South Sudan

Primary Science 5

Primary Science has been written and developed by Ministry of General Education and Instruction, Government of South Sudan in conjunction with Subjects experts. This course book provides a fun and practical approach to the subject of Science, and at the same time imparting life long skills to the pupils.

The book comprehensively covers the Primary 5 syllabus as developed by **Ministry of General Education and Instruction.**

Each year comprises of a Pupil's Book and teacher's Guide.

The Pupil's Books provide:

- Full coverage of the national syllabus.
- A strong grounding in the basics of Science.
- Clear presentation and explanation of learning points.
- A wide variety of practice exercises, often showing how Science can be applied to real-life situations.
- It provides opportunities for collaboration through group work activities.
- Stimulating illustrations.

All the courses in this primary series were developed by the Ministry of General Education and Instruction, Republic of South Sudan. The books have been designed to meet the primary school syllabus, and at the same time equiping the pupils with skills to fit in the modern day global society.

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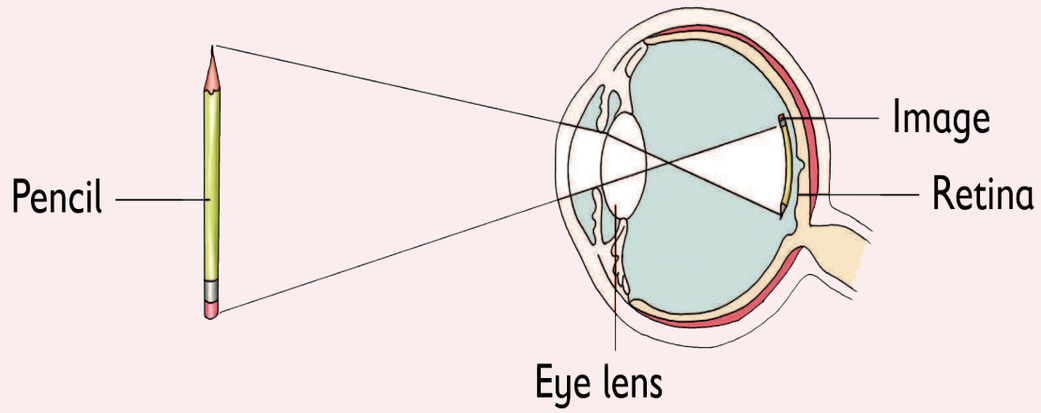
Primary Science Pupil's Book 5

South Sudan

Primary Science 5

Pupil's Book



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3. **Do not tear pages out of the book.**
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South Sudan

PRIMARY 5

Science

Primary 5

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FOREWORD

I am delighted to present to you this textbook, which is developed by the Ministry of General Education and Instruction based on the new South Sudan National Curriculum. The National Curriculum is a learner-centered curriculum that aims to meet the needs and aspirations of the new nation. In particular, it aims to develop (a) Good citizens; (b) successful lifelong learners; (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society. This textbook, like many others, has been designed to contribute to achievement of these noble aims. It has been revised thoroughly by our Subject Panels, is deemed to be fit for the purpose and has been recommended to me for approval. Therefore, I hereby grant my approval. This textbook shall be used to facilitate learning for learners in all schools of the Republic of South Sudan, except international schools, with effect from 4th February, 2019.

I am deeply grateful to the staff of the Ministry of General Education and Instruction, especially Mr Michael Lopuke Lotyam Longolio, the Undersecretary of the Ministry, the staff of the Curriculum Development Centre, under the supervision of Mr Omot Okony Olok, the Director General for Quality Assurance and Standards, the Subject Panelists, the Curriculum Foundation (UK), under the able leadership of Dr Brian Male, for providing professional guidance throughout the process of the development of National Curriculum and school textbooks for the Republic of South Sudan since 2013. I wish to thank UNICEF South Sudan for managing the project funded by the Global Partnership in Education so well and funding the development of the National Curriculum and the new textbooks. I am equally grateful for the support provided by Mr Tony Calderbank, the former Country Director of the British Council, South Sudan; Sir Richard Arden, Senior Education Advisor of DfID, South Sudan. I thank Longhorn and Mountain Top publishers in Kenya for working closely with the Ministry, the Subject Panels, UNICEF and the Curriculum Foundation UK to write the new textbooks. Finally, I thank the former Ministers of Education, Hon. Joseph Ukel Abango and Hon. Dr John Gai Nyuot Yoh, for supporting me, in my previous role as the Undersecretary of the Ministry, to lead the Technical Committee to develop and complete the consultations on the new National Curriculum Framework by 29 November 2013.

The Ministry of General Education and Instruction, Republic of South Sudan, is most grateful to all these key stakeholders for their overwhelming support to the design and development of this historic South Sudan National Curriculum. This historic reform in South Sudan's education system is intended to benefit the people of South Sudan, especially the children and youth and the future generations. It shall enhance the quality of education in the country to promote peace, justice, liberty and prosperity for all. I urge all Teachers to put this textbook to good use.

May God bless South Sudan. May He help our Teachers to inspire, educate and transform the lives of all the children and youth of South Sudan.

