee grass

continued

Plants in Varirata National

Ant plant

Kangaroo grass

Umbrella tree

Shield fern

Clidemia

Butterfly tree

Birthwort

Tropical banksia

Chalmers' neonauclea

Brown pine

Sumac

Gymnostoma

Park in PNG

Varirata National Park is PNG's first national park. It is on state land on the Sogeri Plateau, 48 km east of Port Moresby city. The park has scenic views with beautiful rainforests and savannah grasslands. It is inhabited by some unique plants and animals.

Common pitcher plant

Melastome

Pandanus

Papuan oak

Semecarpus

Water chestnut

Bottlebrush orchid

Cycad

Tropical mistletoe

Spiked pepper

Hyacinth orchid

Planchonia

East New Guinea fig

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