UNIT 6 FORCE

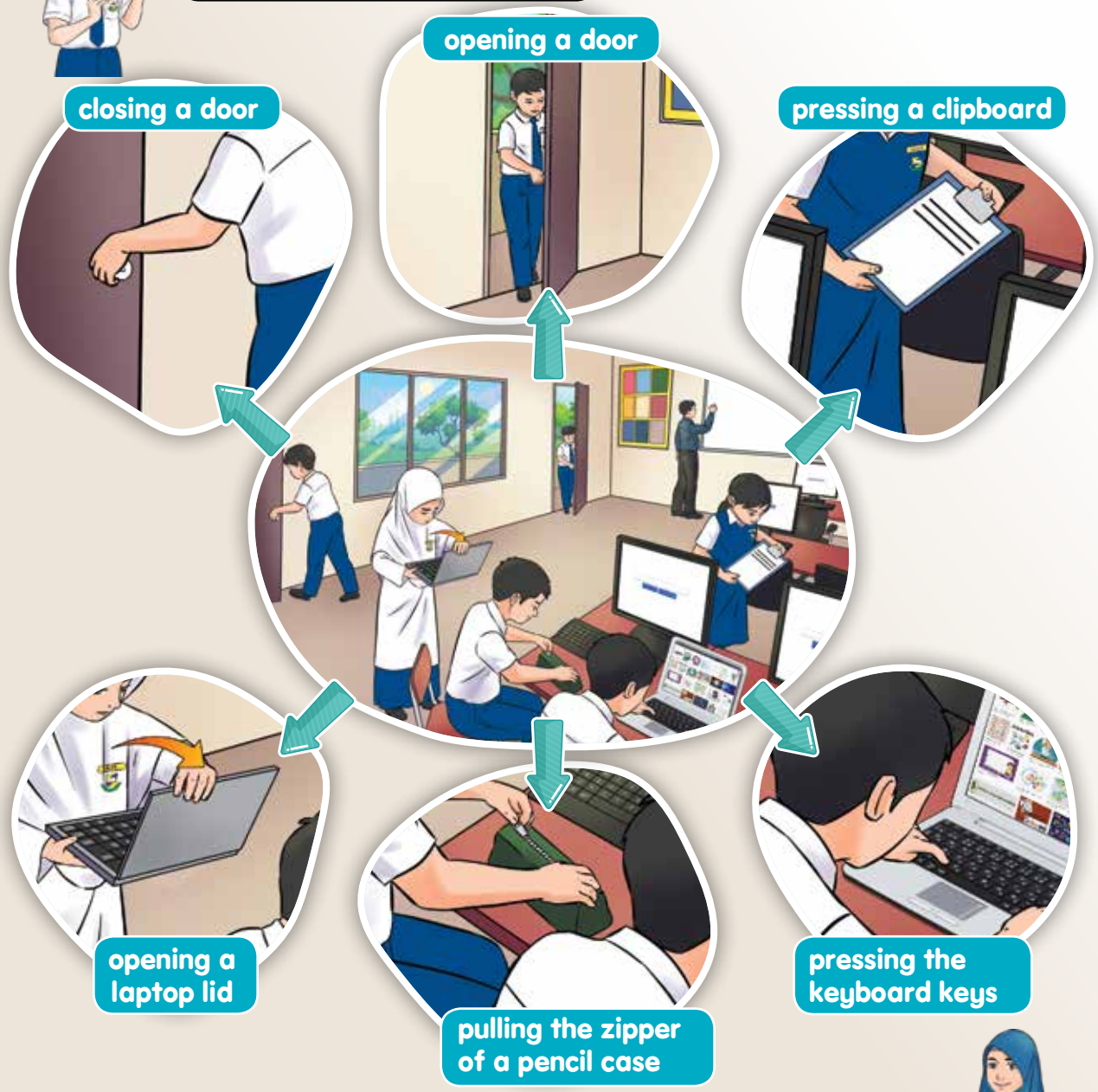
Adam and his friends are on duty in the school library.
Observe their activities.

Based on the situation above, how are the books in the school library moved and arranged?

Force

We apply force to perform various activities. Force is a pull or push that acts upon an object.

What is the force applied in each activity below?



Pull is an action that moves an object closer towards us.
Push is an action that moves an object away from us.

LET'S TEST

Push and Pull

Aim: To state the meaning of force by carrying out an activity

Apparatus and materials: pencil case, spring, ping-pong ball, bar magnet, paper clips

Steps: Carry out the activities below and record your observations.

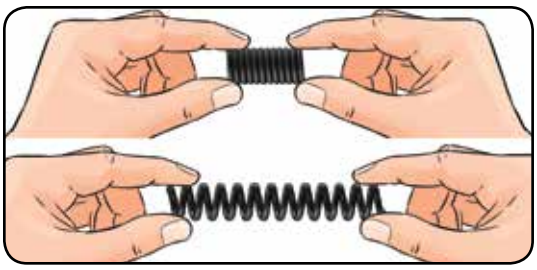
Group Activity

1. 

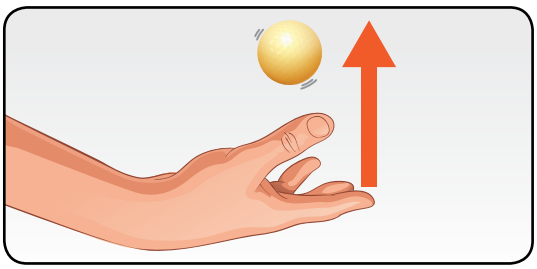
Push the pencil case.

2. 

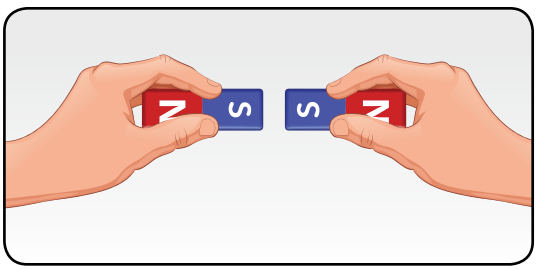
Pull the pencil case.

3. 

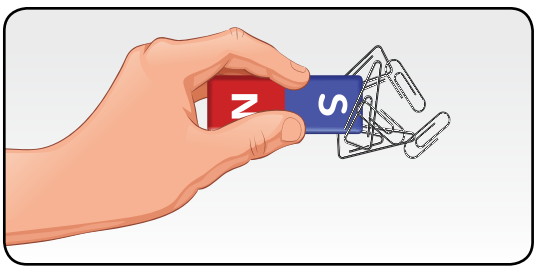
Compress the spring and release it. Then, stretch the spring and release it.

4. 

Throw the ball up and observe its movement.

5. 

Bring two magnet bars of the same pole together.

6. 

Bring a magnet bar towards some paper clips.

Questions:

1. What is the meaning of force?
2. What is the force applied in each activity above?
3. Which activity involves a force applied without the need for contact with the object? What is that force?

What type of force is Earth's gravity? Explain.

Effects of Force

The force applied by an object on another object cannot be seen. However, the effects of the force can be observed and felt.

When Adam is shaking hands with Chua, his hand is applying a force on Chua's hand.

The applied force cannot be seen but we can feel it.

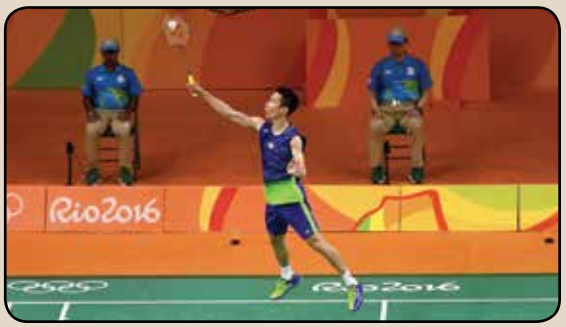
Observe these pictures to understand the effects of force.

Force changes the shape of an object

The shape of a toothpaste tube changes when it is squeezed.

Clay can be pressed and shaped to make various shapes of flowerpots.

Force changes the direction of movement of an object



The player hits the shuttlecock to his opponent.

The player dribbles the ball to control its direction.

Force changes the speed of an object

The cyclist increases his speed by applying more force on the pedals.

The force from the waves can increase or decrease the speed of the kayak.

Force moves a stationary object

The worker pulls the trolley to move the boxes.

The bowling pins fall after the bowling ball hits them.

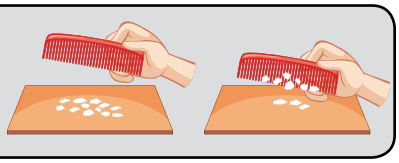
Force stops a moving object

Force can stop a moving toy car.

The ball is stopped from entering the goal post.

SCIENCE INFO

A plastic comb that is rubbed with a cloth can attract tiny pieces of paper through electrostatic force.



FUN ACTIVITY

Identifying and Explaining the Effects of Force

Apparatus and materials: camera, computer, Internet access, Google Slides, Google Classroom

Google Slides app

Individual Activity

21st Century Learning Skills

Steps:

1. Identify and carry out three activities that show the effects of force.
2. Take pictures or record a video while carrying out those activities.
3. Scan the QR code to use the Google Slides app.
4. Prepare your presentation using Google Slides.
5. Share your presentation slides using the Google Classroom app.

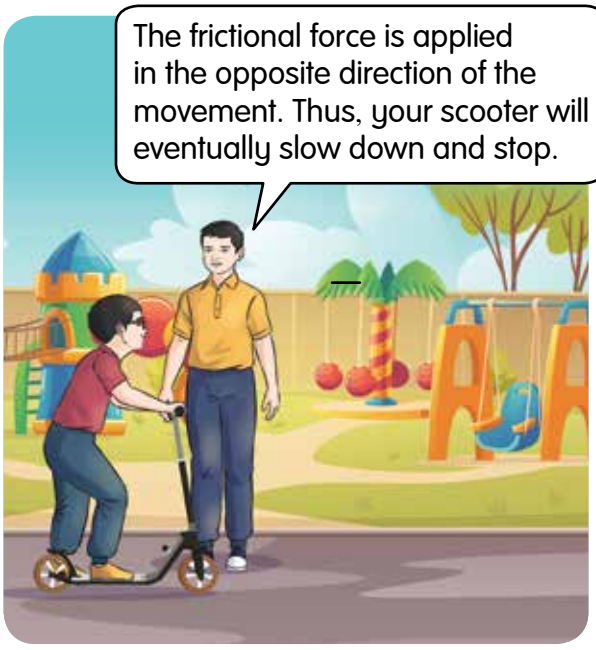
Questions:

1. State the force applied in the activities that you have carried out.
2. What are the effects of the observed force?

- Examples of activities that the pupils can do are kicking a ball, pulling a rubber band, changing the shape of modelling clay, and others.
- Teachers can modify the activities accordingly.
- Besides using Google Slides app, the pupils can also use Microsoft PowerPoint to prepare the presentation slides.

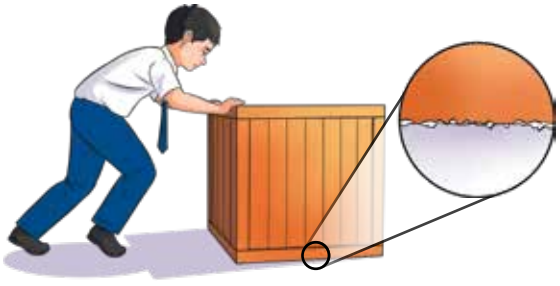
6.1.2, 6.1.3

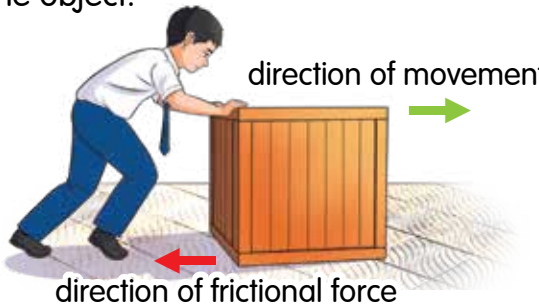
Frictional Force



Frictional force is the force produced when two surfaces are in contact with one another.

Frictional force is always applied in the opposite direction of the movement of the object.





6.2.1

LET'S TEST Frictional Force

Group Activity

21st Century Learning Skills

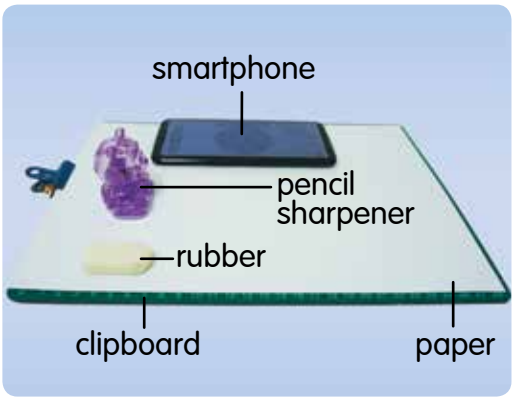
Aim: To state the meaning of frictional force

Apparatus and materials: smartphone, clipboard, paper, pencil sharpener, rubber

Steps:

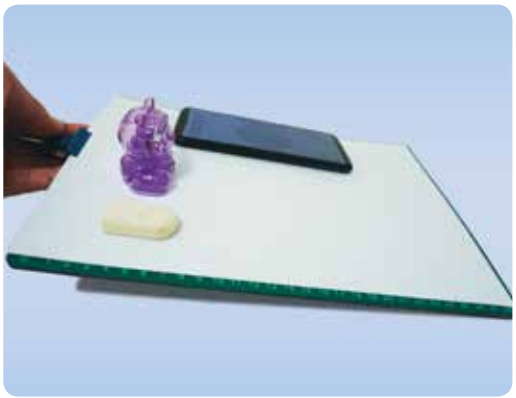
1. Download an inclinometer app in a smartphone. Open the app.
2. Clip a few sheets of paper on the clipboard.

3.



Arrange the apparatus and materials as shown in the picture.

4.



Tilt the clipboard slowly. Stop when the pencil sharpener or the rubber starts to slide down.

5. Take the inclinometer reading and record it in a table.

Object	Inclinometer reading
pencil sharpener	
rubber	

6. Repeat steps 4 and 5 for objects that have not been tested.

Questions:

1. Which object records the highest inclinometer reading? State your inference.
2. What do you understand about frictional force?

- The inclinometer app can measure slopes. It can be downloaded from Google Play Store and Apple App Store. The app is also known as clinometer or bubble level.
- Smartphones can be replaced with a protractor or a ruler to measure inclination of the clipboard.

Effects of Frictional Force

A match can light up when heat is produced as a result of the frictional force between two surfaces that are in contact. The heat causes the end part of the match that is coated with flammable material to burn.

Miss Ema, how does a match light up?

There are advantages and disadvantages of frictional force in our daily activities.

Advantages of frictional force

1.

Rubbers can erase writings on paper.

2.

Brake pads can slow down bicycles and stop their movement.

3.

Sandpaper can smoothen the rough surface of wood.

4.

Tread patterns on vehicle tyres can increase the grip on the soil.

Disadvantages of frictional force

1. 

Frictional force can wear out shoe soles. The worn out shoe soles can cause us to slip easily.

2. 

Loud noise is produced when drilling. It causes sound pollution.

3. 

The friction in car engines can damage the engines over time.

4. 

Rusty screws can increase friction and make them harder to loosen.

What are other effects of frictional force that you can observe?

FUN ACTIVITY

Effects of Frictional Force Around Me

Group Activity

21st Century Learning Skills

Apparatus and materials: marker pen, manila card, sticky notes

Steps:

1. Identify the effects of frictional force around you.
2. In turns, write the effects of frictional force on sticky notes.
3. Sort the advantages and disadvantages of frictional force written on the sticky notes.
4. Paste the sticky notes on a manila card.
5. Discuss your observations in your group.

Question:

Based on your observation, describe the effects of frictional force in our daily lives.

Factors Affecting Frictional Force

Frictional force is affected by several factors. Let us carry out the experiments to test these factors.

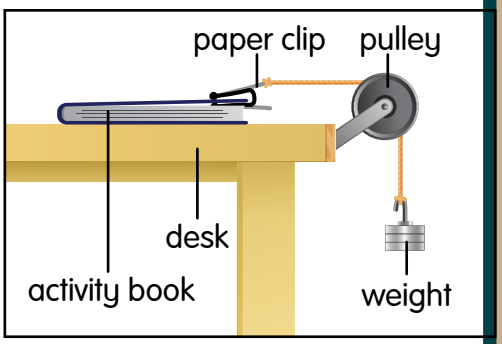
EXPERIMENT

Mass of an Object

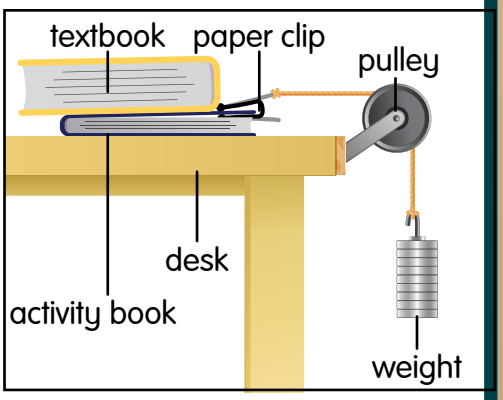
Group Activity

1. **Aim:** _____
2. **Problem statement:** How does the mass of an object affect frictional force?
3. **Hypothesis:** _____
4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____
5. **Apparatus and materials:** pulley, paper clip, 10 units of 50 g weight, exercise book, textbook, thread
6. **Steps:**
   (a) Prepare the apparatus and materials as shown in picture A.
   (b) Add a 50 g weight until the exercise book begins to move on the desk.
   (c) Record your observation in a table.
   (d) Repeat steps 6(b) and 6(c) by adding a textbook on top of the activity book as shown in picture B.
7. **Data:** _____
8. **Interpreting Data:**
   (a) Based on the experiment, compare the weights that are used to move the books. Give your inference.
   (b) What is the factor that affects frictional force?
   (c) What is the operational definition of frictional force?
9. **Conclusion:**

_____



picture A



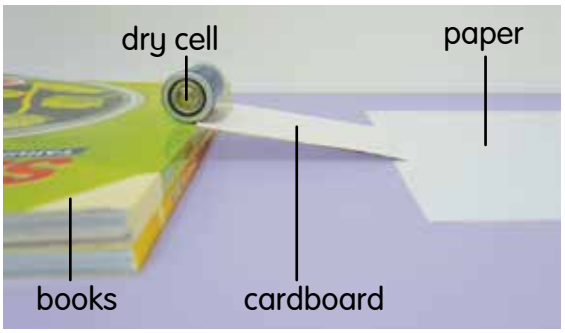
picture B

6.2.3, 6.2.5

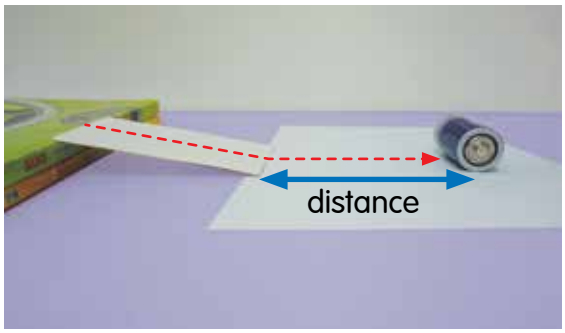
EXPERIMENT Types of Surface

Group Activity

1. **Aim:** _____
2. **Problem statement:** How does the surface of an object affect frictional force?
3. **Hypothesis:** _____
4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____
5. **Apparatus and materials:** ruler, two books, cardboard, dry cell, paper, cloth, sandpaper, small carpet
6. **Steps:**



picture A



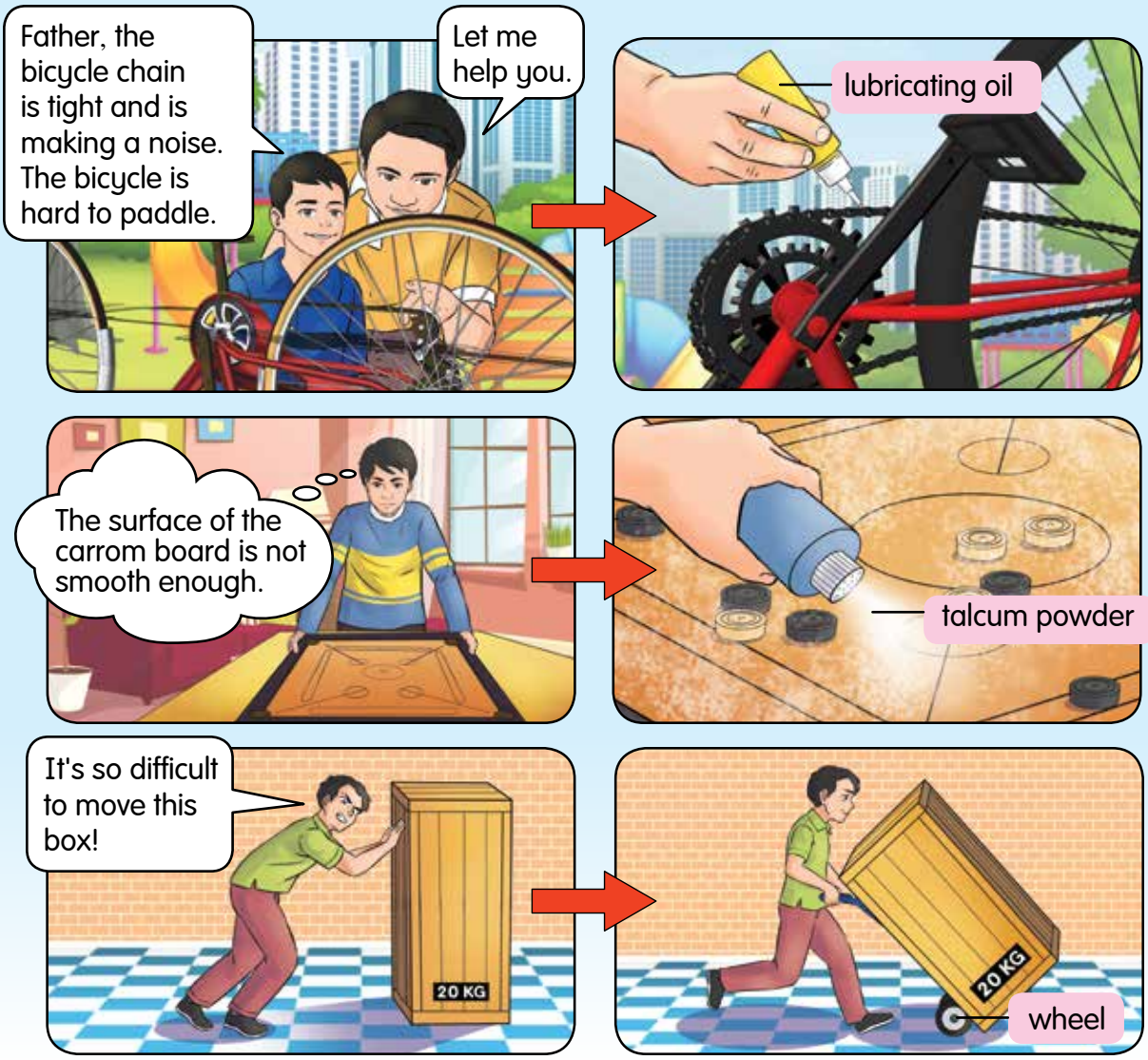
picture B

   (a) Arrange the apparatus and materials as shown in picture A.
   (b) Push the dry cell from the top of the books and let it roll down the cardboard.
   (c) Observe the movement of the dry cell and mark the location of where it stops.
   (d) Measure the distance travelled by the dry cell as shown in picture B.
   (e) Record the observation in a table.
   (f) Repeat steps 6(a) to 6(e) by replacing the paper with a piece of cloth, sandpaper, and a small carpet.
7. **Data:** _____
8. **Interpreting Data:**
   (a) Based on the experiment, compare the distance travelled by the dry cell on the different surfaces. Give your inference.
   (b) What is the factor that affects frictional force?
   (c) What is the operational definition of frictional force?
9. **Conclusion:**
   _____

Frictional Force in Daily Lives

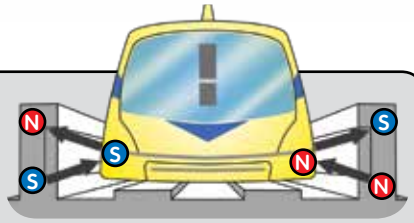
Frictional force always exists in our daily lives. There are times when the frictional force needs to be reduced or increased so that an activity can be done effectively.

Ways to reduce frictional force



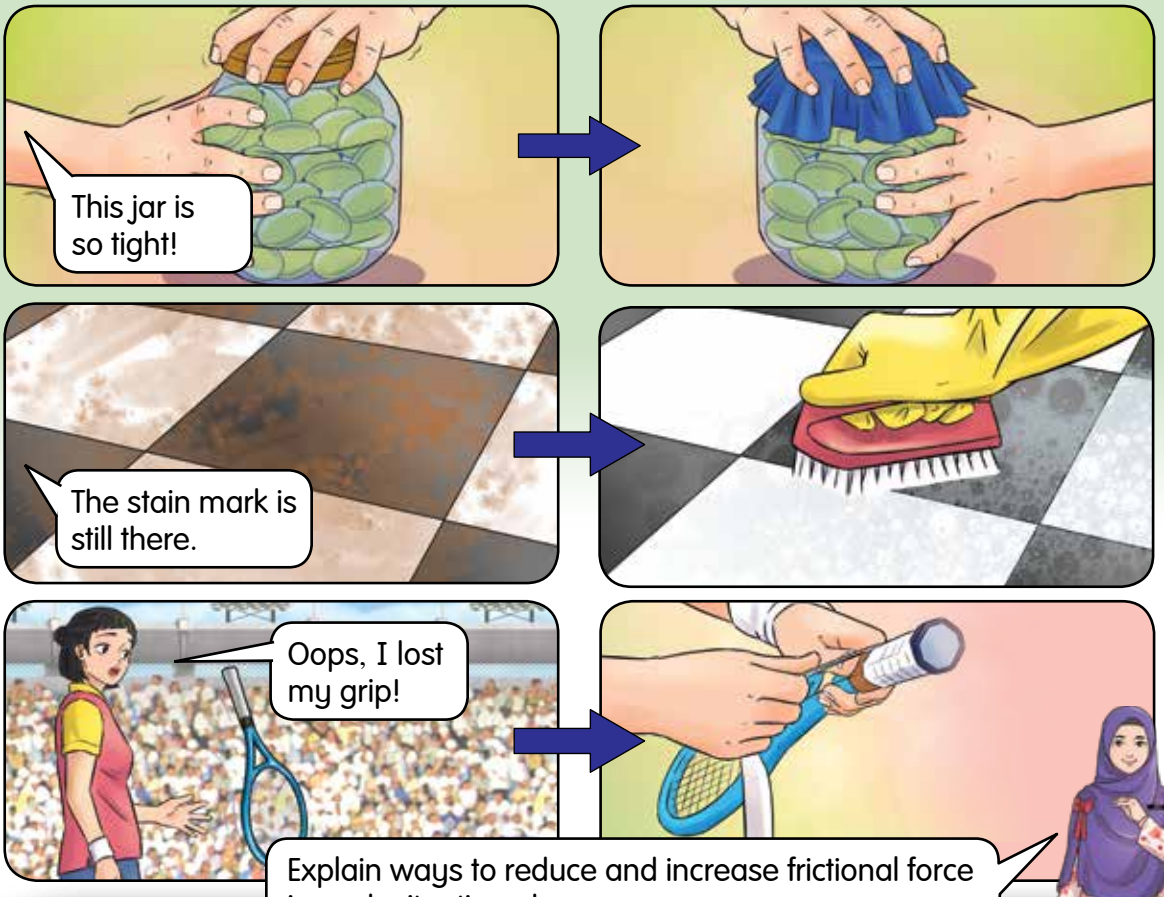
SCIENCE INFO

Maglev is a magnetic train that uses electromagnetic attraction or repulsion to overcome frictional force as it travels.



front view

Ways to increase frictional force



FUN ACTIVITY No Frictional Problems

Apparatus and materials: printer, Internet access, scissors, glue, marker pen, manila card

Pairwork Activity

21st Century Learning Skills

Be careful when using scissors.

Steps:

1. Find pictures that show problems related to frictional force in our daily lives.
2. Print the pictures and paste them on a manila card.
3. Identify ways to overcome problems related to frictional force. Write them on the manila card.
4. Discuss the answers with your partner.

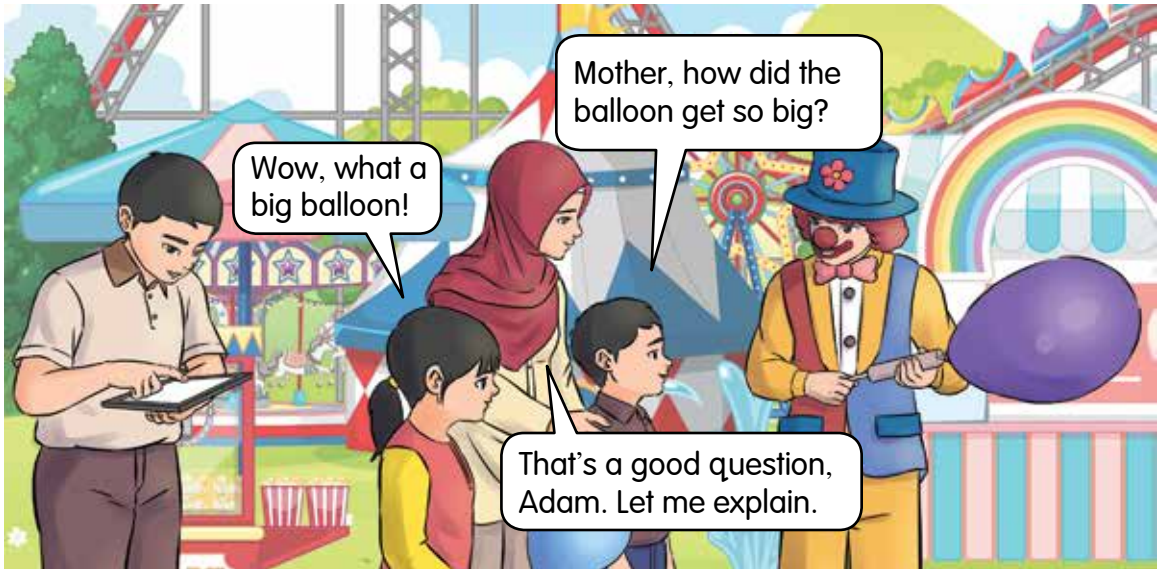
Questions:

1. Based on the pictures observed, state the problems related to frictional force.
2. What are the ways to overcome these problems?

6.2.4, 6.2.5

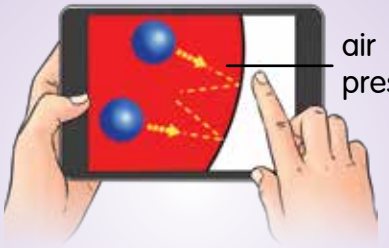
Air Pressure

Air exists around us. Air cannot be seen but air pressure is applied to all objects around us. How is air pressure created?



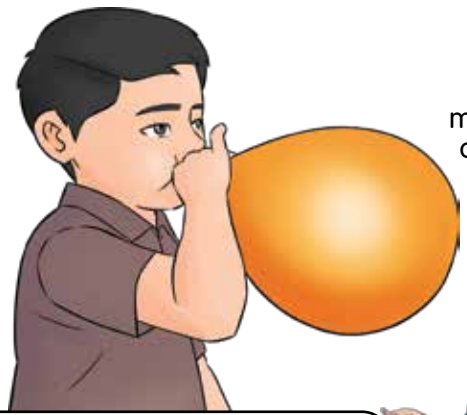
There are many air particles that move randomly inside the balloon.

The air particles inside the balloon collide with one another and with the surface of the balloon.