Deng Deng Hoc Yai, (Hon.)
Minister of General Education and Instruction, Republic of South Sudan

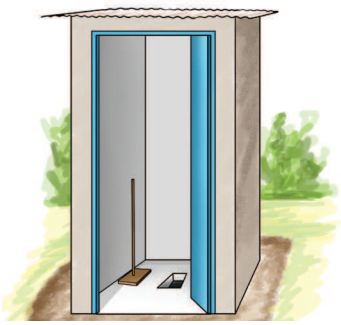
Table of content

Unit 1 Health and Hygiene

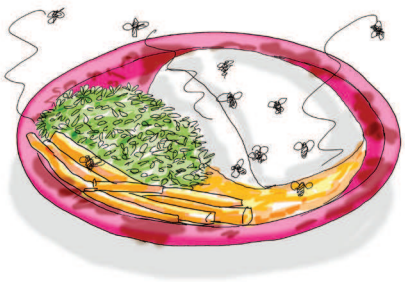
1.1 Germs and sanitation

Activity 1.1 Common areas where germs are found

Work in groups:



A



B

C

D

Answer these questions.

(a) Why are germs common in the places shown in the pictures above?

(b) Name other parts of your body where germs are found.

(c) What should we do to avoid germs?

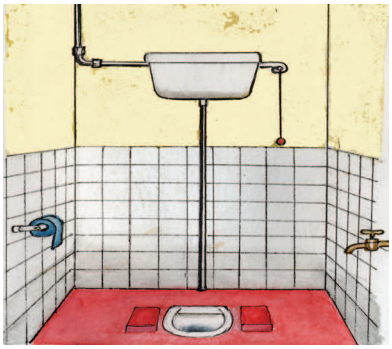
Learning points

Common places where germs are found include:

- In dirty toilets and latrines.
- In uncovered food.
- In areas where garbage is thrown.

Activity 1.2 Comparing clean and dirty environments

Work in pairs:

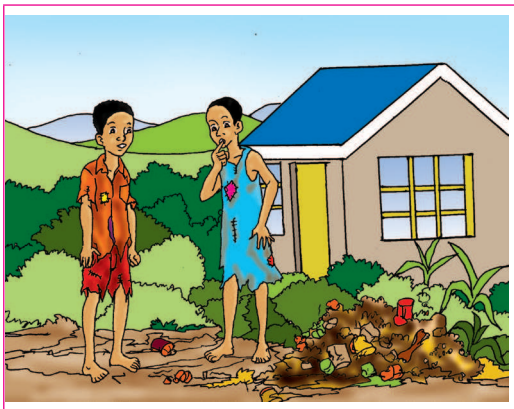


A1

A2

B1

B2



C1

C2

What is the difference between the pictures A1 and A2, B1 and B2, and C1 and C2?

Learning points

- Dirty places keep germs. We should avoid such places.
- We should always keep our environment clean to avoid germs that cause diseases.

Activity 1.3 Importance of keeping our environment clean

Work in pairs:

1. Role play the activities in the pictures below.

A

B

C

D

E

F

2. Answer these questions.

(a) Why is the activity in each picture important?

(b) How else can we keep our environment clean?

(c) Why is avoiding germs important?

Learning points

- A clean environment is free from germs. We should keep our bodies and our environment clean all the time. This will prevent us from getting diseases. Some ways of avoiding germs include:
  - Keeping fingernails short.
  - Cleaning our compounds and surroundings.
  - Washing clothes to make them free from germs.
  - Washing fruits and vegetables before eating or cooking them.
  - Cleaning toilets and latrines to keep away germs.

Fun Corner!

1. Draw and colour the following activities in a manila paper.
   - A boy cutting finger nails.
   - Pupils collecting litter in a compound.
   - A girl washing a toilet.

2. At your free time, practise making a dust bin out of a jerrycan. Use the following procedure.
   - You will need an old jerrycan, a knife and a maker pen.
   - Using the knife, cut across the top part of the jerrycan.
   - Label it 'Dustbin' using the maker pen.

Check your progress 1.1

1. Name three places where germs can be found.
2. _____ environments keep germs.
3. We should _____tall grass in our homes.
4. After visiting a toilet we should _____ our hands.
5. Match the Activity below with why it's importance.

Activity	Importance
(a) 	Ensures we do not swallow germs when we eat.
(b) 	Keeps away germs in our school compound.
(c) 	Keeps flies away.

Activity	Importance
(d) 	Keeps fruits clean

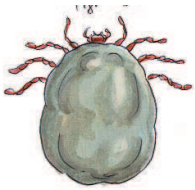
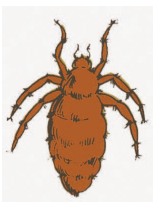
6. In each activity shown in the picture in number 5 above, come up with different questions about germs that are kept away.

1.2 Common human parasites

Activity 1.4 Types of parasites

Work as a class

1. Study the types of parasites below.

 A	 B	 C
 D	 E	 F

2. Answer these questions:

(a) How do you feel after eating food in a dirty environment? Which of the parasites might be affecting you?

(b) How do the rest of the parasites in the picture affect us?

