Chapter 3

Force

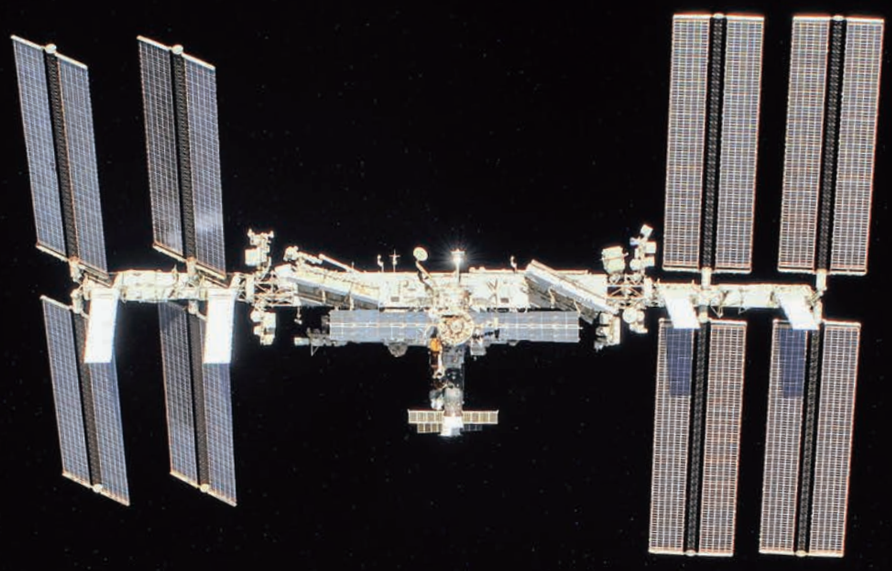


Photo of the International Space Station

3.1 Forces around Us

Lesson 1 Forces in Daily Life

Forces act on everything around us. Pushing or pulling are kinds of forces. What other types of forces act on objects around us?

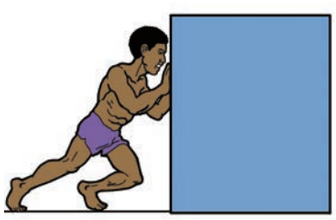
What types of forces can we find in our daily lives?

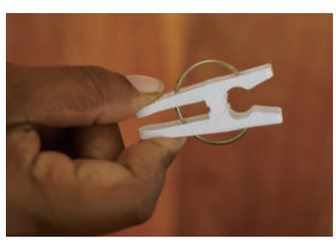
Activity : Finding and classifying forces

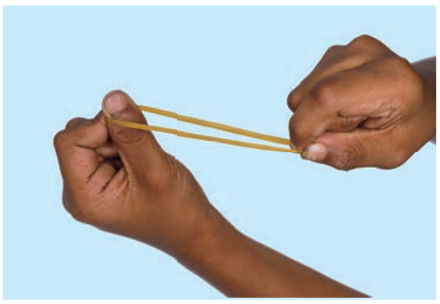
What to Do:

1. Draw a table like the one on the right.
2. Observe the pictures below and find the forces acting on the following objects; rubber band, compass, glass, cloth peg and a box.
3. Record your observations in your exercise book.
4. Share your ideas with your classmates. Talk about:
   (1) What types of forces did you find?
   (2) How can you classify the forces into two types?

Forces in daily life	Does the force act on the object directly or not?







Summary

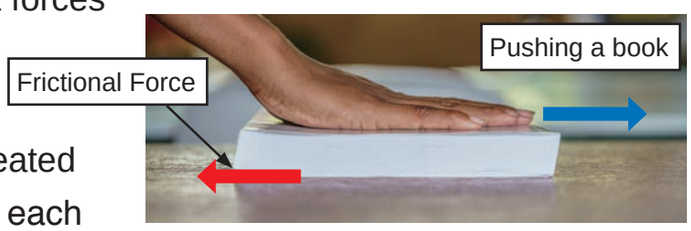
There are different types of forces in daily life. Basically forces can be classified into two; Contact forces and Non-contact forces.

1. Contact Forces

Contact forces are forces when two objects are physically interacting with each other by touching. Some types of contact forces are:

A. Frictional force

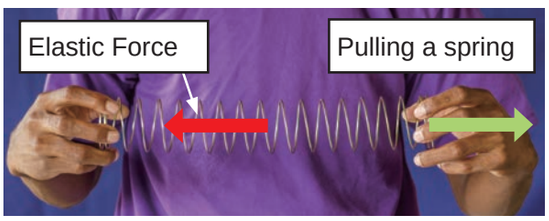
This force is the force that is created when two surfaces slide against each other.



Frictional force: A book sliding on the table is creating an opposite direction of force.

B. Elastic force

This force is the force exerted by an object trying to return to its original shape like a spring or rubber band.



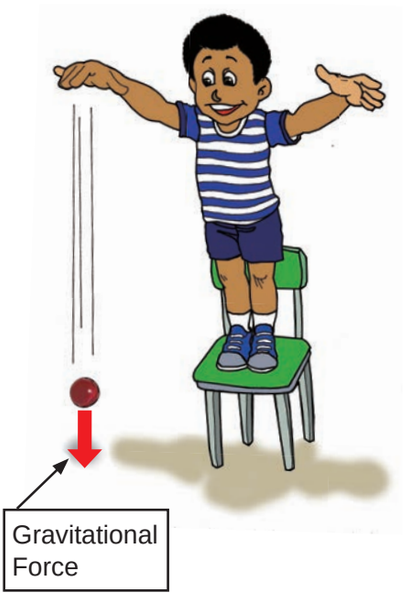
Elastic force: A stretched spring is trying to return to its original shape.

2. Non-contact Forces

Non-contact forces take place when two objects are not in contact with each other but act through the space between them. Some types of non-contact forces are:

A. Gravitational force

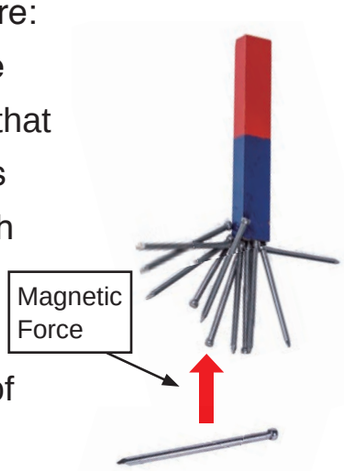
This force is the force that attracts any two objects with mass towards each other.



Gravitational force: The Earth is attracting a ball to the ground.

B. Magnetic force

This force is the force of attraction or repulsion exerted by a magnet.



Magnetic force: Magnet attracting nails.

Lesson 2 Gravity

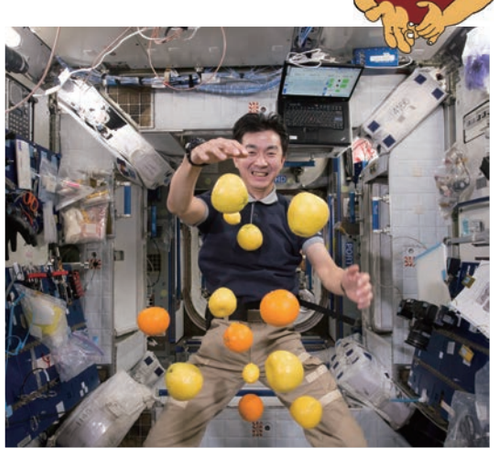
When we drop a stone, it falls towards the ground. Why does it fall to the ground? The answer is 'gravity', but what is gravity?

What is gravity?

Activity : What happens if there is no gravity?

What to Do:

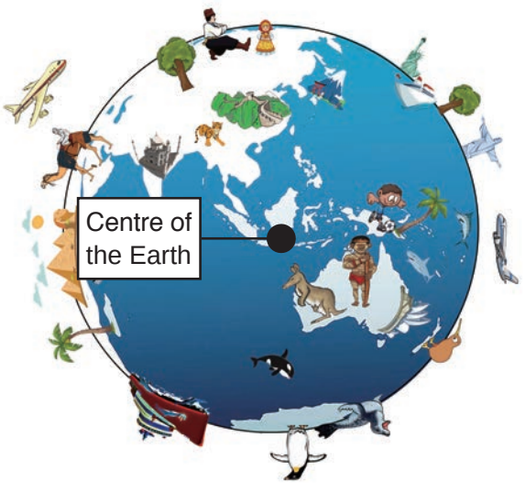
1. The picture below shows astronauts in a spaceship. The spaceship and astronauts are both moving together and rotating around the Earth in orbit. But inside the spaceship there is zero gravity!
2. Study the pictures and observe the following points:
   (1) What is happening to the astronauts in the spaceship?
   (2) What is happening to the fruits in the spaceship?
3. Share your ideas with your classmates. Discuss:
   (1) What would happen if there is no gravity?
   (2) How does gravity work on objects?



Summary

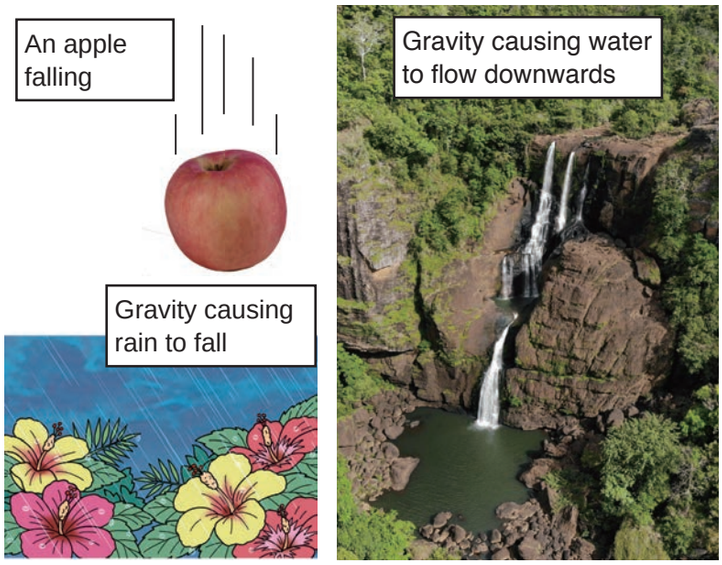
Gravity is also known as gravitation. It is a non-contact force that attracts objects towards each other. It exists between all objects, not just between the Earth and other objects.

Gravity acts on all objects. For example, Earth's gravity pulls a flying bird and airplane towards the ground. It also keeps a book on a desk. Earth's gravity even holds the Moon in orbit around the Earth. Without gravity, everything would be floating around and nothing would be able to stay on the Earth.



The Earth's gravity acts on all objects on earth.

The strength of gravity depends on the amount of matter in an object. The greater the amount of matter, the greater the gravity. For example, the Earth has a greater amount of matter than the Moon, so the gravity of the Earth is more than that of the Moon.



Phenomena caused by Gravity

The first person who discovered gravity is **Sir Isaac Newton**. During his lifetime he developed the theory of gravity. His theory is called 'Newton's Law of Universal Gravitation'. The story is that his theory of gravity was inspired when he watched an apple fall from a tree to the ground.

Lesson 3 Measuring and Describing Force

When a force acts on an object, the effect of the force can be seen. For example, when we release a ball from a hand, it falls to the ground and bounces on the ground. But, we cannot see the force itself.

How can we measure and describe a force?

1. How to Measure Force

The unit of force is '**newton**' (**N**). Force can be measured with a spring balance or a bathroom scale. The gravity acting on an object on the Earth can also be measured with a spring balance because gravity is a force. When a 100 g object is hung on a spring balance, it shows about 1 N. This means that the Earth's gravity pulls the 100 g object towards the ground with the force of 1 N. If an object is 200 g, the magnitude of gravity is about 2 N. When we pull a spring balance, the force (pull) can also be measured.

Measuring the magnitude of gravity

The magnitude of the pull can be measured with a spring balance.

Exercise

What is the force in newton of the following objects below?


300 g banana


40 kg person


50 g stone

2. How to Describe Forces

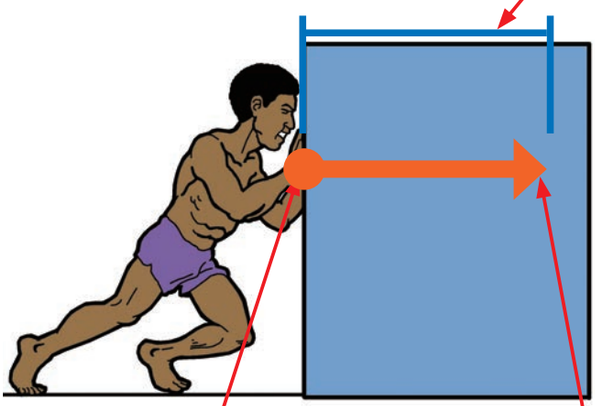
A force can be shown with an arrow. It indicates the **magnitude**, the **direction** and the **point of application** of the force. The length of the arrow shows the magnitude of the force and the direction of the arrow gives the direction of the force. The point of application is the location at which a force is applied to an object.

Three Components of Force:

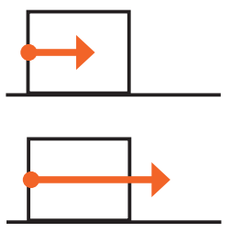
1. The Point of Application of Force
2. The Direction of Force
3. The Magnitude of Force

3. The Magnitude of Force

The length of the arrow shows the amount of force acting on an object.



How to show the Magnitude of Forces



If 1 cm represents force of 1 N, 2 N force can be shown in the length of 2 cm arrow.

How to Show Gravity acting on Objects

Draw an arrow from the centre of an object.

1. The Point of Application

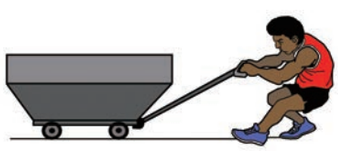
Showing a force begins with a dot that shows where the force begins.

2. The Direction of Force

The direction of the arrow should be the same as the direction of the force.

Exercise

Show the force acting on the following objects with arrows. (1 cm represents force of 1 N)



Pulling a cart with a force of 3 N

Kicking a ball with a force of 2 N

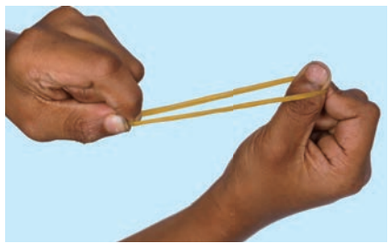
A 200 g mango fruit falling down.

Summary and Exercise

Summary 3.1 Forces around Us

Forces in Daily Life

- Contact forces are forces that take place when two objects physically interact with each other by touching. Examples are Frictional and Elastic forces.
- Non-contact forces are forces that take place between two objects not in contact with each other but act through the space between them. Examples are Gravitational and Magnetic forces.



Elastic force in a rubber band

Magnetic force in a magnet

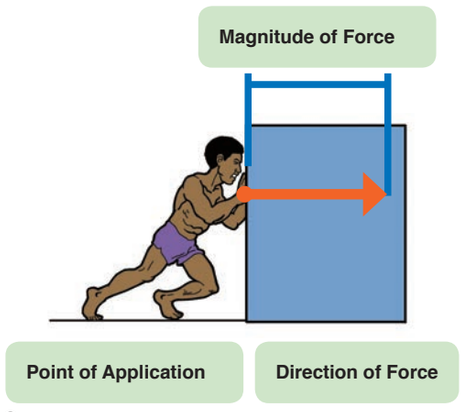
Gravity

- Gravity is a non-contact force.
- Gravity exists between all objects, not just between the Earth and other objects.
- The greater the amount of matter, the greater the gravity.
- Zero gravity is the condition in which there is no force of gravity acting on an object.
- Sir Isaac Newton was the first person who discovered the theory of gravity.

The Earth's gravity acts on all objects on earth.

Measuring and Describing Force

- Force is described by its point of application, the direction of the force and the magnitude. Force is measured in newton (N).
- A force can be shown with an arrow.
  1. The length of the arrow shows the magnitude of the force.
  2. The direction of arrow shows the direction of force.



Summary and Exercise

Exercise 3.1 Forces around us

Q1. Complete each sentence with the correct word.

(1) A force created when surfaces of two objects slide against each other is called _____ force.

(2) An invisible force of attraction and repulsion exerted by a magnet is called _____ force.

(3) A force that attracts any two objects with mass towards each other is called _____.

Q2. Choose the letter with the correct answer.

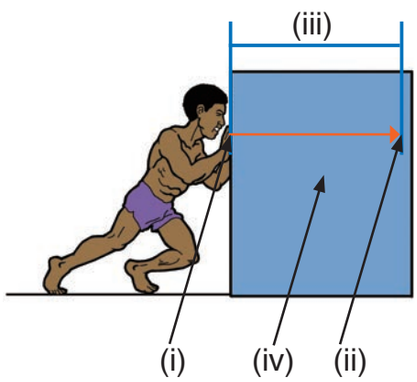
(1) Which letter indicates the point of application in the picture on the right?

A. (i)

B. (ii)

C. (iii)

D. (iv)



(2) Which list contains the non-contact forces?

A. Magnetic force and frictional force

B. Frictional force and gravity

C. Magnetic force and elastic force

D. Gravity and magnetic forces

Q3. Answer the following questions

(1) Name the instrument shown on the right.

(2) What is the unit of force?

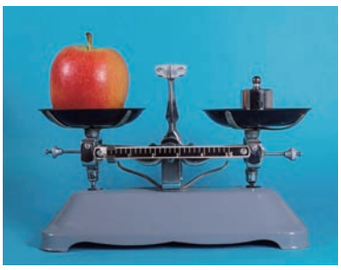
(3) What is the difference between contact force and non-contact force?

Q4. Jonathan plays soccer for the school team. During the training of target practice, he kicked the ball to the right with a force of 3 N. Draw an arrow to show this force (1 cm represents force of 1 N).

Chapter 3
•Science Extras•

Weight and Mass

When you stand on a scale, you measure your weight. But, what is weight? **Weight** is a force caused by gravity.



Measuring mass with a balance

Measuring weight with a spring

In other words, weight is a measurement of how much gravity pulls on an object. Weight depends on the strength of gravity. Weight can be measured with a spring balance or a scale. The unit of weight is also newton (N) because weight is a force.

All objects are made up of matter. Matter is anything that has mass and takes up space, but what is mass? **Mass** is a measurement of the amount of matter in an object. In other words, mass is how heavy an object is **without gravity**. Mass is not a force! Mass is usually measured with a balance. The unit of mass is kilograms (kg) or grams (g).

Difference between Weight and Mass

In our daily life, we often use 'weight' as the same meaning of 'mass', but weight is totally different from mass in science. We should use two terms of 'weight' and 'mass' differently when we study science.

The weight can change from place to place, but the mass will never change. The gravity of earth is greater than that of the moon. The moon's gravity is 1/6 of Earth's gravity.

Astronaut:
Mass: 60 kg
Weight: 600 N

Earth

Weight can change, but the mass never change.

Astronaut:
Mass: 60 kg
Weight: 100 N

Moon

An object with a mass of 60 kg has a weight of about 600 N on Earth. On the Moon, the weight of the object will be only about 100 N. But, the mass of the object will be 60 kg everywhere even on the Moon.

Chapter Test

3. FORCE

Q1

Complete each sentence with the correct word.

(1) A force that attracts two objects with mass towards each other is _____ .

(2) A _____ force is a force of attraction and repulsion exerted by a magnet.

(3) The unit for measuring force is the _____.

Q2

Choose the letter with the correct answer.

(1) Gravity was discovered in the 1680s by a famous scientist when he watched an apple fall from the tree to the ground. Who was this famous scientist?

A. Albert Einstein

B. Isaac Newton

C. Benjamin Franklin

D. Thomas Edison

(2) Which of the following is an example where elastic force is exerted?

A. Fred pushed a trolley across the lawn onto the concrete path.

B. Sandy shot a basketball into the loop to score two points.

C. Ketsin shot a bird high up in the tree with a forked sling shot.

D. Lolo used a coconut palm to slide downhill into the river below.

(3) What type of force is gravitational force classified as? It is classified as.....

A. a contact force.

B. an elastic force.

C. a magnetic force.

D. a non-contact force.

(4) Fred was sick and went to the clinic. He was asked to stand on the bathroom scale so the nurse would know his weight before giving him some medicine. Fred weighs 40 kg. What is the force of gravity in newton?

A. 4 N B. 400 N

C. 40 N D. 4000 N

(5) The strength of gravity depends on:

A. the mass of an object.

B. the size of the object.

C. the colour of an object.

D. the hardness of an object.

Q3

Answer the questions.

Melo releases a ball from his hand and the ball falls to the ground. The mass of the ball is 400 g.

(1) What force is exerted on the ball when it is falling?

_____

(2) Calculate the amount of the force exerted on the ball.