When air particles collide with the surface of the balloon, a force is applied on the surface. This generates air pressure.

movement of air particles

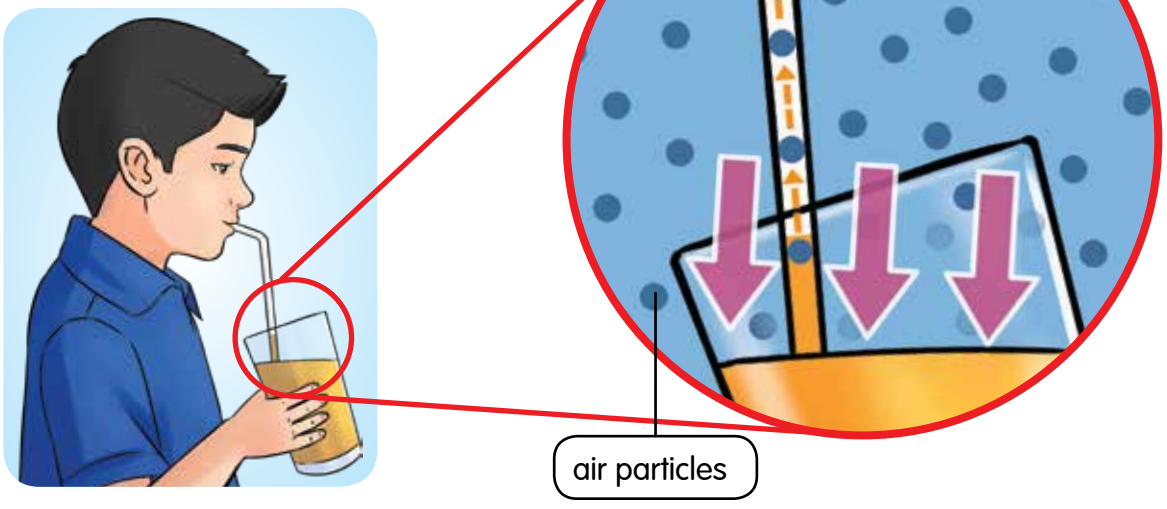


The balloon expands because there is increasing air pressure inside it.

Air pressure results from the force applied on the surface of an object due to the collisions of air particles.

How do we sip the water from the glass?

This situation involves air pressure. When we sip water using a straw, the number of air particles inside the straw decreases.



When the number of air particles inside the straw decreases, the frequency of collisions between the air particles and the inner surface of the straw also decreases. Thus, the air pressure inside the straw is lower.

Therefore, the air pressure which is higher outside the straw will push the water into the straw and straight into our mouth.

What are other examples around us that involve air pressure?

The air pressure around us or in the atmosphere is commonly known as atmospheric pressure.

LET'S TEST

The Presence of Air Pressure

Aim: To investigate the presence of air pressure

Activity 1

Pairwork Activity

Apparatus and materials: glass mug, thick card, water

Steps:

1. Conduct this activity at a sink.
2. 
   Fill a glass mug with water until it is full.
3. 
   Cover the glass mug with a thick card. Hold the thick card so the glass mug is always covered.
4. 
   Invert the glass mug along with the thick card. Then, slowly remove your hand away from the thick card.
5. Sketch your observation.

Questions:

1. What is your observation? Why?
2. Draw arrows to indicate the direction of air pressure in the activity above.
3. What is your conclusion for this activity?

Activity 2

Be careful when using drawing pins.

Pairwork Activity

Apparatus and materials: drawing pins, plastic bottle, water

Steps:

1. Conduct this activity at a sink.
2. Fill a plastic bottle with water until it is full. Then, close the lid tightly.
3. Make three holes at the bottom part of the bottle using drawing pins A, B and C. Make another hole at the upper part of the bottle using drawing pin D.
4. Remove drawing pins A, B and C. Make an observation.
5. Finally, remove drawing pin D. Make an observation.

Questions:

1. What is your observation? Why?
2. Draw arrows to indicate the direction of air pressure in the activity above.
3. What is your conclusion for this activity?

6.3.1, 6.3.4

Activity 3

Apparatus and materials: glass mug, paper cups, tray, candle, kitchen tissues, water

Be careful when using candles.

Pairwork Activity

Steps:

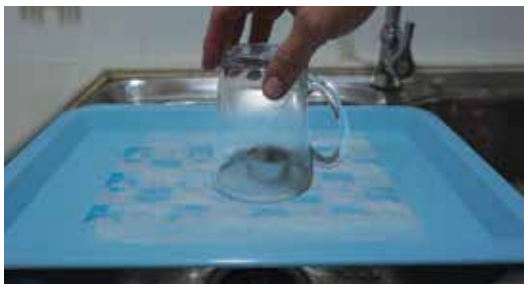
1. 

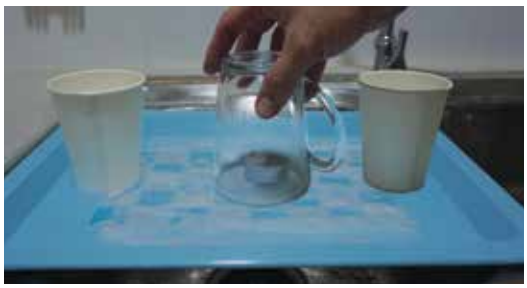
Wet a kitchen tissue and place it on a tray.

2. 
Put a candle on the kitchen tissue and light it up.

3. 
Invert a glass mug to cover the candle.

4. 
Wait until the candle burns out. Then, press the glass mug immediately.

5. 
Wait for a while. Then, lift the glass mug and make an observation.

6. 
Put two paper cups filled with water beside the glass mug. Then, lift the glass mug and make an observation.

Questions:

1. What is your observation? Why?
2. Draw arrows to indicate the direction of air pressure in the activity above.
3. What is your conclusion for this activity?

Relationship Between Air Pressure and Height

I have finally reached the peak of Mount Kinabalu. Why is it hard for me to breathe?

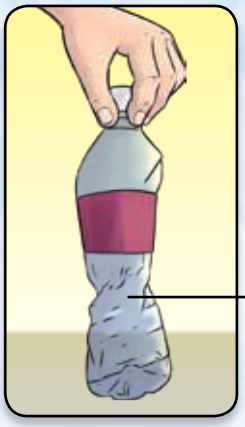
You cannot breathe easily because the amount of air here is lesser than at the base of the mountain. The air pressure here is also lower.

What is the relationship between air pressure and elevation level? In the pictures below, observe the tightly-closed empty plastic bottle brought from the peak of a mountain until it arrives at the base of the mountain.

At the peak of the mountain, the air pressure in the bottle is the same as the air pressure around it.

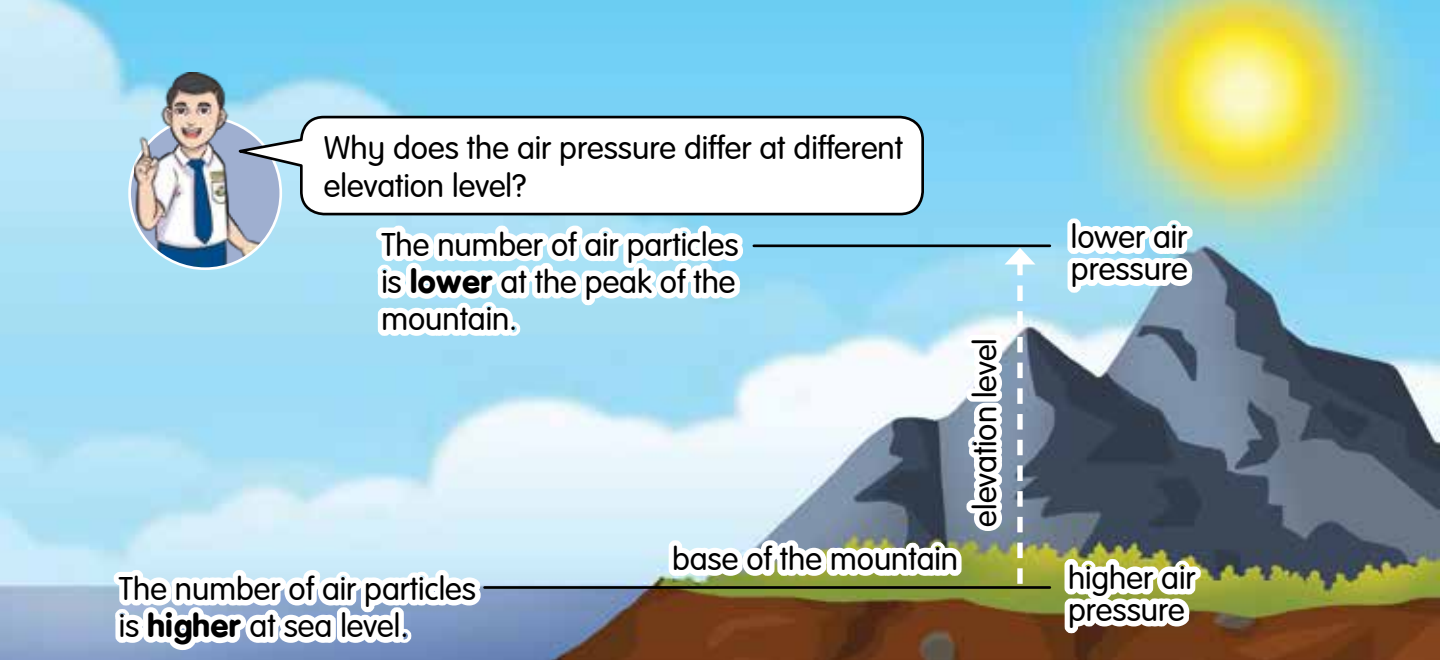
At the peak of the mountain

When going down the mountain



When arriving at the base of the mountain

The crushed bottle proves that the air pressure at the base of the mountain is higher than the air pressure at the peak of the mountain.



Earth is surrounded by a layer of air called the atmosphere. As the elevation level above the sea level increases, the number of air particles decreases. Thus, the collision between the air particles also decreases. This causes the decrease of air pressure.

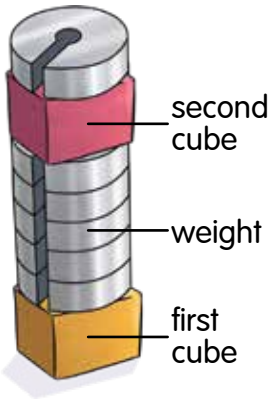
LET'S TEST

Simulation on the Changes in Air Pressure

Pairwork Activity

Aim: To study the relationship between air pressure and elevation level

Apparatus and materials: six units of 100 g weights, two sponges



Steps:

1. Make two cubes using sponges. The cubes represent the elevation level.
2. Place five units of weight on the first cube. The weights represent the number of air particles.
3. Put the second cube and a weight on top of it.
4. Observe both cubes.

Questions:

1. What happened to both cubes?
2. Which cube experienced lower pressure? Why?
3. What is the relationship between air pressure and elevation level based on the simulation?

Application of Air Pressure

The application of air pressure is important to solve problems in our daily lives.

The air pressure outside of the can prevents the milk from flowing out when there is only one hole. Conversely, when two holes are made, the air pressure outside of the can will push the milk to flow out.

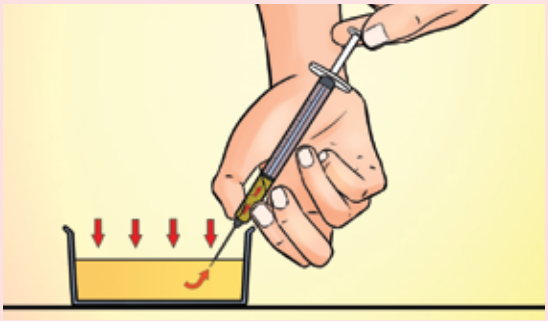
Observe the situation in the following pictures. How are the applications of air pressure used in daily lives?

Siphon

When the siphon tube is at a different height, the water will flow out to the lower level of the siphon. A lower pressure is produced in the siphon tube. The higher pressure outside the tube will push the water into the siphon tube.

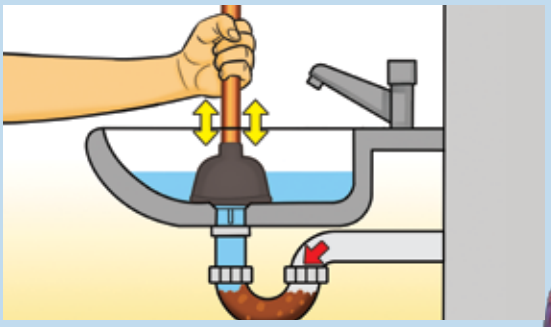
Syringe

When the piston is pulled, a lower pressure is produced inside the syringe. The higher air pressure outside the syringe will push the liquid into the syringe.



Plunger

When the plunger is pressed down, a lower air pressure is produced inside it. When the plunger is pulled back up, the higher pressure in the sinkhole pushes the clogged waste.



If there is no air pressure, could the problem in each of the situation be solved? What is the importance of air pressure?

LET'S TEST Application of Air Pressure

Individual Activity

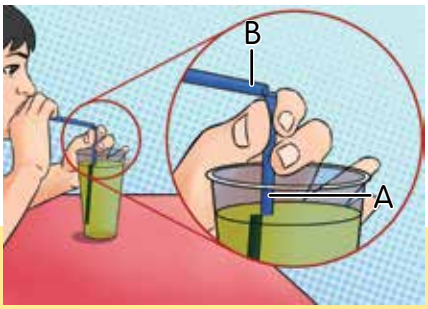
Aim: To explain the application of air pressure through an example

Apparatus and materials: scissors, straw, water

Steps:

1. Fill a glass with water.
2. Cut a straw into two parts of the same length. Label them as A and B.
3. Insert straw A into the water.
4. Bring straw B closer to straw A as in the picture. Blow straw B as hard as you can.
5. Make an observation.

Be careful when using scissors.



Questions:

1. Explain your observation.
2. Name a tool that uses the application of air pressure as in this activity.
3. Design a model using the knowledge that you have learned about air pressure.

FUN SCIENCE

Straw Rocket

Make a straw rocket using a pair of scissors, plastic bottle, modelling clay, adhesive tape, big-sized straw, small-sized straw, and cardboard.

Steps:

Be careful when using scissors.

1. 

Insert half of a small-sized straw into a plastic bottle.

2. 

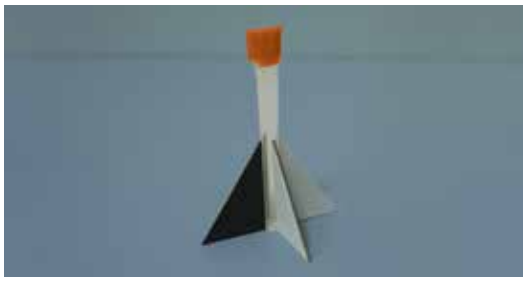
Ensure the small-sized straw is placed upright in the plastic bottle using modelling clay.

3. 

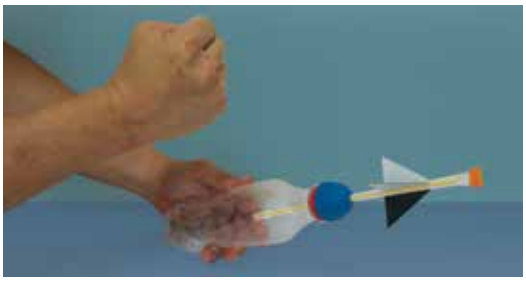
Close one end of the big-sized straw using adhesive tape.

4. 

Cut a piece of cardboard into triangular shapes.

5. 

Paste the triangular shapes onto the big-sized straw as shown in the picture.

6. 

Insert the small-sized straw inside the big-sized straw. Launch your straw rocket by pressing the plastic bottle.

MIND REFLECTION

1. Force is a pull or push applied on an object.
2. The effects of force are as follows:
   (a) changes the shape of an object
   (b) changes the direction of movement of an object
   (c) changes the speed of an object
   (d) moves a stationary object
   (e) stops a moving object
3. Frictional force is the force produced when two surfaces are in contact with one another.
4. The direction of the frictional force always opposes the direction of movement of the object.
5. The advantages and disadvantages of frictional force in our daily activities are as follows:

Advantage	Disadvantage
• Rubbers can erase writings on paper. • Brake pads can slow down bicycles and stop their movement. • Sandpaper can smoothen rough surfaces of objects. • Tread patterns on vehicle tyres can increase the grip of tyres on the soil.	• Worn out shoe soles can cause us to slip easily. • Loud noises are produced when drilling. • The friction in car engines can damage the engines over time. • Rusty screws can increase friction and make them harder to loosen.

6. Factors affecting frictional force are as follows:
   (a) mass of an object (b) type of surface
7. Daily activities can be done effectively by reducing or increasing frictional force as follows:

Ways to decrease frictional force	Ways to increase frictional force
• Using lubrication oil to smoothen a bicycle chain. • Using flour or talcum powder to smoothen a carrom board. • Using a trolley to move a heavy box.	• Using a cloth to open the lid of a bottle. • Using a brush to clean a stain on the floor. • Using a racquet's grip on the handle to increase the grip on the racquet.

8. Air pressure exists around us.

9. Air pressure is caused by the collisions of air particles on the surface of an object.

10. Air pressure at the peak of a mountain is lower than air pressure at the base of a mountain.

11. Examples of the application of air pressure in our daily lives are as follows:
    - making two holes on a can
    - siphon
    - syringe
    - plunger

MIND TEST

Answer all questions in the Science exercise book.

1. State the force used to carry out the following activities.

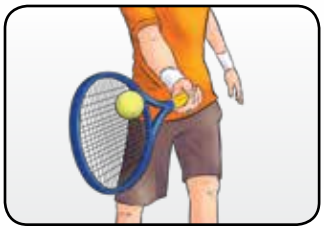
(a) 

(b) 

(c) 

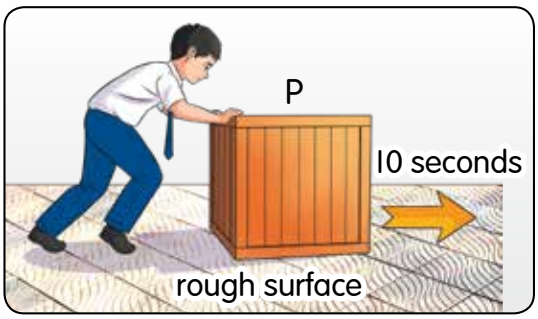
2. Explain the effects of force for the activities shown in the pictures below.

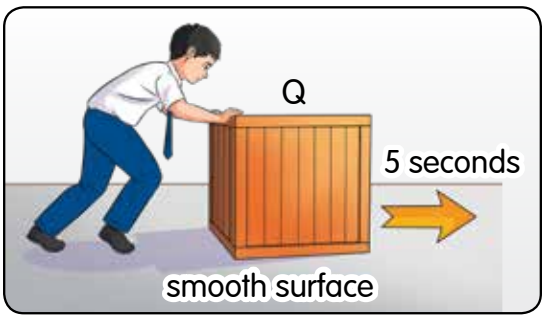
(a) 

(b) 

(c) 

3. The pictures below show the time taken to move box P and Q for the same distance. Box P and Q also have the same mass.





(a) Why does it take a longer time to move box P compared to box Q?
(b) What is the factor that affects the movement of both boxes?
(c) Predict the time taken to move box P and box Q if the mass of the boxes is increased. Give your reasons.

4. State the effect of frictional force in each picture below.

(a) 
(b) 
(c) 

5. The pictures below show problems involving frictional force. State the ways to overcome the problems.

(a) 
(b) 
(c) 

6. Tick (✓) the correct statements.

(a) Air pressure is produced due to the collisions of air particles on the surface of an object.
(b) Air pressure at the peak of a mountain is higher than the air pressure at the base of a mountain.
(c) Air pressure will increase when the number of air particles increases.

7. Answer the questions below based on the following statement.

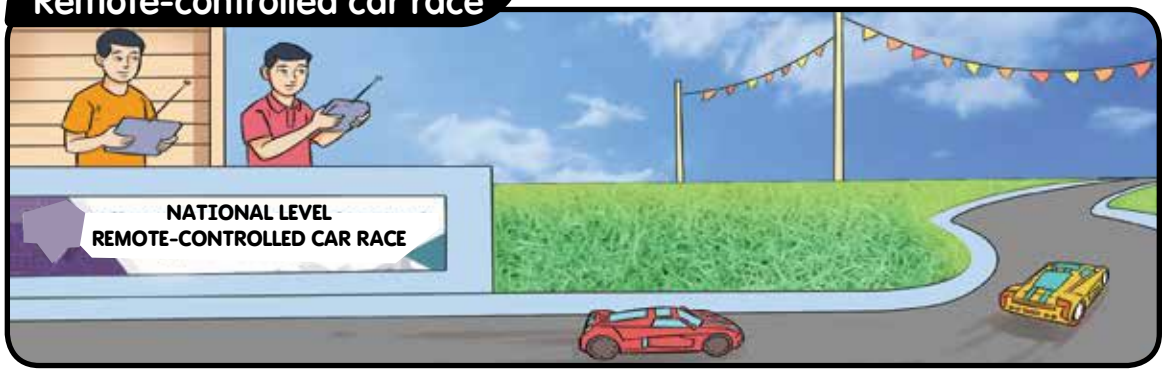
> Many climbers require oxygen tanks to reach the peak of Mount Everest safely.

(a) Why do climbers use oxygen tanks when they are at the peak of Mount Everest?
(b) How do you describe the air pressure at the peak of the mountain based on your answer in 7(a)?
(c) State the relationship between elevation level of the mountain and air pressure.

UNIT 7 SPEED

Remote-controlled boat race

Remote-controlled car race

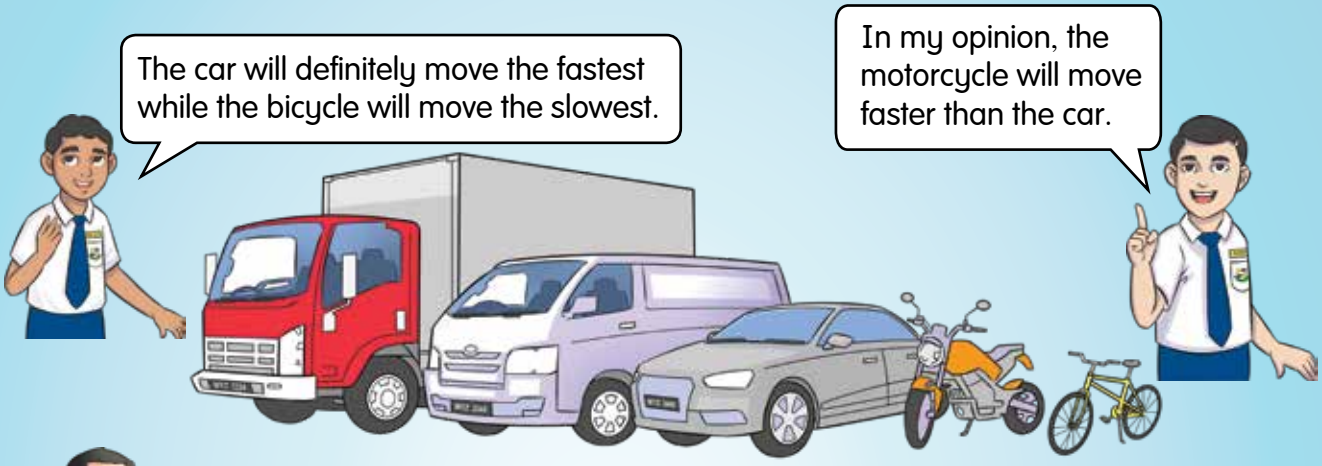


Remote-controlled drone race

The races shown in the pictures above are sports events that use remote control technology. Among the winning factors in these races is speed. What is speed? How does speed affect the chances of winning a race?

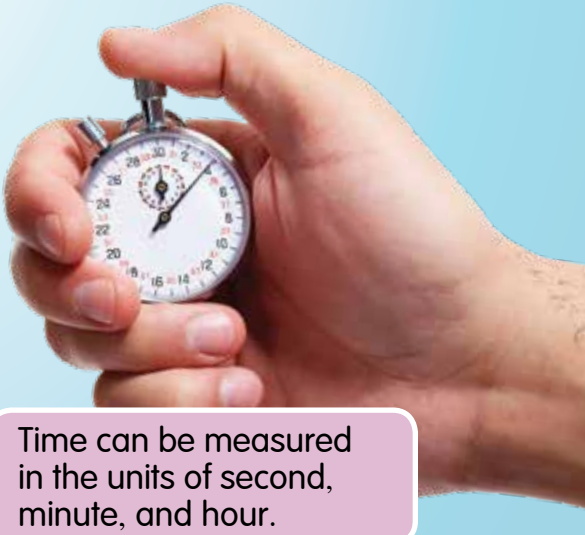
Units of Speed

All moving objects have speed. Speed is the measurement of how fast an object moves from one place to another. All objects move with different speeds. Observe the picture below. Can you state the vehicles that move the fastest and the slowest?



The measurements for distance and time of a moving object needs to be determined before calculating its speed. Do you know what are the units for distance and time?

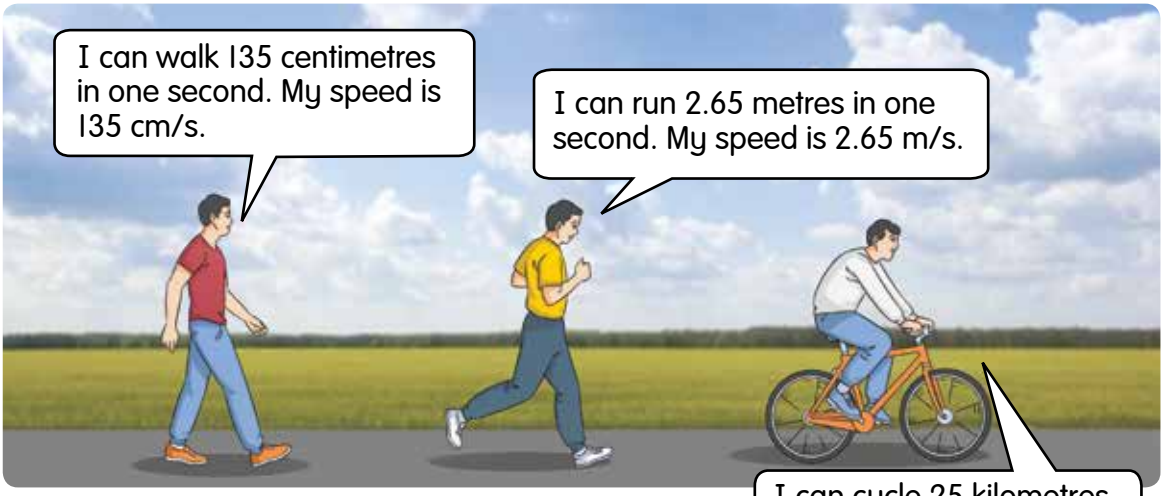
Distance can be measured in the units of centimetre, metre, and kilometre.



Time can be measured in the units of second, minute, and hour.

Speed is calculated based on the distance travelled by an object within a fixed time.

Observe the situations in the picture below.



The units used for speed are centimetre per second (cm/s), metre per second (m/s), and kilometre per hour (km/h).

SCIENCE INFO

The cheetah is the fastest animal on land with a speed of more than 100 km/h.

FUN ACTIVITY Units of Speed

Pairwork Activity

21st Century Learning Skills

Apparatus and materials: computer, Internet access, exercise book

Steps:

1. Find information on the speed of several objects using the Internet.
2. Record the name and the speed of these objects in a table.
3. Compare your findings with the other pairs.

Question:
What is meant by the speed of 100 metre/minute?

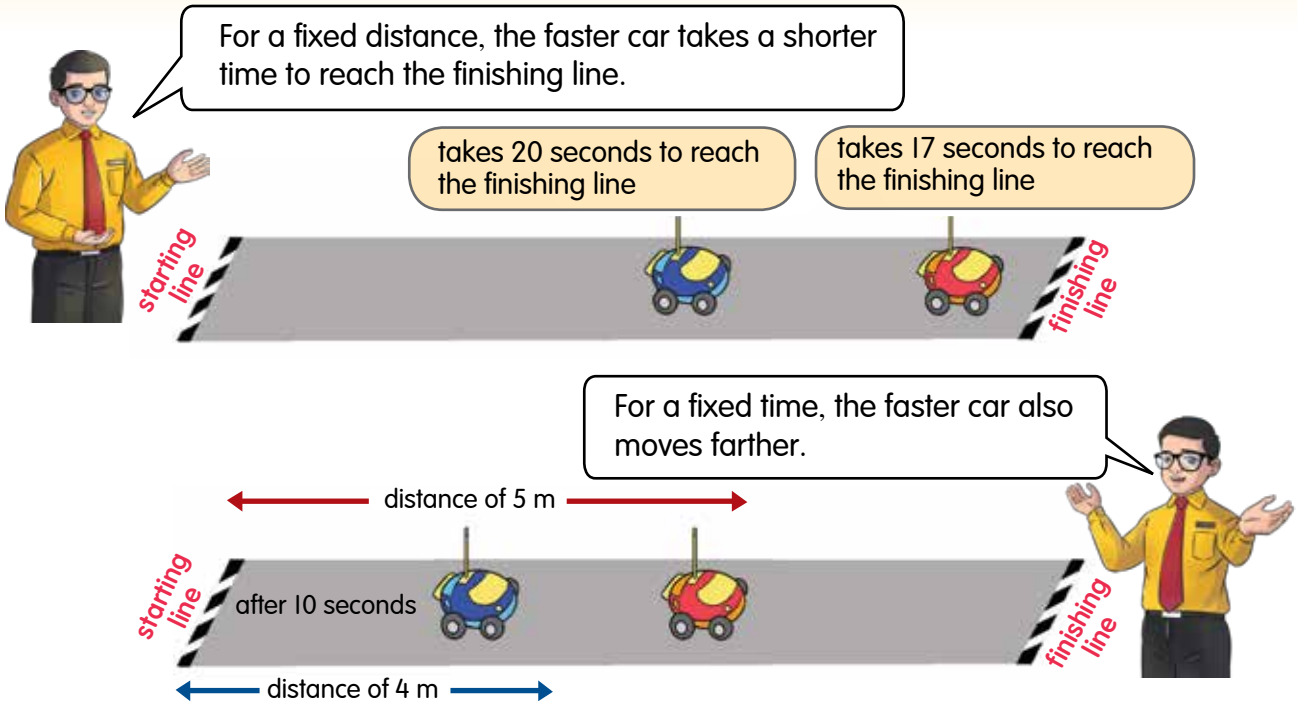
Why is it not suitable to measure the speed of a car in the unit of cm/s?

Examples of information that the pupils can find are the movements of tortoises, rabbits, horses, athletes, and objects such as motorcycles, cars, ships, aeroplanes, rockets, and others.

7.1.1, 7.1.5

Relationship Between Speed, Distance, and Time

Race cars need to reach the finishing line in the shortest time to win a race. How does the speed of an object such as the race car affect the distance it travels and the time taken for it to move?



Thus, an object that moves faster takes a shorter time to move within a fixed distance. An object that moves faster also moves for a farther distance within a fixed time.

EXPERIMENT

The Relationship Between Speed and Time

Group Activity

1. **Aim:** _____

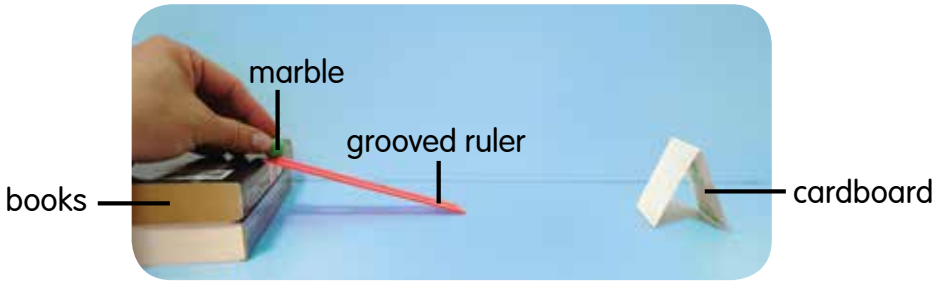
2. **Problem statement:** How does speed affect the time taken for an object to move within a fixed distance?

3. **Hypothesis:** _____

4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____

5. **Apparatus and materials:** ruler with a groove along the centre, stopwatch, adhesive tape, books, cardboard, marble

6. **Steps:**



   (a) Prepare the apparatus and materials as shown in the picture.
   (b) Put the marble in the groove of the ruler. Then, release the marble and start the stopwatch.
   (c) Stop the stopwatch when the marble touches the cardboard.
   (d) Record your result in a table.
   (e) Repeat steps 6(b) to 6(d) by increasing the number of books to increase the height of the plane.
   (f) Plot the graph of change for the number of books against time.

7. **Data:** _____

8. **Interpreting data:**
   (a) Why is the number of books increased?
   (b) What is the relationship between the speed and the time taken for the marble to move?

9. **Conclusion:**

_____

7.1.2, 7.1.5

TEACHER'S NOTES
The number of books can be increased based on the need of the experiment.

