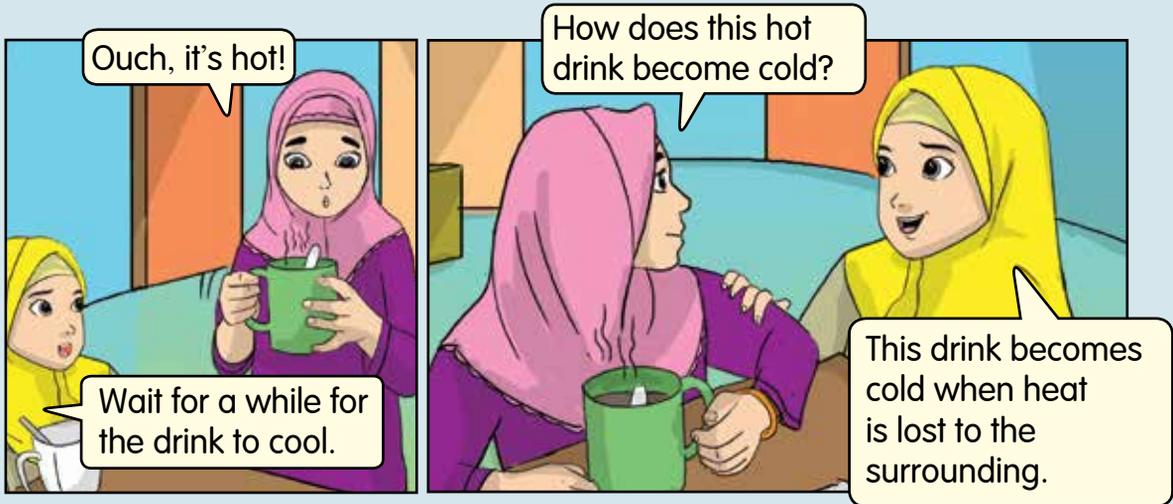


What causes us to feel hot and cold?

HEAT AND TEMPERATURE

Ana and her friend are eating at a restaurant.

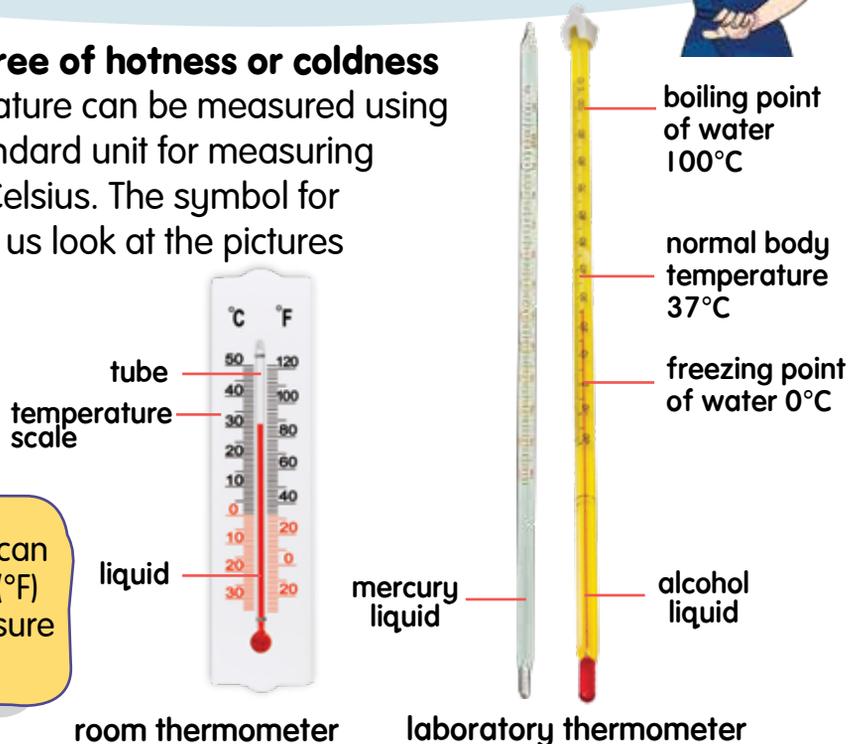


Heat is a **form of energy that is transferred due to the difference in temperature**. A material will become hotter when gaining heat. A material will become colder when losing heat.

How do we measure the temperature of a material?



Temperature is the **degree of hotness or coldness of a material**. Temperature can be measured using a thermometer. The standard unit for measuring temperature is degree Celsius. The symbol for degree Celsius is $^{\circ}\text{C}$. Let us look at the pictures of thermometers.

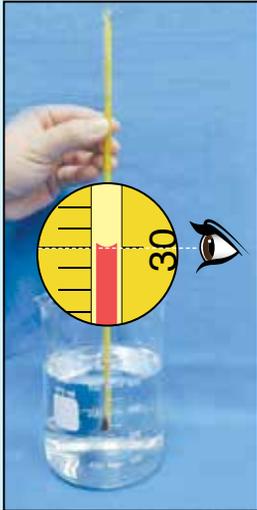


SCIENCE INFO

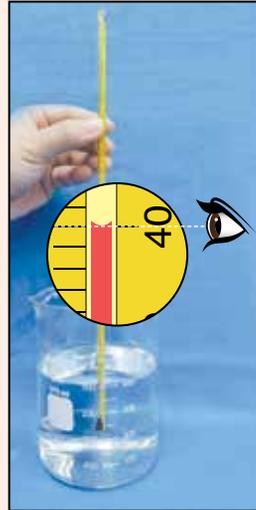
Besides degree Celsius, we can also use degree Fahrenheit ($^{\circ}\text{F}$) on the thermometer to measure temperature.

THERMOMETER

The liquid in the thermometer will expand or contract when exposed to different surrounding temperatures.



When the temperature decreases, the liquid level in the thermometer falls as the liquid contracts.



When the temperature increases, the liquid level in the thermometer rises as the liquid expands.

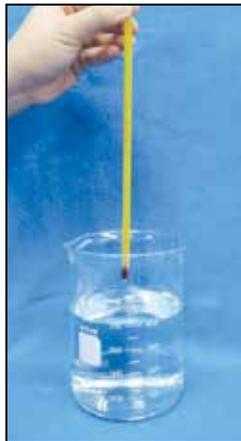


How to use the thermometer correctly?

Let us observe how to use the thermometer with the correct technique.



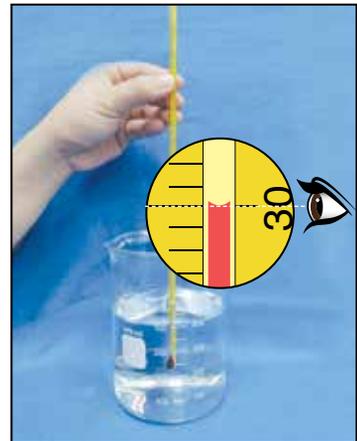
1. Place a beaker filled with water on a flat surface.



2. Hold the upper part of the thermometer upright.



3. Immerse the thermometer into the beaker. Ensure that the bulb of the thermometer does not touch the bottom surface of the beaker.



4. When the liquid level in the thermometer remains constant, adjust the position of the eye to the meniscus of the thermometer to obtain the temperature reading.



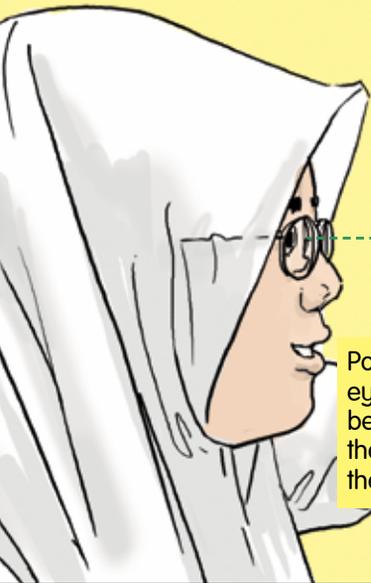
What is the meniscus level in a thermometer?

Meniscus level is the curved level of the liquid in the glass tube of a thermometer.

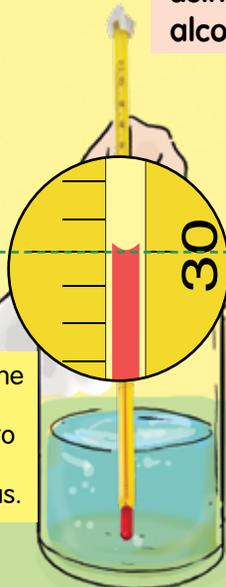


How do we determine the meniscus correctly?

Way to obtain the temperature reading using a laboratory thermometer with alcohol liquid.



Position of the eyes must be levelled to the level of the meniscus.



Position of the eye is too high



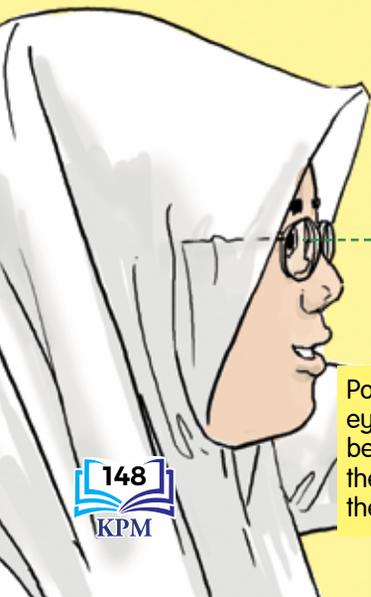
Position of the eye is correct



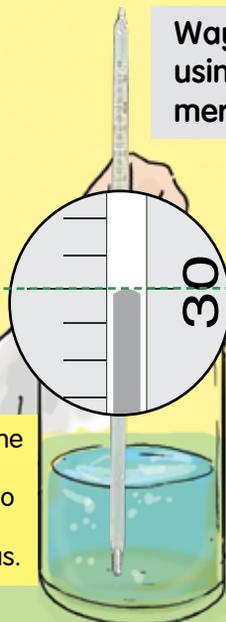
Position of the eye is too low



Way to obtain the temperature reading using a laboratory thermometer with mercury liquid.



Position of the eyes must be levelled to the level of the meniscus.



The correct position of the eye



What do heat and temperature mean?





LET'S TEST

THERMOMETER



AIM

Using the thermometer with the correct technique to measure the temperature of water.

APPARATUS AND MATERIALS

Beaker, thermometer, tap water, hot water, and cold water.

STEPS



- Place the beaker on the table and pour 250 ml of tap water into the beaker.
- Immerse the thermometer into the beaker. Ensure that the bulb of the thermometer does not touch the bottom surface of the beaker.
- Wait until the liquid level in the thermometer becomes constant. Measure the temperature of the tap water at the correct meniscus level.
- Repeat steps 1 to 3 using hot water and cold water.
- Record the observations in the table as shown below.
- Construct a bar chart using the data in the table.

Types of water	tap water	hot water	cold water
Temperature (°C)			

Thermometers cannot be used for stirring.

- Report the results of your group's activity.



- Explain the correct ways to measure the temperature using a thermometer.
- Compare your bar chart with other groups.
- Predict the temperature of the tap water if it is mixed with ice.



Identify the thermometers as shown in the pictures and state their functions. (a)



(b)

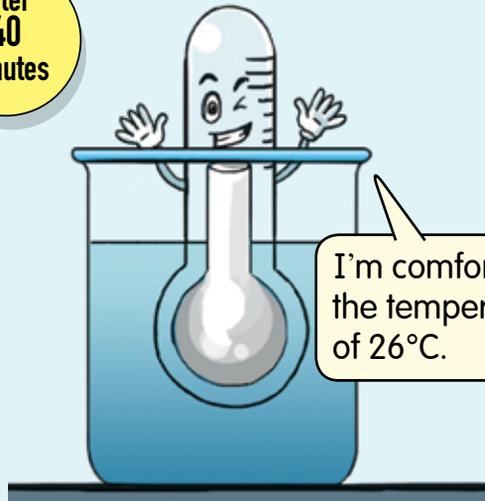
CHANGES IN THE WATER TEMPERATURE

The temperature of our surrounding is constantly changing. The temperature of water also changes according to the temperature of its surrounding. Let us follow the story of Mr Thermometer to understand changes in the temperature of water.

It's cold. The temperature at 0°C has reached the freezing point.

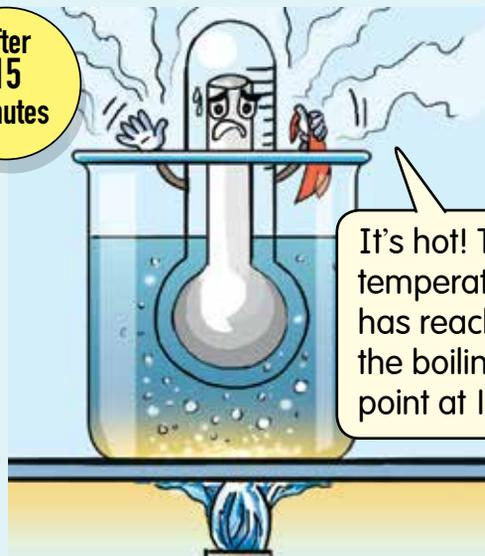


after
40
minutes



I'm comfortable at the temperature of 26°C .

after
15
minutes



It's hot! The temperature has reached the boiling point at 100°C .

Based on the story above, ice changes to water when the temperature increases. When heating duration of water increases, its temperature also increases.

Let us carry out an experiment to determine the relationship between space and time by observing the changes in the temperature of water when heated.



LET'S TEST

FREEZING POINT AND BOILING POINT



AIM

To observe the changes in temperature when ice is heated and to determine the freezing point and boiling point of water.

APPARATUS AND MATERIALS

Retort stand, tripod stand, wire gauze, Bunsen burner, beaker, thermometer, stopwatch, lighter, and ice cubes.

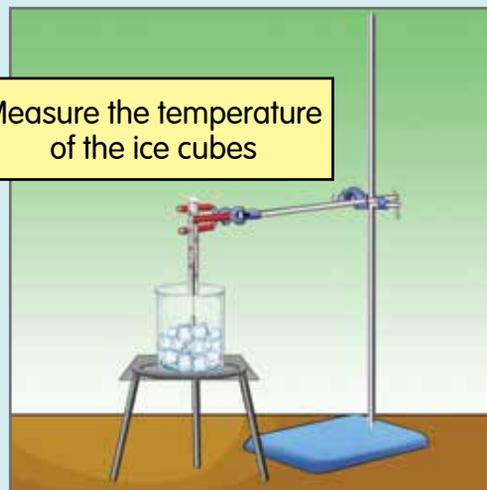
STEPS

1. Prepare the apparatus as shown in the picture.
2. Start the stopwatch and measure the temperature of the ice cubes using the thermometer.
3. Turn on the Bunsen burner.
4. Record the temperature of the water every five minutes until the water boils.
5. Stop heating the water when it boils.
6. Record the observation in the table as shown below.

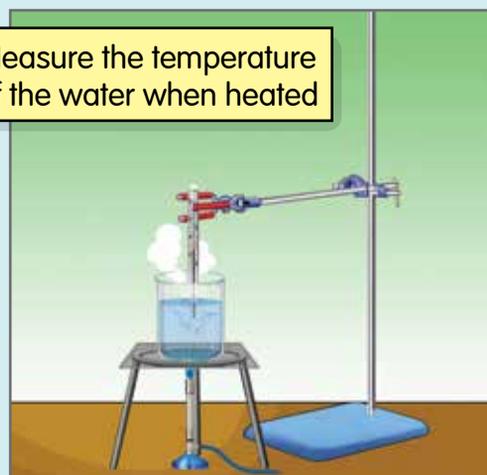
Time (minutes)	0	5
Temperature (°C)		
When water is heated		

7. Construct a bar chart based on the data collected.
8. Discuss your group's observations with other groups.

Measure the temperature of the ice cubes



Measure the temperature of the water when heated



Be careful when handling the hot water and the Bunsen burner.



- (a) State the freezing point and the boiling point of water.
- (b) What is the trend of change of the temperature when the water is heated?
- (c) State the relationship between the heating duration and the water temperature.

WATER AT ROOM TEMPERATURE

How does the temperature of water change when hot water cools to room temperature?



How does hot water become cool?

The heat in the hot tea flows to the metal spoon. The metal spoon becomes hot because it gains heat energy from the hot tea.

The heat in the metal spoon flows to our hand when we touch it. Our hand feels warm because it gains heat from the metal spoon.

The heat from hot water flows to the surrounding from a hot to cold area. This causes the hot water to lose heat and the temperature of the water decreases. The temperature of the water will decrease until it is equal to the temperature of the surrounding or the room temperature.

SCIENCE INFO

People who live in an extremely cold climate make bonfire to warm themselves. The heat energy from the bonfire flows to the surrounding.





LET'S TEST

HEAT FLOWS



AIM

To describe the changes in the temperature of hot water when it is cooled to room temperature.

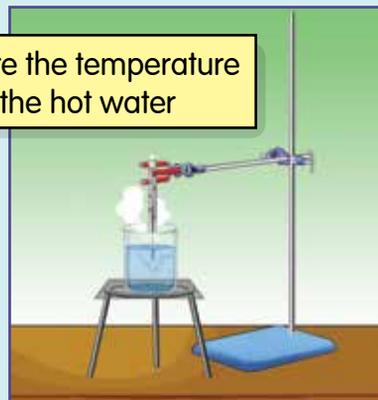
APPARATUS AND MATERIALS

Retort stand, tripod stand, wire gauze, beaker, thermometer, stopwatch, and hot water.

STEPS

1. Prepare the apparatus as shown in the picture.
2. Pour 200 ml of hot water into the beaker.
3. Measure the temperature of the hot water every five minutes until its temperature becomes constant.
4. Record the observations in the table as shown below.

Measure the temperature of the hot water



Time (minutes)	Temperature (°C)
0	
5	

5. Construct a bar chart based on the data collected.
6. Then, upload the bar chart on Google Classroom.
7. Discuss your group's observations with other groups.



Be careful when handling the hot water.



- (a) What can you observe in the trend of change in the temperature?
- (b) At what minute does the temperature of the water become constant?
- (c) Describe the change in the water temperature when the hot water cools to room temperature.

TEACHER'S NOTES

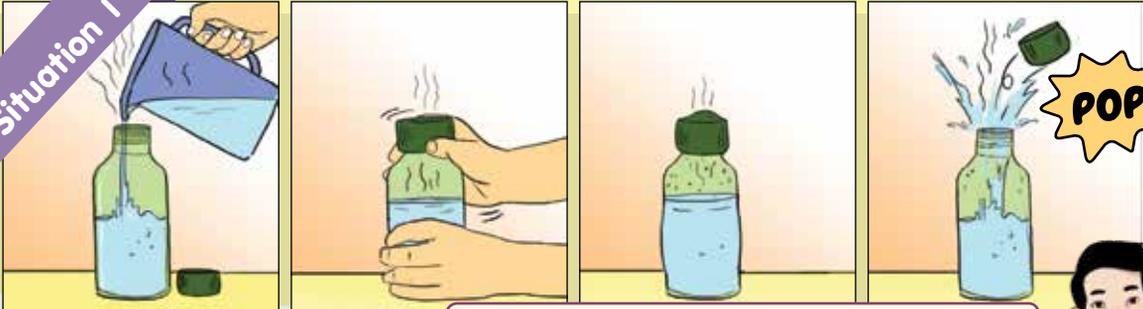
Teachers prepare the hot water.

EXPANSION AND CONTRACTION OF MATERIALS

Materials will expand when gaining heat and contract when losing heat. Let us observe the situations below.

Melia poured hot water into a drinking bottle and then she screwed the cap. A few minutes later, she observed the situation that happened below.