_____ newton

(3) Show the force acting on the ball with arrow on the diagram on the right. (1 cm equals 1 N)

Ball falling to the ground

Q4

The cleaner in the store had just finished mopping a section of the tiled floor when Ketsin walked onto it. Ketsin could not keep his feet firmly on the floor and he slipped and fell. Why did he slip? Explain using the word ‘friction’.

_____

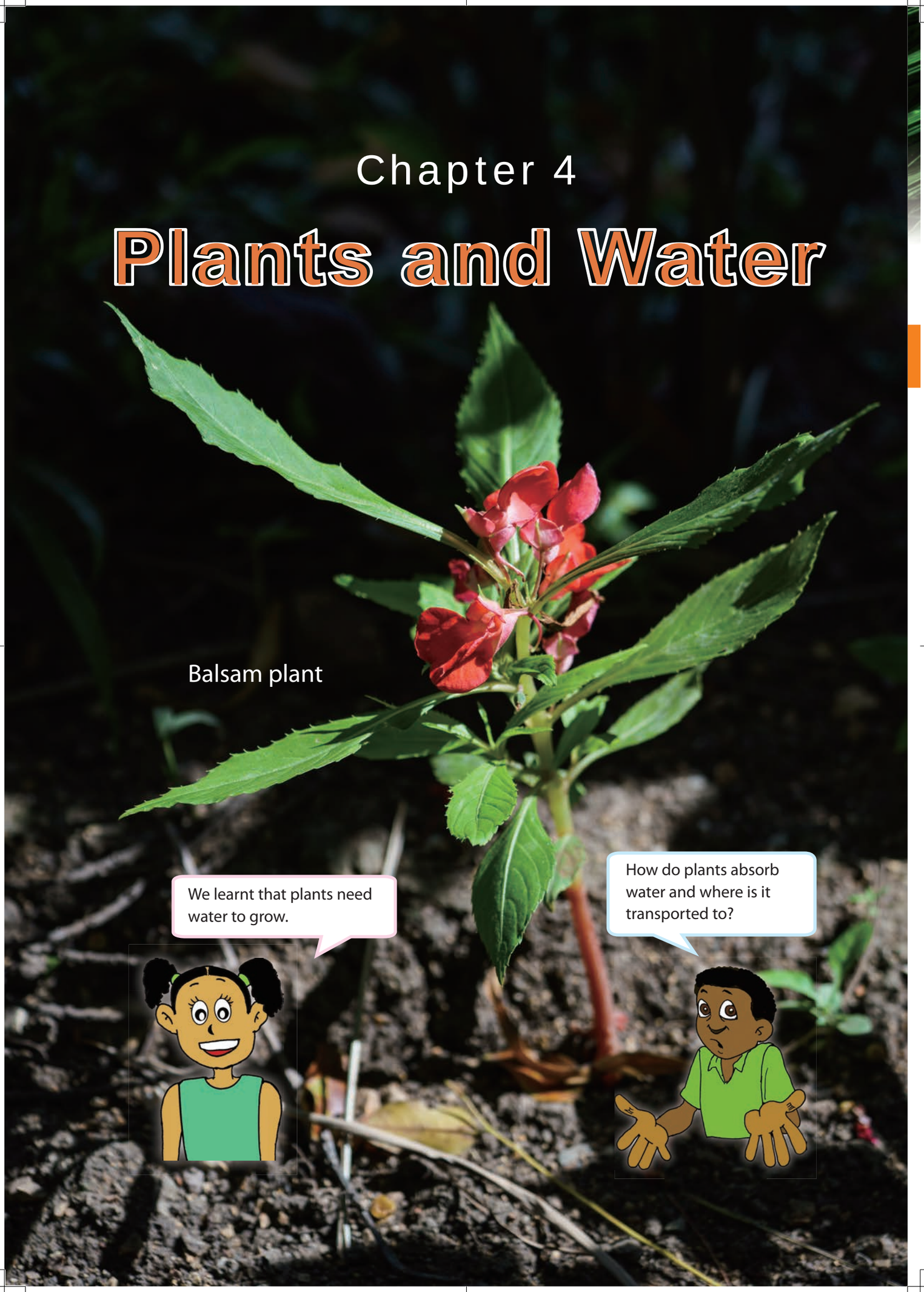
_____

_____

_____

Chapter 4

Plants and Water



Balsam plant

4.1 Water in Plants

Water is very important for plants. Without water, plants will become weak and eventually die. How is water transported in a plant?

Lesson 1 Paths of Water in Plants

Plants use their roots to absorb water from the soil. How do plants transport the water absorbed by the roots?

Which parts of a plant does water pass through?

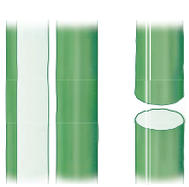
Activity : Observing paths of water

What We Need:

- balsam or cabbage with roots, food colouring, hand lens, cutter knife, clear plastic bottle

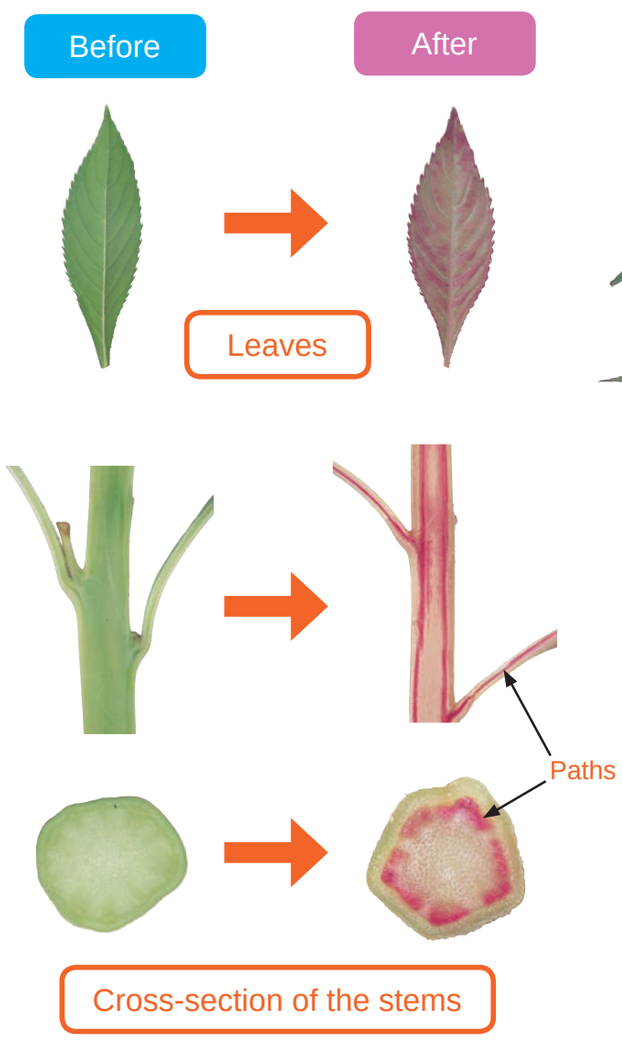
What to Do:

1. Pour water into the clear plastic bottle and add food colouring.
2. Place the balsam plant into the plastic bottle and leave it overnight.
3. Cut the stem of the balsam plant with a cutter knife as shown in the diagram on the right.
4. Observe the cross-section of the stem and the leaves with the hand lens and record your observations.
5. Share your ideas with your classmates. Discuss how water is transported in a plant.



Result

We found out that the paths that coloured water took were from the roots through the stem and to the leaves.



Let's compare the colours of this flowers and the flowers on the previous page. Why did the colour of the flowers change?

Summary

Water absorbed by roots pass through the tubes from the roots to the stem, to the leaves and to the flowers. The tubes act like a drinking straw carrying a flow of water. They help plants transport water to all parts of the plant.

Lesson 2 Water in Leaves

Water absorbed by the roots is transported to the leaves. What will happen to the water in the leaves?

Where does the water in the leaves go?

Activity : Where is the water going?

What We Need:

- two clear plastic bags, string, two plants

What to Do:

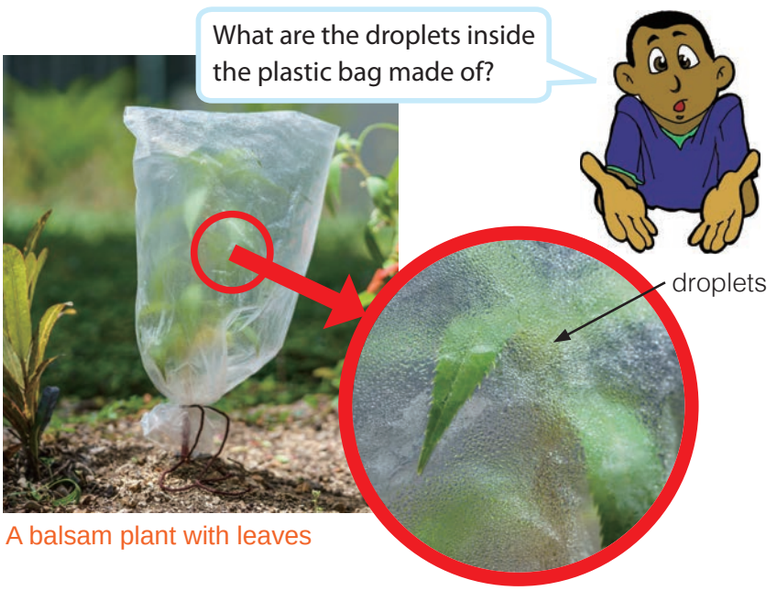
1. On a clear day, select two same sized plants. Remove all leaves from one of the plants.
2. Cover both plants with the plastic bags and firmly tie them with the string.
3. After 2 or 3 hours, observe the inside of the plastic bags. Sketch and record your observations.

A plant with leaves

A plant with no leaves

Result

We found out that with the plant with leaves, there were a lot of droplets inside the plastic bag. However, with the plant with no leaves, there was no change inside the plastic bag.



A balsam plant with leaves

A balsam plant with no leaves

Discussion

Think about the following questions based on your result.

1. Why were there droplets inside the bag of the plant with leaves but no droplets inside the bag of the plant with no leaves?
2. Where did the droplets come from?
3. Where did the water in leaves go?
4. What did you find about the function of the leaves?

Summary

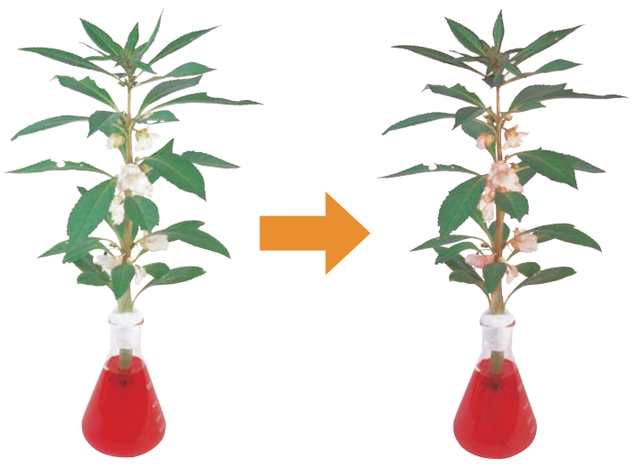
Water is absorbed from the soil and transported from the roots to the stem and to the leaves. Then it is released from the leaves into the air in the form of water vapour. The process of water moving through plants and evaporating from leaves is called **transpiration**.

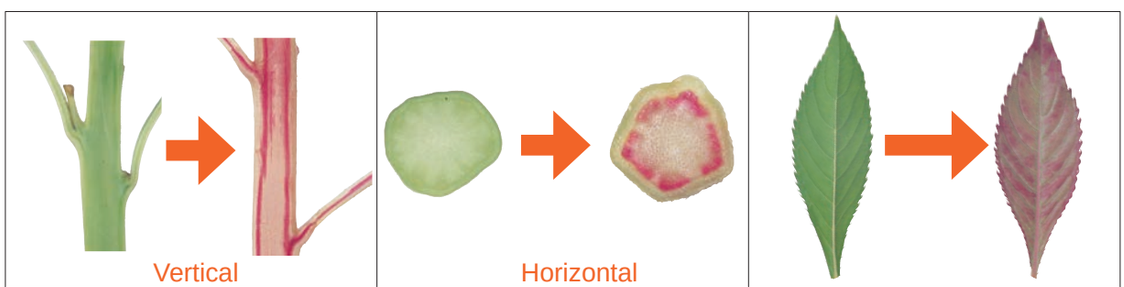
Summary and Exercise

Summary 4.1 Water in Plants

Path of Water in Plants

- Water absorbed by roots pass through the tubes from the roots to the stem, to the leaves and to the flowers.
- Tubes in the stem act like a drinking straw carrying a flow of water continuously to all parts of the plant.

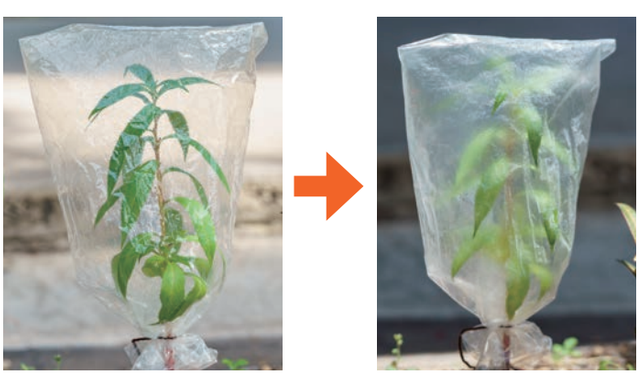




Cross-section of stems	Leaves

Water in Leaves

- Water is absorbed from the soil and is transported from the roots to the stem and to the leaves.
- Water is then released from the leaves into the air in the form of water vapour.
- This process is called transpiration.



Summary and Exercise

Exercise 4.1 Water in Plants

Q1. Complete each sentence with the correct word.

(1) Water is released from the _____ of plants into the air in the form of water vapour.

(2) The _____ help transport water to all parts of the plant.

(3) The process of water moving through plants and released into the air is called _____.

Q2. Choose the letter with the correct answer.

(1) Where do the long tubes in plants that water uses to move through are found?

A. Roots

B. Stems

C. Leaves

D. Flowers

(2) Which of the following correctlly shows the flow of water in plants?

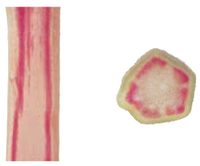
A. Leaves → Stem → Roots

B. Leaves → Roots → Stem

C. Roots → Stem → Leaves

D. Roots → Leaves → Stem

Q3. Study the diagrams on the right. The cross-sections of the plant stem is observed to see the movement of coloured water in the stem. What are found from the observations?



Cross-sections of the stems

Q4. Look at the picture on the right. Explain why the plant with no leaves did not have water droplets in the plastic bag.

Plant with leaves

Plant with no leaves

How much water do plants transpire? What are the things that cause more or less transpiration in plants?

During a growing season, a leaf will transpire many times more water than its own weight. An acre of corn gives off about 11 400 - 15 100 litres of water each day and a large oak tree can transpire151 000 litres per year.

The amount of water that plants transpire varies greatly to their location on the earth and over time. Higher temperatures cause the plant cells which control the openings (stomata) where water is released to the atmosphere to open, whereas colder temperatures cause the openings to close.

The amount of water vapour in the air surrounding the plant rises and the transpiration rate falls. It is easier for water to evaporate into dryer air than into the air with a lot of water vapour.

The increased movement of the air around a plant will result in a higher transpiration rate. Wind will move the air around, resulting in a lot of water vapour close to the leaf is replaced by drier air.

When there is lack of moisture, plants begin to premature in age, resulting in leaf loss and less transpiration of water.

Some types of plants that grow in harsh regions such as the thick, fleshy plants like the cacti conserve water by transpiring less water.

Chapter Test

4. Plants and Water

Q1

Complete each sentence with the correct word.

(1) Plants use their _____ to take in water from the soil.

(2) The water taken in by the plant will _____ from leaves.

(3) The process of water moving through plants and its evaporation from leaves is called _____.

Q2

Choose the letter with the correct answer.

(1) After the plant takes in the water, the water evaporates from the _____ into the air.

A. roots

B. stems

C. leaves

D. flowers

(2) Water is transported to all parts of the plant through the path in the coloured dye. What are these parts known as?

A. The skins

B. The flower

C. The stem

D. The tubes

(3) Which of the following is the correct explanation about the path for the water in plants? Water is transported from the

A. roots to the stem and to the leaves.

B. leaves to the stem and to the root.

C. stems to the roots and to the leaves.

D. roots to the leaves and to the stem.

(4) Samuel prepares two setups as shown in the picture below to investigate where the water absorbed by the plant evaporates from. Why does he have to remove all the leaves from plant 2? To observe if the water

A. evaporates from stems.

B. evaporates from leaves.

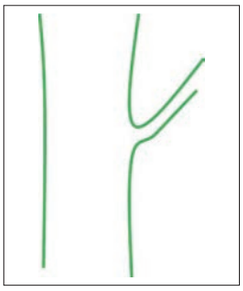
C. comes from air.

D. comes from soil.

Plant 1 Plant 2

Q3

(1) In the experiment, the balsam plant is placed into the bottle filled with coloured water as shown in the picture on the right.



(i) Draw the expected result on the diagram on the far right to show the cross section of the stem.

(ii) Why did the colour of the flowers change?

_____

_____

(2) The plant covered with the plastic bag is shown on the right. In the experiment, we found that there were a lot of droplets inside the plastic bag. Why were there droplets inside the bag covering the plant with leaves?

_____

_____

Q4

After cutting the stem and observing the coloured dye on the stem and the leaves of the plant, can you describe how the tubes transport water in plants?

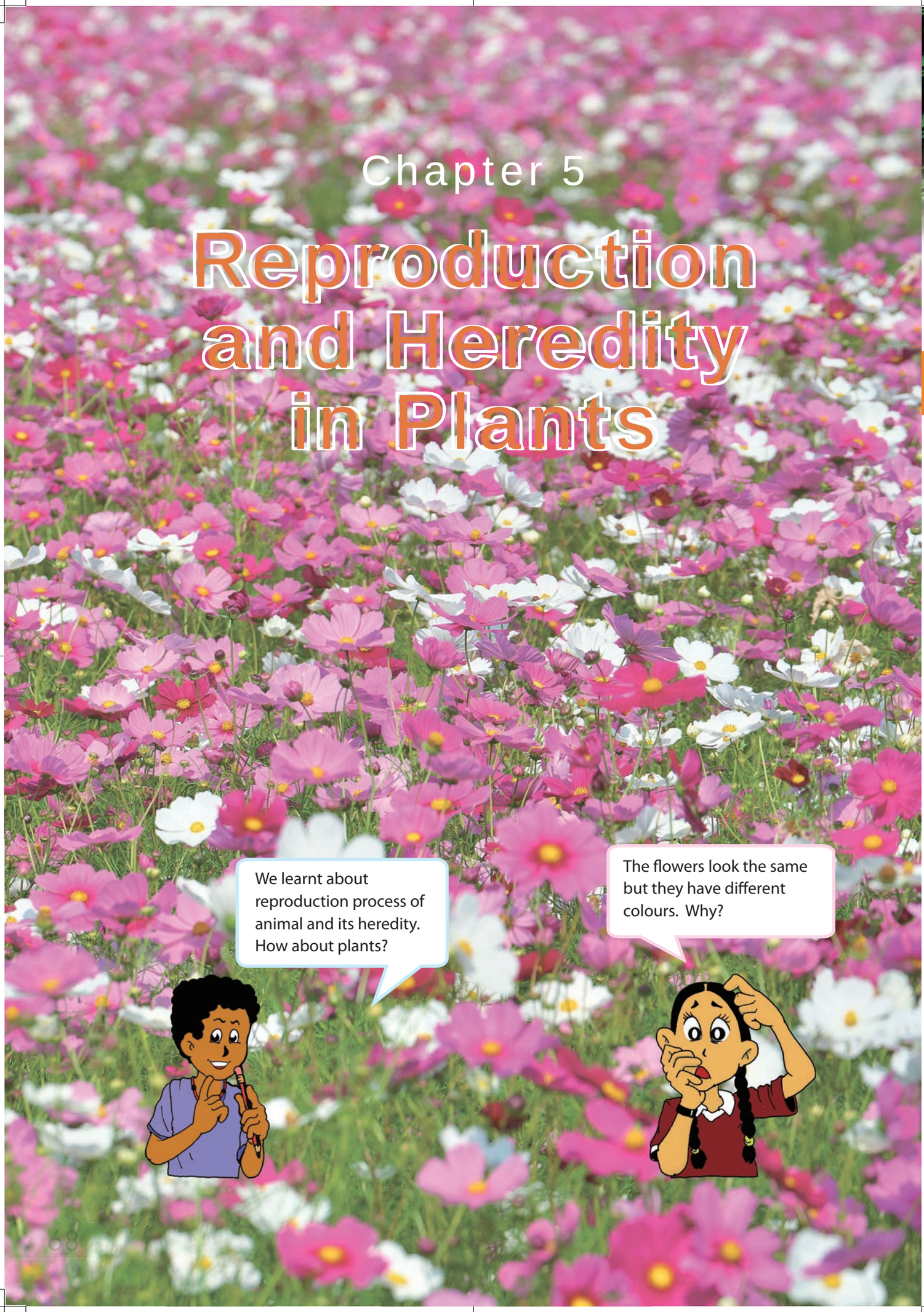
_____

_____

_____

Chapter 5

Reproduction and Heredity in Plants



5.1 Reproduction and Heredity

All animals produce young ones similar to themselves. How do plants reproduce? Is reproduction in plants similar to or different from animals?