KPM

EXPERIMENT

The Relationship Between Speed and Distance

Group Activity

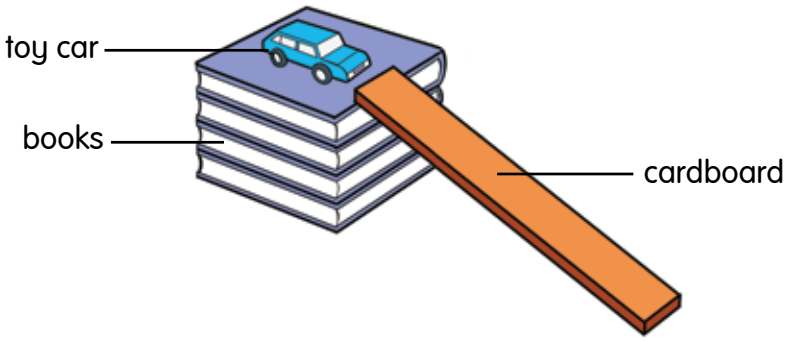
1. **Aim:** _____

2. **Problem statement:** How does speed affect the distance travelled by an object within a fixed time?

3. **Hypothesis:** _____

4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____

5. **Apparatus and materials:** stopwatch, metre ruler, books, toy car, cardboard



6. **Steps:**

_____

7. **Data:** _____

8. **Interpreting data:**
   (a) Why is the number of books increased?
   (b) How can you obtain a more accurate measurement of the distance?
   (c) What is the relationship between the speed and the distance travelled by the toy car?

9. **Conclusion:**

_____

TEACHER'S NOTES
The number of books indicates the speed of the toy car.

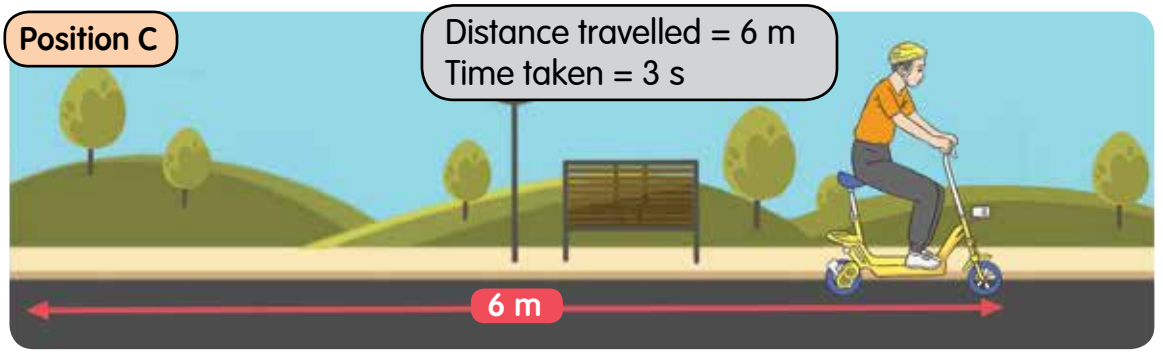
Calculating Speed, Distance, and Time

Speed can be calculated based on the distance travelled by an object within a fixed time.

Speed can be calculated by dividing the distance travelled by an object with the time taken.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

A young man is riding an electric scooter on the road from position A to position C. The time taken and the distance travelled by him at each position are recorded. Do you know his speed?



His speed at each position is 2 m/s.

You're right, Alia. For every one second, the distance travelled by the electric scooter at position A, position B, and position C is the same, which is 2 m. Thus, the speed at each position is also the same, which is 2 m/s.

7.1.3

Problem 1

The train has travelled 250 km in two hours. What is the speed of the train?

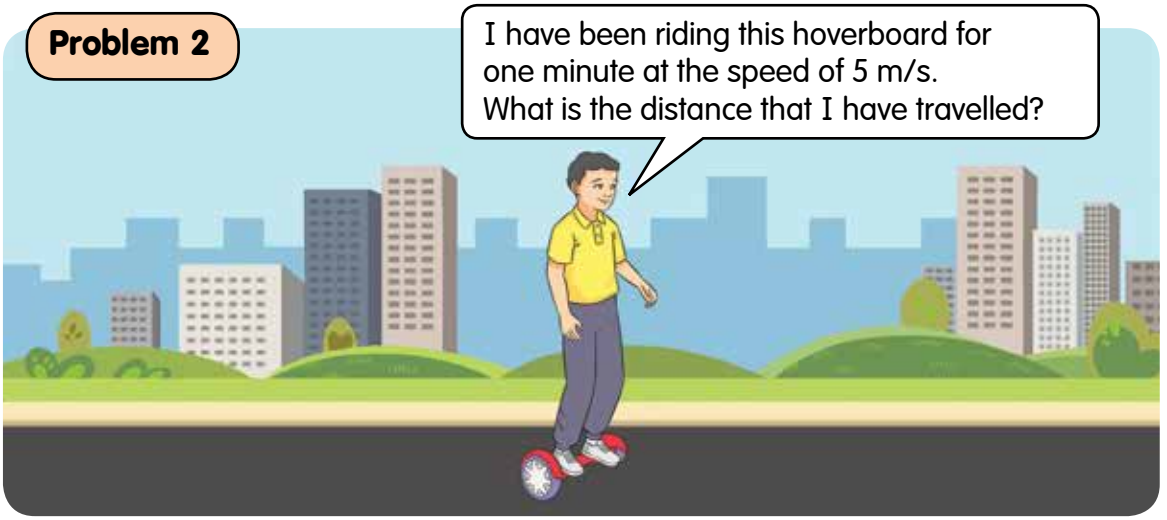
Solution 1:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{250 \text{ km}}{2 \text{ hours}}$$

$$= 125 \text{ km/h}$$

Problem 2



Let's solve the problem above. Firstly, make sure that the unit for time, which is minutes, is converted into seconds. How many seconds are there in one minute?

One minute is equal to 60 seconds, Mr Hadi.

That's right, Adam. We can use the formula below to calculate the distance.

The distance travelled can be calculated by multiplying the speed with the time taken.

Distance = Speed x Time

Solution 2:

Distance = Speed x Time
= 5 m/s x 1 minute
= 5 m/s x 60 seconds
= 300 m

Problem 3

The time taken can be calculated by dividing the distance travelled with the speed.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Solution 3:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$= \frac{10 \text{ km}}{50 \text{ km/h}}$$

$$= 0.2 \text{ hour} \times 60 \text{ minutes}$$

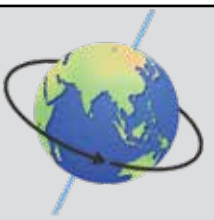
$$= 12 \text{ minutes}$$

I move slowly at the speed of only 5 cm/s. What is the time taken for me to move 100 cm?

The speed of a lorry is 0 km/h. Does the lorry move or remain stationary? Why?

SCIENCE INFO

The rotation of Earth on its axis causes its surface at the equator to move at the speed of approximately 1656 km/h.



LET'S TEST

My Speed

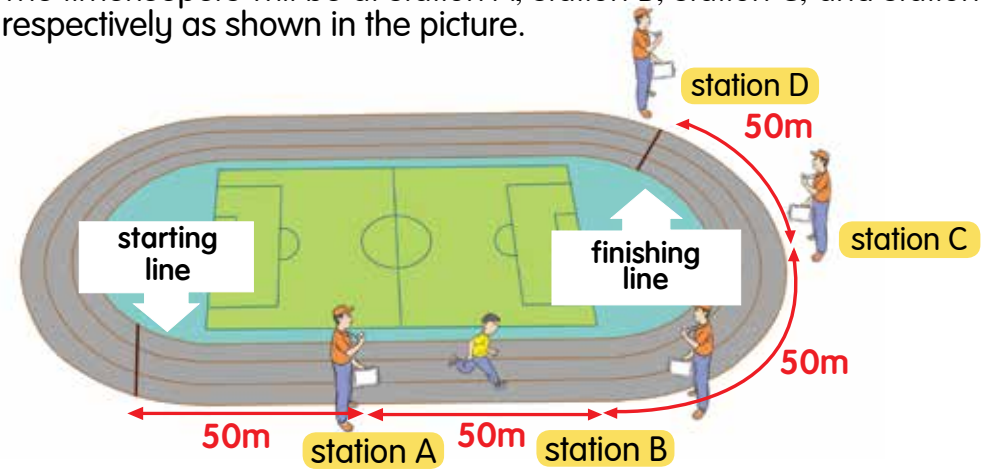
Group Activity

Aim: To define operationally the speed of an individual

Apparatus and materials: stopwatches, pencil, paper

Steps:

1. Carry out a running activity on the school field.
2. Appoint four members of the group as timekeepers and one member as a runner.
3. The timekeepers will be at station A, station B, station C, and station D respectively as shown in the picture.



4. The runner will start running from the starting line to the finishing line.
5. All the timekeepers will start their stopwatches when the running starts.
6. The timekeepers will stop their stopwatches when the runner passes by their respective station.
7. Record the stopwatch readings in the table.

Station	Distance (m)	Time (s)
A	50	
B	100	
C	150	
D	200	

8. Make a bar chart based on the table.
9. Present the results of your group.

Questions:

1. Is the speed of the runner at each station the same? Why?
2. State the manipulated variable and the responding variable.
3. What is the operational definition of speed in this activity?
4. If the runner keeps running for 400 m, predict the runner's speed. Explain your answer.

7.1.4, 7.1.5

FUN SCIENCE

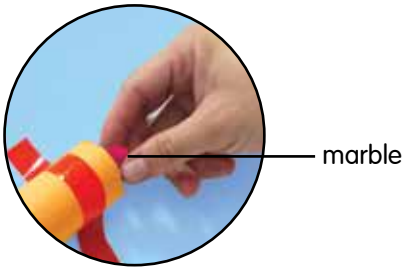
The Marble Route Tube

Make a route tube for a marble using a pair of scissors, adhesive tape, manila card, paper cup, marble, and paper.

Be careful when using scissors.

Steps:

1. Plan and make a route tube to enable a marble to slide and move down from a height and then fall into a paper cup.



example of the route tube for the marble

2. Make the tubes using a manila card.
3. Paste the tubes on a wall based on the routes that you have designed.
4. Ensure that each tube is only placed at an inclined position.
5. Release the marble to test the route tube.
6. Produce another route tube with a different angle of inclination to compare the speed of the marble moving down the tubes.

MIND REFLECTION

1. Speed is a measurement of how fast an object moves from one place to another.
2. Speed can be calculated based on the distance travelled by an object within a fixed time.
3. The units of measurement for speed are as follows:
   - centimetre per second (cm/s)
   - metre per second (m/s)
   - kilometre per hour (km/h)
4. Objects that move faster:
   - take a shorter time to move within a fixed distance.
   - move for a farther distance within a fixed time.
5. Speed can be calculated by dividing the distance travelled by an object with the time taken, that is:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

6. The distance travelled can be calculated by multiplying the speed with the time taken, that is:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

7. The time taken can be calculated by dividing the distance travelled with the speed, that is:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

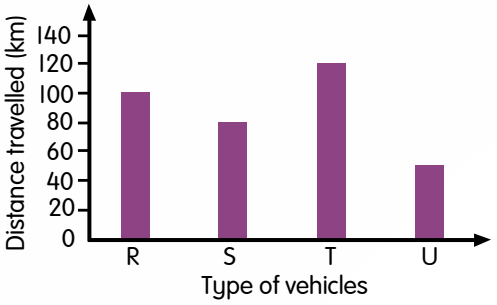
MIND TEST

Answer all questions in the Science exercise book.

1. State the units of speed.

2. Tick (✔) the correct statements about speed.
   (a) Speed measures how fast an object moves from one place to another.
   (b) Objects that move faster take a longer time to move within a fixed distance.
   (c) Speed is the time taken by an object to move within one unit of distance.
   (d) All moving objects have speed.

3. The bar chart shows the distance travelled by four types of vehicles R, S, T and U in 120 minutes.
   (a) Which vehicle travels the fastest and the slowest?
   (b) Calculate the speed of each vehicle in km/h.

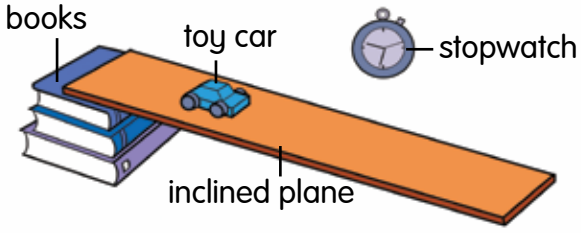


Jesy cycles to school every day at an average speed of 4 m/s. She takes 10 minutes to reach the school.

4. Based on the statement above, answer the following questions.
   (a) What is the distance between Jesy's house and the school?
   (b) Jesy's friend also cycles to school at the same average speed. However, her house is located at a distance of 6 km from the school. What is the time taken by Jesy's friend to reach the school?
   (c) One day, Jesy cycled faster, at the speed of 5 m/s. What is the time taken, in minutes, for Jesy to reach the school?

5. Speed is a measurement of how _____ an object moves from one place to another. The _____ an object moves, the _____ the distance travelled by the object within a fixed _____.

6. Sani and his friends carried out an experiment using the apparatus as shown in the picture below. The length of the inclined plane is 1 m. The result of the experiment is recorded in the table below.



Number of books	Time taken (seconds)
1	10
2	8
3	6
4	4
5	2

a) What is the aim of this experiment?
b) Based on the experiment above, state the two constant variables.
c) State the relationship between the manipulated variable and the responding variable.
d) What is the fastest speed of the toy car?

7. An aeroplane takes three hours for a 2700 km journey. What is the speed of the plane in km/h?

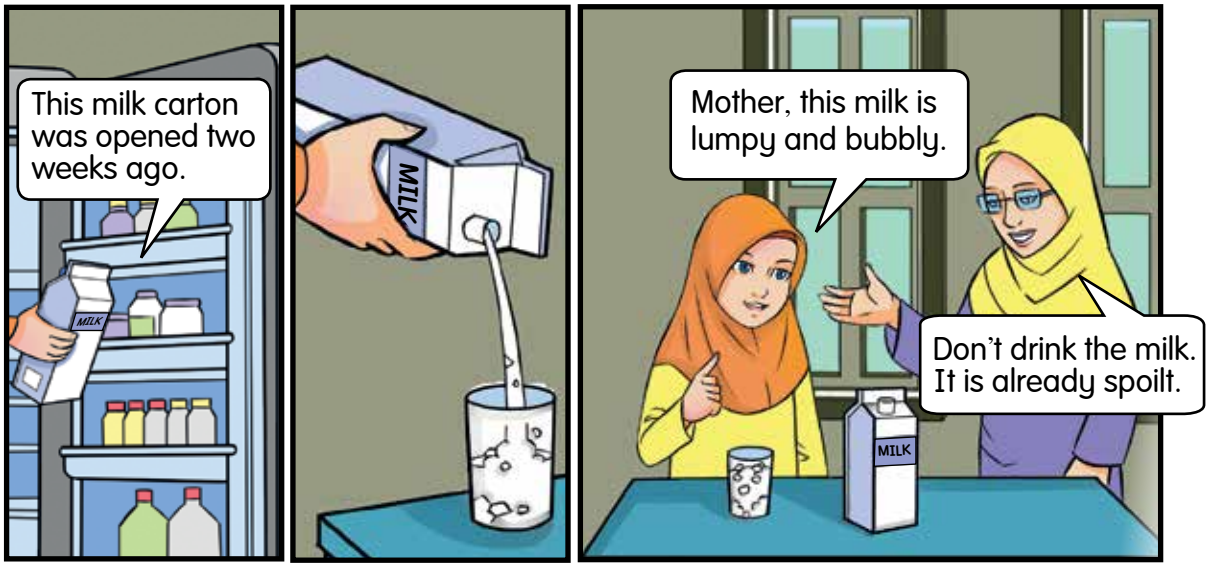
8. A horse runs for 60 minutes at the speed of 70 km/h. What is the distance travelled by the horse?

9. A cyclist cycles at the speed of 6 m/s. Calculate the time taken, in minutes, for the cyclist to cycle 36 km.

UNIT 8 FOOD PRESERVATION TECHNOLOGY

Food Spoilage

Alia wants to eat her breakfast before going for her extra class.



Food becomes spoiled due to the action of microorganisms such as bacteria and fungi, which decompose food from complex to simpler forms.

What are the characteristics of spoilt food?

Spoilt milk can be seen if its texture changes when bubbles and lumps are formed. It also smells bad and tastes sour. The milk tastes sour because the bacteria in it produces acid.

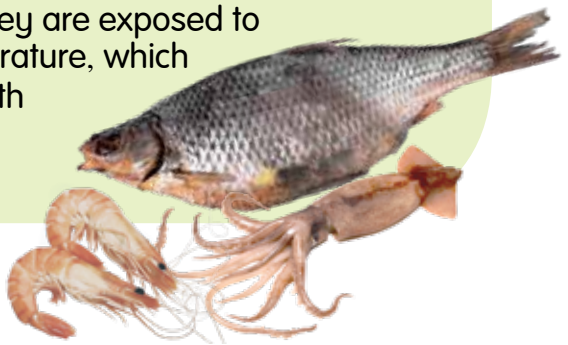
Spoilt bread and rice will be covered with black spots known as moulds. The rice becomes slimy and smelly. The water content in the food and humidity in the air promote the growth of microorganisms like fungi.

8.1.1, 8.1.2, 8.1.3

Decomposition is a process where organic matter is broken down into simpler form by microorganisms.

Spoilt fruits and vegetables become mouldy. They change in texture, taste, and colour. Fruits and vegetables are spoilt when microorganisms decompose them.

Spoilt beef and chicken look blackish, become smelly, and slimy. Spoilt fish, squids, and prawns change in texture, smell bad, feel sticky, and become mushy. These food become spoilt when they are exposed to the surrounding temperature, which is suitable for the growth of microorganisms.



The characteristics of spoilt food can be detected using our senses of sight, smell, taste or touch. Spoilt food can be observed through the changes in its texture and colour, has a bad and unpleasant smell, has a sour and unpleasant taste, and feels sticky and slimy when it is touched.

food spoilage

What causes food to become spoilt? Give other examples of the characteristics of spoilt food.

FUN ACTIVITY Characteristics of Spoilt Food

Apparatus and materials: chopping board, knife, four food containers with lids, water, food such as bread, vegetable, fruit, cheese, raw chicken slices

Group Activity

21st Century Learning Skills

Be careful when using knives.

Steps:

1. Cut the food into smaller pieces.
2. Dip them in water.
3. Store them in a sealed container.
4. Make an observation after one week.
5. Record your observation in the table.

Type of food	First day	Seventh day
bread		
vegetable		
fruit		
cheese		
raw chicken slices		

1.

2.

3.

6. Two members of your group will move to the other groups to observe the tested food.
7. Share the result of the observation in your own group.

Questions:

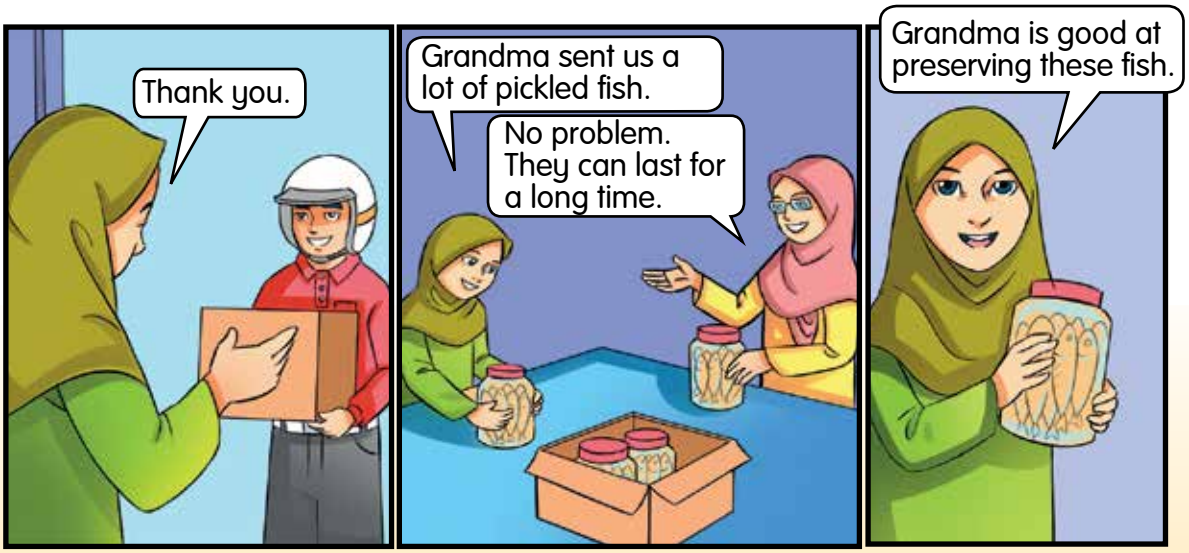
1. Give an inference based on your observation.
2. State the characteristics of the spoilt food.
3. What causes food to spoil?

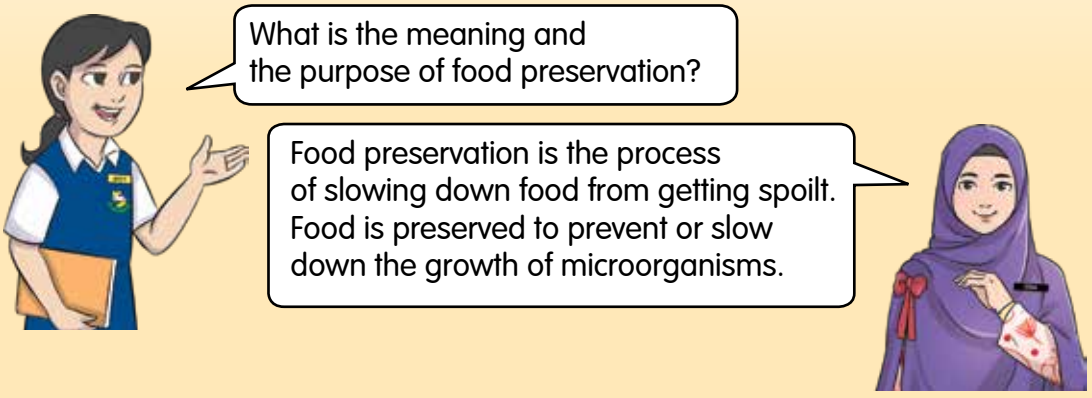
8.1.1, 8.1.2, 8.1.3

Teachers may use other suitable types of food.

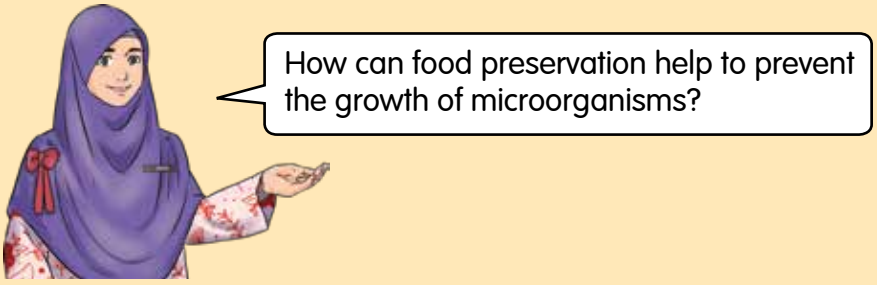
Food Preservation

Alia received a food package sent by her grandmother from her home town.





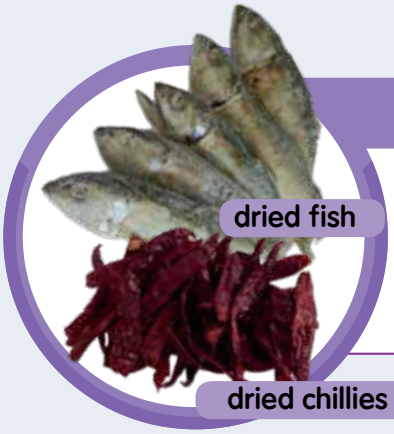
Microorganisms are the main cause of food spoilage. They grow when there is water, air, as well as suitable temperature and acidity.



There are various food preservation methods that can be used to prevent the growth of microorganisms in food.

8.2.1, 8.2.2

Food Preservation Methods



dried fish

dried chillies

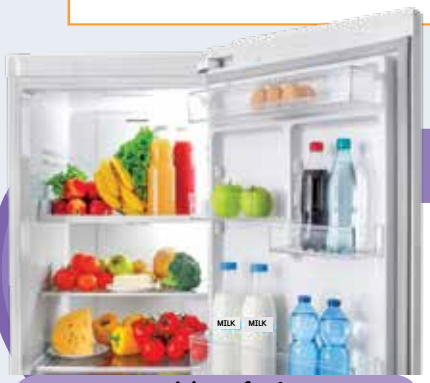
Drying

The food is dried using heat to get rid of the water content. Using this method, the microorganisms are not able to survive because of the absence of water.

Boiling

Food that is cooked and boiled at high temperatures will last longer. High temperatures kill most microorganisms.

The durian paste is boiled until it becomes concentrated jam.



vegetables, fruits, dairy products

Cooling

The food is stored in a cool place at a temperature of about 4°C. The low temperature slows down the growth of microorganisms.

Freezing

The food is frozen at the freezing point of 0°C and below. Very low temperatures stop the growth of microorganisms.

beef, fish, seafood

Vacuum packing

The food packaging is vacuumed and stored. Microorganisms cannot grow in the absence of air.

beef, vegetables, fruits

Canning

The food is cooked and cooled before it is put into a can. The can is then soldered to make it airtight. The absence of air when the food is canned prevents microorganisms from growing. Next, the can is heated at high temperatures to kill the microorganisms.

vegetables, fruits, fish

Bottling

The food is processed, boiled, and then cooled before being placed in airtight bottles. High temperatures and lack of air kill the microorganisms.

vegetables, beans, seafood

Pasteurising

juice, dairy products

The food is heated at 63°C for 30 minutes or at 72°C for 15 seconds. It is followed by immediate cooling at 4°C before being packed and stored. For high temperature pasteurisation (UHT), the food is heated at 135°C for 2 seconds. It is followed by immediate cooling at 4°C. Heating at high temperatures kill the microorganisms. Whereas, low temperatures prevent the growth of microorganisms and make them less active.

Pickling

The food is soaked in vinegar or in a highly concentrated solution of sugar or salt. Unsuitable acidity makes it difficult for microorganisms to grow.

mangoes, fish, chillies

Salting

The food is smeared with a large quantity of salt to remove the moisture in the food. The absence of water prevents the growth of microorganisms.

fish, eggs

Smoking

The food is dried using smoking technique, which takes a long time. The absence of water slows down the growth of microorganisms. Beef, ducks, chickens, fish, and bananas can be preserved through smoking.

beef, ducks, chickens

bananas

Waxing

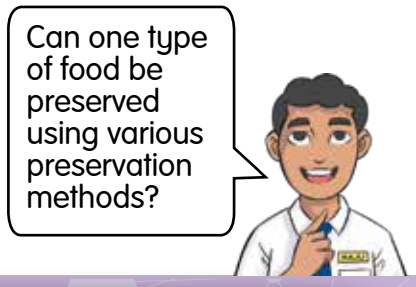
Coating wax onto the surface of the food prevents air and water from entering it. This can prevent the growth of microorganisms.

vegetables, fruits

Why is food preserved? Explain the relationship between food preservation methods and factors that affect the growth of microorganisms.

Food Preservation Project

Various food preservation methods can be done to ensure that the food lasts longer and does not spoil quickly. Let us do the chilli preservation project using various preservation methods.



Chillies Preservation Project

First Method

Group Activity

Aim: To carry out a project of preserving chillies using the drying method

Apparatus and materials: weighing scale, airtight container, wire mesh grill, plastic gloves, 150 g of fresh chillies, kitchen tissues

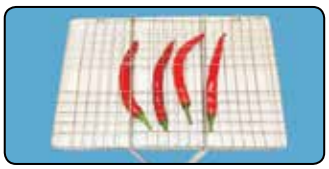
Avoid touching your eyes or nose when handling the chillies.

Steps:

1. 
Wear plastic gloves when cleaning the chillies.

2. 
Dry the chillies using kitchen tissues.

3. 
Weigh and record the initial mass of the chillies.

4. 
Arrange the chillies on a wire mesh grill. Dry the chillies under the sunlight for seven days.

5. 
Weigh the dried chillies and record the final mass.

6. 
Store the dried chillies in an airtight container.

Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.
3. What is the difference between the initial mass and the final mass of the chillies? Give your inference.

8.2.3, 8.2.4, 8.2.7

Second Method

Group Activity

Aim: To carry out a project of preserving chillies using the pickling method

Apparatus and materials: cooking pot, gas stove, knife, plastic gloves, kitchen tissues, sterilised glass jar with a lid, 15 fresh chillies, three tablespoons of salt, six tablespoons of sugar, two cups of food vinegar

1. Avoid touching your eyes or nose when handling chillies.
2. Be careful when handling knives.
3. Be careful when handling gas stoves.

Steps:

1. 
Wear plastic gloves when cleaning the chillies.

2. 
Dry the chillies using kitchen tissues.

3. 
Slice the chillies using a knife.

4. 
Put the sliced chillies into a glass jar.

5. 
Put three tablespoons of salt into the glass jar.

6. 
Heat two cups of food vinegar and add six tablespoons of sugar. Stir the solution until it is dissolved.

7. 
Then, pour the hot solution into the glass jar containing the chillies.

8. 
Let the vinegar cool and close the glass jar tightly.

Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.

Third Method

Group Activity

Aim: To carry out a project of preserving chillies using the freezing method

Apparatus and materials: freezer, ziplock bag, plastic gloves, kitchen tissues, 15 fresh chillies

Avoid touching your eyes or nose when handling chillies.

Steps:

1. 

Wear plastic gloves when cleaning the chillies.

2. 

Dry the chillies using kitchen tissues.

3. 

Put the chillies into a ziplock bag.

4. 

Press the ziplock bag to remove the air completely before sealing it.

5. 

Store the ziplock bag in the freezer of a refrigerator.

6. 

Wait for the chillies to freeze completely.

Questions:

1. What is the food preservation method used to preserve the chillies?
2. What is the microorganism growth factor involved in this preservation method? Explain.

Fourth Method

Group Activity

Aim: To carry out a project of preserving chillies using the boiling method

Apparatus and materials: wok, gas stove, blender, container with a lid, plastic gloves, 15 fresh chillies, two cups of water, cooking oil

1. Avoid touching your eyes or nose when handling chillies.
2. Be careful when handling gas stoves.

Steps:

1. 
Wear plastic gloves when cleaning the chillies.

2. 
Put the chillies, two cups of water, and two tablespoons of cooking oil into a blender.

3. 
Blend the chillies until they turn into a paste.

4. 
Boil the chilli paste in a wok until it thickens.

5. 
Turn off the heat and let the paste cool down.

6. 

Put the chilli paste into a container with a lid.

Questions:

1. What is the food preservation method used to preserve the chillies?
2. Why is cooking oil used in this preservation method? Explain.
3. What is the microorganism growth factor involved in this preservation method? Explain.

Chillies can be preserved using various preservation methods such as drying, pickling, freezing, and boiling. Thus, it is proven that one type of food can be preserved using various methods.

What can you conclude about the food preservation methods that have been carried out?

Combination of Food Preservation Methods

Did you know that food can also be preserved by combining more than one preservation method?

Let us do an activity that combines the various food preservation methods.

LET'S TEST Combination of Food Preservation Methods

Group Activity

Aim: To carry out fish preservation activity by combining more than one preservation method

Apparatus and materials: knife, chopping board, wire mesh grill, two fish, 300 g of fine salt

Be careful when using knives.

Steps:

1. Remove the gills and the inner parts of a fish. Then, clean the fish using water.
2. Cut the fish and spread it out as shown in the picture.
3. Smear salt all over the fish.
4. Place the fish on a wire mesh grill.
5. Dry the fish under the sunlight. Flip it for a period of one week until it is dried.
6. Record your observation.

1.

2.

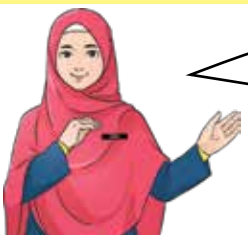
3.

4.

Questions:

1. What are the food preservation methods used to preserve the fish?
2. Why is a large quantity of salt used?
3. What can you conclude from the activity above?

8.2.5, 8.2.7



Give another example of food that can be preserved by combining more than one food preservation method.