Situation 1



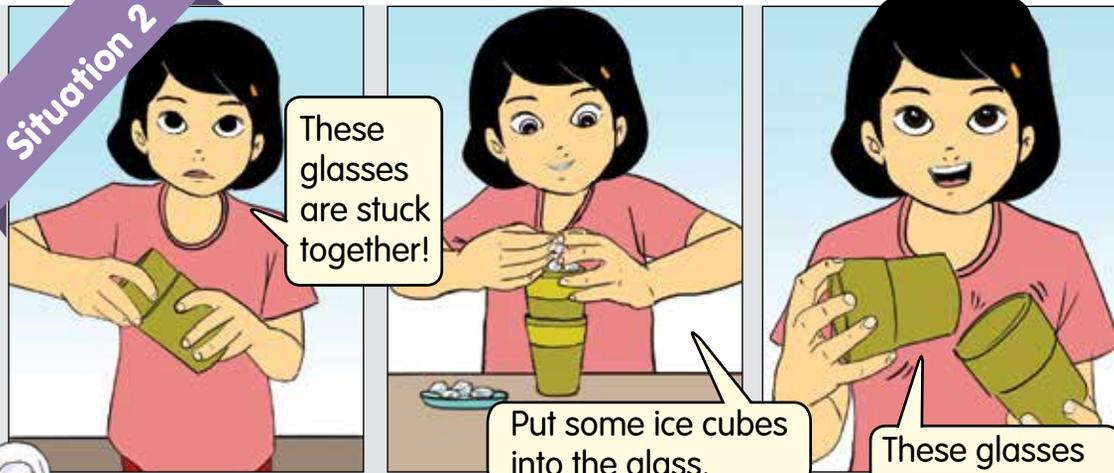
What causes the bottle cap to pop off?

The air in the drinking bottle expanded when it gained heat from the hot water. This causes the bottle cap to pop off.



Melia noticed that two glasses are overlapping and are difficult to be separated. She did the following steps below to solve her problem.

Situation 2



These glasses are stuck together!

Put some ice cubes into the glass.

These glasses are successfully separated.

How can the overlapping glasses be separated?

When the ice cubes are put into the glasses, the glasses will contract because they lose heat. Thus, the overlapping glasses can be separated.



What are the effects when a material gains or loses heat? Let's carry out an experiment to observe the effects of heat on materials.





LET'S TEST

EXPANSION AND CONTRACTION OF MATERIALS



ACTIVITY I

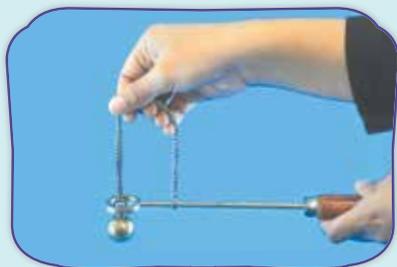
AIM

To observe the effect of heat on a metal ball.

APPARATUS AND MATERIALS

Metal ball and metal ring set, Bunsen burner, lighter, glass container, test tube holder, and water.

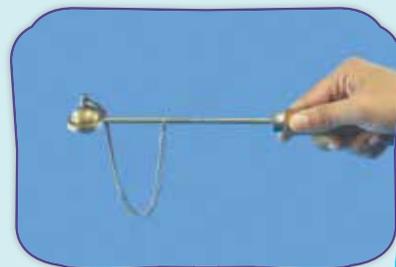
STEPS



1. Insert the metal ball through the ring and observe it.



2. Light the Bunsen burner and heat the metal ball for three minutes.



3. Insert the metal ball through the ring again and observe it.



4. Put the metal ball into the glass container filled with water.



5. Insert the metal ball through the ring again and observe it.

Step	Observation	Inference
Step 1		
Step 3		
Step 5		

6. Record the observations and inferences in the table as shown above.

7. Discuss your group's observation in front of the class.



1. Be careful when handling the Bunsen burner.
2. Use the test tube holder when handling the hot metal ball.



What can you conclude when the metal ball is heated and cooled?

ACTIVITY 2



AIM To observe the effect of heat on liquid.

APPARATUS AND MATERIALS

Conical flask, glass tube, one-holed cork stopper, coloured water, a glass container filled with hot water, and a glass container filled with ice.

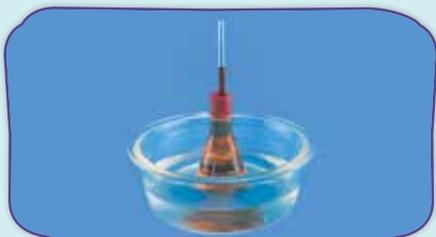
STEPS



1. Pour coloured water into the conical flask until it is full.

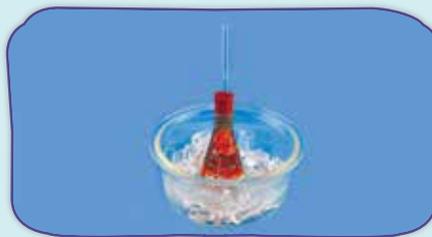


2. Attach the glass tube to the one-holed cork stopper. Then, close the conical flask with the cork stopper.



3. Put the conical flask into the glass container filled with hot water and observe the level of water in the glass tube.
5. Sketch and record your observations in the table as shown below. State your inference for each observation.

Step	Observation	Inference
Step 3	/	/
Step 4	/	/



4. Put the conical flask into the glass container filled with ice and observe the level of water in the glass tube.
6. Discuss your group's observation in front of the class.



Be careful when handling the hot water.



What can you conclude about the level of water in the conical flask when the conical flask is immersed in a glass container filled with:
(a) hot water? (b) ice?

ACTIVITY 3



AIM To observe the effect of heat on air.

APPARATUS AND MATERIALS

Plastic bottle, balloon, a glass container filled with hot water, and a glass container filled with ice.

STEPS



1. Insert the nozzle of the balloon over the mouth of the plastic bottle.



2. Immerse the plastic bottle into the glass container filled with hot water and make an observation.



3. Immerse the plastic bottle into the glass container filled with ice and make an observation.

Step	Observation	Inference
Step 2	/	/
Step 3	/	/

5. Discuss your group's observation in front of the class.

4. Sketch and record your observations in the table as shown above. State your inference for each observation.



What can you conclude about the size of the balloon when the plastic bottle is immersed in the glass container filled with:
(a) hot water? (b) ice?

What is your conclusion based on the results of Activity 1, 2 and 3?



Be careful when handling the hot water.



THE IMPORTANCE OF EXPANSION AND CONTRACTION PRINCIPLE OF MATERIALS

The effect of heat on a material can cause the material to undergo expansion and contraction. The situations in the pictures below show the process of expansion and contraction of materials in daily life.

Gaps between connectors on a metal bridge



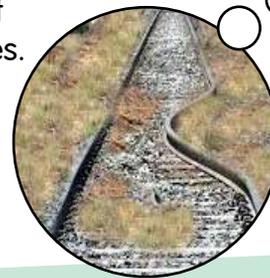
The gaps between metal connectors on the bridge allow the bridge to expand when the temperature of the surrounding increases.



Gaps between connectors on the railway tracks



The gaps between the connectors on a railway track allow the track to expand when the temperature of the surrounding increases.



Electric cables are hung loosely



The electric cables are hung loosely between the electric poles to allow the wires to contract when the temperature decreases.



Why are the applications of expansion and contraction principle of materials very important in our daily life?





FUN ACTIVITY

THE IMPORTANCE OF CONTRACTION AND EXPANSION PRINCIPLE OF MATERIALS

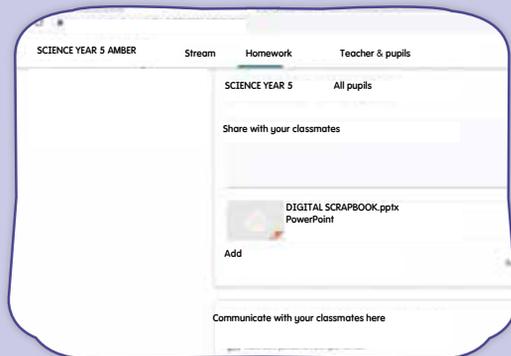
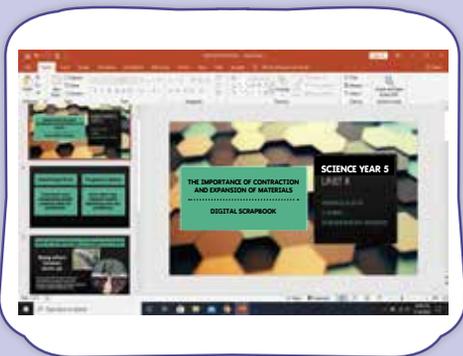
APPARATUS AND MATERIALS

Computer and internet access.



STEPS

1. Surf the internet to find information and pictures about the expansion and contraction principle of materials in our daily life.
2. Download the information and pictures.



3. Make a digital scrapbook about the importance of expansion and contraction principle of materials in our daily life.
4. Upload the digital scrapbook on Google Classroom.



- (a) State daily activities that involve the expansion and contraction principle of materials.
- (b) Why does the expansion and contraction principle of materials as identified in the activity very important in our daily life?



Produce a handmade thermometer using a plastic bottle, rubber band, transparent drinking straw, coloured water, balloon, a glass container filled with hot water, and a glass container filled with ice.

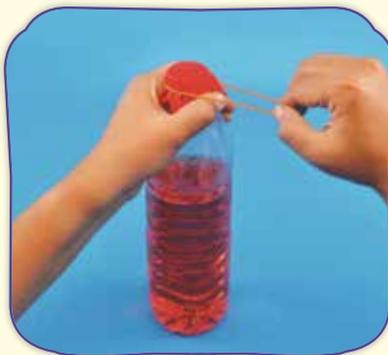


My thermometer

STEPS



1. Pour coloured water into the plastic bottle.



2. Tie the balloon at the neck of the bottle using a rubber band.



3. Make a hole at the centre of the balloon to insert the drinking straw.



4. Put the plastic bottle into the glass container filled with hot water and observe it.



5. Put the plastic bottle into the glass container filled with ice and observe it.

 Be careful when handling the hot water.



MIND REFLECTION

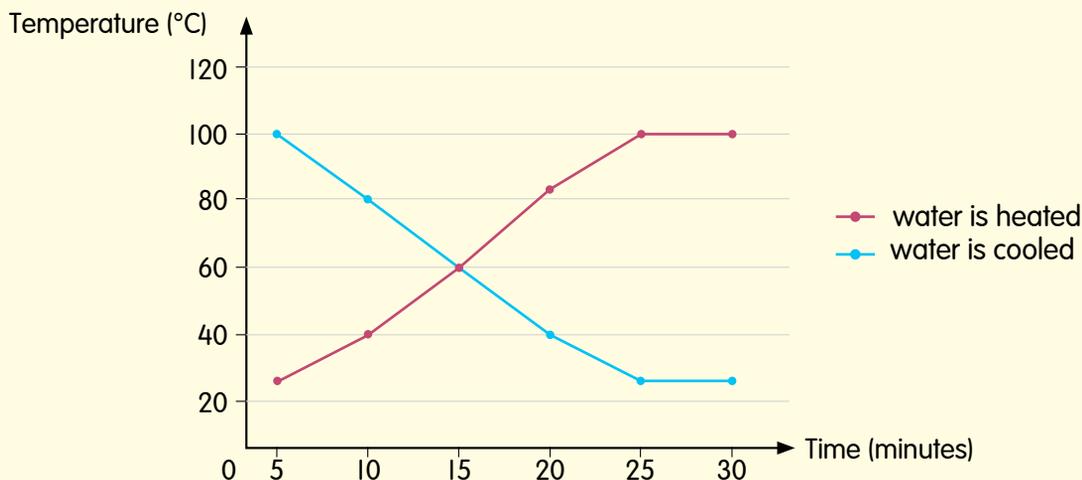
1. Heat is a form of energy that is transferred due to the difference in temperature.
2. A material becomes hotter when it gains heat and becomes colder when it loses heat.
3. Temperature is the degree of hotness or coldness of a material.
4. Thermometer is used to measure the temperature. The standard unit for temperature is degree Celcius ($^{\circ}\text{C}$).
5. When the temperature of a material decreases, the level of liquid in the thermometer falls as the liquid contracts.
6. When the temperature of a material increases, the level of liquid in the thermometer rises as the liquid expands.
7. The meniscus level is the curved level of the liquid in the glass tube of a thermometer.
8. Freezing point of water is 0°C .
9. Boiling point of water is 100°C .
10. When hot water is left unattended, the temperature of the water will decrease until it is equal to the temperature of the surrounding and remains constant.
11. The expansion of a material occurs when materials such as solids, liquids, and gases gain heat from the surrounding.
12. The contraction of a material occurs when materials such as solids, liquids, and gases lose heat to the surrounding.
13. The application of the expansion or contraction of materials is important in daily life. For example:
 - the gaps between the metal connectors on the bridge allow the bridge to expand when the surrounding temperature increases. This prevents damages to the surface of the bridge when it gains heat.
 - the gaps between the connectors on the railway track allow the track to expand when the surrounding temperature increases. This prevents the track from bending when it gains heat.
 - the electric cables are hung loosely between the electric poles to enable them to contract when the surrounding temperature decreases. This prevents the electric cables from snapping when they lose heat.



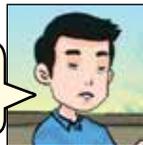
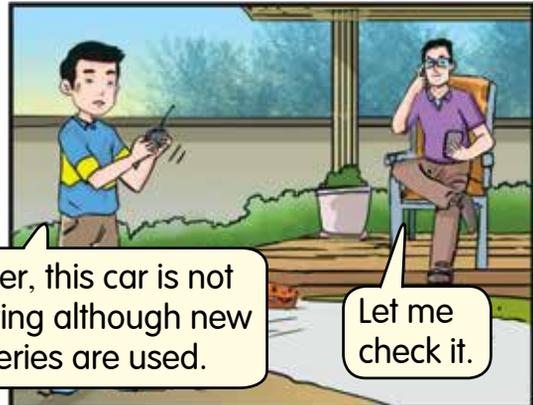
MIND TEST

Answer all questions in Science exercise book.

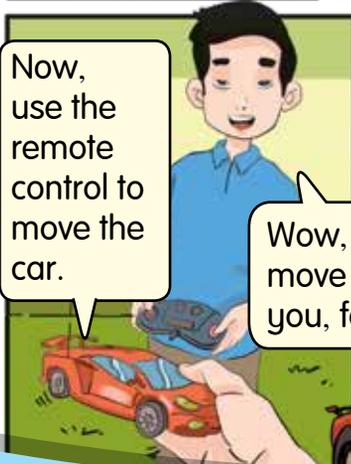
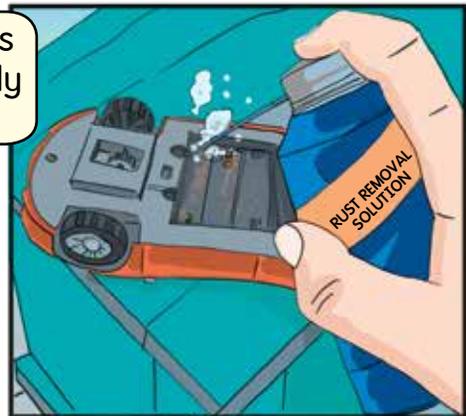
- State the meaning of the following:
(a) heat. (b) temperature.
- What is the temperature of water at the:
(a) freezing point? (b) boiling point?
- Read the situations below and answer the following questions:
(a) Ravi left the key for his bicycle lock at the school field. He was surprised because the key was too hot and cannot be held. Based on this situation, what caused the key to become too hot?
(b) Ana put a bottle of hot milk for her little brother in a container filled with tap water before giving it to him. Based on this situation, why the did Ana put the hot milk bottle in the container filled with tap water?
- The graph below shows the changes in water temperature when the water is heated and cooled.



- What is the trend of change of the temperature as the water is cooled?
- What is the trend of change of the temperature as the water is heated?
- What is the boiling point of the water in the graph above?
- At what minute does the temperature of the water reach the boiling point in this activity?
- At what minute does the temperature of the heated water and the cooled water become the same?
- What hypothesis can you make from the trend of change of the water temperature?



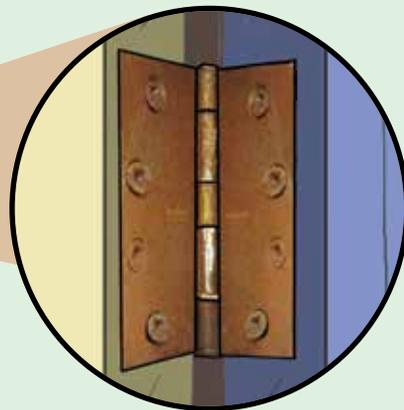
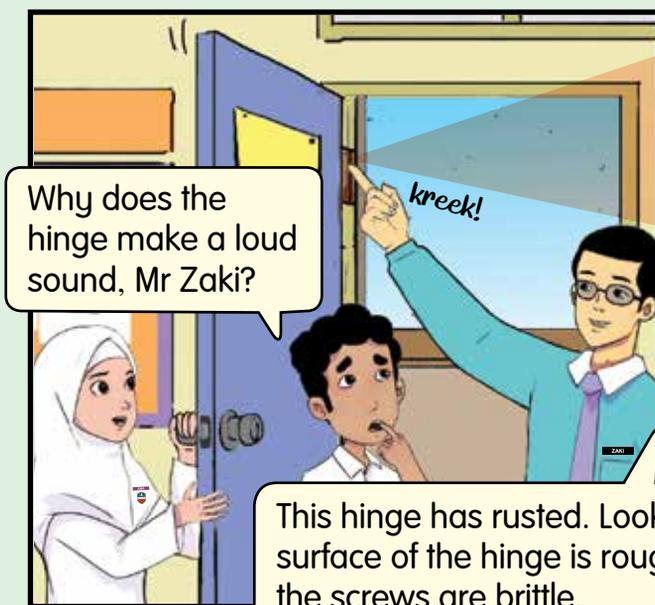
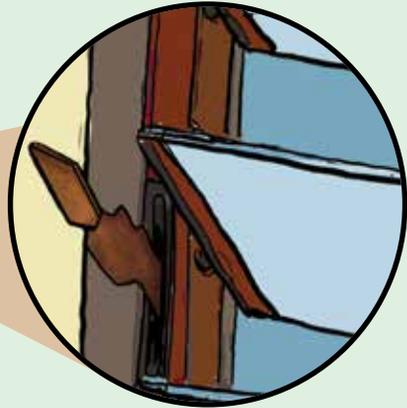
Rusty? Can you fix it?



Why are some parts of the car rusty? How to prevent rusting from occurring?

CHARACTERISTICS OF RUSTY OBJECTS

There are rusty objects around us. Rusty objects have certain characteristics. Let us read the story below to identify the characteristics of rusty objects.



What are the characteristics of a rusty object?





FUN ACTIVITY

CHARACTERISTICS OF RUSTY OBJECTS

APPARATUS AND MATERIALS

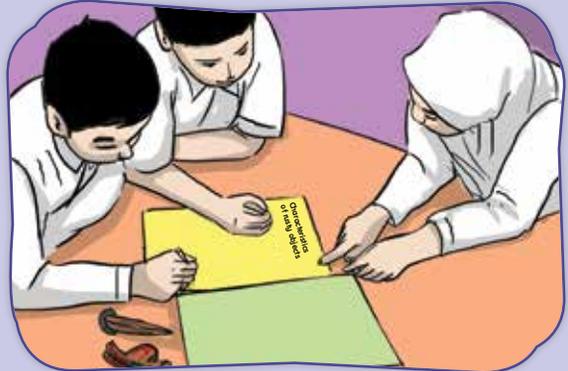
Marker pens, coloured A4 paper, and adhesive tape.



