

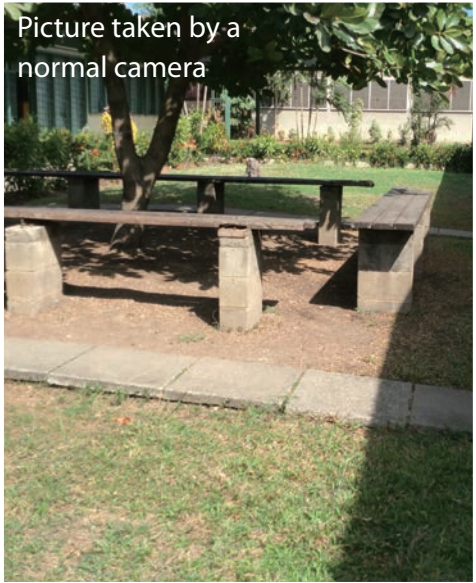
Chapter 11

Heat



Let's compare this image taken by 'thermography camera' with the picture on the right.

Red coloured areas show the areas of higher temperature and blue coloured area shows the areas of lower temperature.



Picture taken by a normal camera

11.

Properties of Heat

Lesson 1 What is Heat?

When we are outside, cold wind makes our body cold. Then we might make a fire so that the fire will make our body warm.



What makes objects hot or cold?



Activity : Making something hot or cold

What We Need:

➔ cup of warm water, ice cubes



What to Do:

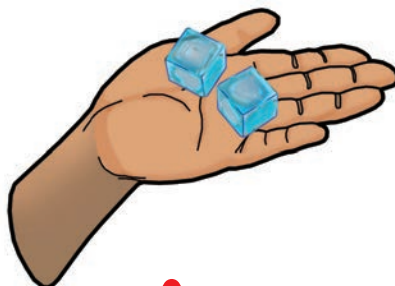
1. Draw a table like the one shown below.

	How do you feel?	Does your palm become warm or cold?
Place an ice cube on your palm		
Hold a cup of warm water		

2. Place an ice cube on your palm. Record in the table how your palm feels and whether your palm becomes hot or cold.

3. Hold the cup of warm water in both palms. Record in the table how you feel and whether your palms become hot or cold.

4. Share your findings with your classmates.



Do not use hot water.

Why does your palm feel cold when you hold an ice cube?



Result



Your palm becomes cold when you place an ice cube on it.



Your palms become warm when you hold a cup of warm water.

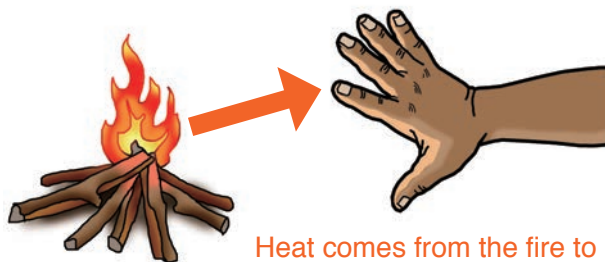
Summary

Heat is a form of energy. We feel heat energy as heat. Heat always moves from warmer objects to cooler objects. For example, we feel warm when we are close to a fire because heat comes from the fire to us.

Why does our palm become cold when we hold an ice cube? This is because heat moves from our palm to the ice cube. In other words, your palm loses heat, while the ice cube gains the heat.

On the other hand, our palm becomes warm when we hold a cup of hot water. This is because heat moves from the cup of hot water to our palms.

Why doesn't your palms become warm when you hold an ice cube?



Lesson 2 Sources of Heat

Burning wood gives off heat that makes our body warm.



What are the sources that produce heat?



Activity : Find sources and the ways they produce heat

What to Do:

1. Draw a table like the one shown below.

Sources that produce heat	The ways that produce heat
wood	burning the wood

2. Write the names of things that produce heat and how they produce heat.
3. Share your ideas with your classmates. Discuss the sources of heat and the ways they produce heat.



Do you remember how you made fire by using the magnifying lens?



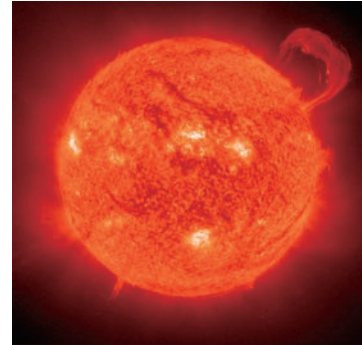
You eat food every day to get energy and keep your body warm. How does your body use food?

Summary

There are many kinds of sources of heat such as; the Sun, electrical appliance and fire wood. These heat sources basically change energy such as electrical energy and chemical energy into heat energy. The following are some examples of sources of heat.

The Sun

We feel warm or hot when we stand in a sunny place. This is because the Sun gives off heat energy.



Electrical Appliance

When we cook food we might use an electrical cooker. It can produce heat by changing electrical energy into heat energy.



Rubbing Your Hands Together

When we rub our hands together they get warm. This is because friction between the two hands produce heat energy.



Burning Wood

When wood is burnt, the chemical energy stored in the wood changes to heat energy.



Eating Food

Our body temperature is normally kept between 36 °C to 37°C. It means our body is also producing heat. How can our body produce heat? Our body changes food we eat into heat energy.



Lesson 3 Uses of Heat

We use heat in many ways. How do we use heat in our daily lives?

? What is heat used for?

🔍 Activity : What can heat do?

What to Do:

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

What is heat used for in your daily life?	What is heat used for in factory and thermal power plant?

2. List what heat can do in our daily lives.
3. Refer to the pictures below and list how heat is used in factories and plants to make our daily lives convenient.
4. Share your ideas with your classmates.

Let's guess what heat can do in factories and plants.



Summary

We use heat for many purposes in daily lives.

Making things warm

Heat is used to warm your body on a cold morning. Heat can make things warm.

Causing a change in matter

Heat is used to cook food such as boiling water and frying eggs. When a lot of heat is added, even metal will melt. In a car factory, heat is used to melt metal so that it can be shaped to build cars.

Generating electricity

At a thermal power plant, heat is used to generate electricity which is used in our daily lives.



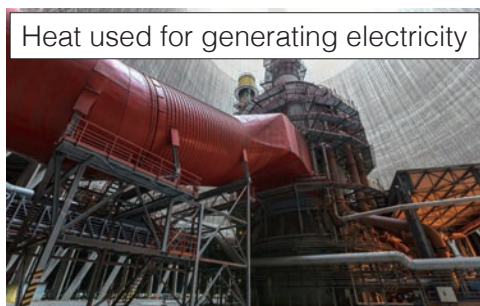
Heat used for making things warm



Heat is used for cooking



Heat is used for boiling water



Heat used for generating electricity



Heat is used for melting steel



Try it!

How does a refrigerator work to keep food cold?



Does 'coldness' move to food?

We studied that 'heat' can move from a warm place to a cold place.



Refrigerator can take heat away from food. The food inside the refrigerator loses its heat so that it can keep cold. Where does the heat go? The heat goes away from the refrigerator into the air.

Lesson 4 Temperature

We shiver when it is cold and sweat when it is hot. What is the temperature outside? How can we measure the temperature?

? What is temperature?



Activity : Measuring temperature

What We Need:

- ➔ thermometer, warm water, cold water



Do you remember how to use a thermometer?