3. Find out what parasites are and their effects on human body.

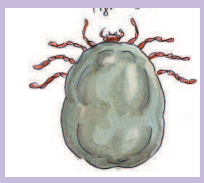
Learning points

- Parasites are organisms that live in or on our bodies and get food from us.
- Parasites that live on our bodies are called external parasites. They include ticks, lice and fleas.
- Parasites that live inside our bodies are called internal parasites. Examples are roundworm, tapeworm and liverfluke.
- Different parasites affect us in different ways.

Fun Corner!

Draw and colour these parasites on a manila paper:






Hang the manila paper on the wall of your classroom.

(a) Effects of external parasites

Activity 1.5 Effects of human parasites

Work in groups:

A

B

What can you see in the pictures A and B above? Write a short story about each.

Learning points

- Most of external parasites bite our bodies. Once bitten, swellings occur which lead to severe itching. This makes us restless due to the itching effect.
- Other parasites like jiggers affect our feet between the toes. We feel a lot of pain and we cannot walk properly as a result.

Fun Corner!

1. Recite the poem below to a friend.

Jiggers! Jiggers! Jiggers!

What a menace you are

You hurt our beautiful feet

You swell our beautiful legs

Causing itchiness and discomfort

We can't walk

We can't sleep

We can't play

Oh! What a menace you are!

Come on everybody

Rise up and say no to jiggers

Let's all work hard

To eradicate jiggers

Say no to jiggers!

2. What did you learn from the poem?
3. Compose a poem of the same type using different parasite.

(b) Effects of internal parasites

Activity 1.6 Effects of internal parasites

Work in pairs:

A

B

1. What is happening in the pictures?

2. Identify the names of the parasites that may have affected the individuals in the pictures. What are their effects to human body?

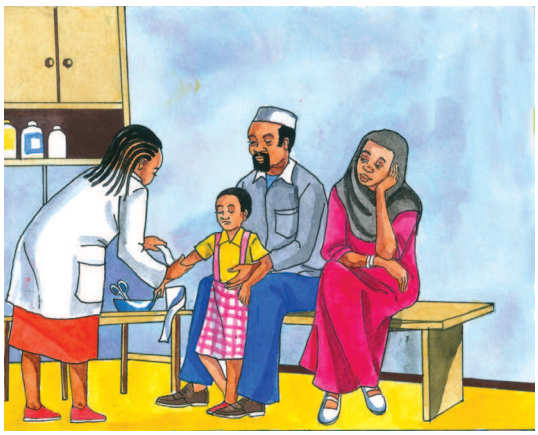
Learning points

- Internal parasites attack the internal parts of the body especially the digestive system.
- Liverflukes attack the liver and damages it. This can result to sudden death.
- Roundworms attack small intestines and lungs.
- Tapeworms attack small intestines and the liver.
- Generally, parasites cause reduced appetite and this can lead to poor health.
- They may also make us vomit.

Activity 1.7 Prevention and control of human parasites

Work as a class:

1. What do you see in the picture below?



2. Visit a nearby health center and research on how we can prevent and control parasites. Write a report and present to other class members.

Learning points

- Human parasites can be prevented by observing cleanliness.
- Creating public awareness on how to prevent and control parasites is also another way of preventing and controlling human parasites.

Fun Corner!

At your free time, come up with a poster of a different design from this. The main message on the poster should be 'aspects of disease prevention.'

Keep Your Environment Clean!

Say No To Parasites!

Remember!

Always keep your environment clean to avoid parasites.

Check your progress 1.2

1. What is a parasite _____.
2. What do we mean by:
   (a) external parasite? _____
   (b) internal parasite? _____
3. Give two examples of:
   (a) external parasites.
   (b) internal parasites.
4. External parasites cause _____ to our bodies, which causes itching.
5. Observing _____ can prevent parasites.

1.3 Health hazards and risks

Activity 1.8 Health hazards and risks in our environment

Work in pairs:

A

B

C

(a) Why do you think the above activities are dangerous to our health?

(b) Name other health risks in our environment that you know.

Learning points

- Health hazards are things which pose danger to our lives. These include germs, parasites and some activities like smoking and activities that may cause accidents.
- Health risks are things that increase the likelihood of developing a disease or injury. These include high blood pressure, stroke, and heart attack.

Activity 1.9 How to avoid health hazards and risks

Work in groups:

1. What do you see in the pictures? Why are the activities important?

A

B

C

D

Learning points

- Health hazards and risks can be avoided by observing personal hygiene and living a healthy lifestyle. Living a healthy lifestyle involves:
  - Eating healthy foods or meals.
  - Having regular exercises.
  - Cleaning our bodies.
  - Having enough sleep and resting after doing heavy activity.

Fun Corner!

Role play any of the following with a friend.

- Eating a healthy meal
- Exercising
- Sleeping

Check your progress 1.3

1. What is meaning of:

   (a) Health hazard _____.

   (b) Health risk _____.

2. Give two examples of:

   (a) Health hazards

   (b) Health risks

4. Match the following activities with their importance.

Activity	Importance
a) 	Removes germs from the body
b) 	Improves heart rate
c) 	Helps relax the body
d) 	Gives the body nutrients that it needs

1.4 Drugs and drug abuse

Activity 1.10 Drugs and medicine

Work in pairs

Identify medicines and drugs from the picture. Which ones are good? Which ones are bad?