Lesson 1 Flowers

Flowers are made up of different parts. The main parts of a flower are stamen and pistil.

What are the structures of a stamen and a pistil?

Activity : Observing a stamen and a pistil

What We Need:

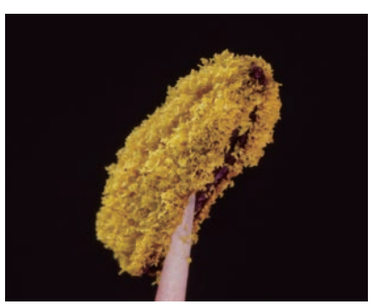
- flower, hand lens, cutter knife



What to Do:

1. Carefully remove the stamens and petals from the flower.
2. Observe the anther using the hand lens. Sketch the anther and record your findings in your exercise book.
3. Carefully cut the pistil in half and observe the inside of the pistil with the hand lens. Sketch the pistil and record your findings in your exercise book.
4. Share your ideas with your classmates. Discuss the structures of a stamen and a pistil.

Be careful when using the cutter knife.

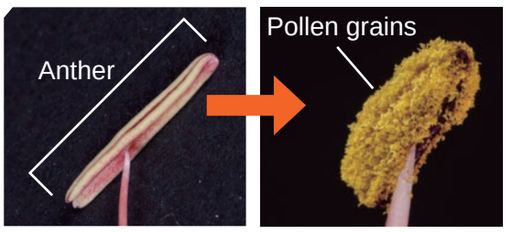



Summary

Flowers are the reproductive parts found in flowering plants. The main reproductive parts of a flower are the stamen and pistil.

Stamen

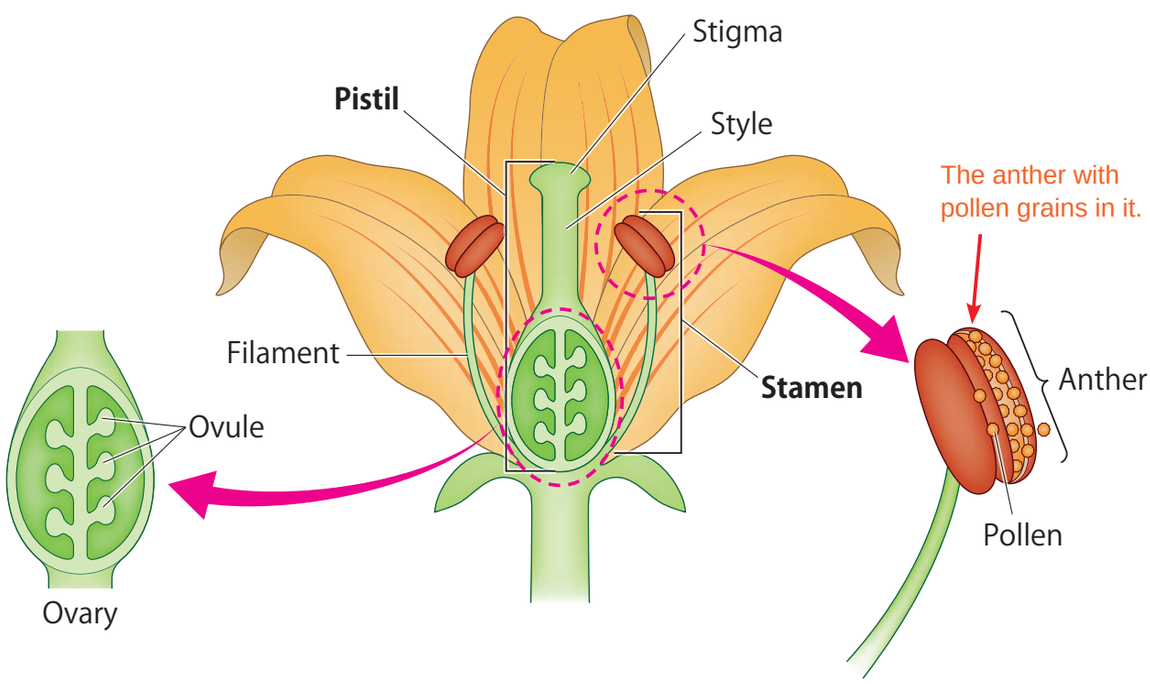
A **stamen** is the male reproductive part of a flower. The stamen is made up of two parts; filament and anther. The **filament** is the stalk that holds up the anther. The **anther** produces and stores **pollen**.



Pollen produced in an anther comes out when the anther tears open.

Pistil

A **pistil** is the female reproductive part of a flower, where the seeds are made. The pistil is found in the centre of a flower. It is made up of three parts; stigma, style and ovary. The **stigma** is the area where pollen grains are received. The **style** is the long stalk that connects the stigma to the ovary. The **ovary** produces one or more ovules which contains the egg cell.



Structures of stamen and pistil

Lesson 2 Pollination

The transfer of pollen grains from the anther to the stigma of a flower is called **pollination**. Pollination is very important for flowering plants to reproduce. How do plants transfer pollen from the anther to the stigma?

How are pollen grains transferred to the stigma?

Activity : The ways that pollen grains are transferred

What to Do:

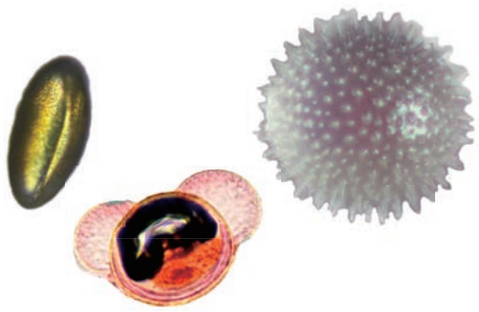
1. Draw a table like the one shown below.

The ways pollen grains are transferred

2. Study the picture below and think about the ways that pollen grains are transferred from the anther to the stigma. Record your ideas in the table.
3. Share your ideas with your classmates. Discuss how pollen grains are transferred from the anther to the stigma.

Summary

Insects, birds, water or wind help flowering plants carry pollen grains from the anther to the stigma. Pollen looks like powder or dust. Pollen can be transferred in many ways.



Pollen grains from different plants (Magnified)

Self-pollination

In some plants, pollen can move directly from the anther to the stigma of the same flowers without the help of others.

Animals

Animals can help pollination in plants. Some flowers have bright colours and sweet smell. Animals such as insects, birds and bats are attracted to the colours and the smell of the flowers. When they come to feed on sugary nectar, pollen gets stuck on their bodies. The pollen is transferred to the stigma of the same flower or different flowers as the animals move.

Honeybees help pollination in plants.

Wind

Many plants depend on the wind for pollination. Pollen grains are very light in weight. When plants release pollen into the wind, the pollen can easily float in the air and move to the stigma of the same flower or different flowers of other plants.

Pollen grains are transferred by wind.

Water

Water also helps pollination in plants. When it rains, pollen can be washed away from the anther and transferred to the stigma. Some plants that live in water also use water to carry pollen. The pollen grains float on water and move from the male parts to the female parts of the plant.

Lesson 3 Reproduction in Flowering Plants

All living things have different life cycles. Plants also have life cycles. Most plants' life cycles start with a seed.

How do plants produce seeds?

Activity : Process of seed development

What to Do:

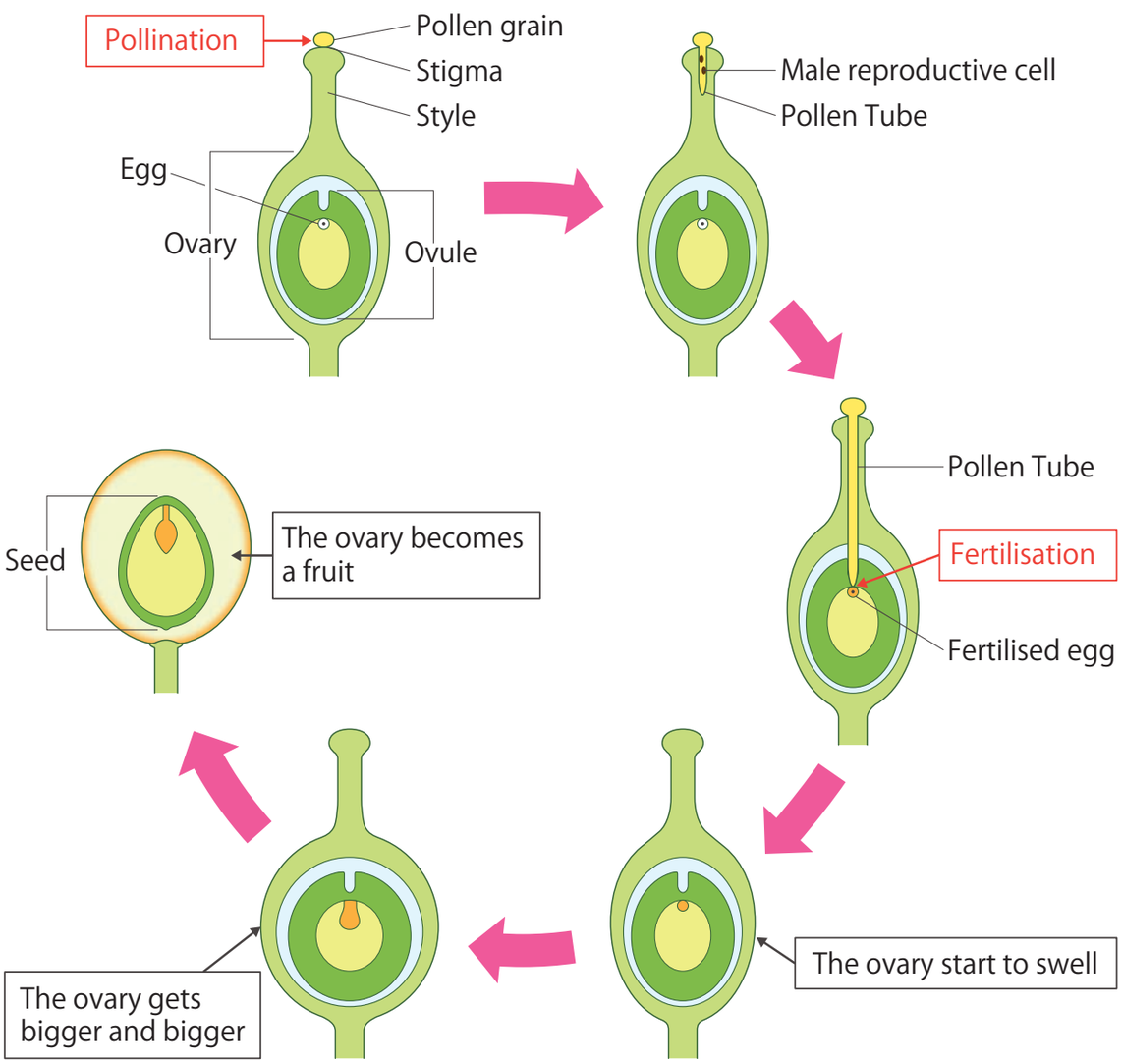
1. Study the pictures at the bottom of this page and the diagram on the next page. These pictures show the process of seed development of platns.
2. Observe the pictures carefully and record how seeds in a flower develop and change.
3. Think about the following questions based on your observations:
   (1) What happens to the pollen grain after it lands on the stigma?
   (2) In which part of a flower do seeds develop?
   (3) How does an ovary change its shape, size, texture and colour?
   (4) Which part of a flower grows and becomes a fruit?
4. Share your ideas with your classmates.
   Discuss how plants produce seeds.

Process of seed development

1. After a pollen grain lands on the stigma, a tube .....
2. .....
3. .....

Summary

After the pollen grain lands on the stigma, it produces a tube which is called the **pollen tube**. This tube grows down from the stigma through the style and into the ovary. A male reproductive cell in the pollen grain reaches the ovule and joins the egg cell in the ovule. This joining of the male reproductive cell and the egg cell in a flower is called **fertilisation**. The ovules in the ovary develop into seeds. As the seeds develop, the ovary gets bigger and bigger and changes to become a fruit. The fruit protects the seeds until they are ready to be released. The fruits we eat are matured ovaries that surround the seeds inside.



Process of an apple seed development

Lesson 4 Heredity in Plants

Animals look like their parents because they inherit the traits from their parents when they reproduce. How about plants?

Do plants inherit the traits from their parents?

Activity : Traits of plants

What to Do:

1. Draw a table like the one shown below.

Similarities between an adult and a young tomato plant

2. The pictures below show the young and adult tomato plants. Compare the two pictures and write their similarities in the table.
3. Share your ideas with your classmates. Discuss what kinds of traits are inherited from the adult plant to the young plant.

A trait is a feature or characteristic of a living thing! How can we compare and describe the traits of an adult and a young tomato?

Young tomato plant

Adult tomato plant

Summary

Heredity is the process through which traits are passed on from parents to young organisms. Like animals, plants also pass on their traits to their young. The traits of plants include the size of the adult plants, the shape of its leaves, the colour of its flowers and the kind of roots. The flavour of fruits and the presence of seeds are also traits of plants.

Shape of leaves

Size of plants

Colour of flowers

Young plants inherit many traits from their adult plants. For example, plants grow to be about the same height as their parents. A young tree has the same leaf shape and colour as an adult tree. The colour of a flower is usually similar to that of its parent plant. A plant with red flowers comes from an adult plant with red flowers. A mango tree produces fruits of the same shape, colour and taste as its parent tree.

A mango tree always has fruits of the same shape, colour and taste as its parent tree.

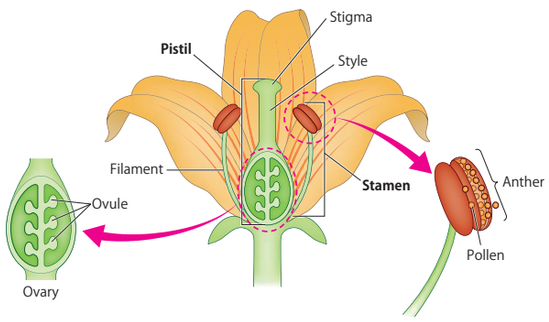
The colour of the flowers is inherited from their parents.

Summary and Exercise

Summary

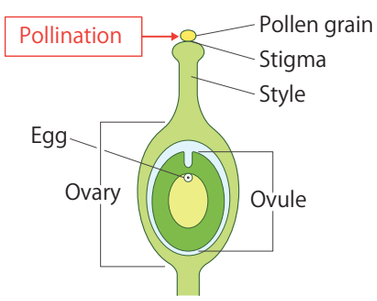
5.1 Reproduction and Heredity

Flowers



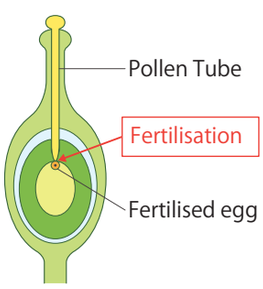
- The stamen is the male reproductive part of a flower and it is made up of the filament and the anther.
- The anther produces and stores pollen.
- The pistil is the female reproductive part and it is made up of the stigma and style.
- The ovary produce one or more ovules which contain the egg cell.

Pollination



- Insects, birds, water and wind help flowering plants carry pollen grains from the anther to the stigma.
- Pollen can be carried in many ways such as self-pollination, by animals, wind and water.

Reproduction in Plants



- Fertilisation is the joining of the male reproductive cell in the pollen grain and the egg cell in the ovule.
- The ovules in the ovary develop into seeds. As the seeds develop, the ovary gets bigger and bigger and changes to become a fruit.

Heredity in Plants

- The fruits we eat are matured ovaries that surround the seeds.
- Heredity in plants is when parent plants pass on their traits to their young plants.
- The traits of plants include the size of the adult plants, the shape of its leaves, the colour of its flowers and the kind of roots.
- The flavour of fruits and the presence of seeds are also the traits of plants.

Summary and Exercise

Exercise

5.1 Reproduction and Heredity

Q1. Complete each sentence with the correct word.

(1) The male reproductive part of a flower is called _____.

(2) The transfer of pollen grains from the anther to the _____ of a flower is called pollination.

(3) The _____ are matured ovaries that we eat and are surrounded by the seeds.

(4) Young plants inherit _____ from their parents such as shape of their leaves and the colour of their flowers.

Q2. Choose the letter with the correct answer.

(1) Which of the following parts of the flower does the pollen tube travels through to reach the egg cell?

A. Anther

B. Filament

C. Pistil

D. Style

(2) What is the name of the process through which traits are passed on from parents to young organisms?

A. Pollination

B. Fertilisation

C. Heredity

D. Germination

Q3. Answer the question below. What are some ways in which pollen grains are transferred from the flower to the stigma?

Q4. Explain what happens to the ovary after fertilisation.

Did you know that vanilla flowers cannot be pollinated naturally like other flowers? How did the method of pollination for Vanilla flowers come about?

In 1829 on the island of Reunion on the east of Madagascar, a 12 year slave boy by the name of Edmund Albius was the first to solve the botanical mystery by inventing a technique of pollination for the sterilised vanilla flower to produce fruits. His technique of hand-pollination is still being used to this day.

Fruits of vanilla plant

He observed that little bees were happily pollinating the plants everywhere, but here the bees were nowhere to be found near the vanilla flowers.

He also learnt to hand-pollinate a watermelon 'by joining the male and female parts together.'

Flower of vanilla

Edmund observed the vanilla closely, looking for the part of the flower that produced pollen. He also discovered the part that needed to be dusted, so that the plant could bear fruit. He noticed that the two reproductive parts of the flower, the male anther and the female stigma, were separated by a little lid. He lifted the flap and while holding it up, simultaneously rubbed the pollen in with a little stick. He had discovered the rostellum, the lid that many orchid plants have, including the vanilla orchid, probably was the part that was stopping the plants from self-pollination.

Chapter Test

5. Reproduction and Heredity in Plants

Q1

Complete each sentence with the correct word.

(1) The main reproductive parts of a flower are stamen and _____.

(2) Pollination is the process of transferring _____ from the anther to the stigma of a flower.

(3) The ovules in the ovary develop into _____.

Q2

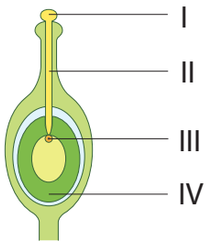
Choose the letter with the correct answer.

(1) Which part of the flower produces pollen grains?

A. Ovule
B. Anther
C. Style
D. Filament

(2) Which roman numeral represents the female egg cell of a flower?

A. I
B. II
C. III
D. IV



(3) What is the name of the process that joins a male reproductive cell in the pollen grain and egg cell in the ovule?

A. Fertilisation
B. Heredity
C. Pollination
D. Germination

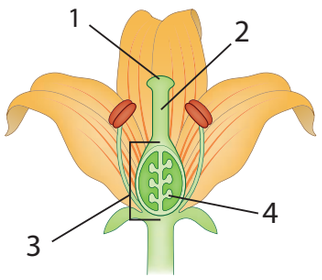
(4) What would cause insects to be attracted to plants for pollination?

A. Shape and colour of the leaves
B. Colour and smell of the fruits
C. Colour and smell of the flowers
D. Colour and shape of the stem

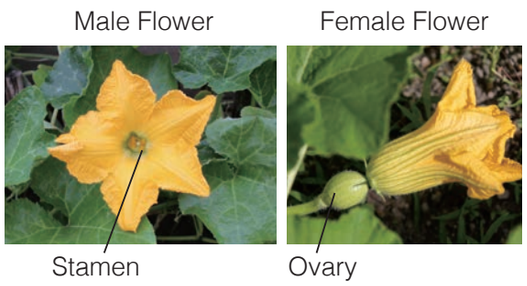
Q3

(1) What are the names of parts of the flower labeled in the picture on the right?

1. _____
2. _____
3. _____
4. _____



(2) A student observed the flowers of the pumpkin plant on the right and noticed that the male flower and female flower are two different flowers. If there were no insects for pollination, what would be a way for pollen grains to be transferred to the stigma from the stamen?



