South Sudan

ALP LEVEL
4

ALP Science

Level 4

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FOREWORD

I am delighted to write the foreword for this book. The Ministry of General Education and Instruction (MoGE&I) has developed the Accelerated Learning Programme (ALP) textbooks based on the National Curriculum of South Sudan.

The textbook was written to help learners develop the background knowledge and understanding in the subject. It is intended largely to serve as a source of knowledge and understanding of the subject concerned, but not to be considered as a summary of what learners ought to study.

The National Curriculum is a competency based and learner-centered that aims to meet the educational needs and aspirations of the people of South Sudan. Its aims are manifold: (a) Good citizenship (b) successful lifelong learners, (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society.

This textbook was designed by subject panelists to promote the learners' attainment of the following competencies; critical and creative thinking, communication, cooperation, culture and identity.

No one can write a book of this kind without support from colleagues, friends and family. Therefore, I am pleased to register my thanks to Dr Kuyok Abol Kuyok, the Undersecretary of the Ministry, who emphasized the importance of Alternative Education System (AES) and approved the development of its textbooks.

I also want to record my thanks toUstaz Omot Okony Olok, the Director General for Curriculum Development Centre (CDC) and Ustaz Shadrack Chol Stephen, the Director General for Alternative Education Systems (AES) who worked tirelessly with thesubject panelists to develop the textbooks.

Lastly, but not least, my greatest thanks and appreciation must go to the Global

Partnership for Education (GPE) and UNICEF-South Sudan for without their

support and partnership this textbook would not have seen light.

Hon. Awut Deng Acuil, MP

Minister,

Ministry of General Education and Instruction

Republic of South Sudan, Juba

Tableof Content

Unit 1 Human systems

Words to learn

Blood, heart, vessels, blood circulation, oxygen, carbon dioxide, arteries, veins, chambers, auricles, ventricles, valves, vena cava, aorta, contraction, relaxation, heartbeat, pulse, capillaries, plasma, platelets, red blood cells, white blood cells, haemoglobin.

1.1 Circulatory system

Activity 1.1

Work in pairs

1. Have you ever slaughtered a chicken, goat, cow or witnessed them being slaughtered?
2. Talk about what happened, when the neck was cut with a knife?
3. Look at the eyes of your partner. Can you see small red lines? What are they?
4. Put your hand on the left side of the chest. What do you feel?
5. Now, look at the picture below. What can you see? What is its importance?

Learning Point

- Blood is a red liquid that is very important in the life of animals. It is the main transport liquid in the human body.
- Blood flows from the heart to all body parts and then back to the heart.
- The movement of the blood from the heart to all the body parts is called blood circulation.
- The path followed by the blood as it circulates in the body is called the circulatory system.
- Blood transports oxygen and other substances to all parts of the body.
- It also removes carbon dioxide and other wastes from the body organs.

Parts of the circulatory system

Activity 1.2

Work in pairs

Materials

Charts, photographs and pictures of a sheep, goat, cow or camel heart.

1. Observe the pictures, charts and photographs provided.
2. Answer the following questions
   - (a) Name the main pumping organ?
   - (b) What is the main liquid in the circulatory system?
   - (c) Talk about the tubes that carry the blood.
   - (d) Tell your friend about the sizes of the tubes.
3. Which other organ supports blood circulation?

Learning Point

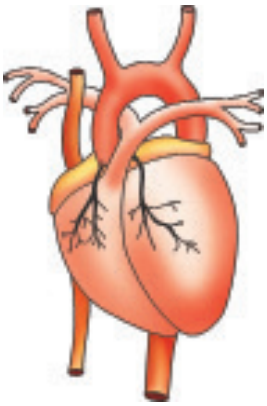
The circulatory system is made up of the heart, the blood and tubes known as blood vessels. The heart is a muscular organ that pumps blood throughout the body.

The heart

Activity 1.3

Work as a class

1. Study at the picture below.



2. (a) How many parts of the heart can you see?
   (b) Which part of the heart is thicker?
   (c) How many tubes are connected to the heart?
3. Your teacher will provide you with a chart that shows the internal structure of the heart. Observe and explain what you can see.

Learning Point

The heart is a muscular organ located on the left side of the chest cavity. It pumps blood to all parts of the body.

The heart is divided into the right and left parts. These parts are divided into two upper chambers called auricles and two lower chambers called ventricles.

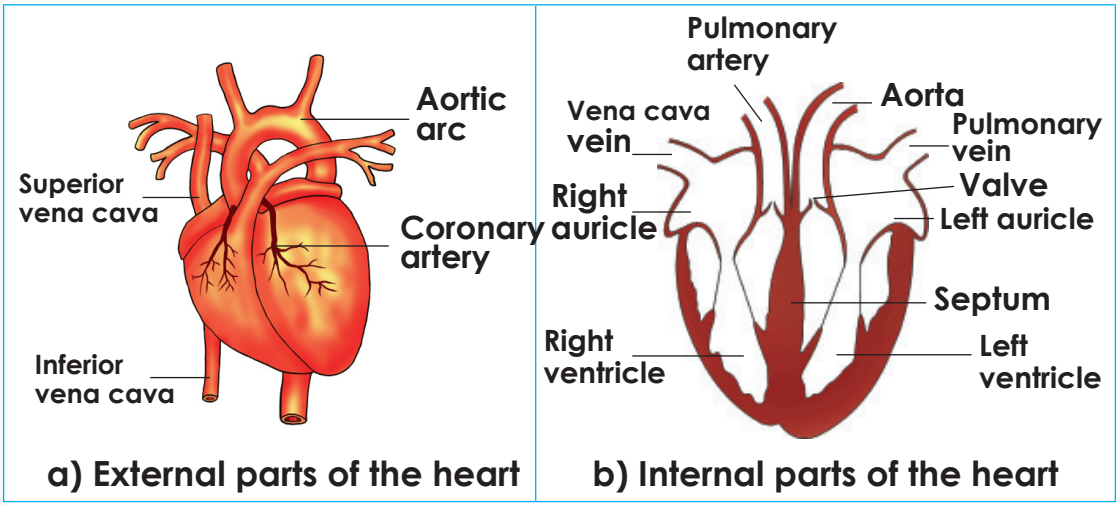
The ventricles are thick and pump blood out of the heart to the rest of the body. Auricles have thinner walls and receive blood into the heart.

The left ventricle has thick walls. It pumps blood to all the body parts.

The right ventricle, has thin walls. It pumps blood to the lungs.

The heart chambers have valves. The valves separate the auricles and ventricles. The valves prevent blood from flowing back to the auricles once it has entered the ventricles.

Another pair of valves are found in the ventricles. These prevent blood from flowing back to the ventricle, after it has been pumped out to the whole body.



a) External parts of the heart b) Internal parts of the heart

Fig. 1.1: Parts of the heart

Each chamber of the heart is connected to a major blood vessel:

- The right auricle to the vena cava
- The right ventricle to the pulmonary artery
- The left auricle to the pulmonary vein
- The left ventricle to the aorta

The pumping action of the heart is made possible by:

- Contraction of the heart muscles which pumps blood out of the

heart to all parts of the body.

- Relaxation of the heart muscles allows blood into the heart from all parts of the body.
- The contraction and relaxation of the heart muscles is called heartbeat or pulse. The heart beats at an average rate of 72 beats per minute.

Recording the heartbeat

Activity 1.4

Work in pairs

Materials: A stopwatch, clock, and an improvised stethoscope.

What to do

1. Place your first finger and the middle finger on the wrist as shown below.

2. Count the number of heartbeats in one minute and record the results in your exercise book.
3. Let your partner take your pulse and record in his or her exercise book.
4. Let your partner jump quickly 15 times and record his or her pulse.
5. Jump quickly 15 times and let your partner take your pulse and record.
6. Go out and run around the school compound then come back to the classroom.
7. Immediately take the pulse of each other at the same time and record the results in your exercise book.

8. Do the number of heartbeats change after running?
9. Why do think this is the case?
10. Record your findings and discuss them with the rest of the class.

Learning Point

The heart of a normal person beats 72 times per minute. However, when we do an activity, the heartbeat increases to supply more blood to the body parts. The heartbeat also increases when we are excited, scared or sick. When we rest the heartbeat decreases.

Note: A stethoscope is used to measure heartbeat.

Fun corner

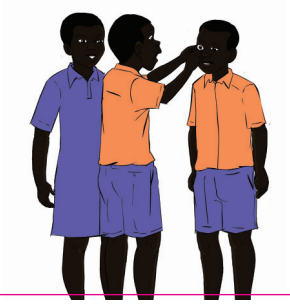
Make a model of the heart using clay, plasticine, papermache or paper cuttings. Display the work in the learning corner.

Blood vessels

Activity 1.5

Work in pairs

1. Check the pulse of your partner on the wrist or neck. Do you feel the heartbeat?
2. Observe your arms at the back of your hands. Clench your fist and observe again. Do you see any dark lines at the surface of the skin?
3. Pull down the lower eyelid of your partner as shown.



4. Look carefully at the inner side of the eyelid.

5. Let your partner look at your eye in the same way.

6. Discuss what you see. Did you see the red lines? What do you think they are?

The tiny red lines are small blood vessels called capillaries. Others are arteries and veins.

Learning Point

a) Arteries

- Arteries carry blood away from the heart. The main artery is called aorta. They have thick walls and a narrow space in the middle called lumen. They are located deep inside the body.

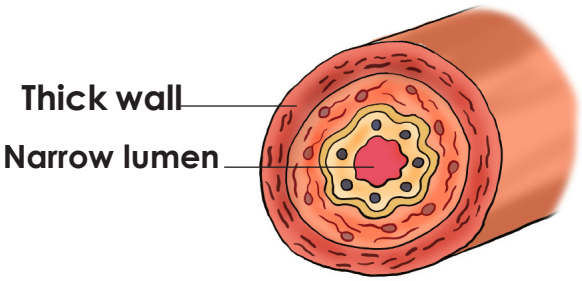


Fig 1.2: Structure of an artery

- They have no valves and the blood is under very high pressure from the heart.
- In arteries blood flows in waves that are felt as pulse.
- They carry blood rich in oxygen (oxygenated blood) except the pulmonary artery which carries blood without oxygen from the lungs to the heart.

b) Veins

- Veins carry blood from all body parts to the heart. They are located near the surface of the body.

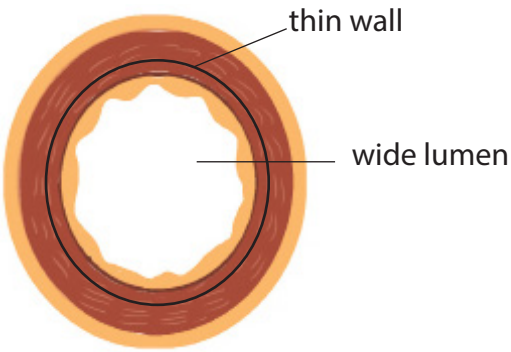


Fig 1.3: Structure of a vein

- They have thin walls with a wide space in the middle called lumen.
- They have valves to prevent backflow of blood which flows under low pressure.
- They have no pulse.
- They carry blood without oxygen (deoxygenated) except the pulmonary vein which carries oxygenated blood from the lungs to the heart.

c) Capillaries

- Capillaries carry blood into and out of the body organs and cells.
- They have thin walls that are one cell thick.

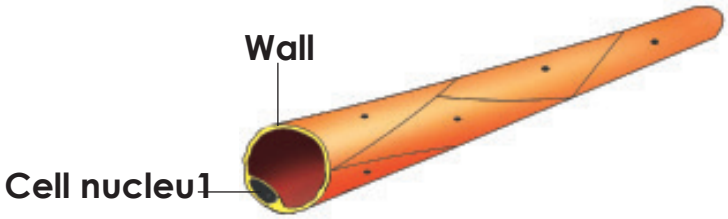


Fig 2.4: Structure of a capillary

- **They carry** oxygen and digested food to all body organs and cells.
- They carry carbon dioxide and wastes out of the body organs and cells.
- They are found all over the body.

Fun corner

Draw and colour blood vessels in a manila paper. Show your drawings to the rest of the class.

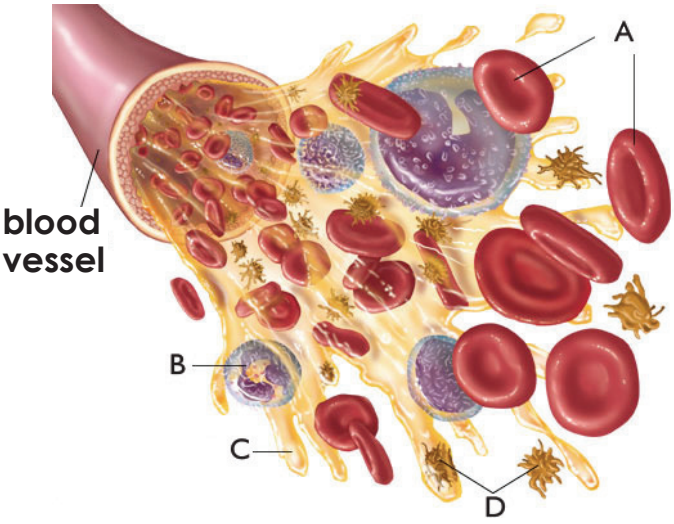
Display the manila paper with the drawings on the wall of your classroom.

Blood components

Activity 1.6

Work in groups

1. Identify the blood components below.



2. Answer the following questions:

   (a) How many components can you see?

   (b) Which component is circular in shape?

   (c) Which component is irregular in shape?

   (d) Name the component that is pale-yellow in colour?

Learning Point

Blood is made up of:

(a) Plasma

It is the pale yellow liquid part of blood made of 90% water. All the blood cells are suspended in the plasma.

It contains digested food substances, salts, hormones, urea and carbon dioxide.

It transports carbon dioxide and other waste substances from all the body cells to the lungs and kidneys where they are removed from the blood.

(b) Red blood cells

- They are circular in shape and have no nucleus.
- Gives blood its red colour. This red colour has a substance called haemoglobin. Haemoglobin mixes with oxygen to form a substance called oxyhaemoglobin which carries oxygen throughout the body.

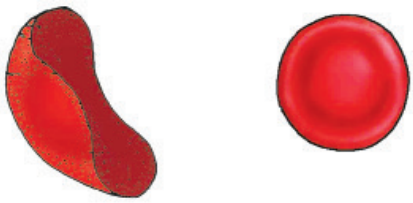


Fig. 1.5: Red blood cells

Blood with oxygen is bright red in colour. Blood without oxygen is dark red in colour.

(c) White blood cells

They are irregular in shape and have a nucleus. White blood cells help to fight and kill disease-causing germs. White blood cells are produced in the yellow bone marrow and lymph.

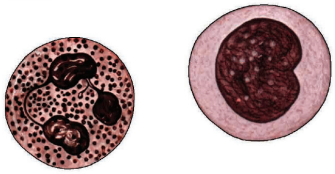


Fig. 1.16: White blood cells

(d) Platelets

This prevents excessive bleeding from the injury. Blood platelets are tiny and irregular. They have no nucleus and are produced in the red bone marrow.

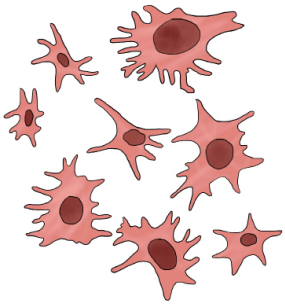


Fig. 1.7: Blood platelets

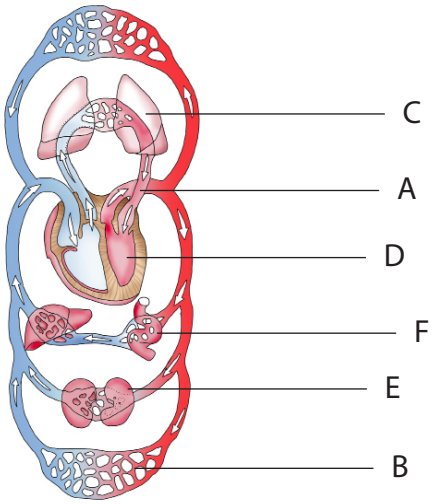
Making a display of components of blood.

1. Model the components of blood using clay or plasticine.
2. Allow them to dry and stick them on a manila paper using a cello tape or glue.
3. Display the components in the learning corner or on the wall of the classroom.

The flow of blood

Work in groups

1. Look at the picture below. Trace the flow of blood in the body.



Answer these questions

1. Which blood vessel brings blood from the lungs to the heart?
2. Which part pumps blood to the aorta?
3. Name the part that brings blood from all body parts back to the heart?
4. Name the part that gives blood oxygen?
5. Discuss your answers with the class.
6. Name the organs labelled B, C, D, E and F.

Fun corner

This is how blood flows in the circulatory system. From the body organs to the vena cava. From the vena cava to the Right auricle. From the right auricle into the right ventricle. From the right ventricle to the pulmonary artery. From the pulmonary artery to the lungs and out of the lungs through the pulmonary vein. From the pulmonary vein to the left auricle. From the left auricle to the left ventricle and to the aorta. From aorta to other body organs.

Activity 2.7

This can be summarized in a cycle as shown below.

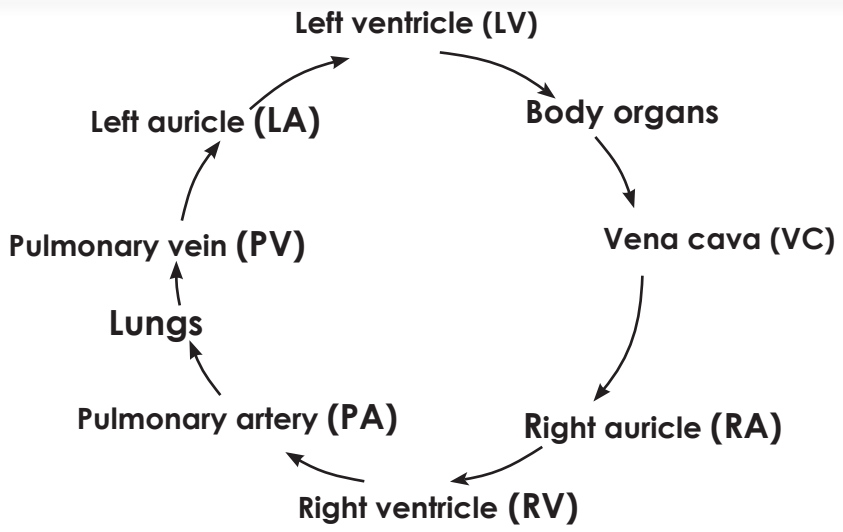


Fig. 1.8: Summary of cycle of blood in the body

Importance of blood circulation

Activity 1.8

Work in pairs

Answer the following questions:

1. How does digested food from the small intestines reach all the body parts?
2. How are waste materials removed from the body?
3. How does white blood cells reach an injured toe?
4. What would happen if your red blood cells were not enough?

Learning Point

Blood is the main transport fluid in the body. It transports the following:

- Oxygen from the lungs to the rest of the body.
- Digested food from the small intestines to all parts of the body.
- Carbon dioxide from the body parts to the lungs.
- Heat from the liver to all parts of the body.
- Waste materials from all the body parts to the kidneys where they are removed.

Fun corner

Model the circulatory system using clay, plasticine, straws, cellotape and paper mache. Trace the path followed by blood from the heart and back.

Show your work to the rest of the class. Display your work in a learning corner.

- We should avoid eating a lot of fatty foods. They cause blockage of the heart and other blood vessels leading to heart problems such as heart attacks.
- We should perform regular exercises and eat a balanced diet for the heart to function properly and blood to circulate well.
- We should handle the knife and other sharp objects with great care. They can hurt us if not properly handled.
- We should avoid touching other people's blood because blood can spread HIV; the virus that causes AIDS.
- When assisting an injured person we should always wear protective gloves.
- It is important we eat food rich in iron for example green vegetables and liver, because iron is required in blood formation.

Remember!

1. Why is oxygen important to blood and to the cells?
2. Why is blood that flows from the lungs to the heart bright red rather than dark red?
3. Kide had a circulatory problem and was advised by the doctor to eat food rich in iron. From the knowledge acquired in class, identify at least three types of food that Kide needs to take.
4. Suppose you have been called upon to talk to patients on prevention from heart attack and other heart related problems. Highlight some of the points you will talk about.
5. Using a table, differentiate between an artery and a vein in terms of their structure.
6. Why is it important to check our blood pressure regularly?
7. Why is it risky to leave a charcoal stove burning in a poorly ventilated room?

1.2 Respiratory system

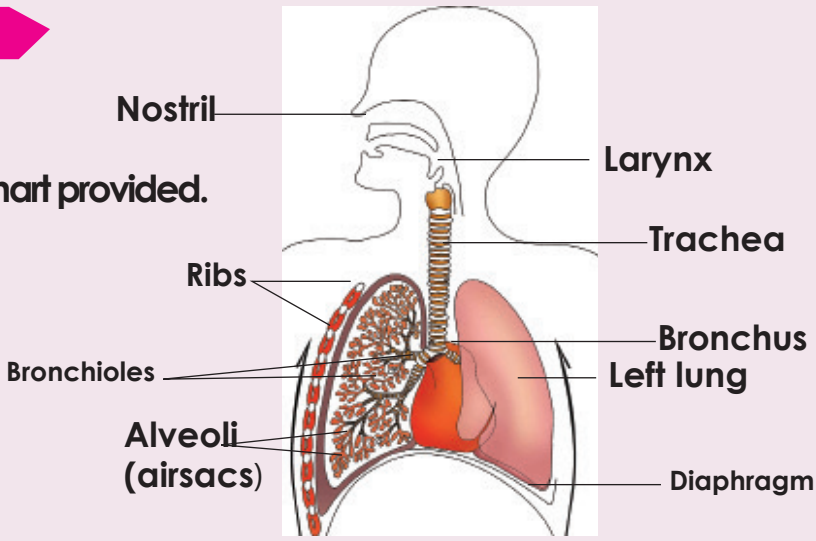
Check your progress 2.1

Respiratory system is also known as breathing system. Breathing is taking in fresh air into the lungs and taking waste air out of the lungs.Trachea, lungs, bronchus, bronchiole, alveoli, diaphragm, epiglottis, gaseous exchange.

Activity 1.9

Work in pairs

1. Study the chart provided.



2. Read the parts aloud.
3. Show your partner also where the nose, trachea and lungs are found in the body.
4. Let your partner show you where the nose, trachea and lungs are also found in the body.
5. Put your hands on the chest
   a) Breath in. What happens? Does the chest and ribs move?
   b) Breath out. What happens? Does the chest and ribs move?
6. Talk about breathing in and out with your friend.

Activity 1.10

Work in groups

Materials

A lung of a cow, goat or sheep, knife, hand lenses and a straw.

What to do

1. Your teacher will bring a lung of a cow, goat or sheep. Look at the lungs and discuss in groups the following questions?
2. Feel the lungs with clean hands. How do they feel?
3. How many lungs are there?
4. Show your partner the following parts
   a) Trachea
   b) Bronchus
   c) Bronchioles
5. Connect the straw to the trachea of the animal and carefully blow air into the trachea. What happens to the lungs?
6. Cut the lungs open using a knife and observe the spongy nature using the hand lens. What can you see?

The breathing system is made up of;

(a) Nose

The nose has two openings called nostrils. As air moves in the nose, it is moistened by the mucus lining, warmed by the blood capillaries and the hair. The mucus in the nose traps dust and germs.

(b) Trachea or windpipe

The trachea is a tube made up of rings. The walls of trachea are lined with hairs. The hairs trap dust and mucus, which are later removed from the breathing system as sputum.

The trachea is divided into two branches called bronchi (singular bronchus).

(c) Lungs

There are two lungs found at the chest cavity. They are enclosed in a double membrane known as the pleural membrane.

The space between these membranes is known as pleural cavity.

Within the lungs, each bronchus divides into small tubes called bronchioles. The bronchioles branch and end in groups of tiny air sacs called alveoli (singular alveolus).

The alveoli are surrounded by a network of blood capillaries. Oxygen gets into the blood and carbon dioxide gets out of the lungs through the nose.

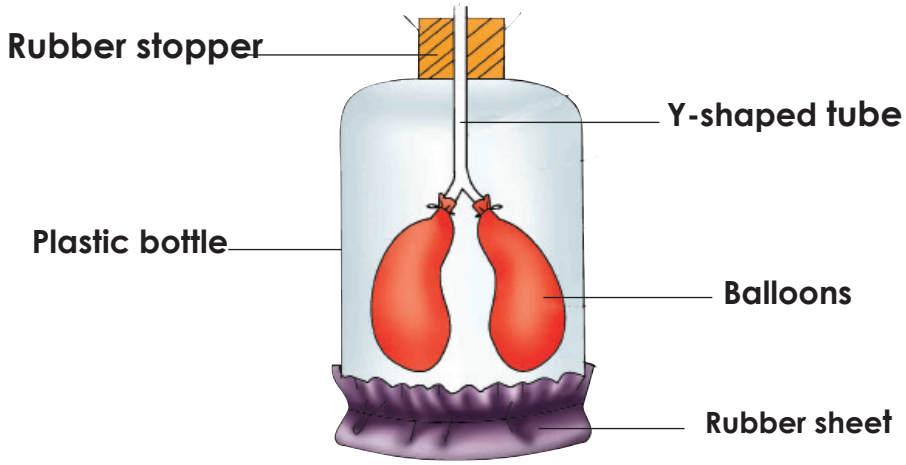


Fig. 1.9: Parts of breathing system

(d) Ribs

During breathing in, the ribs move upwards and outwards. This causes the chest cavity and the lungs to expand and air enter the lungs. During breathing out, ribs move downwards and inwards causing the chest cavity and lungs to contract forcing air out of the lungs. Ribs protect the lungs and heart.

(e) Diaphragm

It separates the chest from the abdomen. During breathing in, the diaphragm moves downwards. The lungs expand and air enters into the lungs. During breathing out the diaphragm moves upwards, the lungs contract and expel the air out of the lungs through the nostrils.

Modelling a respiratory system

Work in groups

Materials

Activity 1.11

Two balloons, plastic bottle, rubber stopper with a hole, y-shaped connector or straws, rubber sheet.

What to do

1. Set up the apparatus as shown in the figure below.

2. Pull down the rubber sheet at the base of the bottle.
3. Observe what happens to the balloons.
4. Release the rubber sheet slowly and observe what happens to the balloons.

5. How else could you design such an experiment?
6. Discuss your findings with the rest of the class.

When the rubber sheet is pulled down, the balloons become inflated.

Fig. 1.10: Respiratory model

When pushed up, the balloons get deflated. These are equivalent to breathing in and out respectively. The rubber sheet represents the diaphragm, the plastic bottle the rib cage, the Y-shaped tube the trachea and bronchi and the balloons the lungs.

Importance of the respiratory system

The food carried by blood to all the body cells is broken down in presence of oxygen to release energy, carbon dioxide and water vapour.

The respiratory process produces energy in continuous manner and that is why we breathe continuously.

The respiratory system is very important to the body. We must protect it from respiratory diseases that would make breathing impossible.

Further activity

Some respiratory diseases are lung cancer, bronchitis, asthma, whooping

cough and tuberculosis. Search on the internet on the signs, symptoms and effects of the diseases.

Activity 1.12

Learning Point

1. A human being without a respiratory system is as good as a car without fuel. Explain this statement.
2. Explain the following observations:
   a) Your heart rate increases when you do exercise such as running.
   b) You cannot hold your breathe for more than five minutes.
3. Relate the following parts of a plant to a respiratory system.
   a) Stem
   b) Branches
   c) Fruits
4. Which one of the following organs is not involved in breathing?
   A. Diaphragm B. Bronchioles
   C. Oesophagus D. Wind pipe
5. Smoking destroys or harms the respiratory system. Justify this statement.
6. How would you ensure that your respiratory system remains healthy?

1.3 Human excretory systems

Remember!

Kidney, lungs, skin, waste products, excretory, organs, pores, sweat glands, urea, urine, nitrogenous wastes, urethra, ureter, sweat.

Activity 1.13

Work as a class

Materials

Hand lenses

What to do

1. Your teacher will organize a visit to the butchery or slaughter house to observe exctretory system of a cow sheep or goat.
2. Ask the butcher to show you the kidney of either cow, goat or sheep.
   a) What is the shape of the kidneys?
   b) What is the colour of the kidneys?
   c) Look at the kidneys using a hand lens. Can you see any blood vessels?
3. Ask the butcher to show you the lungs.
   a) What is the shape of the lungs?
   b) Feel the lungs with clean hands. How do they feel?
   c) How many lungs are there?
   d) Can you identify the trachea?
   e) Look at the lungs using a hand lens. Can you see any blood vessels?
4. Ask the butcher to show you the skin or hide.
   a) What can you see?
   b) How many layers can you see?
   c) Look at the skin using a hand lens. Can you see blood vessels and tiny holes on the skin?

Check your progress 1.2

There are many processes that take place in the body such as digestion and breathing. Several wastes are produced and some are poisonous. They should be removed from the body. The main excretory organs are the skin, lungs and kidneys. The main excretory products are carbon dioxide, excess water, urea and excess salts. Removal of waste products from the body is known as excretion.

The Skin

Activity 1.14

Work in pairs

Materials: Hand lenses or magnifying glasses.

1. Use the hand lens to observe the skin of your hands.
   What do you see?
2. Talk about what you have observed.
3. Draw and label the structure of the skin.

The skin is the excretory organ that removes sweat from the body. Sweat is a mixture of excess salts and water. The tiny holes on the skin are called pores. They help to remove sweat from the body.

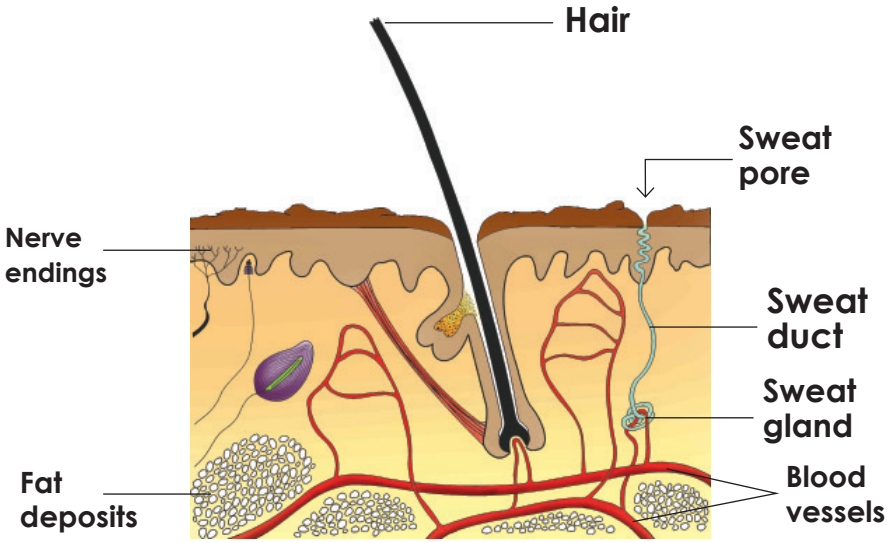


Fig. 1.11: Structure of the skin

Words to Learn

Sweat glands have blood capillaries that deliver waste products from other parts of the body. The sweat glands absorb excess water and salts from the blood. The wastes come out of the body as sweat and evaporates from the skin. Sweat gets rid of wastes from the body and also cools the body.

Activity 1.13

Work in groups

Materials: Playing field, open field.

What to do

1. Run around the classroom or open field for sometime.
2. How does your skin feel?
3. What has brought the changes on your skin?
4. Apart from running or playing, point out other instances that can trigger production of sweat.

Learning Point

When we run, the skin produces sweat.

The sweat makes the skin watery and when it evaporates it cools the body. The sweat tastes salty. This is because of presence of excess salts in sweat.

The lungs

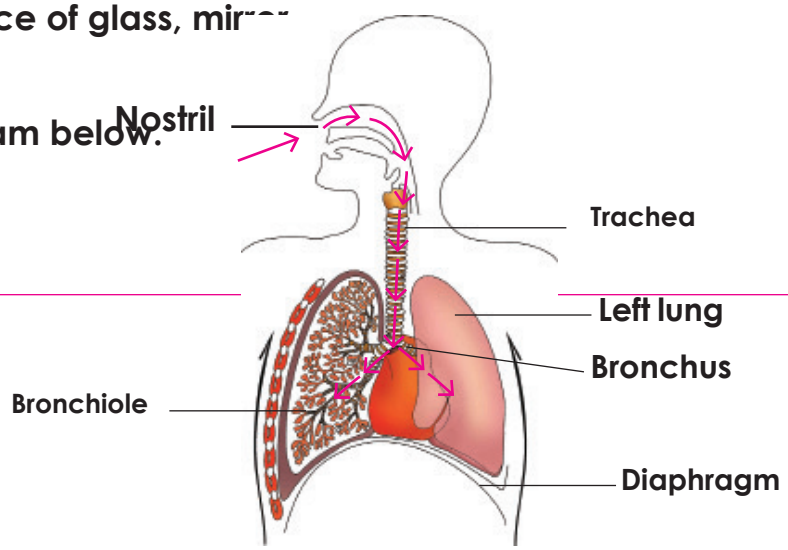
Activity 1.15

Work in pairs

Materials: A piece of glass, mir[illegible]

What to do

Study the diagram below.