Learning points

- A **drug** is any substance that when taken changes the way the body functions. Medicine is a drug that is taken to treat diseases or prevent the body from diseases.
- All medicines are drugs but not all drugs are medicines.
- When medicine is taken for any other purpose other than the intented one, this is called drug abuse.
- Medicine abuse can be through:
  - (a) Taking somebody else's medicine
  - (b) Taking more medicines than directed by the doctor.
  - (c) Taking medicine at the wrong time, among others.
- Some commonly abused drugs are alcohol, tobacco, bhang, khat, cocaine and heroine.

Fun Corner!

Draw and colour some common medicines. Hang your drawings on your classroom walls.

Activity 1.11 Types of drugs

Work as a class:

A

B

C

D

Answer these questions:

(a) What do you see in the pictures? Are they good or bad?

(b) Which drugs are not good? Why?

Learning points

- Some drugs are good while others are not good.
- All medicines are good drugs. They are allowed by the government. They are therefore legal drugs.
- Other drugs such as heroine, cocaine and bhang are not allowed by the government. They are illegal. It is also illegal to underdose or misuse prescribed medicines
- Taking of illegal drugs is drug abuse.

Remember!

All illegal drugs and drug abuse are health hazards.

Fun Corner!

Fill in the table below using colourful drawings.

Legal drugs	Illegal drugs
1.	1.
2.	2.
3.	3.

Activity 1.12 Effects of drug abuse

Work in pairs:

A

B

C

1. What do you think caused the above behaviours?

Learning points

- Drugs have many effects on our bodies.
- If abused, they cause diseases like lung cancer. They also damage the liver and bodies.
- Drugs also damage the brain and interfere with our ability to think properly if abused. This leads to misbehaviour.
- Drugs if abused can also cause lack of appetite leading to malnutrition.

Table 1.1 Summary of effects of drugs

Drug	Effects
Tobacco	1. Cancer of lips, mouth and lungs 2. Breathing difficulties 3. Damages the lungs
Alcohol	1. Lack of appetite 2. Damages the liver (liver cirrhosis) 3. May lead to family break-up
Bhangi/Opium	1. Impaired judgement 2. Damages the brain
Heroin	1. Sleeping problems 2. Feeling drowsy 3. Poor appetite and eventually malnutrition
Cocaine	1. Loss of appetite 2. High blood pressure 3. Hallucination 4. Nausea or feeling like vomitting

Check your progress 1.4

1. When do we say that medicine is abused?
2. What is drug abuse?
3. Give two examples of:
   (a) Legal drugs _____, _____.
   (b) Illegal drugs _____, _____.
4. Name four commonly abused drugs in your community. What can you do about it?
5. State two effects of each of the following drugs:
   (a) Tobacco
   (b) Alcohol
   (c) Bhang

1.5 Importance of living a healthy lifestyle

Activity 1.13

Work in pairs:

1. Role play the conversation below with a friend.

Kim: Hi Judy!

Judy: Hi Kim!

Kim: You look healthy!

Judy: Thank you Kim.

Kim: It is like you take a lot of meat!

Judy: Not really! It is only that I take healthy meals.

Kim: What is a healthy meal, Judy?

Judy: It is a balanced diet. A meal with all the food groups.

Kim: I see!

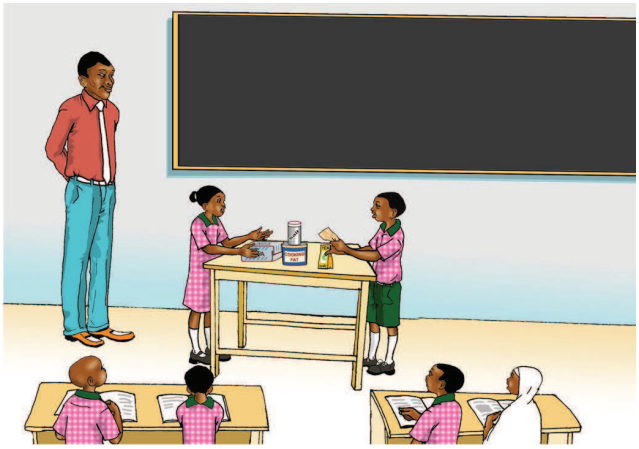
Judy: Eating alone is not enough. I also do a lot of exercises like jogging, press-ups and sit-ups.

Kim: Isn't that tiresome?

Judy: No, it is for physical fitness.

Kim: I see, what else do you do?

Judy: I also have enough sleep and rest. Resting is healthy but not sleeping the whole day!



Kim: It should be after working only.

Judy: Exactly. Above all, keep your body clean and put on clean clothes.

Kim: Cleanliness is next to Godliness. I know!

Judy: Yes. Remember, you should also avoid drugs. They can make you not to concentrate on your studies!

Kim: And they also cause diseases?

Judy: Yes, they are health hazards. We should say no to drugs!

2. What did you learn from the role play?
3. Name healthy lifestyles from the conversation.
4. Come up with a conversation of the same type. use different names.

Fun Corner!

Keep a daily journal on your habits. Share your journal with your classmates. Decide which habits are healthy and which ones are not.

Check your progress 1.5

1. What is healthy lifestyle? _____.
2. Give four ways of maintaining a healthy lifestyle.
3. State three types of exercise that you can do to keep your body healthy.