The Importance of Food Preservation Technology

Food preservation technology is very important to meet the continuous demand for food supply.

How is the food preservation technology able to meet the demand for food supply in our daily lives?

Food has a longer shelf life

Cencaluk, *Inang-inang* rice crackers, and fish crackers are examples of food that can last for a long time.

Preserved food can last and be stored longer. Therefore, the continuous demand for food supply can be achieved.

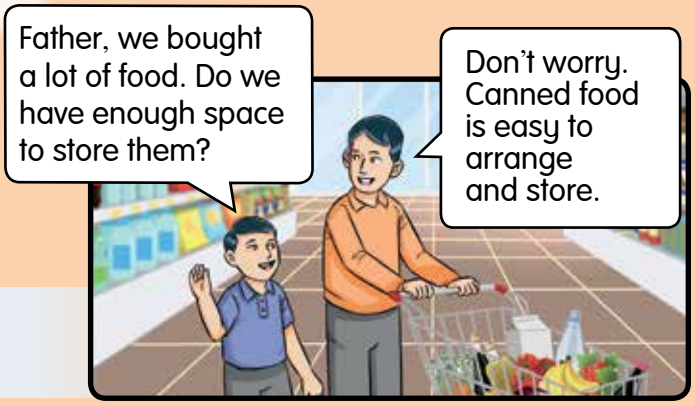
Food wastage can be avoided and prevented

Food leftovers can be processed and dried.

Food that is preserved using various preservation methods can avoid and prevent waste from happening.

Food becomes easier to store

Canned and bottled food do not need a large space to store.



Food that is preserved through canning and bottling can save space and it is easier to store.

Continuous supply of out of season food

Seasonal fruits such as durians, rambutans, and mangosteens can be preserved.

Seasonal foods can be preserved using various preservation methods so that they can be enjoyed throughout the year.

Food becomes easier to be exported

Some food made in Malaysia can be enjoyed in other countries.

Food preservation technology allows food to be exported to other countries.

Production of instant food

Instant food is easy to prepare and can be brought anywhere.

Instant food that is preserved can ease the food supply management when food is limited especially during drought, winter or when natural disasters occur.

Nowadays, food preservation technology has helped to meet the demand for food supply in our daily lives. The importance of food preservation technology includes producing food with longer shelf lives, avoiding and preventing wastage, easier storing of food, ensuring supply of food that are out of season, making food easier to be exported, and producing instant food.

Based on your understanding, discuss the importance of food preservation technology to meet the demand for food supplies.

SCIENCE INFO

Every preserved food has an expiry date. For example, **'USE BEFORE 14 APRIL 2021'**. This shows that the food should be consumed before the stated date.

FUN ACTIVITY

Pickled Fish

Group Activity

Apparatus and materials: knife, chopping board, container with a lid, wire mesh grill, kitchen tissues, fish, salt, cooking oil

Steps:

1. 

Remove the gills and the inner parts of a fish. Then, clean the fish using water and dry it using kitchen tissues.

Be careful when using knives.

2. 

Dry the fish under the sunlight for two hours.

3. 

Smear the fish with salt until it is fully covered.

4. 

Put the fish into a container with a lid. Pour cooking oil into the container until the fish is completely immersed.

5. 

Close the container and store the fish for a few days.

Questions:

1. What is the food preservation method used in this activity?
2. What is the purpose of using salt and cooking oil in this preservation method?
3. Why can the preserved fish be stored for a long time?
4. State other suitable food that can be preserved using the same preservation method.

FUN SCIENCE

Inang-inang Rice Crackers

Make the *Inang-inang* rice crackers using a stove, a wok with a lid, sieve, a container with a lid, wire mesh grill, tray, water, one bowl of rice, one teaspoon of salt, and four tablespoons of tapioca flour.

Be careful when handling gas stoves.

Steps:

1. 

Soak a bowl of rice in water for five minutes. Then, strain off the water.

2. 

Mix one tablespoon of salt and four tablespoons of tapioca flour into the soaked rice.

3. 

Scoop a tablespoon of the rice mixture and spread it thinly over a wok which is heated over a small fire. Cover the wok with a lid for three minutes.

4. 

Flip the dough over to dry both sides of the dough.

5. 

Remove the crackers and let them cool on the wire mesh grill.

6. 

Place the crackers under the sunlight until they are dried.

7. Store the crackers in a sealed container. They can be stored for a long time.

8. Before consuming, fry the crackers in hot cooking oil.

Inang-inang rice crackers

MIND REFLECTION

1. Food is spoilt due to the action of microorganisms.

2. Spoilt food is caused by the:
   - presence of water
   - presence of air
   - suitable temperature
   - suitable acidity

3. Characteristics of spoilt food are as follows:
   - Spoilt milk becomes bubbly and lumpy, smells bad, and has a sour taste.
   - Spoilt bread and rice are covered with black spots, become slimy, and produce bad smell.
   - Spoilt fruits and vegetables become mouldy, and change in texture, taste and colour.
   - Spoilt beef and chicken look blackish, become smelly, and feel slimy.
   - Spoilt fish, squids, and prawns change in texture, produce bad smell, become sticky and mushy.

4. The purpose of food preservation is to prevent or to slow down the growth of microorganisms.

5. Food preservation methods are as follows:
   - drying
   - vacuum packing
   - pickling
   - boiling
   - canning
   - salting
   - cooling
   - bottling
   - smoking
   - freezing
   - pasteurising
   - waxing

6. Food can be preserved by:
   - using more than one food preservation method.
   - combining more than one food preservation method.

7. The importance of food preservation technology are as follows:
   - food has a longer shelf life
   - food wastage can be avoided and prevented
   - food becomes easier to store
   - continuous supply of out of season food
   - food becomes easier to be exported
   - production of instant food

MIND TEST

Answer all questions in the Science exercise book.

1. Observe the following food. State the characteristics that can be identified if the food is spoilt.



2. Look at the picture below.

(a) What is the food preservation process shown in the picture on the left?
(b) State the purpose of preserving this food.

3. The picture below shows various types of seafood.

(a) What is the most suitable method to preserve the food as shown in the picture?
(b) What are the growth factors of the microorganisms involved in the preservation method stated in 3(a)? Explain.

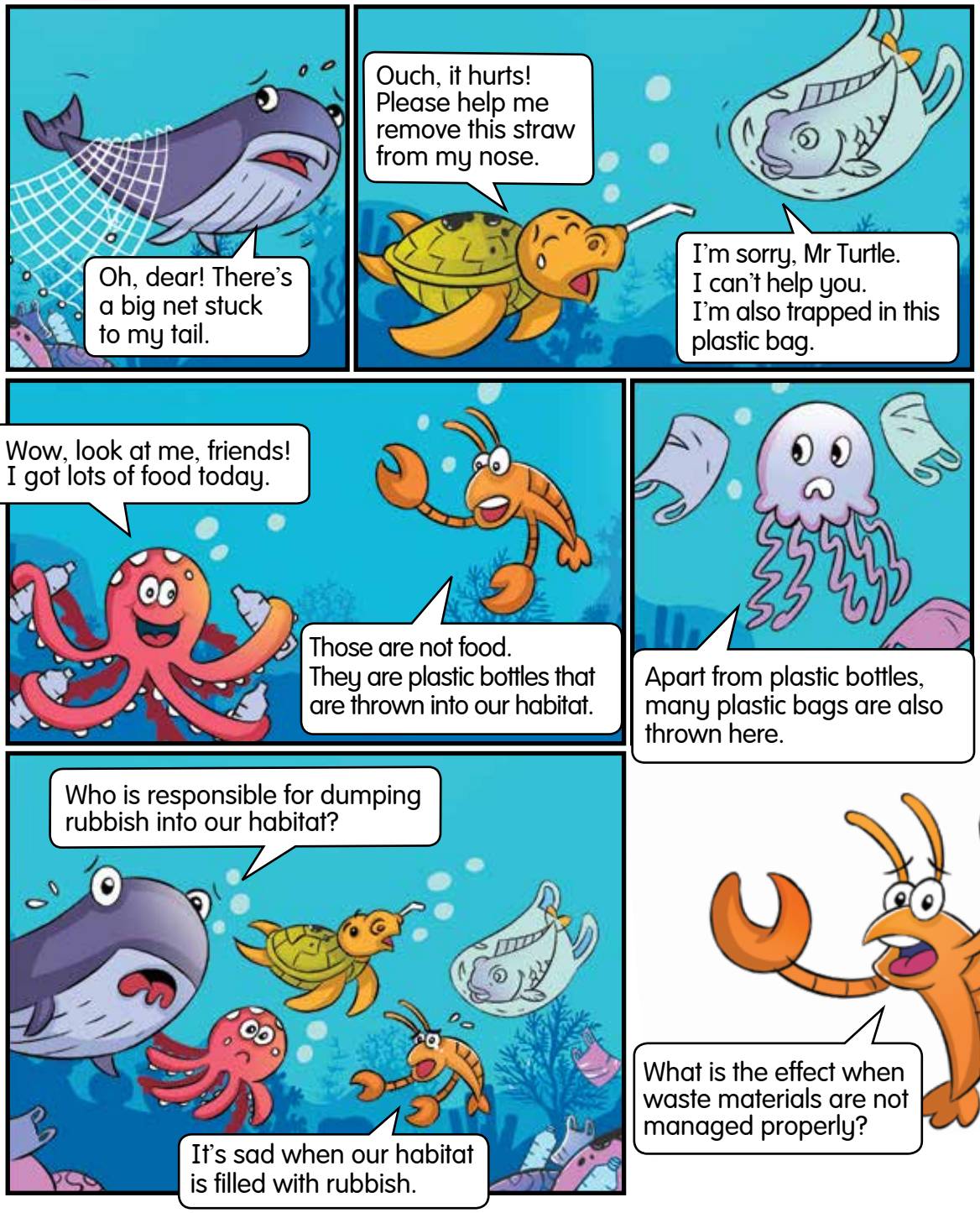
4. The pictures below show three types of food.
State the various preservation methods for the food below.



5. Look at the picture on the right. Puan Anis wants to preserve the food. The food can be preserved by combining more than one preservation method so that it can be stored longer. State the food preservation methods.

UNIT 9

WASTE MATERIALS



Managing Waste Materials

A lot of garbage is thrown away every day. Garbage is a type of waste material.

Waste materials are materials that we no longer need and want to keep. Waste materials can be categorised based on their types.

Glass

Examples of glass waste are glass bottles and drinking glasses.

Metal

Examples of metal waste are aluminium, cans, and scrap metals.

Paper

Examples of paper waste are newspapers, boxes, books, and magazines.

Faeces

Faeces is the waste matter of humans and animals.

Plastic

Examples of plastic waste are plastic food containers and plastic bottles.

Food waste

Food waste is domestic waste such as onion skin, chicken bones, egg shells, leftover vegetables, and used cooking oil.

Toxic waste

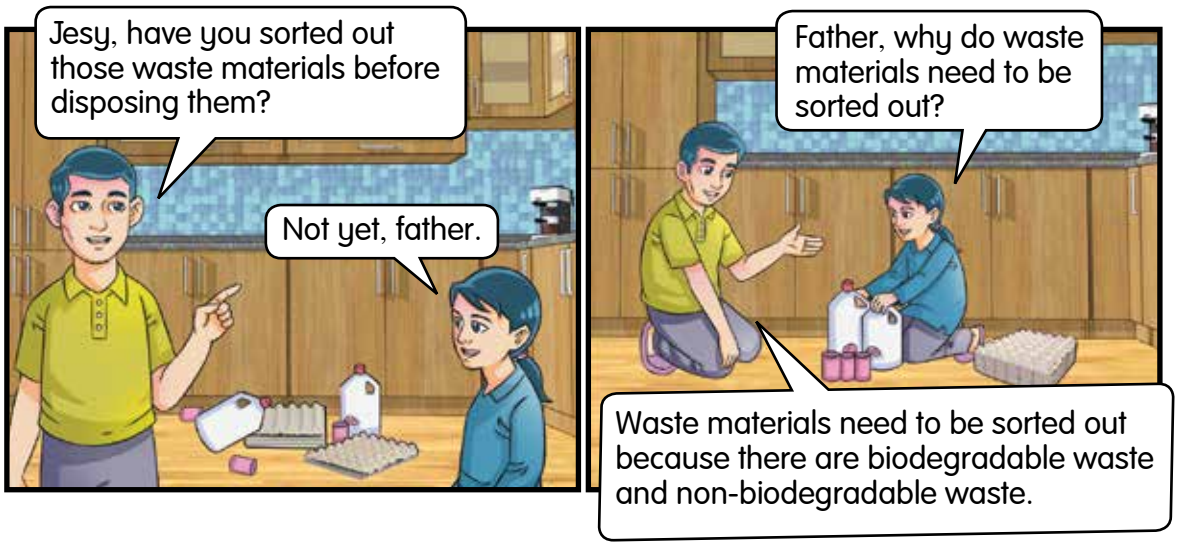
Toxic waste such as smog and chemical waste are released from vehicle workshops and industrial sectors.

Waste materials consist of glass, metals, paper, faeces, plastic, food waste, and toxic waste.

Based on the types of waste shown above, state other examples of waste materials.

Biodegradable and Non-biodegradable Waste

Jesy's father asked her to sort out the domestic waste based on the different types before throwing them into the bin. Let us follow their conversations.



Biodegradable Waste

Biodegradable waste is materials that can be decomposed by microorganisms such as bacteria and fungi. When decomposition process occurs, nutrients will be absorbed back into the soil. Biodegradable waste consists of organic materials as shown in the pictures below.


food waste


paper and boxes


dry leaves


faeces

9.1.2, 9.1.3

Non-biodegradable Waste

Non-biodegradable waste is materials that cannot be decomposed by microorganisms. They will continue to be around us for a long time and will cause pollution to the environment. Non-biodegradable waste consists of materials as shown in the pictures below.


plastic


metals


glass


toxic waste

FUN ACTIVITY

Biodegradable and Non-biodegradable Waste

Group Activity

21st Century Learning Skills

Apparatus and materials: glue, cardboard, scissors, pictures of waste materials, Internet access, computer, printer

Be careful when using scissors.

Steps:

1. Find and download pictures of waste materials using the Internet.
2. Print the downloaded pictures of the waste materials.
3. Observe each picture.
4. Identify the types of biodegradable and non-biodegradable waste materials.
5. Present the work of your group creatively.

Questions:

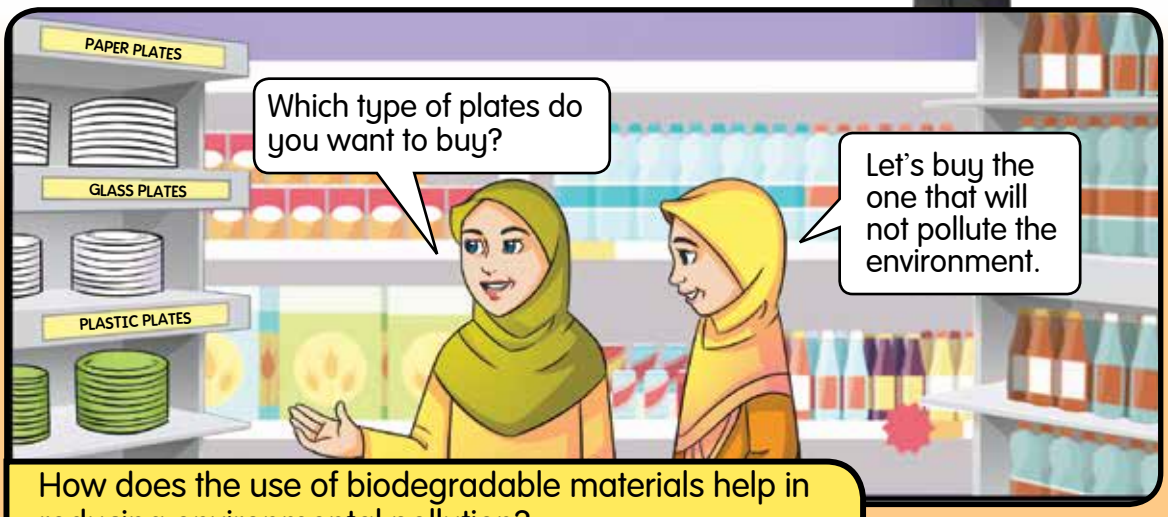
1. What are the biodegradable and non-biodegradable waste that can be identified?
2. What do biodegradable and non-biodegradable waste mean?

9.1.1, 9.1.2, 9.1.6

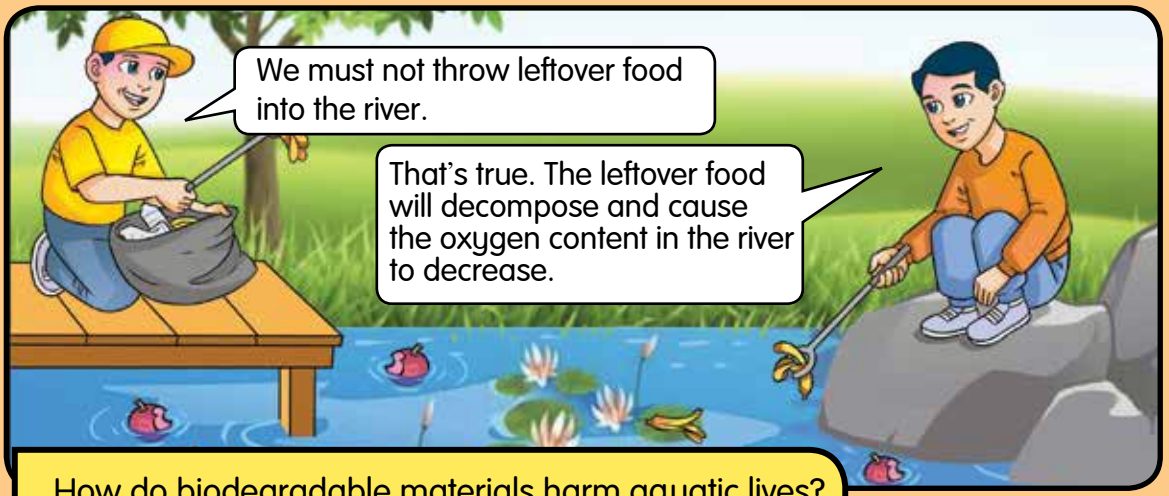
Uses of Biodegradable and Non-biodegradable Materials

The latest development of technology has produced various products made of biodegradable and non-biodegradable materials. We need to use biodegradable and non-biodegradable materials wisely.

Biodegradable Materials



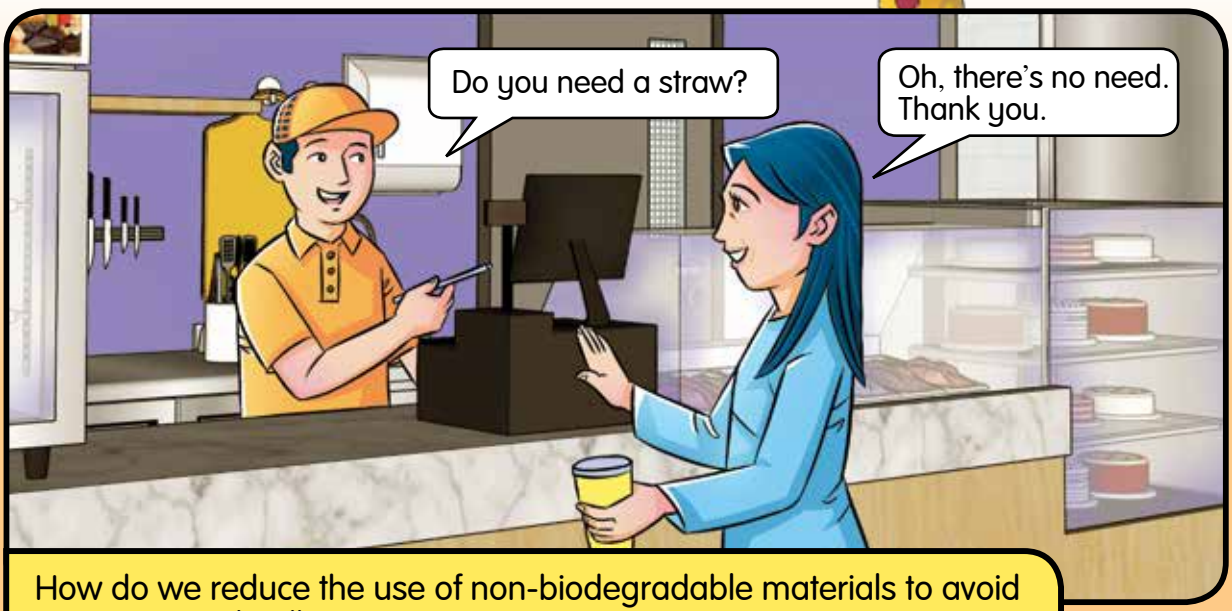
How does the use of biodegradable materials help in reducing environmental pollution?



How do biodegradable materials harm aquatic lives?

Non-biodegradable Materials

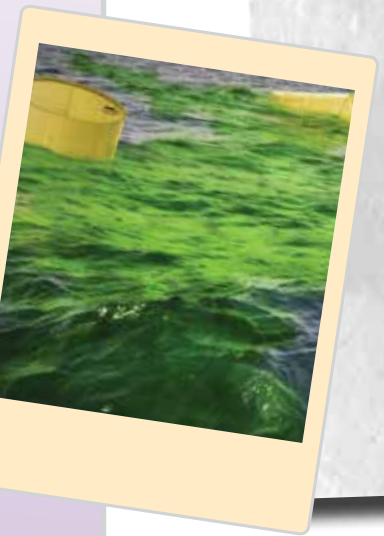
Why do we need to use non-biodegradable materials wisely?



How do we reduce the use of non-biodegradable materials to avoid environmental pollution?

Flash floods are happening more frequently in this city.

How do non-biodegradable materials contribute to flash floods?



National News

Pollution in Kim Kim River

PASIR GUDANG: The illegal dumping of chemical waste into the Kim Kim river by factories has caused serious pollution.

The pollution has caused the river water to change colour, produce bad odour, and also kill aquatic lives.

These chemical waste also released toxic fumes which caused more than 100 people living around the Kim Kim river to be hospitalised. The victims suffered from shortness of breath from inhaling the toxic gases.

How do non-biodegradable materials affect human health?

Based on your understanding, summarise the purpose of using biodegradable and non-biodegradable materials wisely.

SCIENCE INFO

Non-biodegradable materials such as plastic bottles can be recycled into new products such as clothing. The bottles are collected, cleaned, and later sorted according to their colours. Clear plastic bottles can be recycled into white threads. Green plastic bottles can be recycled into green threads.

The bottles are crushed into smaller pieces and processed into plastic fibres. The plastic fibres are spun into plastic yarns. The plastic yarns are woven into fabric. To make a shirt, only eight plastic bottles are needed.

FUN ACTIVITY Classifying Waste Materials

Apparatus and materials: A4 paper, flip chart paper, coloured pencils

Steps:

1. Observe the waste materials that are thrown out from your house for one week.
2. Record your observations in the table.

Waste material	Type of material	Quantity of waste material	
		Biodegradable	Non-biodegradable
Total			

3. Based on the data collected, discuss the results of the observations in your group.
4. Classify the waste materials into biodegradable and non-biodegradable.
5. Make a classification chart on the flip chart paper.
6. Plan ways to reduce each waste material wisely.
7. Present the result of your discussion to the class.

Questions:

1. What is the most discarded material within one week?
2. How do you classify the biodegradable and non-biodegradable waste?
3. How can you reduce each waste wisely?
4. Explain proper waste management. Give examples.

9.1.3, 9.1.4, 9.1.6

Proper Ways of Waste Management

A planned and proper waste management needs to be carried out to reduce the harmful effects to the environment. This also ensures a sustainable life for the future generations.

How can you help in managing waste properly?

I can wrap and tie the plastic bag containing the waste materials tightly.

Waste materials should be wrapped and tied up properly in plastic bags before disposal. This can help to prevent waste materials from being exposed to pests such as rats and flies that carry diseases.

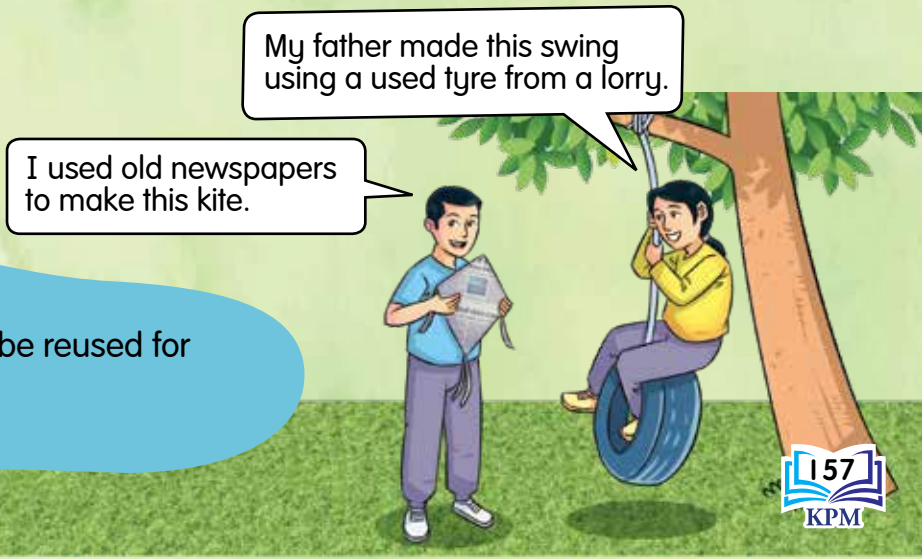
I use the leftover food to make compost fertiliser.

Waste materials such as leftover food can be decomposed and made into compost fertiliser.

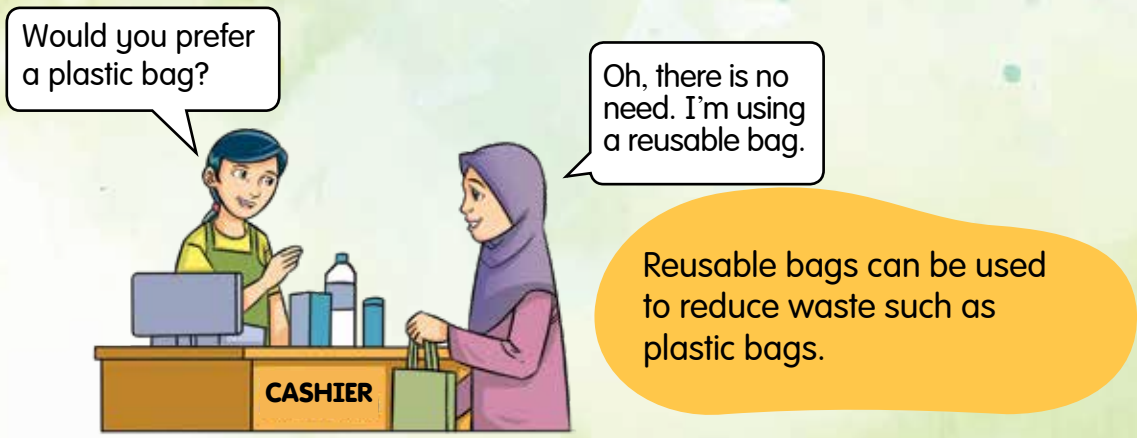
Use special containers to dispose waste materials such as oil waste.

Waste materials must be sorted out according to their types to ease the disposal process.

Waste materials that are in good condition can still be used and can be donated to those in need.



Waste materials can be reused for different purposes.



How does your neighbourhood conduct waste management? Suggest more sustainable ways to manage waste.

What are the types of waste that can be disposed into the recycling bins?

Waste materials can be sorted out using recycling bins as shown in the pictures.

The blue recycling bin is used to dispose waste materials that are made of paper. Examples of waste materials that can be disposed into this bin are as follows:

newspapers

magazines

books

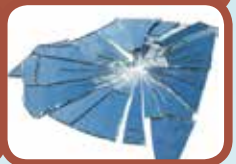
cardboard boxes

The brown recycling bin is used to dispose waste materials that are made of glass. Examples of waste materials that can be disposed into this bin are as follows:

drinking bottles

food containers

cosmetic bottles



mirrors

The orange recycling bin is used to dispose waste materials that are made of aluminium, steel, and plastic. Examples of waste materials that can be disposed into this bin are as follows:

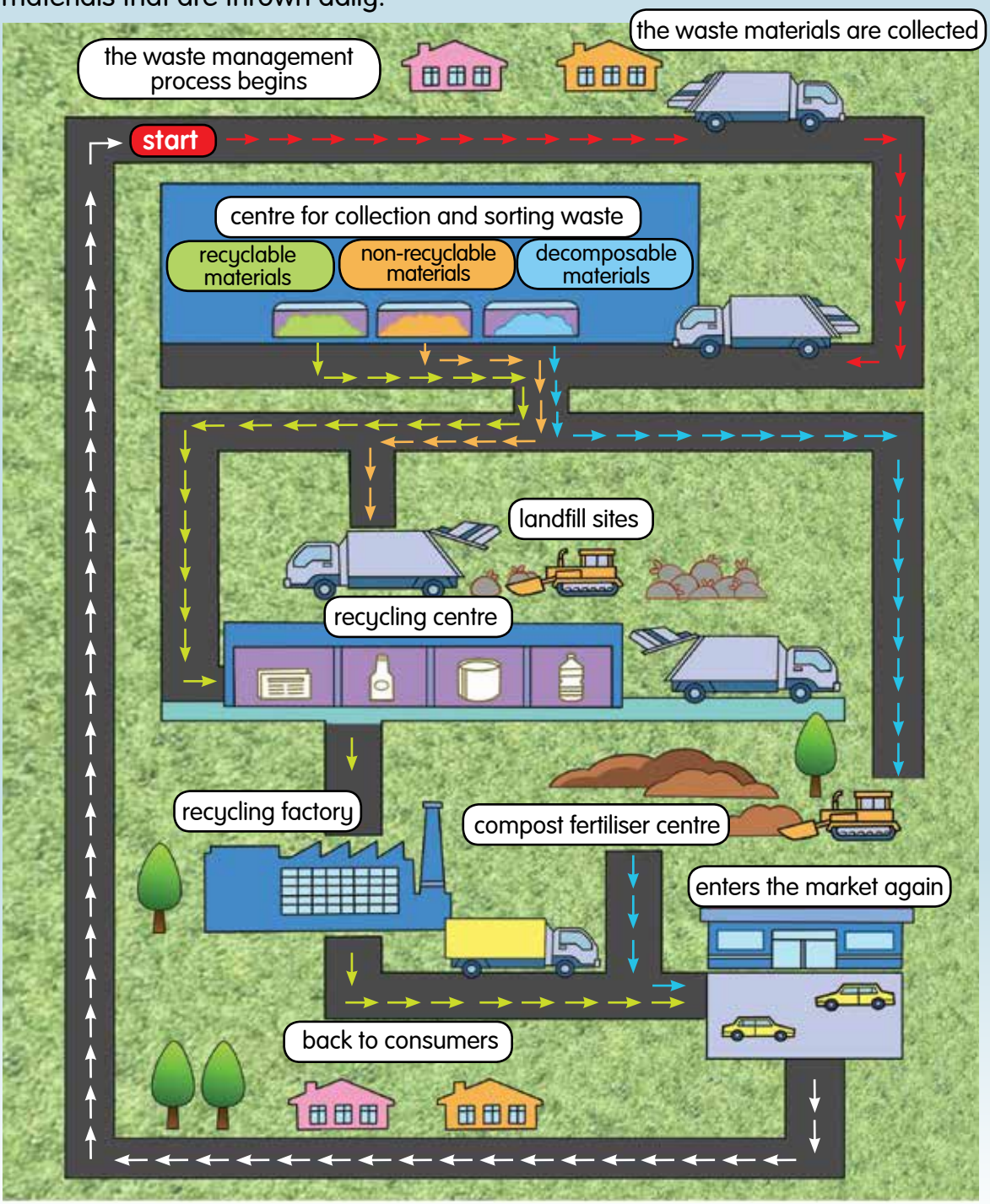
soft drink cans

plastic food containers

detergent bottles

food cans

Proper ways of waste management is also under the responsibility of the local municipal authority. Let us understand the process of managing waste materials that are thrown daily.



How do we manage waste materials properly to ensure a sustainable life?

FUN ACTIVITY

5R Project (Reuse, Reduce, Recycle, Repair, Refuse)

Group Activity

21st Century Learning Skills

Apparatus and materials: camera, computer, printer, scissors, glue, pencils, paper, coloured pencils, manila cards

Steps:

1. The table below shows the 5R Project that will be carried out by your class.

Be careful when using scissors.