1. Read the parts aloud. Trace the flow of air in the picture.
2. Put your finger near the nose. Do you feel the warm air coming out of the nose?
3. Put a cold piece of glass or a mirror next to the nose. What is formed on the mirror?

Learning Point

Air passes through the nose to the trachea into the lungs. Oxygen is taken to the body organs from the lungs through the blood and is then breathed out. All these happen in the breathing system.

Draw and colour the lungs, on a manila paper. Label the parts and display the work in the learning corner. Talk about the drawings with your classmates.

The Kidneys

Activity 1.16

Work in groups

Study the picture below.

1. What can you see in the picture?
2. Predict the functions of the identified parts.
3. What would happen if your kidneys are not working?

During blood circulation, blood flows through the kidneys. The wastes in the blood are filtered by the kidneys. The wastes removed include nitrogenous wastes from digested protein (urea), excess water and excess salts. Urea is mixed with the excess water to form urine.

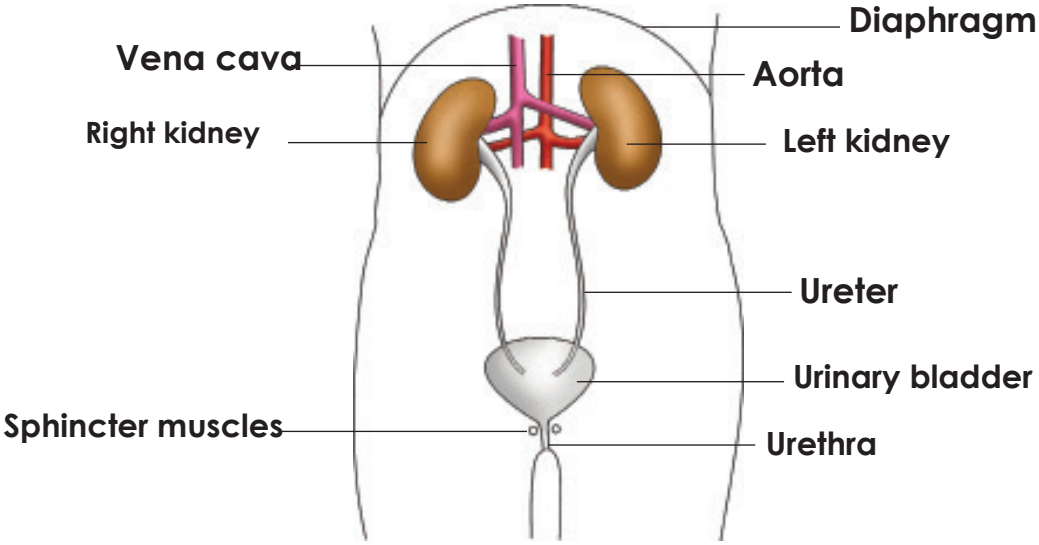


Fig. 1.12: Urinary system

Urine passes through the ureter to the bladder. The urine is later discharged out of the body through the urethra.Use the following materials to model the urinary system,

2 plastic bottles, tube or straws, rubber band, water, piece of wood, cellotape and a knife.

Learning Point

Urine gives important information on the health of an individual. There are many infections that affect the urinary tract and they result to blood in urine, pain as you urinate and urine feeling hot. Take plenty of water to keep off the infections.

Activity 1.17

1. How are wastes formed in the body?
2. How do we know that someone has an infection in the urinary system?
3. Identify the three main groups of excretory wastes found in animals?
4. Why is the left kidney located slightly higher than the right kidney?
5. How is the urinary system adapted to its function?

1.4 Digestive system

Learning Point

Digestion, digestive system, gullet, pancreas, liver, digestive juices, ileum, colon, rectum, balanced diet, bolus, hygiene, sanitation, salivary glands, indigestible wastes faeces.

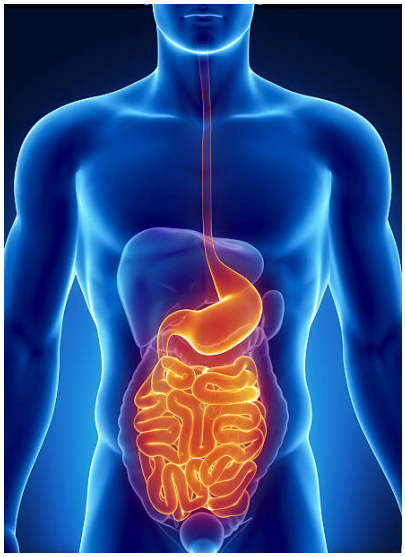
Fun corner

The digestive system breaks down food to make it ready for use by the body cells.

Activity 1.19

Work in pairs

Look at the picture below.



1. What can you see in the picture?
2. The digestive system starts at _____ and ends in the _____.
3. Talk about other organs that assist in digestion of food.
4. Trace the path taken by food during digestion.

Activity 1.20

Work as a class

Your teacher will bring a digestive system model, chart or pictures in class.

1. Observe the organs of the digestive system when the parts and the whole system are still intact.
2. Identify all the parts of the digestive system and draw the digestive system in your exercise book.

The digestive system of animals is almost similar to that of human beings. The parts of the digestive system include; the mouth, gullet, stomach, small intestine, large intestine, rectum and anus.

Digestion in the mouth

Digestion starts in the mouth. The teeth, tongue and saliva help to digest food.

The teeth break down food into smaller pieces that can be swallowed easily.

Saliva – Saliva is produced by salivary glands in the mouth. Saliva mixes with food and makes the food soft and sticky. The food is swallowed in small round balls call boluses. Digestion of starch starts in the mouth.

Tongue – It helps to roll the food in the mouth for proper chewing and swallowing. The gullet connects the mouth to the stomach.

Stomach - The walls of the stomach contains glands which produce digestive juices. The digestive juices digests starch. The hydrochloric acid produced by the stomach kills germs that may come along with food. The food is released in small quantities to the small intestine.

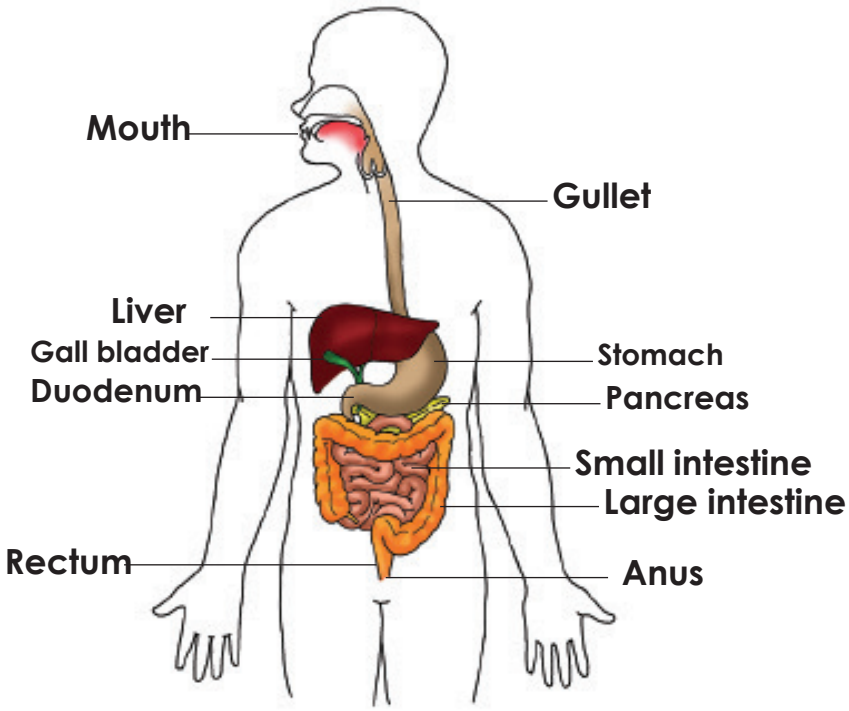


Fig. 1.13: Parts of the digestive system

Digestion in the small intestine

The small intestine is about 6-7 metres long in an adult human being. It is made up of the duodenum and ileum.

Digestion in the duodenum

The duodenum is the first part of the small intestine and it is 25-30 cm long.

The duodenum receives the bile duct and the pancreatic duct.

Bile duct carries bile from the gall bladder.

Bile emulsifies lipids and neutralises the acidic chyme.

Pancreatic duct carries pancreatic juice from the pancreas and it helps in digestion of proteins and lipids.

Pancreatic juice contains enzymes such as pancreatic lipase, pancreatic amylase and trypsin which are responsible for digestion of food substances.

Digestion of food continues in the duodenum with the help of pancreatic juice from pancreas and bile from the liver and

food is readily absorbed.

The food is now ready for absorption into the body. The walls of the small intestine are able to absorb digested food into the bloodstream.

Other digestive juices from the pancreas (pancreatic juice) and liver (bile juice) break down the food further.

Large intestine

The indigestible food passes into the large intestine. Water, vitamins and mineral salts are absorbed into the blood stream.

The remaining water and indigestible food waste, moves to the rectum.

Activity 1.21

Rectum

The waste is stored here for some time and later released from the body through the anus as faeces.

Remember!

Bile only emulsifies fat. Emulsification is breaking down a bigger molecule into smaller molecule.

We should make sure that we eat a balanced diet to keep our bodies healthy.

Use locally materials available to make a model of the human digestive system as shown above.

1. Distinguish between small intestine and large intestine_____.
2. Create a crossword puzzle using the questions below. Shade the crossword puzzle where an appropriate answer is put.

Across

Digestion starts in the _____.

An organ that assists in digestion.

Assists in swallowing food.

Stores food for sometime.

The best method of preventing digestive disorders is through observing proper hygiene and _____.

Down

Breaking down food to make it ready for use by the body.

Another name of small intestine.

Food in the mouth is rolled into round balls called _____.

A liquid produced by the salivary glands.

Another name of the gullet.

Digestion is completed in the _____.

3. Pancreatic juice is produced by one of the following

   A. Liver

   B. Pancreas

   C. Small intestine

   D. Rectum

Unit 2 Reproductive systems in plants and Animals

There are different plants that grow in our surroundings. Some bear flowers while others do not. Flowers are the reproductive parts of a flowering plant. They produce seeds which later grow into new plants.

Words to learn

Stigma, style, ovules, ovary, sepal, stalk, petal, anthers, filament, calyx, stamen, pistil, pollination, fertilization, fruit, seed, scar, reproduction.

Activity 2.2

Work in pairs

Materials

Large fresh flowers, razor blades, hand lenses.

What to do:

1. Collect large mature fresh flowers and bring them to the classroom.
2. Carefully cut to split each of them into two equal parts as shown below.

   Caution: handle razor blade with care.

3. Using a chart, match the parts of the flower with the correct names:
   - Petals
   - Anther
   - Style
   - Ovary
   - Sepals
   - Stigma
   - Filament
   - Ovules
4. Draw one of the halves of the flower you split up in your exercise book.
5. Label the following parts: stigma, style, ovule, sepal, flower stalk, ovary, petal, filament and anther.

Learning Point

- Blood is a red liquid that is very important in the life of animals. It is the main transport liquid in the human body.
- Blood flows from the heart to all body parts and then back to the heart.
- The movement of the blood from the heart to all the body parts is called blood circulation.
- The path followed by the blood as it circulates in the body is called the circulatory system.
- Blood transports oxygen and other substances to all parts of the body.
- It also removes carbon dioxide and other wastes from the body organs.

Activity 2.2

Parts of the circulatory system

Work in pairs

Materials

Charts, photographs and pictures of a sheep, goat, cow or camel heart.

1. Observe the pictures, charts and photographs provided.
2. Answer the following questions
   - (a) Name the main pumping organ?
   - (b) What is the main liquid in the circulatory system?
   - (c) Talk about the tubes that carry the blood.
   - (d) Tell your friend about the sizes of the tubes.
3. Which other organ supports blood circulation?

A flower is made up of several parts. The following are parts of the flower and their functions:

Flower stalk – Holds the flower on the stem.

Sepals – Protects the flower when it is still in a bud stage. A collection of sepals is called Calyx.

Petals (corolla) – Protects the inner parts of a flower. Petals are brightly coloured to attract insects.

Stigma– Receives the pollen grains.

Style – The tube that connects the stigma to the ovary.

Ovary – Protects the ovules. It develops into a fruit.

Ovules – Female reproductive cells (gemetes) in the flower.

Anther – Produces pollen or the male cells (gametes).

Filament – Holds the anthers.

Fig. 1.14: Parts of a flower

Activity 2.2

Work in pairs

Materials:

Large fresh flowers, razor blades, hand lenses.

Remember!

Razer blades are dangerous handle with care

What to do

1. Carefully cut out the anther and filament.
2. Draw what you can see in your exercise books.
3. Using the hand lens, look at the anther. Can you see some powder?
4. Share your findings with the rest of the class.

Learning Point

The male part of a flower is called the stamen. It is made up of the anthers, filament and pollen grains.

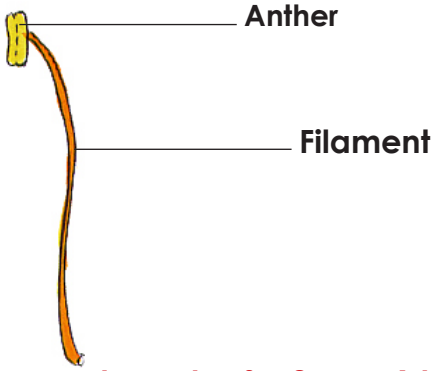


Fig. 1.15: Male parts of a flower (stamen)

Activity 2.3

Work in pairs

1. Carefully cut out the stigma, style and ovary.
2. Draw what you can see.
3. Using a razor blade cut the ovary and observe the ovules using a hands lens.
4. What is the size of the ovules?
5. Share your findings with the rest of the class.

Learning Point

The female part of a flower is called the pistil. It is made up of the stigma, style and ovary. Inside the ovary are ovules.

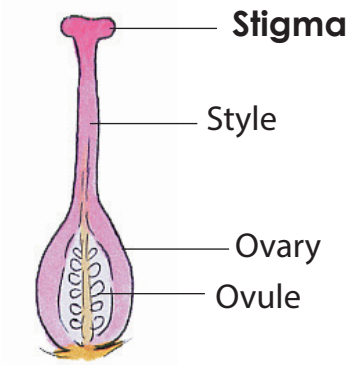


Fig. 1.16: Female parts of a flower (pistil)

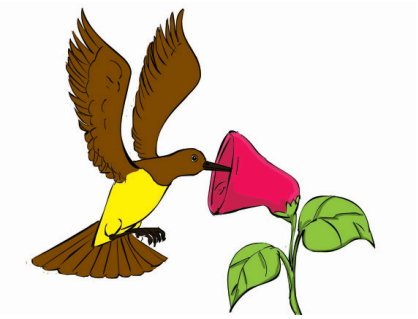
2.2Pollination and fertilization in flowering plants

Activity 2.4

Work in groups

1. **Study the pictures below.**

A



B

- **Talk about what you can see in pictures A and B.**

2. **What attracts insects and birds to the flowers?**
3. **How do the following benefit from one another?**
   a) **Animals?**
   b) **Plants?**
4. **Discuss your findings with other group members.**

Learning Point

Pollination is the transfer of pollen grains from the anthers to stigma.

Fun corner

Draw on a manilla paper a bee and bird collecting nectors from a flower, colour and pin it on the classroom wall.

Remember!

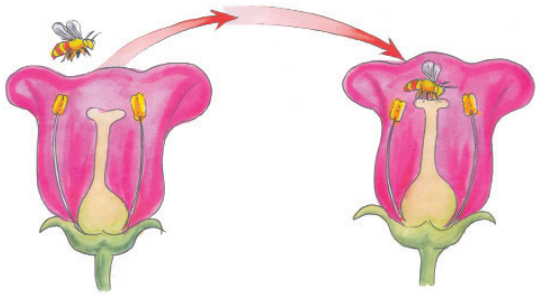
Insects and birds are important for pollination to take place. They transfer pollen grains from one flower to the other.

Activity 2.25

Work as a class

1. Study the pictures below.

A



B

2. Discuss what you can see in the pictures. Compare and contrast the two pictures.
3. What do you think the insect is doing in picture B above?
4. Discuss your findings.

Learning Point

There are two types of pollination.

(a) Self pollination

Is the transfer of pollen grains from the anthers to the stigma of the same kind.

(b) Cross pollination

This takes place when pollen grains of one flower land on the stigma of another flower but on a different plant of the same kind. i.e picture B.

Agents of pollination

Activity 2.26

Work in groups

1. Collect different kinds of flowers from the school compound.
2. Classify the flowers into the following groups:

	A	B
a)	Brightly coloured	Dull colours
b)	Sweet smell	No smell
c)	Large flowers	Small flowers
d)	Sticky pollen grains	Non-sticky pollen grains
e)	Smooth stigma	Hairy stigma

3. Talk about the features of the flowers in group A.
4. Talk about the features of the flowers in group B.
5. Discuss your findings with the rest of the class.
6. What is the possible agent of pollination of the flowers in group A and group B.

Learning Point

Agents of pollination are things which cause pollination to take place. The agents carry pollen grains from the anther to the stigma. The three agents of pollination are:

- Animals (insects, birds)
- Wind
- Water

Animals (insects, birds)

The flowers have these features to attract animals;

- Bright colours.
- Nectar and a sweet smell.
- Large enough.
- They have sticky, stigma and pollen grains.

Name some insects in your locality that collect nectar from flowers. Use your local language.

(b) Wind

The flowers pollinated by wind have these features:

- Dull colours.
- No nectar.
- No smell.
- Large amounts of pollen grains that are light and easily carried by wind.
- Hairy styles and stigmas to trap pollen grains.

Fun corner

Using clay, small seeds, manila paper, threads or string and paint, model a flower pollinated by insects and wind. Allow it to dry. Does it resemble the characteristics above.

Remember!

Plants are very important to human beings and animals. We must protect plants and plant trees.

Activity 2.27

Work in groups

1. **Record the flowers you had collected in activity 1.24 by each agent using local plant names.**

Insect pollinated	Wind pollinated

2. **Identify and name some flowers from your environment which have scent.**
3. **Identify and name other animals that visit flowers to collect nectar.**
4. **Go for a nature walk and observe animal pollination at work.**
5. **Discuss the group work with the rest of the class.**

Fun corner

Name some of the plants at home and their agents of pollination. How do they look like?

Fertilisation

Reproduction in plants starts with pollination followed by fertilisation.

Activity 2.28

Work in pairs

Look at the picture below.

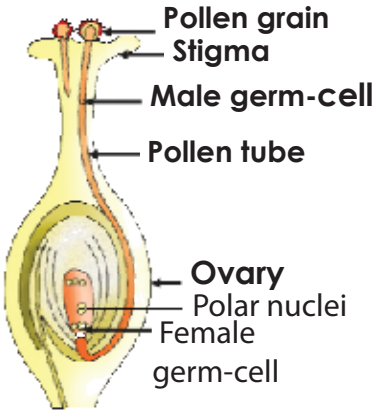


Fig. 1.17: Double fertilisation

1. **What is going on in the picture?**
2. **Identify the germinating pollen grains.**
3. **Follow the pollen tube. Where does it end?**
4. **Discuss your findings with your partner. Write a report then present to other class members.**

Learning Point

Pollen grains develop pollen tubes which transport the male cell to the ovary.

In the ovary, each female cell (ovule) gets connected to the pollen tube.

The pollen grain passing through the pollen tube unites with the ovule. This union of ovules and pollen grains is called fertilization.

After fertilization, the ovary develops into a fruit while the ovules develop into seeds.

The petals, style, anthers dry and fall off.

The point of attachment by the style to the ovary becomes a scar when the style falls off.

Activity 2.29

Work in groups

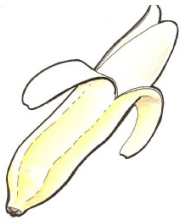
Materials

Different types of fruits, hand lenses, knives.

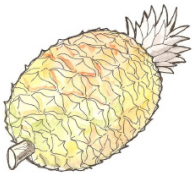
What to do

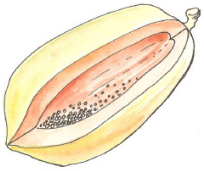
1. **Look at the different types of fruits below.**

A. 

B. 

C. 

D. 

E. 

F. 

2. **Can you relate the fruit to the ovary? Explain your answer.**
3. **Show your friends the points of attachment by the style to the ovary.**
4. **How many scars are there in each of the fruits?**
5. **Cut open the fruit to expose the inside. Use the hand lenses to observe it. Can you see the seeds?**
6. **Talk about the findings with your group members.**

Learning Point

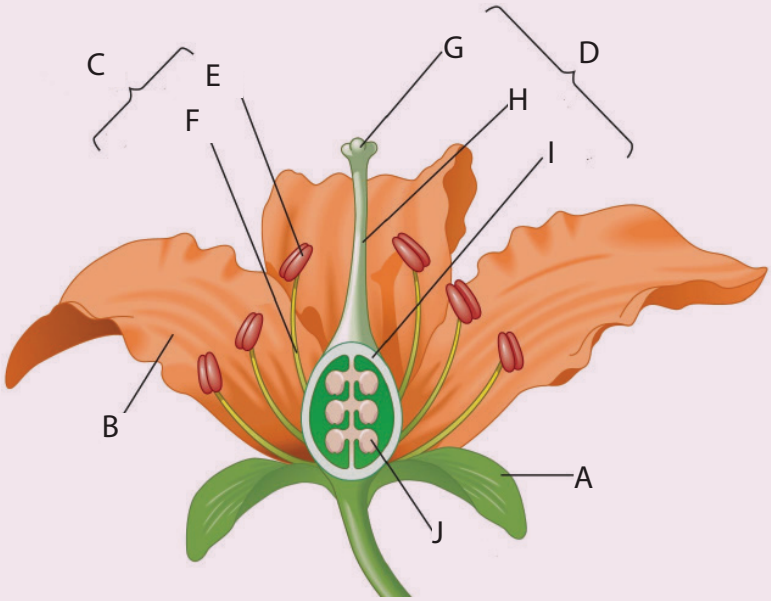
A fruit has two scars. The lower scar is the point of attachment to the flowerstalk and the remains of style. When a fruit is cut, seeds are seen inside it.

Remember!

A fruit is differentiated from a seed because it has two scars while the seed has one scar.

Check your progress 2.5

1. **Study the diagram below and answer the questions that follow.**



   a) **Identify common terms for the parts labelled C and D.**

   b) **How is the parts labelled B adapted to its function?**

   c) **What is the function of the parts labelled E and F?**

   d) **Name the parts labelled A, J and H.**

   e) **Show on the diagram how the pollen grains are usually transferred.**

2. **Which one of the following best describes the union of a pollen grain with an ovule?**

   A. **Cross pollination**

   B. **Self-pollination**

   C. **Fertilization**

   D. Gametes

3. **Using a table, distinguish between wind and insect pollinated flowers.**
4. **Why is maize grain considered a fruit and not a seed.**
5. **Why do wind pollinated flowers produce large quantity of pollen grains?**

Unit 3 Diseases and Hygiene

Words to Learn

Waterborne diseases, effects, spread, prevention, water pollution, airborne diseases, tuberculosis, germs, bacteria, water treatment, disposal.

3.1 Sources of water, methods of Water collection and Purification

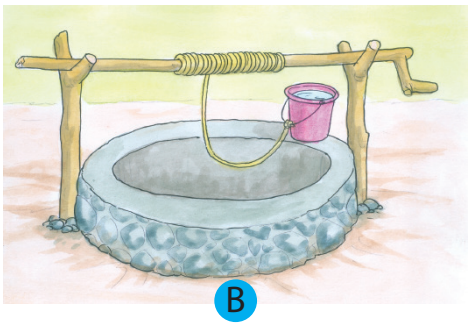
Sources of water

Activity 3.1

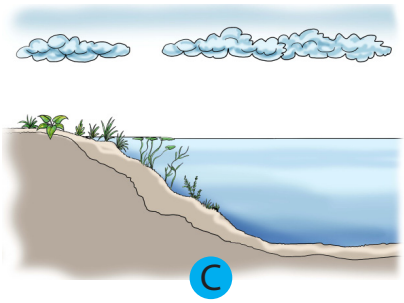
Work in pairs

1. We get water from different places. Some sources of water are shown below. Identify the sources of water.

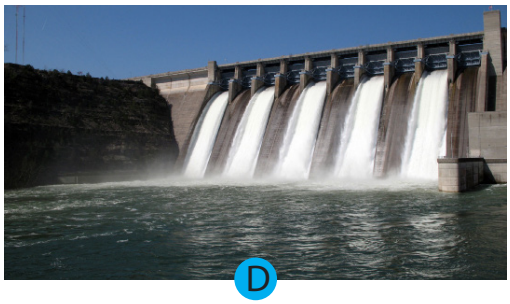
A



B



C



D

E

F

- What can you see in the pictures?

2. Answer these questions

(a) What are the sources of water in your school? How about at home?

(b) Is the water in school or home safe for use? Explain?

(c) How can you make the water sources safe?

Learning Point

Rain, lake, rivers, seas, oceans, borehole, wells are all examples of water sources.

Water sources can be contaminated by people, animals, waste disposal and faeces. To prevent water from being contaminated at the source, the following should be done:

- Maintain proper hygiene around the water sources.
- Building latrines far away from the water sources.
- Fencing of the water sources.
- Proper disposal of faecal wastes.
- Fetching water with clean containers.
- Watering animals away from water sources.

Remember!

Tap is not a source of water.

Fun corner

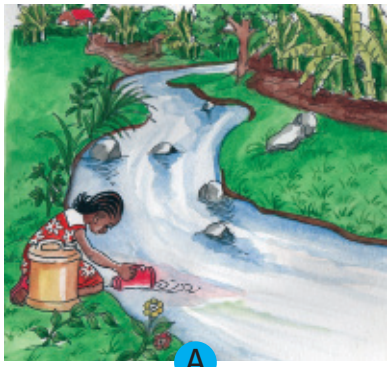
How else can you care for water sources? Write them down in a manila paper and hang it in a classroom wall.

Methods of water collection

Activity 3.2

Work in pairs

1. Study the pictures below:



A

B

C

D

1. What can you see in the pictures?
2. What do people in the community use to collect water?
3. What do you always do after collecting water?
4. How do you store water at home?

Learning Point

There are many methods used for water collection. From the pictures in activity 3.2, different people from different communities collect water using containers, buckets and tanks. After water has been collected, it is always advisable to purify and treat them to kill germs.

Some people also store water in pots. Always cover your stored water to prevent contamination.

Fun corner

Name some of the containers used at home and the community to store water. Draw and colour them.

Remember!

We should store water in a clean container.

Purification of water

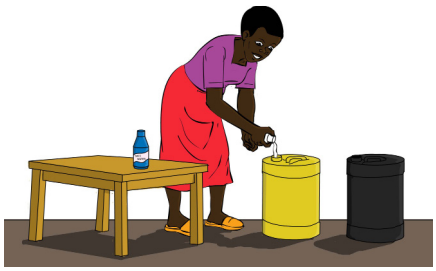
Activity 3.3

Work in groups

Study the pictures below.

A

B



C

D

1. What can you see in the pictures?
2. Identify the methods used to purify water in each picture. Is the water safe for drinking?
3. Discuss other methods of making water safe and clean for use.

Learning Point

Water is made safe for drinking by filtering then boiling. Before filtering, the dirty water can be left undisturbed for sometime to let solid particles settle at the bottom. The clear water on top is then carefully poured out leaving the solids behind. This is called decantation.

After decanting, the water is filtered. Filtering helps to remove dirt and other small solid particles present in the water. The water is then boiled to remove germs.

Water can also be treated with chemicals such as chlorine. Chlorine helps to kill germs present in water. Water can also be placed in bottles and then placed in sun. This is also another way of killing germs in water.

Fun corner

1. Practice singing the following song and present the song during school assembly.

Clean safe water, clean safe water

We all need clean safe water

Clean safe water to drink

Clean safe water to wash

Clean safe water for animals
Clean safe water for plants
Clean safe water, clean safe water
Ooh! how we need you!

Remember!

We should always boil water or treat it with chemicals for example water guard before drinking.

3.2 Water Pollution

Activity .3.4

Work in pairs

Study the picture below.

1. What is happening in the picture above?
2. From the picture, point out different activities that make water dirty.

3. Suppose you were a public health officer, how will you ensure that the water in the above picture is clean?
4. Discuss other ways in which water sources can be contaminated?

Learning Point

Dirty water is usually associated with germs and dirt. Germs are tiny living things which cause diseases to people and other living things.

Activities such as washing clothes, human beings bathing, animals urinating, industrial wastes and toilet near all river source contaminate water and may spread waterborne diseases to both people and animals.

Fun corner

Draw and colour other activities near your home that pollute water.

We should ensure our water sources remain clean and safe every time we use them.

Reducing (prevention) of water pollution

Activity 3.5

Work in groups

What to do

1. Use reference materials such as textbooks, journals, magazines, encyclopedia and internet to research on how water pollution can be prevented.
2. Compile a report and choose a group leader who will make a presentation on behalf of the group.
3. Practise using the above methods to sensitize community members on how to reduce water pollution at home and at school.

Learning Point

Water pollution can be prevented by:

- Digging latrines, septic tanks and reservoirs away from water sources.

- Not bathing or washing in or near water sources.
- Proper disposal of refuse away from water sources.
- Watering animals away from water sources.

Fun corner

Design a poster to sensitize community members on how to prevent water pollution.

Remember!

Prevention is better than cure. We should try as much as possible to reduce water pollution.

When we reduce water pollution we reduce waterborne diseases and we remain healthy hence saving cost of going to hospital to buy drugs.

3.3 Waterborne diseases

Activity 3.6

Work in pairs

Read this story to your partner then answer the questions that follow.

Last holiday, I went to visit my cousins who live in the village. We went outside to play. I felt very thirsty and drank water from a tap. In the evening, I started feeling sick. I had a severe headache and a running stomach. My uncle and my aunt took me to hospital. The doctor gave me medicine. She told me to always drink clean water.

Study questions

1. What made Cynthia sick?
2. Have you ever been sick because of drinking unsafe water? What happened to you?
3. Share your experiences about waterborne diseases in your homes and locality.Record your findings in your exercise books.

Learning Point

Water is very important to life of people and animals.

Water for domestic use should be safe and clean for use.

We should always drink clean water to prevent waterborne diseases.

Common waterborne diseases

Activity 7

Work in groups

Materials

Hand lenses, water from a pool, dam or river, container.

1. Using a hand lens, look at the water sample placed in a container.
2. Is the water clean or dirty? Why?
3. What can the things you have observed cause in the body?
4. Which diseases can you imagine may arise as a result of dirty water?

Causes, effects and spread of waterborne diseases

Activity 8

Work in groups

Materials

Manila paper, felt pen, cellotape and a meter rule.

What to do

1. You will be provided with reference materials and a list of different diseases by your teacher.

2. From the list provided, choose one common waterborne disease.
3. Use the Manila paper provided to tabulate your findings.
4. State the disease name, its cause, signs, symptoms, methods of spread, prevention and treatment.
5. Choose a group leader who will make a presentation on behalf of the group.
6. Stick the Manila paper on a classroom wall.

Learning Point

Table 2.1 Summarises various aspects of waterborne diseases.

Table 2.1: Ways of spread, causes, signs and symptoms, treatment and prevention of waterborne diseases

Name of disease	Cause	Signs and symptoms	Ways it is spread	Treatment and prevention
Cholera	Bacterial germs	Severe diarrhea, Vomiting Dehydration	Contaminated food, milk flies.	Wash uncooked food. Proper disposal of faecal waste. Vaccination.
Bilharzia	Blood flukes	Blood in urine Pain when urinating Blood stained diarrhea Backache	Coming into contact with contaminated water.	Kill fresh water snails. Wearing protective clothing. Avoid bathing in ponds, lakes and rivers.
Typhoid fever	Bacterial germs	Abdominal pains, Severe headache, Body weakness High fever	Drinking contaminated water.	Drinking boiled milk. Wash uncooked food. Vaccination.