Unit 2 Understanding and using our eyes and ears

2.1 Functions of the human eyes and the human ears

Activity 2.1 **Importance of the human eyes**

Work in pairs

1. Blind-fold your partner as shown below.
2. Ask the blind-folded child to locate some points in the classroom. For example, chalk board, the door, desk among others.

3. Answer these questions:
   (a) Is it easy to locate the points?
   (b) Why is it difficult to locate the points?
   (c) Can you read when your eyes are closed? Why?

Learning points

- Eyes are the sense organs for seeing.
- Can you imagine what might be like to live your life without your eyes?
- The eye is like a camera. Light enters it, light is then focussed and an image is formed.
- Blind people cannot see because they don't have functional eyes.

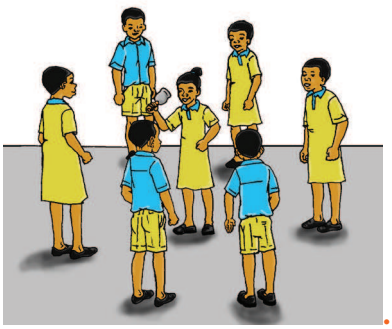
Fun Corner!

Draw and colour the eye.

Activity 2.2 Importance of the human ears

Work in pairs

1. What do you see in the pictures?.



2. Discuss what is happening in each picture.
3. Role-play the activities in the pictures.
4. What are the ears used for?

Learning points

- The ear is the sense organ for hearing. Human ears are located on either side of the head. Human ears are made up of two separate parts: the outer ear and the inner ear. The outer ear is the part that others see. It works like a cup to catch sound as it travels.
- The inner ear translates vibrations into sound and sends signals to the brain.

Fun Corner!

Compose a song on the importance of ears and sing it.

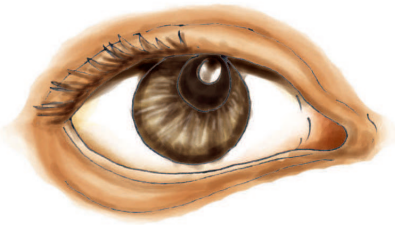
2.2 External structure of the human eye

Learning points

- **Eye brows** – This is the raised hairy surface. The hairs prevent sweat from entering into the eye.
- **Eyelids** – They close to block light, thus preventing the eye from drying out.
- **Eye lashes** – These prevent solid particles from entering into the eye.

- **Pupil** – This allows and controls the amount of light that enter into the eye.
- **Iris** – Iris controls the size of the pupil.
- **Conjunctiva** – It protects the inner delicate parts of the eye.

Activity 2.3 Parts of the eye



1. On the diagram, label the parts of the eye.
2. Identify the parts you have labelled in your partner's eye (Take care not to hurt your friend's eye)
3. Think about the functions of each part of the eye.

Fun Corner!

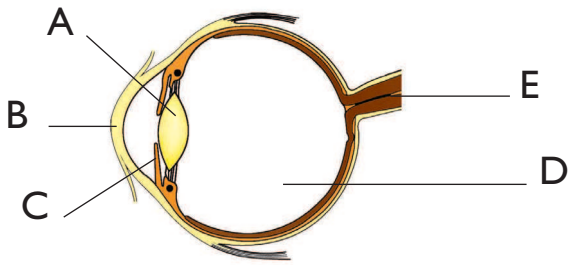
Draw a large eye in the sand. Label the external parts of the eye.

2.3 Internal structure of the human eye

Activity 2.4

Work in groups

1. Look at the picture in the next page.



2. From the diagram, name the internal structures of the human eye labelled.

3. Discuss in groups the functions of each of the parts of the human eye.

Learning points

The functions of the parts of the human eye are given below:

Parts	Functions
Cornea	Transparent for allowing light to pass through.
Aqueous humour	Transparent and colourless fluid that maintains the shape of the eye.
Lens	Allows the light to pass through.
Vitreous humour	Thick colourless fluid that allows light to pass through.
Retina	Has cells that are sensitive to light.
Yellow spot	This is where the image is formed in the eye.
Optic nerve	Transports the impulses formed on the retina to the brain for interpretation.

Fun Corner!

Model the internal structure of the human eye and display it at the Science corner of your class.

2.4 Comparison between human eye and that of other animals

Activity 2.5 Eyes of different animals



1. Identify the animals in the pictures.
2. Where are their eyes located?

Learning points

- All animals have eyes. They use their eyes to see. They cannot see without eyes.
- The two eyes see at the same time.
- The eyes of a hen are found on the sides of the head. They cannot see the same direction at the same time.
- A hen has to tilt its head to the side of an object. Only one eye can see one object at a time.

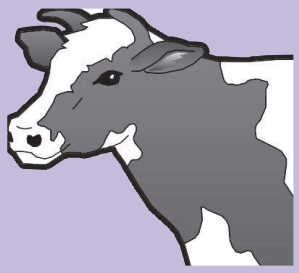
Fun Corner!