STEPS



1. Identify rusty objects found in the school compound.



2. Based on the observation, discuss the characteristics of the rusty objects.

Location	Rusty object	Characteristics of the rusty object
		
		

3. Construct a table on the coloured A4 paper using a marker pen and record the results of the observation.



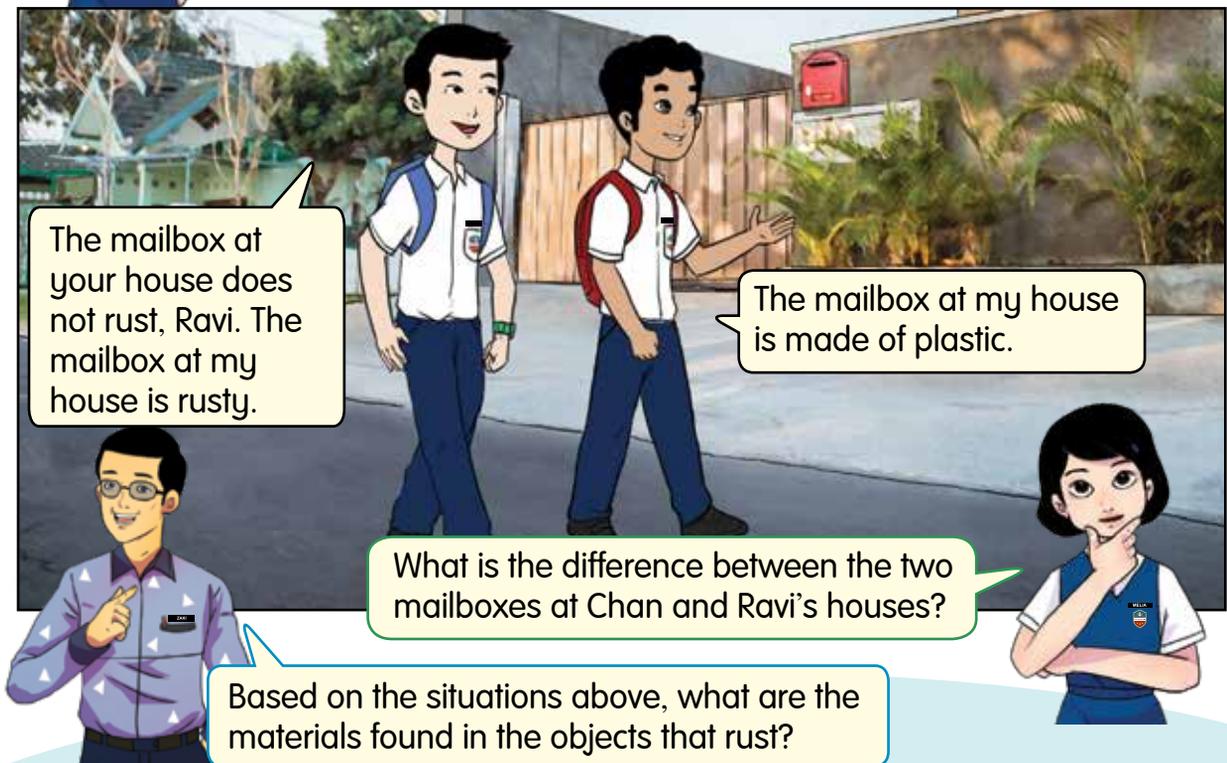
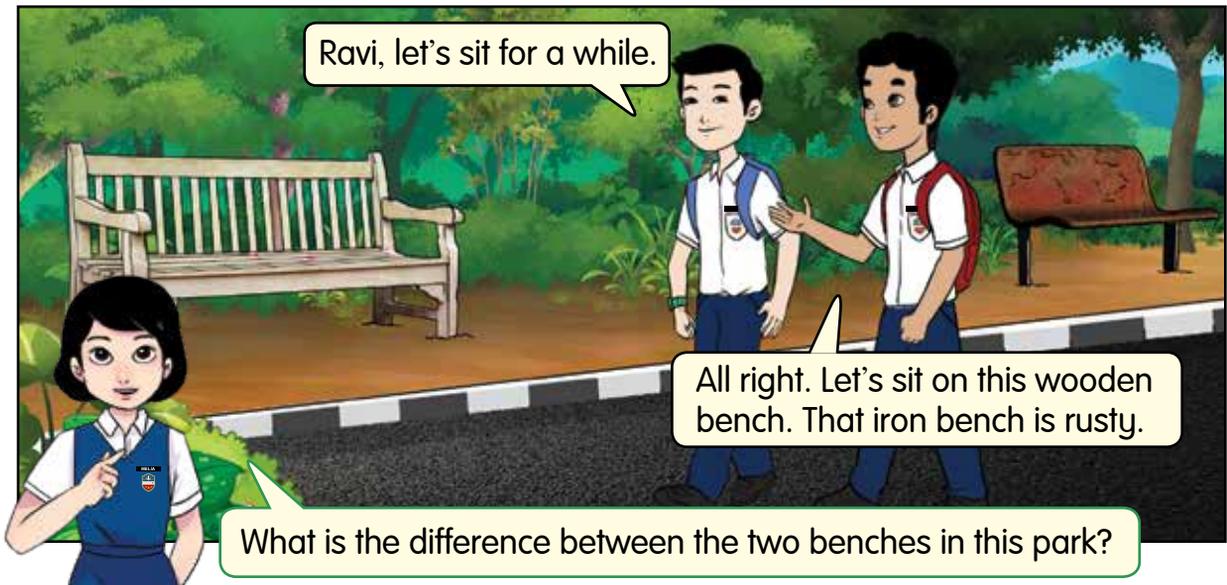
4. Present the results of the observation in front of the class.



- List the rusty objects that you have observed in the school compound.
- What are the characteristics of those rusty objects?

RUSTY OBJECTS

There are objects found in our surroundings that are made of many different materials. Some materials become rusty while some materials do not rust. Let us observe the situations below to find out the materials that rust.





LET'S TEST

RUSTY OBJECTS

AIM To identify objects that rust.

APPARATUS AND MATERIALS

Needle, glass rod, drinking straw, wooden skewer, nail, cotton roll, and vinegar.



STEPS



1. Wet the cotton roll with vinegar.



2. Arrange the needle, glass rod, drinking straw, wooden skewer, and nail on the wet cotton roll.



3. Roll up the wet cotton and leave it for five days. Unroll the cotton after five days.

Object	Observation
needle	/
wooden skewer	/
nail	/
drinking straw	/
glass rod	/

4. Record the observations in the table as shown above.

5. Construct a mind map using the data in the table.

6. Upload the mind map on Google Classroom.



1. Be careful when handling the vinegar and sharp objects.
2. Wash your hands after completing this activity.



What can you conclude from this activity? Why?

FACTORS THAT CAUSE RUSTING

What causes an object which is made of iron to rust?



Rusting occurs due to several factors. Let's conduct an experiment to determine the factors that cause rusting.



1. Aim

To investigate the factors that cause rusting.

2. Problem statement

Do air and water cause rusting?

3. Hypothesis

Water and air will cause iron wool to rust.

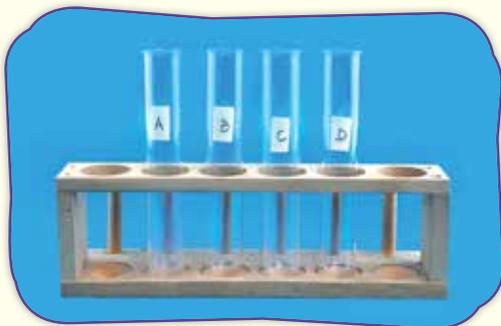
4. Defining variables

- manipulated variable: presence of water and air.
- responding variable: condition of the iron wool.
- constant variable: quantity of the iron wool.

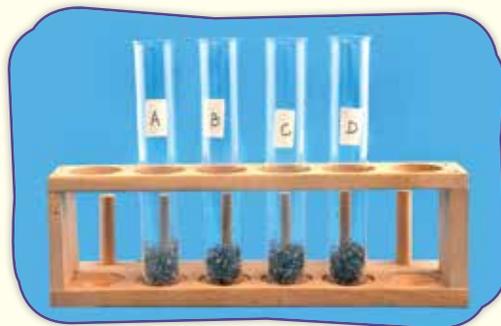
5. Apparatus and materials

Test tubes, test tube rack, test tube stoppers, iron wool, anhydrous calcium chloride, oil, tap water, and boiled tap water.

6. Steps



- (a) Place four test tubes on the test tube rack. Label the test tubes as A, B, C and D.



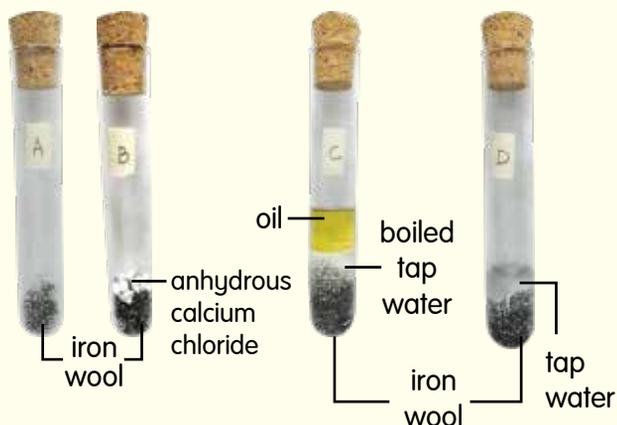
- (b) Put 20 g of iron wool into each test tube.



Be careful when handling the iron wool and boiled tap water.

TEACHER'S
NOTES

Teachers prepare 20 g of iron wool and boiled tap water.



- (c) Add each test tube with the material as shown in the pictures above.
- (d) Close the test tubes using the test tube stoppers.
- (e) Leave the test tubes for four days.
- (f) After four days, observe the condition of the iron wool in each test tube.
- (g) Record your observations in the table as shown below.

7. Data

Test tube	Observation
A	
B	
C	
D	



SCIENCE INFO

Anhydrous calcium chloride is used to absorb moisture so that the condition inside the test tube is dry. Boiled water does not contain any air. Cooking oil is used to prevent air from entering the water.

8. Interpreting the data

- (a) Which test tube contains rusty iron wool? Why?
- (b) Which test tube contains non-rusty iron wool? Why?
- (c) What are the factors that cause rusting?
- (d) What is the conclusion of this experiment?

9. Conclusion

- (a) The hypothesis is (accepted/not accepted).
- (b) The presence of water and air (cause/do not cause) the iron wool to rust.

WAYS TO PREVENT RUSTING

Objects made of iron that are left exposed to water and air for some time will undergo rusting process. Rusting can be prevented in several ways. The pictures below show several ways to prevent rusting.



Ways to prevent rusting

WAYS TO PREVENT RUSTING

Applying oil or grease

Oil or grease is applied to the surface of objects made of iron.

Coating with a layer of rustproof material

Rustproof materials such as plastic are coated onto the surface of objects made of iron.

Plating with a layer of rustproof metal

Rustproof metals such as tin and aluminium are plated onto the surface of objects made of iron.

Painting

Paint is applied on the surface of objects made of iron.

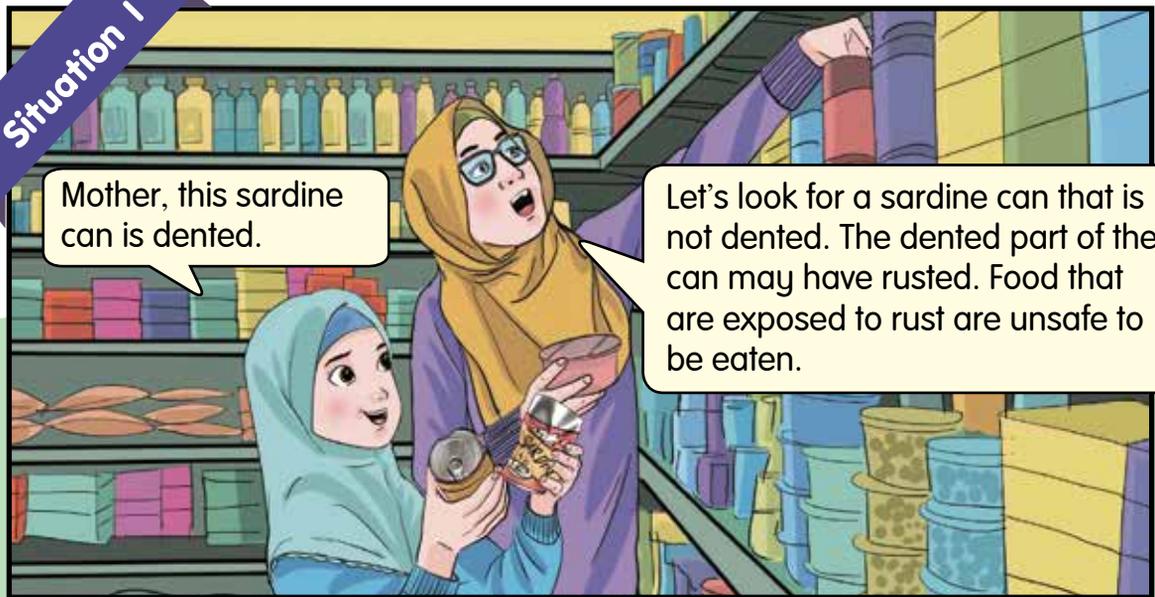
How to prevent objects made of iron from rusting?



THE IMPORTANCE OF PREVENTING RUSTING

Rusting of objects made of iron brings many disadvantages. Observe the situations below.

Situation 1

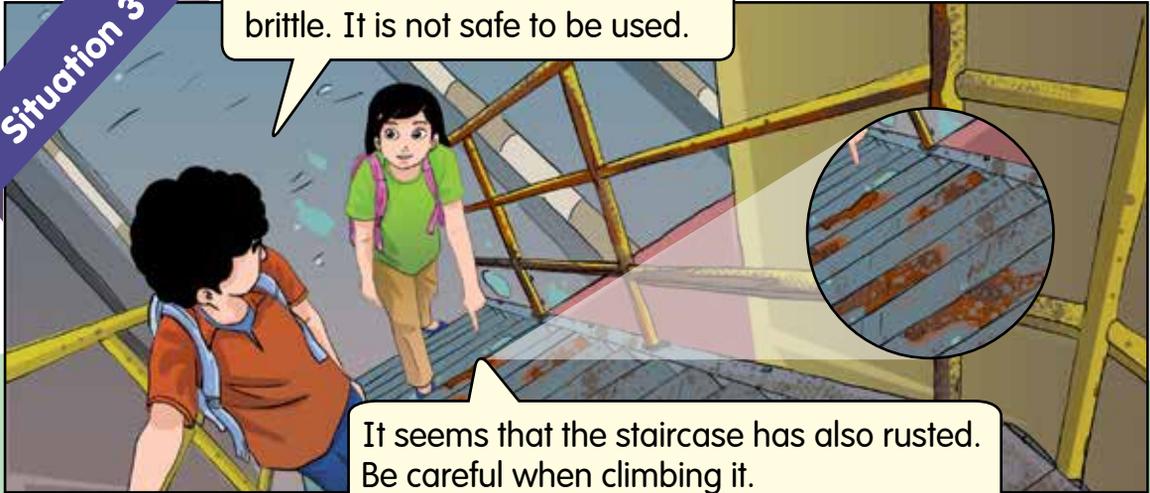


Situation 2



Situation 3

The handrail of this staircase is brittle. It is not safe to be used.



It seems that the staircase has also rusted. Be careful when climbing it.

Situation 4

What are you doing?



I'm looking at this axe. This axe is rusty. I think I need to buy a new axe.

Why do we need to prevent rusting?



Why do the spoons we use at home not rust although they are exposed to water and air?





FUN ACTIVITY

A PROJECT ON PREVENTING RUSTING

APPARATUS AND MATERIALS

Camera, gloves, paint containers, paintbrushes, paint, oil, and grease.



STEPS

1. In groups, make posters on a rust prevention project.
2. Exhibit the posters on the school noticeboard.
3. Identify locations that have rusty objects in the school area.
4. Take photos of the locations and the rusty objects before the rust prevention work begins.
5. Conduct suitable rust prevention work at the locations.
6. When completed, take photos of the locations and the restored objects.
7. Upload the photos on Google Classroom.
8. Present the results of your project.



1. Wear gloves while carrying out the rust prevention work.
2. Wash your hands with soap and water after completing the rust prevention work.



- (a) What ways did you use to prevent rust in this project?
- (b) Why did you choose such ways? Explain.



RUST REMOVAL SOLUTION

Produce a rust removal solution using a glass container, spray bottle, wire brush, 100 ml of vinegar, three tablespoons of salt, three tablespoons of soda bicarbonate, and water.

STEPS



1. Pour 100 ml of vinegar into the glass container.



2. Add three tablespoons of salt into the glass container.



3. Add three tablespoons of soda bicarbonate into the glass container.



4. Stir the mixture of vinegar, salt, and soda bicarbonate.



5. Pour the rust removal solution into the spray bottle.



6. Spray the solution on a rusty object.

7. Leave the object for five minutes and clean it with a wire brush.

8. Rinse the object with clean water.



Wash your hands with soap and water after preparing the rust removal solution and when the rust removing activity is completed.



MIND REFLECTION

1. The characteristics of a rusty object are:
 - reddish-brown colour.
 - rough surface.
 - brittle.
2. Objects made of iron will rust.
3. The presence of water and air cause rusting of objects made of iron.
4. Ways to prevent rusting on objects made of iron are:
 - applying the objects with oil or grease.
 - coating the objects with a layer of rustproof material.
 - plating the objects with a layer of rustproof metal.
 - painting the objects.
5. The importance of preventing rusting of objects made of iron are as follows:
 - safe to be used.
 - durable and not easily damaged.
 - save on maintenance cost.
 - look pleasant.



MIND TEST

Answer all questions in the Science exercise book.

1. The pictures below show three types of rods made of different materials.



iron rod



plastic rod



wooden rod

- (a) Which of the rods above can rust and cannot rust?
- (b) Give your reason for (a).

2. Observe the picture shown and answer the following questions:
 - (a) What can you observe on the objects?
 - (b) State the characteristics of the objects.
 - (c) What are the factors that cause this situation to occur?



3. Observe the picture below. Suggest a suitable way to prevent rusting. Give a reason for your answer.

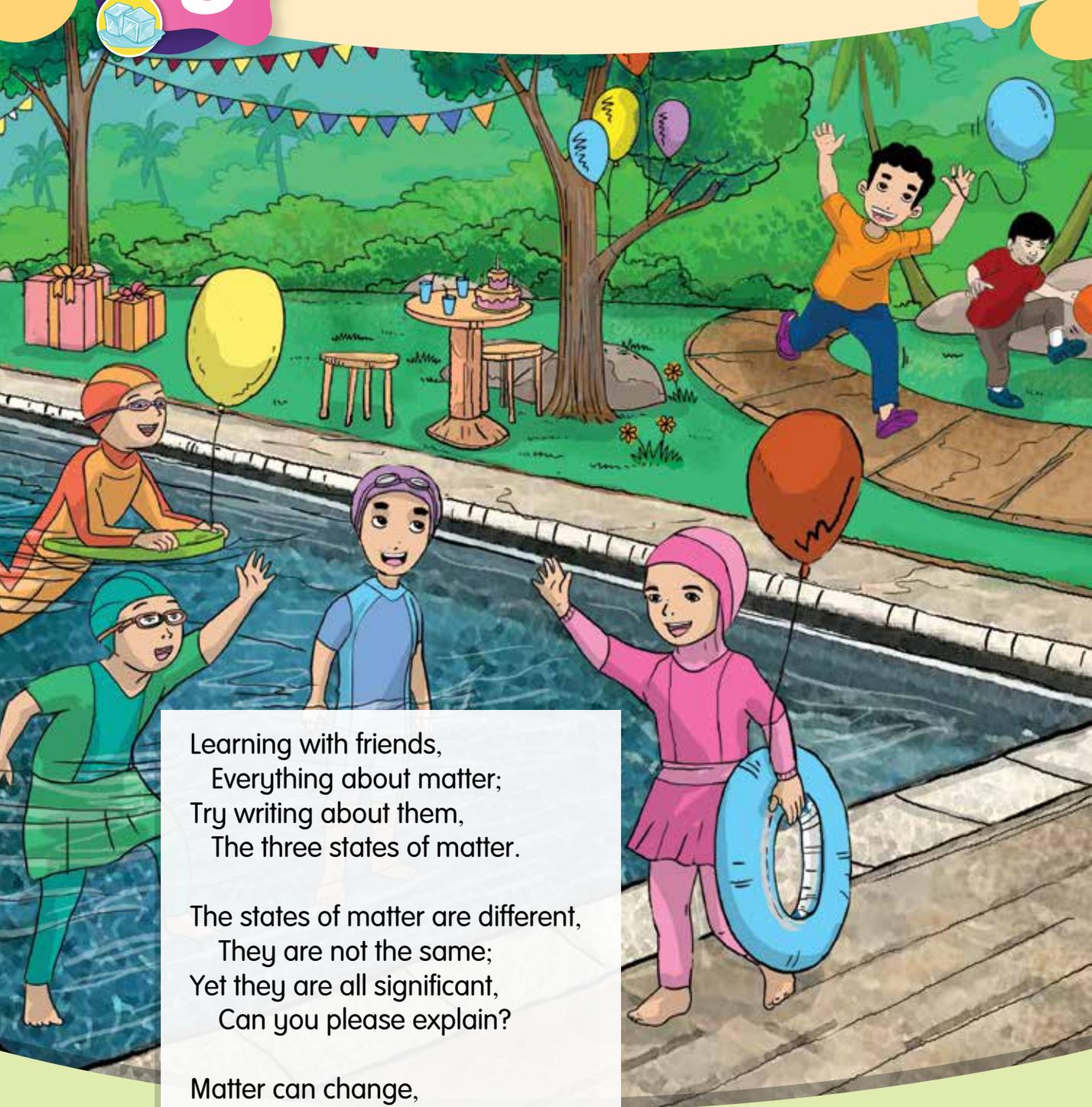


4. The table below shows the results of an experiment to test the factors that cause rusting.

Test tube	Materials in the test tube
A	needle and tap water
B	needle and oil
C	needle, boiled tap water, and oil
D	needle

- (a) Which needles in the test tubes became rusty? Why?
 - (b) Which needles in the test tubes did not become rusty? Why?
 - (c) Based on your answers in (a) and (b), what can you conclude from this experiment?
5. Rust prevention benefits everyone. Efforts to prevent rusting should be appreciated.