Check your progress 3.1

1. Water is a very important molecule of life. Improving water quality in South Sudan improves quality of life among residents. What is your take on this statement?
2. List 3 ways that water becomes polluted.
3. What do you think are effective ways to clean up polluted water? Explain your answers.
4. Okello was hospitalised in hospital with the following symptoms; pain when urinating, blood in urine and blood stained diarrhea.
   a) Predict the likely disease Okello was suffering from?
   b) Suppose you were told to advice Okello, how will you advise him?

3.4 Airborne diseases

Activity 3.9

Work in pairs

Study these pictures.

A

B

1. What is going on in the pictures?
2. Can you identify the difference in the way the people are coughing?
3. Talk about your observations with your partner.
4. What are the dangers of coughing and sneezing without covering your mouth?

Remember!

Always use a handkerchief when blowing your nose.

Learning Point

Germs are found everywhere. They are also in the air.

If a person coughs, talks or sneezes, germs will pass out in the air.

When coughing or sneezing always cover your mouth with a handkerchief to stop germs from spreading to the air. Airborne diseases infect people and animals. Airborne disease can be prevented by blowing nose using handkerchief.

Common Airborne Diseases

Activity 3.10

Work as a class

Materials

Bubble liquid, bubble blowing wand, box of tissues, balloon

What to do

1. Let one student stand in front of a class and fill up the balloon with air.
2. Tie the knot at the tip of the balloon and throw it in a class.
3. The class should remain seated and calm and observe how the balloon moves in class.
4. The learner who the balloon lands on or his desk should lay on the desk and pretend to be infected with an airborne pathogen.
5. Repeat the activity three more times.
6. Identify the students who the balloon landed on?
7. Which common airborne diseases do you know? List them.

Learning Point

The activity above demonstrates how airborne diseases are usually spread in air.

Some common airborne diseases include; tuberculosis, measles, influenza and chicken pox.

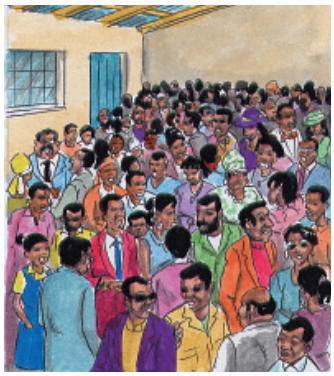
Control and Prevention of Airborne diseases

Activity 3.11

Work in groups

Study these pictures.

A



B

C

D

1. What is wrong or right with the pictures above?
2. Investigate other methods of preventing airborne diseases.
3. Discuss your findings with the rest of your group members.

4. Using reference materials such as textbooks, journals encyclopaedia and internet, research on different types of airborne diseases, their causes, effects, prevention and treatment.

5. Tabulate your results and discuss with other group members.

Learning Point

The following table summarises the types of airborne diseases, their causes, signs/symptoms, treatment and prevention.

Table 3.2: Types of airborne diseases, their causes, signs/symptoms, treatment and prevention

Airborne diseases	Cause and transmission	Signs and symptoms	Treatment and Prevention
Tuberculosis	Bacterial germs. Is transmitted when an infected person coughs, sneezes, shouts or sings.	Fever. Sweating at night. Loss of weight. Pain in the chest. Coughing blood.	Avoid congested places. Immunization. Good hygiene.
Measles/ Rubella	Virus Is transmitted through contact with an infected person through coughing and sneezing.	Fever. Coughing. Running nose. Red eyes. Rash or tiny red. spots.	Immunization. Isolation of sick patients to prevent the spread. Avoid congested places.
Influenza/ Flu	Virus Transmitted through direct contact with infected person, contact with contaminated objects and inhaling virus laden aerosol.	Congested chest. Dry throat cough. Running nose. Sore throat.	Vaccination each year. Avoid congested places.

Chicken pox	Virus It is transmitted through contact with an infected patient/person.	Itchy red blisters. Flulikesymptoms. Headache. Sore throat.	Vaccination. Isolation of infected patients. Disinfecting personal items.

Remember!

Remember: Small pox has been eradicated in South Sudan.

Check your progress 2

1. List some examples of airborne diseases.
2. Design a poster to warn people against airborne diseases.
3. How do we know that someone is suffering from tuberculosis?
4. Distinguish between airborne and waterborne diseases using relevant examples.

3.5 Stress and Depression

Activity 3.12

Work in pairs

Look at the pictures below and the questions that follow.

A

B

1. Are the people in the pictures happy? What are the possible causes of their condition?
2. Have you ever experienced the type of feeling in the pictures?
3. Are there home remedies to prevent or treat the conditions in the pictures above?

Learning Point

The people in the pictures are depressed and stressed at the same time.

- Stress – Anything that causes bodily or mental tension.
- Depression – It is a medical illness that negatively affects how you feel, think and act.

Activity 3.13

Work in groups

Materials

Textbooks, journals, magazines, internet, encyclopedias, Manila paper, felt pen and glue.

What to do

1. **Use the reference books provided to carry out research on stress and depression.**
2. **Identify the common causes of stress and depression.**
3. **How can stress and depression be managed?**
4. **Tabulate your findings on a Manila paper provided.**
5. **Compile a report and choose a group leader to present on behalf of the group.**
6. **Discuss your findings with the rest of the class.**

Learning Point

Stress and depression is common in patients. Stress and depression is caused by:

a) External factors like the environment. The environment in the hospital is not good compared to the home environment. The patient comes into contact with very sick patients, screaming, wailing and almost dying or dead patients. This is not a very common thing at home.

b) Internal factors like illness. When the body has an illness, it does not function properly. A body that is not functioning well is a source of stress and depression.

Stress and depression is manageable and treatable.

Work to do

Work as a class

Debate! Debate! Debate!

Debate on the following motion:

Exam failure is a major cause of Stress and Depression among learners.

Fun corner

Act a play or a skit on patients in hospital. In the play, the patient must appear stressed and depressed.

Remember!

If you have trouble eating, sleeping, poor concentration and feeling low for more than two weeks, you could be suffering from stress and depression.

Self-management can control stress and depression. If symptoms persist, seek medical assistance.

Check your progress3.3

1. Distinguish between stress and depression.
2. How do we know that someone is suffering from depression?
3. Write your own question on stress and depression and share around the class.
4. Suppose you are being interviewed by a journalist on common causes of stress among learners, highlight the major points you will talk about.

3.6 Home nursing

Activity 3.14


Work as a class

A guest speaker was invited to a primary 7 class to talk about home nursing. Read the following conversation aloud.

Nurse: Good morning children.

Pupils: Good morning our visitor.

Nurse: Today we shall learn more about home nursing.

Narot: What is home nursing?

Nurse: Home nursing is the care given to a patient at home.

Odong: What is the difference between home care and hospital care?

Nurse: Home care is one on one medical care at home. This happens mostly after a patient has been discharged from the hospital. Hospital care is an attention given to a patient in hospital by either a nurse or a doctor.

Narot: What happens in home nursing?

Nurse: In home nursing, the patient is given assistance with daily activities like bathing, toileting, grooming, medication, personal care and compassion. The patient is also reminded on the instructions given by the doctor.

Odong: What are the advantages of home nursing?

Nurse: Home nursing has many advantages. Some of the advantages include; there is privacy at home, security, one on one attention, there is less stress and depression which in turn leads to quick recovery. Home nursing is cheaper than admission in hospitals.

Narot: Is home nursing good for people living with HIV and AIDs?

Nurse: Yes, home nursing is good for all recovering patients but best for patients with – long time illness.

In groups of three, talk about these questions:

1. What is home nursing?
2. What kind of help is given to patients during home nursing?
3. What are some of the advantages of home nursing?

Learning Point

n one medical care at home.

It is cheaper and preserves the dignity of the patient.

It assists patients with their daily activities and enables patients to recover from an illness faster.

Fun corner

Act a play or a skit on a patient in bed being given home care by a family member.

Check your progress 2.4

1. Why is home nursing important for people living with HIV/ AIDS?
2. Give reasons why you think home nursing is advantageous.
3. Which activities do a patient need during home nursing?

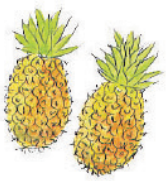
3.7 Nutritional needs for good health and for special groups

Nutritional needs for good health

Activity 3.15

Work in pairs

1. Study these pictures with your partner.

 A	 B	 C
 D	 E	 F
 G	 H	 I
 J	 K	 L

 M	 N	 O

2. Identify the foods in the pictures above.

   Your teacher will assist you classify the foods into different types of as shown in the table below.

Class of food	Picture letter
Carbohydrates	
Vitamins and mineral salts	
Proteins	
Fats and oils	

3. Name two other foods in each class.
4. Discuss your findings with the rest of the class.

Learning Point

The body needs various food substances to maintain good health.
These food substances are called nutrients. Example of nutrients are:

a) Carbohydrates – They are energy giving foods.

b) Proteins – They repair and build the body.

c) Vitamins and minerals – They are protective foods and are also needed for growth.

d) Fats and oils – They are energy giving foods.

The process of continually providing the body with foods necessary for growth and maintaining good health is called nutrition. Lack of enough nutrients leads to nutritional deficiency diseases such as kwashiokor and marasmus.

Fun corner

Collect different types of food from home and bring them to school.

Classify the foods into carbohydrates, proteins, vitamins, mineral salts, fats and oils.

Nutritional needs for special groups

Activity 3.16

Work in groups

Study these pictures.

A

B

C

D

E

F

1. Point out what is happening in the pictures.
2. Talk about the different special groups of people.
3. Find out other groups of people that have special dietary needs?
4. Discuss how you can plan for the meals for each of the special groups.
5. What nutrients must their diet contain?

Learning Point

Special groups of people need a special diet because of their age or health status. Their diet must be balanced and should contain:

- Carbohydrates
- Proteins
- Protective foods (vitamins and minerals)

Identifying food groups for special groups

Work as a class

Materials

Different types of food such as eggs, milk, bread, ripe bananas, sweet potatoes, oranges, beans, rice, fresh vegetables and millet flour.

1. Observe and identify the foods brought to the class?
2. Classify the foods into;
   a) Carbohydrates
   b) Proteins
   c) Vitamins and minerals foods
3. Select the foods and plan a meal for breakfast, lunch and supper for the following groups.

4. Fill in the table below.

	Special group	Breakfast	Lunch	Supper
A	Three year old infant			
B	Breastfeeding mother			
C	A person recovering from illness			
D	An expectant mother			

5. Discuss what you have recorded with other class members.

Table 2.3 is a summary of the nutritional requirements of special groups of people.

Table 3.3: Nutritional requirement for special group of people

Special group	Food requirement	Use
Infant	Breast milk	- Balanced. - Free from germs. - Easy to digest.
Pregnant mother	Proteins Carbohydrates Vitamins and minerals Enough fluids	- Healthy growth, formation of baby's organ and repair of mothers tissues. - Provide energy to the mother. - Helps the body to fight infections. - Formation of blood, organs, bones and teeth. - To maintain the amniotic fluid.
Breastfeeding mother	Balanced diet Enough fluids and Iron Calcium and phosphorus	- Helps the baby to get enough nutrients. - Milk production. - To replace blood lost during child birth. - Formation of teeth and bones in the baby. - Improve quality of breast milk.

People living with HIV and Aids	Proteins Carbohydrates Vitamins and minerals Fibre	- To build the body and repair of body cells. - To provide energy and strength. - Protect the body against infections and helps in digestion. - Prevents diarrhoea and constipation.

Check your progress 3.5

1. Find out how different communities take care of the special groups. Write it down.
2. Identify some foods in your home or community that can be given to
   a) Infants
   b) Pregnant mothers
   c) Breastfeeding mothers
   d) People living with HIV and AIDS

Fun corner

Collect photos of infants, pregnant mothers, breastfeeding mothers and people living with HIV and AIDS and stick them on a Manila paper. Under each photo, write the nutritional needs. Display the Manila paper in the learning corner.

3.8 Hygienic food preparation

Words to learn

Hygienic, contamination, food poisoning, unhygienic, diarrhea, dizziness, nutritional needs, special groups, carbohydrates, proteins, vitamins, minerals, pregnant, calcium, phosphorus, iron, fibre.

Activity 3.18

Work as a class

Primary seven pupils in Malek primary school invited a nurse as a guest speaker to discuss hygienic food preparation. Read what they discussed below to your partner.

Nurse: Good morning children, today we are going to learn about hygienic food preparation.

Pupils: Good morning nurse.

Buwa: How does food get contaminated?

Nurse: Well, unhygienic practices of handling food lead to food contamination and food poisoning.

Wani: What are unhygienic practices?

Nurse: Unhygienic practices are poor methods of handling food like using dirty hands, improper storage of food and many others.

Buwa: What are the causes of food poisoning?

Nurse: Thank you Buwa, food poisoning is caused by some chemicals used at home, natural chemicals in some foods like rotten maize, bacteria as well as mould.

Wani: How can I tell that I am suffering from food poisoning?

Nurse: Good Nyandeng, some effects of food poisoning are violent such as vomiting, severe stomach ache, diarrhea, fever, body weakness and dizziness.

Buwa: Nurse, how can we prevent food poisoning.

Nurse: Simple, observing good food hygiene practices.

Answer these questions

1. Point out some of the diseases that may arise as a result of food poisoning.
2. How do germs reach food?
3. Have you ever suffered from food poisoning?
4. How was the experience?
5. Are there home remedies for food poisoning?
6. Discuss various food preparation practices that would help prevent food poisoning. Present your report to the rest of the class.

Unhygienic practices of handling food lead to food contamination which in turn leads to food poisoning.

Hygienic food preparation techniques include:

- Washing hands properly before cooking or handling food.
- Food eaten raw should be thoroughly washed.
- All foods should be covered to prevent contamination.
- Always buy fresh foods and vegetables.
- Store food in cool and dry places.
- Protect food against insects, dust and rodents?
- Food remains should be reheated properly.

We should always observe these hygienic practices when preparing food.

1. Which food nutrient is correctly matched to its source?

	Food nutrient	Source
A	Carbohydrate	Eggs
B	Proteins	Bread
C	Vitamins	Oranges

2. Classify the following foods as either proteins, protective or carbohydrates;

   a) Eggs _____ b) Pawpaw _____

   c) Carrot _____ d) Fish _____

   e) Milk _____ f) Bread _____

3. The following are hygienic food practices.

   Write true of false.

   a) All stored food should be covered _____.

   b) Wash hands thoroughly with soap before handling food _____.

   c) Foods eaten raw should not be washed _____.

   d) Store food in a hot and moist place _____.

   e) Always check the expiring date on food _____.

4. Why do pregnant mothers require enough proteins?_____.

5. Which is the best food for an infant?

6. A diet rich in vitamins and mineral salts helps a person living with HIV and aids to?

   A. Fat

   B. Boost the immunity

   C. Live negatively

   D. Prevent constipation

3.9: Importance of Personal Hygiene, Home Sanitation and Food Preservation

Personal hygiene

In previous classes you learnt about hygiene practises and causes of diseases. In this unit you are going to learn how to apply the knowledge of hygiene and diseases to personal hygiene, home sanitation and food preservation.

Activity 3.19 Group work

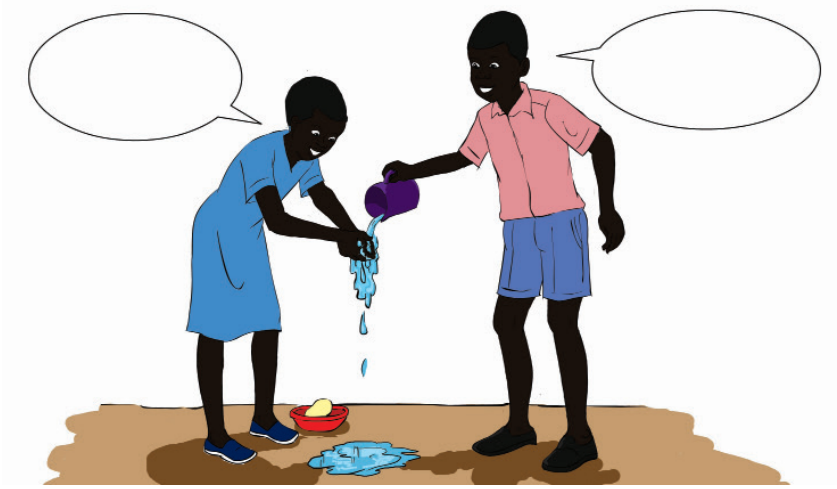
1. In groups of four:
   (a) Discuss personal hygiene practices you do to keep clean.
   (b) Discuss how you would apply the knowledge of hygiene and diseases control to your personal hygiene.
      - How important is practicing personal hygiene in preventing diseases?
2. Note down your findings.
3. Choose one member of the group to do a presentation of your findings to the class.

Learning points

- Personal hygiene ensures wellbeing of an individual. It helps to keep off germs that cause diseases.
- Germs are found in our entire environment. They are found in air, water, soil and on objects and things we touch.
- Germs cause diseases such as cholera, typhoid and dysentery. We should therefore practise good personal hygiene and home sanitation in order to keep germs away.
- Keeping our environment clean and tidy prevent germs from infecting us.

FUN CORNER

1. Fill in the speech bubbles. What is the boy telling the girl? What is the girl's response?



2. Describe diseases that can be prevented by practising personal hygiene methods shown below.

A

B

Did you know

Washing hands prevents over 80% of diseases!

Home Sanitation

Activity 3.20 Group work

1. Your teacher will provide you with charts showing how diseases are spread.
2. Study the charts provided carefully.
3. Using the charts discuss the relationship between hygiene and diseases.
4. Prepare a news report of your findings.
5. Dramatise presenting your report in a radio station in your local language.
6. Share your findings with other groups.

Learning points

- Home sanitation is the cleanliness of the home environment.
- The home environment includes the house, the compound, the toilets and latrines, bathrooms and animal sheds.

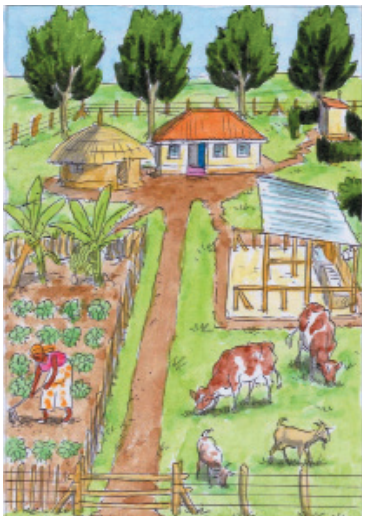


Fig 1.1 Home environment

- All the component of home environment should be kept clean.
- Domestic wastes should be properly disposed in a rubbish pit. Human wastes should be disposed in latrines or toilets.

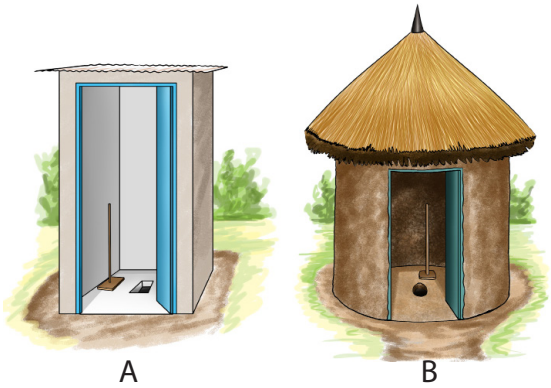


Fig 1.2 Latrines

- Inorganic waste such as plastics, glasses and paper bags should be placed in bins for recycling, reuse or reduction.

Fig 1.3 The 3 R's of conservation symbol

- Organic wastes such as kitchen waste and animal waste should be converted into compost manure to be used in farms. This therefore saves money that could have been used to buy chemical fertilisers. Compost manure, like other organic manure conserves our soil.

Fig 1. 4 compost manure

- When our home environment is clean, we are free from germs that cause diseases.
- A clean home environment also discourages pest and parasites which can also spread diseases.

FUN CORNER

Write a message to your community about the importance of disposing wastes properly.

Did you know

A mature tapeworm is more than 1 m long!

Activity 3.21 Individual work

1. Perform a food safety check at home, at school or at the local shops.
   - How are the foods preserved, stored or kept?
2. View the food packages.
   - Are the products wrapped properly?
   - What 'use by date' or expiry dates are displayed?
   - Are meat products separated from dairy products?
3. Do a write-up about your investigations.
4. Using the observations you have made, give reasons why mishandling food is unsafe and a potential food poisoning risk.

Learning points

- Food is oftenly contaminated because of poor handling, bad storage practices and lack of personal hygiene.
- Contaminate means spoil, pollute, taint or infect by something else.
- Any surplus food should be preserved properly for future use. Food that is not properly preserved can easily cause diseases such as food poisoning.
- Food poisoning is an illness of the stomach that is caused by chemicals

and micro organisms.

- Some chemicals such as aflatoxin occur in food that is not properly stored such as maize grains.

Fig 1.5 Maize infected with aflatoxin

- Food poisoning can kill if not quickly and properly treated.

FUN CORNER

Draw a poster about food poisoning. On the poster write a message to the community informing them that food poisoning can kill.

Project Activity

Make simple grain drier using wire mesh and pieces of wood. Spread grains on wire mesh and put the drier under the sun. When the grains dry completely put them in containers and store them in a dry place.

1. How do you dispose different kind of waste in your local environment?
2. Identify ways in which a person can practice good personal hygiene to prevent diseases.
3. Pick an example below which outlines poor use of personal hygiene.
   A. Taking off jewellery before washing hands and leaving the off.
   B. Washing hands before entering the kitchen.

C. Shower daily and wear clean clothing.

D. Leaving long hair out.

4. If you have a cold and you are working as a chef, waiter or kitchen hand, you turn up to work, what is the best thing to do?
5. Why do food handlers wear apron?
6. Write True or False statement regarding importance of personal hygiene.

3.10: Disease control through hygiene and food preservation

Activity 3.22 Group work

In groups of four:

1. Discuss the following
   - How can you prevent food contamination and spread of diseases?
   - How do you ensure good health of people working in a hotel?
2. Suggest methods of controlling diseases through hygiene and food preservation.
3. Write a report of your findings.
4. Choose one member to do a class presentation of your findings.

Learning points

- Germs breed in dirty places. We should therefore practice personal hygiene and home sanitation to keep off germs.
- We should clean our bodies and environment to destroy the breeding places of germs.
- We should practice good food hygiene to avoid water-borne diseases and food poisoning.
- We should educate the community about the need for proper sanitation and food handling practices to avoid endangering others.

Everyone should be involved in order for us to reduce infections. It all begins with an individual.

Fig 1.6 Public meeting

- Health education can be done through campaigns against diseases through the media, public meeting and advertising.
- Communal activities such as cleaning streets, separating waste and unclogging drainage plays a vital role in controlling the spread of diseases.
- It is possible to reduce germs and hence control diseases.

FUN CORNER

Draw people chasing germs on a Manila paper and hang in your class notice board for display.

Did you know

Scientists carry out research and come up with solutions to problems facing the world.

Further Activity

1. Using the internet and reference books investigate ways of controlling diseases.
2. Record your findings.
3. Compare your findings with other class members.

1. How do we control diseases?
2. Why is it important to store food on a shelf above the floor?
3. Infant food should not be stored at all but must be used immediately. Explain why?

3.11: Food preservation methods

Activity 3.23 Ways of preserving food in our community

1. Find out how people preserve food in your home area. You can ask your parents, older relatives, people in the market places, butchers, farmers and fishmongers.
2. Record the information you get in a table like the one shown below.

Name of food	Method of preservation used	How long the food can stay without getting spoilt
1.		
2.		
3.		

Learning points

Foods such as grains, vegetables and fruits are produced every season. These foods cannot stay for long. They soon decompose i.e. rot. We say that such foods are perishable.

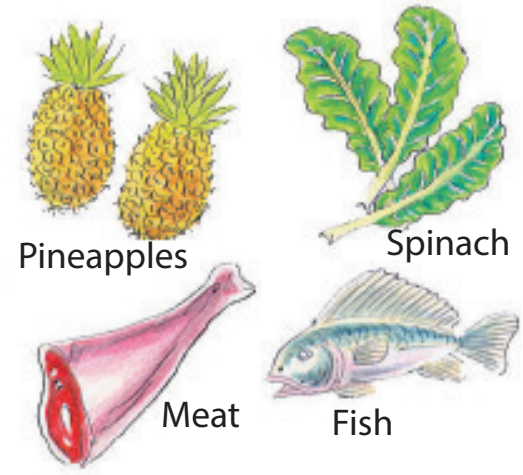


Fig 1. 7 Perishable foods

To prevent perishable produce such as vegetables and fruits from decomposing when they are plenty, they should be preserved so that they can last longer.

Similarly when plenty of fish are caught or animals have been slaughtered for meat, it is not always possible to eat or sell all the fish or meat at once.

Meat and fish are also highly perishable products which can decompose within a very short time. To avoid loss and waste, fish and meat need to be preserved so that they can last longer.

To preserve means to keep in good condition for a long time without decomposing.

When foods are preserved, it is often possible to:

- Retain nutrients in the food.
- Retain the colour of the food.
- Retain the flavour of the food.

- Protect the food against attack by bacteria and pests during storage.

Activity 3.24 Class work

1. Your teacher will invite a resource person to talk to you about food preservation methods or organise a visit to a food storage facility nearby.
2. Prepare a questionnaire to use during the talk or tour.
3. Ask questions concerning:
   - Methods of food storage and preservation methods.
   - Why food is stored?
   - Traditional and modern methods of food storage.
4. Compare traditional and modern methods of food preservation and storage. Summarise your findings in a table format.
5. Compare your findings with other groups in class.

Learning points

Food is preserved to:

- Reduce food wastage when there is surplus production.
- Be transported easily.

There are two main methods of preserving food. These are:

(i) The traditional methods

(ii) The modern methods

Traditional methods of preserving food

They include:

- smoking
- drying
- salting
- use of honey
- use of wood ash to preserve grains

Most of these methods have been in use for many years.

1. Smoking

Smoking food involves passing smoke over food. This method is used to preserve fish and meat. When smoke passes over the fish or meat it removes moisture. Bacteria which are responsible for spoiling food cannot reproduce or grow in the absence of moisture and therefore the meat or fish remains good for a long time without decaying.

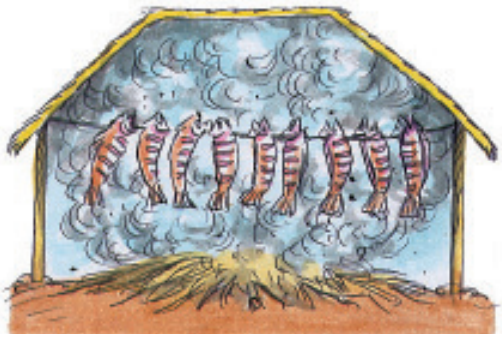


Fig. 1. 8 Smoking fish in a hut

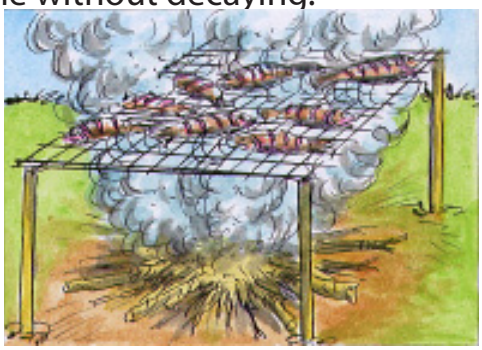


Fig. 1. 9 Smoking fish in the open

2. Drying in the sun

Food is spread in the sun to dry. The sun's energy removes moisture from fruits and vegetables, fish, meat and grains. This inhibits the growth of bacteria and the foods can stay for long without getting spoilt.

The food is turned from time to time to ensure even drying. After drying the food is put in containers.

Fig. 1.10 Sun drying peeled cassava, carrots and unripe bananas

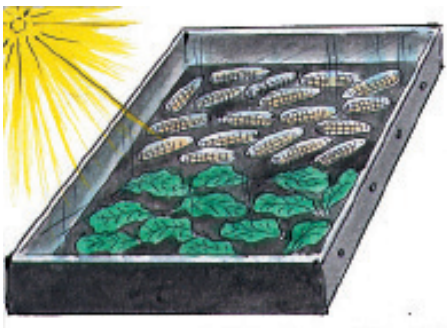


Fig. 1. 11 Sun drying green maize and vegetables

Dried maize and other seeds are prone to attack by weevils. To keep weevils away, the dried produce can be mixed with sifted ashes. Special chemicals can also be bought for this purpose but used strictly according to the manufacturer's instructions.

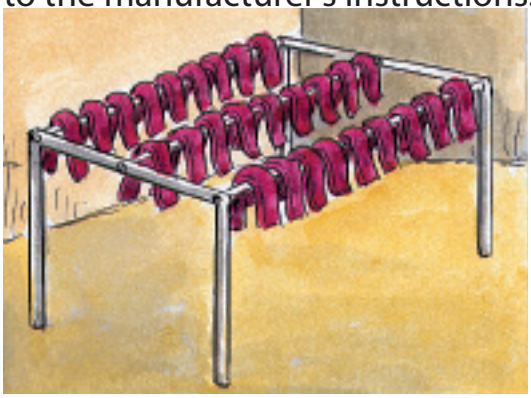


Fig. 1.12 Drying meat

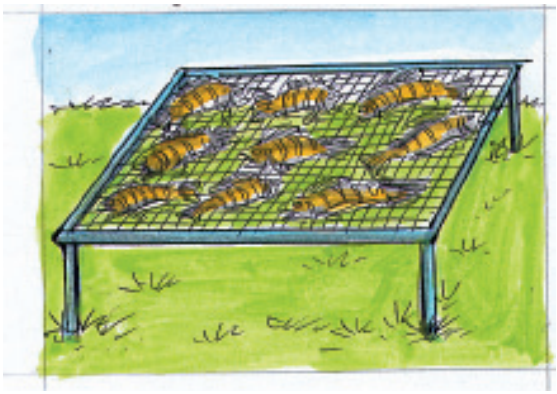


Fig. 1.12 Drying fish

3. Salting

Salt can be used to preserve fish and vegetables.

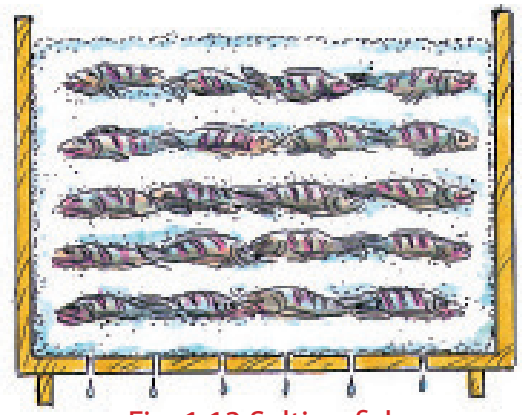


Fig. 1.13 Salting fish

4. Use of honey

This is one of the traditional methods of preserving food. Many communities have used honey for a long time to preserve foods such as meat and fruits.

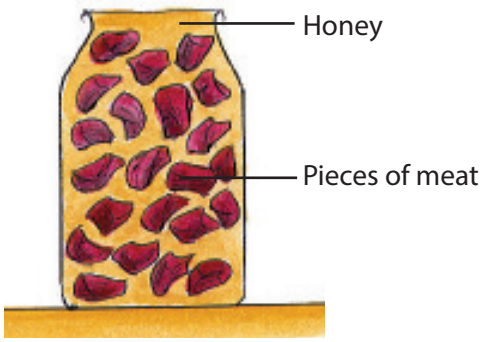


Fig. 1.14 Meat preserved in honey

Modern methods of preserving food

Activity 3.25 Individual work

1. Visit a market or shopping centre near you.
2. Observe how vegetable and fruit sellers preserve their vegetables or fruits.
3. Go to a shop that sells drinks.
   - Which method do they use to keep the drinks cold when there is no electricity?
   - How do they keep perishable foods for long without spoiling?
   - Compare the method used when there is no electricity and the use of refrigerators and freezers?
4. Write a report of your findings.
5. Compare your work with others in class.

a) Use of low temperatures

i) Cooling by evaporation

Vegetable sellers in the market preserve their vegetables such as okra, spinach, cowpea leaves in a sisal bag. They then sprinkle water on the bag. As the water evaporates it takes the heat from the bag and from the vegetables. The vegetables stay cool and fresh much longer.

ii) Use of a charcoal cooler

A charcoal cooler is used in places where their is no electricity.