_____

(3) Why does the shape of leaves on the young and the adult tomato plant the same?

_____

Q4

(1) How do the light weight pollen grains help in the pollination process in a wind pollinated plant?

_____

_____

(2) On the way from school, you came across two very similar plants but only the shapes of their leave edges were different. If the plants flower, what can you infer about their flowers?

_____

_____

_____

Chapter 6

Star

6.1 Stars

Lesson 1 Stars

When we look at the night sky we can see thousands of stars. What do they look like? How are they similar or different?

What is a star?

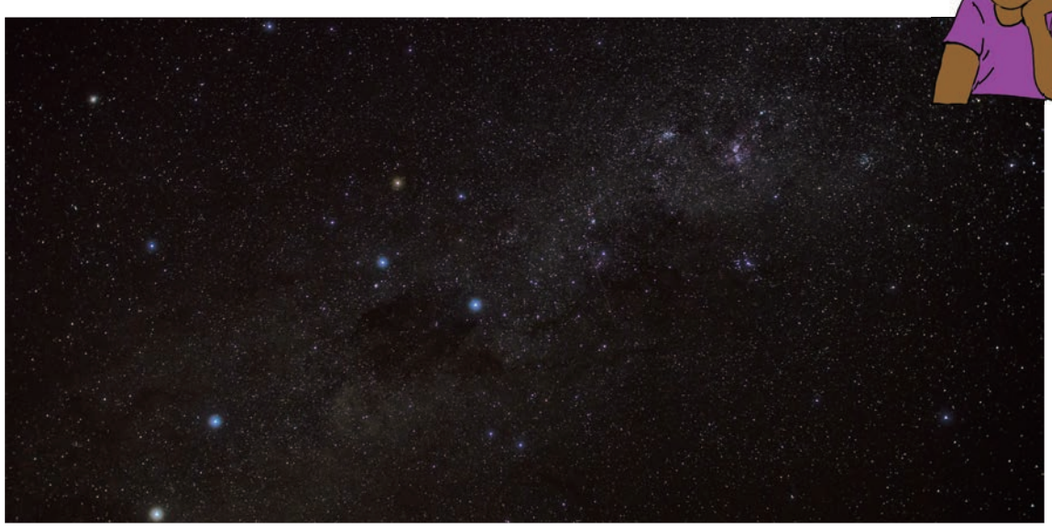
Activity : How are stars similar and different?

What to Do:

1. Draw a table like the one shown below.

How are they similar?	How are they different?

2. Study the picture below and discuss how stars are similar or different.
3. Write the properties of stars in the table.
4. Share your ideas with your classmates. Discuss how stars can be classified.



Summary

A **star** is a giant ball of hot gasses. The Sun is also a star. It gives off light, heat and other forms of energy. There are many different types of stars.

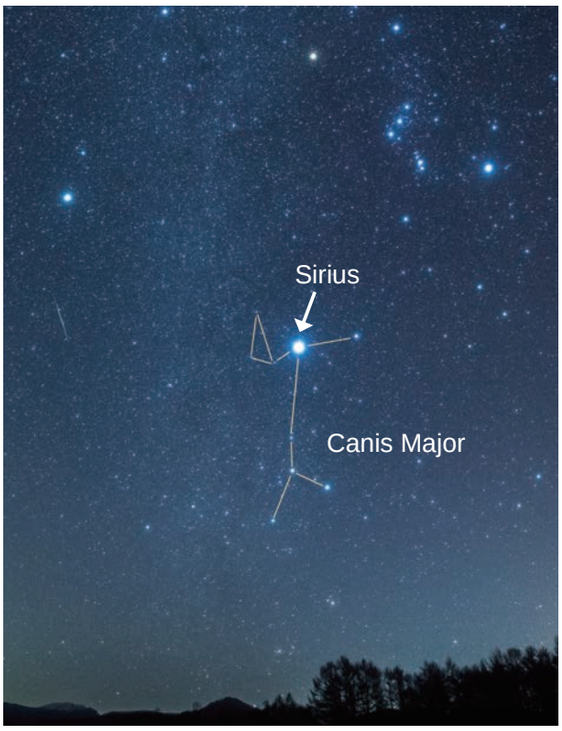
Colours

Stars appear to be in different colours such as blue, white, yellow, orange and red. The colours of stars depend on how hot they are. Hot stars are white or blue, whereas cooler stars appear as orange or red. The Sun is a yellow star. The surface temperature of the Sun is about 5 500°C.

The colours and temperatures of stars

Brightness

Some stars appear to be brighter than the others. For example, Sirius which resides in the constellation of Canis Major is the brightest star in the night sky. Canopus in the constellation of Carina is also a bright star that can be seen in the southern sky.



Sirius in the constellation Canis Major

Size

Stars come in different sizes. The diameter of the Sun is about 1 390 000 km. It is one hundred and nine times bigger than the diameter of the Earth. The smallest star is only about 20 km across in diameter. The largest star is up to two thousand one hundred times the size of the Sun.

Lesson 2 Movement of Stars

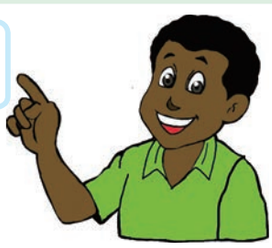
The Sun and the Moon seem to move from east to west. How about stars? Do stars also move like the Sun and the Moon?

How do stars move?

Activity : Observing the movement of stars

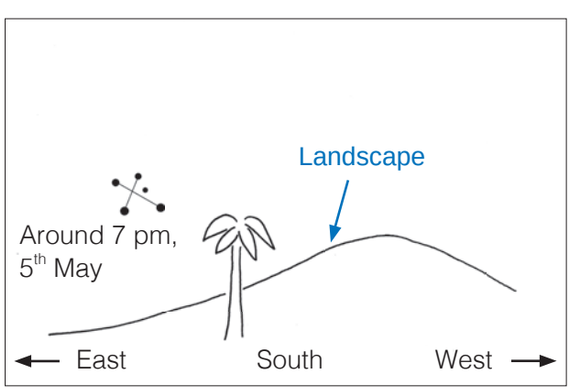
What We Need:

- compass

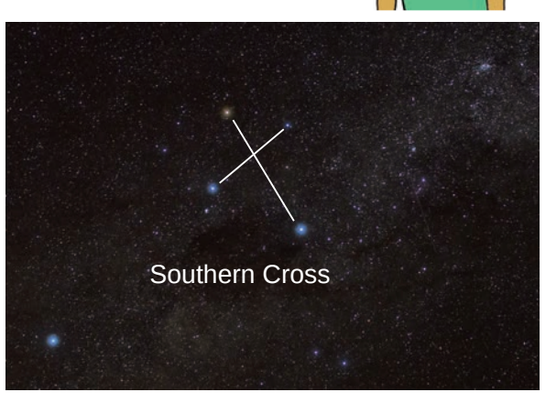


What to Do:

1. Study the night sky and use the compass to find the Southern Cross in the southern sky.
2. Mark the position where you observe the Southern Cross.
3. Sketch the landscape you see and the direction in your exercise book.
4. Observe and record the position of the Southern Cross and the time like the one shown below.
5. After one hour stand at the same position as in Step 2 and repeat Step 4.
6. Share your ideas with your classmates. Discuss how stars move.

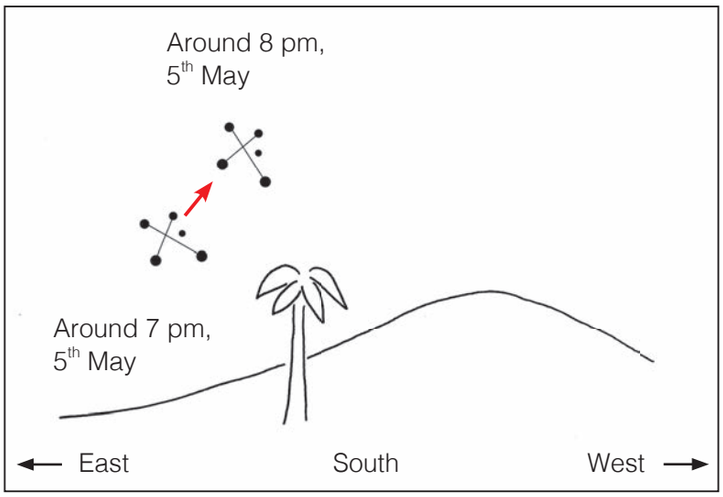


Observe the stars at night with adults.



Result

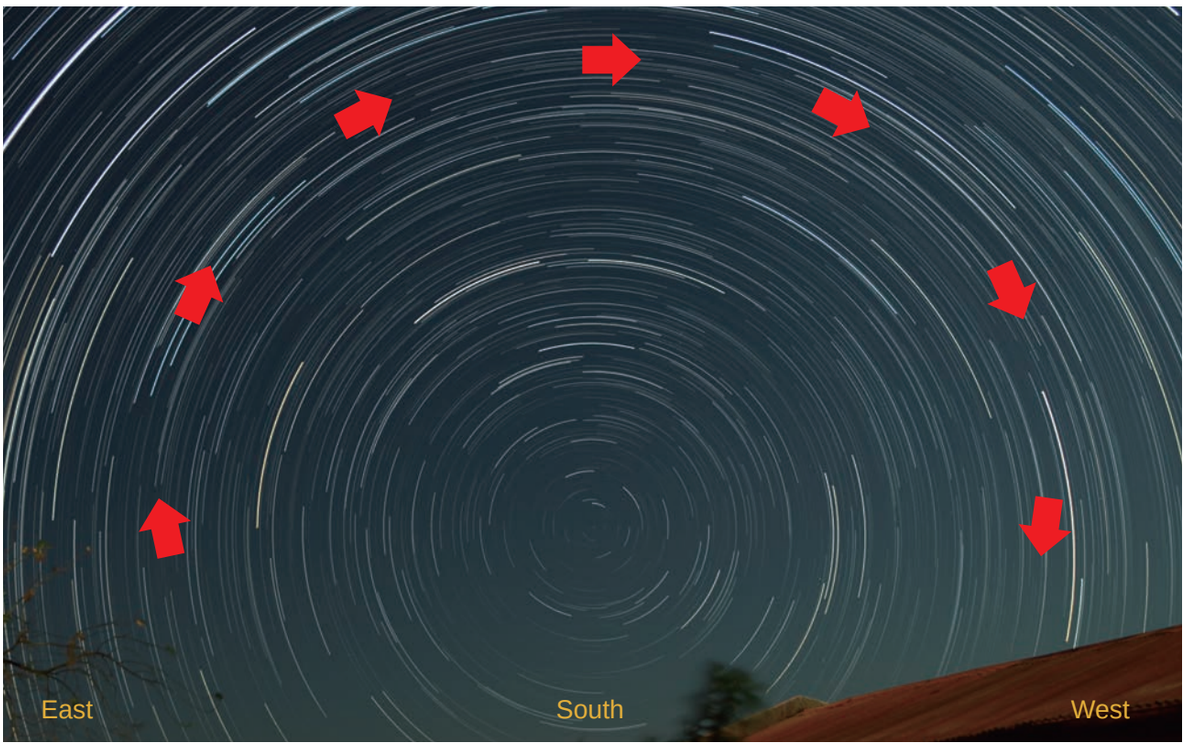
We found out that the Southern Cross changes its position in the sky without changing its shape each hour.



The position of the Southern Cross changes each hour.

Summary

The stars actually do not move. The stars seem to rise in the east, move across the sky and set in the west. This is because the Earth spins on its axis from west to east. But the shape of each constellation does not change. The stars in each constellation has the same pattern even though the constellation appears to be moving.



Stars seem to move from the east to the west without changing their shapes.

Lesson 3 Constellations

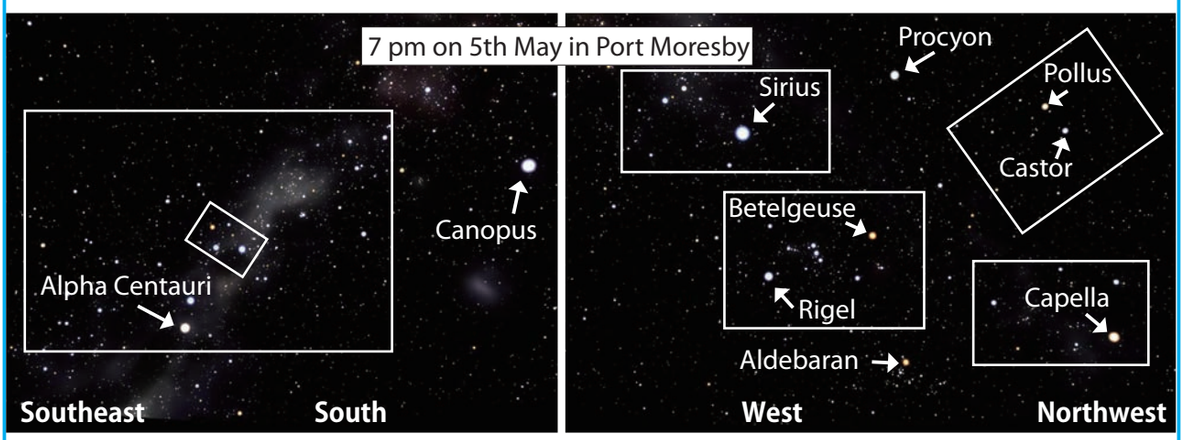
We can see a lot of stars in the night sky. Have you ever seen a group of stars that look like objects or animals?

What are constellations?

Activity : Finding constellations

What to Do:

1. Go to a clear space out of the house on a clear night where the sky can be clearly seen.
2. Find the direction of south and west with a compass. Find the southern and the western direction in the sky chart below.
3. Study the southern and the western night sky and observe the stars.
4. Find the bright stars pointed by white arrows and a group of stars surrounded by rectangles shown in the sky chart below.
5. Sketch the patterns of the stars you observed in your exercise book.
6. Can you find the same patterns of the stars in the sky chart as observed from the sky? Share your findings with your classmate about how star patterns look like.



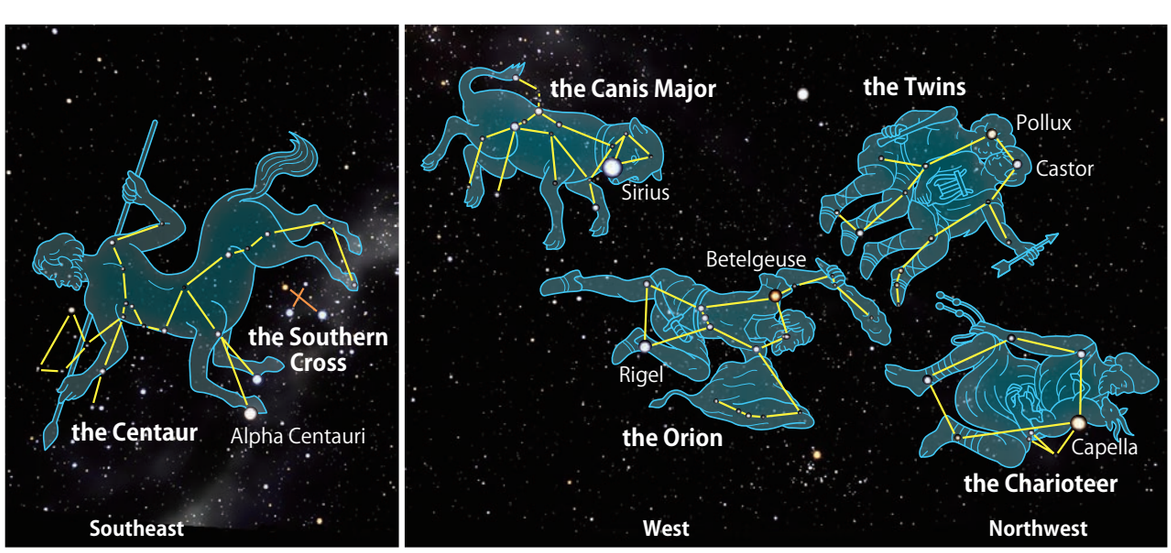
Let's read 'how to use a compass' in Science Tool Box.

Observe stars with adults!

Summary

A group of stars that form a particular pattern is called a **constellation**. The pattern may take the shape of a person, animal, tool or musical instrument. People all over the world tell stories about the constellations they see. Constellations appear in season. But they appear in the same place in the same day, every year. After a rainy season, an early night sky in Papua New Guinea is best for star observation with major stars and constellations. Constellations are useful. People used constellations for navigation. By observing the constellations, people can work out the direction to help travel across the oceans. Constellations are also used for agriculture. The constellations helped ancient people know when to plant and harvest crops. There are eighty-eight different constellations. One well-known constellation in Papua New Guinea is the **Southern Cross** which is featured on our national flag. The pictures below show some examples of constellations that can be seen from Papua New Guinea.

The Southern Cross is featured on the national flag.



Major stars and constellations

Summary and Exercise

Summary 6.1 Stars

Stars

- A star is a giant ball of hot gases.
- The Sun is a star.
- A star gives off light, heat and other forms of energy.
- Stars come in different sizes.
- Stars come in different colours such as blue, white, yellow, orange and red.
- The colours of stars depend on how hot they are.
- Hotter stars are white or blue and cooler stars are orange or red.

The colours and temperatures of stars.

Movement of Stars

- The stars seem to rise in the east, move across the sky and set in the west. This is because the Earth spins on its axis from west to east.
- The pattern of the stars in each constellation does not change because the stars actually do not move.
- An example of a constellation is the Southern Cross. It changes its position in the sky without changing its shape.

Constellation

- Constellation is a group of stars that form a particular pattern in the sky.
- The pattern appears in the shape of a person, animal, tool or musical instrument.


The Southern Cross on the national flag.

- There are eighty-eight different constellations which are very useful to people for navigation and agriculture.
- Southern Cross is a well-known constellation seen in a Papua New Guinea night sky. Hence, it is featured on the national flag.

Summary and Exercise

Exercise 6.1 Stars

Q1. Complete each sentence with the correct word.

(1) The _____ is a giant ball of hot gases.

(2) Stars come in different colours based on their surface _____.

(3) The stars seem to rise in the _____ and set in the _____.

(4) People used constellations for navigation and _____.

Q2. Choose the letter with the correct answer.

(1) Which constellation is featured on our national flag?

A. the Canis Major

B. the Charioteer

C. the Twins

D. the Southern Cross

(2) Based on your observations of the night sky, which of the following is the correct statement about the movement of the stars?

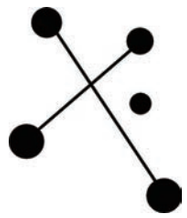
A. The stars move across the sky from east to west.

B. All stars never move in the sky.

C. All stars move randomly in the sky.

D. The stars appear to rise in the west.

Q3. Answer the following questions.



(1) Study the star pattern on the right. What is the name of this constellation?

(2) Two stars were observed. One was red and another was blue in colour. Which of the two stars is higher in temperature?

Q4. Anna observes a star in the night sky every one hour and noticed that it was moving. What is causing the star to move from one position to another position?

Are new stars born like living things?

Yes! Like living things on the Earth, star is born in the universe. A star is formed in a large thick cloud of dust and gas where it is called a Nebula. The cloud of dust and gas begins to come together and form a cloudy ball because of its gravity, and when it is hot enough it glows like our Sun and then the new star is born. Stars live for thousands to billions of years until it uses up its energy.

Look at the picture below taken by the telecsope. This is the Orion Nebula, the brightest nebula in the night sky, which is visible with the naked eye as a reddish patch in the constellation of Orion. The Orion Nebula is a place where thousands of new stars are forming from the dust and gas.

The centre part of the Orion Nebula

Thousand of stars are born in the Orion Nebula that is located in the constellation of Orion.
(NASA, ESA, M. Robberto (Space Telescope Science Institute/ESA) and the Hubble Space Telescope Orion Treasury Project Team)

Chapter Test

6. Star

Q1

Complete each sentence with the correct word.

(1) The _____ of stars depend on how hot they are.

(2) Hot stars are _____ or blue.

(3) The stars appear to rise in the _____ and set in the _____.

(4) There are _____ different constellations in the sky.

Q2

Choose the letter with the correct answer.

(1) What is a constellation?

A. A group of stars that appear to form a pattern.

B. A group of stars that are physically close to each other.

C. A large, round object that orbits the Sun.

D. A single collection of cloud of gases and dust.

(2) Why do stars come in different colours?

A. Because they seem to move from east to west.

B. Because they have different temperatures.

C. Because of their distance from the Earth.

D. Because of their sizes.

(3) What is the name of the constellation featured on the national flag of Papua New Guinea?

A. the Twins

B. the Orion

C. the Canis Major

D. the Southern Cross

(4) Which of these is the brightest star in the sky at night?