5R activity	Description
Reduce	reduce waste materials
Reuse	reuse waste materials
Recycle	recycle waste materials
Repair	repair materials that can become waste
Refuse	refuse materials that can cause waste

2. The leader of each group chooses one 5R activity by voting. The chosen activity will be carried out by the group.
3. Plan each task to be carried out during the activity. For example, the group members can carry out a recycling activity by collecting waste materials near their school and neighbourhood to be recycled. Examples of waste materials that can be collected include aluminium cans, paper, and plastic bottles.
4. Carry out the 5R activities for one week.
5. Take pictures while carrying out the activity.
6. Print and paste the pictures on a manila card.
7. Present the results of the activity creatively.

Questions:

1. Give a suggestion to improve the awareness of 5R practices among your friends.
2. State the effects of improper waste management to the environment.

FUN SCIENCE

Compost Fertiliser

Make compost fertiliser using water, soil, and biodegradable waste such as leftover vegetables, egg shells, banana peels, newspapers, and dry leaves. Prepare a special container to place the compost fertiliser.

Steps:

1. 

Make a hole at the bottom of a flowerpot.

2. 

Cut the biodegradable waste into small pieces.

3. 

Put in the soil as the first layer.

4. 

Put in the biodegradable waste as the second layer.

5. 

Put the soil and biodegradable waste alternately until all the materials are used up.

6. 

Spray some water onto the mixture every day.

7. 

Make sure the container is covered after the water is sprayed.

8. Leave the mixture in the container. Stir it once a week until all the materials are decomposed into compost fertiliser.

compost fertiliser

MIND REFLECTION

1. Waste materials are materials that we no longer need and want to keep.
2. The seven types of waste materials are as follows:
   - glass
   - metal
   - paper
   - faeces
   - plastic
   - food waste
   - toxic waste
3. Biodegradable waste is materials that can be decomposed by microorganisms.
4. Non-biodegradable waste is materials that cannot be decomposed by microorganisms.
5. Examples of biodegradable waste are food waste, paper, boxes, dry leaves, and faeces.
6. Examples of non-biodegradable waste are plastic, metals, glass, and toxic waste.
7. Some of the effects of biodegradable and non-biodegradable materials if they are not used wisely are as follows:
   - Environmental pollution such as water pollution and air pollution will occur.
   - Aquatic lives die due to lack of oxygen.
   - Aquatic lives die from eating plastic that are thrown into the oceans.
   - Drains become clogged and cause flash floods.
   - Human lives become threatened by the disposal of toxic waste.
8. Some proper ways of waste management to ensure a sustainable life are as follows:
   - Waste materials should be wrapped and tied up properly in plastic bags before disposal.
   - Waste materials such as leftover food can be decomposed and made into compost fertiliser.
   - Use special containers to dispose waste materials such as oil waste.
   - Waste materials must be sorted out according to their types to ease the disposal process.
   - Waste materials that are in good condition can still be used and can be donated to those in need.
   - Waste materials can be reused for different purposes.
   - Waste materials can be recycled into new products.
   - Repairing faulty equipment can save money.
   - Reusable bags can be used to reduce waste such as plastic bags.

MIND TEST

Answer all questions in the Science exercise book.

1. Complete the following table by writing the examples of waste materials.

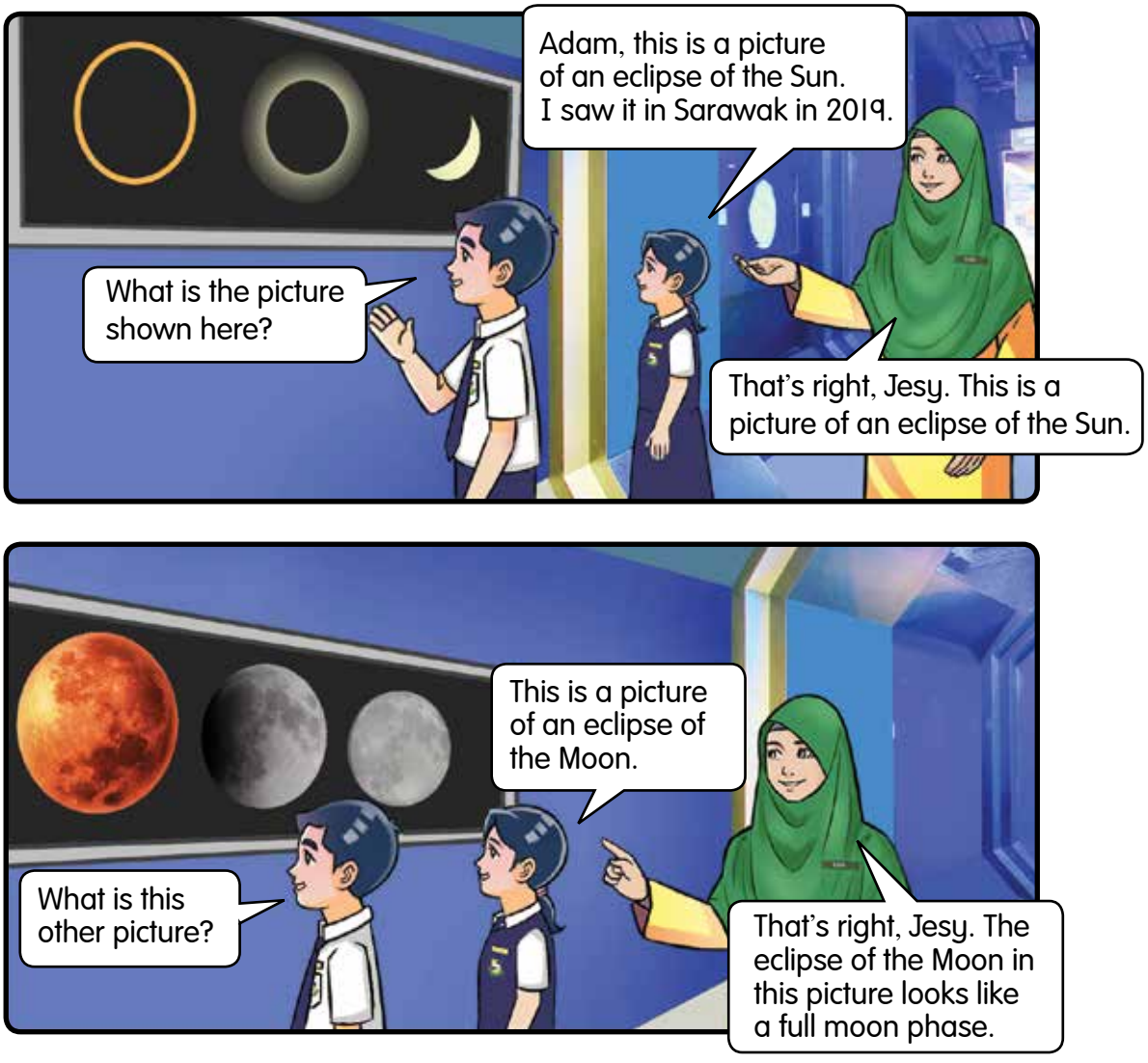
Type of waste	plastic	paper	glass	metal
Example of waste material				

2. What is the meaning of:
   (a) biodegradable waste?
   (b) non-biodegradable waste?

3. The picture below shows a pile of waste by the roadside.

   (a) State the types of waste materials that can be seen in the waste pile.
   (b) Classify the waste materials above into biodegradable and non-biodegradable.
   (c) What are the effects of these waste to the environment?
   (d) Suggest ways to improve the practice of disposing these waste materials.

UNIT 10 ECLIPSE

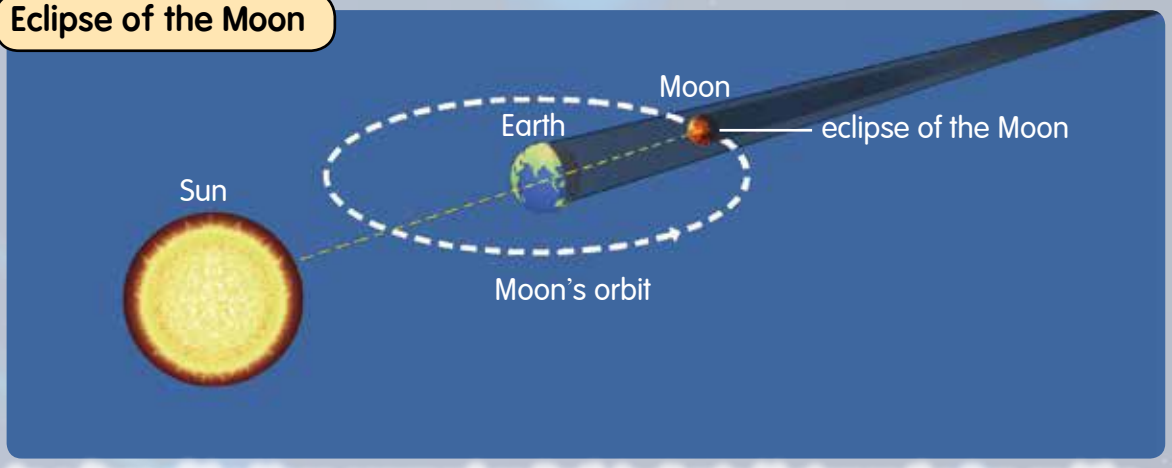


Miss Ema and her pupils visited the National Planetarium in Kuala Lumpur. They were excited with the exhibition on the eclipse phenomena. Do you know how an eclipse occurs? What are the differences between an eclipse of the Sun, an eclipse of the Moon, and phases of the Moon?

Eclipse of the Moon

The picture above shows the changes that can be observed on the surface of the Moon during an eclipse of the Moon. Do you know how an eclipse of the Moon occurs?

Eclipse of the Moon



An eclipse of the Moon occurs when Earth is situated between the Sun and the Moon in a straight line. Earth prevents some or all of the sunlight from reaching the Moon. Thus, the shadow of Earth will be formed on the Moon's surface during an eclipse of the Moon. An eclipse of the Moon only occurs during the full moon phase.

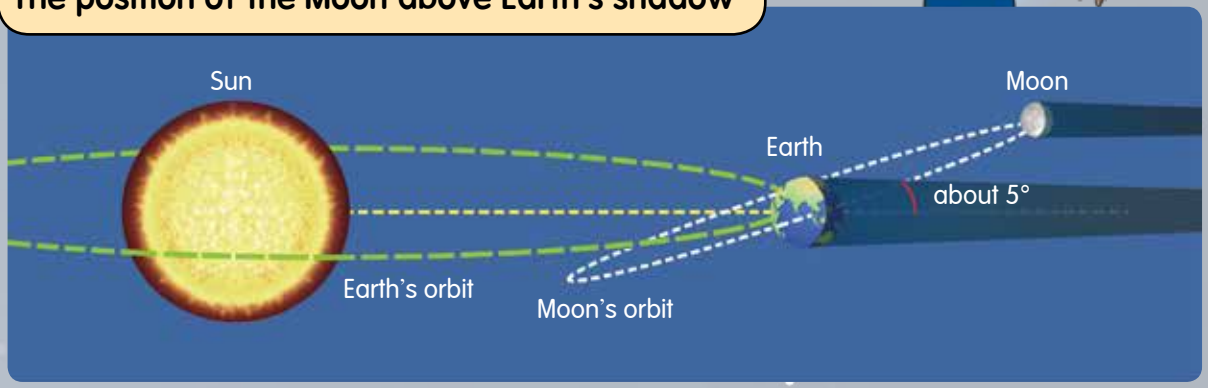
The figure above is not according to actual scale and distance.

Why does an eclipse of the Moon not occur every month during the full moon phase?

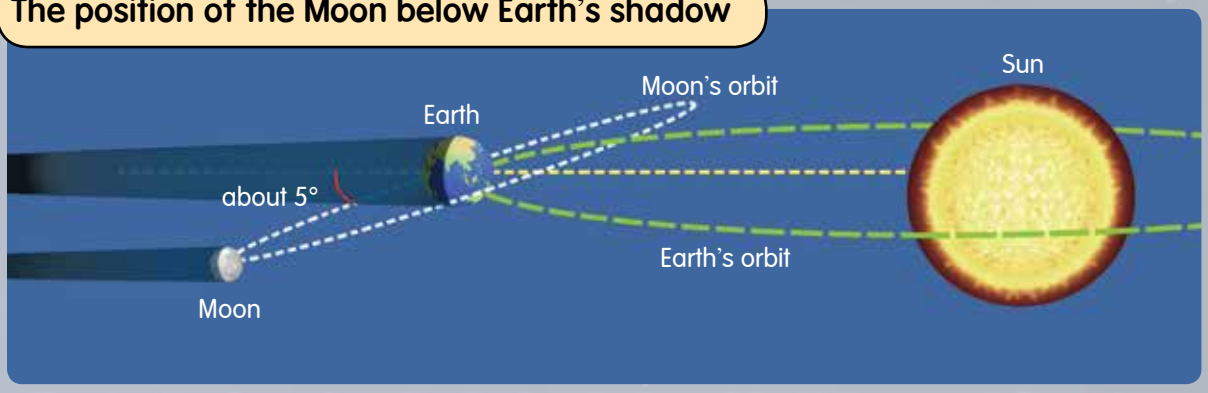
During the full moon phase, an eclipse of the Moon does not necessarily occur. This is because the Moon's orbit around Earth is tilted about 5° from Earth's orbit around the Sun.

Tilting of the Moon's orbit causes the Moon to be either above or below Earth's shadow. Thus, an eclipse of the Moon does not necessarily occur every month during the full moon phase.

The position of the Moon above Earth's shadow



The position of the Moon below Earth's shadow

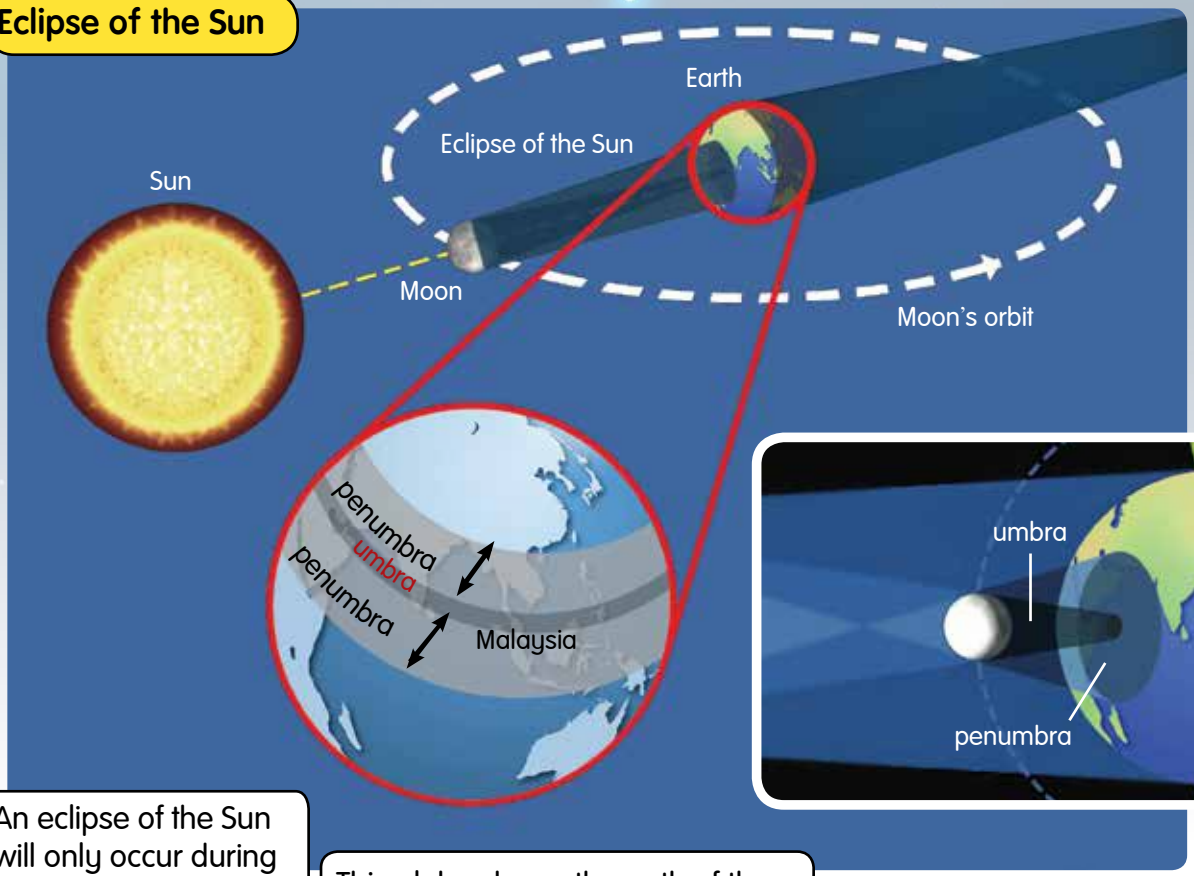


The pictures above show that the Sun, Earth, and the Moon are not always in a straight line during the full moon phase. An eclipse of the Moon can occur twice a year.

Eclipse of the Sun

An eclipse of the Sun occurs when the Moon is situated between the Sun and Earth in a straight line. The Moon prevents some or all of the sunlight from reaching Earth's surface. Thus, the shadow of the Moon will be formed on Earth's surface during an eclipse of the Sun. Observe the picture below.

Eclipse of the Sun



An eclipse of the Sun will only occur during daytime.

This globe shows the path of the Moon's shadow on Earth's surface. A total eclipse of the Sun and a partial eclipse of the Sun can be seen from the region of the umbra shadow path. Whereas, only a partial eclipse of the Sun can be seen from the region of the penumbra shadow path.

simulation of an eclipse of the Sun

Based on the positions of the Sun, the Moon, and Earth as shown above, an eclipse of the Sun only occurs during the new moon phase.

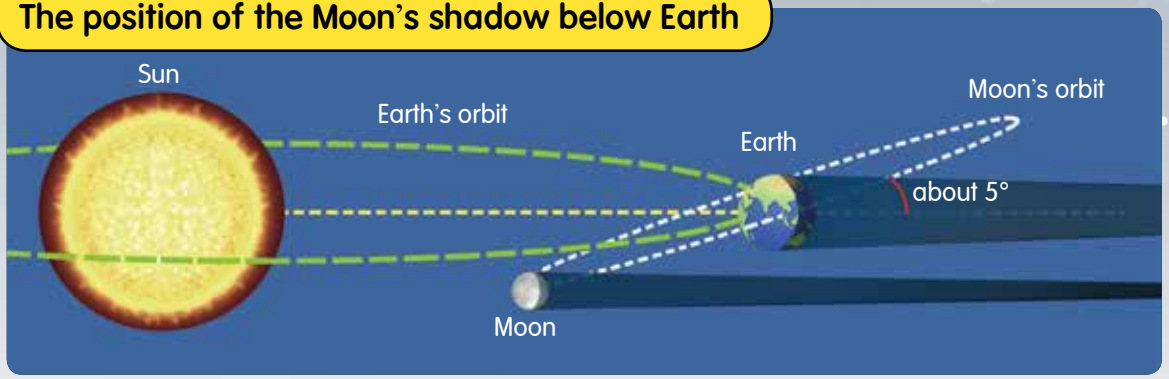
SCIENCE INFO

Umbra is the darkest part of a shadow. The penumbra is a partially dark area that forms around the umbra.

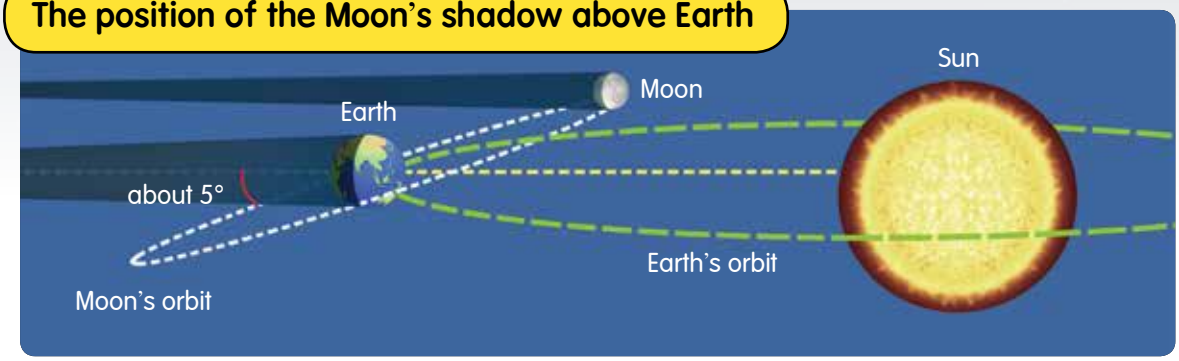
An eclipse of the Sun does not necessarily occur during every new moon phase because the Moon's orbit around Earth is tilted about 5° from Earth's orbit around the Sun.

The tilting of the Moon's orbit prevents the Moon's shadow from forming on Earth's surface. This is because the tilting of the Moon's orbit causes the Moon to pass above or below Earth. Thus, an eclipse of the Sun does not necessarily occur every month during the new moon phase.

The position of the Moon's shadow below Earth



The position of the Moon's shadow above Earth



The pictures above show that the Sun, Earth, and the Moon are not always in a straight line during the new moon phase. An eclipse of the Sun can occur twice a year.

SCIENCE INFO

In astronomy, the new moon phase occurs when the Moon is situated between the Sun and Earth in a straight line. During this phase, the Moon's surface is completely dark and invisible to the naked eye.

EXPERIMENT

Eclipse Simulation Model

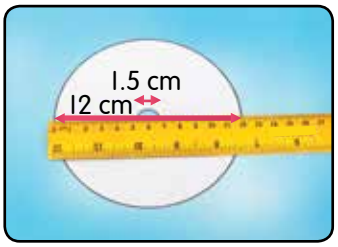
Group Activity

Aim: To describe the eclipse phenomena

Apparatus and materials: torch, a pin, scissors, ruler, protractor, transparent plastic, modelling clay, skewer stick, white-coloured card

Steps:

Be careful when using scissors and pins.

1. 

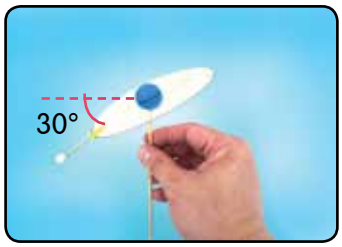
Cut the transparent plastic into a circle with the diameter as shown in the picture.

2. 

Shape the modelling clay into a sphere. Then, stick the sphere to the centre of the rounded plastic.

3. 

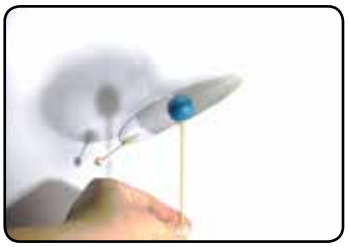
Stick a pin to the edge of the transparent plastic using modelling clay.

4. 

Insert the skewer stick into the sphere at an inclined angle of about 30°.

5. 

Conduct the activity in a dark room. Place the torch on the table.

6. 

Hold a piece of white card facing the eclipse model and the torch. Observe the formation of the shadow of the model.

7. Conduct the eclipse simulation and describe the occurrence of an eclipse of the Sun and an eclipse of the Moon.

Questions:

1. What do the pin, spherical modelling clay, and torch represent in the simulation above?
2. What positions of the Moon, Earth, and the Sun would cause an eclipse of the Moon and an eclipse of the Sun to occur?

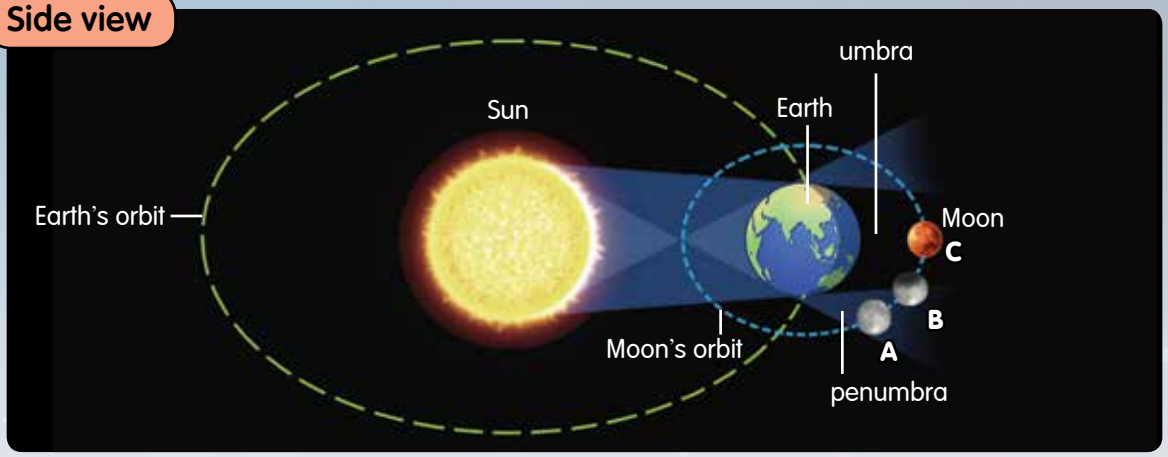
10.1.1, 10.1.2, 10.1.5

Relationship Between Eclipses and the Properties of Light

The Sun is the main source of light in our Solar System. Sunlight travels in a straight line and cannot pass through opaque objects such as Earth and the Moon.

During an eclipse of the Moon, the sunlight that passes through Earth will produce two types of shadows. They are known as umbra and penumbra.

Side view



When the Moon orbits along Earth's shadow from position A to position C, two types of eclipses of the Moon will occur.

View from Earth

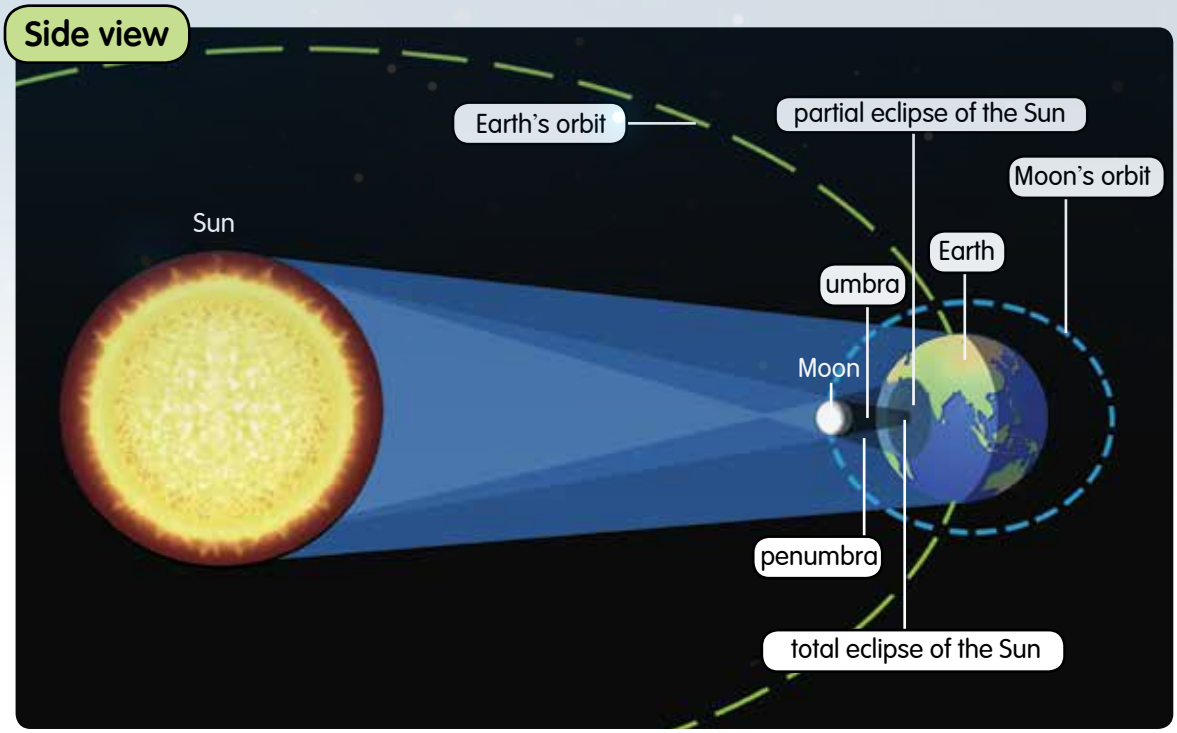
SCIENCE INFO

The reddish-brown colour during a total eclipse of the Moon is caused by the dispersion and refraction of sunlight through Earth's atmosphere. This effect can usually be observed during sunrise and sunset.

During an eclipse of the Moon, the light from the Moon is safe to be seen with our naked eyes. Why?

During an eclipse of the Sun, sunlight moving towards the Moon will produce two types of shadows known as umbra and penumbra. The umbra shadow is smaller and darker than the penumbra shadow.

Side view



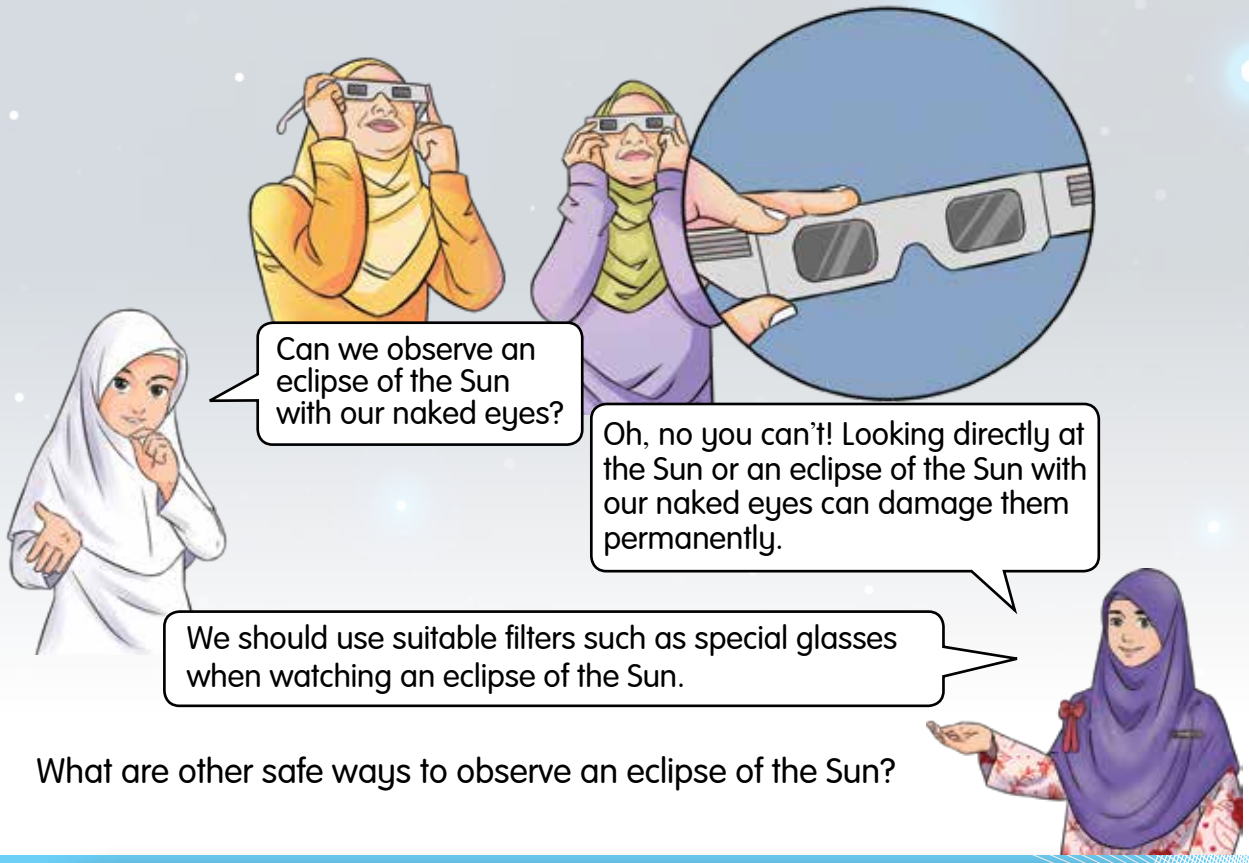
When the Moon's shadow forms on Earth's surface, two types of eclipses of the Sun would occur. A total eclipse of the Sun and a partial eclipse of the Sun can be seen from the region of the umbra shadow path. Whereas, only a partial eclipse of the Sun can be seen from the region of the penumbra shadow path.