What to Do:

1. Draw a table like the one shown below.

	Your prediction (°C)	Temperature (°C)
Warm water		
Cold water		
Mixture of cold and warm water		

2. Predict the temperatures of warm water, cold water and record your predictions in the table.
3. Place the thermometer in warm water. Observe how the liquid in the thermometer changes and measure the temperature.
4. Repeat Step 3 using cold water.
5. Mix warm and cold water. Predict the temperature of the mixture and repeat Step 3.
6. Based on your results, think about the following questions:
 - (1) How does the liquid in the thermometer change?
 - (2) What is the relationship between hotness, coldness and temperature?
7. Share your ideas with your classmates.



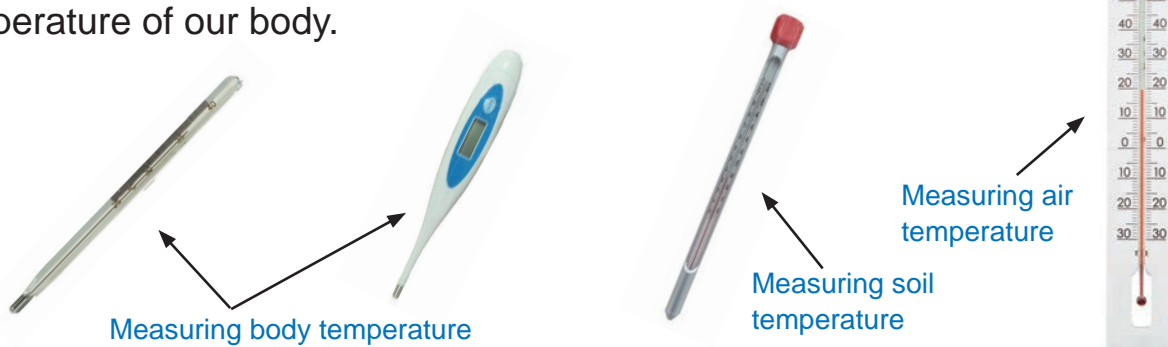
Summary

Temperature and heat are related to each other but they are different. Heat is the form of energy that is transferred from hot area to cold area.

Temperature is a measure of how hot or cold matter is. In other words, it is a measure of heat.

Temperature can be measured using a **thermometer**. A thermometer consists of a glass tube filled with a liquid, usually alcohol or mercury. The hotter the temperature, the higher the liquid rises in the tube. When it is cold, it moves down. There are several kinds of thermometers. Some thermometers measure the temperature of air and some measure the temperature of our body.

Do you have any ideas on what temperature is measured using thermometer?



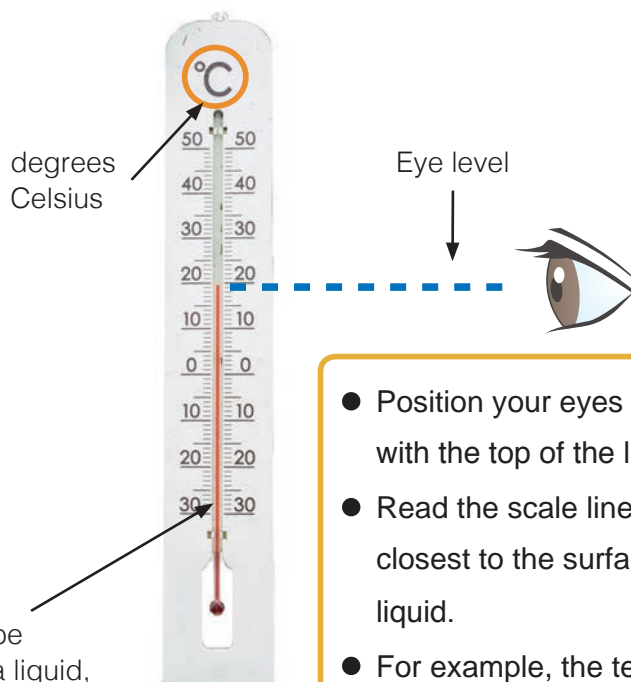
Measuring body temperature

Measuring soil temperature

Measuring air temperature

Different types of thermometer

Temperature is measured in units called degree. A thermometer shows **degrees Celsius ($^{\circ}\text{C}$)**. Celsius is the most common temperature scale in the world. The scale sets the freezing point of water at 0°C and the boiling point of water at 100°C .



degrees Celsius

Eye level

A glass tube filled with a liquid, alcohol

- Position your eyes at the level with the top of the liquid.
- Read the scale line that is closest to the surface of the liquid.
- For example, the temperature on the thermometer is 20°C .

Properties of Heat

- Heat energy moves from warmer places to cooler places.
- Heat energy never travels from cool objects to warm objects.



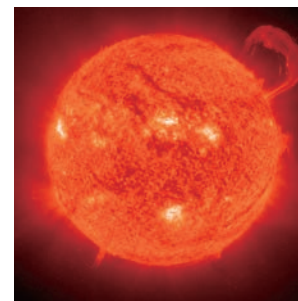
Heat moves from the cup to the palms

Source of Heat

- Examples of sources of heat energy are the Sun, electrical appliances, burning wood, eating food and friction.
- Some forms of energy can be changed to produce heat energy.

Example:

1. Sunlight is changed to heat energy.
2. Electricity is changed to heat energy.
3. Chemicals in food and wood are changed to heat.
4. Rubbing of two objects cause friction to produce heat energy.



Sun is a source of heat

Use of Heat

- Heat is used to make things warm, to boil water and fry eggs and to melt metal to build cars.
- Heat is used to generate electricity at a thermal power plant for our daily lives.



Heat used to melt steel

Temperature

- Temperature is the measure of how hot or cold matter is.
- Temperature is measured in units called degrees Celsius ($^{\circ}\text{C}$).
- Thermometer is the instrument used to measure temperature.
- Thermometer consists of a glass tube filled with a liquid alcohol or mercury.

Q1. Complete each sentence with the correct word.

- (1) A form of energy that moves from warm to cool places is _____.
- (2) A measure of how hot or cold something is called _____.
- (3) The boiling point of water is _____ degrees Celsius.

Q2. Choose the letter with the correct answer.

- (1) Which sentence is not true about heat energy?
 - A. Heat can only move from warm to cool place.
 - B. Heat energy can be felt as warmness.
 - C. Heat moves from cool to warm place.
 - D. Heat can change states of matter.

- (2) What does a thermal power plant provide for our daily use? It provides
 - A. light energy.
 - B. sound energy.
 - C. heat energy.
 - D. electricity.

Q3. Answer the following questions.

- (1) What is the instrument used to measure how hot or cold an object is?
- (2) How is fire used in daily life? Give two examples of how fire is used as heat energy.
- (3) Give two sources of heat energy.

Q4. Our hands become cold when we hold a cold drink, ice block or an ice cube. Why do our hands become cold when we hold cold things for sometime?

11.2

Heat Transfer

Lesson 1

Heat Transfer 1: Conduction

Heat moves from warmer to cooler places. When you cook food using a frying pan with the burner, the food gets hot. How does the heat from the burner transfer to the food on the frying pan?



How does heat transfer?



Activity : Melting margarine on a spoon

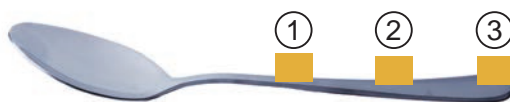
What We Need:

- ➔ a metal spoon, margarine, a cup of hot water (~60°C)

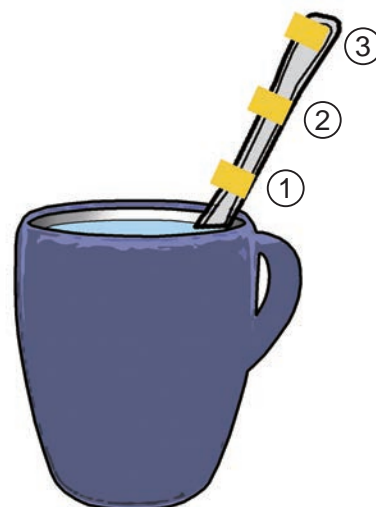


What to Do:

1. Place three small pats of margarine on the spoon handle at equal distances.
2. Predict what will happen to three pats of margarine at these three spots. Record your predictions in your exercise book.
3. Place the metal spoon into hot water and observe the three pats of margarine.
4. Record your observations in your exercise book.
5. Share your results with your classmates.