Based on the above statement, construct a mind map and state the importance of preventing rusting that you have learned.



Learning with friends,
Everything about matter;
Try writing about them,
The three states of matter.

The states of matter are different,
They are not the same;
Yet they are all significant,
Can you please explain?

Matter can change,
Into solid, liquid, and gas;
It's not so strange,
Let's discuss it in class.

SOLID, LIQUID, AND GAS

Matter can be found around us. Matter is any **substance that has mass and occupies space**. All living and non-living things consist of matter.

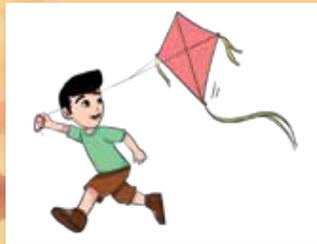
What are the states of matter that are found around us? Let's observe the situation below as examples.



Sand is matter in the **solid** state.



Seawater is matter in the **liquid** state.



The wind is matter in the **gas** state.

The three states of matter found on the beach are solid, liquid, and gas.

The objects found in our environment can be classified based on the states of matter that you have learned earlier. Let us conduct the activity below.



FUN ACTIVITY

CLASSIFYING MATTER

APPARATUS AND MATERIALS

Marker pen, adhesive tape, and flip chart paper.

21ST
Century
Learning

STEPS

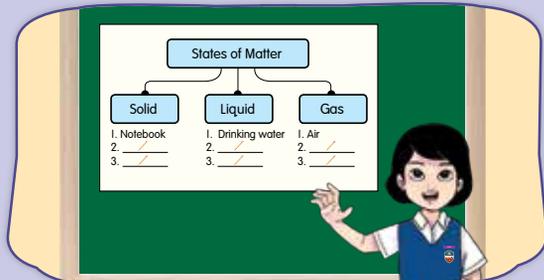
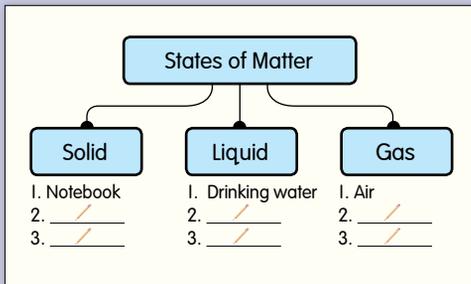
GROUP
ACTIVITY



1. Observe the materials and objects found around the school.



2. Discuss the states of matter for the materials and objects that you have observed.



3. Construct a classification chart on the flip chart paper. Classify the materials or objects based on the states of matter that you have identified.

4. Display the chart in front of the class.



How do you classify materials and objects found around the school based on their states of matter? Explain.

PROPERTIES OF MATTER

Matter found around us can be classified into three states that are known as solid, liquid, and gas. Each state of matter has different properties.

How are the states of solid, liquid, and gas identified?



LET'S TEST

PROPERTIES OF SOLID

AIM

To characterise the properties of solid.

APPARATUS AND MATERIALS

Weighing scale, measuring cylinder, small stone, and water.

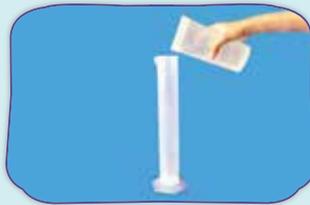


STEPS

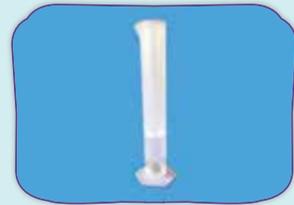
1. Press a small stone with your hand and observe for any changes in its shape.



2. Weigh and take the reading of the mass of the stone.



3. Pour water into the measuring cylinder and record the initial volume of the water.



4. Put the stone into the measuring cylinder and record the final volume of the water.

5. Calculate the volume of the stone using the following formula.

$$\text{Volume of small stone (ml)} = \text{reading of final volume of water (ml)} - \text{reading of initial volume of water (ml)}$$

6. Record your observations in the table as shown below.

Small stone	Change in shape		Mass (g)	Volume (ml)
	Changed	No change		
	/	/	/	/

(a) Name the state of matter of the small stone.

(b) Based on this activity, what are the properties of matter identified?



LET'S TEST

PROPERTIES OF LIQUID

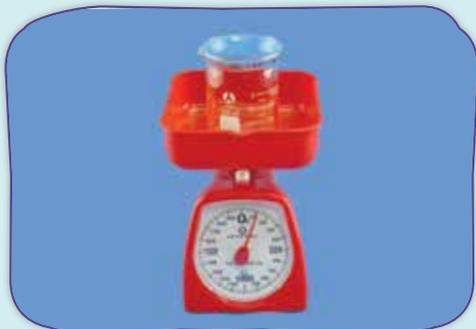


AIM To characterise the properties of liquid.

APPARATUS AND MATERIALS

Beaker, weighing scale, measuring cylinder, conical flask, cup, glass container, and coloured water.

STEPS



1. Weigh an empty beaker using a weighing scale and record the mass of the beaker.
2. Pour coloured water into the empty beaker and record its mass.
3. Calculate the mass of the coloured water using the following formula.

$$\text{Mass of coloured water (g)} = \text{Mass of beaker with coloured water (g)} - \text{Mass of empty beaker (g)}$$

4. Pour the coloured water from the beaker into the measuring cylinder and record the volume of the water.
5. Pour the same water from the measuring cylinder into the conical flask, cup, and glass container one at a time. Observe the shape of the water.
6. Record your observations in the table as shown below.

Water	Change in shape		Mass (g)	Volume (mℓ)
	Changed	No change		



- (a) Name the state of matter of water.
- (b) Based on this activity, what are the properties of matter identified?



LET'S TEST

PROPERTIES OF GAS



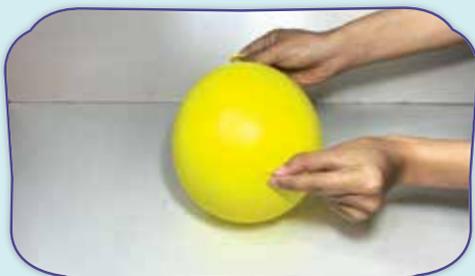
GROUP
ACTIVITY

AIM To characterise the properties of gas.

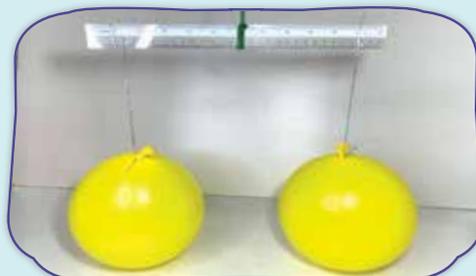
APPARATUS AND MATERIALS Adhesive tape, ruler, needle, syringe, thread, plastic glove, plastic bag, and balloon.

STEPS

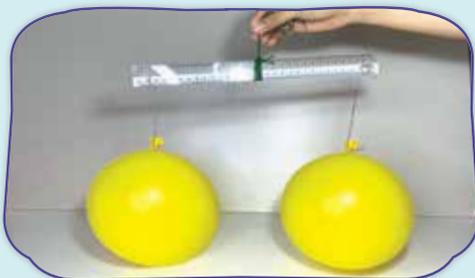
- (a) Observe the size of the balloon before the balloon is inflated.
(b) Inflate the balloon and observe its size.
- (a) Inflate two balloons of about the same size.



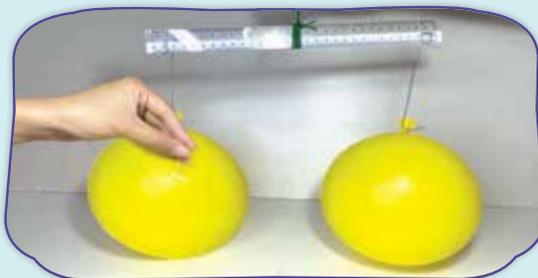
(b) Attach the adhesive tape to one of the balloons.



(c) Tie the middle part of the ruler using a thread. Then, hang the balloons, one at each end of the ruler.



(d) Hold the thread in the middle part of the ruler until both balloons are balanced.



(e) Pierce the balloon using a needle on the part that has the adhesive tape. Then, remove the needle and make an observation.

- Inflate the plastic glove, plastic bag, and balloon. Observe for any changes.



4. (a) Pull the piston of the syringe completely.
- (b) Cover the tip of the syringe with your finger.
- (c) Push the piston slowly and observe.



5. Record your observations and inferences in the table as shown below.

	Step	Observation	Inference
Air	Step 1	/	/
	Step 2	/	/
	Step 3	/	/
	Step 4	/	/



- (a) Name the state of matter of air.
- (b) Based on this activity, what are the properties of matter identified?



What are the properties of solid, liquid, and gas?

Solid has a **fixed shape**, **mass**, and **volume**. Solid also **occupies space**.



Liquid has a **fixed mass** and **volume**. Liquid also **occupies space** but **does not have a fixed shape**.

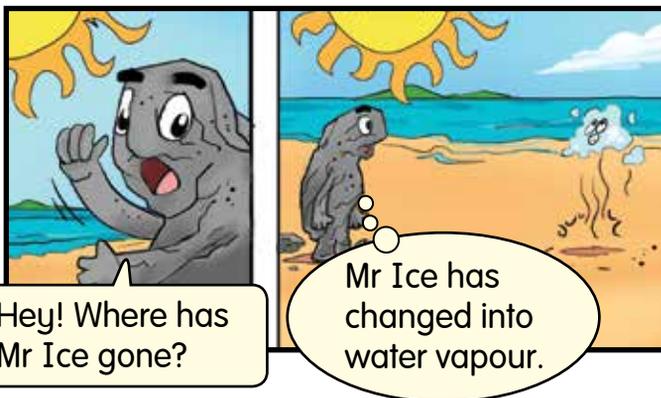
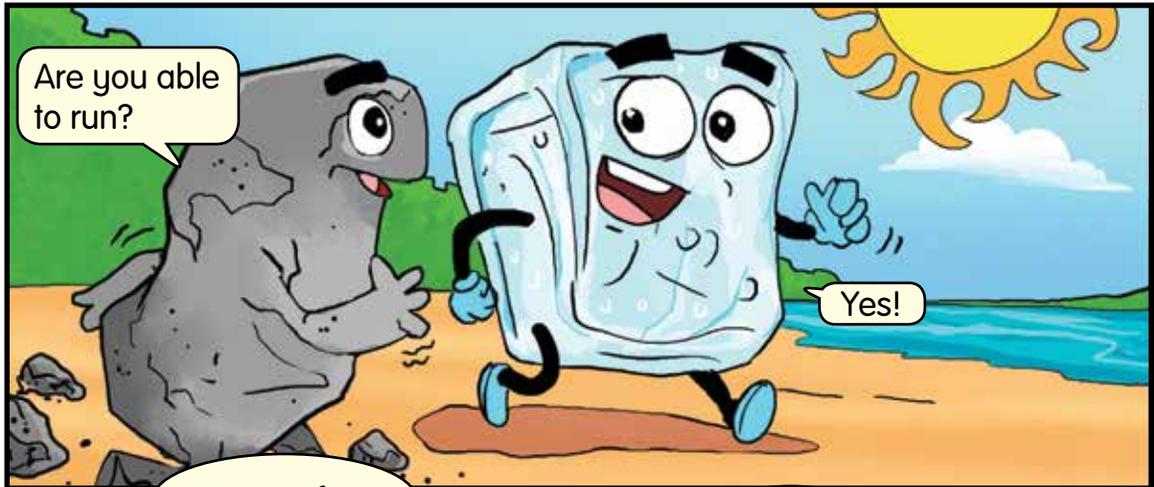


Gas **does not have a fixed shape** and **volume** but its **mass is fixed**. Gas also **occupies space**.



THREE STATES OF MATTER OF WATER

Mr Ice invited his friend, Mr Rock to a race one afternoon.
Let us read the story of these two friends.



Does the state of matter of ice change?



What happened to Mr Ice? Explain.

Water exists in three states of matter that are known as **solid**, **liquid**, and **gas**.

Water in the **solid** state is known as **ice**.

Water in the **liquid** state is known as **water**.

Water in the **gas** state is known as **water vapour**.



ice



water



water vapour



LET'S TEST

THREE STATES OF MATTER OF WATER

AIM

To investigate the three states of matter of water.

GROUP ACTIVITY

APPARATUS AND MATERIALS

Crucible, Bunsen burner, tripod stand, wire gauze, stopwatch, and ice cubes.

STEPS



1. Place an ice cube in the crucible. Record the state of matter of the ice.
 2. Prepare the apparatus as shown in the picture.
 3. Start the stopwatch and heat the crucible containing the ice cube for two minutes. Then, observe the changes.
 4. Continue heating until the water is almost dried up. Turn off the Bunsen burner.
- Be careful when handling the Bunsen burner.

Step	Observation
Step 1	/
Step 3	/
Step 4	/



- (a) What are the changes in the states of matter of the water that can be observed?
- (b) What can you summarise from the above activity?
- (c) Name the three states of matter of water.

CHANGES IN THE STATE OF MATTER OF WATER

Water changes from one state of matter to another. Observe the changes of the ice cream below.



What causes the state of the ice cream to change?

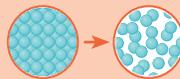
How does the state of matter of the ice cream change?



Particles of matter in the solid state are very closely packed and are uniformly arranged.

MELTING PROCESS

solid \rightarrow liquid



Ice melts into water when ice gains heat from the surrounding.

MELTING PROCESS

GAINS HEAT

LOSES HEAT

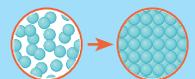
FREEZING PROCESS



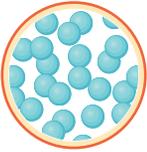
SOLID

FREEZING PROCESS

liquid \rightarrow solid



Water freezes into ice when water loses heat to the surrounding.

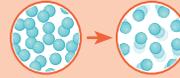


Particles of matter in the liquid state are not in orderly manner and are less packed.



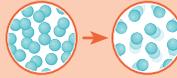
LIQUID

EVAPORATION PROCESS liquid → gas



Evaporation of water occurs at any temperatures below the boiling point of water. Water evaporates into water vapour when it gains heat from the surrounding.

BOILING PROCESS liquid → gas



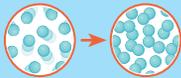
Water vapour is formed when water boils at the temperature of 100°C. Boiling occurs when water gains heat from the surrounding.



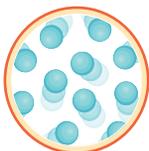
Mr Borhan's spectacles become foggy as he got out of his air-conditioned car. What caused this situation to occur? Explain.

EVAPORATION PROCESS/BOILING PROCESS
GAINS HEAT
LOSES HEAT
CONDENSATION PROCESS

CONDENSATION PROCESS gas → liquid



Condensation of water occurs when water vapour loses heat to the surrounding.



Particles of matter in the gas state are not in orderly manner and are spread out.



GAS



LET'S TEST

MATTER CHANGES ITS STATE



ACTIVITY I

AIM

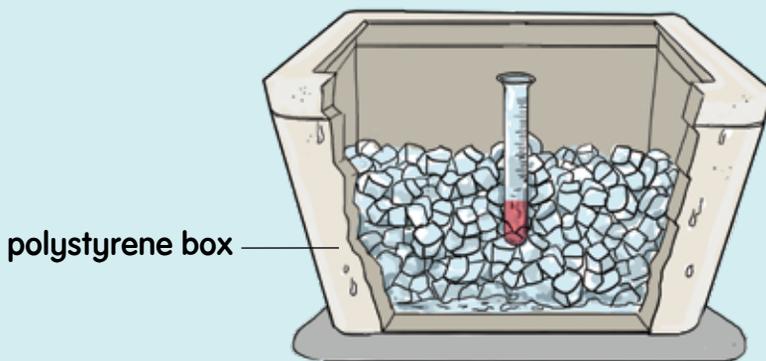
To describe the changes in the state of matter of water during freezing process.

APPARATUS AND MATERIALS

Polystyrene box with its lid, dropper, test tube, ice cubes, salt, water, and food colouring.

STEPS

1. Fill the polystyrene box with some ice cubes until it is half-full and mix with 200 g of salt.
2. Put 10 drops of water and three drops of food colouring into the test tube.
3. Shake the solution of water and food colouring in the test tube.
4. Put the test tube into the polystyrene box containing the mixture of ice and salt.
5. Close the polystyrene box using the lid and leave it for 30 minutes.
6. Observe the state of the water in the test tube after 30 minutes.
7. Discuss the result of the observation and make a conclusion.



- (a) What are the states of matter of the water in the test tube at the beginning and the end of the activity?
- (b) What is the change in the state of matter of the water in this activity? State the process involved.
- (c) Give an inference for your observation.

ACTIVITY 2

AIM

To describe the changes in the state of matter of water during melting process.



APPARATUS AND MATERIALS

Petri dish and ice cubes.

STEPS

1. Place a few ice cubes in the petri dish.
2. Observe the ice cubes after 10 minutes.
3. Discuss the result of the observation and make a conclusion.



- (a) What is the state of matter of the water in the petri dish at the beginning and the end of the activity?
- (b) What is the change in the state of matter of the water in this activity? State the process involved.
- (c) Give an inference for your observation.

ACTIVITY 3

AIM

To describe the changes in the state of matter of water during boiling process.



APPARATUS AND MATERIALS

Beaker, Bunsen burner, tripod stand, wire gauze, wooden board, and water.

STEPS

1. Pour 150 ml of water into the beaker.
2. Prepare the apparatus as shown in the diagram.
3. Heat the water until it boils.
4. Observe the water while it is boiling.
5. Discuss the result of the observation and make a conclusion.



Be careful when handling the Bunsen burner.



- (a) What are the states of matter of the water in the beaker at the beginning and the end of the activity?
- (b) What is the change in the state of matter of the water in this activity? State the process involved.
- (c) Give an inference for your observation.

ACTIVITY 4

AIM

To describe the changes in the state of matter of water during evaporation process.

APPARATUS AND MATERIALS

Petri dish, dropper, and water.

STEPS

1. Put two drops of water into the petri dish.
2. Leave it for 20 minutes under the sunlight.
3. Observe the water after 20 minutes.
4. Discuss the result of the observation and make a conclusion.



GROUP
ACTIVITY



- (a) What are the states of matter of the water in the petri dish at the beginning and the end of the activity?
- (b) What is the change in the state of matter of the water in this activity? State the process involved.
- (c) Give an inference for your observation.

ACTIVITY 5

AIM

To describe the changes in the state of matter of water during condensation process.

APPARATUS AND MATERIALS

Beaker, Bunsen burner, tripod stand, wire gauze, wooden board, mirror, test tube holder, and water.

STEPS

1. Prepare the apparatus as shown in the diagram.
2. Pour 100 ml of water into the beaker and bring it to a boil.
3. Turn off the Bunsen burner when the water has boiled.
4. Place the mirror on the beaker and leave it for a while.
5. Use the test tube holder to lift up the mirror from the beaker.
6. Observe the surface of the mirror.
7. Discuss the result of the observation and make a conclusion.



GROUP
ACTIVITY



Be careful when handling the Bunsen burner.



- (a) What are the states of matter of the water on the surface of the mirror at the beginning and the end of the activity?
- (b) What is the change in the state of matter of the water in this activity? State the process involved.
- (c) Give an inference for your observation.