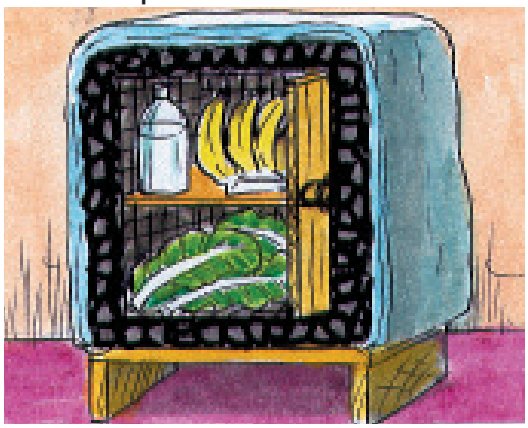


Fig. 1.16 Charcoal cooler

iii) Use of refrigerator or deep freezer

Food can also be preserved using modern coolers for example a refrigerator or a deep freezer. Low temperatures can be used to preserve fish, meat, chicken, some fruits and vegetables.

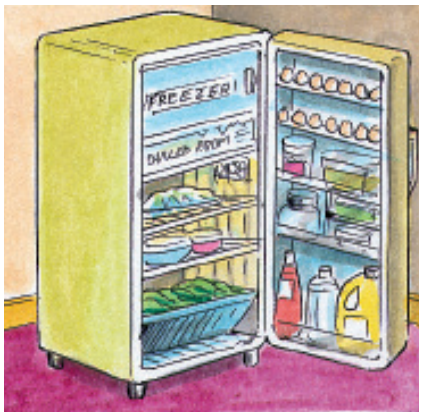


Fig. 1.17 A refrigerator

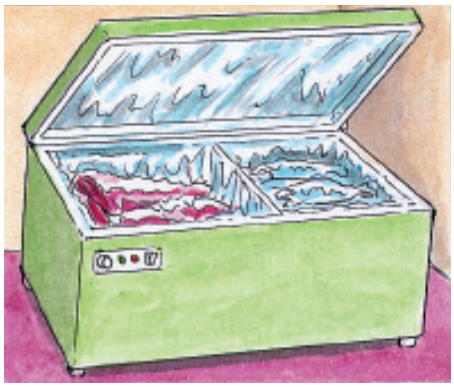


Fig. 1.18 A box freezer

Note: Use of low temperatures is an expensive method because refrigerators, deep freezers, gas, paraffin and electricity are expensive. Note that nowadays we have gas and paraffin refrigerators.

Activity 3.26 Class Activity

1. With the help of your teacher, visit large butcheries or large hotels which preserve foods on a large scale.
   (a) Observe the:
   - Equipment used for preserving foods such as refrigerators and deep freezers.
   - Cold rooms.
   - Foods that are preserved.
   - The temperatures under which the foods are kept.

   (b) Find out:
   - Where and when they obtain their various foods.
   - What they do to the food before preserving them.
   - How long the different foods are preserved.
   - The cost of preserving foods and risks involved.

Discuss the advantages and disadvantages of preserving food using low temperatures.

c) Canning

Canning means putting food that is to be preserved in a can. A can is a thin metal container usually made of aluminium. Foods that are preserved using the canning method include fruits, vegetables, fish and meat.

Note: Canning is usually done in factories. It is an expensive method.

d) Use of chemicals

Some of the chemicals used to preserve food include wood ash, sugar syrup, sulphur dioxide, vinegar and pesticides.

FUN CORNER

1. Coat a piece of meat at home using honey. Keep it in a lockable cupboard and make observation after four days. Report to the class your observation.
2. Using the internet investigate the use of low temperature in food preservation. Compare it with a charcoal cooler.

Did you know

Long time ago our forefathers were preserving food. They were using ash, honey, salting and drying methods.

- Name foods that could be preserved using the above methods.

1. Match the following methods of food preservation with the principle behind them. Use arrows to match.

Methods	Principle
Drying	Dehydrates germs.
Use of honey	keeps off germs and air.
Salting	Dehydrates food.

2. Give reasons why the use of low temperature for preserving food is not common in many homes.
3. What are the objectives for food preservation?

3.22:Importance of science knowledge in improving personal and food hygiene

Activity 3.12 Class debate

Motion: Knowledge of Science is key to improving personal and food hygiene

1. In two groups carry out debate on the motion above.
2. Choose members to represent proposers and opposers of the motion.
3. One member in each group will note down the points.
   - Which group carried the day.

Learning points

Science knowledge is important and plays a great role in improving personal and food hygiene.

1. It informs us on the presence of germs in our environment.
2. It makes us aware that germs cause diseases. We therefore practice personal hygiene to keep off germs. When we keep off germs, we avoid catching diseases.
3. We became aware of how germs get into our body mostly through contaminated food and water. We should therefore ensure food hygiene practices in order to prevent diseases such as cholera, typhoid, amoebic dysentery, food poisoning and human intestinal worms.
4. It enables us to practice food hygiene measures that include proper cooking and storage of food, washing hands before eating and handling food and after visiting the toilet or latrine.

Further Activity

1. Using the Internet investigate the signs of the following diseases.
   (a) Cholera
   (b) Typhoid

2. Record the signs and symptoms of cholera and typhoid in a table like the one shown below.

Disease	Signs and symptoms
Cholera	
Typhoid	

3. Using the information gathered from the Internet draw a chart showing how diseases spread from sick people to healthy people.
4. Visit a local hospital and record how sick people are treated.
5. Report your findings to the rest of the class.

1. How would you use the knowledge of science to improve personal and food hygiene?

Unit 4 Interdependence between Plants and Animals

Words to learn

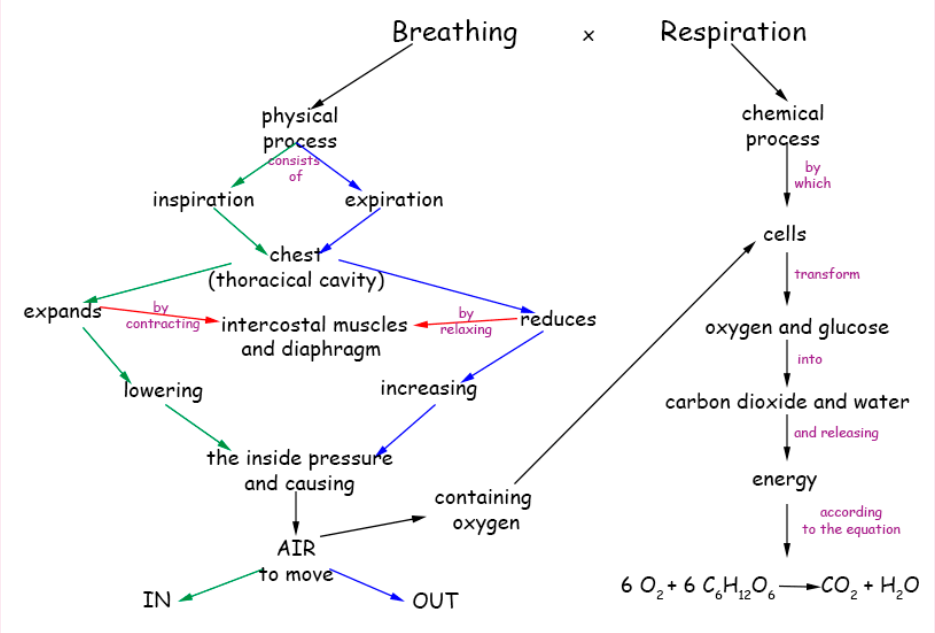
Respiration, Photosynthesis, Interdependence, Carbon Cycle, Inhale, Exhale, Oxidation, Excretion

4.1: The process of respiration

The food we eat gives us energy. Have you ever asked yourself how the body gets this energy?

Activity 4.1 Class activity

1. Jog on the spot for 1 minute. Discuss the changes to your breathing rate and why this happens.
2. Using textbooks and the Internet, discuss the following questions in class.
   - How does breathing rate relate to fitness and health?
   - What are the connection between breathing and respiration?
   - What is the difference between respiration and breathing in?
   - What are the raw materials and products of respiration?
3. Write a report of your findings.
4. Study the diagram below.



- Where does the two processes occur in the body?
- What is the importance of the processes?

5. Choose one member to do a class presentation of your findings.

Activity 4.2 In pairs

1. Role play the following conversation between Mariek and Achan in pairs.

   Mariek: Hello, Achan.

   Achan: Hello Mariek.

   Mariek: Where does the food we eat go?

   Achan: The food we eat goes into the stomach. It only stays there for about 3 – 4 hours. The food is digested partly in the stomach as it moves to the small intestines. Actually its digestion begins in the mouth. Once it is fully digested it is absorbed into the blood stream.

   Mariek: Does it stay in the blood?

Achan: Once it gets into the blood, the blood carries the digested food to all body cells. A part of the air you breath called oxygen gets into the blood, while the other gases are exhaled.

Mariek: Where does that oxygen go?

Achan: The blood carries oxygen to all body cells. The food is carried by the part of blood called plasma and oxygen is carried by the part of blood called red blood cells.

Mariek: Achan, what happens once the food and oxygen are in the body cells?

Achan: Oxygen burns the food chemically. This kind of burning is called oxidation.

Mariek: Does it affect the cells?

Achan: No. When the food is burnt energy is released as the main product.

Mariek: Are there other things that are released?

Achan: Yes there are by products such as carbon dioxide and water.

Mariek: Does it mean our body produces carbon dioxide?

Achan: Yes.

Mariek: That sounds interesting!

Achan: Sure! This process of burning food chemically to release energy, water and carbon dioxide is called respiration.

Mariek: Does that carbon dioxide help us?

Achan: No! Carbon dioxide and some water are excreted through the lungs, some water through the skin as sweat and through the kidney as urine. The carbon dioxide is used by the green plants to make food through a process known as photosynthesis.

Mariek: Thank you Achan. I have known where the body energy comes from.

Achan: Welcome Mariek. It has been good talking to you.

2. What have you learnt from the above conversation?
3. Trace using a diagram the path of food from the mouth to expulsion from the body.
4. Discuss with your friend, then compare your findings with the rest of the class.

Learning points

- Respiration is a chemical reaction that takes place in cells and allows them to release energy. The chemical reaction can be summed up with the following equation:

  Glucose + oxygen ⟶ water + carbon dioxide (+ energy)

- Reactants are the substances that react together in a chemical reaction. In respiration the reactants are glucose and oxygen.
- Glucose is a sugar and is removed from our digestive system into the blood in the small intestines.
- Oxygen is a gas that is needed for respiration. We take it from the air when we breathe in. It moves from our lungs, to our blood to be carried wherever it is needed in the body.
- Products are the substances that are made during a chemical reaction. In respiration the products are water and carbon dioxide.
- Water is a product of respiration that goes into the surrounding tissues.
- Carbon dioxide is a gas that is made during respiration. Carbon dioxide moves from the blood to the lungs. When we breathe out we get rid of the carbon dioxide from our body into the air.

- Respiration occurs in all cells of living things.
- The carbon dioxide released during respiration is used by green plants to make food.
- The air we breathe in (inhale) has more oxygen than the air we breathe out(exhale) since some oxygen is used during respiration.
- The air we breathe out has more carbon dioxide since some carbon dioxide is produced by the body during respiration.

FUN CORNER

Draw a cell of a living thing with oxygen burning food.

Did you know

Much carbon dioxide emmitted by greenhouses are absorbed by forest and seas.

Check your progress 4.1

1. Concentration of oxygen is _____ in the lungs _____ in the tissues.
2. The air we breathe in is rich in _____ while the air we breathe out is rich in _____.
3. Fill the table below.

Process	Reactants	Products
Respiration	_____, food	Water, _____, _____
Photosynthesis	Water, _____, _____	Food,_____

4. During exercise, the heart rate increases. Why does this happen?

4.2: The Process of Photosynthesis

Activity 4.3 Class discussion

1. How do plants make their own food?
2. What raw materials do plants need to make their food?
3. Compare how plants and animals obtain their food.
4. Write a report and present your findings in class.

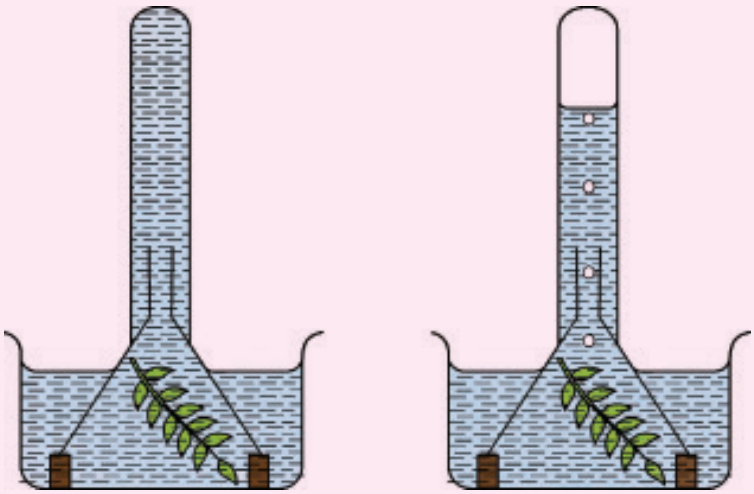
Activity 4.4 Group activity

What you need

Two large beakers, two funnels (glass), two test tubes, water with sodium hydrogen carbonate dissolved in it, splints, match box, water weed e.g. Elodea or Spirogra

What to do

1. Your teacher will assist you to prepare two set ups as shown below.



A B

2. Place one set-up in bright sunshine and the other in a dark cupboard for 2-3 hours.
3. Observe the set – up in the dark cupboard. What did you notice?
4. Test any gas produced using a glowing splint.

Study questions

1. What do you think is the role of sodium hydrogen carbonate dissolved in the water?
2. What happens to the glowing splint when it is exposed to the gas in the test tube?
3. Which conclusion can be made from the observations?
4. What was the role of the set – up that was placed in the dark cupboard?

Learning points

- Photosynthesis is a process by which plants synthesise glucose from water and carbon dioxide using light energy. Oxygen is usually released as a by-product. Through this process plants are able to make their own food.
- All life on earth depends on photosynthesis directly or indirectly.
- Photosynthesis occurs through a series of chemical reactions.
- The process of photosynthesis can be summarised by the following word equation.

$$\text{Water + carbon dioxide} \xrightarrow[\text{Light}]{\text{Sun}} \text{glucose + oxygen}$$

- Note that photosynthesis only provides plants with carbohydrates, which are important sources of energy to living organisms. However, plants needs proteins and mineral salts as well in order to grow. These are obtained in the soil through the roots.

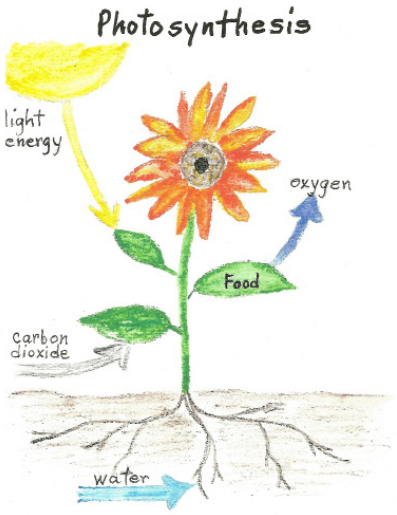


Fig 3.1 Photosynthesis in plants

- Photosynthesis occurs mainly in leaves because they contain chlorophyll: the green colouring matter. It creates a good medium for photosynthesis to take place.
- Water combines with carbon dioxide to form sugar (starch) which forms the basis of all other carbon products or compounds. Light energy enables the process to take place.
- During the process of making starch, oxygen and water are released as by-product.
- Oxygen and water are released to the atmosphere through the tiny holes in the leaves called stomata.
- The equation of photosynthesis is shown below;

$$\text{Water} + \text{carbon dioxide} \xrightarrow[\text{Light}]{\text{Sun}} \text{starch (sugars)} + \text{water} + \text{oxygen}$$

Did you know

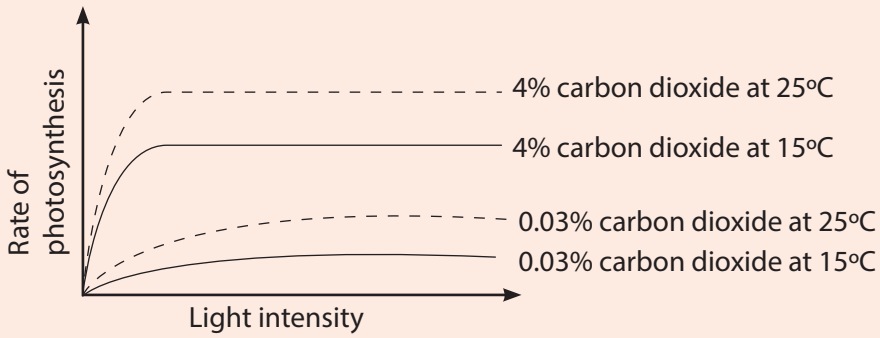
Green plants ensure balance in the atmosphere. They take in carbon dioxide and produce oxygen.

Further Activity — Individual work

1. Investigate using textbook and the internet:
   (a) The importance of light during photosynthesis.
   (b) How non-green plants make their food?
2. What do you think would happen in the atmosphere if there were no green plants?
3. Present your findings in class.

Check your progress 4.2

1. Which of the following is not a raw material needed by the plant to make their food?
   A. Starch
   B. Carbon dioxide
   C. Water
   D. Sunlight
2. Tomatoes in a greenhouse grow faster if the carbon dioxide concentration is increased. How do you explain this?
3. Explain how the products of photosynthesis are used.
4. The graph below shows how the rate of photosynthesis is affected by different conditions.

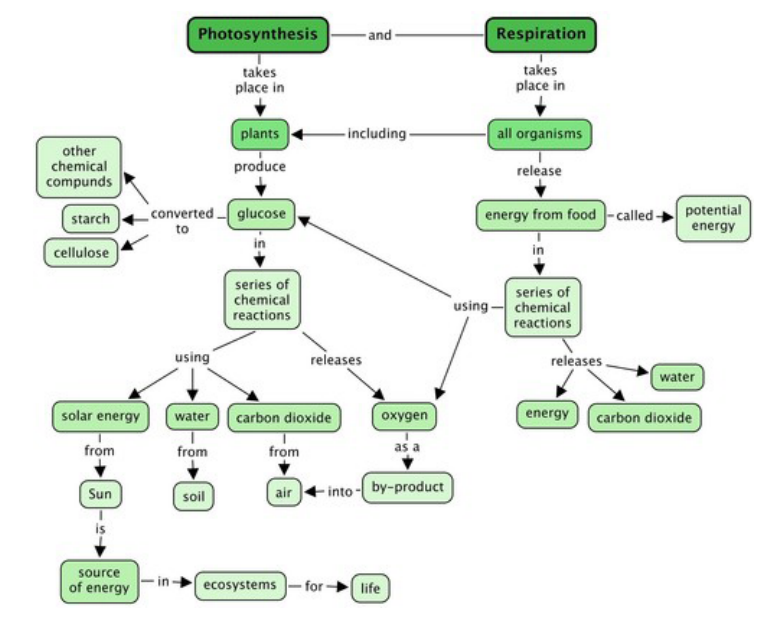


   (a) What patterns can you find from this graph?
   (b) How is this information useful to a farmer?

4.3: Relationship between photosynthesis and respiration

Activity 4.5 Group work

1. Study the diagram below.



2. Identify the relationship between photosynthesis and respiration.
3. Discuss your findings with your group members
4. Choose one group member to present your findings in class

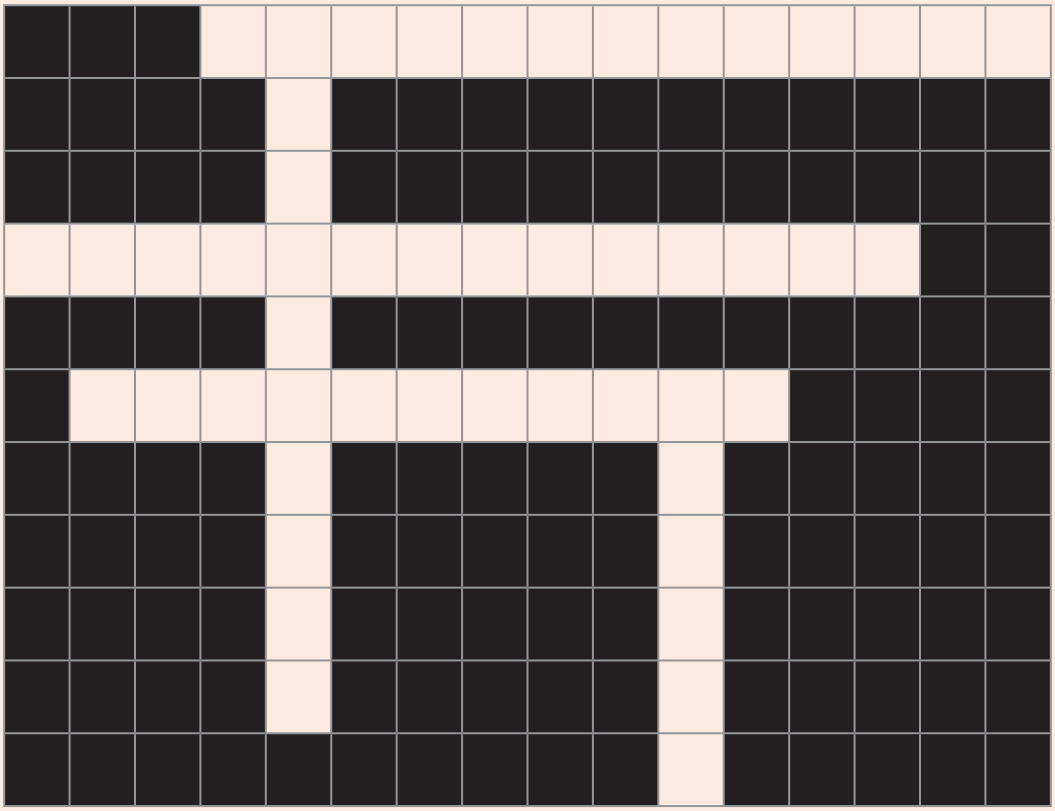
Learning points

- Respiration and photosynthesis are related. The two processes depend on each other for gases as raw material.
- During respiration oxygen is used up. This oxygen comes partly from photosynthesis process and partly from the atmosphere.
- During photosynthesis carbon dioxide is used up. This carbon dioxide comes from respiration process and partly from the atmosphere.
- Respiration and photosynthesis processes supplement each other in balancing the atmosphere.

- Respiration removes excess oxygen from the atmosphere while photosynthesis removes excess carbon dioxide from the atmosphere.

Check your progress 4.3

Fill the crossword puzzle.



Across

1. Photosynthesis gas.
3. Plants food.
4. Breaking food in the cells

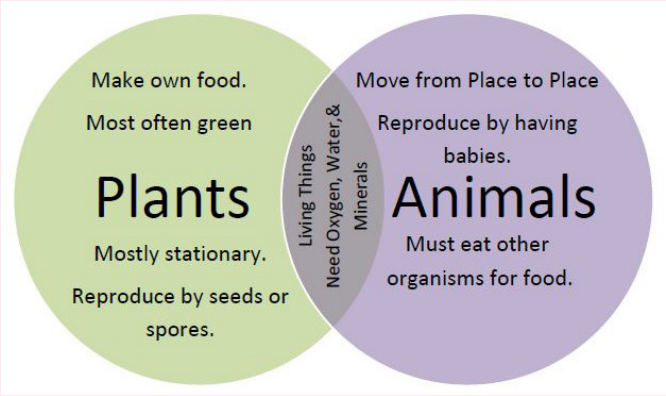
Down

2. The air of a place.
5. Photosynthesis gas

4.4: The difference between plants and animals

Activity 4.6 Pair work

1. Study the diagram below and answer the question below.



   - What are the characteristics of plants and animals?
   - What are the differences between plants and animals?
   - What are the similarities between plants and animals?
2. Record your findings in a table.
3. Share your findings with the rest of the class.

Learning points

- Green plants make their own food through the process of photosynthesis in their leaves.
- The manufactured food is stored in various parts in different plants, for example:
   - Sweet potatoes - roots
   - Sugar cane - stems
   - Onion- leaves.
- Animals do not make their own food. They look for food in their environment to eat.
- Different animals feed on different types of food depending on their adaptation

- Some animals eat vegetation. They are called herbivores.
- Some animals feed on meat only. They are called carnivores.
- Other animals feed on both plants and meat. They are called omnivorous.

Note: Plants make their own food while animals do not make food.

- Animals move about. They move about for various reasons such as looking for food, moving away from predators, looking for mates and moving away from unfavourable conditions like bad weather and fire.
- Plants do not move about from place to place naturally they grow on one point. The conditions for their survival are found within their habitat.

Activity 4.7 Class debate

Motion: Plants are more important than animals.

1. In two groups carry out debate on the motion above.
2. Choose members to represent proposers and opposers of the motion.
3. One member in each group will note down the points.
   - Which group carried the day?

Further Activity Carbon cycle

1. Using the internet research on the processes involved in the carbon cycle.
2. Present your findings to the teacher for assessment.

Did you know

Photosynthesis occurs only in green plants. Do not destroy plants. They balance the atmosphere.

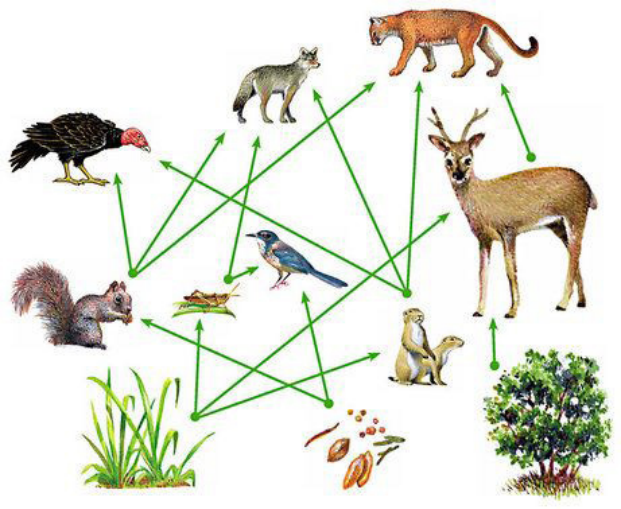
Check your progress 4.4

1. Animals move about while plants remain stationary. Explain this statement.
2. Which external features do plants and animals have in common?

4.5: Interdependence between plants and animals

Activity 4.8 Group work

1. In groups of four study the food web below and answer the questions below.



- How do plants and animals dependent on each other?
- How can the relationships between plants and animas be maintained without conflicts?
- How do we affect the relationships between plants and animals?
- Give examples of relationships between plants and animals.

2. Write a report and present your work to the teacher for assessment.

Learning points

Plants and animals depend on each other for survival. The dependency of organisms upon each other is called interdependence.

a) Plants dependence on animals

1. Plants depend on animals for carbon dioxide. When animals breathe out carbon dioxide during respiration, plants take it in to use during photosynthesis.
2. Plants depend on animals for pollination. Animals such as bees, butterflies and birds carry pollen grains from one flower to another while searching for nectar.

Fig 3.2 Pollination

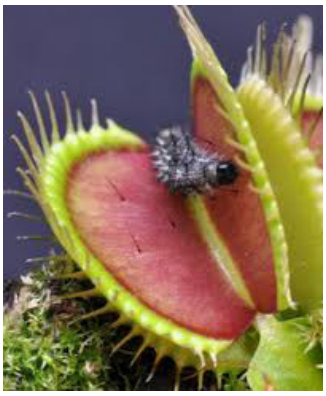


Fig 3.4 Venus fly trap plant

3. Plants depend on animals for nutrients, for example, insectivorous plants such as Venus fly trap, Pitcher plant and sundew plant, trap small animals such as insects and digest them to get nutrients.

   Manure from animals such as farm yard manure or any animal dropping provides nutrients to plants.

b) Animals dependence on plants

Animals similarly depend on plants for various things.

1. Animals receive oxygen that is released by plants during photosynthesis. They use the oxygen during respiration.

2. Animals depend on plants for food either directly, for example, herbivores eat plants while carnivores depend on plants indirectly since they feed on animals that eat plants, for example, a zebra feeds on grass while a lion feeds on a zebra that eats grass.

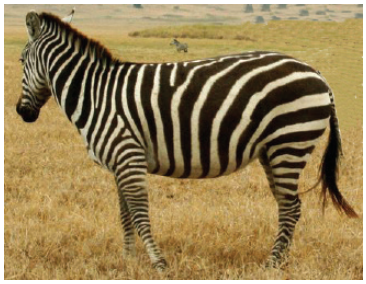


Fig 3.4 A zebra is herbivorous

Fig 3.5 A lion chasing after a zebra

3. Animals also depend on plants for medicine, for example human beings depend on plants such as Neem tree, Aloe Vera and Cinchona tree for herbal medicine.

Note: Quinine that was used to treat malaria was extracted from Cinchona tree.

Fig 3.6 Neem tree

Fig 3.7 Aloe vera is used as a medicine

4. Animals depend on plants for habitat. Animals such as birds and monkeys live on trees.
5. Animals also depend on plants for shade. When it is hot they rest under trees.

Fig 3. 8 A monkey

Fig 3.9 Animals under the shade of a tree

Further Activity

Use the Internet to investigate the importance of Neem tree to human beings.

FUN CORNER

Draw a billboard with a message to the community on the importance of conservation of nature.

Did you know

You have a duty to conserve the environment!

Check your progress 4.5

1. Draw the interdependence between a cow and a tree.
2. How is the plant shown below important to human beings?

3. What do you think will happen if all plants are destroyed?
4. Why do predators need plants such as grass in their ecosystems?

Unit 5 The Earth and the Solar System

Words to Learn

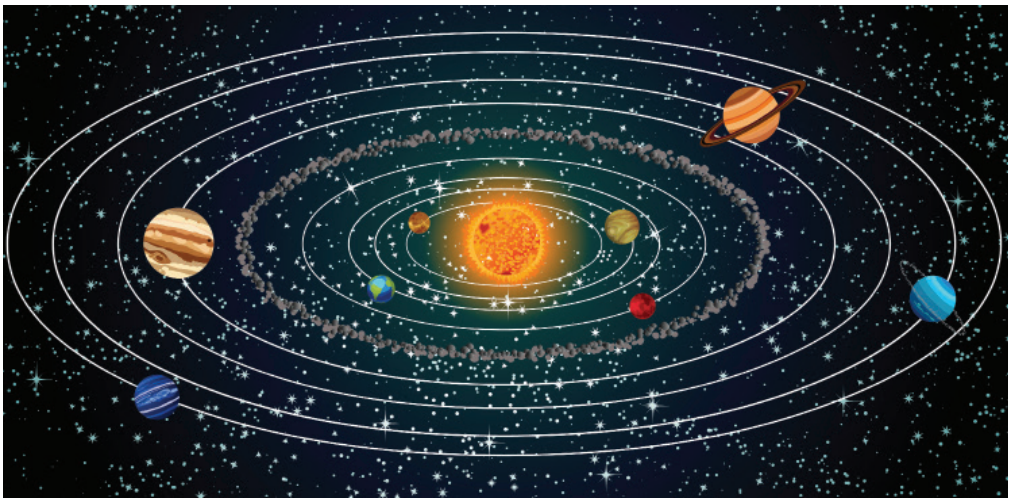
Solar system, component, orbit, planets, rotation, astronaut, satellite, comets, meteors, meteorites, ozone, solar eclipse.

5.1 Reasons for studying the solar system, orbits and the moon

Activity 5.1

Work in pairs

Look at the picture below.



1. What can you see?
2. What do you think is at the centre of the solar system?
3. What do you think is the planet with a ring around it?
4. Draw a solar system in the space below and record your observations in the table below.

Solar system	Observations
	1.
	2.
	3.
	4.
	5.
	6.

5. Share your findings with the rest of the class.

Learning Point

- The solar system is made up of the sun and the eight planets.
- The sun is at the centre of the solar system.
- Some planets are big while others are small.
- Each panet moves on its own path. The planets are not colliding.
- All the planets move round the sun.
- The closer the planet is to the sun, the faster it goes round the sun.
- Some planets have moons while others don't have moons.
- There are other artificial objects called satellites that move round the planets.
- There is a belt of rocks between planets mars and Jupiter. They are called asteroids.
- There are other rocks that are seen moving across the sky. They produce light. They are called meteors and meteorites.
- There are other objects with the head and the tail that goes round the earth. They are called comets.