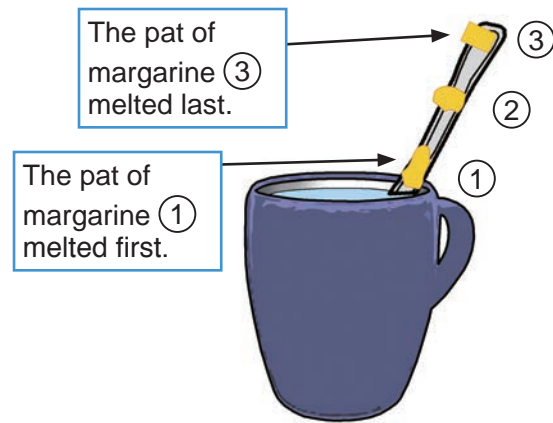
How is the heat from hot water transferred?



Be careful when you touch the spoon in the cup of hot water because it will be hot.

Result

We found out that the pats of margarine on a spoon handle melted in the order of ①, ② and ③.



Discussion

Think about the following questions based on your results.

1. What is the source of heat in this activity?
2. Which pat of margarine is closest to or furthest from the source of heat?
3. Why did the pats of margarine on the spoon handle melted in the order of ①, ② and ③?

How did heat move through the spoon?



Summary

The transfer of heat from one place to another through matter is called **conduction**. Conduction occurs mainly in solids. Heat is transferred from warmer places to colder places through conduction until they are both at the same temperature.

For example, in the activity, heat from the hot water is transferred to one end of the spoon by conduction and the heat is gradually transferred to the cold end of the spoon. The spoon in a cup of hot water becomes warmer. When we cook food, heat from the burner is transferred to the bottom of the pan through conduction. The heat is transferred throughout the pan and into the food. So, the pan and the food become warmer and hotter.

1. Heat in hot water is transferred to the spoon by conduction.



2. Heat spreads to the cold end of the spoon.

Conduction



Cooking is an example of conduction.

Lesson 2

Heat Transfer 2: Convection

Conduction occurs mainly in solids. How about liquids and gases? What type of heat transfer would occur in liquids and gasses?



How does heat transfer in liquids and gases?



Activity : Observing how warmed water moves

What We Need:

- transparent plastic cup, water, dye, candle, dropper or straw



What to Do:

- Predict how heat is transferred in water and record your predictions in your exercise book.
- Put some drops of dye at the bottom of water in a plastic cup using a dropper or a straw as shown in the picture on the right.
- Bring the cup close to a flame and heat the cup of water at the spot where you put some drops of dye. Keep it more than 3 cm away from the top of the flame.
- Observe and sketch how the dye moves inside the cup.
- Share your results with your classmates. Discuss how heat is transferred in water.



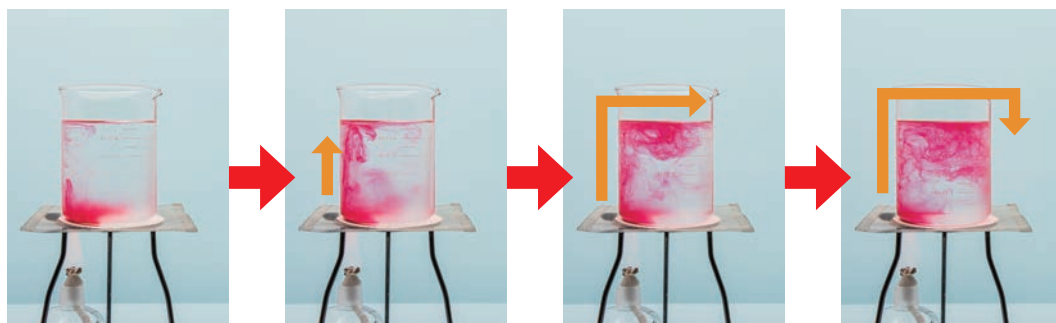
Hold the plastic cup as shown in the picture when heating the cup to avoid getting burnt.



A dye makes it easier to observe the movement of heat in the water.



Result



How is the transfer of heat in liquid different from conduction?



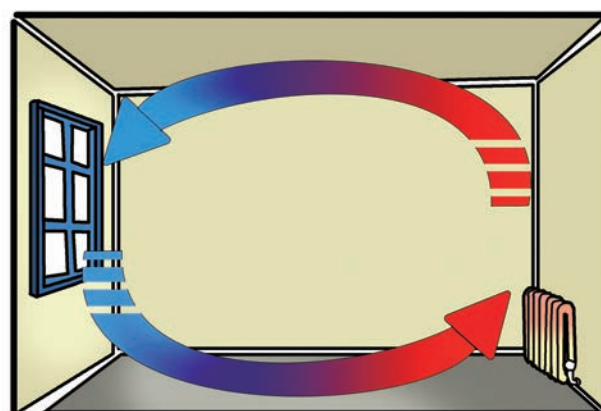
We found out that when we heated water, the warmed part of water rises upward. Water near the surface of water went down. This process continues until all the water in the cup was heated.

Summary

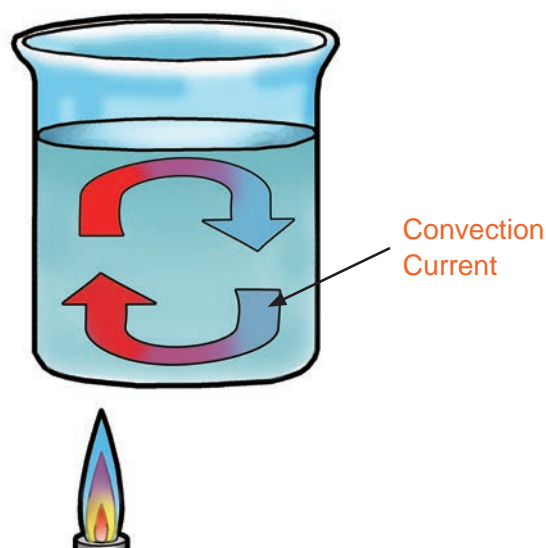
The transfer of heat through liquids and gases such as water and air is called **convection**. Convection occurs when heat is transferred by the movement of liquids or gases.

For example, the picture on the right shows the convection of air. Air is warmed by the stove and the warm air rises. As the air cools, it goes down. The cool air is warmed by the stove again and rises. This process continues until all the air in the room has been heated.

The movement of water or air created by the process of convection is called **convection current**.



Convection of air



Convection Current

Heat is transferred in liquids through convection.

Lesson 3 Heat Transfer 3: Radiation

When we stand in the sunlight, we feel the warmth of the Sun. Why are we warmed by the Sun even though it is millions of kilometres away in space?

? What is another way of heat transfer?

Activity : Inferring how heat transfers

What to Do:

1. Draw the table below:

Situation	Is heat transferred?	Why did you choose the option?
(1) Heat from a fire to people		
(2) Heat from the Sun to the Earth		

2. Study the pictures below in situations (1) and (2).
3. Think about how heat is transferred from a heat source and choose the best choice from the options: a) conduction, b) convection and c) other ways.
4. Write down your choice in the table with your reasons.
5. Share your ideas with your classmates. Discuss how heat is transferred in each situation.