FUN ACTIVITY

SIMULATION OF THE ARRANGEMENT OF PARTICLES

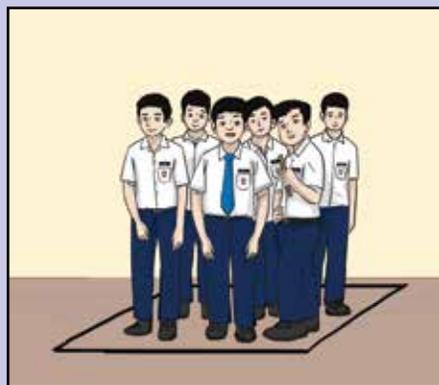
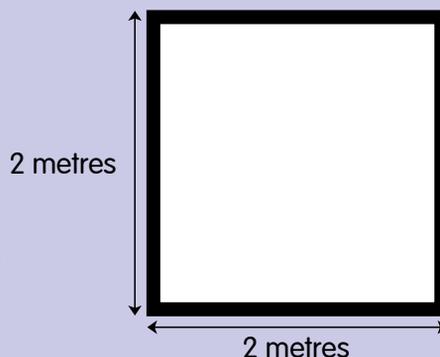


APPARATUS AND MATERIALS

Coloured adhesive tape and simulation cards.

STEPS

1. Form a square with the size of 2 metres \times 2 metres on the floor. Mark the measurement using coloured adhesive tape.
2. The group representative will take a simulation card from set A and set B each.
3. Discuss the arrangement of particles that need to be simulated based on the instructions written in the simulation cards.
4. Move into the square space with your group members.
5. Perform the simulation that has been discussed.



State whether the change in the state of matter of water below is “gaining heat” or “losing heat”. Explain the change in the arrangement of the particles involved.

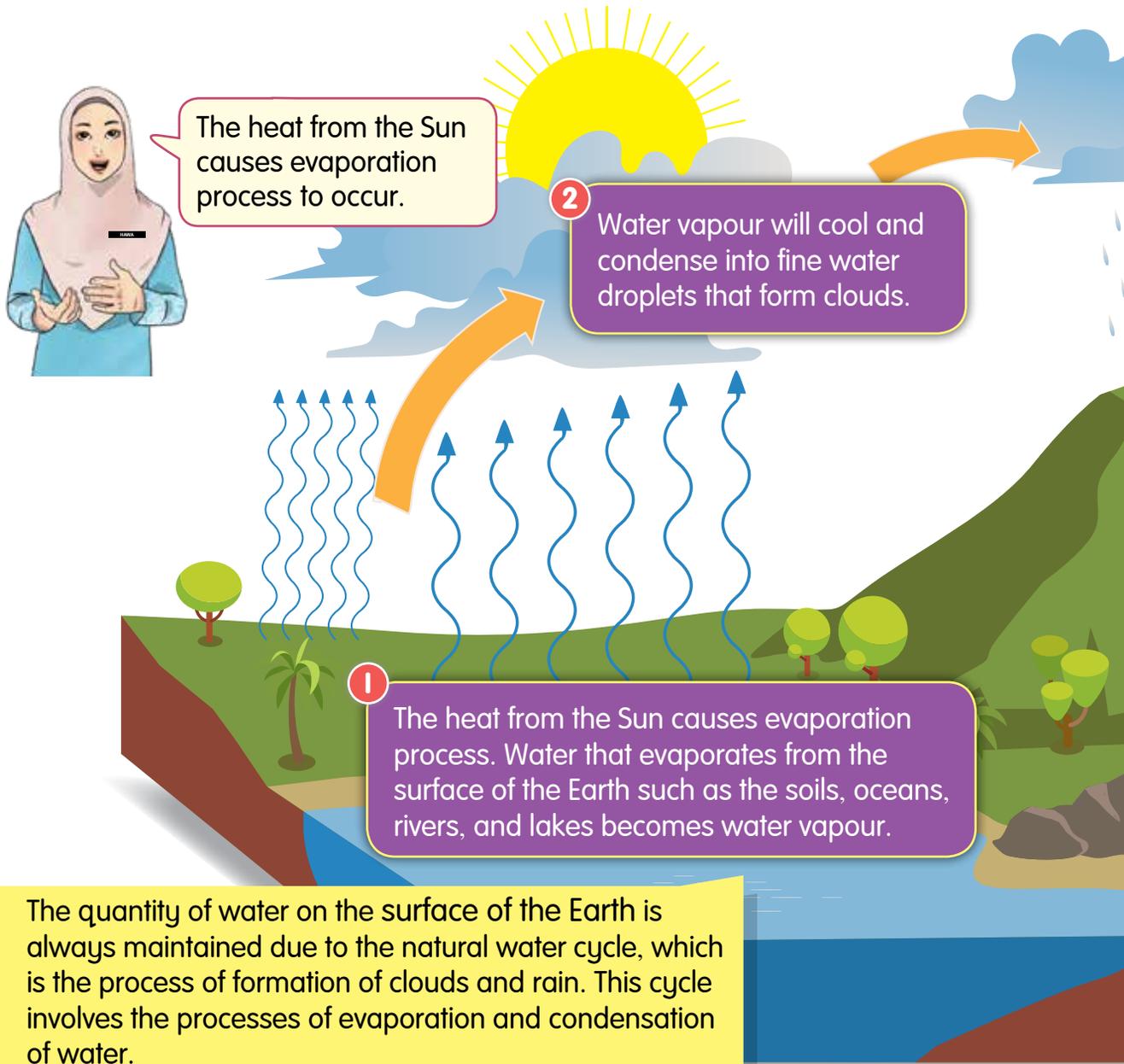
- (a) Solid to liquid.
- (b) Liquid to solid.
- (c) Gas to liquid.
- (d) Liquid to gas.

TEACHER'S NOTES

Prepare two sets of simulation cards with instructions for this activity. Set A consists of three cards written “solid”, “liquid”, and “gas”. Set B consists of two cards written “gaining heat” and “losing heat”. Put set A and set B into two different boxes.

CLOUDS AND RAIN

The movement of water from the surface of the Earth to the air forms clouds that eventually falls back as rain. This process is always repeated and known as the natural water cycle. Do you know that the formation of clouds and rain is a result from the processes of changes in the state of matter of water?



3

When clouds rise further above the sky, cold air causes the water droplets to combine into bigger clouds. The clouds then become heavy and the water droplets in the clouds will fall back to the surface of the Earth as rain.



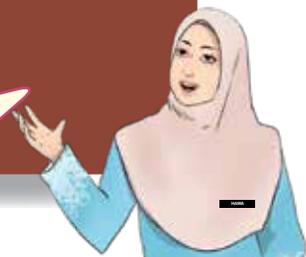
The processes of evaporation and condensation are very important to ensure that the natural water cycle continues. Observe the pictures below and discuss the effects of the natural water cycle in life.



4

Rainwater is absorbed into the Earth. Rainwater will also flow back to lakes, rivers, and oceans.

What are the processes that occur in the changes of the state of matter during the formation of the clouds and rain?





FUN ACTIVITY

RAINING IN A GLASS CONTAINER



APPARATUS AND MATERIALS

Glass container, small clear plastic container, spoon, hot water, salt, plastic food wrap, and ice cubes.

STEPS



1. Pour hot water into the glass container until it is almost full. Then, add six tablespoons of salt and stir the solution.



2. Place the small clear plastic container as shown in the picture. Then, cover the top of the glass container with plastic food wrap.



3. Place ice cubes on the top of the plastic food wrap.



4. Observe after 10 minutes.

5. Discuss the results of the observation.



- What are the processes involved in this activity?
- State the changes in the state of matter that occur in the small clear plastic container.



Predict what will happen if the water that evaporates from the surface of the Earth does not fall as rain.



Produce skewers of crystals using a cooking stove, small pot, spatula or ladle, plastic cup, dropper, cloth pegs, skewer sticks, 150 ml of water, 300 g of sugar, and food colouring.

STEPS



1. Heat 150 ml of water in the small pot.



2. Add 300 g of sugar and stir until it dissolves. Then, leave the solution to cool for a while and pour it into the plastic cup.



3. Add some drops of food colouring into the sugar solution.



4. Clamp the skewer stick with the cloth peg.



5. Put the skewer stick into the plastic cup and leave it for five days.



6. The skewers of crystals are formed by evaporation process.



Be careful when handling the hot cooking stove.



MIND REFLECTION

1. Matter exists in three states that are known as solid, liquid, and gas.
2. Matter can be classified into solid, liquid, and gas based on its properties.
3. Properties of solid, liquid, and gas are as follows:

Property \ State of Matter	Solid	Liquid	Gas
Have mass	yes	yes	yes
Occupy space	yes	yes	yes
Volume	fixed	fixed	not fixed
Shape	fixed	not fixed	not fixed

4. Water can exist in three states of matter that are known as solid, liquid, and gas.
5. Water in solid state is known as ice. Water in liquid state is known as water while water in gas state is known as water vapour.
6. The state of matter of water changes when:

Water gains heat	
solid → liquid	melting process
liquid → gas	boiling process
liquid → gas	evaporation process
Water loses heat to the surrounding	
liquid → solid	freezing process
gas → liquid	condensation process

7. The movement of water vapours from the surface of the Earth to the air forms clouds. It will eventually fall back to the surface of the Earth as rain. This process is constantly repeated and known as the natural water cycle. The natural water cycle that forms clouds and rain maintains the quantity of water on the surface of the Earth. This cycle involves the processes of evaporation and condensation of water.



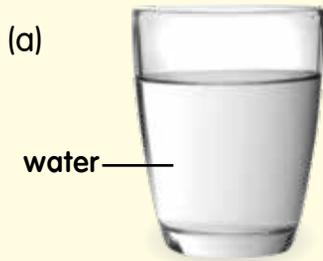
MIND TEST

Answer all questions in the Science exercise book.

1. Give two examples of matter in solid, liquid, and gas states found in your surrounding.
2. Observe the list below. Classify the materials and objects based on their states of matter.

oxygen	carbon dioxide	paper clip	sweat	soy sauce
dice	water vapour	spoon	palm oil	biscuit

3. Observe the pictures below. List the properties of the following materials.

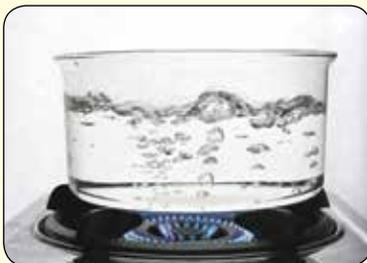


4. (a)



- (i) What is the state of matter of the drink in the picture?
- (ii) Why do the ice cubes become smaller in size after a few minutes?

- (b)



Based on the picture on the left:

- (i) State the change in the state of matter of water after some time.
- (ii) What is the process involved?
- (iii) Why does this process occur?

5. State the processes involved when the states of matter change in the given situations.

Situation	Process involved when the state of matter changes	Change in the state of matter
(a) Ice cubes in the water become smaller in size.		
(b) Wet floor becomes dry after 20 minutes.		
(c) Formation of dew on leaves in the morning.		
(d) The water heated in the kettle releases water vapour.		
(e) Ice cubes formed from the water that is placed in a freezer.		

6. Observe the situations below and answer the questions.



Based on the situations above:

- What is the change in the state of matter that occurred when the clothes become dry?
 - State the process involved for the change in the state of matter.
 - How does this process occur?
7. Explain the changes in the state of matter that occur during the formation of clouds and rain by sketching a diagram.



PHASES OF THE MOON AND CONSTELLATIONS



The Moon is the brightest natural satellite that you can easily identify in the sky at night. If you observe the Moon carefully, the shape of the Moon appears differently on different nights. Why?

THE MOONLIGHT

Ana and Melia are observing the Moon that shines brightly at night.

The Moon shines brightly tonight!

Miss Hawa, does the Moon emit its own light like the Sun?

No, Ana. The Moon does not emit its own light.

Do you still remember the experiment on the reflection of light?

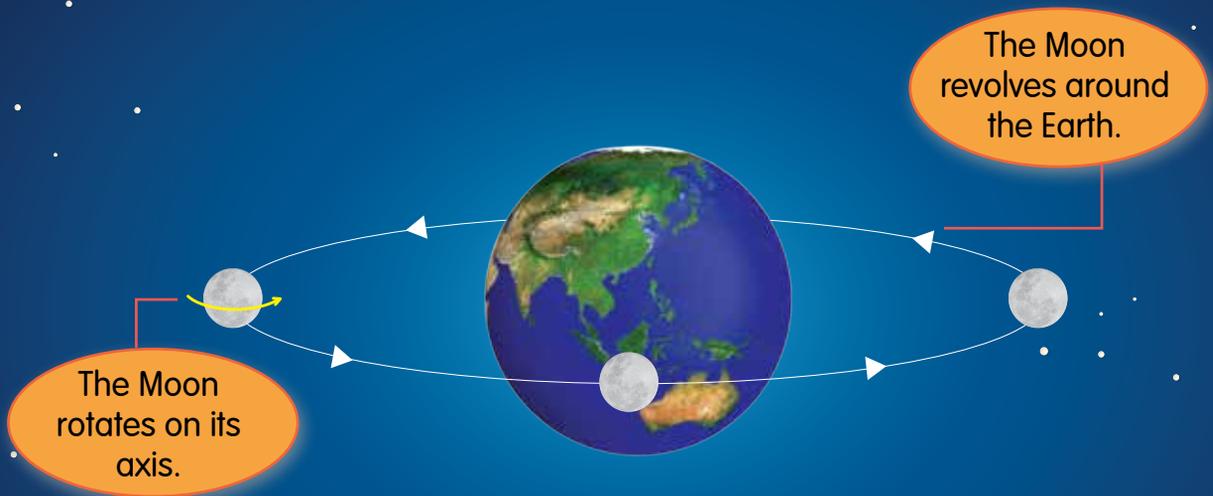
Yes, I do. The mirror shines because it reflects light from the torch.

It's the same for the Moon. The mirror represents the Moon while the light from the torch represents the light from the Sun. So, what do you understand about the Moon that appeared to shine last night?

Oh! I understand now. The Moon does not emit its own light but reflects the light from the Sun.

THE MOON ROTATES, THE MOON REVOLVES

The Earth rotates on its axis and, at the same time, revolves around the Sun. The Moon also rotates on its axis and, at the same time, revolves around the Earth.



Observe the rotation and revolution of the Moon below. What can you tell about the time taken for the rotation and revolution of the Moon?

The diagram shows the Earth in the center with the Moon orbiting it. A yellow arrow on the Moon indicates its rotation, and a white arrow on the orbit indicates its revolution. Two orange callouts provide the periods: $27\frac{1}{3}$ days for both. A central speech bubble explains that the durations are equal, and a bottom speech bubble notes that the Moon's surface facing Earth is always the same.

The Moon rotation period: $27\frac{1}{3}$ days

The Moon revolution period: $27\frac{1}{3}$ days

The duration for one complete rotation of the Moon on its axis is $27\frac{1}{3}$ days. The duration for one complete revolution of the Moon around the Earth is also $27\frac{1}{3}$ days.

Since the duration for both movements is the same, the surface of the Moon facing the Earth is always the same.

How about the direction of the movement of the Moon?

The diagram shows the Earth with the Moon orbiting it. A red arrow on the Moon indicates its rotation, and a green arrow on the orbit indicates its revolution. Two callouts state that both directions are anticlockwise. A female character in a white hijab is shown at the bottom right.

The direction of the Moon's rotation

The direction of the Moon's revolution

The direction of rotation and revolution of the Moon is also the same, that is, anticlockwise.



Let's carry out a simulation of the rotation and revolution of the Moon.



FUN ACTIVITY

SIMULATION OF ROTATION AND REVOLUTION OF THE MOON

APPARATUS AND MATERIALS

Globe, adhesive tape, balloon, and small card.



STEPS



- Inflate a small balloon. Paste a small card to one side of the balloon. The balloon represents the Moon and the small card represents the part of the Moon that is facing the Earth.
- Hold the balloon with both hands. Carry out the simulation of the Moon rotating on its axis and revolving around the Earth. The small card on the balloon must always face the globe as shown in the picture.

Simulation of the Moon rotating on its axis.



Start



$\frac{1}{4}$ rotation



$\frac{1}{2}$ rotation



$\frac{3}{4}$ rotation

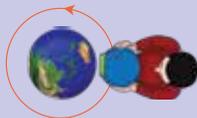


1 complete rotation

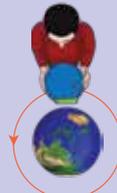
Simulation of the Moon revolving around the Earth.



Start



$\frac{1}{4}$ revolution



$\frac{1}{2}$ revolution



$\frac{3}{4}$ revolution



1 complete revolution



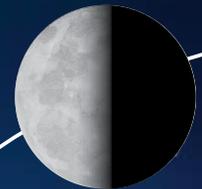
- What are the two types of movements of the Moon?
- State the direction and duration of the movements of the Moon.

PHASES OF THE MOON

As the Moon revolves around the Earth, we will observe different parts of the Moon that are lit up by the sunlight. This causes the shape of the Moon that is observed appears to change. The shapes of the Moon that appear differently are known as the phases of the Moon.



8 crescent moon



1 new moon

The dark side of the Moon is facing the Earth.



Legend:

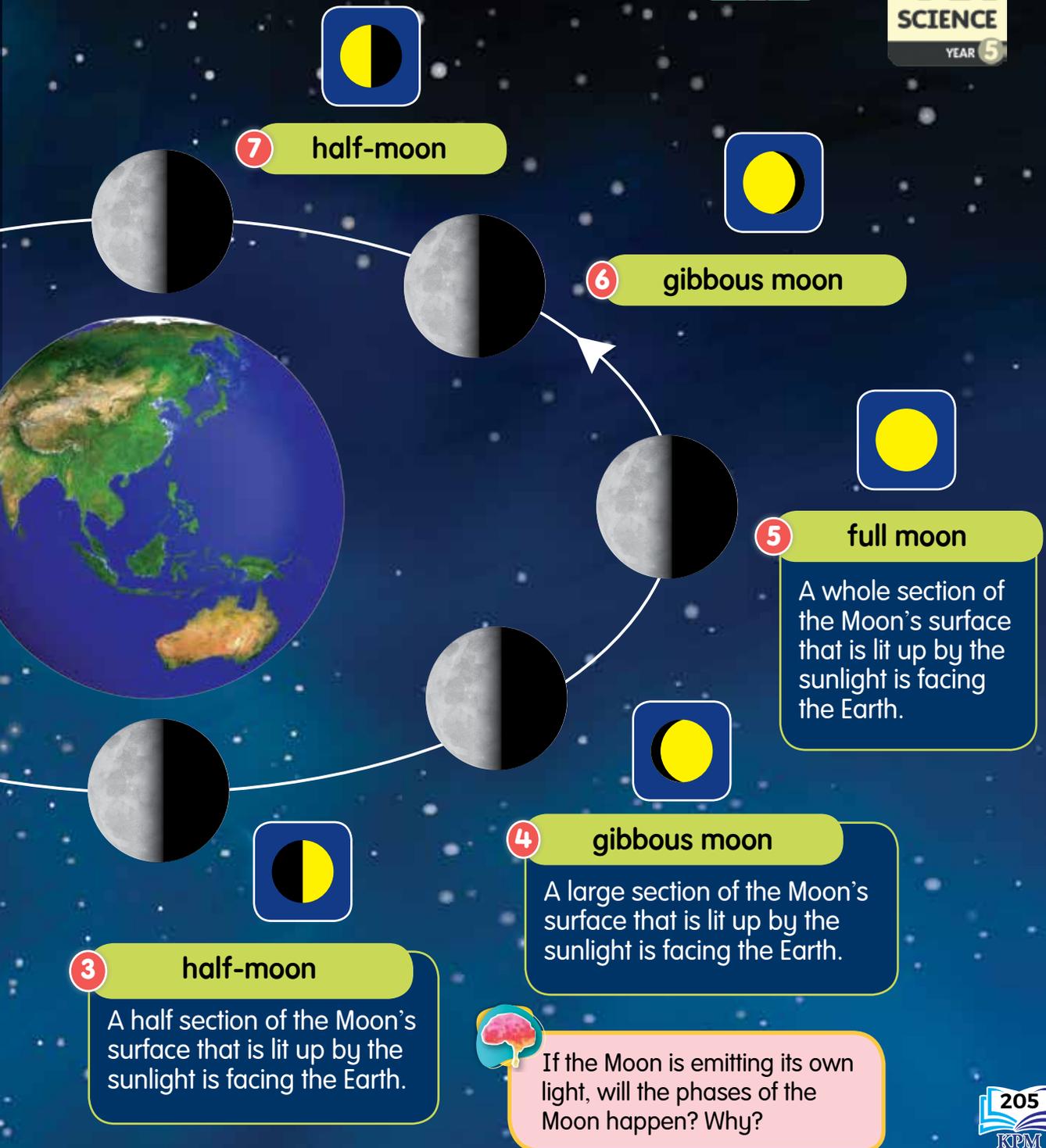
-  The view from space.
-  The observer's view from the Earth.