View from Earth

partial eclipse of the Sun

total eclipse of the Sun

total eclipse of the Sun



What are other safe ways to observe an eclipse of the Sun?

FUN ACTIVITY

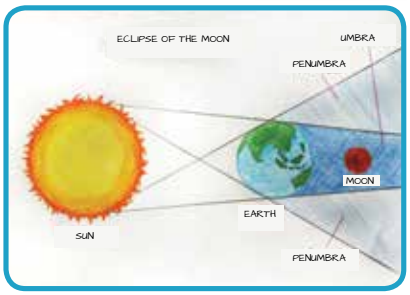
Sketches of Eclipses and the Properties of Light

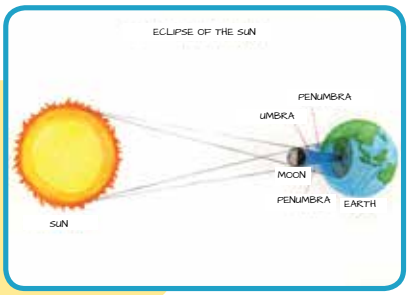
Individual Activity

Apparatus and materials: ruler, coloured pencils, drawing paper

Steps:

1. Sketch and label the positions of the Sun, Earth, and the Moon correctly during an eclipse of the Moon and an eclipse of the Sun.
2. Colour your sketch.
3. Exhibit your sketch to the class.





Questions:

1. List the differences between an eclipse of the Moon and an eclipse of the Sun.
2. What is the relationship between an eclipse and the properties of light?

10.1.3, 10.1.5

The Conditions on Earth During an Eclipse

On 26 December 2019, the people in Malaysia, especially in Johor and Sarawak, had the opportunity to watch an eclipse of the Sun. The pictures below show the surrounding conditions before and during an eclipse of the Sun.

Brightness of the Surrounding

Before

During

The Reactions of Animals

Before

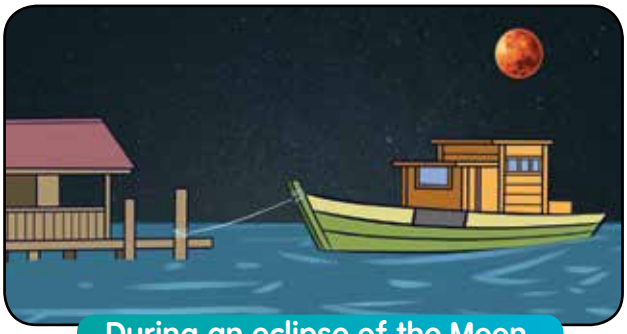
During

How do animals react during a total eclipse of the Sun?

What will happen to Earth during an eclipse of the Moon?

The pictures below show the difference in the level of the sea tide at a jetty during the crescent moon phase and an eclipse of the Moon.

During the crescent moon phase



During an eclipse of the Moon

What can you predict from the level of sea tides during an eclipse of the Moon?

FUN SCIENCE

Pinhole Camera

Make a pinhole camera using a pair of scissors, adhesive tape, pin, two pieces of white cardboard, and aluminium foil.

Be careful when using scissors and pins.

Steps:

1. 

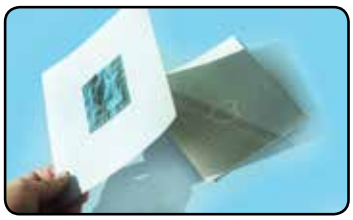
Make a square hole in the centre of the cardboard.

2. 

Paste an aluminium foil to cover the hole.

3. 

Make a few holes on the aluminium foil. The holes made are known as pinholes.

4. 

Allow the sunlight to pass through the pinholes until it forms a clear image on the surface of the other cardboard.

An eclipse of the Sun can be viewed safely using a pinhole camera.

MIND REFLECTION

1. An eclipse of the Moon will only happen:
   - when Earth is between the Sun and the Moon in a straight line.
   - during the full moon phase.
   - when the Moon enters the shadow's region of Earth.

2. An eclipse of the Sun will only happen:
   - when the Moon is between the Sun and Earth in a straight line.
   - during the new moon phase.
   - when the shadow of the Moon forms on Earth's surface.

3. An eclipse of the Moon or an eclipse of the Sun does not necessarily occur during the full moon phase or the new moon phase. This is because the tilted orbit of the Moon often causes the Moon to be above or below Earth.

4. Sunlight travels in a straight line and cannot pass through opaque objects such as Earth and the Moon.

5. A total eclipse of the Sun and a partial eclipse of the Sun can be seen from the region of the umbra shadow path. Whereas, only a partial eclipse of the Sun can be seen from the region of the penumbra shadow path.

6. Looking directly at the Sun or an eclipse of the Sun with our naked eyes can damage the eyes permanently.

7. During an eclipse of the Sun, the surrounding conditions become darker, the temperature decreases, and living things such as animals will return to their nests.

8. During an eclipse of the Moon, the level of the sea tides rise.

MIND TEST

Answer all questions in the Science exercise book.

1. State the types of eclipses shown in the following pictures.




2. Tick (✔) the correct statements about the eclipse of the Moon.

(a) An eclipse of the Moon only occurs during the full moon phase.
(b) An eclipse of the Moon occurs when the Moon is situated between the Sun and Earth in a straight line.
(c) An eclipse of the Moon cannot be seen with our naked eyes.
(d) When the Moon is in the umbra shadow of Earth, a total eclipse of the Moon will occur.

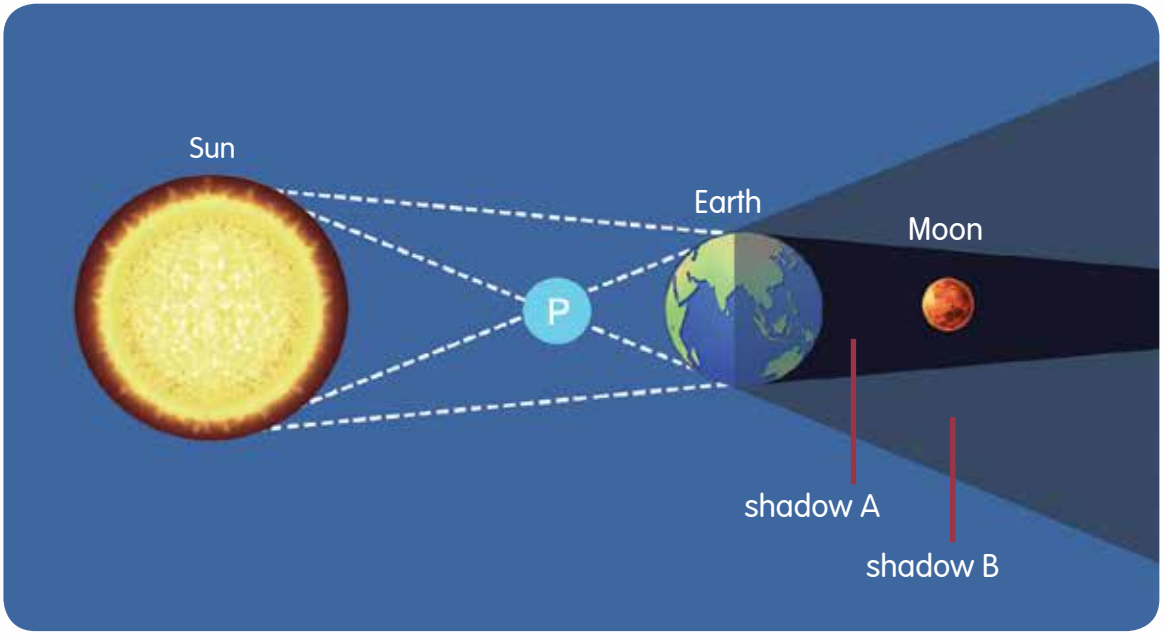
3. During eclipse A, the surrounding conditions become darker like night-time and the surrounding temperature also decreases.

Answer the following questions based on the statement above.
(a) What is the type of eclipse A that occurred?
(b) Explain your answer in 3(a).
(c) State suitable tools that can be used to observe eclipse A.

4. Fill in the blanks below with the correct answers.

When an eclipse of the _____ occurs, the Moon is situated between the Sun and Earth in _____ . This eclipse will only occur during the _____ phase.

5. The diagram below shows the positions of the Sun, Earth, and the Moon during an eclipse phenomenon. Answer the following questions.



(a) What is the type of eclipse phenomenon shown in the picture above?
(b) Name shadow A and shadow B.
(c) State the two properties of sunlight for the phenomena of shadow A and shadow B.
(d) Predict the phenomenon that can be seen when the Moon is in position P.

6. Predict the conditions on Earth during a:
(a) total eclipse of the Moon.
(b) total eclipse of the Sun.

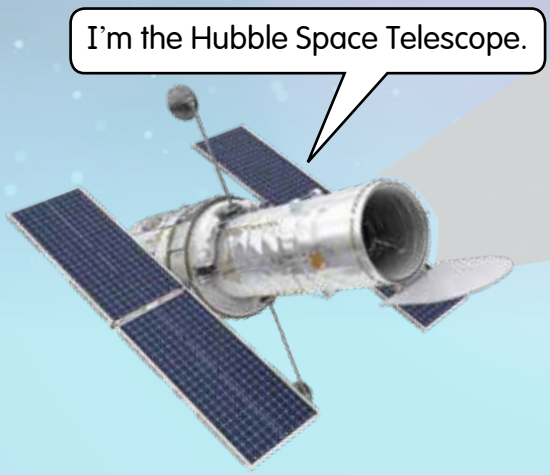
UNIT 11 GALAXY

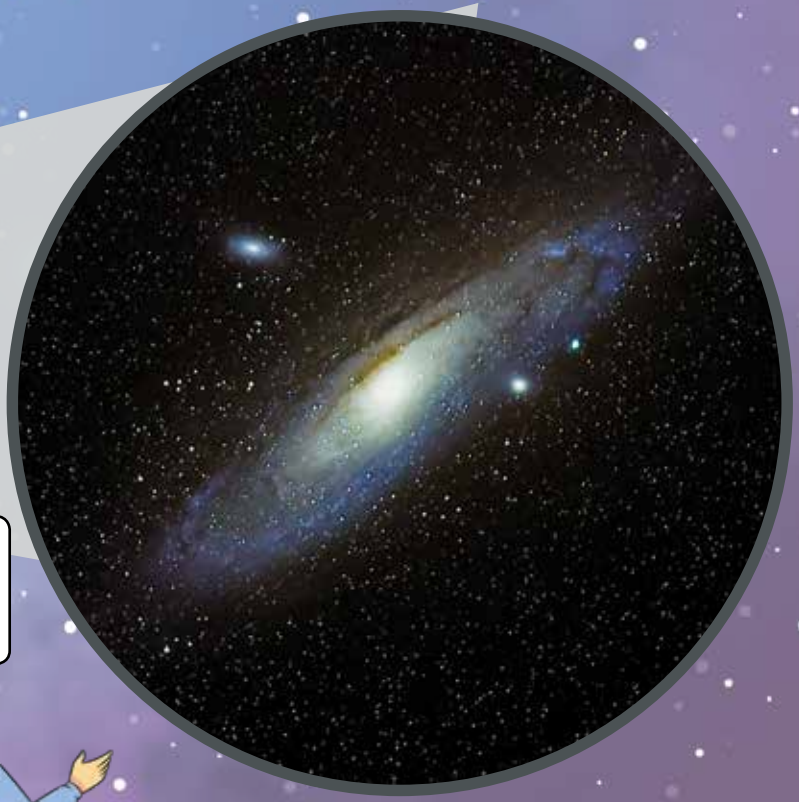
Have you ever seen a galaxy like the one in the picture above?
The Milky Way galaxy can only be seen at night and only in very dark areas.
What is a galaxy?

Getting to Know Galaxies

Chua and his father are observing a galaxy using a telescope.

A galaxy is a system made up of millions of stars, gases, dust, and other types of matter. There are billions of galaxies of various shapes and sizes in the universe. The size of galaxies consists of several million to several trillion stars. These stars revolve around the centre of their galaxies.





I can see many stars in that galaxy. Its centre is also very bright.

We can see the galaxy clearly because the size of the galaxy is very big. It is the nearest to our galaxy. There are many more galaxies in this universe. Some of the little dots in the sky are also galaxies.

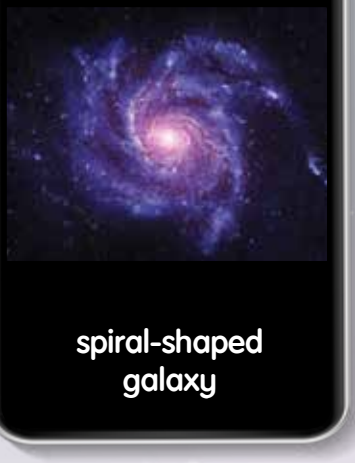
Let's look at this picture. This picture was taken by the Hubble Space Telescope showing thousands of little dots. Each of these little dots is actually a galaxy.

SCIENCE INFO

The Andromeda galaxy is a large spiral galaxy. It is also the nearest to Earth. It can be seen with our naked eyes from the northern hemisphere during a very dark night.

What are the types of galaxy found in this universe?

Did you know that there are several types of galaxies? Let's learn about a few types of galaxies.



spiral-shaped galaxy

elliptical-shaped galaxy

irregular-shaped galaxy

FUN ACTIVITY

Sketches of Galaxies

Individual Activity

Apparatus and materials: computer, Internet access, coloured pencils, white paper

Steps:

1. Find pictures of galaxies and their shapes using the Internet.
2. Sketch the shapes of those galaxies.
3. Exhibit your sketch in the class.

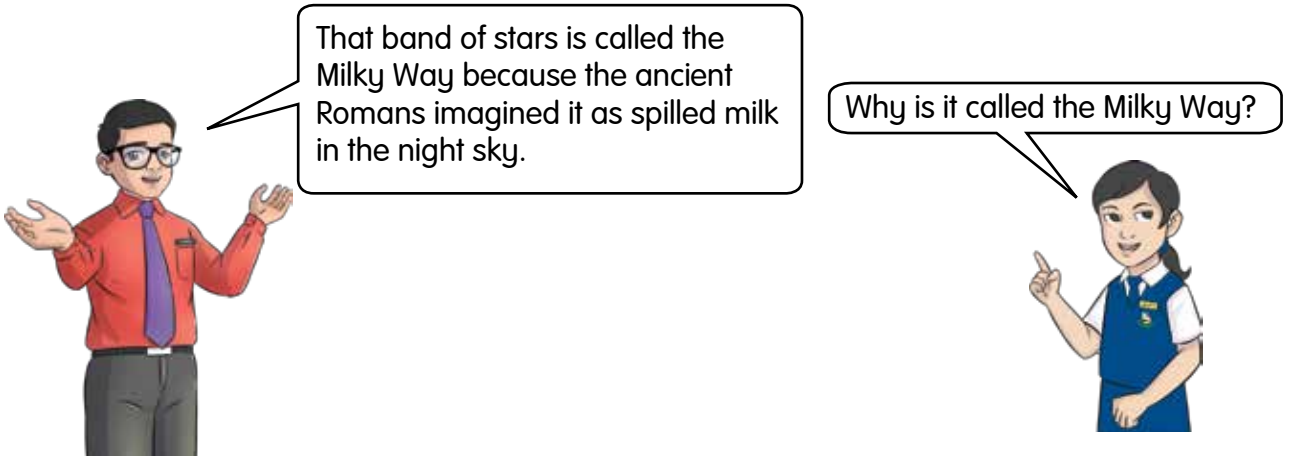
Questions:

1. What are the galaxies that you have sketched?
2. What do you understand about galaxies?

The Milky Way Galaxy

Try looking at the sky from a very dark area at night. You may be able to see a band of stars with their dim light as shown in the picture below.

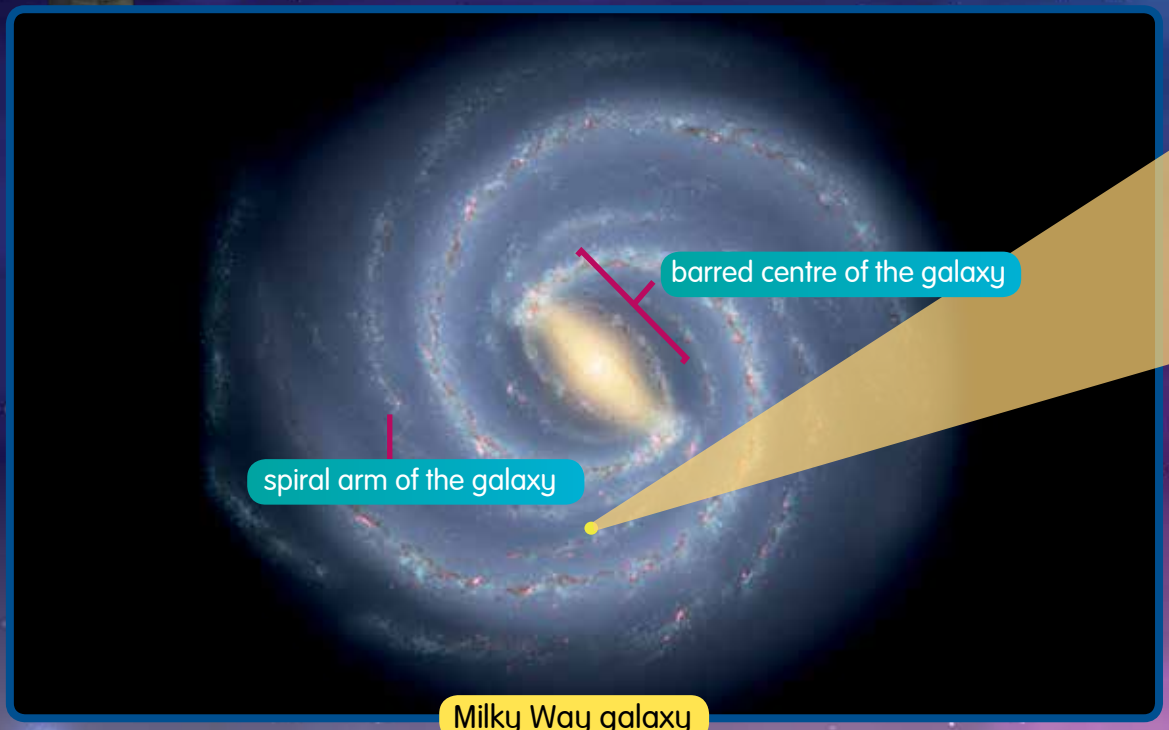
Astronomers identified that band of stars as the Milky Way galaxy.
The Milky Way is a galaxy. We can see the huge Milky Way galaxy in the night sky because Earth is located in this galaxy. The stars we see in the night sky are mostly found in the Milky Way galaxy.



11.1.2.
11.1.3

Earth is part of the Solar System. Do you still remember about the Solar System? Do you know where our Solar System is located in this universe?

Let's look at this picture. The Milky Way galaxy is one of the billions of galaxies in the universe. The centre of the Milky Way is surrounded by billions of stars.



Milky Way galaxy

The Solar System consists of the Sun, Earth, and seven other planets. It is part of the Milky Way galaxy.

The Milky Way is a barred spiral galaxy with two main arms. This galaxy also has a bright and thick centre. Thus, this galaxy resembles a thin disc that bulges at the centre if it is observed from the side view.

AR SAINS SK DLP TAHUN 6

Solar System

Our Solar System is at the edge of one of the spiral arms of the Milky Way galaxy.

Earth

The Sun is one of the stars found in the Milky Way galaxy.

side view of the Milky Way galaxy

I see. No wonder we're only able to see a part of the Milky Way galaxy from Earth. It's because Earth is at the edge of this galaxy.

FUN ACTIVITY

The Milky Way Galaxy

Activity 1

Group Activity

21st Century Learning Skills

Apparatus and materials: computer, Internet access, marker pen, manila card

Steps:

1. Find information on the Milky Way galaxy.
2. Each member takes a turn to write at least one fact about the Milky Way galaxy on a manila card.
3. Present the work of your group.

Questions:

1. Describe the Milky Way galaxy based on the above activity.
2. Are asteroids, meteoroids, and comets also found in the Milky Way galaxy? Why?

Activity 2

Individual Activity

Apparatus and materials: scissors, pencil, string, glue, cardboard, white paper

Be careful when using scissors.

Steps:

1. 
Cut the cardboard and white paper into round-shaped discs.

2. 
Paste the white disc on top of the cardboard disc.

3. 
Draw the Milky Way galaxy on the white disc. Mark the location of the Solar System.

4. 
Make two holes at the centre of the disc.

5. 
Insert a string through the two holes. Tie both ends of the string together.

6. 
Turn the disc to spin the string. Then, pull the string.

Question:

Explain the position of Earth in the Milky Way galaxy.

KPM

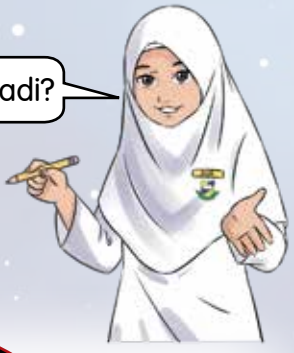
II.1.2, II.1.3, II.1.5

Size of the Solar System in the Milky Way Galaxy

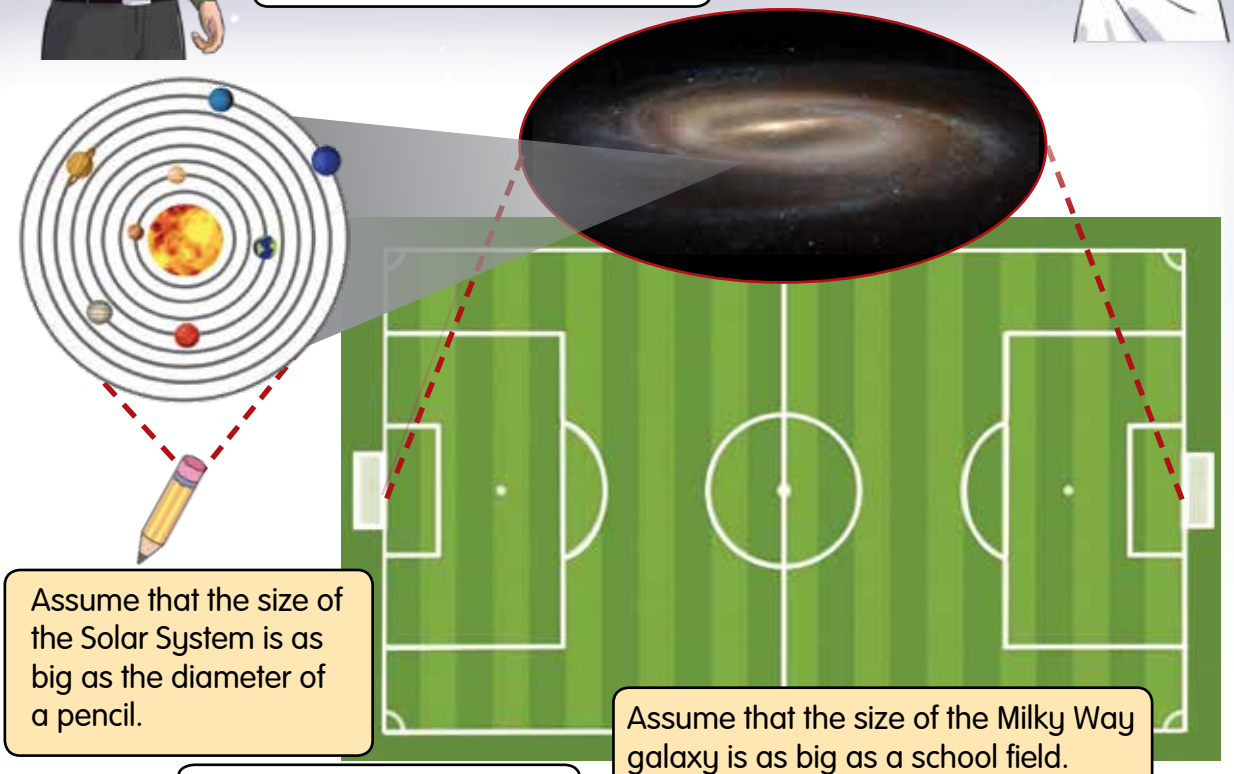
How big is the size of the Solar System in the Milky Way galaxy?

Let's imagine that the size of the Solar System is as big as the diameter of a pencil.

Like this pencil, Mr Hadi?



Yes, Alia. See the difference in the size of the Solar System and the Milky Way galaxy as shown in the picture below.



Assume that the size of the Solar System is as big as the diameter of a pencil.

Assume that the size of the Milky Way galaxy is as big as a school field.

Based on this comparison, the size of the Milky Way galaxy is as big as the whole area of the school field if the size of Solar System is as big as the diameter of a pencil.

Wow, the size of the Milky Way galaxy is so big!

Based on the comparison above, what is your conclusion on the size of the Solar System in the Milky Way galaxy?

11.1.4

The simulation above is not according to the actual scale. It is only used to help the pupils to understand better.

LET'S TEST

Simulation on the Size of the Solar System and the Milky Way Galaxy

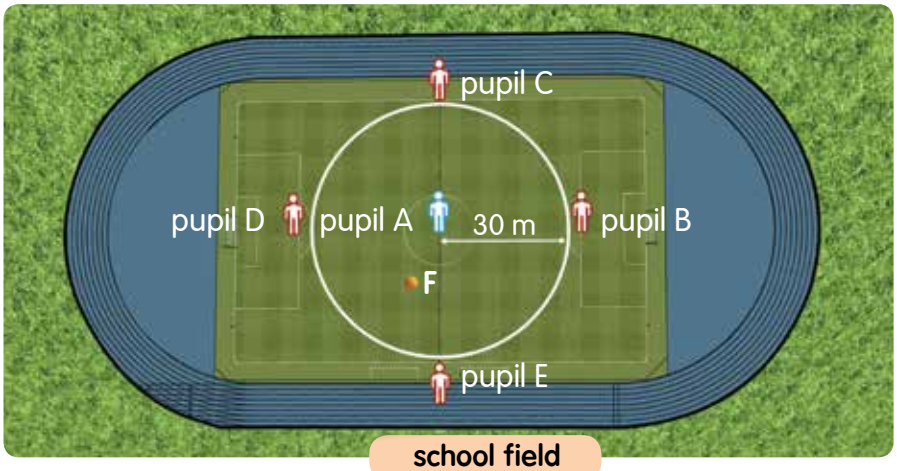
Group Activity

Aim: To run a simulation that represents the size of the Solar System in the Milky Way galaxy

Apparatus and materials: measuring tape, hockey ball, flour

Steps:

1. Conduct this activity at the school field.



school field

2. Place pupil A in the middle of the school field as the centre of the Milky Way galaxy.
3. Measure a distance of 30 m from the position of pupil A to the position of pupil B.
4. By keeping a distance of 30 m, pupil B walks around pupil A while sprinkling flour along the path to form a circle on the field.
5. Place the pupils at positions C, D and E as the marked boundaries of the area that represent the Milky Way galaxy.
6. Place the hockey ball at position F to represent the position of the Solar System in the Milky Way galaxy.
7. Sketch the simulation above and discuss.

Questions:

1. Based on the simulation above, compare the size of the Solar System to the size of the Milky Way galaxy.
2. Predict the size of the Milky Way galaxy, in metre, if the size of the Solar System is three times the size of the hockey ball.

11.1.4, 11.1.5

- The simulation above is not according to the actual scale and shape.
- Teachers may use other suitable location.

FUN SCIENCE

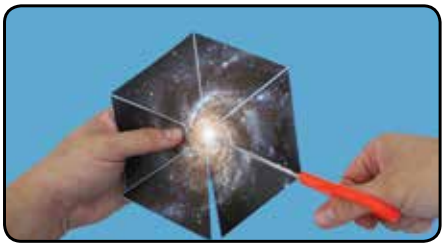
Galaxy Windmill

Make a galaxy windmill using a computer, Internet access, printer, scissors, hole punch, pencil, iron wire.

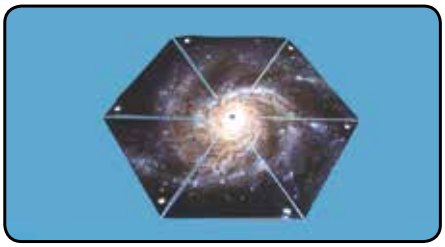
Steps:

Be careful when using scissors and iron wire.

1. Download a picture of a galaxy from the Internet. Print it out.

2. 

Cut the picture into the shape of a hexagon and along the white lines as shown in the picture.

3. 

Make six holes at the sides and make one hole in the middle of the hexagon using a hole punch.

4. 

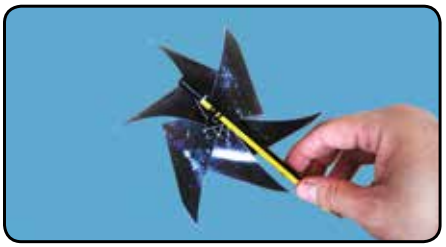
Flip the hexagon and insert the iron wire into the middle hole of the hexagon.

5. 

Fold each flap of the hexagon. Insert the iron wire into the hole at the side of each flap.

6. 

Tie the iron wire at the front part of the windmill.

7. 

Tie the back end of the iron wire to a pencil. Do not tie it too tightly.

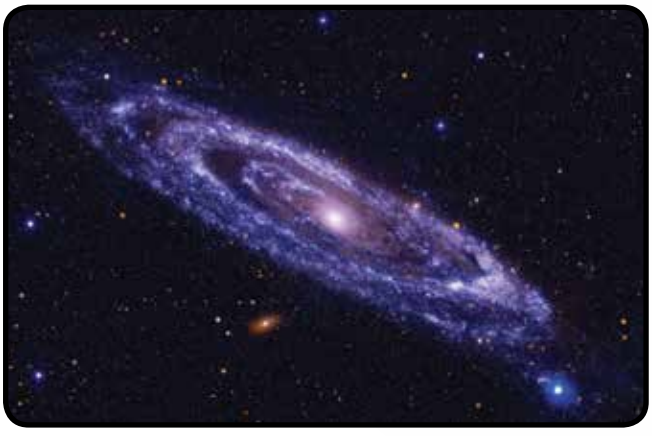
8. Point the galaxy windmill towards the direction of the blowing wind.

MIND REFLECTION

1. A galaxy consists of millions of stars, gases, dust, and other types of matter.
2. The universe contains billions of galaxies of various sizes and shapes.
3. The size of galaxies consists of several million to several trillion stars. These stars revolve around the centre of their galaxies.
4. The Milky Way is a barred spiral galaxy with two main arms.
5. The Milky Way galaxy resembles a thin disc that bulges at the centre if it is observed from the side view.
6. The Solar System that consists of the Sun, Earth, and seven other planets are part of the Milky Way galaxy.
7. The size of the Solar System is very small compared to the Milky Way galaxy.

MIND TEST

Answer all questions in the Science exercise book.



1. The picture above shows a galaxy taken by a space telescope.
   (a) What is the definition of a galaxy?
   (b) What is the type of the galaxy shown in the picture above?

2. Fill in the blanks below with the correct answers.

(a) The Milky Way is a _____ with a _____ shape.

(b) The Solar System consists of the _____ , Earth, and _____ other planets that are located in the _____ galaxy.

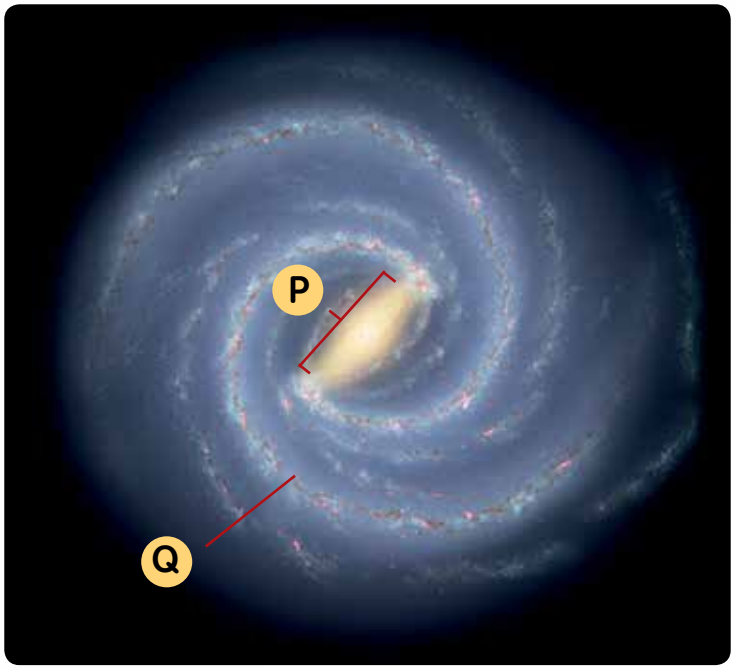
(c) The universe contains billions of galaxies that have various _____ and _____ .