Do you remember how heat is transferred by conduction and convection?



(1) Heat from a fire to the people.

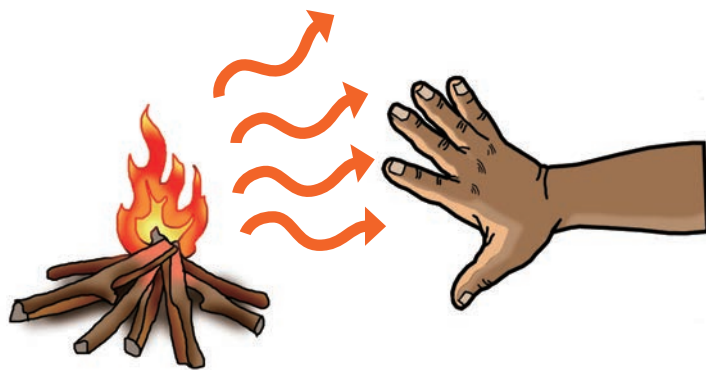


(2) Heat from the Sun to the Earth.

Summary

The transfer of heat in the form of waves through air or empty space is called **radiation**.

When we are near a fire, we receive and absorb radiation from the fire. Then we feel the warmth.



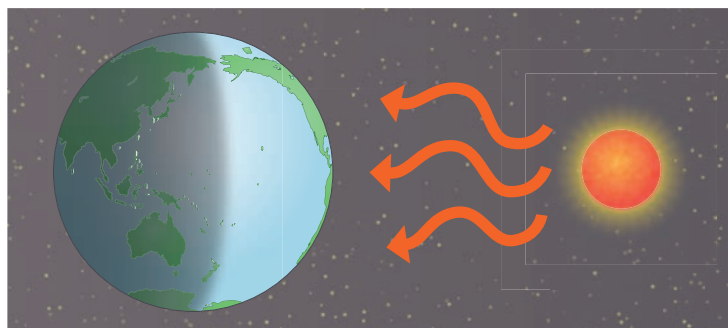
Radiation from the fire.

Both conduction and convection need matter such as solids, liquids and gases to transfer energy but radiation does not require matter.

There is no air in the space.

The Space is an empty space.

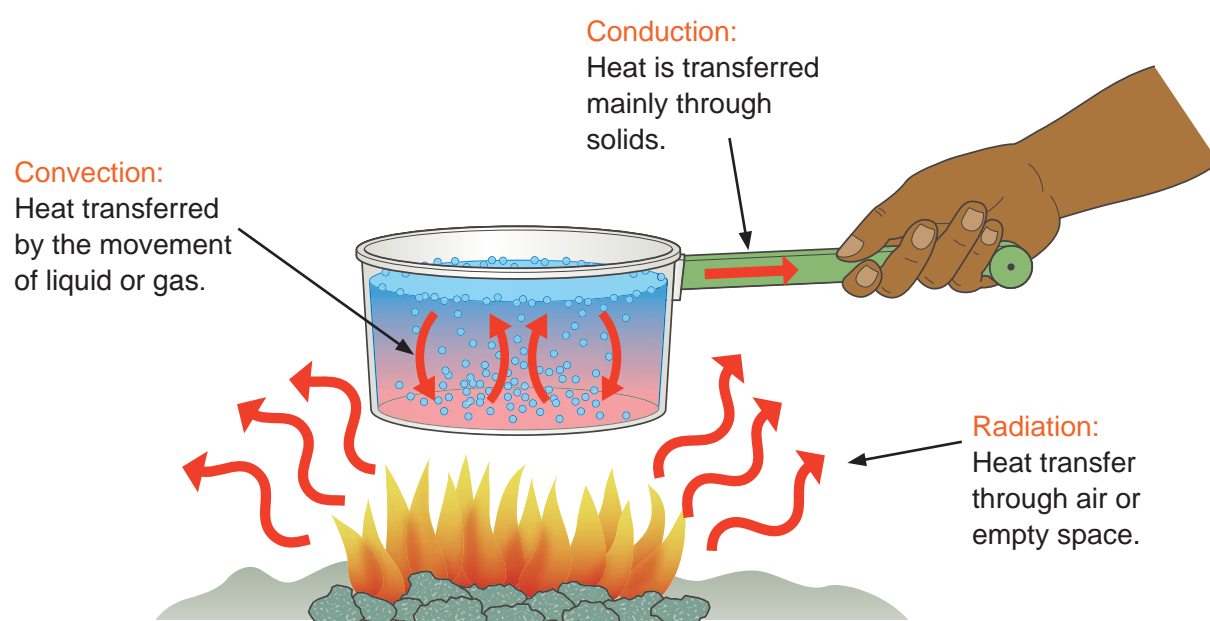
The Sun give off heat. The heat is transferred through space to the Earth by radiation.



The heat is transferred through empty space.

Heat can be transferred in

three ways: conduction, convection and radiation. The following diagram shows an example of the three ways in which heat is transferred.



Three ways of heat transfer.

Heat Transfer

- ☑ Three ways of heat transfer to receive or give off heat are; conduction, convection and radiation.

(1) Conduction

- ☑ Conduction is the transfer of heat from one place to another through matter.
- ☑ Heat is transferred from warmer places to colder places through conduction until they are both at the same temperature.

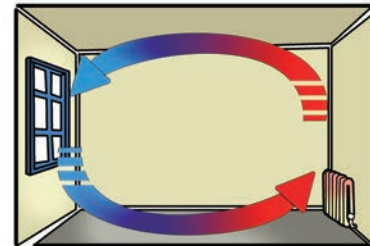
Example: Heat from the burner is transferred to the pan. The heat is transferred throughout the pan and into the food.



(2) Convection

- ☑ Convection is transfer of heat through liquids and gases such as water and air.
- ☑ Convection occurs when heat is transferred by the movement of liquids or gas

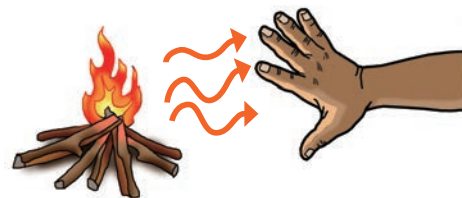
Example: Air is warmed by the stove and the warm air rises and as the air cools it moves down. The cool air is warmed again by the stove and rises. This process continues until all the air in the room has been heated.



(3) Radiation

- ☑ Radiation is the transfer of heat in the form of waves through air or empty space.

Example: We receive and absorb radiation when we are near the fire. This makes us feel warm.



Q1. Complete each sentence with the correct word.

- (1) The transfer of heat through liquids and gases is called _____.
- (2) Heat from the Sun travels through space and reaches the Earth by _____.
- (3) The transfer of heat from one place to another through matter is called _____.

Q2. Choose the letter with the correct answer.

- (1) When you put a metal spoon into the hot water, the spoon gradually becomes warm. Which type of heat transfer is occurring?
 - A. Conduction
 - B. Absorption
 - C. Radiation
 - D. Convection

Q3. Answer the following.

- (1) When you sit near a fire you can feel the heat. What type of heat transfer is this?
- (2) Study the picture on the right. Water in the pot is heated by the fire. Draw an arrow on the picture to show how the heated water moves by convection.



- Q4. Study the picture of the frying pan on the right. Infer the reason why the pan has a handle, using the word 'conduction'.