Check your progress 5.1

1. Identify the components of the solar system.
2. All planets go round the sun. True or false
3. The path the planets follow as they go round the sun is called _____.
4. What is found between planets mars and Jupiter?
5. Which planet is next to the sun?
6. Arrange the planets below from the biggest to the smallest;
   Mars, Venus, Jupiter, Mercury.
7. What is at the centre of the solar system?
8. Which planet goes round the sun in an anti-clockwise manner?
9. Which planet takes the longest time to go round the sun? Why?

Activity 5.2

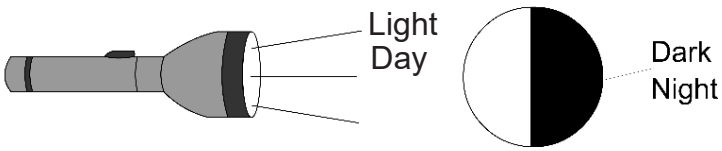

Work as a class

Read the following conversation loudly.

Teacher Alam:	Good morning class.
Learners:	Good morning teacher Alam.
Teacher Alam:	I am happy to see you are all present and eagerly waiting to learn.
Learners:	Yes, teacher.
Teacher Alam:	Today, we are priviledged to have a visitor from the meteorological department. Do you welcome her?
Learners:	Yes teacher.
Teacher Alam:	Okay. Lets welcome her in our own way. Head boy lead them.
Headboy:	Lets welcome her with three hearty claps (all claps).

Riya:	Good morning class.
Class:	Good morning Madam.
Riya:	Today is our good day when we are going to share a lot more about the solar system. I got your request from your head teacher about your concerns on components of the solar system. Are you ready?
Learner 1:	Yes Madam, how are the planets suspended in the space.?
Riya:	Good question. Whats your name?
Learner 1:	My name is Okello.
Riya:	Look Okello, all the planets are held in their position by a force from the sun.
Okello:	Which force?
Riya:	The force of gravity.
Learner 2:	How come the sun is at the centre of the solar system.
Riya:	The sun is the controller of the solar system. Actually beside holding the planets in their positions, it is the main source of energy in all the planets.
Learner 2:	Madam, do you mean it is the main source of our energy.?
Riya:	Exactly! It is the chief source of energy even on earth. What is your name, good boy?
Learner 2:	My name is Ladu.
Riya:	Ladu and the others, the sun causes many things. It causes the wind. When it is hot, it makes air light and the air starts moving.
Deng:	True…Moving air is called wind.
Riya:	Class, you need to know that the sun also affects the weather and the climate of an area.
Achol:	Do the moon have effects on the planets?

Riya:	Good question. The moon causes tides in the oceans. It has a force that attracts the water.
Okello:	Is this the reason why during the full moon there are very high tides?
Riya:	Yes Okello. Do you come from an area where people practice fishing.
Okello:	Yes.
Riya:	Please advice them not to go fishing during the phase of full moon.
Bol:	Is there any other planet where there is life.
Riya:	No…the only planet where there is life is the earth, our planet. The conditions in other planets are not favourable. They are either too hot, too cold or they lack oxygen.
Opi:	Can you become big if you go to the big planet?
Riya:	No. you cannot become big. If you visit a bigger planet, you can weigh more because it has a higher gravity. And if you go to a smaller planet you weigh less.
Nyok:	Do you mean if Nyerew who weighs 45 kilograms here can weigh 60 kilograms in Jupiter and 23 Kilograms in mercury.
Riya:	Fantastic. Yes because of the difference in gravity.
Lenaola:	Does the sun cause day and night?
Riya:	Days and night occurs as a result of the rotation of the earth. One side receives the sun and so it is day while the other faces away from the sun.



Deng:	Madam, yesterday when I was milking our cow, I saw a bright object that was slowly moving across the sky. What could that be?
Riya:	That was an artificial satellite. Scientists put them in

	the space to collect information about weather and mineral deposits.
Lopuke:	What about the bright objects that moves across the sky in a flash.
Riya:	Those are called shooting stars. The ones which reach the earth are called meteorites and the ones which do not reach the earth are called meteors. When they are falling, you should be careful because they cause destructions. Comets have a tail when observed. Any other question.
	Thank you class for your good questions.
Teacher Alam:	Let us clap for our visitor.
	Thank you so much it has been a good lesson.
Learners:	Clap your hands and say thank you together.

Learning Point

1. The planets are held in their position by the gravitational force from the sun.
2. The sun affects the weather by increasing the temperature of the atmosphere.
3. The moon causes tides in the ocean.
4. There are other heavenly bodies such as the comets and meteors which are found in the space.
5. Objects weigh differently on different planets because of the difference in gravity.

Check your progress 5.2

1. Which type of force holds planets in the right position?
2. What causes wind _____ ?
3. Why is it not advisable to go swimming or fishing during full moon?

4. Identify the heavenly bodies in the picture below.

A

B

C

5. Why do objects weigh differently on different planets?

Did you know

There are traces of dry river beds in planet mars.

Remember!

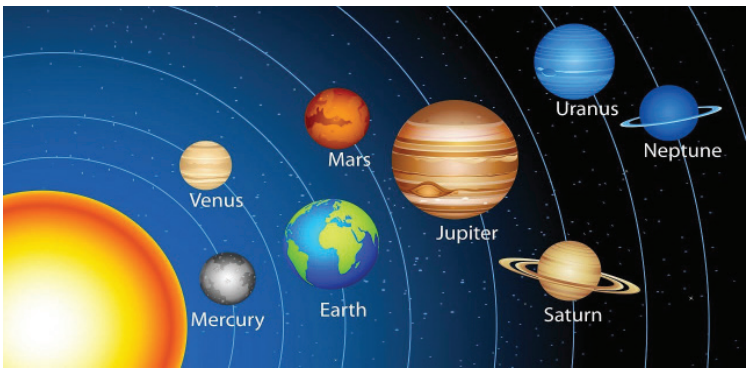
Rotation of the earth causes days and nights.

5.3 Arrangement of planets in relation to the sun

Activity 5.3

Work in groups

Look at picture below.



1. Practice singing the following song loudly.

   My Very Eager Mother Just Served Us Noodles

2. Discuss the names represented by each letter and record the names in the table below.

Letter	Planet
M	
V	
E	
M	
J	
S	
U	
N	

3. Discuss the features of each of the above planets from the pictures above and record in the table below.

Planet	Main features
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

4. In groups, design and compose a rhyme to help you remember the order of planets.

Learning Point

There are eight planets.

Each planet goes round the sun following its own orbit.

The planets takes different periods of time to go round the sun. The longer the orbit from the sun the longer the planet takes to go round the sun.

The smallest planet is Mercury while the biggest planet is Jupiter.

Jupiter has the highest gravity due to its mass.

The earth is the only planet where there is life due to presence of Oxygen and water. It is called the blue planet due to its large water bodies covering the surface.

Saturn is the only planet with 3 rings around it.

Pluto was relegated to the group of dwarf planets in 2006. It is grouped with other dwarf planets such as Ceres, Haumea, iris and makemake.

Most of the planets have natural satellites called moons as indicated in the table below.

Table 3.1: Properties of planets in the solar system.

Planet	Approximate distance from sun (Million Km)	Diameter (Km)	Period of rotation in hours or days	Period of revolution length of years	No. of moons
Mercury	57.9	4,879	1403 hours	88.0 days	0
Venus	108.2	12,104	5832 hours	224.7 days	0
Earth	149.6	12,756	24 hours	365.2 days	1
Mars	227.9	6,792	24.5 hours	687.0 days	2
Jupiter	778.6	142,984	10.0 hours	12 years	67
Saturn	1433.5	120,536	11 hours	$29\frac{1}{2}$ years	62
Uranus	2872.5	51,118	17 hours	84 years	27
Neptune	4495.1	49,528	16 hours	165 years	14

Check your progress 5.3

1. Why does Neptune take long to revolve round the sun compared to mercury?
2. Jupiter has many moons compared to earth. Why do you think this is so?
3. Why do you think planet earth is mostly referred to as a blue planet?
4. Describe planet Saturn.
5. Between Mercury, Venus and Mars, which planet do you think is the hottest? Why?

Activity 5.4

Work in groups

Materials

- Plasticine or clay
- Manila paper
- Pieces of paper
- Felt pen or chalk
- Soft board
- Pins
- Glue
- Name tag

What to do

1. Model the sun and the planets using plasticine or clay.
2. Paste the manila paper on the soft board.
3. Draw circles to represent the orbits.
4. Fix the sun at the centre using the pins and then the planets in their orbits.
5. Write the name tags on the papers and label the planets.
6. Fix small pebbles between mars and Jupiter to represent the asteroids.

Learning Point

1. When modeling the solar system the models should vary in size.
2. The arrangement of planets from the sun is as follows; Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
3. If planets are arranged in order of size from the smallest to the biggest, then it is as follows; Mercury, Mars, Venus, Earth, Uranus, Neptune, Saturn and Jupiter.
4. The real orbits are oval in shape.
5. There is a belt of rocks between mars and Jupiter is called asteroid.

Fun corner

Model the solar system using carton box, wires, clay, pieces of paper, marker pen and a pin.

Remember!

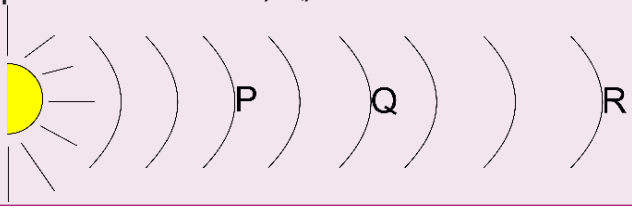
Pluto used to be grouped with other planets but was removed in 2006 by scientists. It is a dwarf planet.

Did you know

There are many other planets that scientists have discovered.

Check your progress 5.4

1. List the materials you can use to model the solar system.
2. Arrange the following planets from the smallest to the largest. Mars, Neptune, Jupiter, Venus.
3. List the steps followed when modeling a solar system.
4. What do you think are the functions of satellites in the solar system?
5. Name the planets marked P, Q, R in the model below.



6.1: Differences between weather and climate

Activity 6.1 Group work

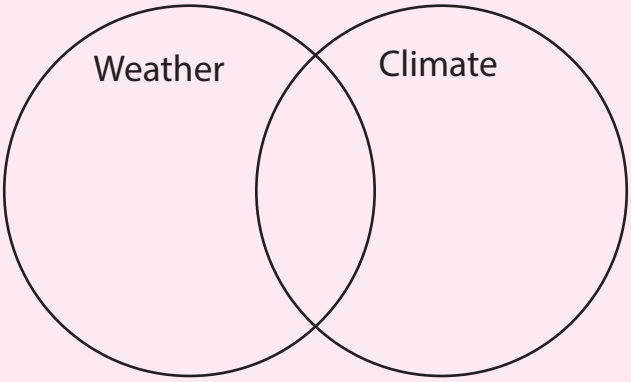
What do you need

- Set of temperature data for a particular area (daily, monthly and yearly)
- Graph paper
- Coloured pencils

What to do

1. Your teacher will provide each group with a set of temperature data for a particular area.
2. Study the given data carefully. You will be required to draw a graph using the data given.
3. Create graphs form the data given.
    - What kind of graphs did you draw?
    - What kind of pattern does the graphs show?
4. Each group to arrange all their graphs end-to-end and hang them on a wall where the class can easily see the entire length of the new graph.
5. Look for daily, weekly, monthly and yearly patterns in the graphs displayed.
6. Discuss in your groups what patterns is shown by the graphs over a period of time.
    - Can you now diffentiate between weather and climate?

7. Note the differences and similarities in circle like the one shown below.



8. Choose one member do to a class presentation of your findings.

Learning points

- Weather is the condition of the atmosphere at any given time or short period of time. Weather conditions can change suddenly. It may be warm and sunny; tomorrow may be cool and cloudy. Weather conditionsincluderain,sunshine,wind,temperatureandthunderstorms.
- Climate describes surface and atmospheric conditions over a long period of time or over a large geographical area. The climate of an area is concerned with the average weather conditions, which are taken over a year or more.
- Climate changes slowly, usually over decades, centuries and thousands of years. The Earth has many climatic regions. Some places experience different climatic conditions such as winter and summer.
- Three main things cause the weather to change i.e Heat, wind and moisture.
- Heat comes from the sun that is why places near the equator get more heat from the sun than places near the North and South poles do.
- Land heats up quicker than oceans but oceans hold heat longer than the land. Land aslo cools quicker than the oceans.

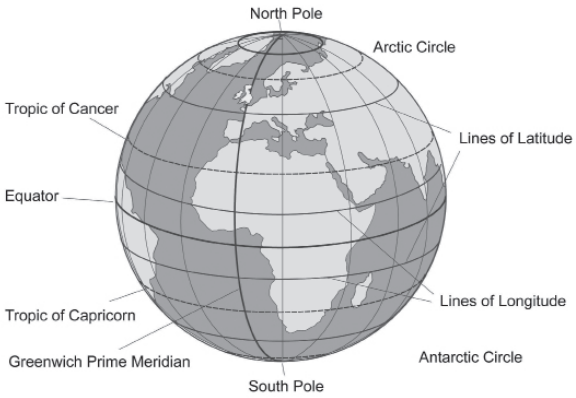


Fig 4.1 The Earth

- The uneven heating and cooling of different parts of the Earth causes winds. Winds move clouds from place to place. Clouds carry moisture that falls as rain or snow. Warm air can carry more moisture than cooler air can.

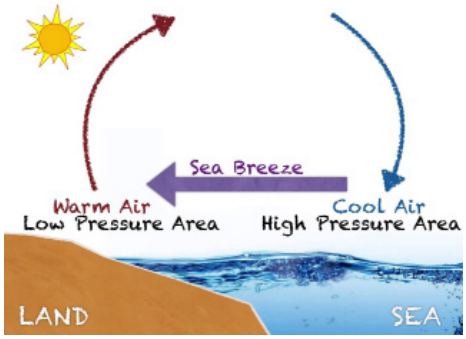


Fig 4.2 Sea breeze

The elements of weather and climate are temperature, atmospheric pressure, wind, humidity and precipitation.

The following factors influence the weather and climate of different places around the world:

- Ocean currents that involves movement of water at different temperatures through the oceans.
- Amount of water and dust in the atmosphere.
- The direction that winds usually blow from.
- Altitude i.e. height above sea level.
- Latitude i.e. angle of sun's rays and effect on day length.

- Distance from the sea.
- The influence of slopes e.g. different sides of a valley.

Climate change in some parts of the earth is as a result of human activities such as cutting down trees and use of fossil fuel.

Fig 4.3 Desertification

Fig 4.4 A desert

- Desertification refers to the cutting down of trees for various purposes without planting others making that place a desert (an area without vegetation). Trees attract rainfall as mentioned earlier this means that without trees an area may not experience enough rainfall or none at all.
- Trees and other plants also help to remove excess carbon dioxide from the atmosphere by using it during photosynthesis. The excess carbon dioxide is introduced into the atmosphere through respiration by animals and burning of fuels such as paraffin, petrol and diesel. Excess carbon dioxide causes global warming.
- Global warming is a condition that is brought by excess carbon dioxide that traps a lot of heat from the sun. The carbon dioxide does not release the heat as fast bringing about very high temperatures. Therefore, planting of trees is a way of avoiding the changing climate conditions that results to the problems discussed earlier.

FUN CORNER

1. Observe and record the weather changes around your school and home every day for a week by use of various weather signs. Make a weather chart for the week and compare with those made by your classmates. You can use three columns, in your table: morning, afternoon and night.
2. In groups of four have a discussion about the main climatic regions of South Sudan? Compare with other countries. Use your Atlas for this activity.

Did you know

During the olden days, people did not use weather instruments. They instead used weather scales which included:

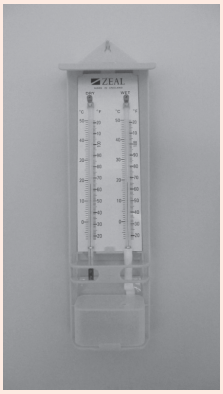
- Looking at the movement of trees, their leaves and branches to tell the direction of wind.
- Looking at how smoke behaved as it moved upwards to tell the direction of wind.
- Observing movement of certain animals such as safari ants to signify the onset of rains.
- Cracking of the ground to signify onset of drought, croaking of frogs among others.

Further Activity

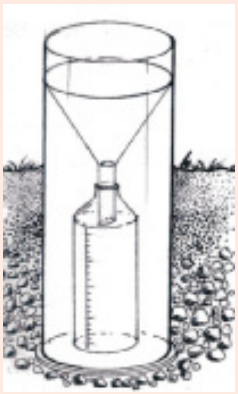
1. Ask your grandparents how they used to tell weather patterns and changes.
2. Compare your findings with the rest of the class.

Check your progress 6.1

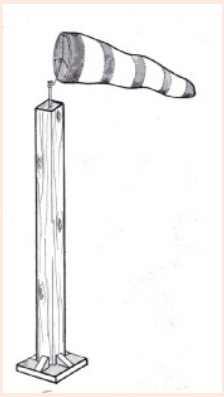
1. Write down the aspect of weather measured by each of the instruments drawn below.



(a)

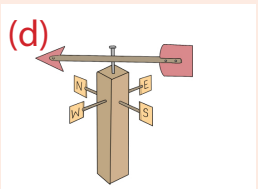


(b)

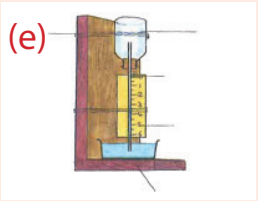


(c)

(d)



(e)



2. Write true or false for the following statements.

   (a) People in the olden days did not know anything about weather.

   (b) People in the olden days used the behaviour of certain animals to predict the weather.

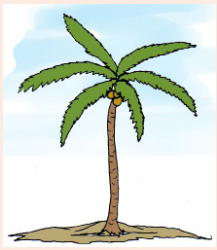
   (c) There is only one aspect of weather every day.

3. Which aspect of weather is represented by each of the weather signs drawn below?

A

B

C



D

4. Why does the regions around equator experience about the same temperature year-round?

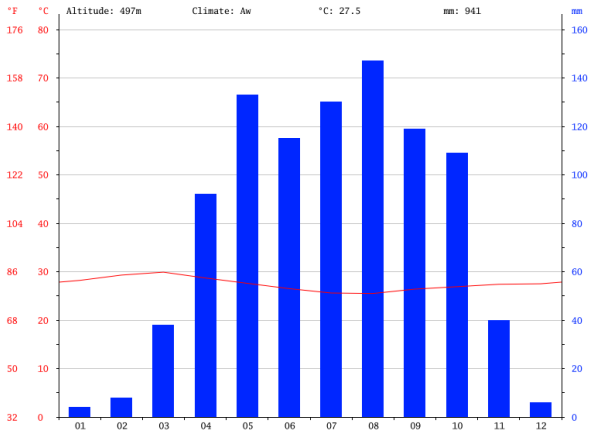
5. Write true or false for the statements below.

   (i) Excessive use of fuels such as kerosene can lead to global warming.

   (ii) Global warming cannot cause flooding.

   (iii) Climate is the same across the world.

6. Study the graph shown below. The graph shows the weather patterns in Juba for one year.



Describe the weather patterns of Juba from the graph.

Did you know

Global warming may result to melting of ice caps. This increases the levels of water in oceans and seas. This can lead to flooding at coastal regions and very high temperatures that leads to death of human beings and other animals and plants.

6.2: How weather and Climate affect Land use and Human Population in South Sudan

Activity 6.2 Class activity

1. Your teacher will organise for a meteorologist to talk to you about weather and climate in South Sudan.
2. Prepare a questionnaire that you will use to ask questions.
3. Listen carefully during the talk; ask questions and note down the answers.
4. Write a report and present it to the teacher for assessment.

Did you know

South Sudan has a total population of between 12,000,000 and 14,000,000 million people.

Poverty, diseases, high mortality rates, drought, floads, heat waves, conflicts between pastoralist and farmers are all negative effects of weather and climate change they are instrument in land use and human population in South Sudan.

Learning points

- The majority of the population of South Sudan entirely depend on Agriculture.
- Land in South Sudan is mainly used for growing of crops and keeping of livestock.

Fig 4.5 Herding

Fig 4.6 Coffee farm in South Sudan

- The right amount of rainfall and temperature determines the types of crops grown and where the crops are grown.
- Major crops grown in South Sudan are sorghum, millet, maize, rice, sunflower, cotton, cassava, beans, peanuts etc. Crops grown in small scale farms include coffee, tea, sugar tobacco etc.
- Unreliable rainfall and total lack of it may lead to prolonged periods of drought affecting human population negatively.
- Floods from overflowing River Nile as a result of heavy rains from the Ethiopian plateaus results to migration of people to urban areas.

Fig 4.7 Flooding displaces people

- Flash floods from high rainfall areas of South Sudan causes a lot of damage to crops and this affects soil fertility. Soil erosion affects food

production hence human population.

- Diseases such as cholera, bilharzia and malaria are associated with floods. This also affects human population negatively.
- Heat waves and dust storms brought about by weather and climate change affect human population in South Sudan.
- Lack of rainfall due to weather and climate change leads to famine. This causes migration of people to other parts of the country and other neighbouring countries (Refugees).
- Migrants live under very harsh conditions. This leads to psychological suffering and social conflicts. The conflicts affect the security and stability of the country.

1. From the puzzle below search and circle some of the crops that are grown in South Sudan.

Hint: The words are written forward, backwards, upwards and downwards.

T	E	A	V	A	S	S	A	C	P	Q	R
S	U	N	F	L	O	W	E	R	E	A	I
A	I	S	O	R	G	H	U	M	A	X	C
Y	A	H	I	J	M	L	K	I	N	N	E
A	M	A	S	N	O	M	E	L	U	O	P
E	G	G	P	L	A	N	T	L	T	I	Q
T	O	B	A	C	C	O	B	E	A	N	S
S	E	S	A	M	E	C	O	T	T	O	N
C	B	A	B	A	N	A	N	A	S	D	A
P	E	F	V	U	R	S	T	N	Z	G	S
E	W	X	Y	E	E	F	F	O	C	M	N

2. What are the two main climate factors that determine land used in South Sudan?

   A. Wind and clouds

   B. Sun and wind

   C. Soil and clouds

   D. Temperature and rainfall

3. What are the effects of floods along River Nile?

4. Write true or false for the following statements.

   (a) Heat waves and dust storms are experienced by people of South Sudan every day.

   (b) Flash floods can cause soil erosion.

   (c) The study of weather of a place is called metrology.

5. Explain in your words the main cause of conflicts between pastoralists and farmers in South Sudan.

6. Write down a short composition on how the people of South Sudan can adapt and strengthen their resilience to be able to better prepare for natural disasters such as floods, droughts, famines, heat waves and dust storms.

6.3: Conservation of Water

Activity 6.3 Individual activity

1. Move around in your home area and observe:
   - How water is used.
   - How water is harvested and stored.
   - How water is recycled.
2. Record the different ways of conserving water you may have observed.
3. Discuss your findings with your friends.
4. Suggest ways by which you can teach the community on water conservation methods.

Learning points

Conserving water ensures that water is spared for future use. There are several ways of conserving water. They include:

- harvesting
- using water sparingly
- recycling
- mulching and shading
- re-using
- storing water in dams

a) Harvesting water

There are different methods of harvesting water.

(i) Using a gutter to collect rain water from roofs of houses as it rains:

Fig4.8Harvestingrain water

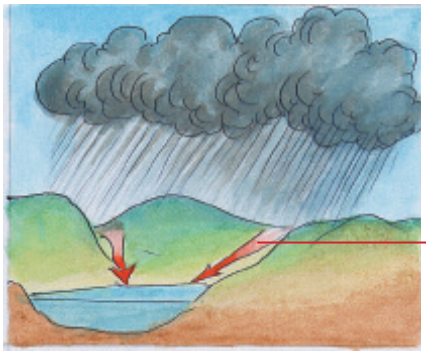


Fig 4.9 Rock catchment

(ii) Water can also be harvested by constructing catchment rocks. This method is mostly used in rocky areas. A wide hole is dug on the ground until the base rock is reached to form a dam.

Shallow trenches are dug in the area surrounding the dam to direct run off water into it. When it rains, the run-off water flows into the rock catchment.

b) Recycling water

Used water or waste water from factories and sewers can be recycled. The waste material in the water is removed and the water treated to kill germs. Such water is then fit for use.

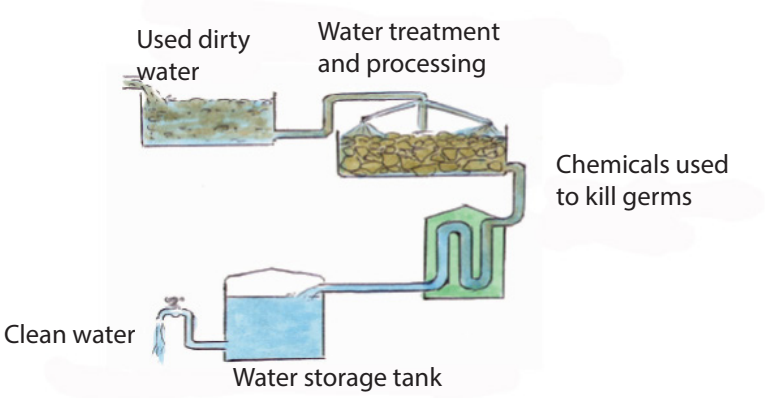


Fig 4.10 Recycling water

c) Reusing

It is the using of water, which has already been used for another purpose. Water can be used for a number of times before being discarded. For

example, water can be used for washing clothes and then be re-used to clean toilets.

Further Activity

Suggest other ways in which water can be reused at home.

d) Using water sparingly

To conserve water, the amount of water we use should be just enough for our need. Unnecessary usage of water should be avoided. For example, there are things we can do to avoid wastage of the little water available.

- Instead of washing a cemented floor, it can be mopped with a wet piece of cloth.
- Taps should be turned off when not in use.
- Leaking pipes and taps should be repaired to avoid wastage of water.
- Plants can be watered using the drip method. This ensures that the plants use little water for a long time.

Fig 4. 11 Drip irrigation

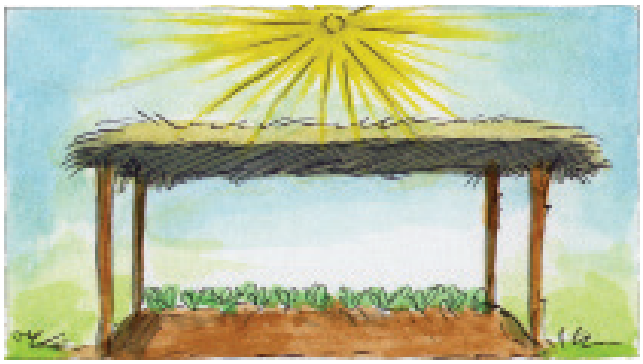


Fig 4. 12 Seedlings growing under a shade

e) Mulching and shading

Mulching is the use of dry plant materials to cover soil around the base of a plant. Mulch reduces evaporation of water from the soil. This helps

to conserve soil water. We therefore do not have to water the plants frequently.

Shading is covering young plants in a nursery or seedbed. Shading reduces evaporation or water loss from seedbeds due to direct sunlight.

f) Storing water in dams

Run-off water from rain can be conserved by storing it in dams. A dam is made across a valley by putting heaps of soil or concrete to make a barrier. Run-off water that enters the valley from the surrounding slopes is held back, forming a large water reservoir. This water reservoir is called a dam.

A dam can also be made by digging out large quantities of soil in a valley to make a huge hole. The soil dug out is heaped on the lower side to make a barrier. The barrier prevents run off water from flowing down the slope, instead, the water is held back and fills up the huge hole.

Water stored in dams can be used for:

- watering livestock.
- irrigation during dry season.
- generation of electricity.
- household and industrial purposes.

Other ways of storing water

In most homes water is commonly stored in containers of different shapes. Water is stored in containers such as pots, jerrycans, drums, tanks, cooking pots among others.

Further Activity

Name other containers that you use to store water.

Did you know

You can survive for several weeks without food but you cannot survive for more than seven days without water!

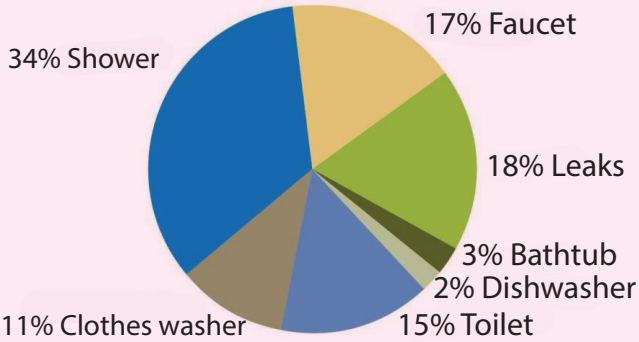
FUN CORNER

Draw the diagram of a person using improvised drip irrigation method.

Importance of water conservation

Activity 6.4 Group Activity

1. Draw a pie chart that shows how water is used at home for different activities.
2. Compare your pie chart with the one shown below.



3. How do you conserve water at home.
4. In groups of four, discuss why there is a concern about water and its conservation.
5. Note down your findings.
6. Compare your findings with other groups.

Learning points

- Water conservation makes a big difference for the environment. Water conservation means using water wisely and caring for it properly.
- Water conservation is a personal responsibility and not other people's problem. Our water supply is limited, which means that we do not have an endless supply. We only have the water that we have now.
- Ninety-seven percent of all the water on the earth is salt water, which is not suitable for drinking. Only three percent of all the water is fresh water, and only one percent is available for drinking water. The other two percent is locked in ice caps and glaciers.

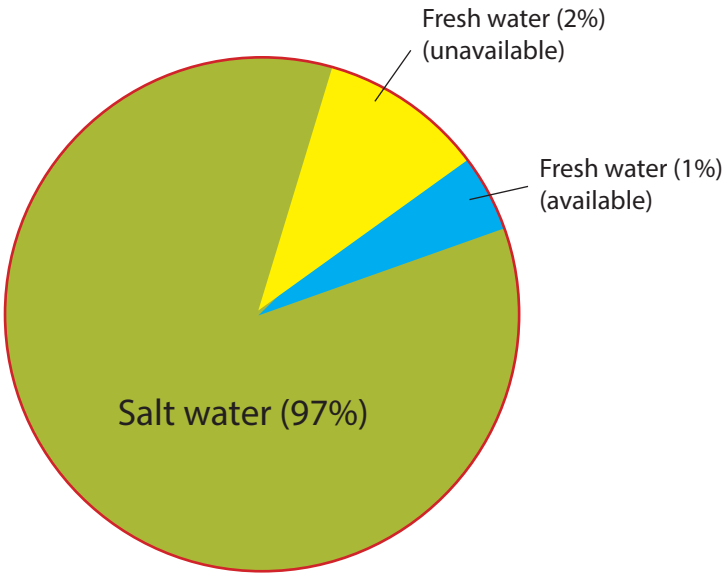


Fig 4.13 Percentage of water available on Earth

- All the people on Earth rely on such a small percentage of all the water on Earth. Therefore, it only makes sense that we must preserve and conserve our water.
- We must not pollute our water because it is the only water we will ever have. Some people do not realise the importance of water. They therefore, continuously pollute it.
- The quality of water is very important. We have the same amount

of water now as there was when the earth was created. This is the water we have, and we must preserve its quality.

- Water is the foundation of food and life, therefore it is a precious resource. We cannot live without water.
- Saving water helps to preserve our environment. It reduces the energy required to process and deliver water, which helps in reducing pollution and in conserving fuel resources.
- Saving water now means having water available in the future for recreational purposes, too.
- Conserving the water we have, minimises the effects of water shortages and helps build a better defence against future drought years. If we save water now, we are helping to ensure a water supply adequate for future generations.

Remember!

Saving water saves money.

Check your progress 6.2

1. Write true of false for the following statements.
   (a) To conserve water give your livestock only a small amount every day.
   (b) People should bathe only twice a week in order to conserve water.
   (c) Plants and animals will die without water.
2. Which one of the following does not show water being re-used.
   A. Using water for washing toilets after washing clothes.
   B. Watering plants with water used for washing utensils.
   C. Using water that remains after bathing for cleaning latrines.
   D. Filtering and boiling dirty water for drinking.

3. Why do you think in recent years the need for water has risen so much.
4. What can you do to save water at home?
5. Give reasons why watering of crops is usually preferred early in the morning and late in the evening.