Object X appears like a band of stars stretching across the sky and glowing dimly when it is viewed from Earth. The ancient Romans imagine it as spilled milk in the night sky.

3. Based on the statement above, answer the following questions.

(a) What is object X?

(b) What is the type of object X?

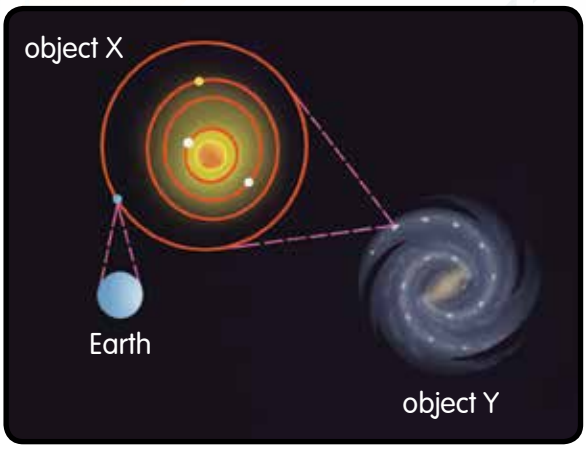


4. State the parts marked as P and Q as shown in the picture above.

P: _____

Q: _____

5. The picture shows object X as part of object Y in the universe
   (a) Name object X and Y.
   (b) What is the name of the star in object X?



6. Tick (✔) the correct statements about the size of the Milky Way galaxy.

   (a) The size of the Milky Way galaxy is the same as the Solar System.
   (b) The size of the Milky Way galaxy is very small compared to the Solar System.
   (c) The size of the Milky Way galaxy is very big compared to the Solar System.
   (d) If the size of the Solar System is imagined to be as big as the diameter of a pencil, then the size of the Milky Way galaxy could cover the size of a school field.

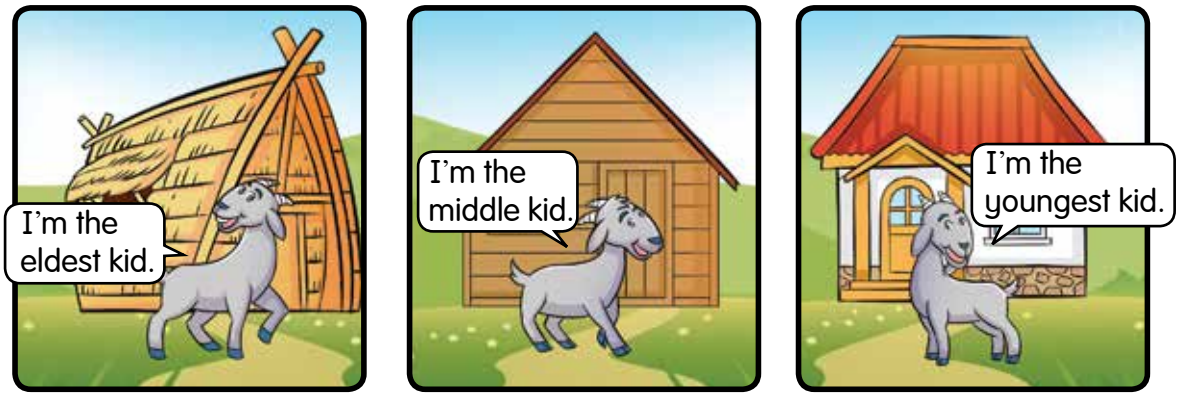
7. The picture above shows the side view of galaxy Q that contains the Sun.
   (a) Name galaxy Q.
   (b) Give two facts about galaxy Q.

8. The Milky Way galaxy resembles a _____ that _____ at the centre if it is observed from the side view.

UNIT 12

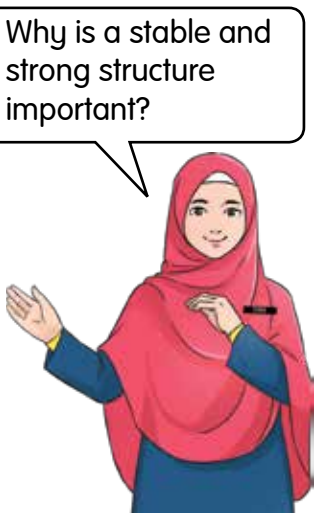
STABILITY AND STRENGTH

Once, there were three kids that lived in a village. The kids built their own houses for shelter.



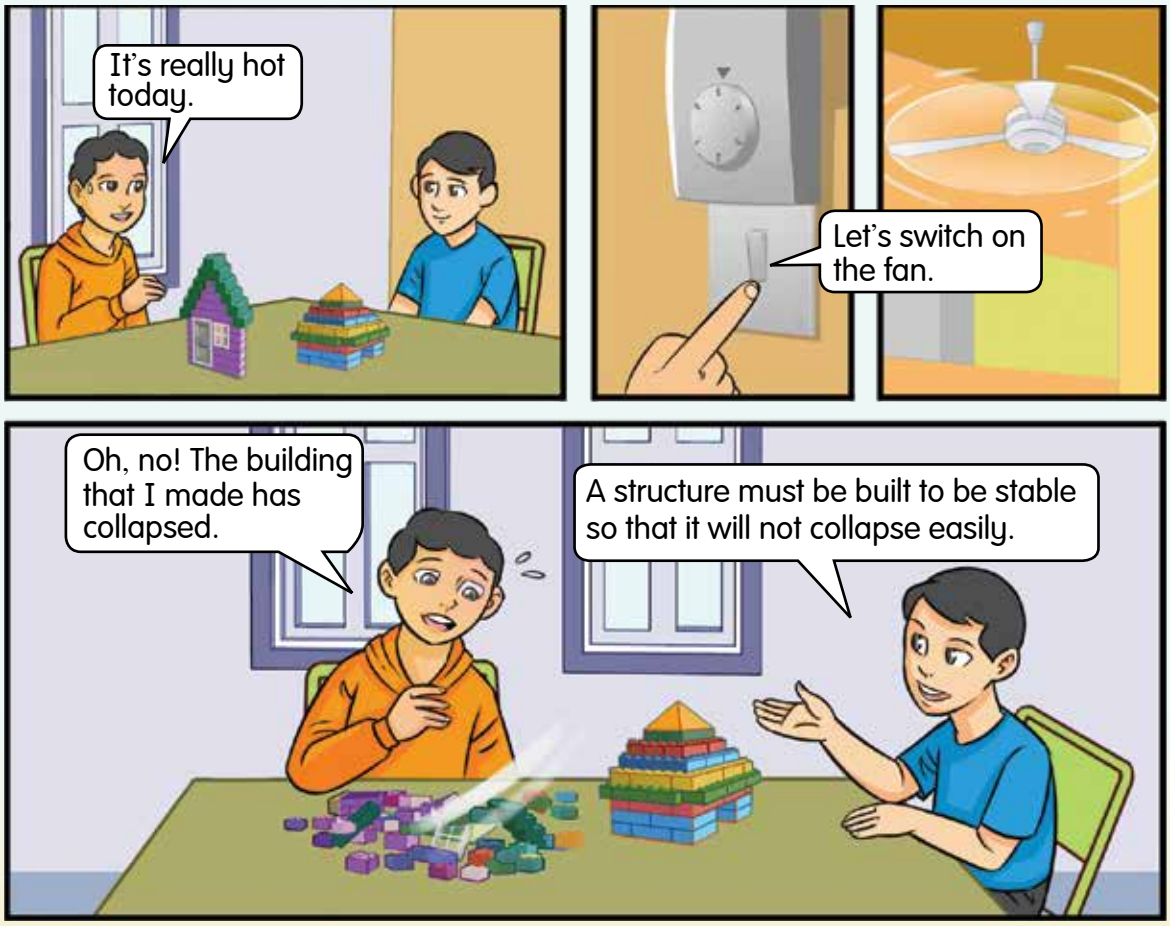
One day, a bad wolf came to destroy their houses.

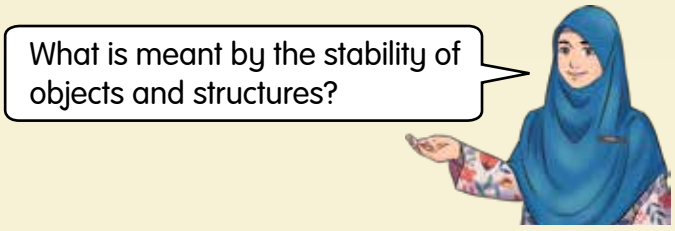
Eventually, the wolf left. Now, all the kids live together in the house of the youngest kid.



Stability of Objects and Structures

Adam and Raju are playing with building blocks.

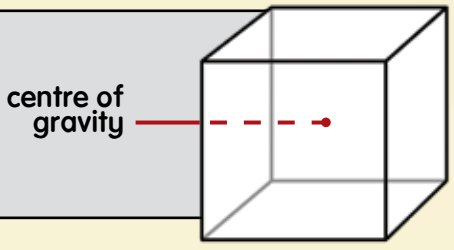




The stability of objects and structures is the ability of the objects and structures to remain stable, or for the objects and structures to return to their original positions.

SCIENCE INFO

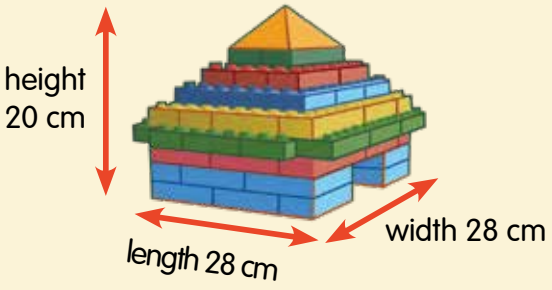
The centre of gravity is the point located at a certain height in the middle of an object. The lower the centre of gravity of an object, the more stable it is.



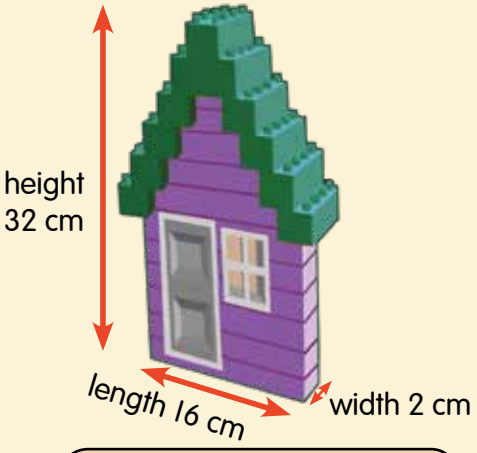
12.1.1, 12.1.2

Factors Affecting the Stability of Objects and Structures

A stable structure does not collapse when a movement or a force is applied to it. Let us observe the structures built by Adam and Raju.

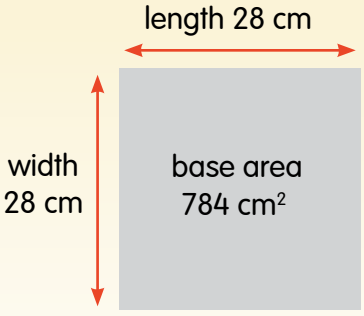


Adam's structure

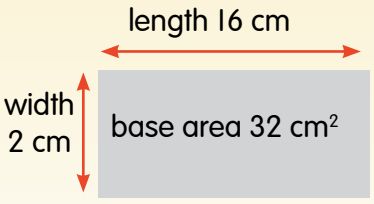


Raju's structure

The structure built by Raju is taller than the structure built by Adam. Height is a factor that affects the stability of objects and structures. As the height of an object and structure increases, the stability of the object and structure decreases.



the base area of Adam's structure



the base area of Raju's structure

Observe the pictures above. The base area of Adam's structure is bigger than the base area of Raju's structure. Base area is also a factor that affects stability of objects and structures. As the base area of an object and structure increases, the stability of the object and structure also increases.

Based on your understanding, what is meant by the stability of objects and structures? Explain the factors that affect the stability of objects and structures.

The factors affecting the stability of objects and structures are height and base area. Plan and carry out the experiments to test these factors.

EXPERIMENT

Height of Structures and Objects

Group Activity

1. **Aim:** _____
2. **Problem Statement:** Does a structure become more stable or less stable if its height increases?
3. **Hypothesis:** _____
4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____
5. **Apparatus and materials:**
   12 paper cups, cardboard, stopwatch

6. **Steps:**
   (a) Put a cardboard on a table.
   (b) Arrange the paper cups on a cardboard.
   (c) Move the cardboard front and back repeatedly.
   (d) Record the time taken when any of the paper cups begin to fall.
   (e) Record your observation in a table.
   (f) Repeat steps 6(a) to 6(e) by increasing the structural height of the paper cups.

7. **Data:** _____

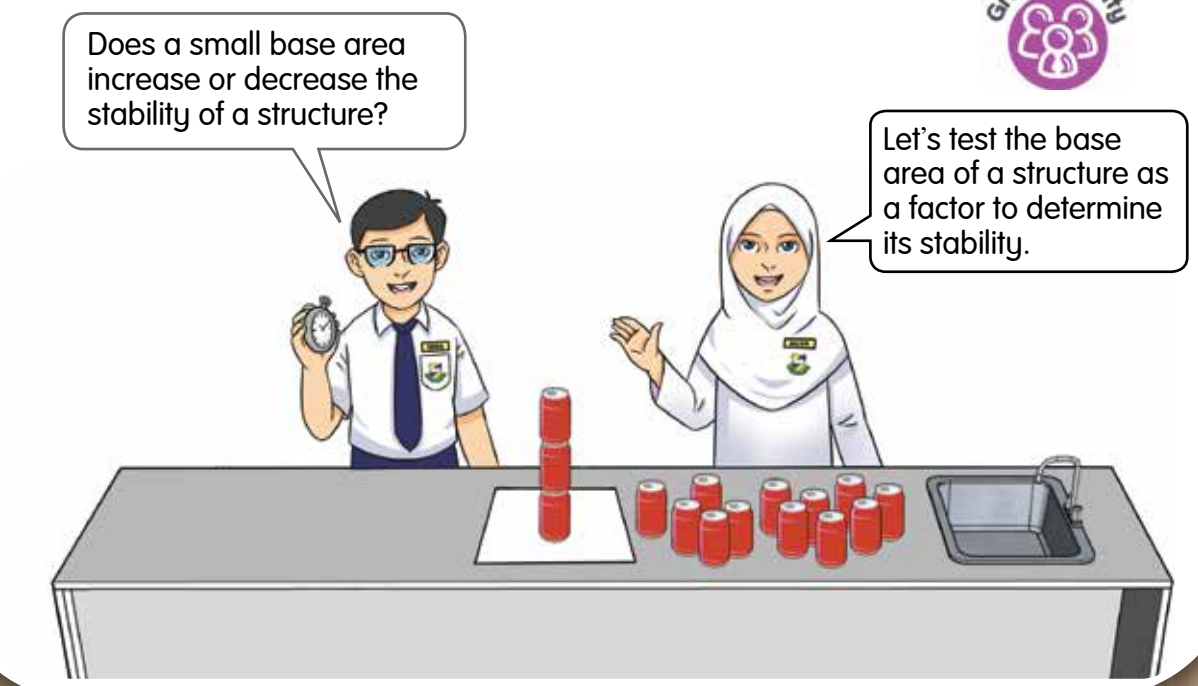
8. **Interpreting Data:**
   (a) Which model structure is more stable? Why?
   (b) What is the relationship between the height of the model structure and its stability?

9. **Conclusion:**
_____

EXPERIMENT

Base Area of Structures and Objects

Group Activity



12.1.3, 12.1.7

1. **Aim:** _____

2. **Problem Statement:** Does the stability of a structure increase or decrease if its base area decreases?

3. **Hypothesis:** _____

4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____

5. **Apparatus and materials:**
   15 cans of the same size, cardboard, stopwatch, adhesive tape

6. **Steps:**
   _____

7. **Data:** _____

8. **Interpreting Data:**
   (a) Which model structure is more stable? Why?
   (b) What is the relationship between the base area of the model structure and its stability?

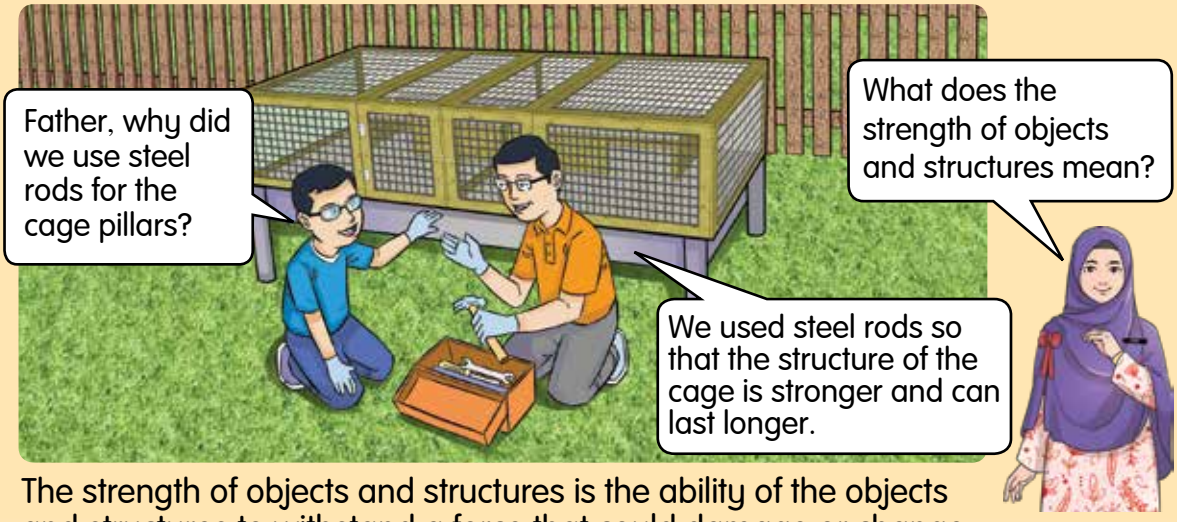
9. **Conclusion:**
   _____

SCIENCE INFO

Giraffes spread their front legs to make themselves stable while drinking water. This action increases their base area and lowers their height.

Strength of Objects and Structures

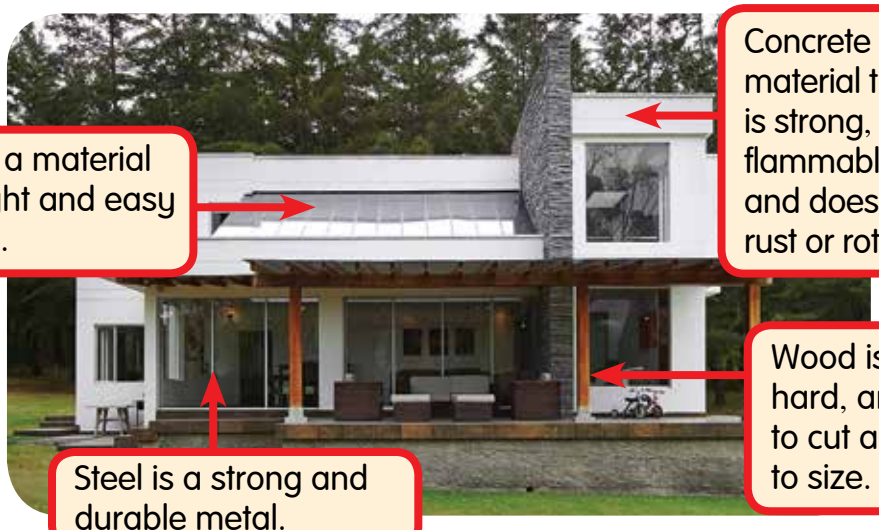
Chua and his father have just finished building a rabbit cage.



The strength of objects and structures is the ability of the objects and structures to withstand a force that could damage or change their structural shapes.

Factors Affecting the Strength of Objects and Structures

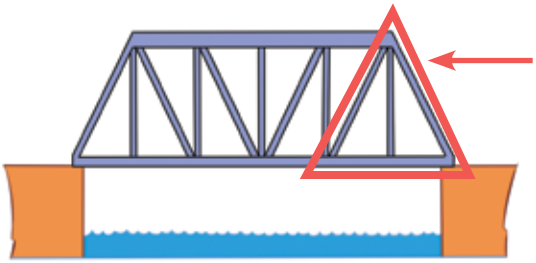
Structures such as buildings are built using various types of materials such as concrete, steel, plastic, and wood to ensure their structural strength. Different materials have different strength.



12.1.1, 12.1.2

Observe the shapes of the objects and structures below. The shapes of objects and structures also affect their strength.

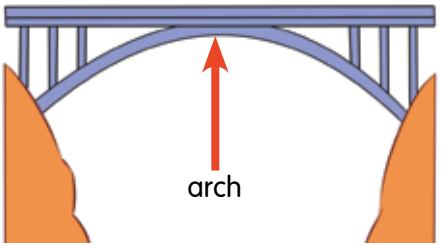
The shape of the truss is a series of poles that forms triangles. They can withstand heavy loads.



The combination of several trusses in building a bridge makes the bridge stronger.

The combination of several trusses in building the roof of a house makes the roof stronger.

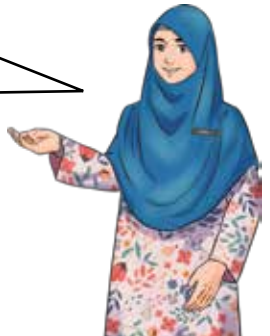
The arch is an example of curved structure that is used to support loads.



The arch used on a bridge makes the bridge stronger and able to support loads.

The hemispherical shape of the dome makes it strong and does not require pillars for support. This structure is often used in building the roof of a stadium.

Based on your understanding, what is meant by the strength of objects and structures? Explain the factors that affect the strength of objects and structures.

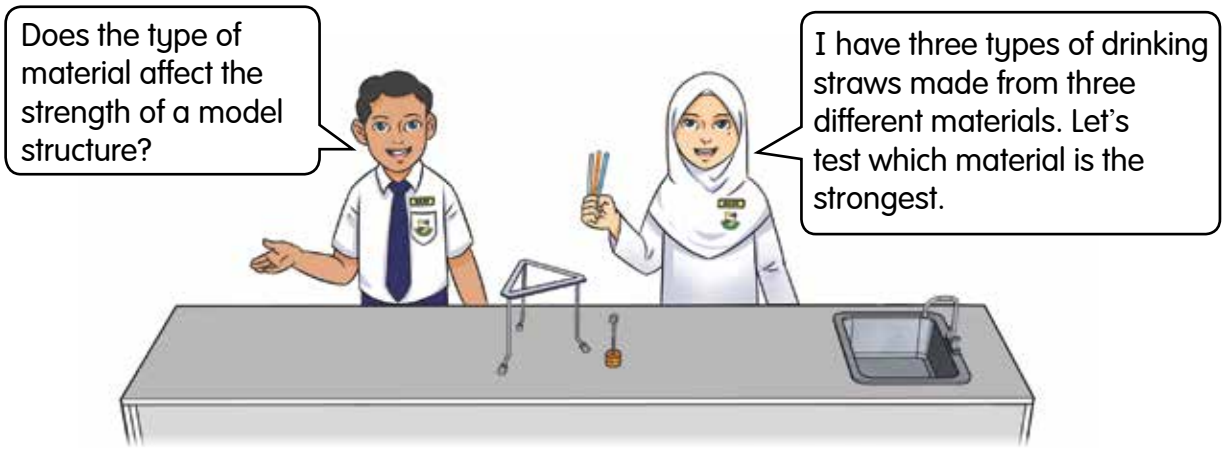


Factors affecting the strength of objects and structures are the type of material and the shape of the structure. Plan and carry out the experiments to test these factors.

EXPERIMENT

Types of Building Materials

Group Activity



1. **Aim:** _____

2. **Problem statement:** Does the type of material affect the strength of an object?

3. **Hypothesis:** _____

4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____

5. **Apparatus and materials:** tripod stand, paper straw, plastic straw, steel straw, 10 units of 10 g weight

6. **Steps:**
   _____

12.1.4, 12.1.7

7. **Data:** _____

8. **Interpreting Data:**
   (a) What can you observe? Give your reasons.
   (b) What is the relationship between the type of material and the strength of the object?

9. **Conclusion:**
   _____

Shapes of the Built Structure

Be careful when using scissors.

1. **Aim:** _____

2. **Problem statement:** Does shape affect the strength of objects and structures?

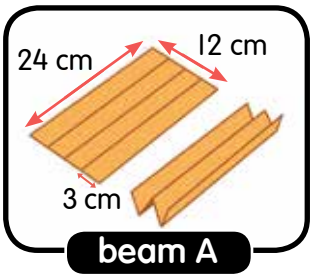
3. **Hypothesis:** _____

4. **Variables:**
   (a) manipulated: _____
   (b) responding: _____
   (c) constant: _____

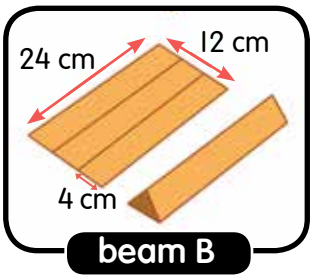
5. **Apparatus and materials:** ruler, scissors, two desks, weight sets, manila card, adhesive tape, thread

6. **Steps:**

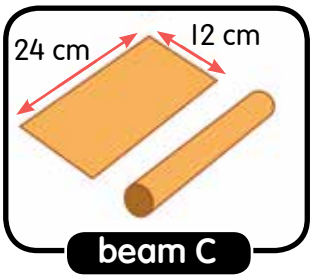
(a) Building beams for the structures.



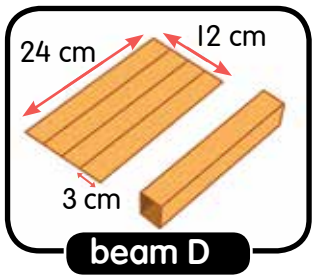
Structure of beam A:
(i) Cut a manila card with the measurement of 24 cm x 12 cm.
(ii) Draw four lines of 3 cm each on the manila card.
(iii) Fold the manila card as in the picture on the left.
(iv) Paste the folded part of the manila card using adhesive tape.



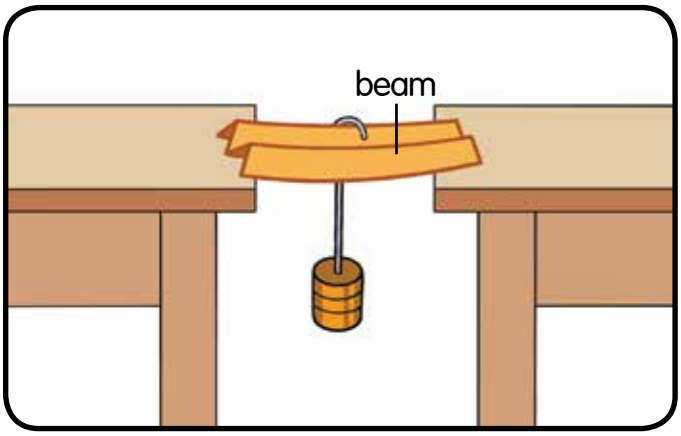
Structure of beam B:
(i) Cut a manila card with the measurement of 24 cm x 12 cm.
(ii) Draw three lines of 4 cm each on the manila card.
(iii) Fold the manila card to form a triangular beam.
(iv) Paste both ends of the manila card using adhesive tape.



Structure of beam C:
(i) Cut a manila card with the measurement of 24 cm x 12 cm.
(ii) Roll the manila card to form a cylindrical beam.
(iii) Paste both ends of the manila card using adhesive tape.



Structure of beam D:
(i) Cut a manila card with the measurement of 24 cm x 12 cm.
(ii) Draw four lines of 3 cm each on the manila card.
(iii) Fold the manila card to form a cuboid beam.
(iv) Paste both ends of the manila card using adhesive tape.



(b) Put beam A horizontally between two desks.

(c) Hang the hook to beam A.

(d) Place the weight onto the hook. Add more weights until a change occurs to the beam.

(e) Record your observations in a table.

(f) Repeat steps 6(b) to 6(e) using beams B, C and D.

7. **Data:** _____

8. **Interpreting Data:**

(a) What can you observe? Give your reasons.

(b) What is the relationship between the shape of a structure and its strength?

9. **Conclusion:**

_____

SCIENCE INFO

Lighthouses are built on high areas or in the middle of the sea to help sailors to sail safely. They also help ships to dock at night. The cylindrical structure of a lighthouse enables it to reduce wind resistance. Cylindrical shape is a structural shape that is strong, durable, and does not damage easily.

LET'S TEST

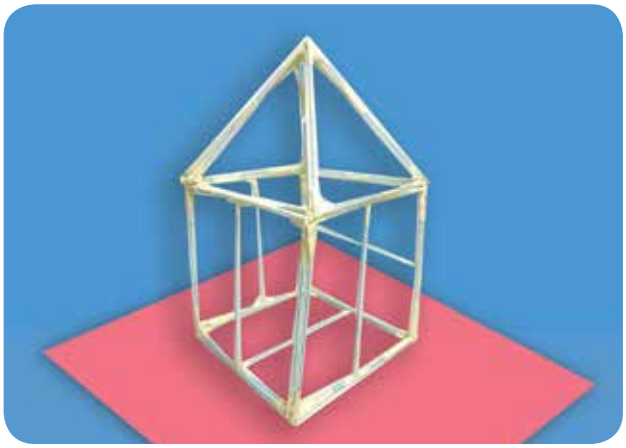
Stable and Strong

Aim: To define operationally the strength and the stability of structures

Group Activity

21st Century Learning Skills

Apparatus and materials: straws, adhesive tape, A3-sized cardboard



example of built structure

Steps:

1. Discuss the structure to be built by taking into consideration the factors for stability and strength.
2. Put an A3-sized cardboard on a table.
3. Build a structure using straws and adhesive tape on the A3-sized cardboard.
4. Discuss in your group the best method to test the stability and strength of the built structure.
5. Compare your group's structure with the structures built by the other groups.
6. Discuss the result of your observation in the class.

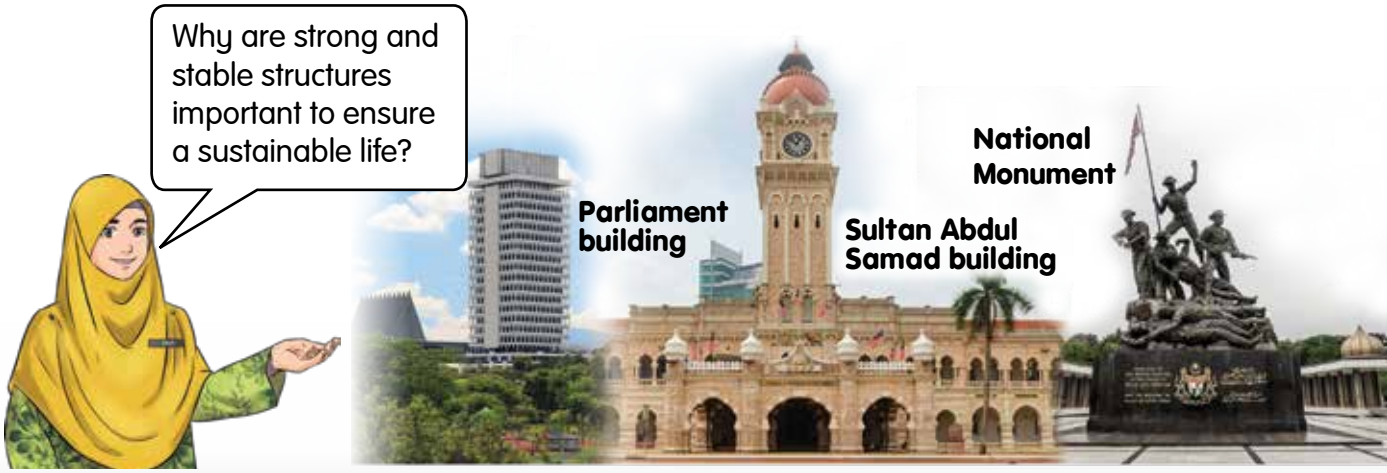
Questions:

1. Which structure is the strongest and the most stable?
2. What is the operational definition of the stability of objects and structures?
3. What is the operational definition of the strength of objects and structures?