Chapter 11

•Science Extras•

How is heat produced? Can heat be absorbed?

What do you notice when lighting a candle? The beginning energy causes oxygen and wax to react which produces carbon dioxide, water and heat. When you put a laundry detergent powder in your hand and add water you can feel the heat. This type of change gives off heat.

There are changes that give off heat while other changes take in or absorb heat. Changes that release energy into the environment in the form of heat cause the reaction products and its surroundings to become hotter. It feels warm or hot or may even explode. Some examples of heat been given off are; lighting a match and burning wood.

Heat can also be taken in or absorbed. It is a change in which heat energy is absorbed from its environment. The absorbed energy provides the beginning energy for the change to occur. An example of heat taken in includes dissolving salt. When salt is dissolving into water, the temperature of the water decreases. Other examples include melting ice cubes and evaporating liquid water.

An example of change in which heat is given off.



A burning candle

Examples of change in which heat is taken in.



Dissolving salt



Melting ice cube

Chapter Test

11. Heat

Q1

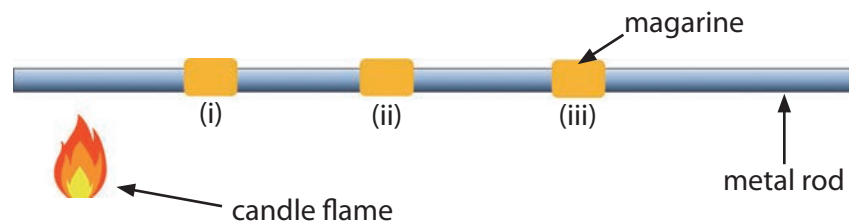
Complete each sentence with the correct word.

- (1) We feel warm when we are near a fire because _____ energy from the fire is transferred to us.
- (2) The transfer of heat mostly in liquids and gases is called _____.
- (3) The transfer of heat by _____ occurs mainly in solids.
- (4) The measure of how cold or hot an object is called _____.

Q2

Choose the letter with the correct answer.

- (1) Which is not a source of heat energy?
 - A. A lit kerosene lamp
 - B. Cooling a metal with water
 - C. Burning a wood
 - D. Burning newspapers
- (2) What is radiation? It is the transfer of heat
 - A. in a form of waves through air or an empty space.
 - B. by movement of liquid and gases.
 - C. through one solid to another that are touching.
 - D. that occurs in solid only.
- (3) Placed at different parts of the metal rod were pats of margarine at (i), (ii) and (iii). What is the correct order of the pats of margarine that would melt when heated as shown below?

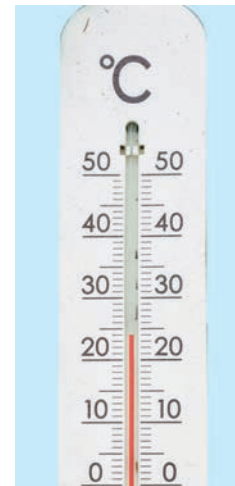


- A. (i) → (ii) → (iii)
- B. (ii) → (iii) → (i)
- C. (iii) → (i) → (ii)
- D. All places at the same time

Q3

- (1) Study the diagram on the right.
- (i) What is this instrument? _____
- (ii) What is the unit used in this instrument?

- (iii) What is the reading shown on the instrument?



- (2) Study the diagram below. The hot cup of tea is held by hand and cold metal spoon dipped in the tea.
- (i) Identify the object losing heat and gaining heat in the picture.

Example	Object that is losing heat	Object that is gaining heat
<p>Hot tea</p> <p>Spoon</p> <p>Cup</p> <p>Hot cup of tea</p>		

- (ii) How does the heat move from one part of the object to another in the picture?

Q4

Moses says that ice cube cools a drink because the cold from the ice gets into the drink. Evaluate his statement and explain your idea.

Science Tool Box

1. How to use a Thermometer

2. How to use a Compass

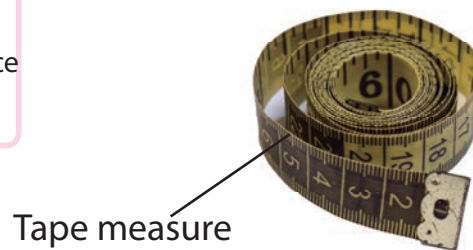
3. How to use a Tape measure

4. How to make a Beam balance

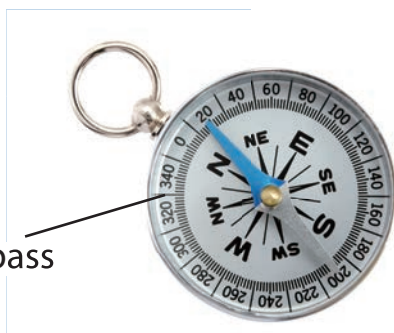
5. How to read a Bar Graph



Let's check and learn how to use the science tools here.

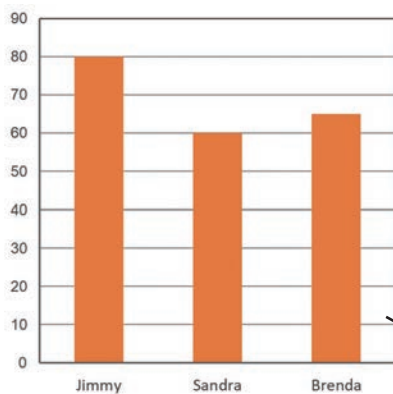


Tape measure

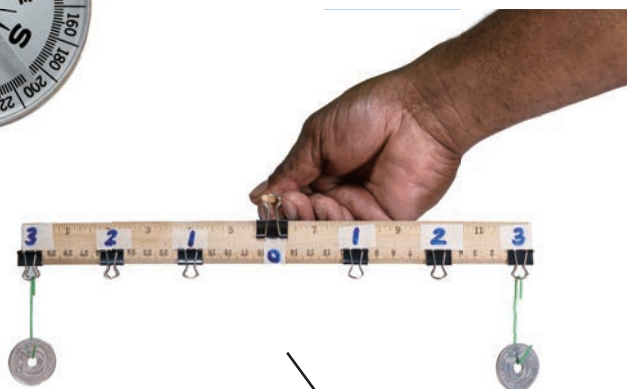


Compass

Thermometer



Bar Graph



Beam balance

How to use a Thermometer

1. What is a thermometer?

A thermometer is an instrument used to measure temperature. A thermometer consists of a glass tube with marks on it. When the liquid in the glass tube is heated, it expands and begins to rise up the tube. Temperature is measured in degree Celsius [$^{\circ}\text{C}$].



2. Measuring temperature

STEP 1:

Place the bulb in the place where you want to measure the temperature. Make sure that there are no bright lights or direct sunlight shining on the bulb.

STEP 2:

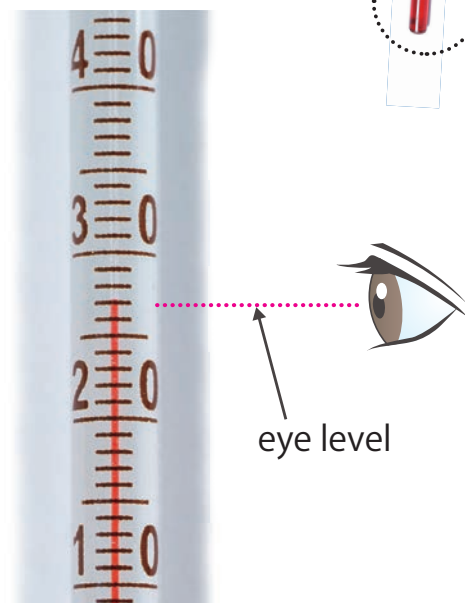
Wait for a few minutes until the liquid in the tube stops moving. Position your eyes at the same level with the top of the liquid in the tube.