6.4: Relationship between temperatures, pressure and volume of air

Activity 6.5 Group activity

What you need

- Balloon
- Pressure pump
- Source of heat
- Tin with a lid
- If possible a car or a bicycle tyre
- Pieces of paper or two tennis balls

What to do

1. Fill a balloon with air using the pressure pump until it fills up. Tie the mouth of the balloon with a string. Hang it outside on a sunny day. Observe what happens.
   - Why did the balloon burst?
2. Fill another balloon using the pressure pump. Pump air into it until it bursts.
   - Why did it burst?
3. Take two sheets of paper and blow between the two sheets of paper.
   - What did you observe?
4. Suspend two tennis balls, using a string. Blow air in between them.
   - Observe and record what happens.

5. Open a closed tin then place the lid tightly. Place the closed tin on a source of heat. Observe what happens.
   - Why did the lid pop out?
6. Observe inflated tyres of a car or bicycle.
   - What is inside the tyres?
7. Try riding a bicycle that does not have air in it. Now ride one that has inflated tyres.
   - In which case did you find it easy to ride?
8. Cut small pieces of paper from one of the two sheets of paper; drop them directly from above the source of heat as shown alongside. The pieces of paper are seen to move up and down and out of the source of heat.
   - Explain why they were moving up and down and out on the source of heat.
9. Spray a perfume at the centre of the class.
   - What happens?

Learning points

- Air pressure is a force that exists when air is put in a closed container or in the atmosphere.
- Air temperature refers to how hot or cold air is at day on a day give time.
- Volume is the space that air occupies at a certain temperature.
- Temperature, pressure and volume of air are interrelated. Changing one affects the other.
- Air is made up of small particles called molecules.

- Air does not have a definite volume. The small particles of air (molecules) occupy every available space. That is why when you spray perfume at the middle of a class the smell of the perfume spreads to the rest of the class.
- As the pressure on a gas increases, the volume of the gas decreases because the gas particles are forced closer together.

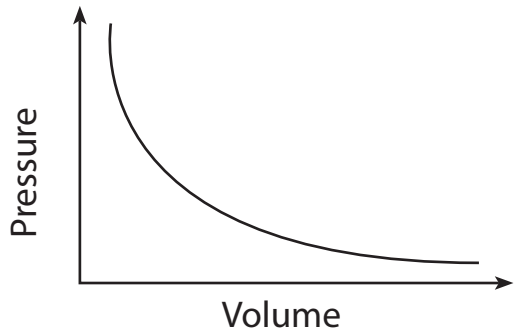


Fig 4.14 Graph of volume against pressure

- As the pressure on a gas decreases, the gas volume increases because the gas particles can now move further apart.
- Weather balloons get larger as they rise through the atmosphere to regions of lower pressure because the volume of the gas has increased; that is, the atmospheric gas exerts less pressure on the surface of the balloon, so the interior gas expands until the internal and external pressures are equal.
- Hot air rises, which is why hot-air balloons ascend through the atmosphere and why warm air collects near the ceiling and cooler air collects at ground level.
- The reason for this behaviour is that gases expand when they are heated. Because the same amount of substance now occupies a greater volume, hot air is less dense than cold air. The substance with the lower density (hot air) rises through the substance with the higher density, the cooler air.
- We can conclude that the volume of a gas is inversely proportional to its pressure and directly proportional to its temperature and the amount of gas.

$$\text{Volume} = \frac{\text{Temperature}}{\text{Pressure}}$$

- Wind is the flow of a huge amount of air, usually from a high-pressure area to a low-pressure area.
- As the earth is affected by an unequal heat energy from the sun, the state of the air differentiate between different regions. Warm air expands and rises up while cold air condenses and sinks, hence resulting in the flow of air and forms wind.

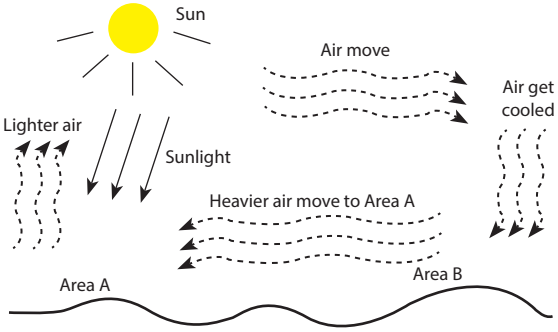


Fig 4.15 Flow of air

- Each time there are differences in atmospheric (air) pressure; there will be wind. This is because air will move from the high-pressure area to the low-pressure area. It also means that winds may be even stronger where the difference in the air pressure is greater.
- When you increase the temperature of air in a closed container, the air expands (volume increases). It therefore occupies a large space than before. Pressure of air in the container increases (this explains why the balloon burst when placed outside in the sun. It also explains why the lid popped out of the container).
- When the temperatures of air increases, its volume increases and the air moves up to occupy the space of the risen air.

FUN CORNER

Fill two balloons with air; tie the mouth of the balloons with long strings. Suspend one of the balloons outside in the classroom and the other balloon inside the class. Observe and record what happens.

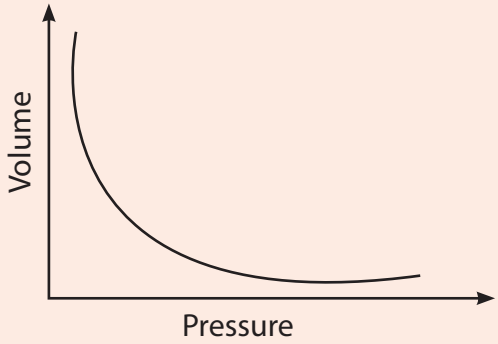
Did you know

Land and sea breezes are formed as a result of difference in air pressure due to changes of air temperature.

Check your progress 6.3

1. Explain the meaning of the following words
   (a) Volume
   (b) Temperature
   (c) Pressure
2. Write true or false in the following statements.
   (i) When the temperature of air in the atmosphere increases pressure and volume also decrease.
   (ii) When the temperature of air in a container increases the volume and pressure decrease.
   (iii) Air moves from an area of high pressure to an area of low pressure.
   (iv) High air pressure in the tyre of a car helps the car move easily on a road.
   (v) When air is heated in a container the small particles that make the air move about knocking on each other.
3. Which one of the following is true about volume of air?
   A. It is fixed
   B. It is not definite
   C. Has no volume
   D. Is the same
4. Explain why it is dangerous to heat a small quantity of water in a sealed container.

5. Describe the graph below.



4.5: Vacuum

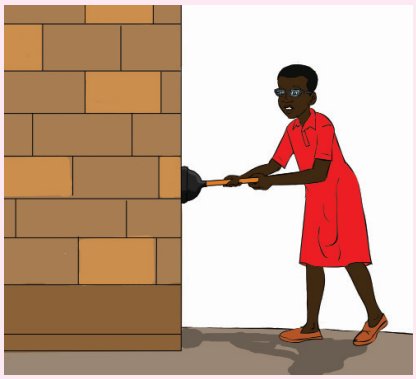
Activity 6.6 Group activity

What you need

- Suction pad
- Vacuum flask
- Water
- Cooking pot
- Cooking pan with a plastic handle
- Pictures of some animals with feathers and fur

What to do

1. Take suction pad, press it hard against a smooth wall and release it.



- Were you able to remove the suction pad? Was it easy?

2. Boil some water in a cooking pot then put the boiled water in a vacuum flask. Replace the cap. Leave the water in the flask for several hours. Find out if the water is still hot.
    - Explain how vacuum in the flask conserves heat of the water in the flask.
3. Observe an improved charcoal stove and identify the main part that helps in conserving heat. Compare the improved charcoal stove with the usual charcoal stove.
4. Observe a frying pan and explain the reason as to why it has a plastic handle.
5. Observe pictures of some animals that have feathers, for example, birds such as domestic fowl and those that have fur such as sheep and goat.
    - Explain how the feather and fur help the animals conserve heat.
6. What do you think is inside an empty bottle? What if you sucked the air inside an empty bottle? What will remain inside?

Learning points

- A vacuum is a space that does not have any matter. This means that it has no air, solid or liquid.
- Vacuum is a space in which there is no matter or in which the pressure is so low that any particles in the space do not affect any processes being carried on there.
- A vacuum can be created by removing air from a space using a vacuum pump or by reducing the pressure.
- Animals and plants cannot survive in an area that does not have air (oxygen and carbon dioxide) and water. This explains why there is no life in a vacuum.
- Cooking utensils such as frying pan have handles made of plastics

to insulate them from heat, this protects the cook from heat during cooking.

- Some animals have fur or feathers, which helps them prevent loss of heat form their bodies. When it is very cold, birds raise their feathers so that they can trap a column of air between the feathers and their bodies. Air being an insulator will not allow heat to pass through. The bird therefore remains warm. Animals that live in very cold places have fur (Seals, polar bears etc) that traps a column of air that prevents loss of heat from their bodies.

Did you know

The space is a very good example of a vacuum. No animals or plants can be found in space as there is no oxygen or water.

Check your progress 6.4

1. A vacuum is a place that does not have
   - A. Matter
   - B. Mass
   - C. Weight
   - D. Force
2. There can be no life in a vacuum mainly because
   - A. It is very cold.
   - B. It is very hot.
   - C. There is very heavy rainfall.
   - D. No air or water.
3. The vacuum in a flask prevents loss of heat by
   - A. Radiation
   - B. Convection

C. Conduction only

D. Conduction and convection

4. A cooking pot has a plastic handle to

A. Make it look attractive

B. Plastic is cheap

C. Plastic is an insulator

D. Plastic is readily available

5. Which of the three methods of heat transfer does not need any material for heat to travel through?

Unit 7 Energy Changes and Uses of Energy

Words to Learn

Water vapour, humidity, evaporation, physical change, chemical change, hygrometer.

7.1 Physical changes

a) Boiling water in a kettle

Activity 7.1

Work in groups

Materials

- Water
- Glass mirror
- Source of heat
- Kettle
- Bottle with cold water

What to do

1. What can you see in the picture below?

Fig. 4.1: Boiling water in a kettle

2. Set up the apparatus as shown in the above picture and observe what will happen to the kettle?
3. What is coming out of the kettle through the spout?

4. What can you see on the face of the mirror?
5. Remove the glass and put somewhere and see what will happen after some time.

Learning Point

When the water is in the kettle boils, water vapour comes from the spout of the kettle. When hot air meets the cold surface, it condenses and forms water droplets.

Remember!

When water is heated it changes to steam or vapour.

b) Exhaling (Breathing) on a mirror

Fig. 4.2: Breathing on a mirror

Activity 7.2

Work in pairs

1. Looking at the picture. What can you see?
2. How else can you design the above experiment?
3. When you breathe on the mirror, what do you see? Why is this so?
4. Do the same experiment in the afternoon and find out what will happen and why?

Learning Point

1. When you breathe on a mirror you see water vapour forming on it.
2. When hot air meets a cold surface or areas the air condenses to form moisture.
3. A lot of moisture forms on the grass in form of water droplets in the morning when it's cold.
4. When it's hot in the afternoon less moisture forms on the mirror because the air around is hot and cannot allow condensation.

Fun corner

Design an experiment of your choice in groups to demonstrate physical change. Share your findings with the rest of the class.

7.2 Chemical changes

Activity 7.3

Work in groups

Materials

- Match box
- Bottle tops
- Papers
- Plastics
- Fire wood
- Water

What to do

1. Use the above materials to design several experiments of your choice that demonstrate how chemical change takes place.
2. Record your observations in the table below.

	Activity	Results	Reversible/ Irreversible reaction
1.	Bottle tops with water on top		
2.	Burning papers		
3.	Burning plastics		
4.	Burning fire wood		

Learning Point

1. Chemical changes are irreversible reactions.
2. In chemical change, the original substance cannot be obtained back.
3. Chemical changes requires more energy in order to take place.
4. Examples of chemical changes are;
   a) Nails rusting.
   b) Burning materials such as papers, plastics and firewood. The ash produced cannot be used to make the original material.
   c) Germinating seeds is an example of a chemical reaction. When the seed forms a seedling , the seedling cannot become a seed again.
5. In the processs of respiration, a chemical reaction occurs whereby the food eaten is burnt using oxygen to release heat energy.

Fun corner

Put a steel wire or shiny nail in an open container. Sprinkle some water on it and observe after a few days. Record the observations and share with your classmates the results.

7.3 Humidity

Activity 7.4

Work in groups

Materials

- Water
- Source of heat
- A bowl
- Cold water
- Cooking vessel

1. Use the above materials provided to demonstrate how humidity takes place.
2. Draw a well labelled diagram and discuss on how humidity comes about.
3. Come up with another experiment that can be used to demonstrate humidity.

Learning Point

When water is heated you can see steam coming out of the bowl.

Steam was seen moving upwards because it's hot and light.

Droplets of water were formed at the bottom of the bowl because the surface was cold due to cold water.

Droplets will not form when water on the bowl gets warm as there will be no condensation.

7.4 Evaporation

Fig. 4.3: Water evaporating in bottle tops

Activity 7.5

Work in groups

Materials

- Water
- Bottle top

1. What can you see in the picture above?
2. Set the experiment and observe what happens to water on the bottle top after sometime when placed in the sun.
3. Where has water gone from the bottle tops?

Learning Point

1. Heated water boils to release a steam in form of water vapour.
2. When water on bottle top was left under the sun, it was heated by the sun's heat and evaporated.
3. When this mixes with air in the space it's known as humidity and can be seen by a human eye if it increases.
4. Humidity can be described as physical change.

   Liquid ⟶ gas

Fun corner

In pairs, design another experiment similar to the above using locally available materials that can be used to demonstrate humidity.

7.5 Measuring humidity

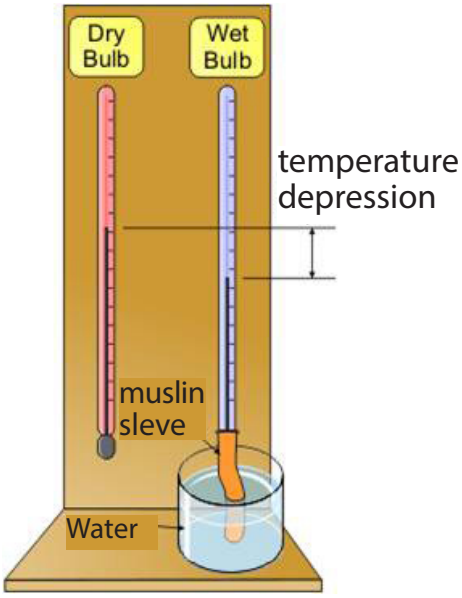


Fig. 4.4: A sling psychrometer

Activity 7.6

Work in pairs

1. What can you see in the picture above?
2. Discuss with your friend about the picture and suggest what it measures.

Learning Point

Humidity is the measure of the amount of moisture (water vapour) in the air.

A sling pyschometer has two thermometers mounted together.

One thermometer is ordinary and the other has a cloth wicked over its bulb (Wet bulb thermometer).

A sling psychometer measures the relative humidity.

Dry bulb (ordinary) thermometers measures the actual air temperature.

Wet bulb thermometer allows temperatures to take place on moist wick when air is dry, this cots the temperature and shows a lower temperature as compared to dry bulb thermometer.

The difference between the two thermometers is calculated to determine the humidity of a place and is then expressed as a percentage.

Higher humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture on the skin.

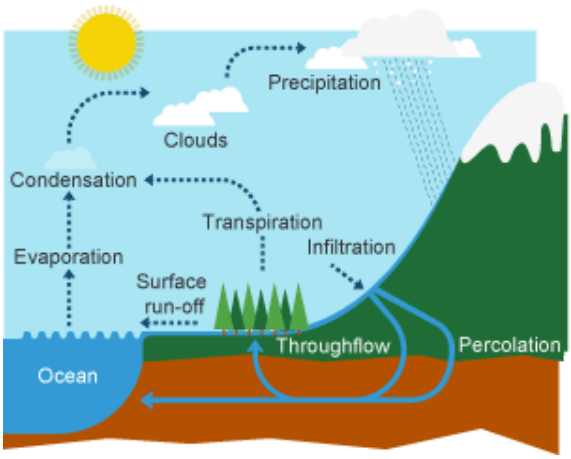
Fun corner

In groups, use the above materials to make a hygrometer.

2 thermometers, cotton gauze, rubberband small container with some water and card board. Use the hygrometer made to take reading of the day.

7.6 Importance of humidity and its measurements

a) Cloud formation resulting to rain



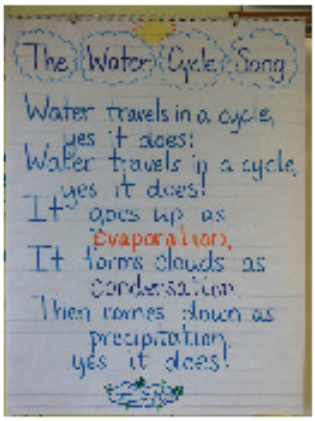


Fig. 4.5: Formation of clouds resulting to rain

Activity 7.7

Work in pairs

1. What do you see in the pictures above?
2. What will happen in areas that border larger bodies on a hot day?

Learning Point

There will be a high evaporation of water to the space to form clouds that will cause rainfall such as convectional rainfall.

b) Drying wet clothes

Fig. 4.6: Drying clothes

Activity 7.8

Work in groups

1. What can you see from the picture above?
2. From the illustrations which group of clothes took long to dry?
3. Suppose you wash a blanket and a bed sheet, which one will dry faster when both are placed in the sun? Explain.

Learning Point

1. On humid and cloudy days clothes take long to dry.
2. On sunny and windy days clothes take short time to dry.
3. Warm air holds more water vapour than cold air.

Fun corner

In pairs, wash a handkerchief and place it on a shade and on the sun.
In which condition did the handkerchief dry first. Explain the reason why.

Check your progress 7.1

1. Using a table, distinguish between physical change and chemical change giving relevant examples.
2. Study the table below and answer the questions that follow.

	Air Temperature	Dew-point Temperature
City P	40 °C	20 °C
City Q	20°C	12 °C
City R	30 °C	17 °C

   (a) Which city has the largest relative humidity?

   (b) Which City has the lowest relative humidity?

   (c) Which city has the greatest amount of water vapour in the air?

   (d) Which city has the least amount of water vapour in the air?

3. Explain why air expands when it rises?
4. Identify four instruments that are used to measure relative humidity?
5. How is humidity important to plants?

7.7 Force, Mass and Weight

Words to Learn

Force, mass, weight, Newton, energy.

Force

A

B

Activity 7.9

Work in pairs

1. What can you see in the pictures above?
2. Suggest the likely reason as to why the two balls are not at the same distance.
3. Practise this activity during games time.

Learning Point

The ball kicked at a longer distance requires more force while the ball that moved a shorter distance required less force.

Force is either a push or a pull of an object.

Fun corner

During break time as a class try to pull a rope in groups of five in a school compound and find out which group is the strongest. Suggest a reason why? Which group was the weakest? Give a reason.

Measuring force

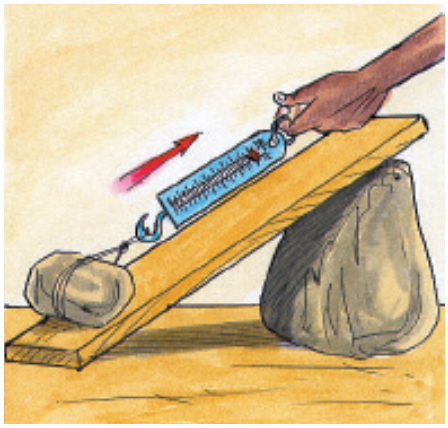


Fig. 5.1: Using a spring balance along a slope

Activity 7.10

Work in pairs

Materials; wood, spring balance, stone

What to do

Set the apparatus as shown in the picture above.

1. What can you see in the picture above?
2. Using a spring balance weigh the stone and record the weight.
3. Place same block under plank near one end gentle slope. Pull the stone and note down the reading of the balance.
4. Talk about what you discovered when measuring force of the block?

5. How is force measured? What makes the pointer of a spring balance move.

Learning Point

1. The reading on the spring balance indicated the amount of force required to pull the block of wood.
2. Most force was required to lift the block straight up.
3. Less force was needed where we used an inclined plane.
4. On a more steep slope, more effort is needed compared to a gentle slope.
5. Force is measured in units called Newtons (Short form, N). A spring balance is used to measure force. The force stretches the spring and the pointer attached to the spring moves on the scale.
6. The position of the pointer indicates the size of the force.

Fun corner

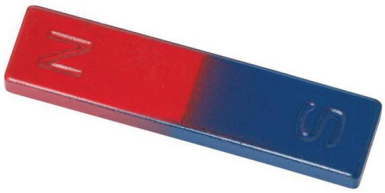
In pairs, use locally available materials to make a spring balance. Use the spring balance to weigh some materials of your choice.

Types and effects of force

Activity 7.11

Work in groups

A



B

C

D

Suggest the likely type of force shown in the pictures above and what are the effects of these forces in an object.

Learning Point

1. There are four different types of forces i.e
   a) Gravitational force-the force that pulls the objects down.
   b) Magnetic force- found in magnets and magnetic materials.
   c) Upthrust force-force that opposes movement in water.
   d) Frictional force-a type of force that opposes movement on a surface.
2. a) Force can stop a moving object.
   b) Force can change the direction of a moving object.
   c) It can accelerate the motion of an object.
   d) Force can start motion.

Mass and weight

Activity 7.12

Work in groups

Materials:

A brick, a jug full of water.

What to do

1. By lifting a brick and a jug full of water each at a time, determine which is heavier.

2. Let your group member repeat the activity.
3. Compare your findings. Did all of you make the same judgement on which object is heavier?
4. What is the disadvantage of using such a method to measure mass?
5. What would be the remedy?
6. What is mass? What is weight? How do we convert mass to weight?

Learning Point

From Activity 7.12, you must have noted that, one cannot be accurate when determining how heavy an object is using non-standard measures like hands. This calls for the need to use a standard measure.

Mass is the quantity of matter in an object.

Relationship between mass, weight and force

Activity 7.13

Work in pairs

Materials

- Beam balance
- Electric balance

1. Look at the pictures below.

A

B

C

2. What can you see? What are they used to measure?
3. Where are the pictures above mostly seen?
4. In which units do we measure mass?
5. What is weight?
6. How can we convert mass to weight?

Learning Point

A beam balance is used to compare masses.

A spring balance is used to measure force such as weight.

Beam balance and an electric balance are mostly seen in shops, factories, laboratories and butcheries.

Mass is measured in grams.

Weight is the total amount of downward pull.

To convert mass to weight; we multiply mass in kilogram with the gravitational force.

Check your progress 7.2

What force helps the car moving on a road to come to a stop?

When a person is riding a bicycle, where does the force that make a bicycle move come from?

Why is a moving bicycle with worn out brakes difficult to stop?

Why should a tarmac road not be made perfectly smooth?

Distinguish between mass and weight. In which units is mass and weight measured?

7.8 Forms of Energy

Heat energy

Activity 7.14

Work in groups

Materials: Fire wood and a match stick.

1. How can you use the above materials to demonstrate how heat energy is produced.
2. Discuss in groups and carry out an experiment.
3. Which other experiment can you design similar to this to demonstrate heat energy?

Learning Point

1. Whenever two surfaces rub over each other through friction, heat energy is produced.
2. When we rub hands against each other we feel warm, showing that heat is produced.
3. Heat energy is also called thermal energy.
4. When fuel burn, they produce heat energy.
5. Heat in life can be used to do many things such as warming ourselves, cooking, drying things and ironning clothes.
6. Common sources of heat energy are: sun, electricity, fuels (fire wood), charcoal, gas and biogas.

Fun corner

1. Go outside a class room on a sunny day and stand for 5 minutes. How do you feel?
2. Draw three common sources of heat energy you normally use at home and what are they normally used for?

Chemical energy

Activity 7.15

Work in groups

Materials

- Fuel
- Firewood
- Charcoal
- Kerosene

- Cooking pot
- Charcoal burner
- Match stick
- Water
- A gas lighter
- Irish potatoes

What to do

1. You are provided with the materials above, discuss in your groups and show how you are going to demonstrate how chemical energy occurs.
2. Identify some devices that store energy in form of chemical energy.

Learning Point

When charcoal, fire wood or kerosene is burnt, heat energy is produced.

Heat produced is used in doing different work such as cooking food, warming, drying things, smoking meat and fish.

Substances with chemical energy are said to store energy called chemical energy.

When chemical energy is broken down it gives out heat energy.

When we eat food, the body get chemical energy and stores it in form of fats. This energy is used when needed by the body.

Car batteries and dry cells have stored chemical energy to run vehicles. They produce light and electricity.

Fun corner

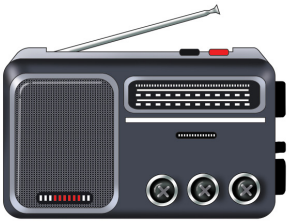
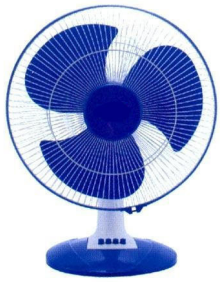
In groups of four, connect a dry cell, a bulb and a wire and see what happens to the bulb. Explain your results.

Remember!

Most people use chemical energy to run vehicles, cook at home and for lighting.

Activity 7.16

Work in pairs

 A	 B	 C
 D	 E	 F

1. Identify the items shown in the pictures?
2. What do they need in order to work?
3. Share with your partner how you connect elecrical items at home to work.

Learning Point

Electrical energy is also called electricity.

The two forms of electricity are current and static electricity.

The source of current electricity are car batteries, torch, dry cells, bicycle dynamos, generators fuel, geothermal, wind driven turbines, solar panels and hydro-electric power.

Fun corner

In groups of five, each group to draw how the following sources of energy produce electricity on a manila paper and hang them on the wall of the classroom. Generators, solar panel, hydroelectric power, wind driven turbines.

Remember!

We should not touch naked electric cables. We can get shock and die.

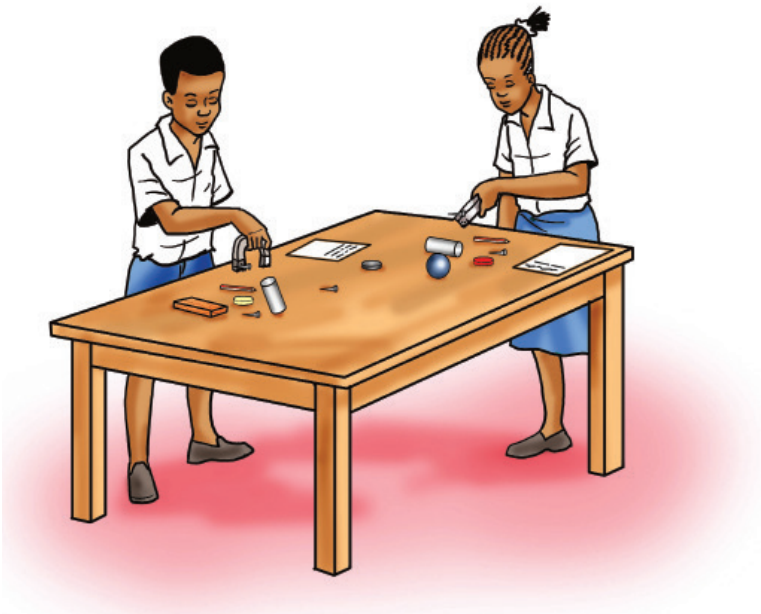
Never operate electrical equipments with wet hands. It can lead to death.

Magnetic energy

Activity 7.17

Work in pairs

1. Look at the picture below.



2. What are the pupils doing?
3. Use magnets to attract some materials.
4. Do magnets attract or repel one another?
5. Do magnets attract all types of materials? Why?

Learning Point

Magnets attract metals especially those made of iron and steel.

Metals that are attracted by magnets are called magnetic materials.

Metals which are not attracted by magnets are said to be non-magnetic materials such as copper, zinc and aluminium. Other materials such as papers, wood, pencils, rubber are also not attracted by a magnet.

Fun corner

Use a magnet to attract the following types of materials; pieces of paper, rubber, nail, pins, chalk and iron fillings. Make a table and list magnetic and non-magnetic materials.

Remember!

Magnets are used in speakers of radios to help in sound production. It is also used in making electric bells.

Magnets are also used in constructing electric motors and generators.

Mechanical energy

Activity 7.18

Work in pairs

Materials

- Sand paper
- Match stick
- Iron bar
- Piece of wood
- Match box
- File

What to do

1. Use the above materials to show how mechanical energy can be demonstrated.
2. Share your findings with other pairs.

Learning Point

Stored energy can be put in motion.

Energy in motion is called Kinetic energy.

Energy stored in a substance is known as mechanical energy.

When a match stick was rubbed on a match box it busted in a flame because of mechanical energy stored in the match stick that was changed into heat energy that produce fire on a match stick.

When sand paper was rubbed on top of a piece of wood, heat is produced from mechanical energy.

When using a file to rub a piece of an iron bar mechanical, energy is converted to heat.

Static energy

Activity 7.19

Working in groups,

A

B

1. What can you see in the picture?
2. Cut small pieces of paper and put on the table.
3. Take a pen, a ruler or plastic comb and rub it on your hair severally.
4. Immediately use a ruler, comb or pen to prick the small pieces of paper, what happens?
5. Discuss and come up with another experiment that can be used to demonstrate static energy.

Learning Point

Static energy is a stationary (not moving) electric charge produced through friction.

When a ruler, pen or a comb was placed on pieces of papers, before rubbing on hair, nothing happened.

The ruler, pen or a comb were able to pick pieces of paper after being rubbed on hair due to static energy produced.

Static energy in charged materials remain shortly with energy and loose it through electric current or discharge.

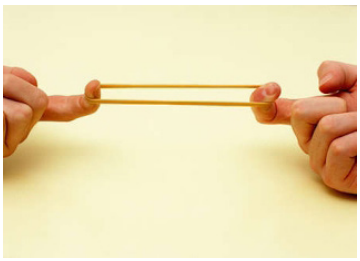
Elastic energy

Activity 7.20

Work in groups

Materials

- Rubber band
- Old bicycle tyre tube
- A coiled spring



A

B

C

1. What can you see in the pictures above?
2. Take each of the following materials and try to stretch. What do you notice?
3. Find out which areas the materials above are mostly used.
4. What are some of the advantages of the materials shown in the picture?

Learning Point

Elastic material are those that can stretch when pulled apart.

Elastic energy is found in materials that can stretch, such as rubber bands and coiled springs.

They can be used to make functional items used in life such as catapult, springs, balances and in vehicles as a shock absorber.

Fun corner

Make a catapult using an old bicycle tyre tube and use it to throw small stones in an open field. How far does the stone move? Throw the same stone using bare hands. What do you notice?

Remember!

Elastic energy is used in vehicles as a shock absorber and in a spring balance to weigh different objects.

Sound energy

Activity 7.21

Work in groups

Materials

- Stick
- Drum
- Soil particles

What to do

1. Place soil particles on the drum.
2. Hit the drum with a stick. What happens?
3. Try hitting the drum slowly and harder, what happens?
4. How is sound brought about? Explain.

Learning Point

When the drum is hit, the drum skin vibrates and the soil particles jumps up and down.

As the soil particles vibrate, sound is produced.

Small vibrations produce soft sounds while big vibrations produce loud sounds.

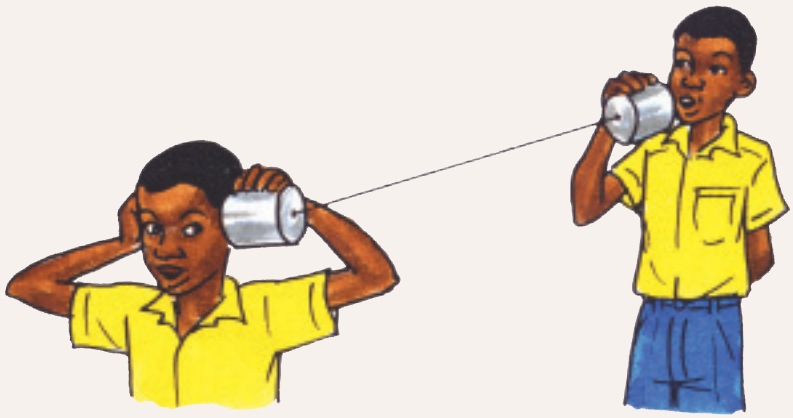
Slower vibrations produce low or deep sound while very quick vibrations produce high or sharp sound.

When an object vibrates, sound travels through the air in form of vibrations. These vibrations are called sound waves.

When sound waves reach the ear, we hear the sound. This brings about communication.

Fun corner

Use the following materials: nail, string or wire, two containers and a hammer to make a simple phone. Practise using it with your partner.



Remember!

Sound plays an important role in communication.