1. Draw and colour these on a manila paper.

(a)

(b)

(c)



(d)

2. Label the eyes on the picture.

Activity 2.6 Binocular vision in human and in other animals

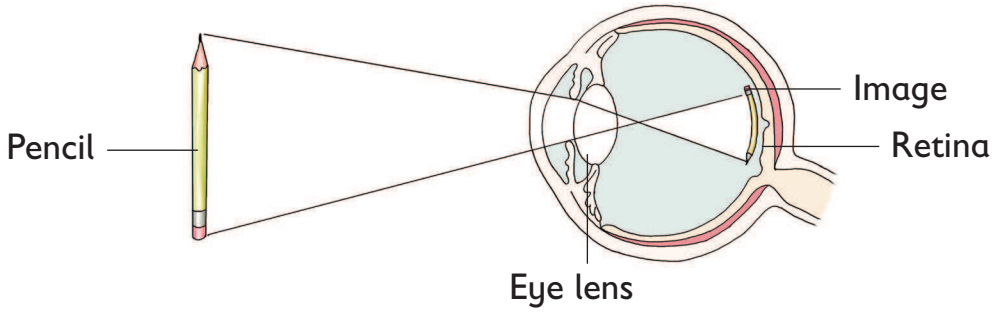
Work in groups

1. From the picture, explain how the image is formed inside the eye.
2. Close one eye with your hand. Hold your book close to the eye. Move the book away from the eye until you are not able to read anything.
4. Open the other eye while still holding your book at that same point. Look at the book.

(a) Are you able to read?

(b) Is it important to have one eye or two eyes? Why?

Study the picture below carefully. It shows how the image is formed inside the eye.



Learning points

- The image formed inside the eye is:
  - Real
  - Smaller in size
  - Upside down
- Human beings have two eyes to ensure that when you look at an object, each eye forms an image inside the eye. This is called **binocular** vision.
- It helps in assessing distance for example, when crossing the road more clearly.
- It is important because when one eye is damaged the other eye is used for seeing.

Check your progress 2.1

1. The eye is a sense organ that is used for _____.
2. Draw and label the external parts of the human eye.

3. The ears help us to _____.

4. Which part of the eye prevents sweat from entering into the eye?

5. State the functions of the following parts.

Part	Function
(a) Iris	_____
(b) Pupil	_____.
(c) Eyelid	_____

6. Match the following parts with their function using lines.

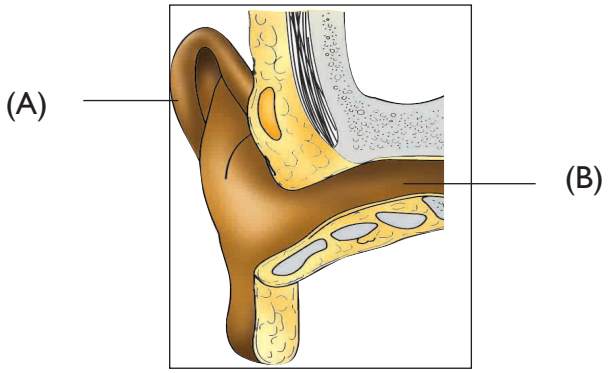
Part	Function
Aqueous humour	Allow light to pass through.
Lens	Where image is formed.
Yellow spot	Maintain the shape of the eye ball

2.5 External structure of the human ear

Activity 2.7

Work in groups

Study the picture in the next page carefully.



1. Identify and label the parts shown in the picture.
2. Observe the parts of your partner's ear.
3. What is the function of each part.

Learning points

- **Pinna** is the part that protrudes outwards. It collects and directs sound into the **external auditory** canal.
- The external auditory canal has hair and wax. It is where sound waves pass into the ear.
- The wax and hair trap dust particles and prevent them from reaching the internal parts of the ear.

Fun Corner!

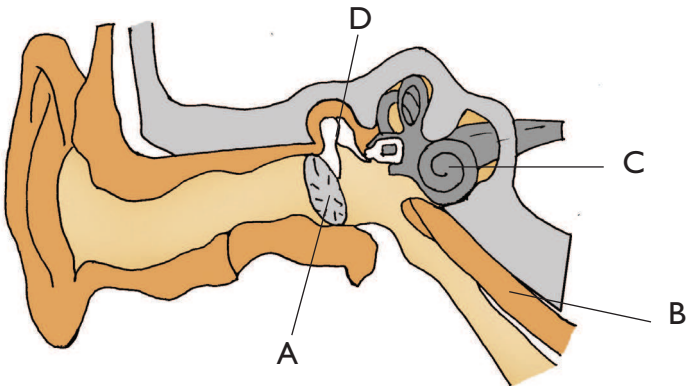
Draw a diagram to show the external parts of the ear.

2.6 Internal structure of the human ear

Activity 2.8 **Internal structure of the human ear**

Work in groups

Study the picture in the next page carefully.



1. Identify and label the parts of the ear.
2. What are the functions of the parts of the ear?
3. Find out why we yawn.

Learning points

- Internally the human ear is divided into two parts: the middle ear and the inner ear.
- The middle ear consists of ear drum, ear ossicles, eustachian tube, round and oval windows.
- The inner ear consists of vestibule, cochlea and semi-circular canal.

Table 2.1 Parts of the ear and their functions

Part	Function
Ear drum	Changes sound waves into vibration.
Ear ossicles	Transmits sound waves into the inner ear.
Oval windows	Equalises pressure between the inner and middle ear.