STEP 3:

Read the scale line that is closest to the top of the liquid. The thermometer as shown on the right shows 27°C .

Thermometer

bulb



How to use a Compass

1. What is a compass?

A compass is an instrument used for finding directions (North, South, East and West). It has a dial and a magnetic needle that always points to the north/south. This helps you to locate your position on a map and to set the direction you wish to travel.



Compass

2. Finding directions

STEP 1:

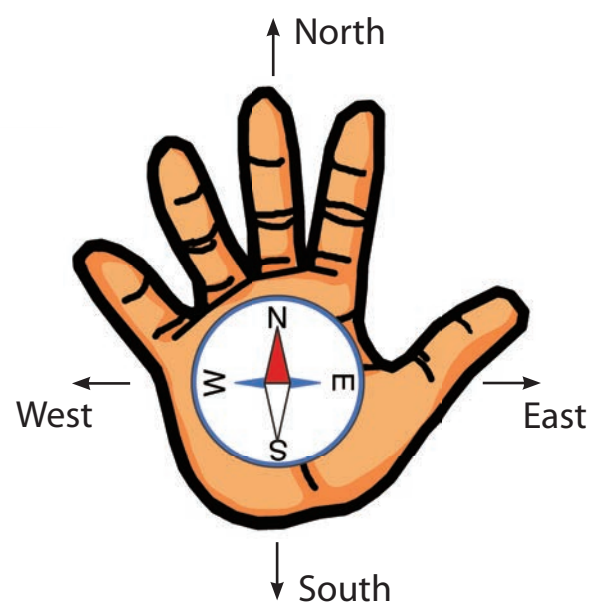
When you want to face North, place the compass flat on your palm and hold your palm in front of your chest as shown in the picture on the right.

STEP 2:

Turn your body until the magnetic needle comes to the North sign on the dial. When the needle overlaps the North sign on the dial, you are facing North.

STEP 3:

Find other directions when you are facing North. Your right side points to East and left side points to West, and your back is facing the South when you are facing North.



How to use a Tape measure

1. What is a Tape Measure?

A tape measure is also called a measuring tape. It is a type of flexible ruler. Tape measures may be in metric (centimetres and metres) and imperial units (Inches and feet).



2. Finding the circumference around your partners head

STEP 1:

Have your partner to stand in front of you with head up straight.

STEP 2:

Hold on one end of the tape that begins with 0 and wrap the tape around your partner's head just above the top of the ears.



STEP 3:

Find the line where the tape measure begins to wrap over itself or the end of the length of the object.

STEP 4:

Record the circumference of your partner's head to the nearest centimetre.



How to make a Beam Balance

1. What is a Beam Balance?

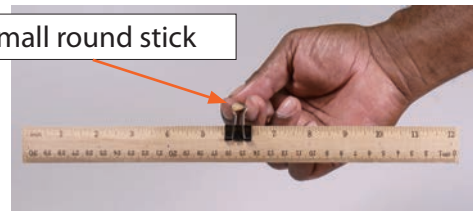
A beam balance is a type of lever that can be used to compare weights of two objects. It has an arm or bar with a centre point, called a fulcrum. If one side of the lever is pushed down, the other side is pushed up.

2. Making a Beam Balance

STEP 1:

Use a 30 cm ruler as the beam balance. Put the 1st bull dog clip approximately in the centre of the ruler. Put a round stick through the clip to check if the beam is balanced properly. If it is not balanced, adjust the position of the 1st bull dog clip to the left or right sides.

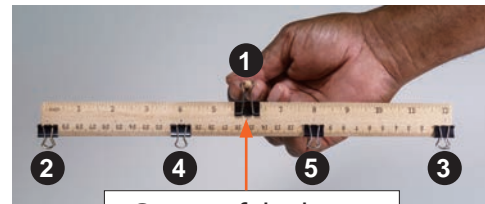
Small round stick



STEP 2:

- (1) From the centre on the beam, measure and mark every 5 cm to the right end and to the left end. On the opposite edge of the 1st clip, put the 2nd and the 3rd clips at both ends of the ruler with their centres on the marks. Check if the beam is balanced.
- (2) On the marks on either sides of the centre, put the 4th clip and the 5th clip with their centres on the marks and also on the same edge as the 2nd and 3rd clips. Check if the beam is balanced.
- (3) Between the two clips on the right side and on the left side, put the 6th clip and the 7th clip with their centres on the marks and on the same edge as the 2nd, 3rd, 4th and 5th clip. Check if the beam is balanced.

Centre of the beam



STEP 3:

Label the centre clip '0' with a sticker. From '0', label the clips on the left side and right side of the beam as '1', '2' and '3' with stickers.



STEP 4:

Use paper clips as 'hooks' to hang and balance 1 Kina coins on distance 3 on both the left side and right side of the beam.



How to read a Bar Graph

1. What is a Bar Graph?

A bar graph helps to compare data. The bar graph below shows the weight of three students.

2. Reading a Bar Graph

STEP 1:

Read the title of the bar. What is the bar graph about?

STEP 2:

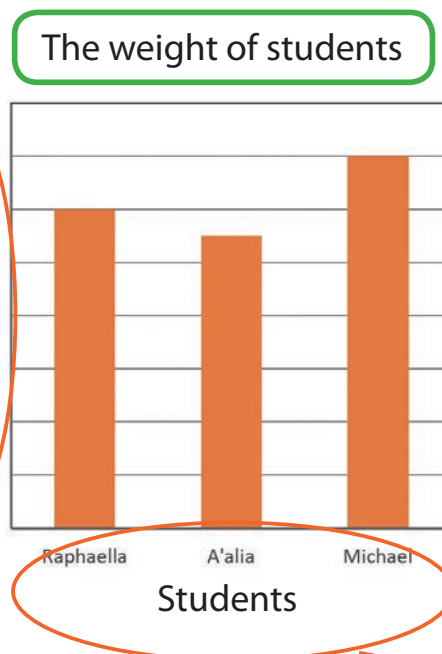
Study the bottom part of the graph called the horizontal axis labeled 'Student' that shows the name of students; Michael, Raphaella and A'alia.

STEP 3:

(1) Study the numbers on the left side of the graph called the vertical axis labeled 'Weight'. The number represents the weight in kilograms.

Vertical axis

Weight (kg)



Horizontal axis

(2) The highest represented number is 80 kg. Between any two numbers example between 30 and 40 the interval amount is 10 kg.

STEP 4:

(1) Study the bar graph. Look at the bar on label as 'Raphaella' and move across to the vertical axis to identify the weight in numbers. The bar shows that the weight of Raphaella is 60 kg.

(2) Read the question asked. Example: Which student is the heaviest? Compare all the heights of the bars. Follow the highest bar down to identify the name of the student on the horizontal axis. Michael is the heaviest among the students and his weight is 70 kg.

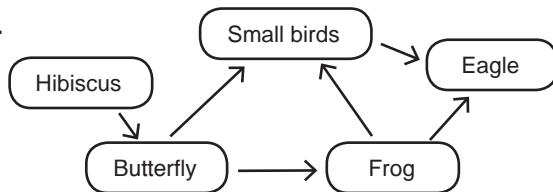
Answer of Exercise

Chapter 1. Topic 1. Page 18

Q1. (1) energy (2) Sun (3) food chain
(4) Food web

Q2. (1) B (2) D

Q3.