A. Alpha Centauri

B. Canopus

C. Rigel

D. Sirius

Q3

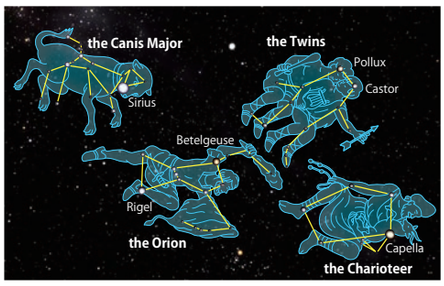
(1) Why are constellations useful to people in ancient times or even today?

_____

_____

(2) In which constellation does Sirius belong to?

_____



(3) Stars come in different colours such as blue, white, yellow, orange and red. What is the difference between white and blue stars and orange and red stars?

_____

_____

Q4

Study the picture shown on the right. Stars do not move but they appear to rise in the east, move across the sky and set in the west.

(1) Why do stars move in this manner without changing shape of constellation?

_____

_____

(2) Explain the similarity of the movement of the Sun, the Moon and the stars in the sky.

_____

_____

Chapter 7

Energy

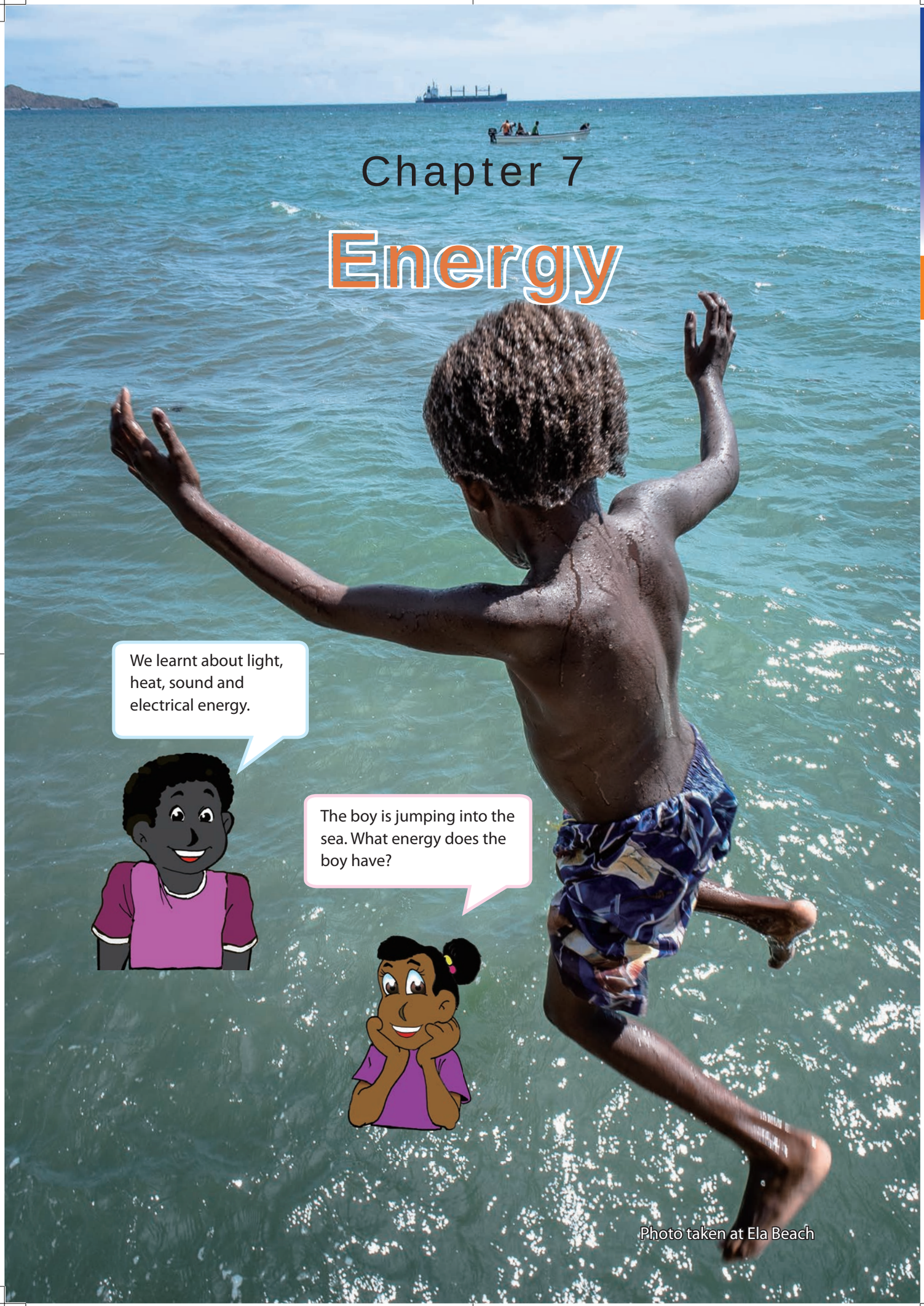


Photo taken at Ela Beach

7.1 Forms and Uses of Energy

Lesson 1 Kinetic Energy

There are many different forms of energy around us such as; light, heat, sound and electricity. How about an object in motion? Does a moving ball also have some kind of energy?

What form of energy does a moving object have?

Activity : Knocking down bottles of water

What We Need:

- 6 bottles of water, ball

What to Do:

1. Draw a table like the one shown on the right.
2. Arrange the bottles of water on the ground as shown in the picture below.
3. Roll the ball slowly towards the bottles and record the number of bottles knocked down.
4. Repeat Steps 2 and 3 three times.
5. Arrange the bottles again and this time, roll the ball faster towards the bottles.
6. Record the number of bottles knocked down.
7. Repeat Steps 5 and 6 three times.
8. Share your results with your classmates. Discuss what causes the difference in the results.

	Number of bottles knocked down		
Speed of ball	1st attempt	2nd attempt	3rd attempt
Slow			
Fast			

Result

We found out that when the ball moved faster, it knocked down more bottles of water than when it moved slower.

Discussion

Think about the following questions based on your result.

1. Does the moving ball have energy? Why do you think so?
2. What is the relationship between the amount of energy and the speed of the ball?

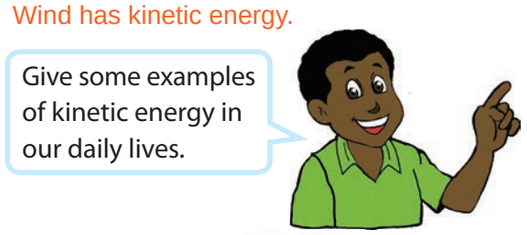
Summary

A moving object has kinetic energy. **Kinetic energy** is the energy of a moving object. Any object in motion has kinetic energy. For example, a moving car has kinetic energy. When you are running, your body also has kinetic energy. Wind is moving air so it also has kinetic energy.

The amount of kinetic energy that an object has depends on the speed of the object. The faster the object moves, the larger kinetic energy it has.


A running animal has kinetic energy.


Wind has kinetic energy.




Slow moving ball has smaller kinetic energy.


Fast moving ball has larger kinetic energy.

Lesson 2 Potential Energy 1: Gravitational Potential Energy

A pencil rolling on a desk has kinetic energy because it is in motion. Does a pencil on a desk also have any energy when it is at rest?

What form of energy is stored in an object at rest?

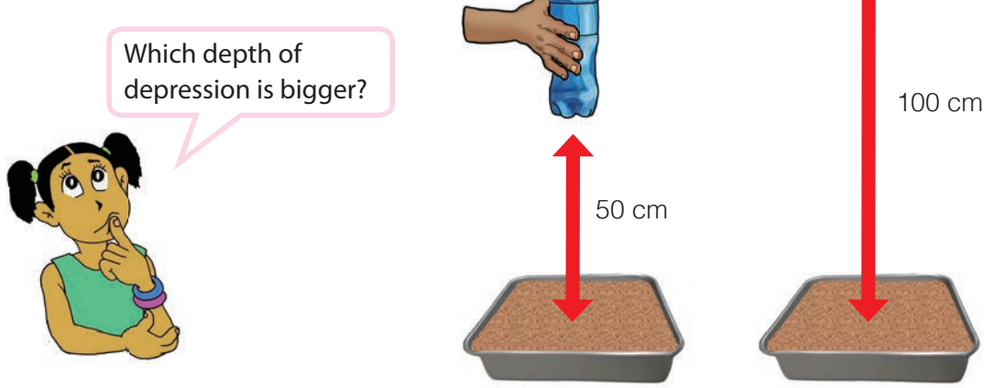
Activity : Dropping an object from different heights

What We Need:

- a bottle of water, deep tray, sand, tape measure

What to Do:

1. Fill the tray with sand.
2. Hold the bottle at the height of 50 cm above the tray of sand. Drop the bottle on the tray and measure how deep the depression is on the sand. Record the measurement in your exercise book.
3. Flatten the sand on the tray. Hold the bottle at the height of 100 cm above the same sand. Drop it again and measure the depth of depression. Record the measurement in your exercise book.
4. Compare the depth of depression between Steps 2 and 3.
5. Share your results with your classmates. Discuss how the depth of depression changes.



Result

We found out that a deeper depression was created when the bottle of water was dropped from a higher position.

Discussion

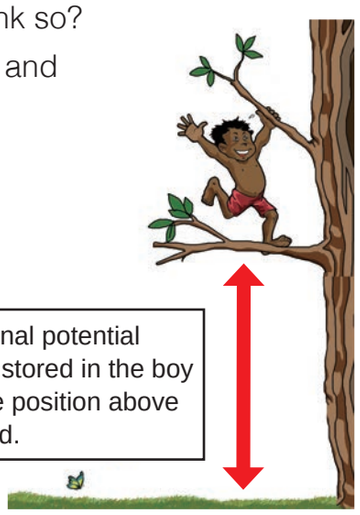
Think about the following questions based on your result.

1. What happened to the sand when the bottle was dropped from a higher position?
2. Did the bottle at rest have any energy? Why do you think so?
3. What is the relationship between the amount of energy and the height of the bottle?

Summary

Gravitational potential energy is the energy stored in an object. Gravitational potential energy in an object depends on its height above the Earth's surface. For example, a boy standing on a branch of a tree has energy. He does not seem to have any energy when he is not moving but he has stored energy. He has stored gravitational potential energy due to his position above the ground.

The higher an object is, the more gravitational potential energy it stores. Therefore, the higher a bottle of water is, the deeper the depression it can create on the ground.



Gravitational potential energy in the boy depends on his height above the ground.

Objects at higher position have greater gravitational potential energy.

Lesson 3 Potential Energy 2: Chemical Energy

We eat food to get energy. We burn wood to get heat and light. What form of energy is stored in the food and wood?

What different forms of energy are stored in objects?

Activity : Energy stored in objects

What to Do:

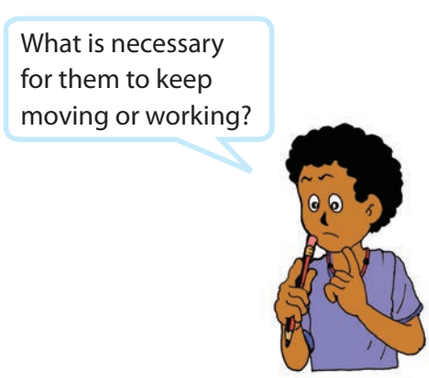
1. Draw a table like the one shown below.

	How do they get energy to move or work?
A mobile phone working	
A boy running	
A fire producing heat and light	
A flashlight lighting	
A car speeding	

2. Study the pictures below. Identify how each of them get energy to move or work and record your findings in the table.
3. Share your ideas with your classmates. Discuss how energy is stored and how they are classified.

A mobile phone working

A boy running



A fire producing heat and light

Flashlight lighting

A car speeding

Summary

Chemical energy is energy stored in foods, batteries and fuels. It is a form of potential energy. Unlike gravitational potential energy, chemical energy does not depend on the position of the object. Chemical energy stored in an object can be changed into other forms of energy through chemical changes.

Food

Food stores chemical energy. When food is eaten, the food is digested and the stored energy in the food is used by our body to do work. The chemical energy helps to keep us warm, enabling us to move and carry out all life processes.

Battery

The chemical energy is stored in batteries. A flashlight gets its energy from batteries (dry cells) inside it. When an electrical device operated by batteries is switched on, the chemical energy stored in the batteries is changed into electrical energy. This enables the device to work.




Fuel

Chemical energy is also stored in fuels such as gasoline, charcoal, natural gas and wood. The way chemical energy is used in fuels is by burning. Heat and light energy come from burning wood. Gasoline is burnt to produce motion in the engine of a car and the motion moves the car.



Lesson 4 Forms of Energy

There are many forms of energy around us. Can you identify what forms of energy can be found in our daily lives?

What situations do the different forms of energy exist in?

Activity : Finding the different forms of energy

What to Do:

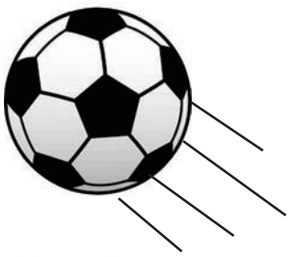
1. Draw a table like the one shown below.

Forms of Energy	What situation?

2. Study the picture below and find the different forms of energy; kinetic, gravitational potential, chemical, electrical, light, sound and heat energy.
3. Write in the table the forms of energy and the situations they are used or stored.
4. Share your ideas with your classmates. Discuss how the different forms of energy can be classified and in what situation these different forms of energy can be found in our lives.

Summary

Energy can be widely found in our everyday lives and comes in many different forms.
A moving ball has kinetic energy. An apple on the tree stores gravitational potential energy and chemical energy inside it. The Sun produces heat and light energy. Electrical energy enables us to run electrical appliances to make our lives easier.



Kinetic Energy

Gravitational Potential Energy

Chemical Energy

Heat and Light Energy

Electrical Energy

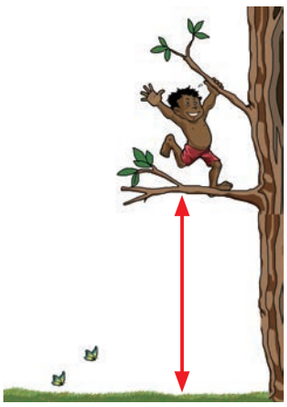
Forms of Energy	Description	Sources of Energy	Examples in daily life
Kinetic Energy	Energy in objects that are moving.	Movement of an object.	To move an object.
Gravitational Potential Energy	Energy that is stored in an object because of its position.	Position of an object above the Earth's surface.	To fall objects into ground.
Chemical Energy	Energy that is stored in an object.	Foods, batteries, fuels	To enable us to work. To light a torch. To move cars.
Electrical Energy	Energy that runs electrical appliances.	Power outlet, batteries	To run electrical appliances and other machines.
Sound Energy	Energy that we can hear.	Drum, speaker, voice	To hear music. To communicate with others.
Light Energy	Energy that enables us to see.	The Sun, fire, flashlight, burning of fuels	To see objects. To light up dark place.
Heat Energy	Energy that makes objects warm and hot.	The Sun, fire, burning of fuels	To cook food. To make our body warm.

Summary and Exercise

Summary

7.1 Forms and Uses of Energy

Forms and Uses of Energy



- **Kinetic energy** is energy of a moving object.
  - The amount of kinetic energy of an object depends on the speed of the object.
- **Gravitational potential energy** is energy stored in an object.
  - Gravitational potential energy in an object depends on its height above the Earth's surface.
- **Chemical energy** is energy stored in foods, batteries and fuels.
  - Chemical energy stored in an object can be changed into other forms of energy through chemical changes.

- Energy can be widely found in our everyday lives and comes in many different forms. Some forms of energy, their descriptions and sources are provided in the table below.

Forms of Energy	Description	Sources of Energy
Kinetic Energy	Energy in objects that are moving.	Movement of an object.
Gravitational Potential Energy	Energy that is stored in an object because of its position.	Position of an object above the Earth's surface.
Chemical Energy	Energy that is stored in an object.	Foods, Batteries, Fuels
Electrical Energy	Energy that runs electrical appliances.	Power point, Batteries
Sound Energy	Energy that we can hear.	Drum, Speaker, Voice
Light Energy	Energy that enables us to see.	The Sun, Fire, Flashlight, Burning of fuels
Heat Energy	Energy that makes objects warm and hot.	The Sun, Fire, Burning of fuels

Summary and Exercise

Exercise

7.1 Forms and Uses of Energy

Q1. Complete each sentence with the correct word.

(1) Energy stored in an object at a height above the Earth's surface is called _____ _____ energy.

(2) Energy of a moving object is known as _____ energy.

(3) Form of energy stored in food, fuel and batteries is _____ energy.

Q2. Chose the letter with the correct answer.

(1) Which pictures are examples of kinetic energy?

(A)	(B)	(C)	(D)
			

(2) Which of the following has stored chemical energy in fuel?

A. A girl running

B. Charcoal for barbeque

C. A boy standing on top of the roof

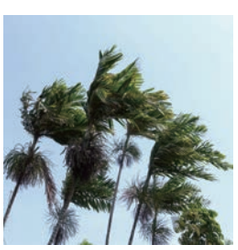
D. Sound from a speaker

Q3. Answer the following questions.

(1) What does the amount of kinetic energy of an object depend on?

(2) Look at the picture of the two books on the right. Which of these would have the largest gravitational potential energy stored?

Q4. Ketsin observed a very tall coconut tree on a windy day. The wind blew so strong that a coconut fell off the tree to the ground. Describe the forms of energy Ketsin observed on that day.



7.2 Energy Conversion

Lesson 1 Relationship between Kinetic and Gravitational Potential Energy

When we hold a ball above the ground, it has potential energy because of its position. When we drop the ball, it has kinetic energy because of its motion.

What is the relationship between kinetic and potential energy?

Activity : A marble rolling down and up

What We Need:

- clear plastic tube, marble

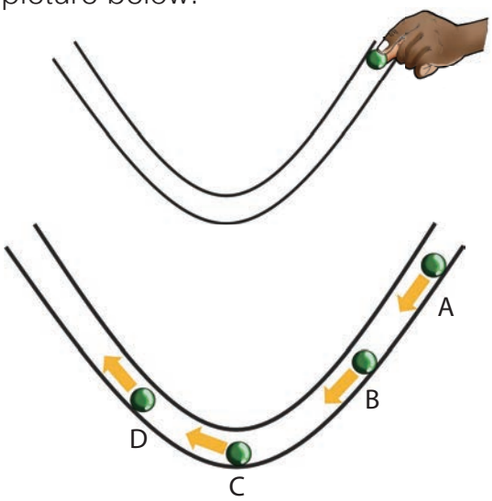
How does the speed of the marble change as its position changes?

What to Do:

1. Draw a table like the one shown below.

	Before the marble reaches the ground	After the marble passes through the ground
Height of marble		
Speed of marble		

2. Curve the plastic tube as shown in the picture below.
3. Predict how the movement and the height of the marble will change if you drop the marble into the tube.
4. Drop the marble into the top of the tube.
5. Observe how the height and the speed of the marble changes in the tube.
6. Record your observations in the table.
7. Share your findings with your classmates. Discuss the relationship between the speed and the height of the marble.



Result

We found out that as the marble fell, its height decreased but its speed increased. After passing through the ground level, its height increased but its speed decreased.

	Before the marble reached the ground level	After the marble passed through the ground level
Height of marble	decreased	increased
Speed of marble	increased	decreased

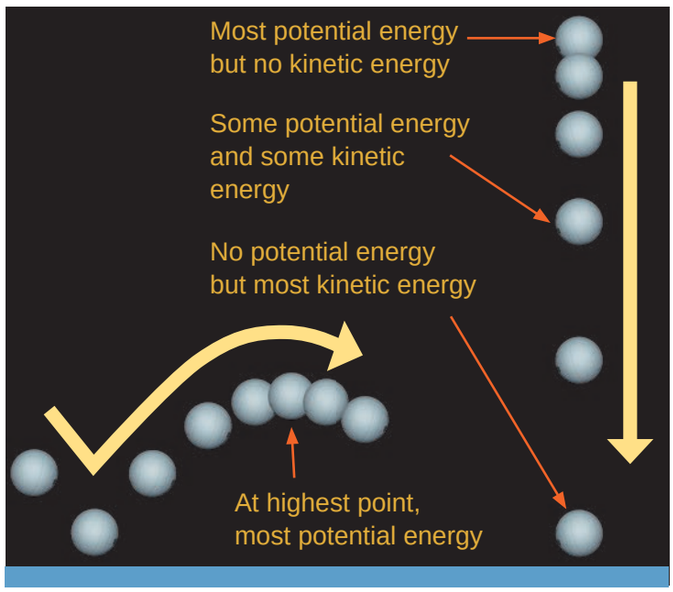
Discussion

Think about the following questions based on your result.