Part	Function
Eustachian tube	Opening through which sound waves pass.
Vertible and semicircular canals	Maintains body balance.
Cochlea	Receives sound in form of vibrations.

Fun Corner!

Draw the internal structure of the ear on a wall chart and display.

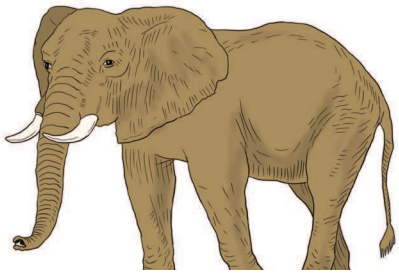
2.7 Comparison between the human ear and that of other animals

Activity 2.9 **Ears of different animals**

Work in pairs

A

B



C

D

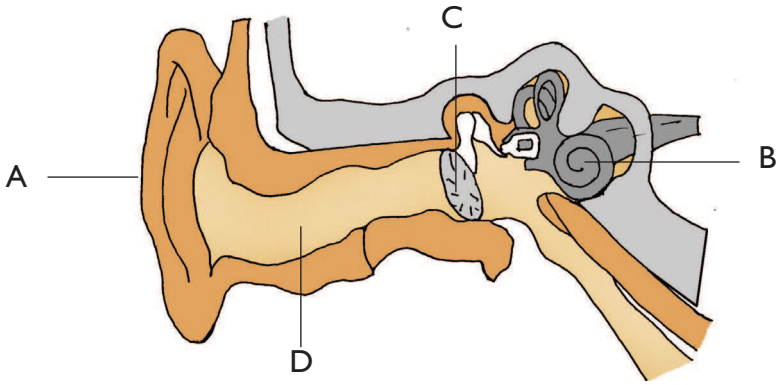
1. Which animals are in the pictures? How do their ears compare?
2. Write short notes about the ears of the animals.

Learning points

- All animals have two ears. They use the ears for hearing.
- All animals' ears are located on the head.
- Other animals have bigger ears than those of human beings.
- Animals raise their ears to capture sound waves while human beings cannot.

Check your progress 2.2

1. Name the parts of the ear below.



2. The main function of wax and hair found in the ear is to _____.

3. State the functions of the following parts of the ear.

   (a) Ear ossicles (b) Cochlea (c) Ear drum

4. The part of the ear that is responsible for maintaining balance is _____.

5. State the similarities between human ear and the ears of other animals.

6. What is the main difference between the human ear and the ears for other animals?

2.8 Transparent, translucent and opaque objects

Activity 2.10 **To differentiate between transparent and opaque materials**

Work in groups

1. Place a clear glass on top of a book.
   - Are you able to read the book?
2. Now place a piece of carton on top of the book.
   - Are you able to read the book?
3. Repeat these activities using a clear polythene bag, a piece of wood and a clear glass of water.
   - Through which objects were you able to read the book?

Learning points

- In some objects you are able to read the book. This is because they allow light to pass through them. Objects which allow light to pass through them are known as **transparent** objects. Examples are clear water, clear glass and clear polythene bag.
- In other objects, you are not able to read the book. This is because they do not allow light to pass through them.

  Objects which do not allow light to pass through them are known as **opaque** objects. Examples are a piece of wood, carton, stone among others.
- When light comes across opaque objects, it is blocked. A **shadow** is formed on the opposite side of the object.

Fun Corner!

Play a game of seeing one another through transparent objects like glass.

Activity 2.11 Translucent objects

Work in pairs

1. Apply oil on a piece of paper from your exercise book. Look through the part you have applied oil. What do you see?
2. Look at your friend through a piece of paper. Can you see your friend clearly through the paper?
3. Observe your partner through frosted glass. Can you see him or her clearly?

Learning points

- You cannot see clearly through the piece of paper. You only see partially. This is because the paper with oil only allow some light to pass through it.
- Objects that allow some light to pass through them are called **translucent** objects.

Check your progress 2.3

1. Define the following terms.
   (a) Transparent object.
   (b) Translucent object.
   (c) Opaque object.
2. Classify the following objects as transparent, translucent and opaque.

   Plastic block, clean water, frosted glass, oiled paper, wooden door, glass window, car windscreen, coin.

3. Name three materials which can form shadows.

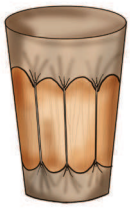
4. In which position is the source of light in the following diagram?

2.9 Nature of sound and how sound travels

Activity 2.12 **Production of sound**

Individually,

1. Draw and colour the following instruments.



2. What are the instruments used for?

Learning points

- Sound is produced in various ways. The instruments above are used to produce sound.
- A whistle is blown to produce sound. Other objects blown to produce sound are horn, trumpet among others.

- Guitars and violin are plucked to produce sound.
- A drum is beaten to produce sound. The same applies to a marimba.

Fun Corner!

Practice producing sound with these instruments.

Make your sound as attractive as you can.

Activity 2.13 Finding out how sound travels

Work in pairs

1. Place one ear on one end of the desk and listen as your partner taps the desk on the other end. What do you hear?
2. Put water in a bucket. Tap two metallic spoons under the water. What do you hear?
3. Stand ten metres away from your partner. Listen to what your partner is saying and imitate his or her words.
4. Using two tins and a piece of string, make a telephone and communicate to your partner.