Q4. In a food chain the energy begins from the sun and the arrow showing the transfer of energy only in one direction. However, in a food web which is made up of several food chains more arrows connect more animals and is more complex.

Chapter 2. Topic 1. Page 28

Q1. (1) gravity (2) friction

Q2. (1) A (2) D

Q3. The ball decelerates or decreases the speed due to the friction between surface of the ground and the ball.

Q4. (Expected answers) The car accelerated because the speed of the car increased as the time went by on his record.

Chapter 2. Topic 2. Page 36

Q1. (1) lever (2) effort (2) load

Q2. (1) A (2) C

Q3. (1) Eight (8) one kina coins should be hanged on 1 of the right arm.
(2) Distance 2

Q4. (Expected answers) By moving the girl sits closer to the fulcurm and the boy sits at the far end of the see-saw.

Chapter 3. Topic 1. Page 46

Q1. (1) cloud (2) altitude (3) weather

Q2. (1) A (2) D

Q3. (1) Cumulonimbus (2) It ranges from low level to high level attitude.

Q4. (Expected answer) Her prediction would be bad weather with precipitation/ rain

Chapter 3. Topic 2. Page 52

Q1. (1) season (2) rainfall (3) dry
(4) warmest

Q2. (1) A (2) D

Q3. The leaves turn brown and drop to the ground.

Q4. (Expected answer) The seeds get enough water to germinate and grow well in the wet season.

Chapter 4. Topic 1. Page 64

Q1. (1) chemical (2) ash (3) different
(4) properties

Q2. (1) D (2) A

Q3. (1) The burning sugar (2) When sugar is burnt, odour (sweet smell) is produced, colour changes as well as the state changes from solid to liquid. (Caramel) (3) Heating sugar produces a caramel that has different colour as a new kind of matter.

Q4. The chemical change takes place inside plant because new matter are produced.

Chapter 5. Topic 1. Page 78

Q1. (1) states (2) solid (3) shape (4) 0°C

Q2. (1) B (2) D

Q3. Condensation

Q4. The hot water that was poured over the top of the bottle made the bottle expand and made it to expand and he was able to open the bottle easily.

Chapter 6. Topic 1. Page 92

Q1. (1) Reproduction (2) Fertilisation (3) Womb (4) Heredity

Q2. (1) B (2) C

Q3. (1) Heredity (2) Eye colour, hair colour, blood type, shape of nose, types of hair (curly or straight), etc.

Q4. When an egg meets with a sperm, the egg becomes a fertilised egg. Human life begins with a fertilized egg. In human, fertilization takes place inside the body of the female

Chapter 7. Topic 1. Page 108

Q1. (1) series (2) symbol (3) appliances (4) positive

Q2. (1) A (2) D

Q3. (1) parallel circuit (2) bulb (3) dry cell/ battery

Q4. (Expected answer) Series connection has the brightest light while the parallel and the single dry cell the brightness of the bulbs were the same.

Chapter 8. Topic 1. Page 122

Q1. (1) crust (2) magma (3) metamorphic (4) sedimentary

Q2. (1) D (2) C

Q3. (Expected answer) The mineral used to make electrical cables and wires is copper.

Q4. (Expected answer) Igneous rock is

formed when melted rock in the earth cools and hardens. Examples of Igneous rocks formed when melted rocks cool and harden are basalt and granite.

Chapter 8. Topic 2. Page 128

Q1. (1) fossil (2) mould (3) bones (4) teeth

Q2. (1) A (2) B

Q3. (Expected answer) (1) Plant fossil (2) Dinosaur (or Tyrannosaurus)

(Expected answer) (3) When living thing dies, it is buried in sediments.

The sediments turn into a rock. The hard parts of the living thing dissolve completely. The hard parts of the living thing dissolve completely and the shape is left in the rock. The shape of a living thing found in a rock is called a mould.

Chapter 9. Topic 1. Page 146

Q1. (1) habitat (2) Ocean (3) rainforest (4) grassland (5) freshwater

Q2. (1) C (2) A

Q3. (1) grassland (2) rainforest (3) freshwater (4) ocean

Q4. (Expected answer) If there is a big bush fire in the forest some animals will run away from their habitat while the others will be burnt to death./ If there is a big bush fire in the forest habitat most of the plants will be burnt death.

Chapter 9. Topic 2. Page 158

Q1. (1) Adaptation (2) Habitat/Environment (3) Mimicry (4) Behaviour

Answer of Exercise

Q2. (1) A (2) A

Q3. To scare away birds that want to eat them.

Q4. The animals such as bears go into a long deep sleep through the winter to survive with little or no food.

Chapter 10. Topic 1. Page 172

Q1. (1) seed coat (2) water (3) oxygen (4) temperature

Q2. (1) D (2) A

Q3. (Expected answer) (1) Similar conditions - Seeds are given water/ Seeds are exposed to light and brightness/ Seeds are exposed to same temperature (2) Different conditions - A. Seeds are not exposed to air / B. Seeds are exposed to air.

Q4. (Expected answer) Seeds germinate because they are exposed to water, air and proper temperature./ Seeds germinate because they are given water, air and left in good temperature./ Seeds can germinate because they have water, air and good temperature

Chapter 10. Topic 2. Page 180

Q1. (1) Nutrients (2) Fertiliser (3) Water (4) Sunlight (5) Photosynthesis

Q2. (1) C (2) B

Q3. (Expected answers) (1) Similar conditions - The same light and brightness (2) Different conditions - Water

Q4. (Expected answers) The nutrient from

the fertilizer makes the plant leaves green, the flowers big, and the roots strong./ Nutrients from fertilizer makes plant leaves green, big flowers and strong roots.

Chapter 11. Topic 1. Page 194

Q1. (1) Heat (2) Temperature (3) 100 / Hundred

Q2. (1) A (2) D

Q3. (1) Thermometer (2) Fire can be used to keep us warm at night or during cold weather. / Fire is used to cook food, etc. (3) The Sun / fire / electrical appliance, etc.

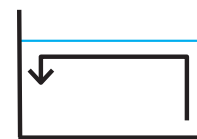
Q4. Our hands become cold because heat in the hands is transferred to the cold ice cubes.

Chapter 11. Topic 2. Page 202

Q1. (1) Convection (2) Radiation (3) Conduction

Q2. (1) A

Q3. (1) Radiation (2)



Q4. Expected answers. (1) There is no conduction of heat directly from the fire. (2) There conduction of heat because the handle does not touch the fire

Glossary

Accelerate is to increase in speed.	24
Adaptation is the use of body part or a behaviour that helps an organism survive in its environment or a new environment.	148
Alloy is a mixture of two or more metals.	120
Autumn (fall) is the season that follows summer. The weather slowly gets colder.	48
Behaviour is the way organisms act in a certain situation.	148
Boiling point is the temperature at which a liquid changes into a gas. ...	76
Camouflage is a type of animal adaptation that use the colours, patterns or shape of body parts of an animal that allows it to blend in with its surroundings.	152
Carbon dioxide is a colourless and odourless gas produced by people or animals when they breathe out.	12
Cast is the opposite of its mould.	124
Chemical change is a change that produces new kinds of matter.....	58
Circuit diagram is a diagram representing an electrical circuit drawn using symbols.	104
Cloud is made of water droplets or ice crystals floating in the sky.	42
Condensation is the process that causes a matter to change from gas to liquid.	76
Conduction is the transfer of heat from one place to another through matter.	196
Convection is the transfer of heat through liquids and gases such as water and air.	198
Convection current is the movement or flow of water or air created by the process of convection.	198
Core is the hottest, innermost layer of the Earth.	114
Cotyledon is the part of a plant that stores food.	164
Crust is the thinnest outer layer of the Earth.	114
Decelerate is to reduce in speed or slow down.	24