7.9 Energy Transformation

Mechanical energy

Activity 7.22

Work in pairs

1. Rub your hands against one another. What happens?
2. File a piece of metal using the file. Feel the file at the back of your hand, what do you notice?
3. Rub a pen against your hair, feel the pen using back of your hand. Identify the energy transformation taking place.
4. What is energy transformation?

Learning Point

The above experiments indicates how to change mechanical energy to heat (thermal) energy.

When you rub an object against one another, heat is produced.

The process of converting energy from one form to another is known as energy transformation for example,

Mechanical energy ——————→ Heat Energy

Transforming mechanical energy to electrical energy

Activity 7.23

Work in pairs

1. Rub a comb or a ruler against your hair and attract pieces of paper. What happens? Discuss the energy transformation taking place.

Learning Point

When a pen or a comb is rubbed against hair, electrical energy known as static energy is produced.

Mechanical energy ⟶ Electrical energy.
(Comb rubbed on hair) (Static electricity produced)
Other examples are wind mills and hydroelectric power station.

Chemical energy

Transformation from chemical energy to heat energy

Activity 7.24

Work in groups

Materials

- Water
- Charcoal
- Match box
- Cooking
- Cooking pot
- Wood

What to do

1. Use the above materials to come up with an experiment to demonstrate how chemical energy can be transformed to heat energy.
2. Write down the energy transformation taking place.

Learning Point

The water boils when heated to make it hot.

It changes from chemical energy to heat energy.

Chemical energy ⟶ heat energy
(Burning fuel) (Boiling water)

Fun corner

In groups of three, light a candle. Write down the energy transformation observed.

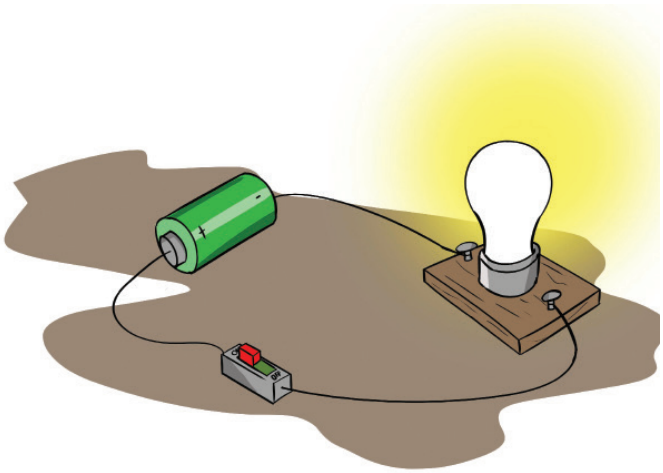
Remember!

Fire wood comes from trees. We should avoid cutting trees. We should plant three trees when we cut one.

Transformation from chemical energy to electrical energy

Activity 7.25

Work in groups



What to do

1. Set the experiment as shown in the picture.
2. Write down the energy transformation taking place.
3. Design another experiment that can be used to demonstrate transformation of chemical energy to elecrical energy.

Learning Point

When a switch is put on, the bulb lights. This is because stored chemical energy in dry cell is transformed into electrical energy when switch is put on.

Chemical energy ⟶ Electrical Energy

(A dry cell) (In a bulb)

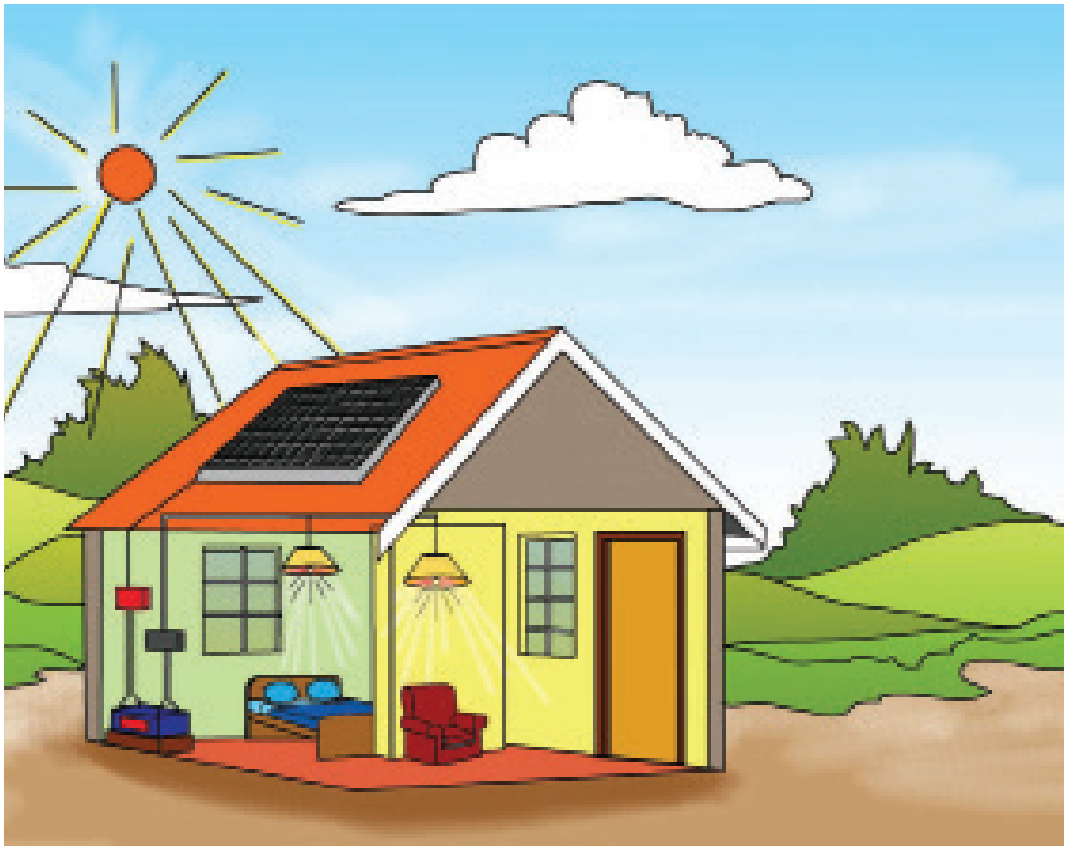
Solar energy

Transformation from solar energy to electrical energy

Activity 7.26

Work in pairs

Look at the picture.



1. What do you see?
2. Write the energy transformation taking place in the picture above.

Learning Point

The solar energy produced by the sun is used to produce electrical energy used to light the house.

Solar energy ⟶ Chemical energy ⟶ Light energy

(In the solar panel) (In a battery) (In a bulb)

Fun corner

Practise carrying out the activity shown in the picture above and describe the energy transformation taking place.

Remember!

Our main source of energy is the sun (Sun).

Electrical energy

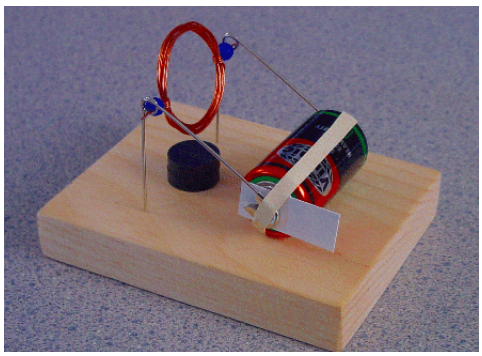
Transformation from electrical energy to mechanical energy

Activity 7.26

Work in groups

Materials

- Dry cell
- Connecting wires
- Pieces of wood
- Motor fan



1. What do you see?
2. Connect the materials as shown in the picture.
3. Write down the energy transformation taking place.
4. Design another experiment that can be used to show transformation of energy from elecrical to mechanical.

Learning Point

In the (circuit) connected, electrical energy is converted into mechanical energy in the motor to rotate the fan.

Electrical energy ⟶ Heat energy ⟶ Mechanical energy
(In a motor) (In a motor) (Turbines of rotating fan)

Fun corner

At home, place a dry cell in a radio and tune on the radio. Write down the energy transformation.

Remember!

The law of energy conservation states that; Energy can neither be created nor destroyed but can be transformed from one form to another.

We should know how energy is transformed from one form to another so that we reduce expenses in our daily lives.

7.10 Importance of energy and energy conservation

Finding out the importance of energy

Activity 7.27

Work in groups

1. Why do we eat food?
2. What would happen if a vehicle runs out of fuel?
3. Suppose the sun did not exist, what will happen to plants?
4. How do we get the electricity that we use in South Sudan?

Learning Point

We cannot live without energy as it helps us in movement, growth, as a source of light, heat and electricity.

Light helps us to see. Sun plays an important role in photosynthesis.

Heat from different sources, such as the sun, burning fuels and electricity helps us to do many in things in life.

Fun corner

In groups, discuss and carry out a practical activity to show how cow dung can be used to produce heat.

Discuss the importance of using energy to the economy of South Sudan. Write short notes then share it with the rest of the class.

How can energy be lost?

Activity 7.28

Work in pairs

A

B

1. What can you see in the picture?
2. Prepare the same activity when one is cooking potatoes covering the lid of a cooking pot and the other one is open.
3. Which one will cook first and why?

Learning Point

Cooking potatoes in uncovered cooking vessel results to heat loss while cooking potatoes in a covered cooking vessel conserves heat.

Fun corner

Dramatise in groups how energy is usually lost at home and at school.

Remember!

We should use resources sparingly to avoid affecting our environment when using charcoal.

We should plant more trees when we cut one.

Activity 7.29

Materials

- A bigger cooking vessel
- A smaller cooking vessel
- Firewood or charcoal
- Water and cooking oil
- Match stick
- Irish potatoes

Work in groups

A

B

1. Look at the pictures, what can you see?
2. Peel of the sweet potatoes, wash and place them in a cooking vessel.
3. Set up the materials as shown in the pictures in your groups.
4. Predict in which cooking vessel will the food cook first. Why?

5. Carry out the remaining experiment and record the results.
6. Practice this activity at home with your parent or guardian.

Further activity

Practise boiling sweet potatoes or irish potatoes with water and when using cooking oil. In which experiment will the potatoes cook fast. Why is this so? Explain.

Learning Point

Cooking vessels with a smaller surface area cooks food faster compared to larger cooking vessels.

Cooking potatoes in water cooks slowly compared to in oil due to removal of water by oil.

Remember!

We should try to minimize heat loss as much as possible. This will help us save on cost of buying fuel for example charcoal, gas, kerosene and fire wood. This will also reduce on cutting of trees.

Using energy efficient devices

A

B

Fig. 5.2: Energy efficient devices

Activity 7.30

Work in pairs

Materials

a) A charcoal stove b) An improvised charcoal stove

1. What can you see in the picture?
2. Which charcoal stove cooks the food first and why? Explain.
3. What are the differences between a charcoal stove and an improved charcoal stove. Present your results in form of a table.

Fun corner

Draw and name the source of energy you use at home for cooking. Suggest the reason why you use it?

Remember!

We should use improvised charcoal stove because it prevents heat loss and uses less charcoal.

We should handle with care experiments involving heat.

Learning Point

Charcoal stove is made of metal. It is cylindrical in shape and has a larger space for charcoal.

It is cheaper to buy and is locally available.

The disadvantages of traditional charcoal stove is that it loses a lot of heat through metallic lining. It also uses a lot of charcoal.

Improved charcoal stove is made of metal and lined with clay from inside to prevent heat loss. It is small in size and conical in shape to bring charcoal together.

Improved charcoal stove saves a lot of energy and less charcoal is used (very economical).

The only disadvantage of improved charcoal stove is expensive, delicate and less durable.

Other types of charcoal stove include; fire less tin shaped, clay cooking, traditional fire place, kumi mbili charcoal stove.

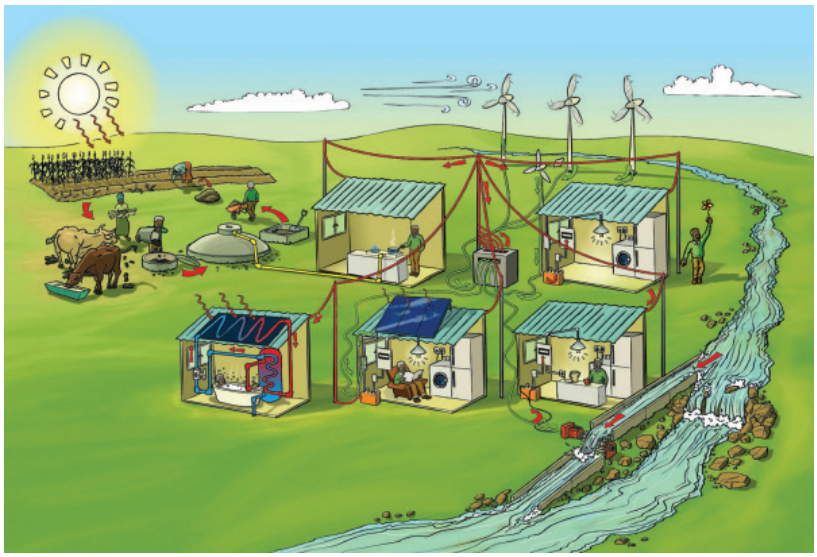
Other efficient devices include: Pressure cooker, thermos flask, hot pots.

Renewable sources of energy

Activity 7.31

Work in groups

1. Study the picture below.



2. Point out from the picture at least five sources of energy.
3. From the sources of energy mentioned above, which is the major source of energy? Explain.
4. Compare and contrast the above sources of energy compared to the ones you use at home.
5. What are the advantages of renewable sources of energy?
6. Carry out a research on the above sources of energy based on the following topics:
   a) Power generation to industries, schools and homes.

b) Transport sector

c) Job creation

d) Climate change

7. Compile a report and present to the class.

Learning Point

Some advantages of renewable sources of energy are:

- They are cheap hence can be afforded by many families.
- They do not pollute the environment that is, they are environmental friendly.
- They help us to conserve non-renewable sources of energy.
- They are readily available and in abundance.
- They, help to conserve trees, thereby conserving the environment.
- Renewable energy sources are convenient to use.

Activity 7.32

Work in groups

Visit to a nearby biogas generation facility. During the visit, find out:

1. What biogas digester is made of?
2. Explain the process of producing biogas and the challenges faced in operating biogas digester.

Learning Point

Biogas is produced in a special unit called biogas digester.

Water and cow dung or other materials used to produce biogas are mixed in the digester. From the digester, a pipe is connected to the bulb or the cooker where the biogas is intended for use.

Fig 7.3 Biogas plant

Activity 7.33

Work in groups

Materials

- 3 containers.
- Enough cow dung and water mixed in the ratio of 4:5:1.
- A long wire and a pipe.
- A delivery tube (rubber) of about 60 m long.
- Candle wax, plasticine or clay.

What to do

1. Set the biggest drum of the three with open end facing up.
2. Add the cow dung-water mixture.
3. Cut open end of the second drum to make three stands. These stands should be about 7 cm long.
4. Make a hole on the extreme right of the closed end (bottom).
5. Make another hole (pipe-size) on the extreme left.

6. Place the small drum upside down into the large drum. Tie it with wires to keep it in central position.
7. Insert the pipe with bigger diameter through the bigger hole.
8. Insert the delivery tube through the hole on the small drum.
9. Make a hole the size of delivery tube at the top right side of the third tin.
10. Seal round it with wax to close all the spaces.
11. Connect the delivery tube from the first tin to this tin.
12. Connect this tube to a tap (regulation of gas).
13. After one week, connect the tube to the gas cooker open the tap and light the matchbox.
14. Outline the advantages of biogas.

Learning Point

The gas produced from animal dung mixed with water is called methane. The bacteria present in the mixture breaks down the organic materials to produce the gas. The gas is burnt to produce flame. The gas burns with a blue flame. Advantages of biogas compared to other fuels include;

1. It is a clean source of energy hence good for our environment.
2. It is less cheap unlike other sources of energy such as fuels.
3. It is more convenient to use than other energy sources.
4. Biogas can be produced by anybody with minimum training.

Remember!

We should always strive to conserve energy. We can do this by;

a) Using energy sparingly.

b) Using energy efficient devices.

c) Conserving energy by using renewable energy first.

d) Emphasizing the three R's of conservation which are; Reduce, Re-use and Recycle.

Fun corner

In pairs, use locally available materials of your choice to model a biogas plant. Does it look like the one in the picture?

How else can you model a biogas plant?

Check your progress 7.3

1. When we eat, we get energy to work and to do other things. What form of energy is contained in food?
2. Why would a vehicle without fuel stop moving?
3. a) You have been provided with the following; metal rods, lemon, bulb, crocodile clips and connecting wires. Using a well labelled diagram, show how you will connect the materials to ensure the bulb lights.
   b) Identify the energy transformation taking place.
4. You have been employed in an organisation dealing with environmental conservation in your home area. Assume you have been asked to explain to the people the importance of planting trees, what are some of the points you would give?
5. Plan and execute a project on biogas digester at home. Use the biogas to cook a variety of foods?
6. Describe a simple experiment you would use to demonstrate the existence of thermal energy.
7. a) What is the difference between static and current electricity?
   b) Describe how you would produce static electricity using comb.

8. Mention ways you can use to conserve energy in your community.
9. Distinguish between renewable and non-renewable sources of energy giving examples in each case.
10. Many solar types of equipment are painted black. Give a reason for this.
11. Suggest three ways in which cow dung can be used as a source of fuel.

7.11 Gears and Pulleys

Understanding the use of gears and multiple pulleys

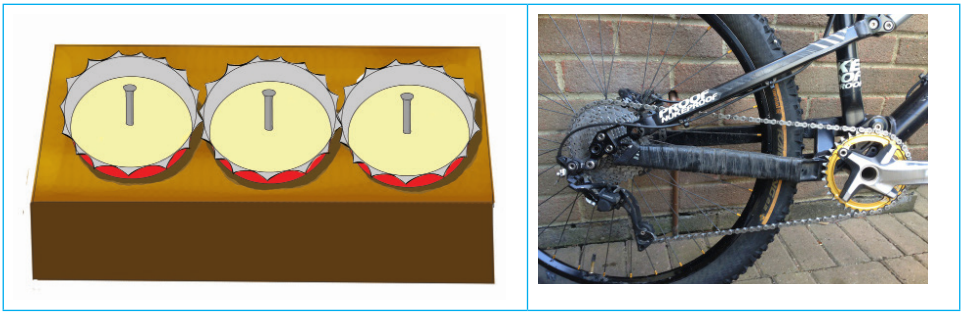


Fig. 5.4: Gears

Activity 7.35

Work in pairs

Materials

- Bottle tops
- Nails
- Piece of wood

1. What can you see in the picture above?
2. How can you use the above materials to make a gear?
3. Rotate the first bottle top and see the direction of movement of the bottle tops.
4. Which direction do other bottles move? Why is this so?
5. Set up another experiment using 8 bottle tops arranged in different manner. Rotate the first bottle top, how do other bottle tops move?
6. Identify other devices that uses gears.

Learning Point

When the first bottle top is moved in clockwise direction the second one moves anti clockwise the third move in clockwise direction. This is how gears transform energy from one lever to the next to create movement in machines.

Other areas where gear system are used include bicycles, motorbikes, manual hand drill and pencil sharpener.

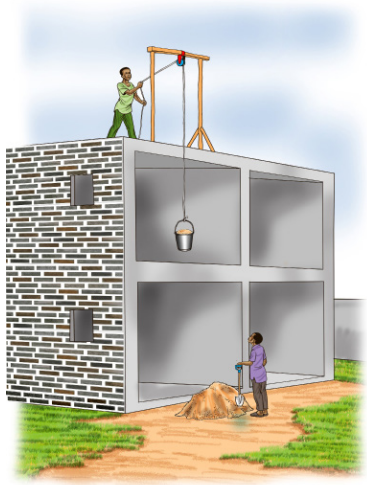
Fun corner

In pairs, use an old slippers to make a gear. Share your model with the rest of class. Do they look the same.

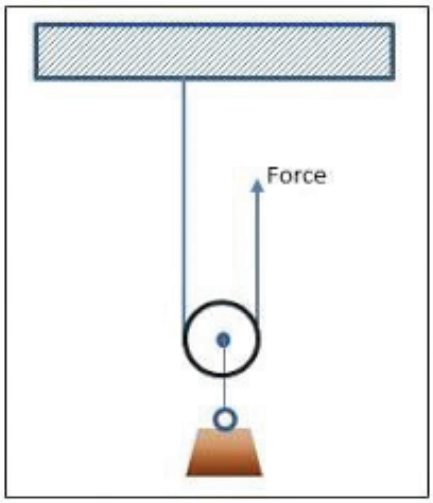
Remember!

Gears are important because it increases the power and speed of an object and through this we work quickly and save on time wastage.

Pulleys



A



B

Fig. 5.5: Single pulleys

Activity 7.36

Work in pairs

1. What do you see in the pictures A and B?
2. Have you ever used it in daily life?
3. Name the places where this type of machine are used?

a) Single fixed pulley

Using a single fixed pulley to raise a flag

Activity 7.37

Work as a class

Materials

- Flag post with a pulley system
- A rope

1. Go to the school flag post and identify the pulley on the flag post.
2. Tie the flag on one side of the rope.
3. Raise the flag by pulling the other end of the rope.
4. Practice raising and lowering the flag in turns.

In case there is no flag post and a pulley within the school compound,

1. Obtain a long post and fix a pulley at one end of the pole.
2. Put the rope around the groove of a pulley and erect the pole in a hole so that it stands upright.

This is now called a flag post. Tie the flag on your new flag post and practice raising and lowering the flag.

Learning Point

A pulley is a system made up of a wheel and an axle used for lifting heavy loads.

The wheel has a groove on the outer rim, along its circumference.

A rope or a string is used to pull the load and it passes through the groove.

The groove prevents the rope from slipping out of the pulley wheel.

A single fixed pulley refers to one pulley and it is always fixed.

Single fixed pulley is advantageous since it helps us to pull a load easier and it also reduces the amount of force required to pull the load.

Fun corner

Make a single fixed pulley using the following materials

2 binder clips, towel, clay, string, stiff, paper, card, markers or coloured pencils and scissors. Practise pulling the string. What happens?

Remember!

Pulleys are used to lift heavy objects and materials.

Single fixed pulleys does not increase the force we apply but changes the direction of the force.

b) Multiple pulleys

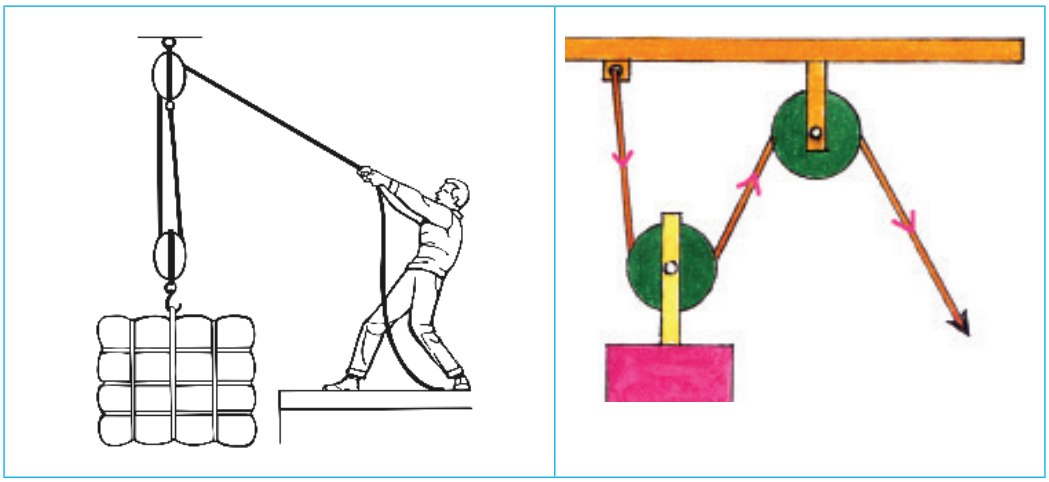


Fig. 5.6: Multiple pulleys

Activity 7.38

Work in pairs

1. Look at the pictures. What can you see.
2. Draw the diagrams and label load and effort.
3. Indicate movable and fixed pulleys on the diagram.

Learning Point

In this system one pulley is fixed and one is movable. The distance moved by effort (force) is twice the distance.

If a load of 4 kg is moved 0.5 m upwards the effort will move twice the load distance which;

is $0.5\ m \times 2 = 1\ m$

Mechanical advantage of the machine will be

Load x distance = effort × distance

$4\ kg \times 0.5 = \text{effort} \times 1\ m$

$$\text{Effort} = \frac{4\ kg \times 0.5\ m}{1\ m}$$

$= 2kg.$

If 1 kg = 10 N

$$\therefore 2\ kg = \frac{2\ \cancel{kg} \times 10\ N}{1\ \cancel{kg}}$$

$= 20N$

If somebody would carry the load to the top of building he would use effort equal to 4kg, but when the uses machine to lift he use less efforts of 2 kg.

Learning Point

A multiple pulley is a simple machine that consists of two or more pulleys. These pulleys can be fixed or moveable. Multiple pulleys are also called block and tackle

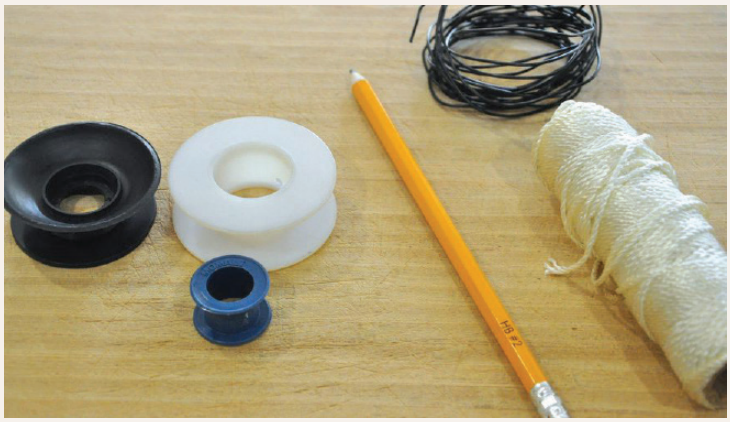
The pulleys are usually assembled side by side in a block or frame on the same axle. The pulleys and the ropes are called the tackle.

The arrangement of pulley block and their ropes is referred to as a block and tackle

Multiple pulleys are mostly used by builders in cranes to load and offload containers, in factories, garages, stores and sailing ships to lift heavy loads.

Fun corner

Use the materials shown in the picture to make a pulley.

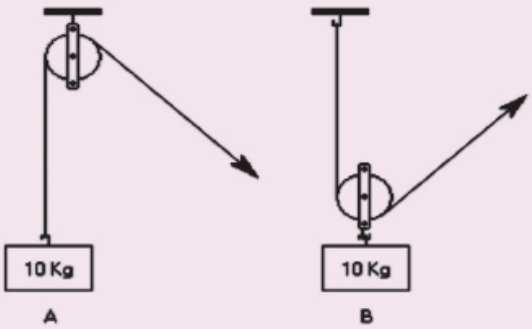


Remember!

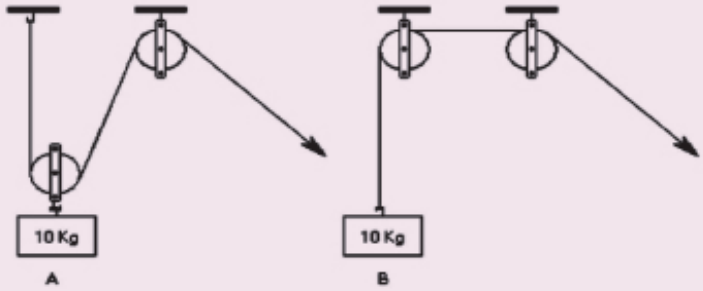
We should use simple machines to help us do work with less effort in our daily lives. These machines helps to prevent one from falling down on a tall building.

Check your progress 7.5

1. Which weight requires the least force to move?

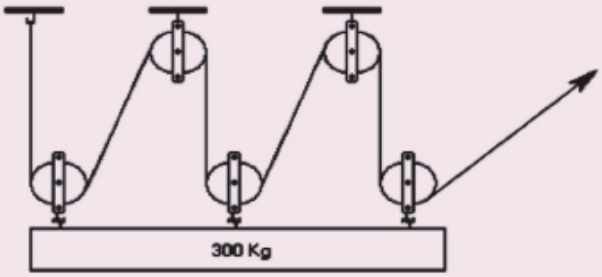


2. Which weight requires the least force to move?



a) A b) B c) Both require the same force

3. How much force is required to move the weight?



A) 100kg B) 150kg C) 50kg D) 60kg

4. Why are single fixed pulleys important in our lives? Give any two real life applications of a single fixed pulley.

5. An example of a simple gear system is _____.

a) a gear box

b) bottle tops locked together

c) a car wheel

d) a ladder

6. Who will use less effort to raise 20 kg load?

a) Single fixed pulley man

b) Two pulley man

c) Both single and two pulley man

d) Any of the three pulleys

Unit 8 Acids, Bases and Indicators

Words to learn

Indicators, litmus paper, neutral point, corrosive, antacid, pH

8.1: Properties of acids, bases and indicators

Activity 8.1 Pair activity

Discuss the following questions.

1. Come up with three things you know about acids and bases.
2. Name some examples of acids and bases commonly used at home?
   - Where have you seen them in real life?
   - Are the examples you have given above useful or harmful to us?
3. Why do you get more teeth cavities from drinking soda, eating sweets, biscuits or cakes?
4. The swimming pool is a shared facility. How is it made germ free.
5. Some people take wood ash when they have heartburn.
   - How does it help?
6. Why should we brush our teeth at least twice a day using a tooth brush and toothpaste?

Learning points

The sour and bitter tastes we find in food are due to the presence of acids and bases. Some naturally occurring acids are: vinegar (acetic acid) and citric acid (present in orange and lemon).

Vinegar

Orange

Lemon

Fig 8.1 Examples of substances containing acids

Our stomach also produces hydrochloric acid, which helps in the digestion of food. Some commonly used bases are baking soda and tooth paste. Toothpaste is a basic substance used for cleaning the teeth and it neutralizes the excess of acids present in the mouth and prevents tooth decay.

Toothpaste

Baking soda

Fig 8.2 Examples of substances containing bases

Although most acids are harmless, some are harmful, for example, some acids eat through plastics, clothing and skin while others corrode metals. Sometimes these properties of strong acids are useful, for example, hydrochloric acid in your stomach helps digest food.

- Sulfuric acid is used in car battery.
- Phosphoric acid is used in preservation of cold drinks.
- Lactic acid is found in milk.

Bases are used at home tool, for example:

- Ammonia is used as household cleaners.
- Sodium bicarbonate as baking soda.
- Potassium hydroxide used to make liquid soap.
- Aluminum hydroxide used in the manufacture of antacid.

Fig 8.3 Antacid syrup

Activity 8.2 Group activity

What you need

- Oranges
- Lemons
- Vinegar
- Sour milk
- Baking powder
- Toothpaste

What to do

1. Taste these substances and record your observations in a table format like the one shown below.

2. What did you find out?

Learning points

- Acids and bases can be classified into various classes. Some are natural while others are artificial.
- Strong acids such as sulphuric acid and nitric acid are dangerous.
- Strong bases such as sodium hydroxide are dangerous too.
- Some examples of weak bases are saliva, wood ash and toothpaste.

- Example of weak acids are vinegar and citric acids. They are found in some fruits.
- Acids and bases have properties some of which are shown in the table below.

Acids	Bases
Have a sour taste	Have bitter taste and soapy feel
Neutralise bases	Neutralise acids
Are corrosive	Some a corrosive (Strong base)
Can conduct electricity	Strong bases can conduct electricity

- It is difficult to tell if a substance contains an acid or a base and to what extent, except for the foodstuffs that we can consume. This then means we must have another substance that we can use to test if another substance is a base or an acid. Such a substance is known as indicator.

Indicators

Activity 8.3 Pair discussion

Discuss the following.

1. The meaning of different colours produced by traffic lights that guide motorists and pedestrians in busy towns.
   - Why are the colours different? What do they indicate?
2. How can we apply this knowledge to differentiate between acids and bases?
3. Now research from reference materials the meaning of acid-base indicators.

Learning points

Acid –base indicator is a substance which shows one colour when in an acid solution and a different colour when in a basic solution. Therefore, an indicator can be used to classify substances as either acids or bases.

Indicators can be classified as either naturally occurring or commercial indicators. The most common commercial indicator is litmus paper, phenolphthalein and methyl orange.

Many other plant materials contain dyes which can be used as acid-base indicators. Examples are red cabbages, coloured flower petals of hibiscus or bougainvillea. They show one colour in an acid solution and another different colour in a basic solution.

Did you know

All acids and bases are liquids.