1. At which point does the marble has the most and least potential energy?
2. At which point does the marble has the most and least kinetic energy?
3. How does gravitational potential and kinetic energy change when the marble goes down and up?

Summary

Gravitational potential energy can be changed to kinetic energy and back again. When we hold a ball above the ground it has only gravitational potential energy. When we release the ball it starts moving. Some of its potential energy is transformed into kinetic energy. Kinetic energy increases while gravitational potential energy decreases during its fall. The moment before the ball hits the ground, all of its potential energy is transformed into kinetic energy. When the ball bounces off the ground, it moves upward. Its kinetic energy is decreased and potential energy is increased. When the ball is at its highest point, it has the most potential energy.



Relationship between potential and kinetic energy

Lesson 2 Change in Forms of Energy in Daily Life

Energy changes from gravitational potential to kinetic and back again. How about other forms of energy? Does energy also change into different forms?

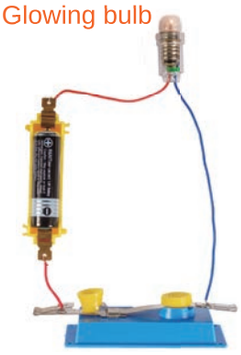
How does energy change form?

Activity : The ways energy changes forms

What to Do:

1. Study the pictures below. Identify the forms of energy in each picture and describe how the forms of energy changes in your exercise book.
2. Share your ideas with your classmates. Discuss how energy changes forms in our daily lives.

A. Glowing bulb



B. Moving car

C. Watching TV

D. Releasing water from a dam

Summary

Energy can exist in many forms and it can be changed from one form to another. The change in the forms of energy can be observed everywhere in our daily life. The following show some examples of the change in forms of energy in our daily lives.

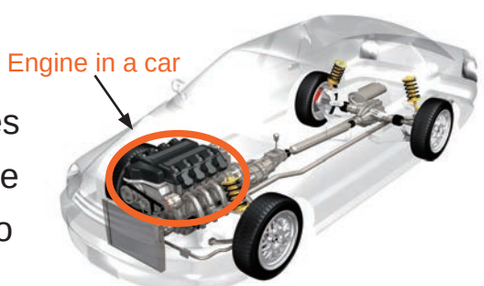
Chemical Energy → Electrical Energy → Light and Heat Energy

Chemical energy stored in a dry cell changes to electrical energy when it is connected to a closed circuit. The electrical energy changes to light and heat energy when the current passes through the light bulb.

Glowing bulb

Chemical Energy → Kinetic, Sound and Heat Energy

A car needs fuel to move. Fuel stores chemical energy. The engine in a car changes the chemical energy to kinetic energy to move the car. Then sound and heat energy are also released.

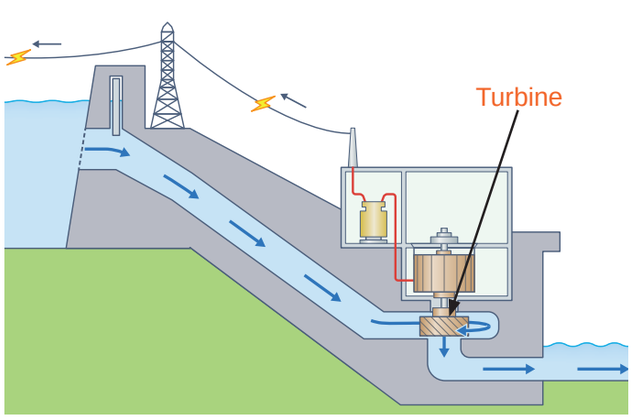


Electric Energy → Light and Sound Energy

Electricity comes from power points in a house. A television changes electrical energy to light and sound energy so we can see image and hear sound while watching program.

Potential Energy → Kinetic Energy → Electrical Energy

People build dams to produce electricity. Large amounts of water stored in dams have a lot of gravitational potential energy. The energy changes to kinetic energy that turns the turbine in power plants. When the turbine spins, electricity is generated.



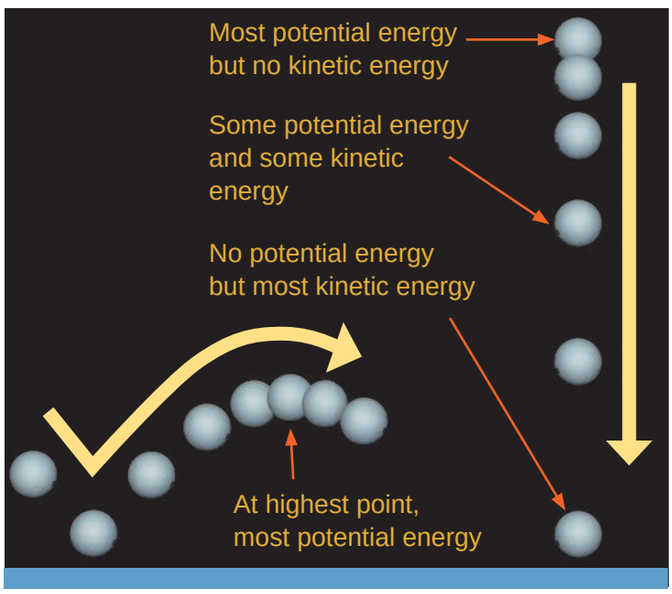
Hydroelectric plant

Summary and Exercise

Summary 7.2 Energy Conversion

Kinetic Energy and Gravitational Potential Energy

- Gravitational potential energy can be changed to kinetic energy and back to gravitational potential energy again.
- Kinetic energy of an object increases while its gravitational potential energy decreases in falling.
- Kinetic energy of an object decreases while its gravitational potential energy increases in object moving upward.



Conversion of Energy

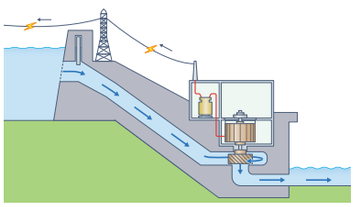
- Energy exists in many forms and changes from one form to another.
- The change in the forms of energy can be observed everywhere in our daily lives.

Chemical Energy → Electrical Energy → Light and Heat Energy

Chemical energy stored in a battery changes to electrical energy that changes to light and heat energy when the electrical current passes through the circuit.

Potential Energy → Kinetic Energy → Electrical Energy

When the water flows down through the dam, the gravitational potential energy changes to kinetic energy to turn the turbine in the power plant. When the turbine is spinning, electricity is generated.



Summary and Exercise

Exercise 7.2 Energy Conversion

Q1. Complete each sentence with the correct word.

(1) Chemical energy stored in a dry cell changes to _____ energy when it is connected to an electrical circuit.

(2) After a ball is bouncing off the ground, gravitational potential energy can be changed to _____ energy.

(3) Energy that is generated by moving turbines in a power plant is _____ energy.

Q2. Choose the letter with the correct answer.

(1) Fuel is used to move a car. Which of the following is the correct order of energy changes when the car moves?

A. Chemical energy → Kinetic energy

B. Sound energy → Kinetic energy

C. Gravitational potential energy → Chemical energy

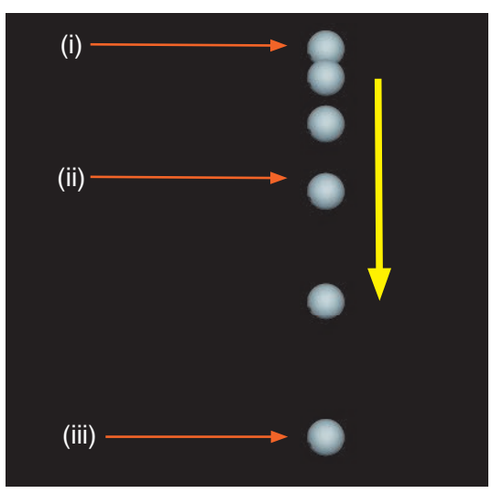
D. Light energy → Chemical energy

Q3. Study the picture on the right and answer the following questions.

(1) At which position is there more gravitational potential energy?

(2) At which position is less gravitational potential energy?

(3) Describe the change of kinetic energy of the ball during the fall.



Q4. When going uphill Jonathan stood up and pedaled the bicycle with great effort, when he reached the top he sat down and went downhill without pedalling. Why did Jonathan pedal uphill with great effort?

Chapter 7

•Science Extras•

How do we use wind?

We can feel winds on our faces and body. We can see wind sway trees. Wind is moving air all the time in the Earth's atmosphere. Winds have kinetic energy.

Sailing across oceans

The kinetic energy of winds was used by our ancestors to sail their boat and travel across ocean to other places to trade. Lakatoi is sail boat of Papua New Guinea. They are named in the Motu language and traditionally used in the Hiri trade cycle.

A Lakatoi at seashore during Hiri Moale Festival.

Generating electricity

Today there are many homes and industries that depend on electricity to power electric appliances. But producing electricity often leaves wastes in the land, air and water. People are now looking for clean energy and wind is one of the sources of clean energy that is renewable. In order to generate electricity from wind, large windmills called wind turbines are used. The wind turbine converts kinetic energy of wind to electrical energy by turning the blades which spin the turbine. When the turbine spins, electricity is generated.

Wind turbines to generate electricity

Chapter Test

7. ENERGY

Q1

Complete each sentence with the correct word.

(1) The stored energy in a battery is called _____ energy.

(2) The energy that a moving object has is called _____ energy.

(3) A generator is a machine that generates _____ by converting kinetic energy when its turbine is spinning.

(4) The stored energy in an object placed at high place is _____ _____ energy.

Q2

Choose the letter with the correct answer.

(1) Which list contains sources of chemical energy?

A. Power outlet, battery and bulb

B. Voice, speaker and drum

C. Fuel, battery and food

D. Air, sunlight and fire

(2) There are four marbles on each cupboard at different heights. Which is true if the marbles were to fall off the cupboards?

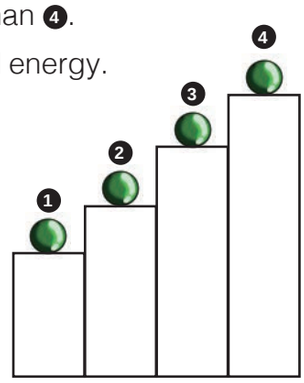
A. Marble ❸ has more gravitational potential energy.

B. Marble ❶ will have more speed when it falls.

C. Marble ❷ will have more kinetic energy than ❹.

D. Marble ❹ has more gravitational potential energy.

(3) Which of the marbles would increase in speed more than the others during the fall?



A. ❶

B. ❷

C. ❸

D. ❹

(4) Which of the following is <u>not</u> correct about energy?

A. Energy can change from one form to another.

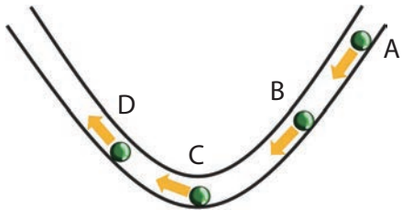
B. Kinetic energy can be changed to gravitational potential energy.

C. An object being at rest does not have any energy.

D. The Sun is a source of heat and light energy.

Q3

(1) Study the diagram. A marble started rolling at point A and moved down the slope.



(i) At which point does the marble have the most gravitational potential energy?

_____

(ii) At which point does the marble have the most kinetic energy?

_____

(iii) Describe the energy change during the marble moving from point C to D.

_____

_____

(2) Name the energy as it changes form in each situation as shown by the arrows.

i) Listening to the radio working by batteries

_____ (energy) → _____ (energy) → _____ (energy)

ii) Cooking using a gas stove

_____ (energy) → _____ (energy) + _____ (energy)

iii) Generating electricity at a hydroelectric plant

_____ _____ (energy) → _____ (energy) → electrical energy

Q4

Melo is riding his bike along the path. He starts on level ground. But when he gets to a hill, he has to pedal harder to go up the hill at the same speed. Why does this happen?

_____

_____

Chapter 8

Moon

8.1 Moon in Motion

Lesson 1 Movement of the Moon

We can see the Moon moving from east to west in the sky from the Earth. But how does the Moon move when we see it from space?

How does the Moon move in space?

Activity : Revolving and spinning

What We Need:

- one blue clay, one white clay, pan, pencil

What to Do:

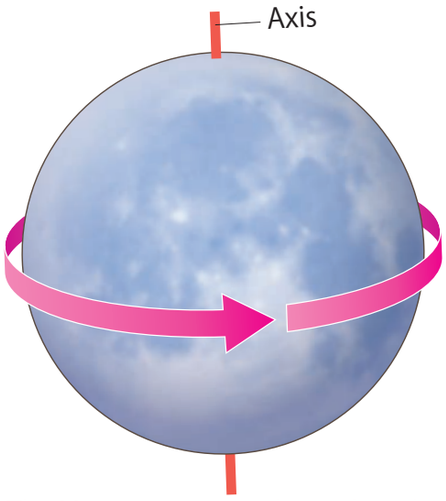
1. Shape the white clay into a ball.
2. Stick the pencil through the white clay. Hold the edge of the pencil and spin it. Observe how the white clay moves.
3. Remove the white clay from the pencil and put it in the pan. Attach the blue clay in the middle of the pan.
4. Hold the pan and move the white clay around the blue clay in the pan. Observe how the white clay moves.
5. Think about the following questions:
   (1) How are the movements of the white clay in Steps 2 and 4 different?
   (2) The white clay represents the Moon and the blue clay represents the Earth. Can you guess how the Moon moves?
6. Share your ideas with your classmates. Discuss your answers.

Summary

The Moon has two main movements: Rotation and Revolution.

Rotation

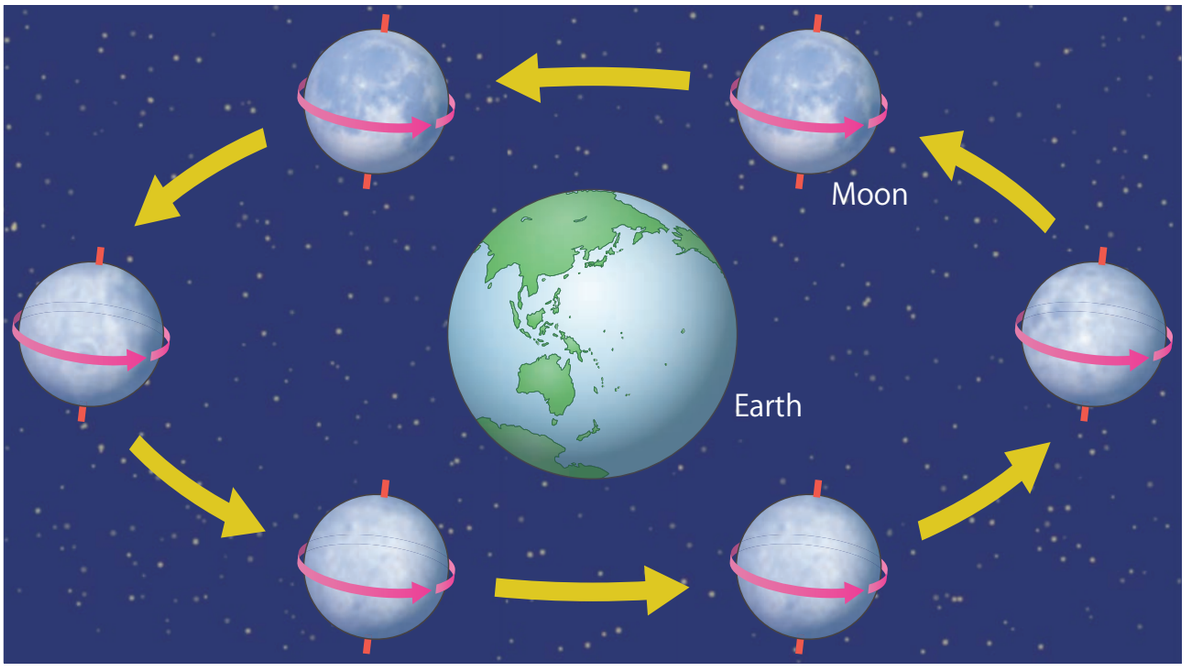
The Moon spins in space. This movement is called **rotation**. The Moon also rotates on its axis. An **axis** is an imaginary line through the centre of an object around which it rotates or spins. It takes about 27.3 days for the Moon to rotate once.



The Moon rotates or spins on its axis.

Revolution

The Moon also moves around the Earth. This movement is called **revolution**. The Moon revolves in an orbit around Earth by rotating on its axis. An **orbit** is the path the Moon takes to go around the Earth. It also takes about 27.3 days for the Moon to orbit the Earth once.



The Moon revolves in an orbit around the Earth by rotating on its axis.

Lesson 2 Causes of Moon Phases

The Moon seems to change its shape every night. Why do the phases of the moon occur?

What causes the phases of the Moon?

Activity : Modelling the Moon Phase

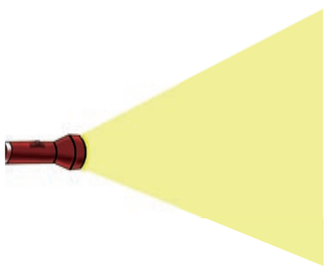
What We Need:

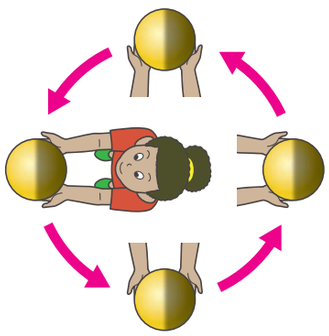
- small ball, flashlight

What to Do:

1. Hold the ball in front of you above the level of your head. Have your friend hold the flashlight a metre away. Observe how the ball appears to you.
2. As you hold the ball, slowly make a turn in anticlockwise direction, keeping the ball in front of you. Observe how the ball appears to change its lit surface in this position.

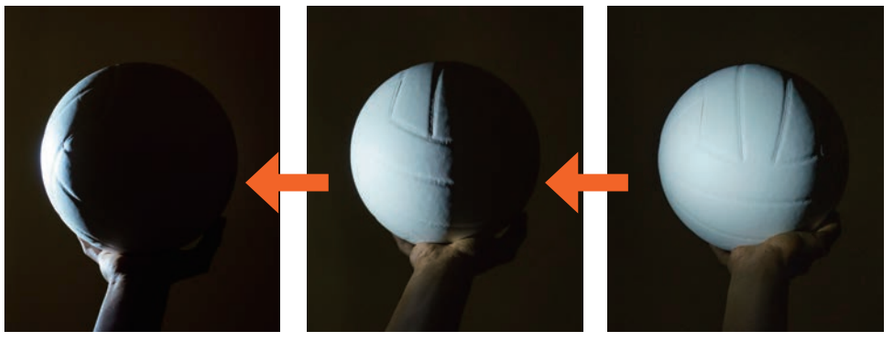
3. Draw the shape of the light and the dark surface of the ball that you observed.
4. Share your findings with your classmates. Discuss how the Moon appears to change its shape.





Result

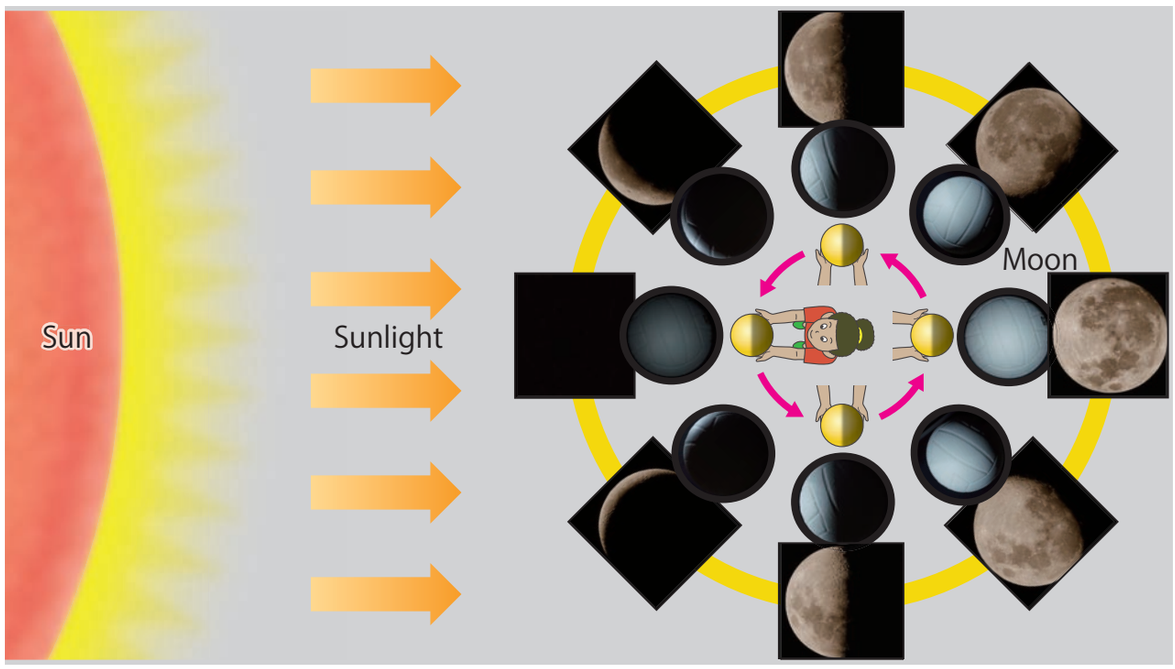
We found out that the amount of the lit area of the ball changed when we made a turn.