2 crescent moon

A small section of the Moon's surface that is lit up by the sunlight is facing the Earth.

When the Moon revolves around the Earth, the position of the Moon changes with time. This causes the following phases of the Moon.



THE LUNAR CALENDAR

Have you heard of the lunar calendar? This calendar is determined based on the phases of the Moon. The lunar calendar is also known as the Hijra calendar. Observe the dates of the lunar calendar for the month of Muharam 1442H that are determined by the phases of the Moon.

1 Muharam 1442H
20 August 2020

The first day of each lunar month is determined when the new moon has fully appeared.

1 Safar 1442H
19 September 2020

Phases of the Moon	 new moon	 crescent moon	 half-moon	 gibbous moon	 full moon	 gibbous moon	 half-moon	 crescent moon	 new moon
Dates of Lunar Calendar	①, 2	3, 4, 5, 6	7, 8, 9, 10	11, 12, 13	14, ⑮, 16	17, 18, 19, 20	21, 22, 23, 24,	25, 26, 27, 28,	29, 30, ①

15 Muharam 1442H
3 September 2020

The full moon always appears in the middle of each lunar month.

The lunar calendar is also used to determine the Islamic celebrations. What celebration that you know falls on the 1st Syawal? What is the phase of the Moon that appears on that date?



LET'S TEST

THE SIMULATION OF THE PHASES OF THE MOON

GROUP ACTIVITY

AIM

To explain about the phases of the Moon through simulation and sketching.

APPARATUS AND MATERIALS

Pencil, polystyrene ball, and a lamp with lampshade.

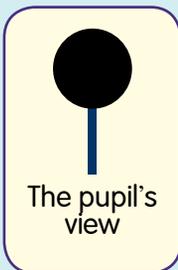
STEPS



1. Stick the pencil into the polystyrene ball. Take off the lampshade and put the lamp in the middle of a dark room. The polystyrene ball represents the Moon while the lamp represents the Sun.

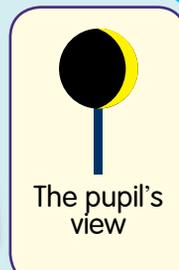


Simulation of the phases of the Moon



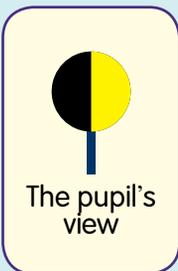
The pupil's view

2. Point the ball towards the lamp. Look at the direction of the ball to observe the new moon phase.



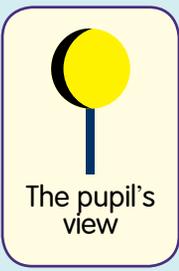
The pupil's view

3. Turn your body to the left at 45° to observe the crescent moon phase.



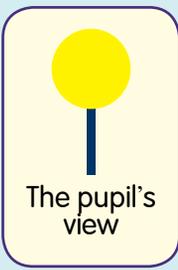
The pupil's view

4. Turn your body to the left again until 90° to observe the half-moon phase.



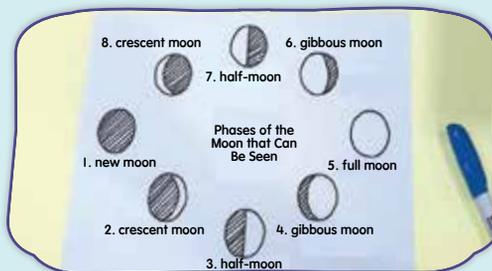
The pupil's view

5. Keep turning to observe the gibbous moon phase at the angle of 135° .



The pupil's view

6. Keep turning until the position of the ball is directly opposite to the lamp to observe the full moon phase at the angle of 180° .



7. Keep turning to observe all the phases of the Moon in the 360° . Sketch the shape of the Moon that you have observed in sequence on a piece of paper.



- Explain the positions of the Moon at the new moon and full moon phases.
- Why is the new moon not visible?
- Why does the Moon appear full during the full moon phase?
- Why do the phases of the Moon occur?

TEACHER'S NOTES

This activity must be carried out in a dark room.

CONSTELLATIONS



Sir, the crew members are ready to raise the net.

Good.



Hopefully we can catch many fishes at this location.

Look at that constellation. There is a mainland over there where we can sell our catch.

Come on, everyone! We sail to the north while our catch is still fresh.

Yes, sir!

You are right, sir. Thanks to our effort, our catch is almost sold out.

Fresh fish! Come buy some fresh fish!

Have you seen a constellation? In the olden days, the constellations were very useful to the sailors while sailing. What is the meaning of constellations?

A constellation is **a group of stars which appears to form a certain pattern in the sky that can be seen at night**. Not all the constellations are visible from all locations on the Earth. Some of the constellations are visible in the northern hemisphere, while some are visible in the southern hemisphere. There are also some constellations visible between the northern and southern hemispheres.

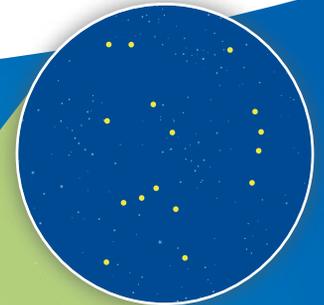
The Big Dipper constellation can be observed at the northern hemisphere.

The Orion constellation can be observed between the northern and southern hemispheres.

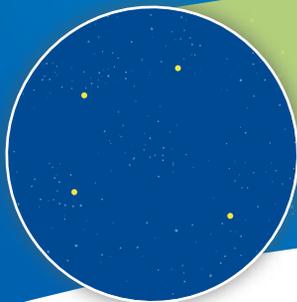


Big Dipper

northern hemisphere

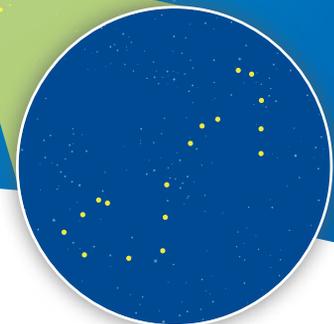


Orion



Southern Cross

southern hemisphere



Scorpion

The Southern Cross constellation can be observed at the southern hemisphere.

The Scorpion constellation can be observed at the southern hemisphere.





If we connect each group of stars with a line, what is the pattern formed on each constellation?

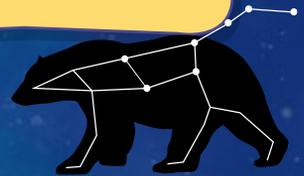
The Big Dipper

The Big Dipper constellation comprises a group of seven stars. This constellation appears to form a pattern of a water dipper or a scoop.



SCIENCE INFO

The Big Dipper is part of the Ursa Major or the Great Bear constellation.



The Orion

The Orion constellation appears to form a pattern of a hunter wearing a belt and holding a weapon.



The Southern Cross

The Southern Cross is the smallest constellation. This constellation comprises a group of four stars that appears to form a pattern of a kite.



The Scorpion

The Scorpion constellation comprises a group of stars that appears to form a pattern of a scorpion.



THE USES OF THE CONSTELLATIONS

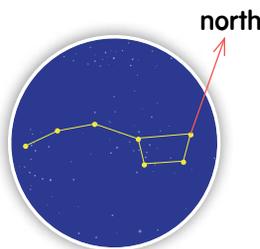
Constellations are useful because they help humans to identify certain stars in the sky. The direction and location of a place can be easily identified when looking at the patterns of the stars.

How do humans use the constellations in their daily life?

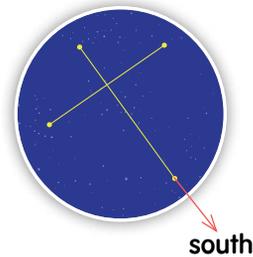


TO SHOW DIRECTION

Travellers and sailors used the constellations as a compass to determine their directions.



The Big Dipper constellation always points to the north.



The Southern Cross constellation always points to the south.

We are lost. How do we find the way out?



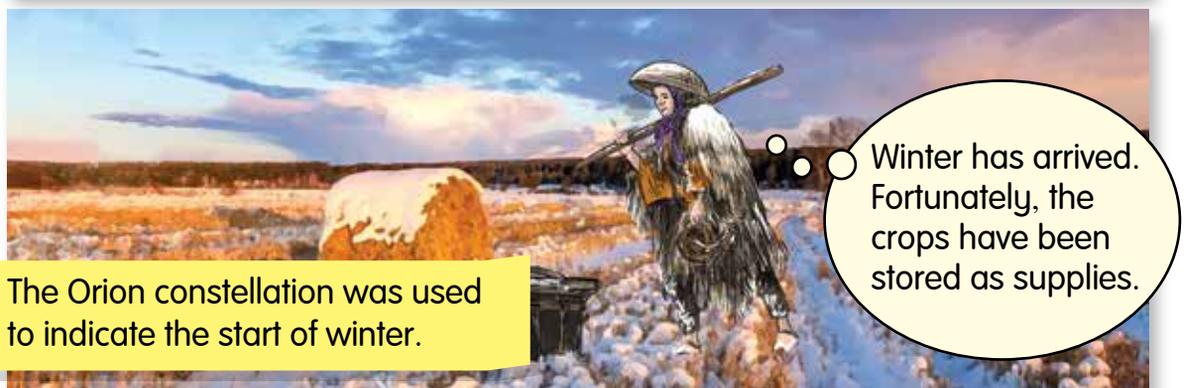
Don't worry. Let's rest and find the way out tonight.



Oh, look at the Southern Cross constellation. The direction of north is over there. Follow me!

TO INDICATE SEASONS

Before the calendar was invented, farmers in the areas with four seasons in the northern hemisphere looked at the constellations to identify certain seasons. The constellations helped them to plan the time for planting and harvesting crops.





FUN ACTIVITY

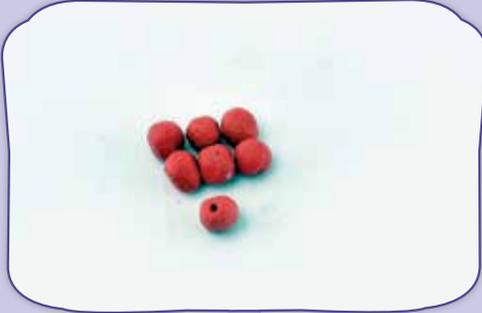
MODELS OF THE CONSTELLATIONS



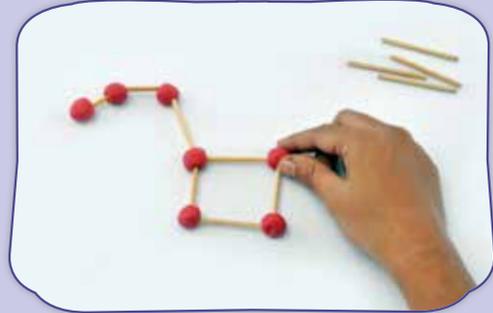
APPARATUS AND MATERIALS

Computer, internet access, modelling clay, and skewer sticks.

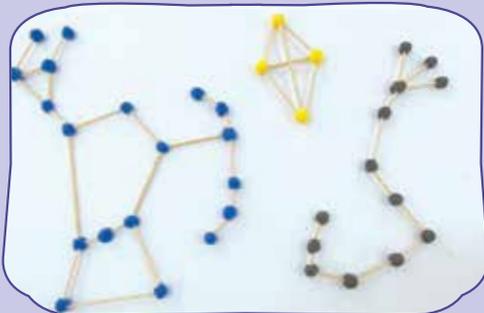
STEPS



1. Make seven small balls using modelling clay to form a model of a group of stars.



2. Cut the skewer sticks accordingly. Then, connect the small balls using the skewer sticks to form a model of the Big Dipper constellation.



3. Make the models for the Orion, Southern Cross, and Scorpion constellations using the same method.



4. Make the models for other constellations in the sky by gathering information from the internet.

5. Discuss the features of the constellations that you have built in front of the class.



Be careful when using sharp tools to cut the skewer sticks.



Based on the models of constellations that you have built, state the uses of constellations to humans.

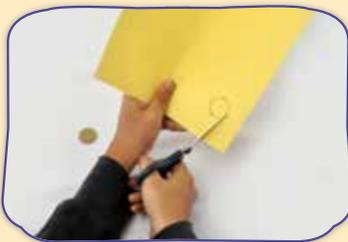


Build a model of a moon phase cup using a coin, two clear plastic cups, yellow-coloured paper, black-coloured paper, glue, marker pen, and coloured adhesive paper.



Moon phase cup

STEPS



1. Trace the shape of a coin on the yellow-coloured paper and cut it out.



2. Put the black-coloured paper inside the first cup.



3. Paste the cut yellow-coloured paper on the outer part of the first cup.



4. Insert the first cup into the second cup.



5. Sketch the phases of the Moon in sequence on the outer part of the second cup.



6. Draw arrows and label the phases of the Moon in sequence on the coloured adhesive paper. Then, paste the coloured adhesive paper on the moon phase cup.

7. Turn the second cup to see the changes in the phases of the Moon.



MIND REFLECTION

1. The Moon does not emit its own light but reflects light from the Sun.
2. The Moon rotates on its axis, anticlockwise for $27 \frac{1}{3}$ days.
3. The Moon revolves around the Earth, anticlockwise for $27 \frac{1}{3}$ days.
4. As the Moon revolves around the Earth, we will observe different parts of the Moon that are lit up by the sunlight.
5. Parts of the Moon that appear differently are known as phases of the Moon.
6. Phases of the Moon:



7. Phases of the Moon are used to determine the dates in the lunar calendar which is also known as the Hijra calendar.

The first day of each lunar month is determined when the new moon has fully appeared.

Phases of the Moon									
Dates of Lunar Calendar	①, 2	3, 4, 5, 6	7, 8, 9, 10	11, 12, 13	14, ①5, 16	17, 18, 19, 20	21, 22, 23, 24,	25, 26, 27, 28,	29, 30, ①

The full moon always appears in the middle of each lunar month.

8. A constellation is a group of stars which appears to form a certain pattern in the sky that can be seen at night.
9. Examples of constellations are Big Dipper, Orion, Southern Cross, and Scorpion.
10. Constellations are used to:
 - show directions.
 - indicate seasons.



MIND TEST

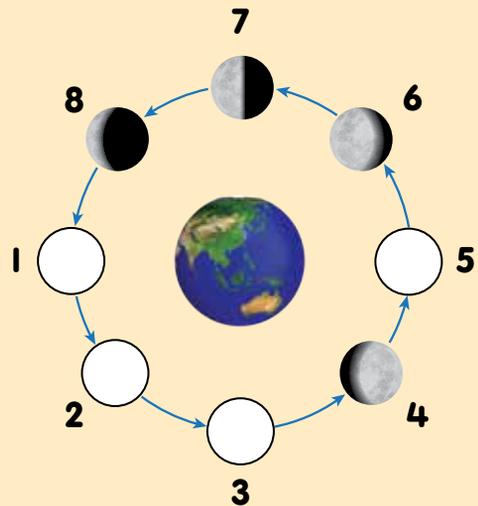
Answer all questions in the Science exercise book.

1. The diagram shows a phenomenon.

- State the phenomenon.
- Why does this phenomenon happen?
- Shade the section of the Moon that is visible at positions 1, 2, 3 and 5.
- Write the observation and the reason to explain the phase of the Moon at location 3.

Observation: _____

Reason : _____



(e) Below is an excerpt from a radio announcement.

**“In two weeks,
Malaysians will be
celebrating Hari Raya
Aidilfitri ...”**



State the phase of the Moon when this radio announcement was made.
Explain your answer.

2. The following is the information about the function of constellation X.



Constellation X: Indicates the presence of planting season.

- Based on the information above, state other uses of constellation X.
- State three other constellations besides constellation X above.

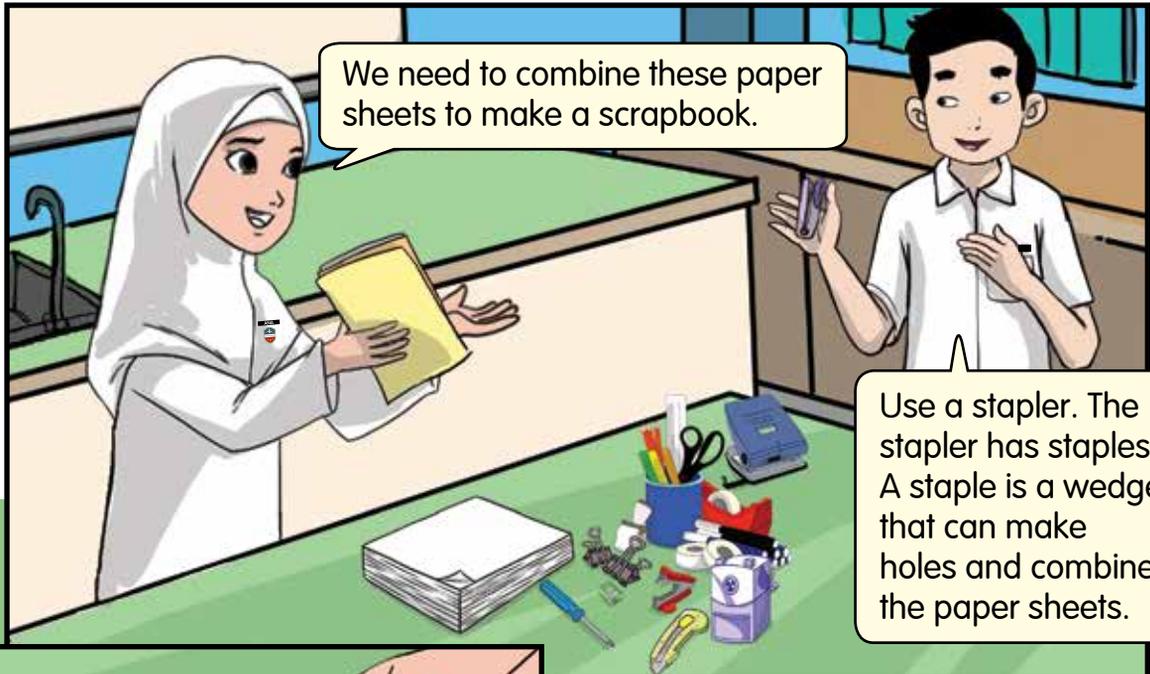


Machines help to simplify human work.
How do machines help to make our lives
more comfortable?

Wow, the house
is so clean! Thank
you, everyone.

MACHINES AND LIFE

Machines are **tools or equipment that help us do our work easier and faster**. Let us follow the situation below.



Right. The stapler also uses the lever principle.

Name other tools that can be used to prepare your scrapbook and state the uses of those tools.



LET'S TEST

I AM USEFUL AND FUNCTIONAL



AIM

To state the functions of tools and to identify simple machines.

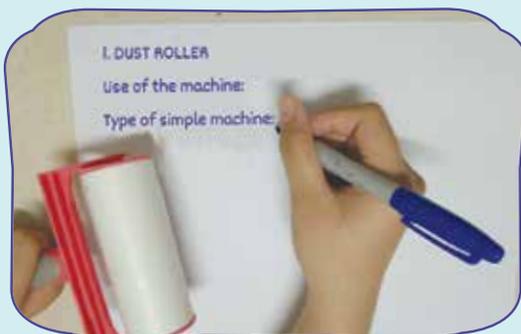
APPARATUS AND MATERIALS

Dust roller, marker pen, tap, mechanical pencil sharpener, nail clipper, scissors, toy tractor, and A4 paper.

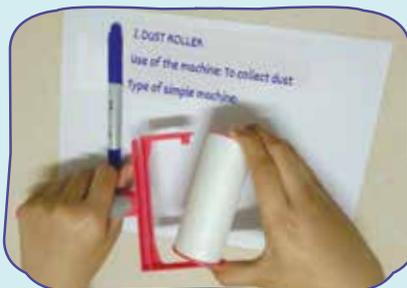
STEPS



1. Observe the dust roller.



2. Identify the function of the tool and the type of simple machines in the dust roller.



3. Disassemble and reassemble the dust roller to understand its function.



4. Sketch the dust roller and label all the simple machines in it.



5. Observe other tools such as tap, mechanical pencil sharpener, nail clipper, scissors, and toy tractor. Then, repeat steps 2 to 4.