Glossary

Degrees Celsius is the unit of measurement used to measure temperature.	192
Desert is a large, hot, dry area of land with very little water and very few plants.	150
Dry season is a time of year when little rain falls.	48
Effort is the force applied to a machine to do work.	30
Egg is the female reproductive cell.	84
Electric current is the flow of electricity.	98
Electric circuit components are basically the various parts of circuit such as dry cells, bulb, switch and motor.	103
Embryo in animals is an early developmental stage of an animal while it is within the mother's womb (uterus) or in the egg....	88
Embryo in plants is the tiny plant inside the seed.	164
Energy pyramid is a representation of the flow of energy from one energy level to another.	16
Evaporation is the process that causes a matter to change from liquid to a gas.	76
Fertilisation is the process where the egg meets the sperm and joins it.	84
Foetus is the unborn offspring of an animal that develops from an embryo.	88
Food chain is the path of food energy from the plants to animals.	14
Food web consists of several food chains linked to each other.	16
Fossil is the remains of once a living thing.	124
Freezing is the process that causes a matter to change from a liquid to a solid.	76
Freezing point is the temperature at a certain point where liquids start to change to solid.	74
Freshwater habitats are natural water sources that do not contain salt.	136
Friction is the force that occurs when two surface of objects rub against each other from opposite directions.	24
Germination is the process of the seed growing into a seedling.	165

Grassland habitats are an area mostly covered by grasses with few or no trees.	142
Habitat is the part of a natural environment where a plant or an animal lives.	134
Heat is a form of energy.	186
Heredity is the way in which traits are passed on from parents to young organisms.....	90
Hibernation is the state of inactivity where animals go to a deep sleep.	156
Igneous rock is a rock formed when melted rock from inside the Earth cools and hardens.	118
Lever is a type of simple machine that makes an object move with less force.	29
Load is the force applied on the lever by the object to be lifted.	30
Magma is melted rock form in the Earth or a result of volcanic eruption.	118
Mantle is the thick, hot layer of the Earth.	114
Melting is the process that causes a matter to change from a solid to a liquid.	76
Melting point is the temperature at a certain point where solids start to melt.....	74
Metamorphic rock is a rock formed when a rock inside the Earth has been changed by heat and pressure.	118
Migration is the movement of fish, bird and other animals from one place to another.	156
Mimicry a type of animal adaptation that allows an animal to look like another kind of animal.	154
Mineral is a valuable or useful substance that is dug out of the ground.	114
Motor is an electrical device that produces power to rotate things using electricity.	97
Mould is the shape of a dead living thing found in a rock.	124
Ocean habitat is the area with salty water.....	138

Glossary

- Organism** is any living thing such as plant, animal and other living things..... 144
- Ovary** is the female body part that contains thousands of eggs. 86
- Parallel circuit** is a circuit in which the electric current flows in two or more paths. 100
- Penis** is the male body part that passes semen out of the man's body. ... 86
- Photosynthesis** is the process by which plants make their own food (starch) from carbon dioxide and water by using light. 176
- Radiation** is the transfer of heat in the form of waves through air or empty space. 200
- Rainforest habitat** is an area with a lot of rain, warm climate and tall trees. 140
- Reproduction** is the process where living things produce young ones similar to themselves. 83
- Reproductive system** is the group of the body parts that work together for the purpose of reproduction. 86
- Rock** is a naturally formed, non-living material as part of the Earth crust. 114
- Rusting** is the red or orange coating that forms on the surface of metal due to chemical change between metal surface and the environment. 60
- Season** is a period of the year that is divided by typical weather conditions. 48
- Sediment** is a collection of sand particles of rock and small bits of soil piled up over time. 118
- Sedimentary rock** is a rock formed when sediments are glued together and become hard. 118
- Seed coat** is the hard outer layer of the seed covering the embryo and the cotyledon. 164
- Semen** is a mixture of sperm and fluids. 86
- Series circuit** is a circuit in which the electric current flows in one path. 100
- Sleet** is a mixture of snow and rain. 48
- Solar energy** is the energy that comes from the Sun. 12

Sperm is the male reproductive cell.....	84
Spring is the season that follows winter. The weather begins to get warmer.....	48
Sublimation is the direct change of state from solid to gas.....	79
Starch is a substance made by plants to store energy in foods such as rice, bread, kaukau and potato.	164
Summer is the season that follows spring. It is warmest season of the year with long hours of sunlight.....	48
Temperature is a measure of how hot or cold a matter is.	192
Testes is the male body part that produces millions of sperm.	86
Thermal expansion is the increase in volume of matter due to an increase in temperature.	72
Thermometer is an instrument that is used to measure temperature in degrees Celsius.....	192
Trait is a feature or characteristic of a living thing.	90
Vagina is a muscular tube that connects the womb to the outside of a female's body.	86
Weather forecast is to predict the upcoming weather.	43
Wet season is the time of year when most of the rain falls.	48
Winter is the season that follows autumn (fall). Winter is the coldest season of the year with fewer hours of sunlight.	48
Womb is the place where a baby grows until its birth.	86

Plants in PNG



Kleinhovia



Maniltoa



White gum



Casuarina



Rusty berries



Harpullia



◆ Fishtail palm



Hoop pine



Sepik blue orchid



Blue ginger



Coffee bush



◆ Yellow flame tree



Brown pine



Cassowary plum



Ebony



Big vine



◆ Galip nut



◆ Rain tree



Antelope orchid



Bird nest fern



Coconut tree



Cycas palm

Varirata National Park

◆ Plants found nationwide



Mangrove



◆ Candle tree pendula



Family palm



Kerosene tree



Screw pine



◆ Bougainvillea



◆ Hibiscus



Leichhardt tree



◆ Mango



◆ Frangipani



Nutmeg



Manatee grass

continued

Plants in Varirata National



Ant plant



Kangaroo grass



Umbrella tree



Shield fern



Clidemia



Butterfly tree



Birthwort



Tropical banksia



Chalmers' neonauclea



Brown pine



Sumac



Gymnostoma

Park in PNG

Varirata National Park is PNG's first national park. It is on state land on the Sogeri Plateau, 48 km east of Port Moresby city. The park has scenic views with beautiful rainforests and savannah grasslands. It is inhabited by some unique plants and animals.



Melastome



Pandanus



Common pitcher plant



Semecarpus



Water chestnut



Papuan oak



Bottlebrush orchid



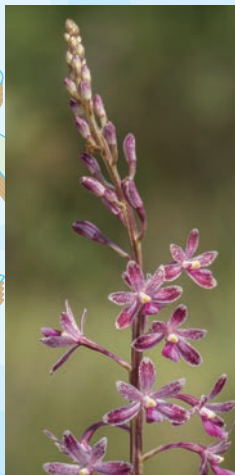
Cycad



Tropical mistletoe



Spiked pepper



Hyacinth orchid



Planchonia



East New Guinea fig

National Science Grade 5 Textbook Development Committees

The National Science Textbook was developed by Curriculum Development Division (CDD), Department of Education in partnership with Japan International Cooperation Agency (JICA) through the Project for Improving the Quality of Mathematics and Science Education (QUIS-ME Project). The following stakeholders have contributed to manage, write, validate and make quality assurance for developing quality Textbook and Teacher's Manual for students and teachers of Papua New Guinea.

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