12.1.1, 12.1.2, 12.1.6

The Importance of Strong and Stable Structures

Strong and stable structures are durable and sturdy.

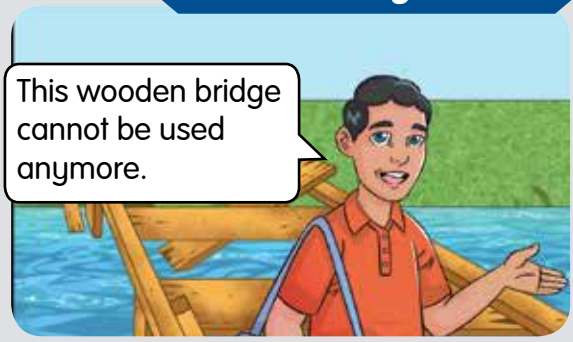


Let us observe the situations below.

Situation 1

25 February 2010

25 February 2021



Situation 2

25 February 2010

25 February 2021

Strong and stable structures are not easily damaged, can save maintenance cost, and are safe to be used. These structures can be used for a long time.

Creating a Model Structure: Bottle Chair

I have collected many plastic bottles for recycling.

I suggest that all the plastic bottles to be reused by making a bottle chair that is strong and stable. Let's create the bottle chair together.

Apparatus and materials: scissors, 18 plastic bottles of the same size with their caps, wide adhesive tape, used towels, ribbons, cloth

Steps:

Be careful when using scissors.

1. Sketch the bottle chair to be built.

2. 

Cut the upper part of a bottle.

3. 

Insert the cut bottle into the upper part of an uncut bottle.

4. 

Attach the combined bottle parts using wide adhesive tape. Repeat steps 2 to 4 for the remaining bottles.

5. 

Group all the combined bottle parts. Attach them using wide adhesive tape.

6. 

Cover the top part of the combined bottles using used towels.

7. Decorate the bottle chair using cloths and ribbons.

bottle chair

Based on your understanding, create a model structure that is strong and stable using recycled materials. Explain the reasons for selecting those materials.

12.1.6, 12.1.7

FUN SCIENCE

Box Basket

Using your creativity, make a basket using a pair of scissors, hot glue gun, used box, used cloth, and coir rope.

Be careful when using scissors and hot glue guns.

Steps:

1. 

Make two circles to form the base of a basket using a used box.

2. 

Paste both circles using a hot glue gun.

3. 

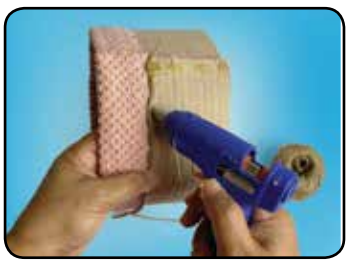
Cut a piece of cloth following the shape of the base. Paste the cloth to one part of the base that will be used as an inner base of the basket.

4. 

Cut the box to form the wall of the basket. Paste the cloth around the basket's wall.

5. 

Paste the base and the wall together until the shape of the basket is formed.

6. 

Decorate the basket by wrapping and pasting a coir rope around the outer part of the basket.

box basket

MIND REFLECTION

Stability of Objects and Structures

1. The stability of objects and structures is the ability of the objects and structures to remain stable, or for the objects and structures to return to their original positions.
2. Factors affecting the stability of objects and structures are as follows:
   - height
   - base area
3. As the height of an object and structure decreases, the stability of the object and structure increases.
4. As the base area of an object and structure increases, the stability of the object and structure also increases.

Strength of Objects and Structures

1. The strength of objects and structures is the ability of the objects and structures to withstand a force that could damage or change their structural shapes.
2. Factors affecting the strength of objects and structures are as follows:
   - type of material
   - shape of a structure
3. Different building materials have different strength. Some of the building materials are as follows:
   - Concrete is a material that is strong, not flammable, and does not rust or rot.
   - Steel is a strong and durable metal.
   - Plastic is a material that is light and easy to shape.
   - Wood is strong, hard, and easy to cut according to size.
4. Structures with the shape of trusses, arches, and domes are examples of strong structures.
5. The importance of strong and stable structures to ensure a sustainable life are as follows:
   - not easily damaged
   - save maintenance cost
   - the structure is safe to be used
   - the structure can be used for a long time

MIND TEST

Answer all questions in the Science exercise book.

1. Observe flowerpots A and B below. Which flowerpot is more stable? Explain your answer.

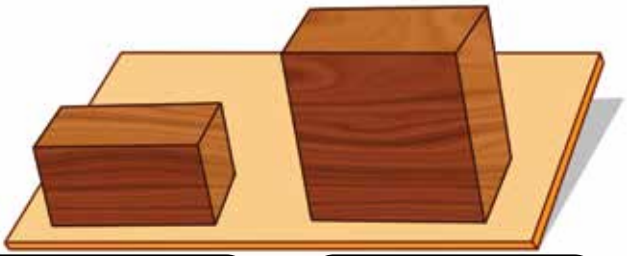
flowerpot A

flowerpot B

2. State the meaning of the:
   (a) stability of objects and structures.
   (b) strength of objects and structures.

3. State the factors affecting the stability and strength of objects and structures.

4. A group of pupils carried out an activity to test the stability of wooden blocks A and B. The blocks were placed on a thin wooden board that was tilted slowly as shown in the picture.



wooden block A

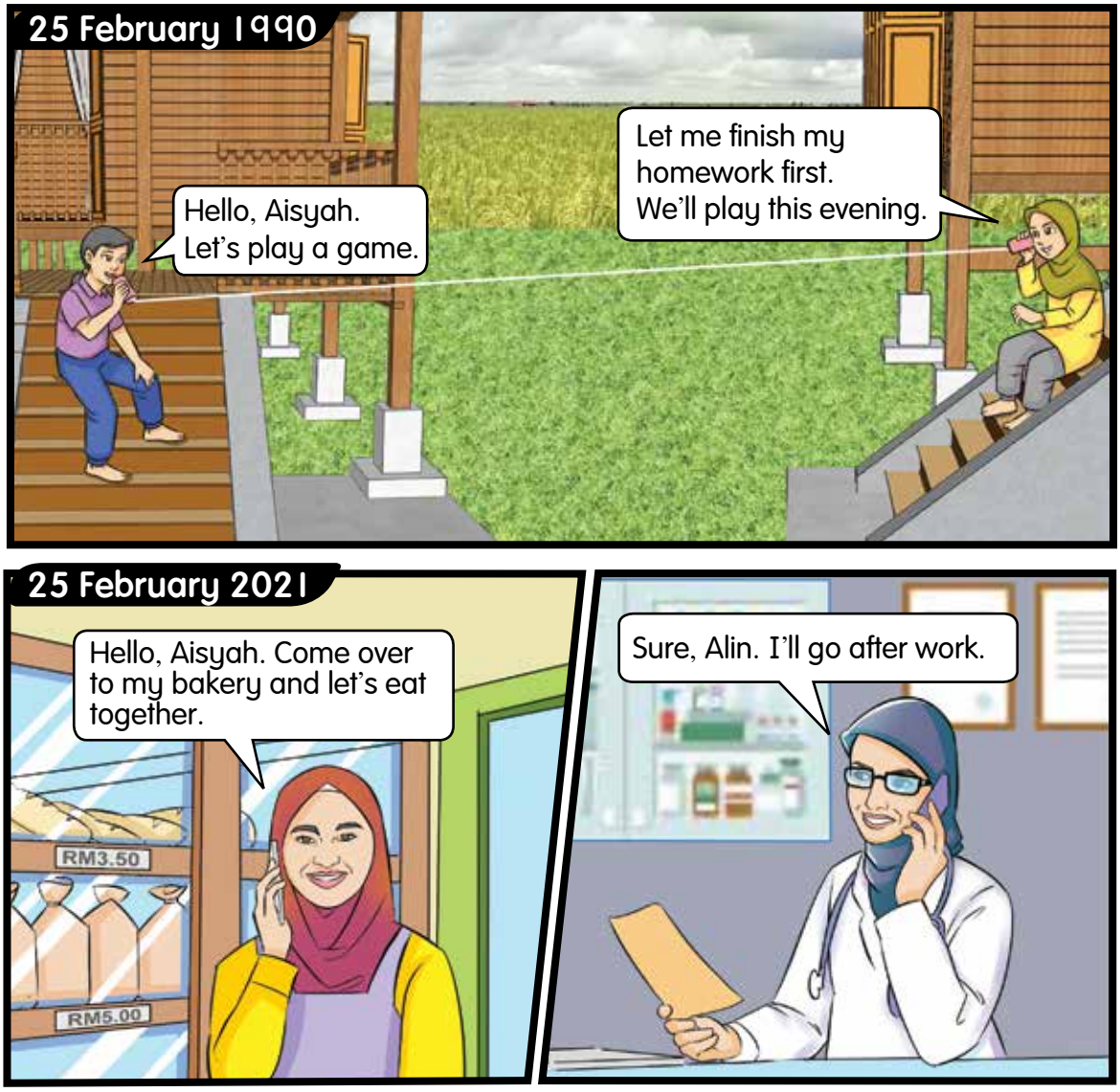
wooden block B

   (a) Which of the wooden block, A or B, will fall first?
   (b) Give an inference for your observation in 4(a).
   (c) Suggest one way to make the wooden block stable.
   (d) What conclusion can you make for this activity?

5. Summarise the importance of strong and stable structures to ensure a sustainable life.

UNIT 13 TECHNOLOGY

This is a story of two best friends who live next to each other.



Technology grows rapidly over time. What is the role of technology in our daily lives?

Technology and Its Importance

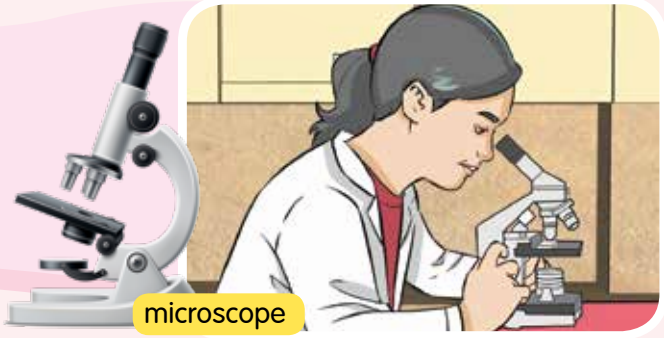
Humans are able to do various daily activities using our senses and parts of the body. However, there are limitations to our senses and parts of the body. Thus, we need to use technology.

What is the meaning of technology?

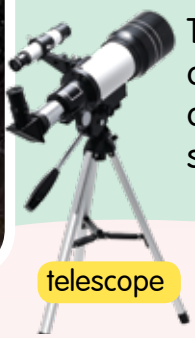
Technology is one of the applications of scientific knowledge to overcome human limitations.

Various tools have been invented to help overcome human limitations.

Microscopes help humans to observe microorganisms and tiny objects.



microscope



telescope

Telescopes enable humans to observe the Moon, other planets, and objects that are very far in space.

loudspeaker

Microphones and loudspeakers amplify our voice to be heard clearly.

microphone

The human ears are not able to hear sounds with very low frequency. Stethoscopes enable humans to listen to heartbeats clearly.

stethoscope

telephone

mobile phone

Humans are only able to speak and listen to the voices of other people within a limited distance. Telephones enable long distance communication between humans.

aeroplane

car

ship

Humans are only able to move within a short distance. Vehicles enable humans to move farther in a short time.

The invention of technological equipment is vital to help overcome human limitations in our daily lives.

Based on your understanding, state the meaning of technology and its importance in our daily lives.

Development of Technology

Nowadays, we can enjoy various benefits from the development of technology.

How does development of technology in various fields help us in our daily lives?

The Development of Technology in Agriculture and Farming

The development of technology in agriculture is very important in providing a continuous food supply to humans.

The Invention of Agricultural Equipment

The use of drones to spray fertilisers and herbicides at agricultural sites.

The use of automatic chicken feeder at chicken farms.

The invention of modern equipment in agricultural and farming industries help to facilitate management, as well as save time and human resources.

Research

The research in sustainable agriculture technology improves the quality of crops.

The research in farming biotechnology improves the quality of feed for local livestocks.

Research development in agriculture and farming industries has helped to improve the qualities and products of these industries.

The Development of Technology in Medicine

The development of technology in medicine plays an important role to improve the quality of public health.

The Invention of Medical Equipment

The invention of electron microscope enables humans to detect microorganisms that cause diseases. The invention of the ultrasound, X-ray, and MRI machines enables doctors and researchers to detect diseases inside the human body.

electron microscope

ultrasound machine

X-ray machine

MRI machine

The Invention of Medicine

The invention of medicines and vaccines, as well as the discoveries of new medical practices have helped to cure or prevent dangerous diseases.

vaccine

modern medicine

Development of Technology in Transport

The development of technology in air, land, and sea transport improves human movement from one place to another.

Development in Air Transport

aeroplane

Aeroplanes enable humans to save time when going to a far-off destination.

rocket

Rockets enable humans to explore outer space and beyond.

Development in Land Transport

light rail transit system (LRT)

bullet train

The varieties of transport service networks enable passengers to choose any modes of transport. The use of bullet trains can save time and prevent traffic congestion.

Development in Sea Transport

submarine

Submarines can strengthen a country's defence system.

cruise ship

Cruise ships open opportunities for travelling.

Development of Technology in Communication

The field of communication grows rapidly with the invention of broadband and Internet access. Information can be disseminated quickly regardless of borders.

online teaching and learning

online meetings and work

online shopping

Development of Technology in Construction

The development in constructions produces more efficient and durable structures.

The Stormwater Management and Road Tunnel (SMART) can reduce loss and traffic accidents caused by flash floods in the city.

Prefabricated houses are built in a shorter time and with a lower construction cost.

Presently, the construction of a building or structure can be completed quickly using the prefabricated method. It is a process of on-site assembling using various components of the building which are factory-made.

The development of technology in various fields such as agriculture, medicine, transport, construction, and communication enables humans to live comfortably.

Humans need the development of technology in various fields. Why?

Advantages and Disadvantages of Technology

The development of technology also brings advantages and disadvantages to our daily lives.

What are the advantages and disadvantages of technology?

Advantage of technology

The use of drones to spray pesticides on crops can help save time and human resources.

Disadvantage of technology

The battery life of drones is limited and can cause pollution when the batteries are discarded.

Advantage of technology

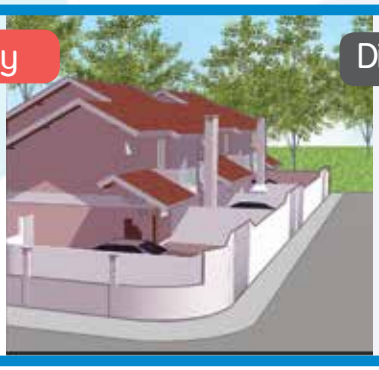
The production of medicines can help treat patients and improve quality of health.

Disadvantage of technology

The abuse of medicines can cause addiction.

Advantage of technology

Forests can be developed to build houses.



Disadvantage of technology

Flora and fauna will be destroyed due to deforestation for the purpose of building infrastructure.

SCIENCE INFO

Drones use lithium batteries which contribute to the increase of e-waste.

Advantage of technology

Information can be disseminated quickly and without limits. This can save time.

Disadvantage of technology

The intrusion of personal data can easily happen. The data can be exploited by irresponsible parties.

Advantage of technology

The increase in the number of vehicles facilitate movement from one place to another.

Disadvantage of technology

The emission of harmful gases contributes to air pollution.

Give other examples of the advantages and disadvantages of technology in our daily lives.

FUN ACTIVITY Effects of Technology

Apparatus and materials: computer, Internet access

Group Activity

21st Century Learning Skills

Steps:

1. Using the Internet, find information on the advantages and disadvantages of technology in various fields.
2. Discuss the information in groups.
3. Build a tree map using Microsoft PowerPoint from the information collected.
4. Present and discuss the tree map of your group in the class.

Questions:

1. State the advantages and disadvantages of technology in our daily lives.
2. Why do we need to invent new technologies?

13.1.3, 13.1.4

FUN SCIENCE

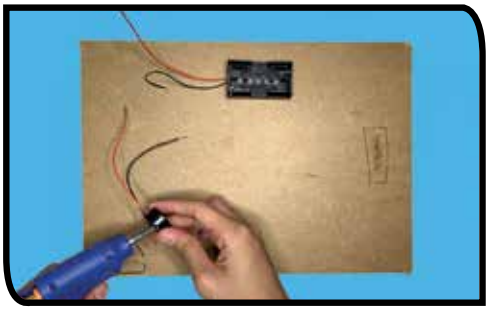
Simple Telegraph Machine

Make a simple telegraph machine using a Morse code chart, two AA-sized dry cells, dry cell holder, buzzer, connecting wires, switch, A4-sized cardboard, and hot glue gun.

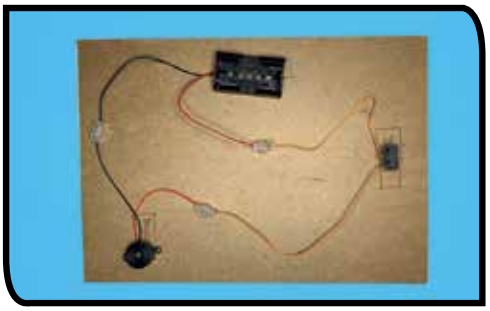
Steps:

1. 

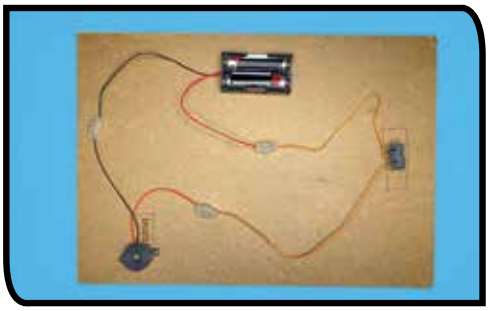
Sketch the position of each component for the telegraph machine on a cardboard.

2. 

Paste the components such as the dry cell holder, buzzer, and switch on the sketches using a hot glue gun.

3. 

Use connecting wires to connect each component in the telegraph machine.

4. 

Put dry cells into the dry cell holder.

5. 

Turn on and switch off the switch to produce sound from the buzzer. Long buzzing sounds refer to the lines in the Morse code chart. Whereas, short buzzing sounds refer to the dots (.) in the Morse code chart.

simple telegraph machine

MIND REFLECTION

1. Technology is an application of scientific knowledge to overcome human limitations.
2. Humans invent various equipment to overcome their limitations. Among the inventions are as follows:

Human limitation	Invented equipment
• unable to see tiny objects	• microscope
• unable to see faraway objects	• telescope
• unable to speak with a loud voice	• microphone and loudspeaker
• unable to listen to sounds with low frequency	• stethoscope
• unable to speak over a long distance	• telephone and mobile phone
• unable to move quickly to a far-off destination	• land, water, and air transport

3. The development of technology in various fields such as agriculture, medicine, transport, communication, and construction enables humans to live comfortably.
4. The advantages and disadvantages of technology are as follows:

Advantage of technology	Disdvantage of technology
The use of drones to spray pesticides on crops can help save time and human resources.	The battery life of drones is limited and can cause pollution when the batteries are discarded.
The production of medicines can help treat patients and improve quality of health.	The abuse of medicines can cause addiction.
Forests can be developed to build houses.	Flora and fauna will be destroyed due to deforestation for the purpose of building infrastructure.
Information can be disseminated quickly and without limits. This can save time.	The intrusion of personal data can easily happen. The data can be exploited by irresponsible parties.
The increase in the number of vehicles can facilitate movement from one place to another.	The emission of harmful gases contributes to air pollution.

MIND TEST

Answer all questions in the Science exercise book.

1. What is the meaning of technology?
2. Give examples of equipment that can be used to help overcome human limitations in the situations below.
   (a) Syuhada cannot see microorganisms with her naked eyes.
   (b) Mr Lim is not able to speak with a loud voice in front of the school assembly.
3. The picture below shows the development of technology in agriculture.

   (a) State the benefits of the development of technology in this field.

   (b) What is the relationship between the effects of using technology and the sustainability of human lives?

4. The pictures below show the development of technology.

   (a) State the specific field related to the development of technology as shown in the pictures.

   (b) Why do humans always invent new equipment in the field of technology that you have stated in 4(a)?

   (c) What is the advantage of this development of technology?

SUGGESTED ANSWERS AND REFERENCES

SUGGESTED ANSWERS

UNIT 1 SCIENTIFIC SKILLS

Mind Test (pages 11-12)

1. Manipulated variable: methods of harvesting paddy plants
   Responding variable: land area
   Constant variable: type of plant
2. (a) Observation: Mango B is heavier than mango A.
   Inference: Mango tree B obtained sufficient basic needs such as water, air, sunlight, and nutrients.
   (b) Mango B is bigger in size compared to mango A.
3. The higher the concentration of the liquid, the longer the time taken for the liquid to flow out.
4. (a) the animal's method of reproduction or other suitable characteristics
   (b) eating habit or other suitable characteristics
   (c) accept pupils' classification charts (accept any suitable characteristics)

UNIT 2 HUMANS

Mind Test (page 31-32)

1. (a) Organ: testis
   Function: a place where sperms are produced.
   (b) Organ: penis
   Function: transfers sperm into the female reproductive organ
2. (a) The zygote divides itself to form multiple cells known as the embryo.
   (b) A place where embryo develops to form foetus
   (c) No, ovum is not produced.
3. (a) (i) sperms
   (ii) vagina
   (b) (i) swim
   (ii) ovum
   (iii) fuse
   (c) (i) ovum
   (ii) zygote
   (d) (i) embryo
   (ii) foetus
   (e) (i) foetus
   (ii) nine
   (f) (i) foetus
   (ii) baby
4. (a) central nervous system
   (b) peripheral nervous system
5. (a) Zaimi pulled his hand away when he touched a hot kettle. This requires an immediate unconscious response or reflex action. In this situation, the spinal cord receives the signal and produces a response from the body. The signal pathway is as follows.
   (i) the skin receives the stimulus through the sense of touch
   (ii) the sense of touch sends a signal to the spinal cord through the peripheral nerve
   (iii) the spinal cord sends a signal to the hand
   (iv) the hand is instantly pulled away

   stimulus → sense organ → spinal cord → response

   (b) Siti heard her phone ring. This response is a voluntary action which involves the central nervous system controlled by the brain and peripheral nervous system. The signal pathway is as follows:
   (i) the ears receive the stimulus through the sense of hearing
   (ii) the sense of hearing sends a signal to the brain through the peripheral nerves
   (iii) the brain sends signal to the hand
   (iv) the hand picks up the phone

   stimulus → sense organ → brain → hand → response

UNIT 3 MICROORGANISMS

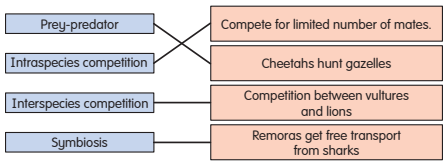
Mind Test (page 50)

1. (a) virus
   (b) algae
   (c) protozoa
   (d) fungi
   (e) bacteria
2. (a) *Paramecium*
   (b) The position of the *Paramecium* changes.
   (c) Because the *Paramecium* moves
3. (a) Dough C is the largest in size.
   (b) Dough C is the largest in size because the most amount of yeast was added to dough C or because the largest amount of gas was released by the yeast in dough C.
   (c) breath
   (d) The size of the dough increases because the dough itself provides nutrients for the yeast to become active and able to breathe.
4. Accept any suitable answers.

UNIT 4 INTERACTION AMONG LIVING THINGS

Mind Test (page 66)

1. (a) relationship
   (b) depend
2. Type of Interaction — Situation



3. (c) crabs - barnacles
4.

Type of Symbiosis		
Mutualism	Parasitism	Commensalism
Benefits both organisms	Benefits one organism but harms the other	Benefits one organism but does not benefit nor harm the other
Example: crocodile and bird	Example: cat and tick	Example: remora and shark

5. The types of interactions among plants are:
   (a) Competition to obtain water, sunlight, space, and nutrients.
   (b) There are two types of symbiosis. They are commensalism and parasitism.
   (i) Commensalism
   Bird's-nest ferns grow on large trees. They depend on the host plants to obtain support and sunlight but do not harm them.
   Orchids grow on the trunk of the host plant for support, sunlight, and nutrients from their surrounding. At the same time, the host plant is not harmed nor does it gain any benefits.

(ii) Parasitism
The Rafflesia does not undergo the photosynthesis process. Instead, it grows on a host plant to obtain water and nutrients which harms the host plant. Indian willow grows on a host plant to obtain water and nutrients from it. This interaction harms the host plant.

UNIT 5 PRESERVATION AND CONSERVATION

Suggested Answer for HOTS (page 71)

Large animals are more likely to be at risk of extinction because they need a large habitat to continue living compared to small animals.

Mind Test (page 86)

1. Preservation means keeping animals and plants in their original and balanced state. Conservation means returning animals and plants to their natural conditions.
2. (a) The number of elephants decreased from 2015 to 2017 and increased from 2017 to 2019.
   (b) (i) The number of elephants decreased because of illegal hunting or any suitable answers.
   (ii) The number of elephants increased because they are undergoing conservation process.
   (c) (i) Gazetting forest X as a forest reserve.
   (ii) Enforcing a stricter law to protect the elephants from facing a threat of extinction.
3. (a) X: Dodo bird Y: Hornbill
   (b) Bird X cannot be conserved because it has become extinct.
   (c) The conditions of bird Y can be conserved by:
   (i) Reforestation to increase the habitat of bird Y.
   (ii) Setting up a conservation centre for bird Y.
   (iii) Gazetting more forests as protected areas.
   (iv) Enforcing laws protecting bird Y.
   (v) Educating the communities on the importance of protecting bird Y from the threat of extinction.
   (accept any three answers)

UNIT 6 FORCE

Suggested Answer for HOTS (page 89)

Earth's gravitational force is a pulling force because this force pulls all objects towards the centre of Earth.

Mind Test (pages 111-112)

1. (a) pulling force and pushing force
   (b) pushing force
   (c) pulling force
2. (a) changes the shape of an object
   (b) changes the direction of movement of an object
   (c) moves a stationary object
3. (a) Box P takes a longer time to be moved because the frictional force produced by box P is greater than box Q.
   (b) The type of surface that are in contact.
   (c) The time taken for box P and Q will increase as the frictional force increases.
4. (a) causes palms to become warm
   (b) erases writings on paper
   (c) tires become worn out
5. (a) using lubricating oil
   (b) using chalk
   (c) using lubricating oil
6. (a) and (c)
7. (a) Climbers use oxygen tanks because oxygen is less at the peak of the mountain.
   (b) The air pressure at the peak of the mountain is low.
   (c) The higher the elevation of the mountain from the sea level, the lower the air pressure.

UNIT 7 SPEED

Suggested Answer for HOTS (page 115)

Since the distance of a car moves is farther, thus it is measured in kilometres. Therefore, the most suitable unit of speed is km/h rather than cm/s.

Suggested Answer for HOTS (page 121)

The lorry remains stationary. The speed of the lorry is 0 km/h.

Mind Test (pages 125-126)

1. cm/s, m/s, and km/h
2. (a) and (d)
3. (a) Vehicle T is the fastest while vehicle U is the slowest
   (b) Speed of vehicle R = 50 km/h; Speed of vehicle S = 40 km/h; Speed of vehicle T = 60 km/h; Speed of vehicle U = 25 km/h
4. (a) 2400 m or 2.4 km (b) 1500 s or 25 minutes
   (c) 8 minutes
5. fast; faster; farther; time
6. (a) To investigate the relationship between the speed and the time taken for an object to move./ To investigate the relationship between the number of books and the time taken for a toy car to move.
   (b) The distance of the plane and the mass of the toy car.
   (c) The higher the number of books, the shorter the time taken for the toy car to move.
   (d) 0.5 m/s
7. 900 km/h
8. 70 km
9. 100 minutes

UNIT 8 FOOD PRESERVATION TECHNOLOGY

Mind Test (page 146)

1. Apples: change in texture and colour, and become mouldy
   Chicken: looks blackish, smells bad, and becomes slimy
   Milk: tastes sour, smells bad, and becomes bubbly and lumpy
   Lettuce: change in texture and colour
2. (a) Drying
   (b) To remove water content from the food and to prevent the growth of microorganisms.
3. (a) Freezing
   (b) Temperature. Microorganisms cannot grow in a very low temperature.

4. Tomatoes: bottling, canning, waxing, boiling, cooling
   Shrimps: drying, freezing, vacuum packing
   Guavas: cooling, vacuum packing, canning, pickling, waxing
5. Freezing, vacuum packing, and smoking.

UNIT 9 WASTE MATERIALS

Suggested Answer for HOTS (page 158)

Accept any suitable answers.

Mind Test (page 164)

1. Plastic: plastic bottles, plastic bags
   Paper: magazines, newspapers, egg trays, boxes
   Glass; aluminium cans, drinking glasses, mirrors
   Metal: aluminium cans, milk cans, food cans
2. (a) Biodegradable waste is materials that can be decomposed by microorganisms.
   (b) Non-biodegradable waste is materials that cannot be decomposed by microorganisms.
3. (a) metal, paper, plastic, rubber, glass
   (b) According to common characteristics determined by the pupils.
   (c) These waste materials may cause environmental pollution.
   (d) Carry out 5R programmes.

UNIT 10 ECLIPSE

Suggested Answer for HOTS (page 171)

During an eclipse of the Moon, the light from the Moon is safe to be observed because the Moon does not emit its own light but reflects light from the Sun to Earth.

Mind Test (pages 177-178)

1. Total eclipse of the Moon; Partial eclipse of the Sun; Total eclipse of the Sun; Partial eclipse of the Moon
2. (a) and (d)
3. (a) Total eclipse of the Sun
   (b) The Moon is between the Sun and Earth in a straight line and the shadow of the Moon's umbra is formed on Earth's surface.
   (c) Special glasses, suitable filters or pinhole camera.
4. Sun; a straight line; new moon
5. (a) Total eclipse of the Moon
   (b) Shadow A is umbra and shadow B is penumbra.
   (c) Sunlight travels in a straight line and cannot pass through opaque objects such as Earth and the Moon.
   (d) Eclipse of the Sun
6. (a) The level of the sea tides rises.
   (b) The surrounding conditions becomes darker and the surrounding temperature decreases.

UNIT 11 GALAXY

Mind Test (pages 190-192)

1. (a) The galaxy consists of millions of stars, gases, dust, and other matter.
   (b) Spiral-shaped galaxy
2. (a) galaxy; barred spiral
   (b) The Sun; seven; The Milky Way
   (c) sizes; shapes
3. (a) The Milky Way galaxy
   (b) Barred spiral
4. P: Barred centre of the galaxy
   Q: Spiral arm of the galaxy
5. (a) X : Solar System; Y : The Milky Way galaxy
   (b) The Sun
6. (c) and (d)
7. (a) The Milky Way galaxy
   (b) This galaxy is a barred spiral-shaped galaxy and the Solar System is located in it.
8. thin disc, bulges

UNIT 12 STABILITY AND STRENGTH

Mind Test (page 210)

1. Flowerpot B, because it is shorter than flowerpot A.
2. (a) The stability of objects and structures is the ability of the objects and structures to remain stable or for the objects to return to their original positions.
   (b) The strength of objects and structures is the ability of the objects and structures to withstand a force that could damage or change their structural shapes.
3. Factors affecting the stability of objects and structures are base area and height. Factors affecting the strength of objects and structures are type of material and shape of a structure.
4. (a) Wooden block B
   (b) Wooden block B is less stable.
   (c) The base area of wooden block B can be increased by changing its orientation.
   (d) As the height of the wooden block increases, its stability decreases.
5. Strong and stable structures are not easily damaged, can be used for a long time, low maintenance cost, and safe to be used.

UNIT 13 TECHNOLOGY

Mind Test (page 222)

1. Technology is an application of scientific knowledge to overcome human limitations.
2. (a) Microscope
   (b) Loudspeaker and microphone
3. (a) The use of technology to spray fertilisers and pesticides makes farming easier and can save time, as well as human resources.
   (b) This technology can help maintain the quality and improve crop production.
4. (a) In the field of medicine
   (b) New medical devices are being invented to enable efficient diagnosis and treatments.
   (c) An improved quality of healthcare and well-being of humans can be achieved.

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