- What is the function of each tool that you have observed?
- How do the simple machines in the tool enable it to function?

TEACHER'S NOTES

Teachers can use other tools besides the tools stated in this activity.

COMBINATION OF FUNCTIONS IN SIMPLE MACHINES

There are several simple machines with different functions that are combined in a tool to enable it to function well. Let us understand the combination of functions in simple machines in the tools as shown below that enable them to function.

Wheel and axle

The wheel and axle at the hand crank make this tool easier to be turned. The crank needs to turn so that the wedge can function to sharpen the pencil.



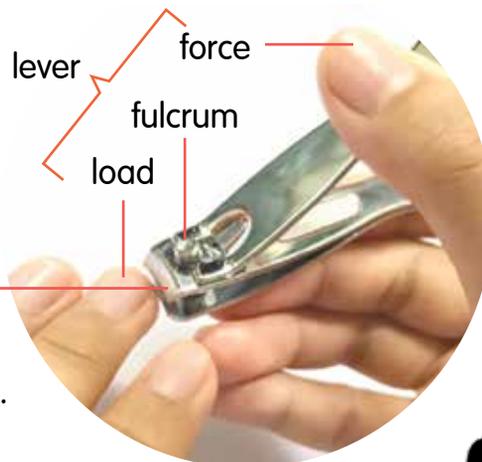
Wedge

The wedge in the mechanical pencil sharpener allows the pencil to be sharpened.

mechanical pencil sharpener

Lever

Nail clipper is a lever. The position of the load is at the nail whereas the position of the force is at the thumb. The fulcrum is located between the load and the force that allows the nail clipper to function.



Wedge

The function of the wedge at the cutter is for cutting the nail.

nail clipper

Can this nail clipper function if there is no combination of lever and wedge?



Gear

The gear in this wristwatch is used to move and turn the hands of the wristwatch.

Screw

The screw is used to fasten the components of the wristwatch.

Wheel and axle

The wheel and axle at the crown is for setting the wristwatch.



wristwatch



What will happen if the wristwatch has no gear and screw?

Wedge

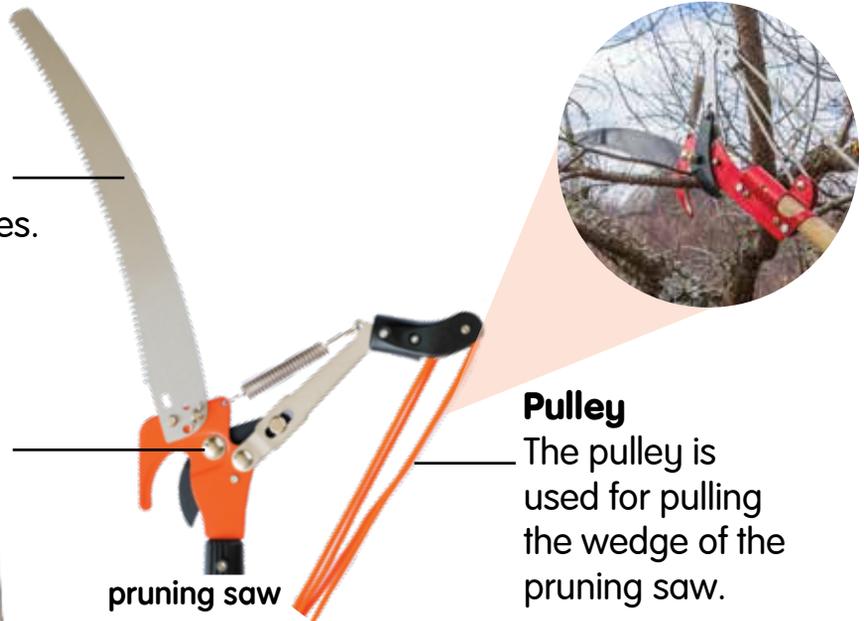
The wedge at the saw is used for cutting tree branches.

Screw

The screw is used to fasten the parts of the pruning saw.

Pulley

The pulley is used for pulling the wedge of the pruning saw.



pruning saw



Explain the combination of functions in simple machines for another tool, which ensures that the tool can function well.

THE IMPORTANCE OF COMBINATION OF SIMPLE MACHINES

Let us observe the situations below to understand the importance of combination of simple machines in a tool.

Situation 1



Situation 2



The combination of simple machines in a tool is important to ensure that it can function well. Why?

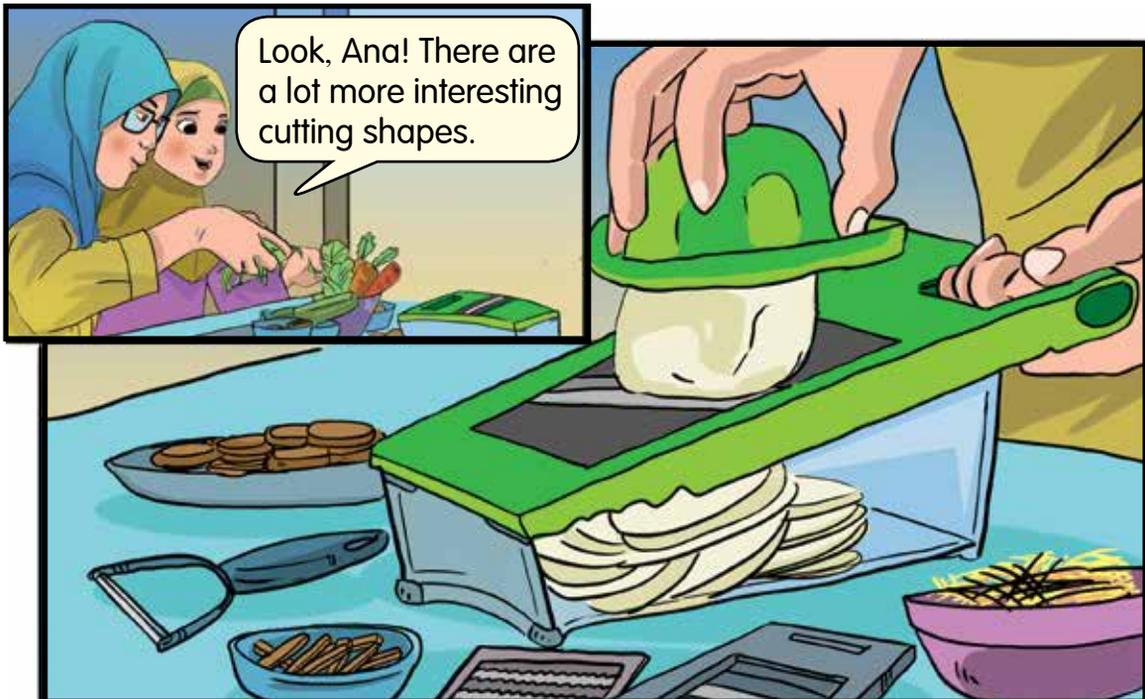
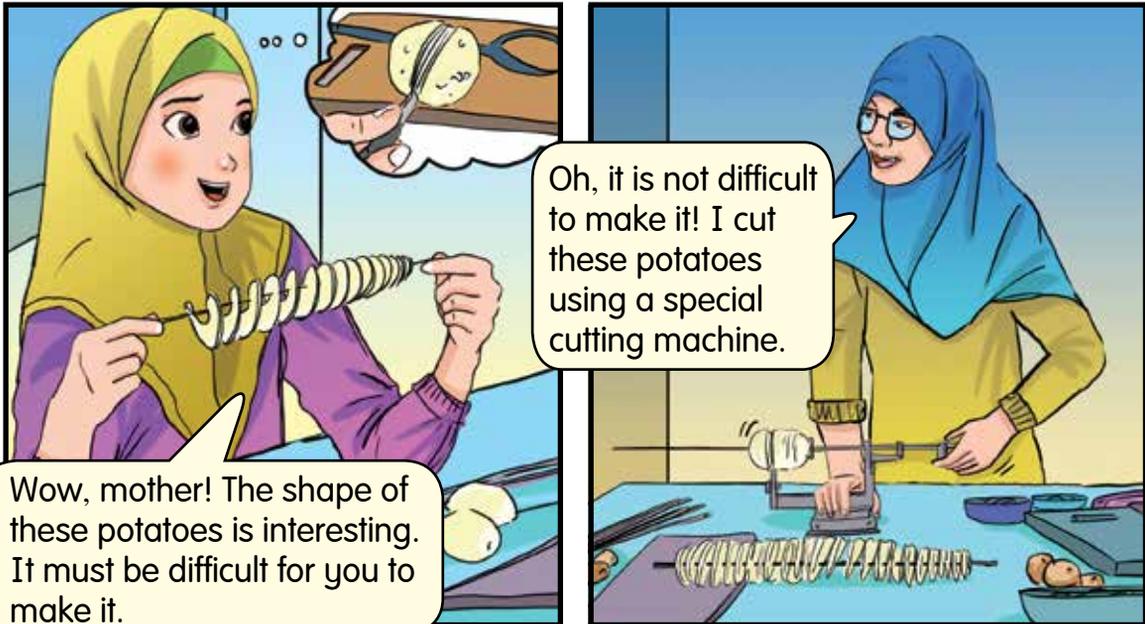


Can screws function if there are no spiral or thread grooves?



THE IMPORTANCE OF INVENTING TOOLS WITH SUSTAINABLE CHARACTERISTICS

The use of tools in many fields help to make our jobs easier and faster in our daily life. Let us follow the story of Ana and her mother to understand the importance of inventing tools with sustainable characteristics.



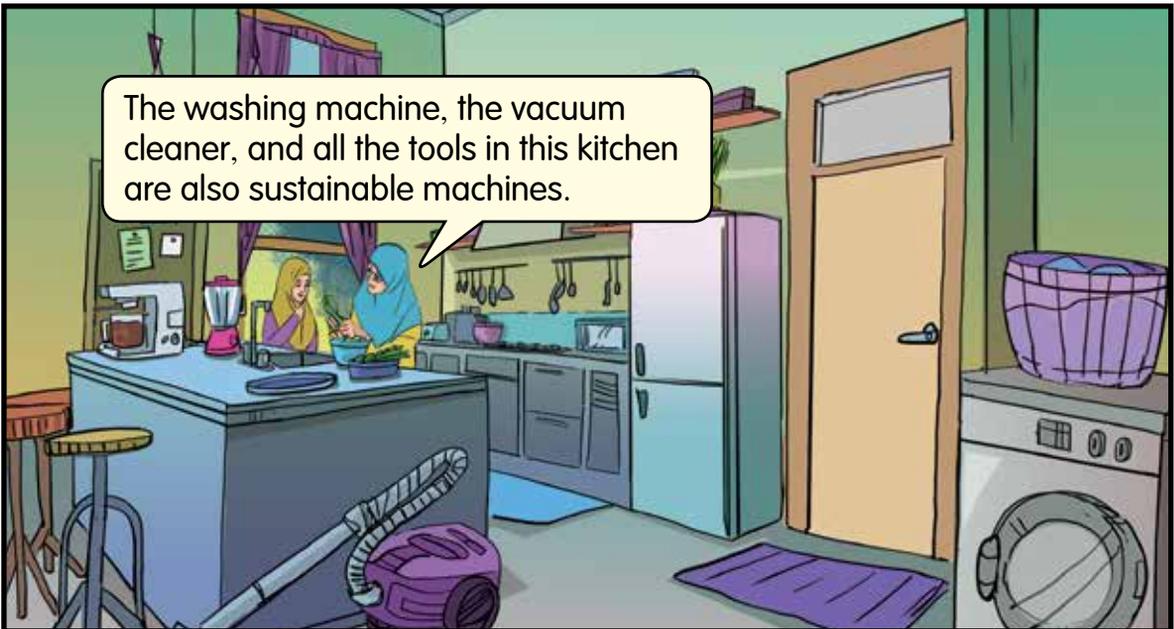
Wow, that's great! That's why you can work quickly.

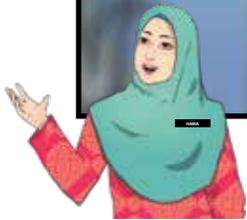


Actually, this grater is a sustainable machine. This machine can simplify work, save time, and is safer to use compared to a knife. Furthermore, it is easy to clean.

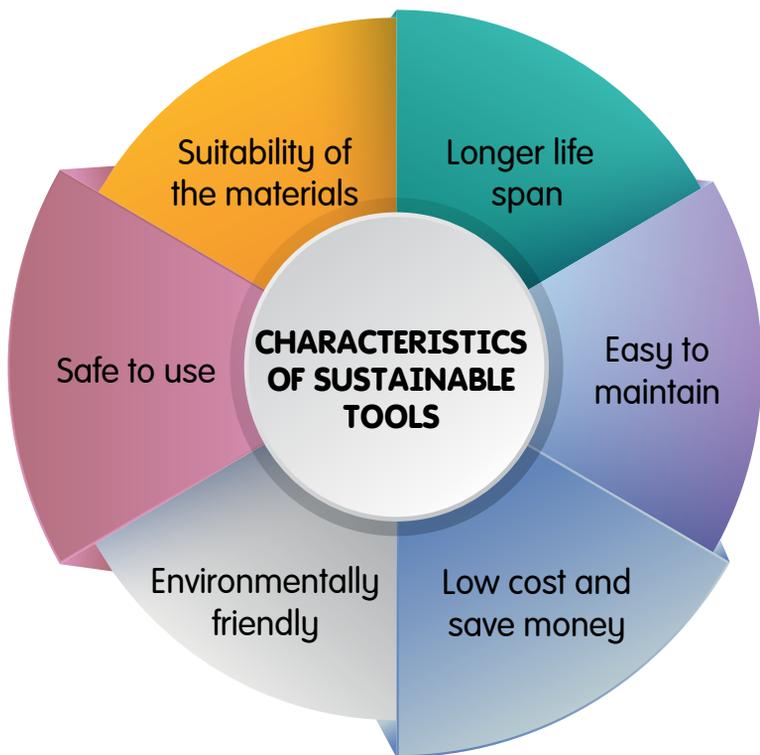


The washing machine, the vacuum cleaner, and all the tools in this kitchen are also sustainable machines.





Every tool that is invented should have sustainable characteristics. What are those characteristics?



The invention of tools with sustainable characteristics is important to make our job easier, faster, as well as save time, cost, and energy.

In any industries, the use of sustainable tools can increase the quantity and quality of product manufacturing.

Industrial products can then be managed more efficiently, faster, and safer with minimal cost.

Let us continue the story of Ana and her mother.

I will buy a new waste bin sometime later.

There's no need, mother! Our waste bin works fine. Besides, this waste bin is big that its inner space can be separated into parts for recyclable materials or compost. It's just the design that needs some improvement.



Based on the characteristics of sustainable tools, help Ana to improve the design of the waste bin.



FUN ACTIVITY

INVENTING A SUSTAINABLE TOOL

21ST
Century
Learning

APPARATUS AND MATERIALS

Marker pens, pencils, coloured pencils, A4 paper, and manila card.

GROUP
ACTIVITY

STEPS

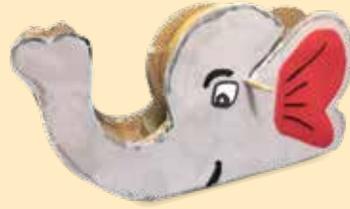
1. Discuss several designs of waste bins.
2. Select the best design and sketch it on the manila card.
3. Discuss the improvements that can be added to the sketch.
4. Present the result of your group's discussion.

- (a) What are the importance of inventing tools with sustainable characteristics?
- (b) Relate the importance of the sustainable characteristics discussed to the design of your waste bin.



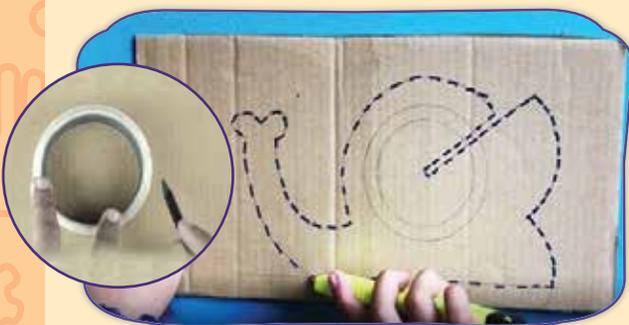
ADHESIVE TAPE CONTAINER

Build an adhesive tape container using adhesive tape, marker pens, small knife, ruler, pencil sharpener, screwdriver, hot glue gun, cardboard, ice cream sticks, and skewer stick.

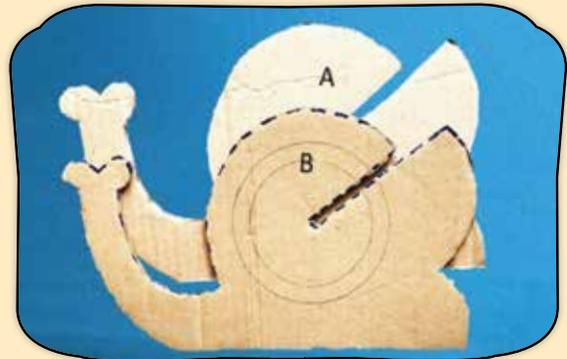


Adhesive tape container

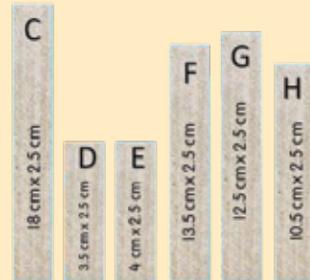
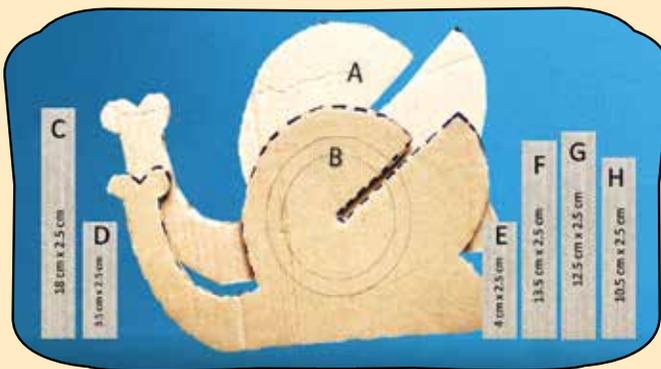
STEPS



1. Sketch a circle on the cardboard based on the size of the adhesive tape. Then, sketch the shape around the circle as shown in the picture.



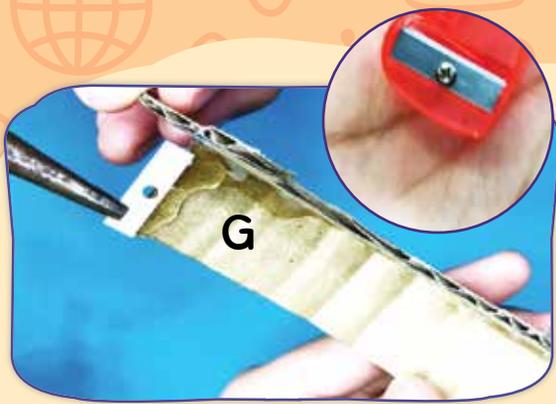
2. Cut the cardboard into two similar shapes. Label them as A and B.



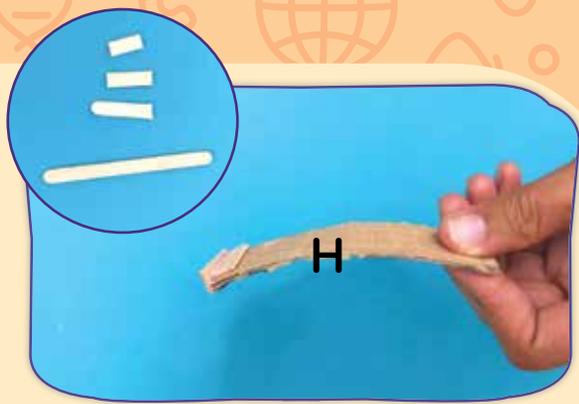
3. Measure sections C, D, E, F, G and H on the cardboard according to the measurements as shown in the pictures. Then, cut each part.