Changes in the amount of the lit area of the ball represents the moon phases.

Summary

The changes in the amount of the lit areas of the Moon that can be seen from the Earth are called **moon phases**. The moon phases depend on the Moon's position in relation to the Sun. The Moon does not produce its own light like the Sun. The Moon reflects light from the Sun. We only see the lit side of the Moon that is facing the Sun. The amount of the lit side of the Moon changes according to the relationship between the position of the Moon and the Sun. These changes cause moon phases.



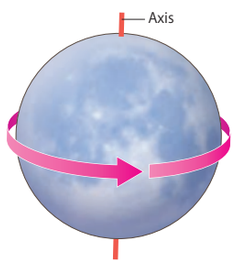
The amount of the lit side of the Moon changes according to the relationship between the position of the Moon and the Sun.

Summary and Exercise

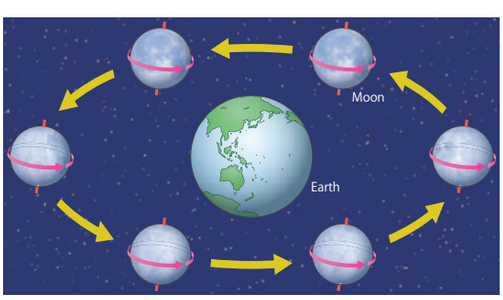
Summary 8.1 Moon in Motion

Movement of the Moon

- The Moon has two main movements; rotation and revolution.
- The Moon rotates on its axis as it spins in space.
- It takes about 27.3 days for the Moon to spin once.
- The Moon also moves around the Earth and this movement is called revolution.
- The Moon revolves in an orbit around the Earth.
- An orbit is the path the Moon takes to go around the Earth.
- It takes about 27.3 days for the Moon to orbit the Earth.



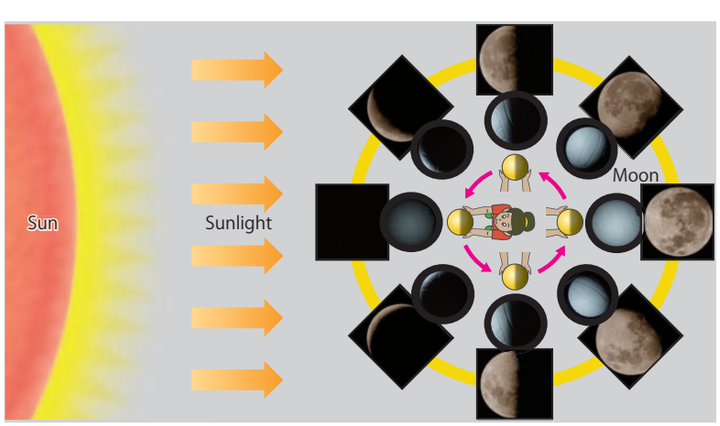
The Moon rotates or spins on its axis.



The Moon revolves in an orbit around the Earth.

Causes of Moon Phases

- The Moon does not make its own light like the Sun but it reflects light from the Sun.
- The changes in the amount of lit areas of the Moon that can be seen from the Earth are called moon phases.
- The amount of the lit side of the Moon changes according to the relationship between the position of the Moon and the Sun. These changes cause moon phases.
- The moon phases depend on the moon's position in relation to the Sun.



Summary and Exercise

Exercise 8.1 Moon in Motion

Q1. Complete each sentence with the correct word.

(1) The path taken by the Moon to go around the Earth is called _____.

(2) The movement of the Moon around the Earth is called _____.

(3) The changes in the amount of lit area of the Moon are moon _____.

(4) The lit side of the _____ facing the Sun is seen from the Earth.

Q2. Choose the letter with the correct answer.

(1) What is the name of an imaginary line through the centre of an object around which it rotates or spins?

A. Revolution

B. Orbit

C. Phase

D. Axis

(2) Which of the following is <u>not</u> a correct statement about the Moon? The Moon..

A. revolves the Earth once every 27.3 days.

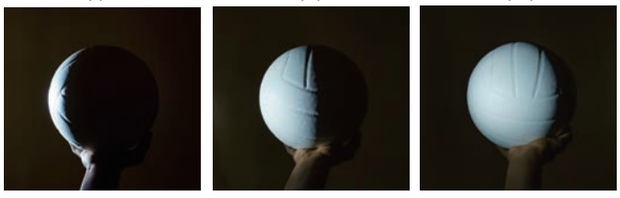
B. phase depends on the Moon's position in relation to the Sun.

C. does not spin on its axis.

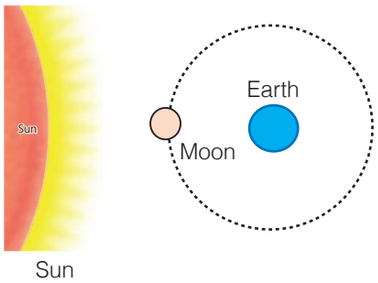
D. has two movements of rotation and revolution.

Q3. Draw the Moon phases represented by the figures (i), (ii) and (iii) shown in the pictures on the right.

(i) (ii) (iii)



Q4. Look at the diagram on the right. What would the moon phase look like when you see it from the Earth? Explain why.



What does ocean tides creates?

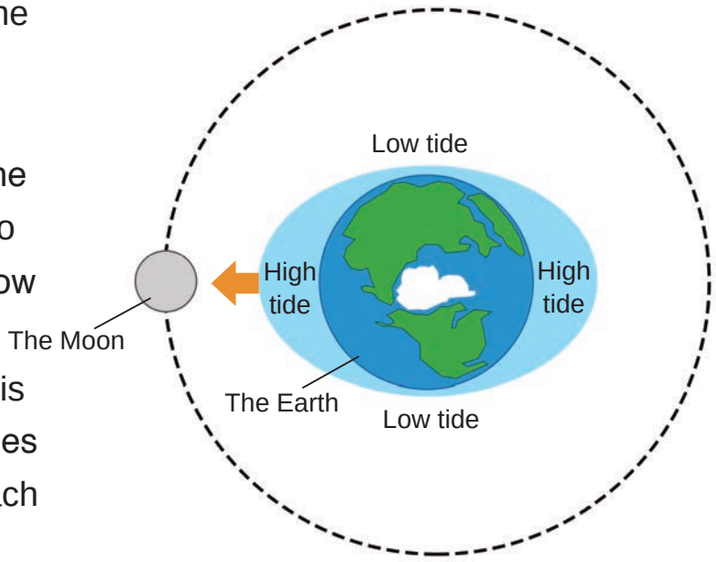
Tides are rise and fall in sea level in relation to the land. Each day, there are two high tides and two low tides. There is about 6 hours between the high tide and the low tide.

High tide

Low tide

Tides are created because the Earth and the Moon are attracted to each other due to gravitatioal force, just like unlike poles of magnets are attracted to each other. The Moon tries to pull at anything on the Earth closer it. But the Earth holds onto everything except the water in the oceans. As shown in the diagram below, the gravitational force of the Moon pulls the water in the oceans upwards making the oceans bulge, which creates high tide in the areas of Earth facing the Moon and on the opposite side. At the same time, in other parts of the planet, the ocean water drains away to fill these bulges, creating low tides.

The Earth rotates on its axis once a day, so two high tides and two low tides occur each day.



The gravitational force of the Moon makes the water in the oceans bulge and causes a high and low tide on the Earth.

Chapter Test

8. Moon

Q1

Complete each sentence with the correct word.

(1) The Moon can be seen moving from _____ to West in the sky.

(2) The Moon reflects light from the _____.

(3) It takes the Moon about 27.3 days to orbit the _____.

(4) The path taken by the Moon to go around the Earth is called _____.

Q2

Choose the letter with the correct answer.

(1) What causes the Moon's phases to change?

A. The Moon's spin

B. The Moon's revolution around the Earth

C. The Earth's spin

D. The Sun's spin

(2) What happens when you see the Moon's phases change? The Moon seems to change its

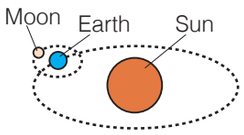
A. colour.

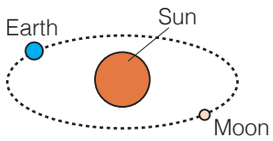
B. speed.

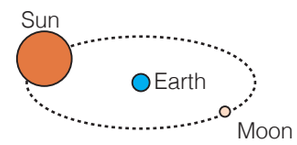
C. shape.

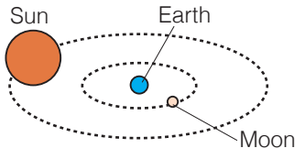
D. distance.

(3) Which of these best shows that the Earth revolves around the sun as the Moon revolves around the Earth?

A. 

B. 

C. 

D. 

(4) Why does the Moon appear to move across the sky in the day?

A. It travels around the Earth every day.

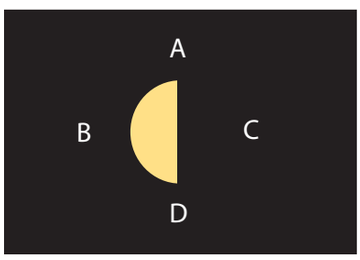
B. The Earth rotates on its axis.

C. All objects in space are moving.

D. It is extremely far away.

Q3

Use the picture of the moon shown on the right to answer the two questions below.



(1) At what direction is the sun?

_____

(2) The area between A, B and D is lit by the Sun. Why is the area between A, C and D shaded black?

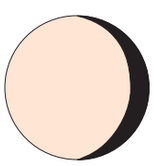
_____

(3) The Moon moves around the Earth. What do we call this movement?

_____

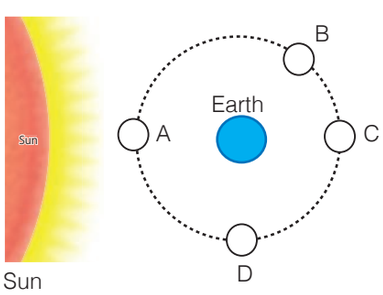
Q4

Edward is keeping a journal of the Moon phases for homework assignment. His sketch of how the Moon appeared on a clear night is shown on the right.



(1) Study the diagram on the right. Which position was the Moon located in space when he observed it?

_____

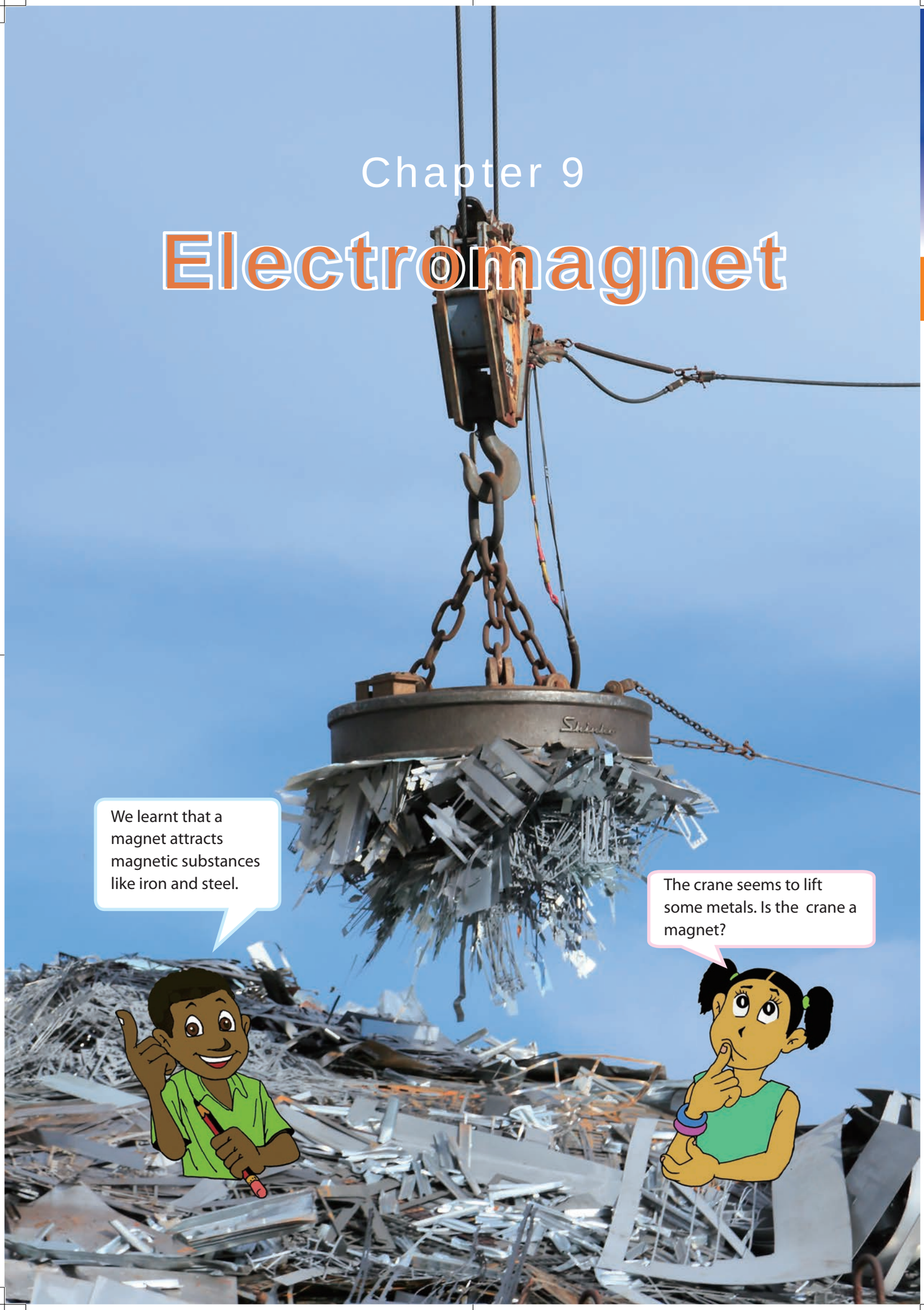


(2) How will the phase of the Moon look like if the Moon is at position C in the diagram? Explain why.

_____

_____

_____


Chapter 9
Electromagnet
We learnt that a magnet attracts magnetic substances like iron and steel.
The crane seems to lift some metals. Is the crane a magnet?

9.1 Properties of Electromagnet

Lesson 1 Characteristics of Electromagnet

An **electromagnet** is a type of magnet which consists of a coil of wire wrapped around an iron core with electric current flowing in the coil.

What are the characteristics of an electromagnet?

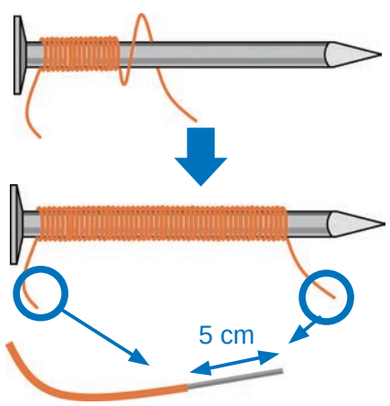
Activity : Making an electromagnet

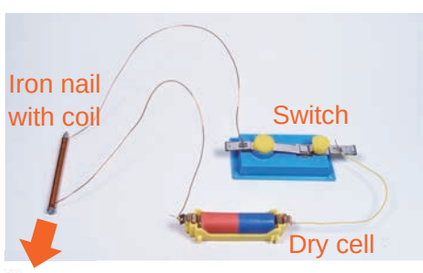
What We Need:

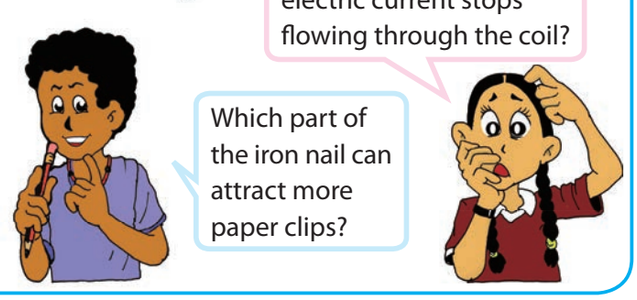
- iron nail, enamel wire, dry cell, cell holder, switch, sand paper, steel clips

What to Do:

1. Wrap the wire 50 times around the iron nail in the same direction to make a coil as shown on the right.
2. Strip the coating 5 cm on both ends of the wire by using sand paper because the coating does not conduct electricity.
3. Connect the wires to the positive (+) and negative (-) side of the dry cell as shown in the figure on the right.
4. Bring the iron nail closer to the paper clips. Record what you observed in your exercise book.
5. Share your findings with your classmates. Discuss the similarities and the differences between an electromagnet and a bar magnet.

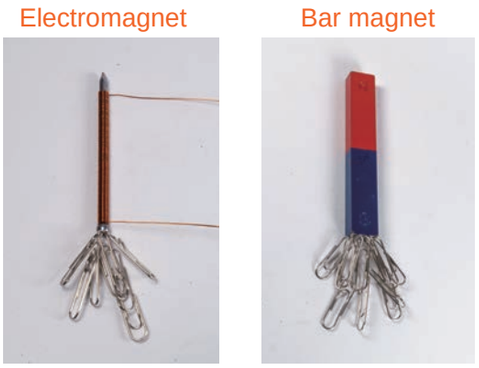






Result

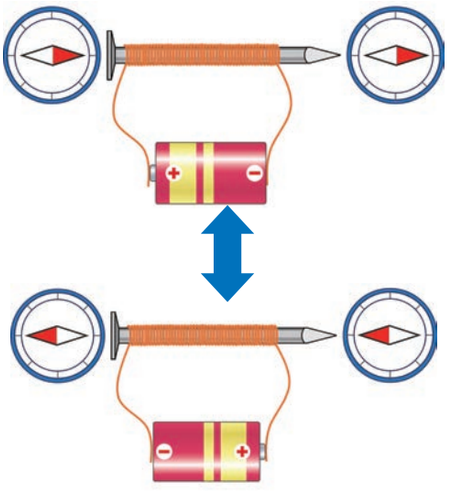
We found out that more clips were attracted to both ends of the iron nail. The iron nail attracted steel clips only when electric current flows in the coil. Unlike a bar magnet, the electromagnet did not attract clips when the electric current stopped.



An electromagnet attracts magnetic objects like a bar magnet.

Discussion

Both ends of an electromagnet can attract more steel clips. Does an electromagnet also have two poles like the bar magnet? Let's investigate the characteristics of electromagnetic poles.



Step 1. Place a compass near the both ends of an electromagnet. Observe the needle of the compass and identify which magnetic pole it has.

Step 2. Change the direction of the dry cell in the coil and then repeat Step 1.

Step 3. Based on the results, think about the characteristics of the electromagnetic poles.

Summary

An electromagnet has the following characteristics:

1. An electromagnet remains a magnet as long as electric current flows in the coil. Unlike a bar magnet, the electromagnet stops being a magnet when the current stops flowing in the coil.
2. An electromagnet has two poles: the north and the south pole. Unlike a bar magnet, the poles of the electromagnet changes when the direction of the electric current changes.

Lesson 2 How to Strengthen an Electromagnet 1

A bar magnet cannot change its strength. How about an electromagnet? Can we change the strength of an electromagnet?

How can we change the strength of an electromagnet?

Activity : Changing the number of dry cells in a circuit

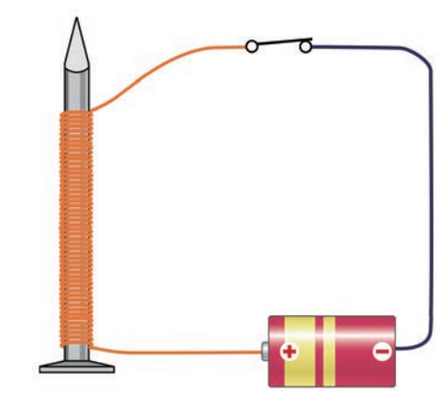
What We Need:

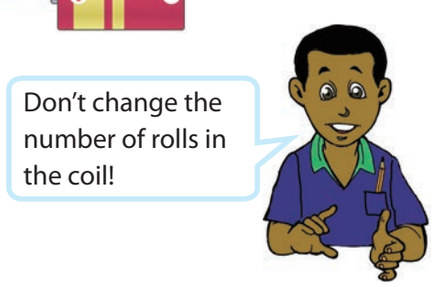
- electromagnet, two dry cells, three cell holders, switch, wires, paper clips

What to Do:

1. Draw a table like the one shown on the right.
2. Make an electrical circuit like the one shown on the right.
3. Switch on the circuit and bring one end of the nail close to the clips. Try to pick up as many paper clips as possible. Do this three times.
4. Record the number of paper clips attracted to the electromagnet. Calculate the average of the number of paper clips picked up.
5. Add the second dry cell in series to the circuit and repeat Steps 3 and 4.
6. Share your results. Discuss the relationship between the number of dry cells and the strength of an electromagnet.