Activity 8.4 Group activity

1. Using reference books fill the table below.

Indicator	Colour change in acids	Colour change in bases
Red litmus		
Blue litmus		
Phenolphthalene		
Methyl red		
Methyl orange		
Red cabbage		
Black berries		
Curry powder		
Blue grapes		
Morning glory		
Red onion		
Turmeric powder		
Red hibiscus		

FUN CORNER

Look for brightly coloured petals of some flowers. Make an indicator from them and used it to find out if a substance is an acid or a base.

Do you know

Never taste or get into contact with strong acids and bases. They are highly corrosive.

Check your progress 8.1

1. Write true or false for the statements below.
   (i) You can taste all substances to find out if they are acids or bases.
   (ii) Acids taste sour while bases taste bitter.
   (iii) The stomach produces an acid that is highly corrosive.
   (iv) Acids found in lemons, oranges, sour milk are not corrosive.
   (v) Acid found in a lemon can produce small amount of electricity.
2. Which one of the following is not true about bases?
   A. They neutralise acids.
   B. They have a bitter taste.
   C. They have a pH of less than 7.
   D. Some of them are corrosive.
3. One of the following cannot be used to make an indicator. Which is it.
   (a) Red tea
   (b) Red cabbage
   (c) Coffee leaves
   (d) Rose flower petals

4. _____ changes the colour of _____ litmus red.

   A. Acids, blue

   B. Acids, red

   C. Bases, blue

   D. Bases, red

8.2: Using indicators to find the strength of an acid

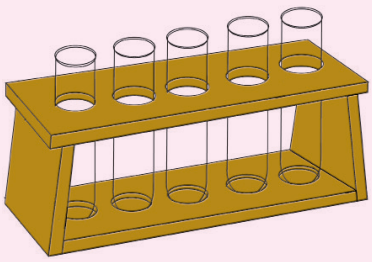
Activity 8.5 Group activity

What you need

- Acids such as dilute hydrochloric acid, dilute sulphuric acid
- Bases such as sodium hydroxide solution
- Distilled water
- Rain water
- Lemon juice
- Universal indicator
- Test tubes or clear containers or glass
- pH scale or chart
- Droppers

What to do

1. Place small portions of acids, bases, distilled and rain water, and lemon juice into different test tubes.



2. To each test tube, add 3 drops of the universal indicator and observe the colour of the solution.

3. Place each test tube and its contents against a pH chart. Match the colour of the indicator in the solution against the shade on the pH chart and record the pH values of each solution in a table.

Solution	Colour of universal indicator in the solution	pH value
Hydrochloric acid		
Sulphuric acid		
Sodium hydroxide		
Distilled water		
Rain water		
Lemon juice		

4. Discuss in groups the findings of your experiment.
5. Present your findings in class.

Learning points

- The universal indicator is a mixture of several indicators. It shows a range of colours in acids and bases depending on the degree of acidity or alkalinity. Some acids are more acidic than others while some bases are more basic than others.
- By use of a universal indicator and the pH chart, we can get pH values of various solutions.
- The pH scale measures how acidic or basic a substance is. It has numbers ranging from 0 to 14. A pH of 7 shows that a solution is neutral whiles a pH below 7 shows that a solution is acidic. A pH higher than 7 indicates that a solution is basic.
- Example of a standard pH colour chart is shown below.

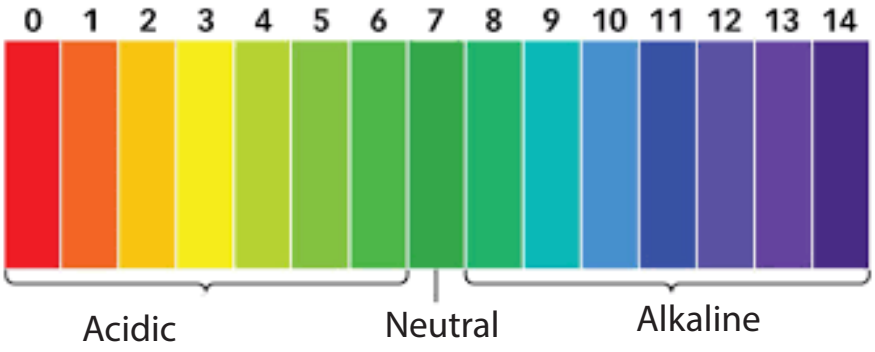


Fig 8.4 Standard pH scale

- The pH values of acids range from 0 to just below 7. Substances such as rain water and lemon juice are considered acidic and have pH values, which range between 4 and 7. They are said to be weak acids. Solutions of hydrochloric acid and sulphuric acid have pH values, which range between 0 to 4. These solutions are said to be strong acids. As the pH values decreases from 7 to 0, the strength of acids increases.
- A pH value of 7 implies the solution is neither acidic nor basic and it is hence said to be neutral. Distilled water is neutral.
- The pH values of bases range between 7 and 14. Hence bases such as ammonia solution and wood ash are weak bases. Sodium hydroxide and potassium hydroxide solutions have pH values above 10. They are said to be strong bases. As the pH values increases from 7 to 14, the strength of the bases also increases.

FUN CORNER

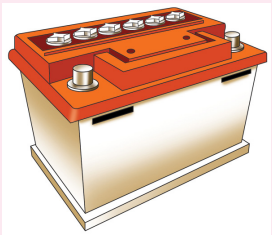
Using an acid and an indicator write a secret message. Use an unripe lemon and write a message to your friend on a piece of paper. Allow it to dry. Let your friend paint an indicator with a paint brush over the message to reveal it.

Check your progress 8.2

1. Write down some commonly available basic substances at your home environment.
2. Pupils used 10 drops of acid Y to change the colour of indicator B. They used 4 drops of acid X to change the colour of indicator B. Which of the two acids was stronger?
3. Write true or false for the statements below.
   (i) An acid can neutralise a base.
   (ii) A base can neutralise an acid.
   (iii) Excess acids produced in the stomach can be neutralised by taking a little amount of wood ash.
4. Which one of the following cannot be used to neutralise an acid?
   A. Water
   B. Lemon juice
   C. Wood ash
   D. Sodium hydroxide
5. All the following will not change the colour of an indicator except.
   A. Salt
   B. Urine
   C. Sugar
   D. Water
6. Strong acids are used to be _____ while weak acids are said to be _____
7. An acid was found to have a pH of 3. Was it a strong or a weak acid?

8.3: Uses of acids and bases

Activity 8.6 Individual activity



A

B

C

1. Mention the applications of acids and bases in the product shown above.
2. What other ways are acids and based applied in day-to-day life?
3. Compare your findings with others in class.

Learning points

Acids and bases are useful in our lives for example:

- Ascorbic acid which is naturally found in citrus fruits such as oranges and lemons control scurvy disease.
- Vinegar is an acid that adds flavour to food.
- In the making of fire extinguishers, acids are combined with carbonates to form carbon dioxide. The carbon dioxide is used to extinguish fire because it does not support burning.

Fig 8.5 Fire extinguisher

- Nitric acid is used to purify gold, make explosive and detergents.
- We also use acid such as sulphuric acid in car batteries to produce electricity.
- Our stomach lining produces hydrochloric acid that kills germs and creates a good environment for digestion to take place.
- Caustic soda is a base that is used in making soap.
- When soil becomes acidic we neutralise using a base called lime. We also neutralise acid in the stomach using antacids such as Actal.
- We use toothpaste to neutralise the acid produced by bacteria in our mouth to prevent tooth decay.

FUN CORNER

Create an advertisement for toothpaste you use at home. Compare your creation with other classmates.

Check your progress 8.3

1. A bee sting contains methanoic acid. That is why it is so painful. How then can you treat someone who has been stung by a bee?
2. Which base can we use if our soil becomes acidic to make it neutral?
3. Achol is feeling some burning pain along her gullet.
   (a) What do you think she is suffering from?
   (b) What can be done to help relieve the burning feeling?

Unit 9 Sound and Light

Words to learn

Translucent, reflex action, nerves, pitch, receptor, stimuli, volume

9.1: The pinhole camera

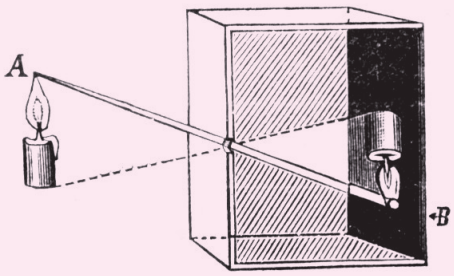
Activity 9.1 Making a pinhole camera

What you need

Cardboards, translucent paper, black paper, nail, hammer, pin, candle, matchbox, black paint and brush.

What to do

1. Using the materials above make a pinhole camera shown below.



2. Light a candle and place it at a distance from the pinhole.
3. Observe the image on the translucent paper.
4. Repeat the activity by varying the size of the pinhole and the distance of the candle.
5. Discuss your observations and record them as shown below

	Variable	Description of image
A	Tiny hole	
B	Bigger hole	
C	Object nearer to the hole	
D	Object far from the hole	

Learning points

- Pinhole camera uses light to form images.
- The light passes through a tiny hole and then it falls on a screen usually made up of a translucent material.
- The image formed on the screen is upside down and it is smaller than the object.

Activity 9.2 Observing and drawing parts of the human eye

1. Your teacher will invite an optician.
2. Design questionnaire you will use to engage the optician concerning the eye; its structure, functions and malfunctions.
3. Note down points during the talk.
4. Write a report and do a class presentation.

Learning points

A human being has two eyes in order to improve the focus and to supplement each other in the formation of a common image. This is also due to body symmetry and thus we have two eyes, two ears, two legs, two hands, two nostrils etc.

The human eye works like a pinhole camera.

6.2 Differences between pinhole camera and the human eye

Activity 9.3 Pair activity

What you need

Pinhole camera and pictures or model of human eye

What to do

1. Compare the pinhole camera and the human eye model.

2. Note your findings in a table like the one shown below.
3. Share your findings with the rest of the class.

1		
2		
3		
4		

Learning points

- The human eye and the pinhole camera have the following similarities:
  (a) They use light to form images.
  (b) The images are formed at the back.
  (c) The images are upside down (inverted).
  (d) The images are smaller than the object (diminished).
  (e) When the object is far the image is blurred.
  (f) When the object is near the image is clear.
- The human eye and the pinhole camera have the following differences:
  (a) The eye has a lens while the pinhole camera does not have a lens.
  (b) In the eye, light passes through the cornea membrane, fluid and lens while in the pinhole camera it passes through the tiny hole only.
  (c) In the eye the amount of light entering the eye is controlled by the iris while in the pinhole camera it is not controlled.
  (d) The eye has a wider perspective since both eyes work together while a pinhole camera has a smaller perspective.
  (e) The eye sends the impulse about the image to the brain for interpretation while the camera does not send the impulse to any device for interpretation.

FUN CORNER

Make a pinhole camera and use it to observe the images of different objects.

Did you know

Hawks have the best eyesight since in their retina they have millions of light sensitive cells. Explain why it is important for the hawks to hake a sharp eyesight.

Check your progress 9.1

1. Draw an eye, on it indicate:
   (a) Where images are formed.
   (b) Parts of the eye that control the light entering the eye.
   (c) Optical nerves
2. The eye has a better perspective than a pinhole camera. Explain.
3. The eye sends an impulse to the brain through_____.
4. Read the passage below and answer questions that follow.

   When we pass under a tree covered with many large leaves, we notice small patches of sunlight under it. These circular images are, infact, pinhole images of the Sun. The gaps between the leaves, act as the pinholes. These gaps are all kinds of irregular shapes, but we can see circular images of the Sun. This is called natural pinhole camera.

   (i) Which of the following act as pinhole in the natural pinhole camera?
      A. Leaves
      B. Gaps between the leaves
      C. Water droplets
      D. None of these

(ii) Which of the following is true about natural pinhole camera?

A. The circular patches of lights formed on the ground are examples of images.

B. The circular patches are pinhole images of the sun.

C. We see circular images of the Sun irrespective of the irregular shapes of the gaps between the leaves.

D. All the above.

(iii) Pinhole camera produces?

A. An erect and small image.

B. An erect and enlarged image.

C. An inverted and small image.

D. An inverted and enlarged image.

9.3: The structure of human ear and sound perception

Activity 9.4 Individual activity

1. Observe ears of animals around you.
2. Compare the structure of their ears with other animals from other places.
   - How is the structure of their ears?
   - Discuss the reasons why the ears are raised or erected.
3. Compare the structure of animal ears and yours.
   - Are they similar or different?
4. Record your findings.

Activity 9.5 Group activity

What you need

- Charts with pictures of the human ear
- Model of the human ear

What to do

1. Observe pictures of the human ear and models in groups of four.
2. Draw and label the ear using the picture charts.
3. Discuss the functions of the parts of the ear and record them in the table like the one shown below.

A		
B		
C		
D		
E		

4. Discuss why we have two ears

Learning points

- The ear is divided into the outer ear, middle ear and inner ear.

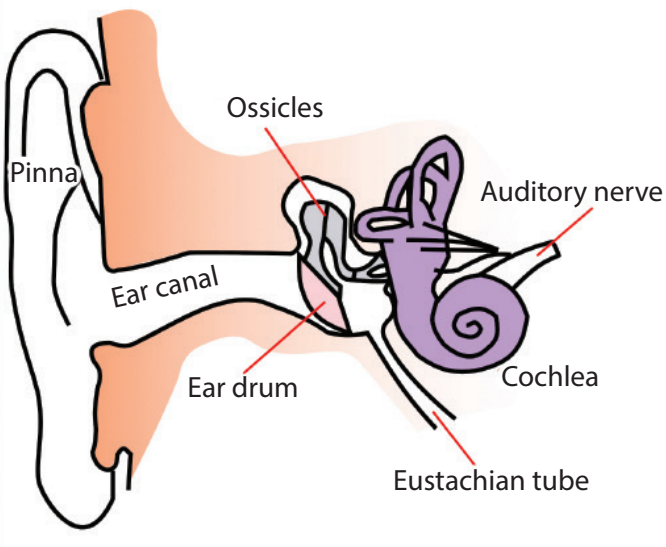


Fig 9.1 Structure of the human ear

- The outer ear is a tube opening on the side of the head and the other end goes to the ear drum.
- The outer ear has an extended skin (ear lobe) that helps to capture the vibrations. It also helps a person or an animal to know the direction of the sound.
- The middle ear is filled with air. It opens to the back of the mouth cavity through a tube called Eustachian tube.
- There are three small bones known as the ossicles which link the ear drum to a small opening in the scull which is called the oval window
- The inner ear has a fluid and a coiled tube known as cochlea. The cochlea tube has many sensory nerve endings.
- When sound is produced, for example, by plucking, beating, hitting or blowing, it moves in waves. The sound waves are then captured by the outer ear and directed to the ear drum.
- The ear drum vibrates making the three bones to vibrate. The inner most bone vibrates more against the oval window which is an opening into the inner ear.
- The vibrations of the ear drum and the small bones (ossicles) make the fluid and the cochlea in the inner ear to vibrate. These vibrations are converted into nerve impulse.
- The cochlea has fibers of different lengths that responds to sound of different pitches.

  (a) Short fibres respond to sound of high pitch.

  (b) Intermediate fibers respond to sound of medium pitch.

  (c) Long fibres respond to sound of low pitch.
- The nerve impulses are sent to the brain through the auditory nerve. The brain determines the pitch.
- Most mammals are able to move the pinna (outer ear) to be able to concentrate the sound waves like the ones of the dog below.

Fig 9.2 A dog with erected outer ear

- We have two ears to be able to detect sound from different sides
- The other reason for having two ears is because the body is symmetrical.

Did you know

Sound from a single source is heard more loudly in one ear than the other ear!

Check your progress 9.2

1. Match the information in column A with those in column B.

A	B
(a) Outer ear	Acts as a lever
(b) Ear drum	Transmit impulse
(c) Auditory nerve	Determine pitch
(d) Brain	Vibrate
(e) Small bones	Capture vibrations

2. Distinguish between pitch and volume.

9.4: The nervous system

Activity 9.6 Class work

Carry out the following activities and answer questions that follow.

1. Dim the lights in a room. After a few minutes, look at the eyes of the other person and note the changes in the pupil.
2. Turn the room lights back on. Check the size of the pupils again.
   - What did you observe?
3. Suddenly slam a book on a table to create a loud noise. Ask your partner to count the number of learners who:
   - Twitched
   - Moved their heads
   - Blinked their eyes
   - Put their hands up
   - Screamed
4. Have a partner sit with his or her legs crossed so that the leg can swing freely. Hit his or her leg gently just below the knee with the side of your hand.
   - What was your observation?
5. Let one pupil stand behind a class window, while others are observing him or her. Throw a folded paper towards the pupil.
   - Observe his or her reaction?
6. In groups answer the following questions
   (a) Why do you think you salivate when you see or smell food?
   (b) What happens when you touch a hot or sharp object?
   (c) What do you conclude from the observations and questions regarding the nervous system?
   (d) Write a report and present it to the teacher for assessment.

Learning points

- The nervous system is made up of all the nerve cells in the body. It is through the nervous system that we communicate with the outside world and, at the same time, many mechanisms inside our body are controlled.
- The nervous system takes in information through our senses, processes the information and triggers reactions, such as making your muscles move or causing you to feel pain.
- The nervous system consists of the brain, spinal cord, sensory organs, and all of the nerves that connect these organs with the rest of the body. Together, these organs are responsible for the control of the body and communication among its parts.

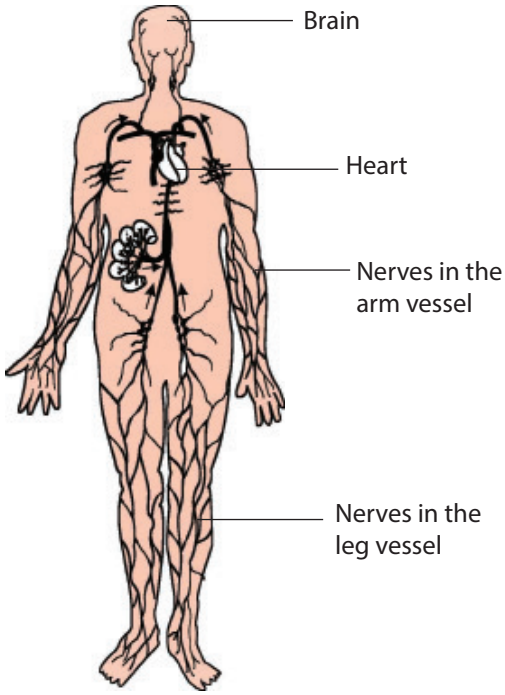


Fig 6.3 The human nervous system

- The brain is like a computer that controls the body's functions, while the nervous system is like a network that relays messages to all parts of the body.
- Our brain sends a motor impulse to the organs concerned for action.

- The nervous system is made up of nerve cells. The nerve cells have a body, an extension and filaments.
- The extension is called axon and the filaments that branches from axon are called dendrites.

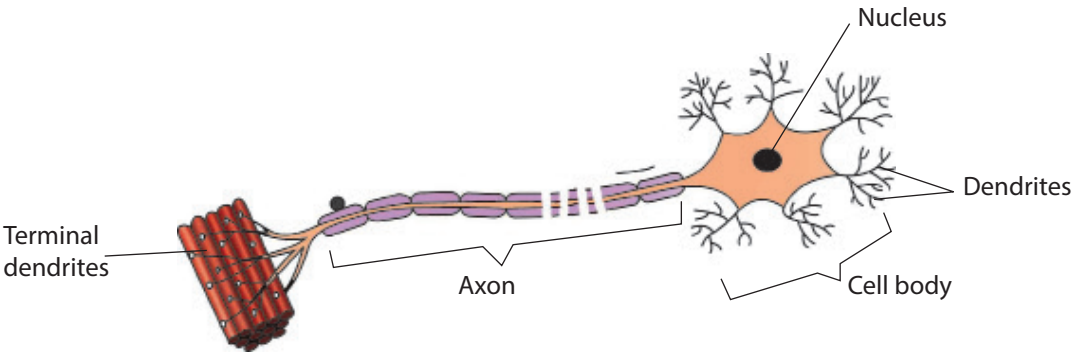


Fig 7.4 Nerve cell

- Our nervous system coordinates our body functions.
- When sense organs are triggered by stimuli they send an impulse to the brain or spinal cord where the cell bodies of nerve cells are located.
- Some actions in our bodies are automatic. They are commanded by our brain. Examples are blinking of an eye and sneezing. The automatic actions are called reflex actions.
- Our brain also stores information so that behaviour can be changed according to experiences.
- Our brain can be conditioned to respond even in the absence of the real stimuli, for example, we can salivate when we hear the bell for lunch even without the food. This is known as conditioned reflex.

FUN CORNER

Draw a waiter dropping a hot plate of food in a restaurant. Caption it .

Did you know

Nerve cells transmit impulses in one direction only.

Check your progress 9.3

1. Malik stepped on a sharp object then removed his foot very quickly. What made him do so?
2. A man kept a rope on the path of sheep; the sheep jumped the rope several times. He removed the rope on the path and let the sheep pass through the same path.
   (a) What do you think the sheep did when they reached where the rope was?
   (b) What is the name of the condition?
3. What causes our eyes to be wet when we cut onions?
4. Sort the following as either reflex action or condition reflex in a table format.

   Sneezing, salivation after seeing food, riding a bicycle, blinking an eye,

Unit 10 Electromagnetism

Words to learn

Electromagnet, dynamo, circuit, kinetic, transformation, magnetism, induction, coil, series connection

10.1: Making an electromagnet

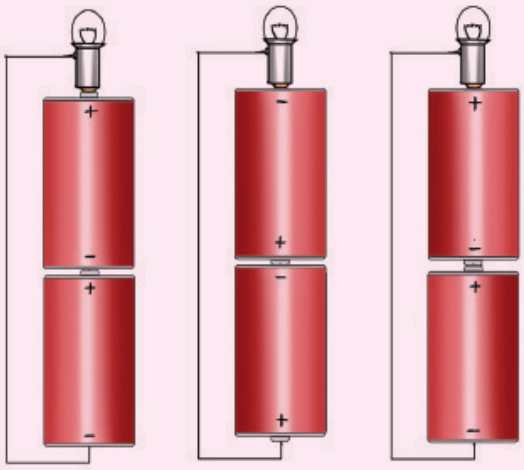
Can you recall what you learnt about electromagnets in level 2?

Activity 10.1 Group activity

What you need

- Torch batteries
- Bulb
- Copper wire
- Battery holder

1. Connect circuits as shown below.



A B C

2. Record your observation.

Circuit	Observation
A	
B	
C	

Study questions

(a) Which one shone the brightest? Why?

(b) Which one did not light? Why?

Making an electromagnet

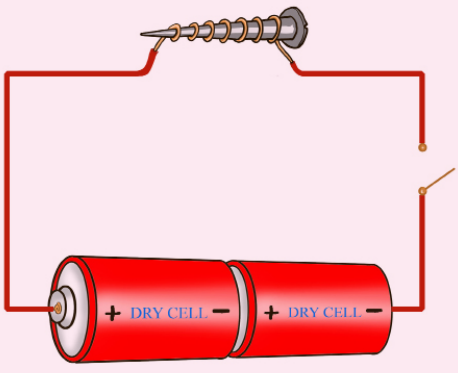
Activity 10.2 Group activity

What you need

1. Long copper wire
2. Dry cells
3. Long nails
4. Office pins
5. Cell holder

Procedure

1. Arrange the set-up as shown below.



2. Repeat the activity using more cells and increase the number of coils on the wire.
3. Record the observation in a table as show below.

Set-up using	How many clips does it hold	Remark on magnetism
3 cells		
6 cells		
9 cells		

Note: On the remark column indicate as strong, stronger or strongest.

4. Discuss the observations made.
5. What happens when the wire is disconnected?
6. What kind of energy transformation takes place in an electromagnet?

Learning points

- An electromagnet is a temporary magnet made using current electricity. It comprises of a source of electricity, wire and a nail.
- The sources of current electricity include:
  (a) dry cells
  (b) car battery
  (c) generators
  (d) bicycle dynamo
  (e) solar panels
- When the wire is connected to the source of electricity such as dry cells the energy is transformed into electrical energy.
- In the dry cells there is chemical energy which is transformed into electrical energy.
- The electrical energy flows through the wire. When it reaches the nail the electrical energy is transformed into electromagnetic energy. The nail is magnetised through induction.

- The electromagnetic energy is transformed into energy and therefore it pulls magnetic materials such as paper clips, pins and staples.
- The more the number of pins the nail can hold the stronger the magnet.
- The following flow diagram shows energy transformation in an electromagnet

  Chemical energy (in dry cells) ⟶ Electrical energy (in wires) ⟶ Electromagnetic energy(in pins/clips) ⟶ kinetic energy (in dry cells)

Note: The electromagnet is temporary because when the wire or the cell are disconnected the nail loses magnetism.

Further Activity

1. Investigate using the internet the uses of an electromagnet.
2. Compare your findings with the rest of the class.

FUN CORNER

1. Make an electromagnet in pairs and investigate the materials it can attract and those it cannot attract.
2. Record your findings in a table like the one shown below.

Materials attracted	Materials not attracted

Did you know

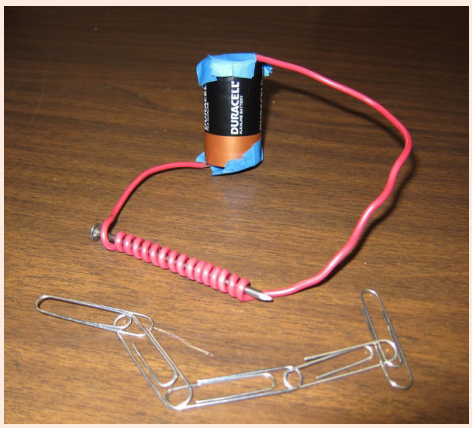
Changing the variables such as the number of cells affects the strength of an electromagnet.

Energy can be transformed from one form to another, for example, electrical to electromagnetic energy. It cannot be destroyed though.

Check you progress 10.1

1. Electromagnet is temporary. True or false
2. What happens to an electromagnet when the wire is disconnected?
3. Which form of energy is found in a dry cell?
4. (a) State the energy transformation in the electromagnet shown alongside.

   (b) Can you identify a mistake in the set-up.



5. Name any two ways in which electromagnetism can be increased.
6. Explain the term polarity.

10.2: Changing the strength of an electromagnet

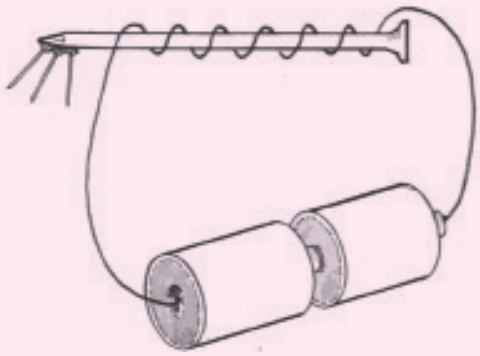
Activity 10.3 Group work

What you need

1. Dry cell
2. Wires
3. Long nails
4. Cell holders
5. Office pins/ paperclip/ staples

What to do

1. Arrange the cells in series in the cell holder.
2. Make several coils on the nail using the wire.
3. Connect the wire to the cell. One end to the positive terminal and the other one on negative terminal.
4. Place pins near the pointed end of the nail.

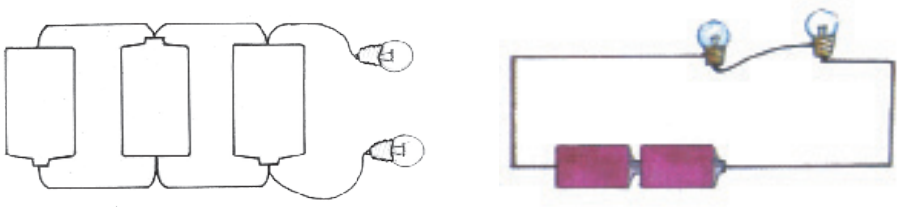


5. Record the number of pins it holds.
6. Repeat the activity by first making the following changes. One at a time:
   (a) Increase the number of cells in series.
   (b) Increase the number of coils.
   (c) Arrange the cells in parallel connection.
   (d) Reduce the number of cell.
   (e) Reduce the number of coils.
7. Record observation as shown in the table below and make conclusions.

Set-up	Observation	Conclusion
A		
B		
C		
D		
E		

Learning points

- We can know the strength of an electromagnet by observing the number of pins or clips it holds. If it holds more pins or clips it is a strong electromagnet.
- We can increase the strength of an electromagnet by:
  (a) Increasing the number of dry cells arranged in series connection. The higher the number of cells in series the higher the amount of voltage. For example if one cell has 1.5 volts (V) and we use 10 cells the total amount of voltage will be 15. Increasing the number of cells for example to 20 cells will increase the voltage to 30 V. 30 V will result in a stronger electromagnet than 15 V.
  (b) Increasing the number of coils. When we increase the number of coils more electrical energy is transformed into electromagnetic energy. The nail therefore becomes a stronger magnet.



(a) Parallel connection (b) Series connection

Fig 10.1 Circuit connections

- We can also reduce the strength of an electromagnet. An electromagnet can be made weaker by;
  (a) Arranging the cells in parallel connection. When cells are arranged in parallel the amount of voltage is less. In parallel connection the total amount of voltage is equal to the voltage of one cell.
  (b) Reducing the number of coils. When we reduce the number of coils the amount of electrical energy being transformed into electromagnetic energy is reduced and therefore the magnet becomes weaker.

(c) Reducing the number of cells. Using fewer cells reduces the amount of voltage and therefore the amount of electrical energy being transformed into electromagnetic energy is less.

Further Activity

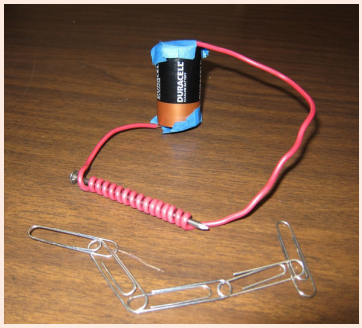
Investigate using the internet ways of changing the strength of an electromagnet.

Did you know

We can increase the strength of an electromagnet by increasing the number of cells arranged in series and increasing the number of coils.

Check your progress 10.2

1. What can be done to the electromagnet below to make it stronger?

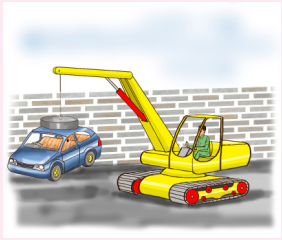


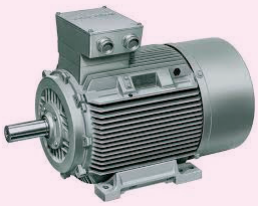
2. What would happen if the nail is replaced with a plastic?
3. A car battery can make a stronger electromagnet. True or false?
4. Show how the following can be done:
   (a) The best way of connecting cells in making of an electromagnet.
   (b) Reducing the strength of an electromagnet.
   (c) Increasing electromagnetism.
   (d) Making the nail lose its magnetism in an electromagnet.
5. Why is it advisable to arrange the cells in series than in parallel?

10.3:Application of electromagnetism

Activity 10.4 Individual work

Copy the table and complete it.

	Picture	Name	Use
a.			
b.			
c.			
d.			
e.			

	Picture	Name	Use
f.			
g.			
h			
i			
j			

Learning points

- Electromagnetic energy is produced using electricity.
- We use electromagnetic energy in cranes to lift loads.
- In radios, the electromagnetic energy is used to produce sound.
- The electric bells use electromagnetic energy to ring.

- Bicycle dynamo uses electromagnetic energy to produce electricity for lighting.
- Computers stores information in the hard disk using electromagnetic energy.
- Generators produces electromagnetic energy to produce electricity
- Other device that uses electromagnetic energy includes: microphone, microwaves and transformers.

FUN CORNER

Identify electromagnets used at home and in school.

Remember!

Electromagnetic energy can be controlled by changing the variables such as number of coils and cells.

Did you know

We can use electromagnetic energy to move a train!

Check your progress 10.3

.3

1. Match the devices in column A with the information in column B. Use arrows.

	A	B
A	Computer	To lift loads

B	Crane	To produce sound
C	Television	To produce electricity
D	Radio	To store information
E	Bicycle dynamo	To direct the beam of light
F	Train	To ring
G	Electric bell	To move

2. What is the importance of electromagnetic energy in a bicycle dynamo?
3. Which form of energy makes electric bell to ring
4. Unscramble the words below. They use electromagnetic energy to function.

   (a) eancr

   (b) pcteomr

   (c) telcceri lelb

   (d) droai