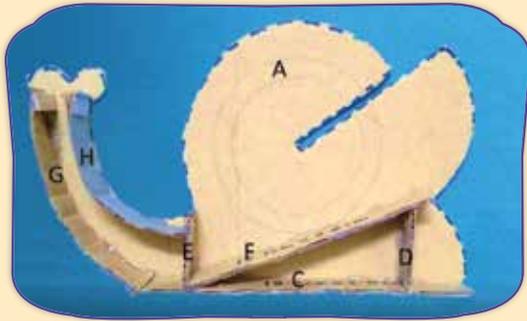
Be careful when using sharp and hot tools.



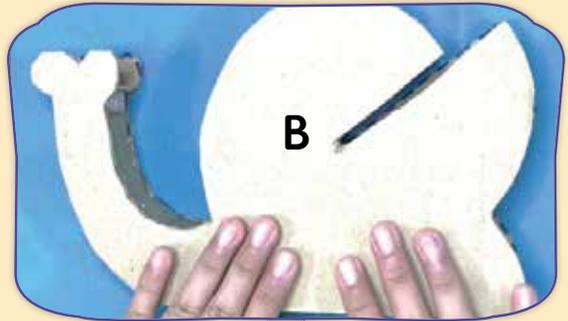
4. Unscrew the wedge from the pencil sharpener using a screwdriver. Paste it onto the end of section G.



5. Paste the ice cream sticks that have been cut into smaller pieces onto the end of section H.



6. Then, paste sections C, D, E, F, G and H onto cardboard A as shown in the picture.



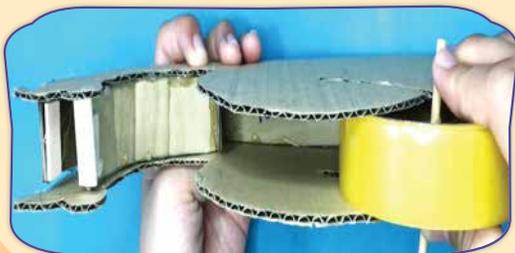
7. Combine cardboard B as shown in the picture.



8. Sketch two circles according to the inner shape of the adhesive tape. Then, cut the circles out and make holes in the middle of the circles.



9. Insert a skewer stick into the middle of both circles. Then, insert the circles into the middle of the adhesive tape.



10. Next, fasten the adhesive tape to the adhesive tape container as shown in the picture.

11. Decorate your adhesive tape container.

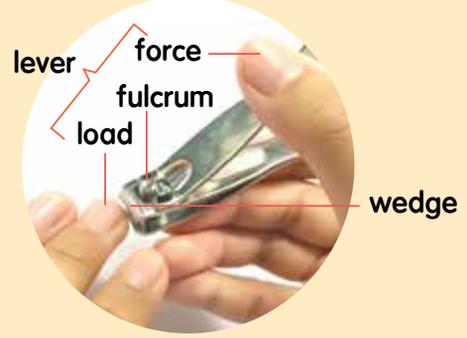


MIND REFLECTION

1. Machines can simplify the daily work of humans.
2. The combination of simple machines in a tool with different functions enables the tool to function well. For example:



mechanical pencil sharpener



nail clipper

3. The characteristics of inventing sustainable tools are as follows:
 - suitability of the materials.
 - longer life span.
 - easy to maintain.
 - low cost and save money.
 - environmentally friendly.
 - safe to use.
4. The invention of tools with sustainable characteristics is important to make our job easier, faster, as well as save time, cost, and energy.



MIND TEST

Answer all questions in the Science exercise book.

1. Match the tools to their correct functions.

making holes

transportation

sucking dust



2. Identify the tools and simple machines as shown in the pictures below:



3. Using two examples of tools, explain the importance of the combination of simple machines in those tools.

4. Which of the following tools is more sustainable to sharpen a pencil? Explain.



mechanical
pencil sharpener



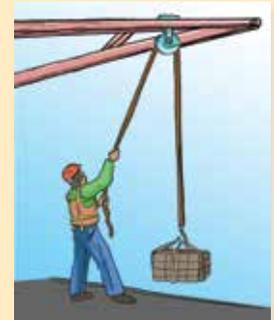
pencil sharpener



knife

5. While lifting heavy packages to a higher place, Amir only uses a simple pulley. After a while, the rope on the pulley broke.

- (a) In your opinion, why did the rope on the pulley break?
(b) Suggest ways for Amir to solve the problem.



6. The picture shows a tool with the combination of several types of simple machines to enable it to function well.

- (a) Identify the tool and the combination of simple machines in it.
(b) What is the importance of the combination of functions in simple machines identified in this tool? Explain.
(c) Name another tool that is more sustainable and has the same function as this tool.



7. The following are two tools with various uses.

- (a) Identify each tool and its sustainable characteristics.
(b) What are the importance of inventing tools with sustainable characteristics? Describe.



ANSWERS AND REFERENCES

Answers

Unit 1 Scientific Skills

Suggested answer for HOTS (page 5)

(Answers are based on the results of the experiment.)

Mind Test (pages 15–18)

- Large logs float on water because they are less dense compared to water.
 - The rate of breathing increases because the body needs more oxygen after exercises.
- The time taken by pupil A is shorter than pupil B.
 - The time taken by pupil A is less than 15 minutes.
- The number of turtles that landed from 2013 to 2015 decreased but started to increase from 2016 to 2018.
 - The number of turtles that landed on 2015 and 2016 are the lowest because the beach in State M was polluted/Because the beach in State M was destroyed due to a natural disaster and was unsuitable for turtle landings.
(Accept all other suitable answers.)
 - 600 turtles.
- Classification features: Function of the tools
 - Stationery – pencil, hole puncher, and stapler.
 - Kitchen utensils – oven mitt, wooden ladle, and kettle.
- K and M are acidic.
 - J is alkaline, K and M are acidic, while L is neutral.
 - Alkali changes red litmus paper to blue./Alkali does not change the colour of blue litmus paper.

- (d) ✓

- The size and height of the sapling increase with the number of days.
- Jupiter.
 - The planet's position from the Sun.
 - The time taken by the planet to revolve completely around the Sun.
 - As the distance of the planet from the Sun increases, the time taken for the planet to revolve around the Sun also increases.
 - The time taken for Planet R to revolve around the Sun is longer because the orbit size of Planet R is larger than the orbit size of the Earth.

Unit 2 Humans

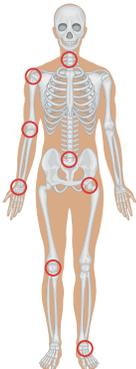
Suggested answer for HOTS (page 25)

The hand has 27 bones. More bones means that there are more joints between the hand bones that enable flexibility of the hands to perform various tasks such as gripping, holding, squeezing, pinching, pulling, pushing, and others.

MIND TEST (pages 46–48)

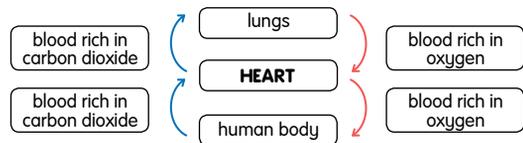
- Skull.
 - Rib.
 - Backbone.
 - Hand bone.
 - Leg bone.

2.



- Joints allow movement and flexibility of the body.
- Pumps blood to the lungs and the whole body.
 - Transports blood throughout the body.
 - Transports oxygen, nutrients, water, and waste products.

5.



- nutrients.
 - waste products.

7. Situation A

When choking on food, the digestive system is disrupted at the oesophagus. Food trapped in the oesophagus will prevent air from entering the trachea. This will make breathing difficult and disrupt the respiratory system.

Situation B

A fractured bone disrupts the skeletal system. At the same time, the arm will be swollen because the blood flow in the blood circulatory system is disrupted.

Situation C

When the heart fails to function, the blood circulatory system is unable to transport blood containing oxygen, nutrients, and water to the whole body. At the same time, all other systems in the body will also fail to function because there is no oxygen and nutrients needed for the systems to function efficiently.

- The habit of eating foods that are high in cholesterol disrupts the blood circulatory system because blood vessels become narrow due to the formation of plaque from the excessive cholesterol in the body.
- Not smoking.
 - Exercise. (Accept any suitable answers.)

Unit 3 Animals

Suggested answer for HOTS (page 53)

Thick and hard skin can protect the animals from being gripped or hurt when attacked by the enemies.

Suggested answer for HOTS (page 54)

Pufferfish often become prey because their predators are not aware of the sharp spines on the pufferfish's bodies before they inflate due to the threat. Pufferfish are also natural prey to sharks and sea snakes. Humans also eat pufferfish as an exotic delicacy after the poison is removed.

Suggested answer for HOTS (page 57)

Predators have their own specific characteristics to protect themselves. Snakes and spiders have venom that can kill their enemies and prey. Eagles have sharp beaks and claws while lions have sharp canines and claws to tear away the meat of their enemies and prey.

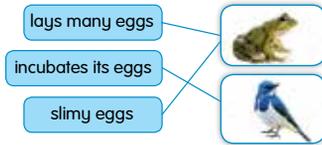
Suggested answer for HOTS (page 59)

The thick layer of fat acts as a heat insulator while the thick fur traps heat in the body. These specific characteristics help to protect the animals from extreme cold weather.

Suggested answer for HOTS (page 65)

Eggs that are not taken care of by their parents have specific characteristics to protect themselves. Mosquitoes lay a lot of tiny eggs that are hidden in the water. Turtles lay a large number of eggs at the beach at night before burying them in the sand.

Mind Test (pages 91–92)

- C.
- (a) Porcupine: sharp spines.
(b) Tortoise: hard shell.
(c) Scorpion: venomous sting.
(d) Moth: patterns that resemble fake eyes on its wings.
- 
- (a) Carry their young in their mouths.
(b) Carry their young in their pouches.
(c) Attack enemies that disturb their young.
- (a) The cat failed to catch the lizard because it only managed to catch the lizard's detached tail.
(b) Detaching its tail.
(c) The lizard detached its tail to deceive the cat.
(d) Octopus.
- Producers are living things that make their own food such as plants.
 - Food chain is the food relationship among living things.
 - Food web is a combination of several food chains.
- (a) $K \rightarrow L \rightarrow O$.
 $K \rightarrow N \rightarrow O$.
 $K \rightarrow M \rightarrow N \rightarrow O$.
 $K \rightarrow J \rightarrow N \rightarrow O$.
(Accept any three answers).
(b) One.
(c) Population N and O are reduced because of the reduced food source.
(d) Main source of energy: the sunlight.
Producer: K.
Consumers: J, L, M, N and O.
(e)
 - K is a plant.
 - L is a herbivore.
 - N is an omnivore.
 - O is a carnivore.
- Food relationship among living things is important to ensure the balance of the nature.

Unit 4 Plants

Suggested answer for HOTS (page 108)

Dispersal by wind enables seeds to be dispersed far away from their parent trees due to the seeds' specific characteristics such as small, lightweight, winged, and have fine hair.

Suggested answer for HOTS (page 110)

The specific characteristics of durians are sweet smell, attractive colour, and edible flesh enable them to attract animals and humans to disperse their seeds.

Mind Test (pages 113–114)

- Yam plant: produces latex.
Citronella plant: bad smell.
Poison ivy plant: fine hairs.
- (a) Specific characteristics: flexible stems and split leaves.
(b) Specific characteristics: thick bark on the stems.
- (a) Okra seed: explosive mechanism.
(b) Burr mallow seed: animals and humans.
(c) Dandelion seed: wind.
(d) Lotus seed: water.
- (a) Edible flesh and attractive colour of the fruit.
(b) Animals and humans.
- (a) Water: coconut.
(b) Animals and humans: rambutan. (Accept any suitable answers.)
(c) Explosive mechanism: balsam seed.
(d) Animals and humans: burr mallow seed.
(e) Wind: angsana fruit.

Unit 5 Electricity

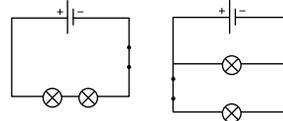
Suggested answer for HOTS (page 124)

The bulbs that are arranged in the parallel circuit will light up brighter than the bulbs that are arranged in the series circuit even though there are more bulbs in the parallel circuit. The brightness of the bulbs in the parallel circuit is the same even though the number of bulbs increases because the amount of electricity that flows in every path is the same. Whereas, the brightness of the bulbs in the series circuit decreases if the number of bulbs increases because all of the bulbs share the same amount of electricity in one path.

Mind Test (pages 142–144)

- Sources of electrical energy are solar cells, dry cells, dynamos, accumulators, generators as well as power plants that use wind, waves, and hydroelectric.

- (a)



- The bulbs in the parallel circuit are brighter because the parallel circuit has more than one path for the electric current to flow. Therefore, the total amount of electricity that flows through each path is the same.

- (c)

Circuit	Series	Parallel
Arrangement of bulb	Arranged in a chain	Arranged in several branches parallel to each other

- (a) Number of dry cell.
(b) Bulbs in Circuit C → bulbs in Circuit B → bulbs in Circuit A.
(c) There is no difference because a parallel circuit has more than one path for the electric current to flow and has the same amount of electrical energy that flows through each path.
- Increase the number of dry cells.
 - Decrease the number of bulbs.
- (a) All bulbs do not light up.
(b) All bulbs do not light up.
(c) Only bulbs M_1 , M_2 , and M_4 light up. Bulb M_3 does not light up.
- Switch off electrical appliances when not in use.
 - Switch off the lights when sleeping.
 - Use a fan to cool the room.
 - Replace fluorescent lamps with LED lamps or compact fluorescent lamps.
- (a) The pupil can get electrocuted.
(b) Touch switches or electrical appliances with dry hands.
(c)
 - The switch must be turned off before removing the plug from the socket.
 - Connect only one plug to one socket.

Unit 6 Heat

Suggested answer for HOTS (page 149)

- (a) Food thermometer: measures temperature of food being cooked.
 (b) Clinical thermometer: measures body temperature of humans.

MIND TEST (page 162)

- (a) Heat is a form of transferable energy due to the difference in temperature.
 (b) Temperature is the degree of hotness or coldness of a material.
- (a) 0°C. (b) 100°C.
- (a) Ravi's key gains heat from the surrounding.
 (b) Ana put the bottle of hot milk in a container filled with tap water to allow it to lose heat to the environment.
- (a) Decrease. (b) Increase.
 (c) 100°C. (d) At the 25th minute.
 (e) At the 15th minute. (f) When water gains heat, its temperature increases and when water loses heat, its temperature decreases.

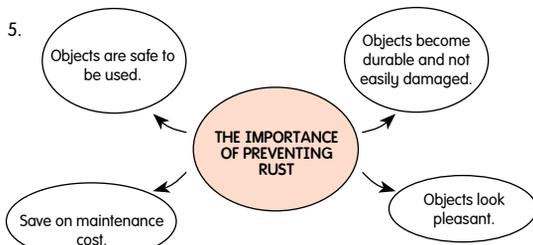
Unit 7 Rusting

Suggested answer for HOTS (page 172)

The spoons that are used in our houses do not rust because they are plated with stainless steel.

Mind Test (pages 175–176)

- (a) Iron rod rusts while plastic and wooden rods do not rust.
 (b) Objects made of iron will rust.
- (a) The objects are rusty.
 (b) Reddish-brown colour, rough surface, brittle.
 (c) Presence of water and air cause the object to rust.
- The rust on the bicycle chain that is made of iron can be prevented by applying oil or grease to prevent the chain from being exposed to water and air.
- (a) The needles in test tubes A and D are rusted because they are exposed to water and air.
 (b) The needles in test tubes B and C are not rusted because they are not exposed to water and air.
 (c) Objects made of iron rust when they are exposed to water and air.



(Accept any other types of thinking map.)

Unit 8 Matter

Suggested answer for HOTS (page 187)

When Mr Borhan gets out of his car, the water vapour from outside of the car hits the cooler surface of the lenses. The condensation process occurs when water vapour loses heat to the glasses and becomes water droplets.

Suggested answer for HOTS (page 193)

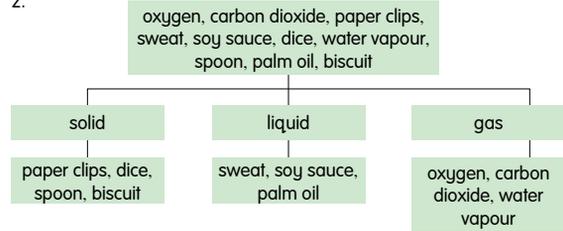
Natural water cycle supplies water for crops, as well as food and water for humans and animals.

Suggested answer for HOTS (page 194)

If the water evaporated from the surface of the Earth does not fall as rain, there would be very little water on the Earth, a lengthy drought, and plants would die. Then, animals and humans would also die.

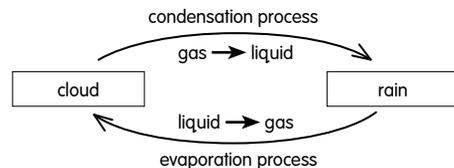
MIND TEST (pages 197–198)

- (Accept the pupils' answers regarding matter in solid, liquid, and gas states)
-



- (a) Water has a fixed mass and volume as well as occupy space. Water has no fixed shape.
 (b) Ice has fixed shape, mass, and volume. Ice also occupies space.
- (a) (i) Solid and liquid.
 (ii) Ice undergoes melting process to become water.
 (b) (i) Liquid → gas.
 (ii) Boiling process.
 (iii) The liquid gains heat and becomes gas.
- (a) Melting process: solid → liquid.
 (b) Evaporation process: liquid → gas.
 (c) Condensation process: gas → liquid.
 (d) Boiling process: liquid → gas.
 (e) Freezing process: liquid → solid.
- (a) Liquid → gas.
 (b) Evaporation process.
 (c) This process occurs when the water gains heat and becomes water vapour.

7.



Unit 9 Phases of the Moon and Constellations

Suggested answer for HOTS (page 205)

If the Moon emits its own light, it will always shine and the phases of the Moon will not happen because they depend on how much surface of the Moon is lit up by the Sun as it revolves around the Earth.

MIND TEST (page 216)

- (a) Phases of the Moon.
 (b) This phenomenon occurs because the Moon revolves around the Earth.



- (d) Observation: Half-moon.
 Reason: Half-moon occurs when half of the Moon that is lit up faces the Earth.

- (e) The full moon phase occurs in the month of Ramadan because a full moon always appears on the 14th, 15th or 16th of each lunar month.

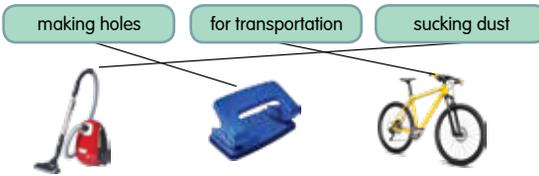
- (a) Shows the direction of north.
 (b) Orion, Southern Cross, and Scorpion constellations.

Unit 10 Machines

Suggested answer for HOTS (page 222)

The screw cannot function because it functions as a fastener for two parts of an object. Without the spiral or thread grooves, it would be difficult to tighten or remove the screw.

Mind Test (pages 224–230)



2. (a) Pruning shears – lever, screw, and wedge.
(b) Doorknob – lever, wheel and axle.
(c) Bottle cap – lever and screw.

3. Example 1:

A bicycle has screws, wheels and axles as well as gears for it to function efficiently. Screws are used to fasten the different parts of the bicycle. The wheels and axles are used to ease the movement of the bicycle while the gears help to change the bicycle's speed.

(Accept any suitable answers.)

Example 2:

A mechanical pencil sharpener has wheel and axle as well as a wedge. Wheel and axle are used to rotate the handle. The wedge is used to sharpen the pencil.

(Accept any suitable answers.)

4. The mechanical pencil sharpener is more sustainable because the combination of wheel and axle as well as a wedge enables it to function better, easier, and safer to use.
5. (a) The rope on the pulley broke because the load is heavier than the size of the rope and the number of pulleys used.
(b) Use a bigger rope or increase the number of pulleys so that a smaller force is needed to lift the load.
6. (a) Hand drill - wedge, screw, wheel and axle.
(b) Without screws, the hand drill cannot be assembled. The wheel and axle enable the handle to be rotated easier for the wedge to function. The wedge is used to make holes. The combination of simple machines in the hand drill make it works efficiently.
(c) Electric drill. (Accept any suitable answers.)
7. (a) Ploughing machine – saves time, cost, and energy.
Aeroplane – saves time and energy.
(b) Sustainable tools are important in making work easier and saving time, cost, and labour. Sustainable tools also increase the quality of life as they last longer, technologically advanced, and environmentally friendly.

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