Name of dry cells	How many paper clips can be picked up?			
	1st attempt	2nd attempt	3rd attempt	Average
1				
2				





Turn the switch on ONLY during testing. If electric current flows continuously, the coil will get hot.

Result

We found out that an electromagnet attracted more paper clips when more dry cells were added to the circuit in series.

Examples of the Results

Number of dry cells	How many paper clips can be picked up?			
	1st attempt	2nd attempt	3rd attempt	Average
1	5	6	5	5.3
2	13	11	12	12

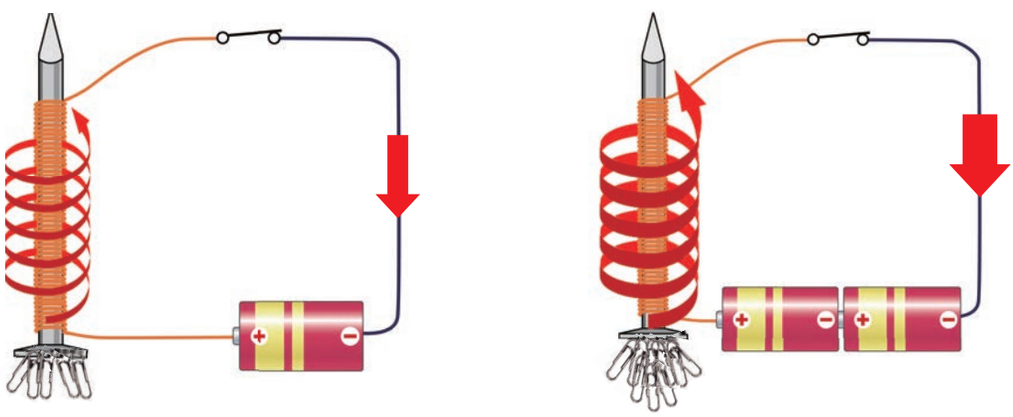
Discussion

Think about the following questions based on the results.

1. What condition did you change in this activity?
2. How did the electric current change with the increased number of dry cells in series?
3. What is the relationship between the strength of the electromagnet and the amount of electric current in the coil?

Summary

The strength of the electromagnet depends on the amount of electric current in the coil. The larger the electric current in a circuit, the stronger the strength of the electromagnet. When the number of dry cells in series increases, the strength of the electromagnet also increases and more paper clips are attracted.



When an electric current in the coil increases, the strength of the electromagnet also increases.

Lesson 3 How to Strengthen an Electromagnet 2

One of the ways to strengthen an electromagnet is to increase the amount of electric current in the coil. Is there a different way to strengthen an electromagnet?

What is another way to change the strength of an electromagnet?

Activity : Changing the number of coils

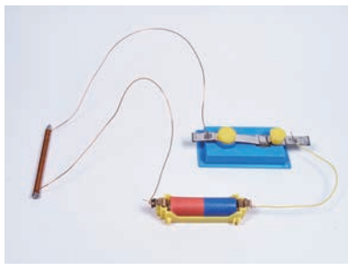
What We Need:

- electromagnet, a dry cell, a dry cell holder, switch, wires, paper clips

No. of rolls in the coil	How many paper clips can be picked up?			
	1st attempt	2nd attempt	3rd attempt	Average
10				
30				
50				

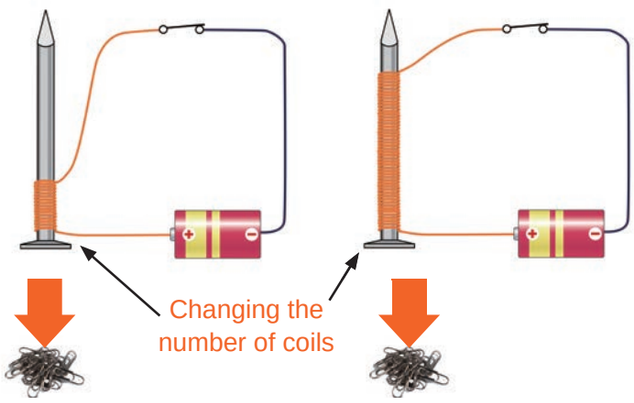
What to Do:

1. Draw a table like the one show above.
2. Make ten coils and then construct the electric circuit as shown on the right.



3. Switch on the circuit and bring one end of the nail close to the clips. Try to pick up as many paper clips as possible. Do this three times.
4. Record the number of paper clips attracted to the electromagnet. Calculate the average of the number of paper clips you picked up.

5. Repeat Steps 3 and 4 by changing the number of coils to 30 and 50 respectively.
6. Share your results and discuss the relationship between the number of rolls in the coil and the strength of the electromagnet.



Result

We found out that the electromagnet attracted more paper clips when the number of coils increased.

Examples of the Results

No. of the coils	No. of dry cells	How many paper clips can be picked up?			
		1st attempt	2nd attempt	3rd attempt	Average
10	1	4	6	5	5
30	1	7	9	8	8
50	1	13	10	12	11.7

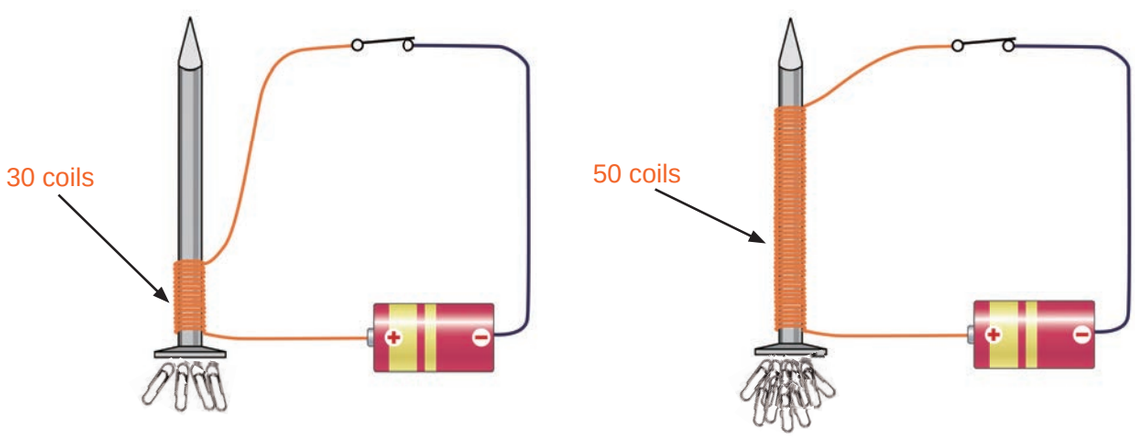
Discussion

Think about the following questions based on your results.

1. What condition did you change in this activity?
2. What is the relationship between the strength of the electromagnet and the number of coils?

Summary

The strength of the electromagnet depends on the number of coils. As the number of coils increase, the strength of electromagnet also increases.



When the number of coils increase, the strength of the electromagnet also increases.

The strength of an electromagnet can be increased by:

(1) Increasing the amount of electricity in a coil.
(2) Increasing the number of coil.

Lesson 4 Uses of Electromagnets in Daily Life

Electromagnets are used in many ways because of their characteristics. How are their characteristics helpful in our daily lives?

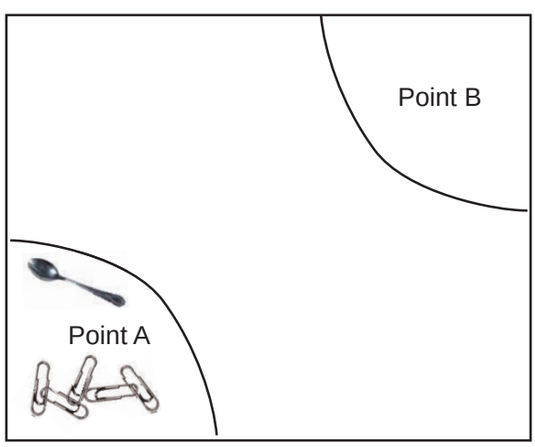
Scrap metal yard

How are electromagnets used in our daily lives?

Activity : Transporting objects using battery, wire and nail

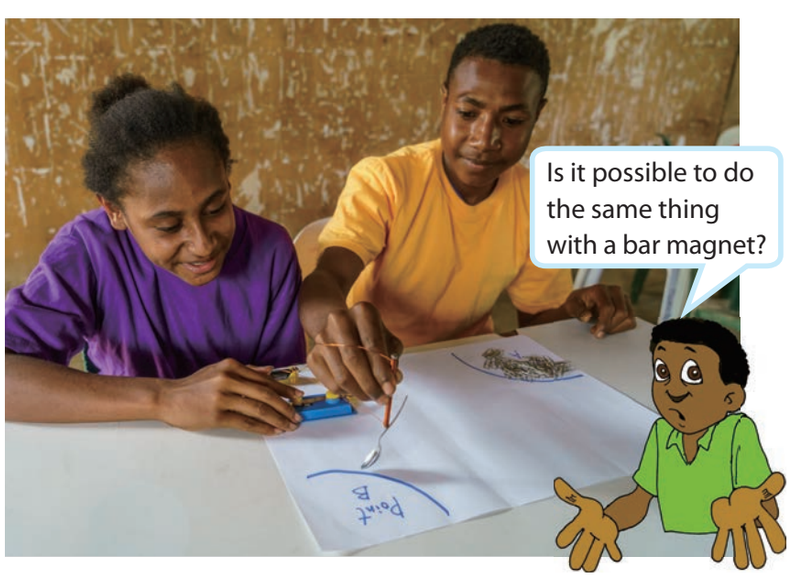
What We Need:

- electromagnet, two dry cells, two cell holders, switch, bar magnet, paper clips, metal spoon and A3 paper



What to Do:

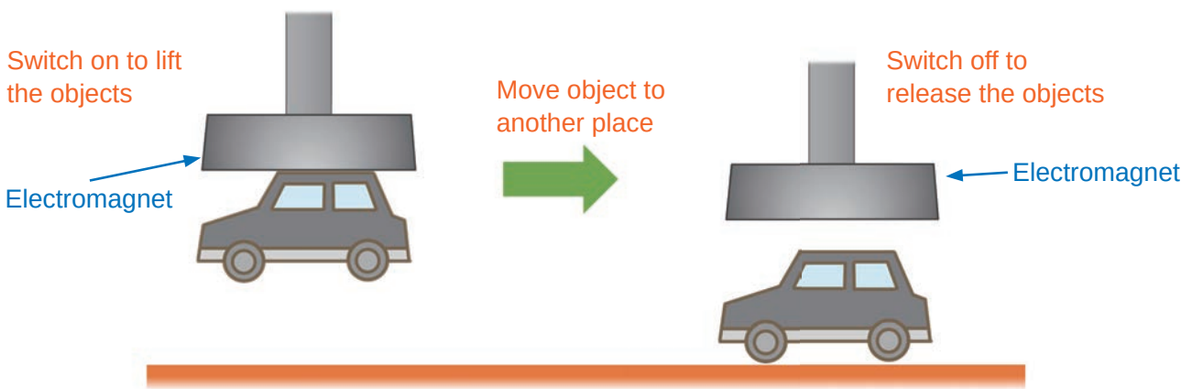
1. Draw point A and B on the A3 papper as shown on the right.
2. Put paper clips and metal spoon on point A.
3. Plan how you can transport these items to point B without touching them.
4. Carry out your plan and record your results in your exercise book.
5. Share your results with your classmates. Discuss how an electromagnet can be used in daily life.



Summary

Uses of electromagnet: How electromagnets are used in daily lives

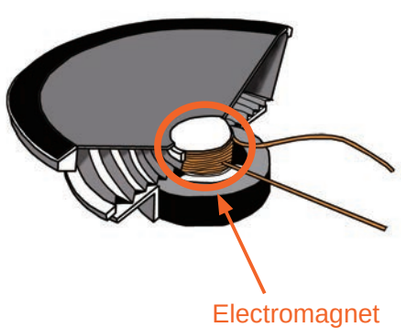
An electromagnet is used as a tool to lift heavy objects. A heavy object containing iron or steel is attracted to the electromagnet and lifted up when the electric current is switched on. The magnetic object is transported to another location and released by switching off the power supply to the electromagnet. The strength of the electromagnet is designed to change upon the weight of the object by changing the amount of electric current.



Large electromagnets are used in recycling factories to move old wrecked vehicles.

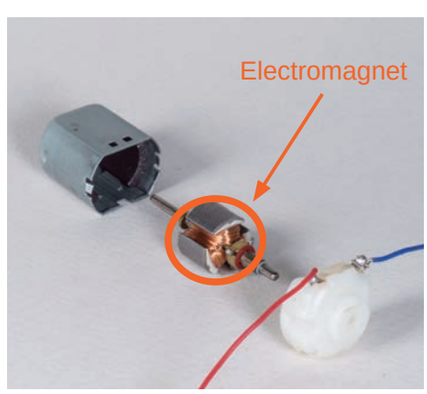
Use in Speakers

Electromagnet is used in radio speakers, cell phones, television sets and others. A speaker consists of several parts as shown on the right. An electromagnet is one of the parts which can convert electrical signal into physical vibration to produce sound.



Use in Motors

An electric motor is a device which powers machines such as fans, refrigerators, car parts and others. Electromagnet is one of the main parts which converts electrical energy into kinetic energy to rotate the axle of a motor.

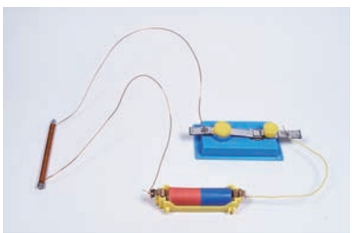


Summary and Exercise

Summary

9.1 Properties of Electromagnet

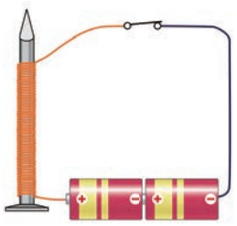
Characteristics of Electromagnet

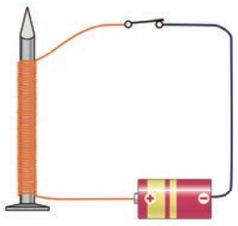


Electromagnet

- An electromagnet is a type of magnet which consists of a wire wrapped around an iron core with electric current flowing in the coil.
- Characteristics of an electromagnet are:
  1. It remains a magnet as long as electric current flows in the coil. Unlike a bar magnet, electromanget stops being a magnet when the current stops flowing in the coil.
  2. It has two poles; the north and the south pole. Unlike a bar magnet, the poles of the electromagnet changed when the direction of the electric current changes.

Strength of Electromagnet





- The strength of an electromagnet depends on;
  1. the amount of electric current in the coil
  2. the number of the coils
- As the amount of electric current in the coil increases, the strength of the electromagnet also increases.
- As the number of coils increases, the strength of electromagnet also increases.

Uses of Electromagnet in Daily Life

Scrap metal yard

- An electromagnet is used as a tool to lift heavy objects. A heavy iron or steel object is attracted by turning on the electromagnet and lifted up. It is transferred to another location and released by switching the electromagnet off.
- It is used in radio speakers, cell phones, televisions and motor in fans and refrigerators.

Summary and Exercise

Exercise

9.1 Properties of Electromagnet

Q1. Complete each sentence with the correct word.

(1) An _____ is a type of magnet which consists of a wire wrapped around an iron core and electric current flowing in the coil.

(2) The electromagnet remains a _____ as long as electric current flows in the coil.

(3) The strength of the electromagnet depends on the amount of _____ _____ in the coil.

(4) The strength of the electromagnet also depends on the number of _____.

Q2. Choose the letter with the correct answer.

(1) Which of the following is a characteristic of an electromagnet?

A. It has a north and a south pole.

B. It can attract plastic clips.

C. It can be used to pick up coals.

D. It does not use electricity.

(2) What happens to the number of paper clips when the number of the coils is increased?

A. It decreases.

B. It stays the same.

C. It increases.

D. It does not attract any paper clips.

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

(1) How can we increase the strength of the electromagnet?

(2) List two examples of the use of electromagnet.

Q4. Peter wants to move the heavy steel blocks from a ship onto the land. How can he move the steel blocks from the ship to the land?

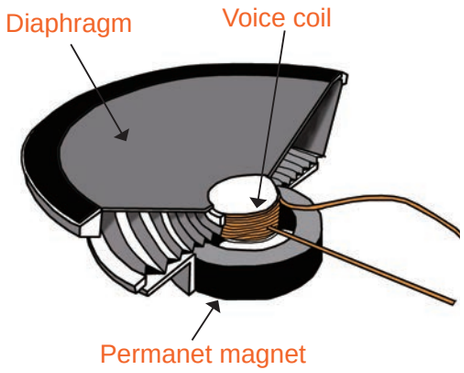
How a speaker works!

Have you ever realize something interesting? In nearly every device you buy there is a speaker. Speakers are all around us. Our television set, mobile phones, headphones, radios and even computers all use speakers of different types. Although they come in many different sizes, shapes, prices and sounds, speakers use the same underlying system, which relies on electricity and magnetism. A speaker is the opposite of a microphone. It takes an electric signal and transforms it into sound waves that humans can hear. There are three main parts of a speaker: the diaphragm, the voice coil and the magnet.

The **diaphragm** is a cone shaped structure. The cone is a flexible sheet of paper, metal, or plastic attached to the wide end of the diaphragm. The suspension (also known as surround) is a flexible rim that allows the cone to move. It in turn is attached to the frame of the diaphragm. The narrow end of the diaphragm is attached to the voice coil by the spider.

The **voice coil** is the electromagnetic part of the speaker. The voice coil is a tight coil of wire hooked up the speaker's power source. Alternating current electricity runs through the voice coil, causing it to constantly switch polarity.

The **magnet** is a permanent magnet that sits beneath the voice coil. The side that is facing the voice coil has one unchanging pole. Since the voice coil keeps changing polarity, it is constantly being attracted to and repelled from the magnet.



The voice coil's back and forth movement causes the diaphragm to vibrate. This vibration translates electrical signals into sound waves which humans can hear.

Chapter Test

9. Electromagnet

Q1

Complete each sentence with the correct word.

(1) One of the characteristics of electromagnet is that it has a north and a south _____.

(2) As the electric current and the number of rolls increases the _____ of the electromagnet also increases.

Q2

Choose the letter with the correct answer.

(1) Which of the following lists contain the materials needed to make an electromagnet?

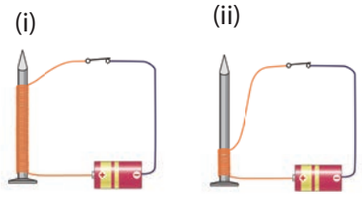
A. Dry cell, wire and piece of wood

B. Dry cell, wire and iron nail

C. Magnet, iron nail and wire

D. Magnet and dry cell

(2) Study the pictures on the right. Which of the following is the reason why electromagnet (i) is stronger than (ii)?



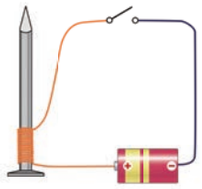
A. Because (i) has shorter iron nail.

B. Because (i) has more rolls of coil.

C. Because (i) has many dry cells.

D. Because (i) has thinner iron nail.

(3) Study the picture on the right. Why does the electromagnet not attract paper clips?



A. Because the iron core is too short.

B. Because the number of dry cells is not enough.

C. Because the weight of iron core is too light.

D. Because the electric current does not flow in the coil.

(4) How are electromagnets different from magnets?

A. Only bar magnet can be turned on/off.

B. Only electromagnet can be turned on/off.

C. Only bar magnet can change its strength.

D. Only electromagnet has north and south poles.

Q3

(1) A student conducted an experiment with an electromagnet and a bar magnet using magnetic substances as shown on the right. How are they alike?

_____

_____

_____

(2) Where can you find electromagnets in your home?

_____

_____

(3) This is a diagram of a simple electromagnet. How do you make an electromagnet stronger?

1. _____
2. _____

Q4

(1) How does the pole of an electromagnet change?

_____

_____

(2) Scrap metal yards use an electromagnet to separate iron from scrap materials. Explain how using an electromagnet instead of a regular magnet helps to separate iron from scrap materials?

_____

_____

_____

_____