Learning points

- Sound travels in form of **waves.** It travels in various media such as solids, liquids and gases.
- It travels slowly in air, faster in water and fastest in solids. This is because particles in solids are closely packed together and thus vibrations are passed from one particle to another at a faster rate.
- When the school bell is rang, pupils from all corners of the school are able to hear it. This shows that sound travels in all directions in air.

Fun Corner!

Make a simple telephone using two tins and a string and use it to communicate with your friends and partner at the other end.

2.10 Pitch and volume of sound

Activity 2.14 **To differentiate between pitch and volume**

1. Pluck a guitar gently using your fingers. Listen to the sound produced by the strings.
2. Repeat the above using a guitar with thicker wires.

   How is the sound produced compared to the first case?

3. Now pluck the wires of the guitar harder. How is the sound produced?

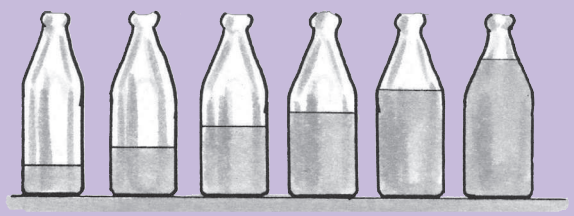
4. Hit your desk using your pen three times. Hit your desk again using your palm. How is the sound produced?

Learning points

- When a guitar is plucked, the thin wire produce a high sound while the thick wire produces low sound. The highness or lowness of sound is called **pitch**.
- When the guitar is gently plucked, a soft sound is produced. When it is plucked hard, a **loud** sound is produced. The softness or loudness of sound is called its **volume**.
- When the desk is hit using a pen, a soft sound is produced. When it is hit using a palm, the sound is loud.

Fun Corner!

Fill these bottles with water to different heights as shown below.



Hit each of the bottles with a nail and listen to the sound they produce. Which one produces sound with highest pitch?

Activity 2.15 To investigate sound of different pitches

1. Tie wires of the same thickness and same length on a piece of wood as shown below.

Pluck the wires and listen to the sound produced.

- Which wire produces a high sound?
- Which wire produces a low sound?

2. Repeat the experiment using wires of different thickness but the same length.

   (a) Which wire produces a high sound?

   (b) Which wire produces a low sound?

3. Tie a piece of wire loosely on a piece of wood. Pluck the wire and listen to the sound it produces. Now tighten the wire and pluck it.

   (a) When does the wire produce a high sound?

   (b) When does the wire produce a low sound?

Learning points

- In the first activity, the short wire produces a high sound while the long wire produces a low sound.
- In the second activity, the thin wire produces a high sound while the thick wire produces a low sound.
- In the third activity, a tight wire produces high sound while a loose wire produces low sound.
- To increase pitch of sound:
  - Shorten the wire.
  - Use a thinner wire.
  - Tighten the wire.
- To reduce pitch of sound:
  - Increase the length of the wire.
  - Increase the thickness of the wire
  - Reduce the tension of the wire.
- Therefore, the factors affecting pitch of sound are:
  - Length of wire.
  - Thickness of wire.
  - Tension of wire.

Fun Corner!

Why do you think the wires of a guitar produced different pitches of sound?

Activity 2.16 To investigate volume of sound

1. Fold a manila paper to form a cone shape. Speak through the paper from the narrow end of the cone. How is the nature of sound produced?

2. Place the paper down. Speak to your friend using the same energy. How is the nature of the sound produced?
3. Hit a drum and identify the nature of sound it produces.
4. Hit an empty tin and identify the nature of sound it produces.

Learning points

- A folded paper produces loud sound. This is because it amplifies sound.
- When speaking without the paper, the sound produced is low and soft.
- Hitting a drum produces loud sound while hitting an empty tin produces soft sound.
- A loud sound has a high volume while a soft sound has a low volume.

> **Note:** Loud sound is dangerous to our ears. It destroys the ear drum.

- To enhance volume, sound is amplified. this can be done using objects like a cone.
- To reduce volume, the source of sound is hit/blown/ plucked gently.

Fun Corner!

Read the poem below to your friend.

Soft sound we make in class,

We whisper to each other,

A lullaby mama sings softly to the baby,

Soundly and calmly the baby falls asleep,

Tick tock the clock ticks, telling us the time,

The thunder rumbles!

A deafening sound! Too loud to our ears,

Pee! Pee! The car hoots,

Chuu! Chuu! The train chugs down the rail,

Nnneeaoow! The aeroplane flys as the leaves sway on the trees whispering everywhere.

Study questions

1. What did you learn from the poem?
2. Compose another poem of the same type.

Check your progress 2.4

1. Name objects which produce sound when:
   (a) Blown
   (b) Hit
   (c) Plucked

2. During games time, the games master rang the bell at the assembly ground. All the pupils ran to the assembly ground. The pupils were able to hear the _____.

3. What is the meaning of:

   (a) Pitch?

   (b) Volume?

4. Jane plucked a wire 20 cm long while John plucked his wire of the same length as Jane's. John's wire produced a high sound while Jane's wire produced low sound. Who used a thicker wire?

5. State three ways of enhancing pitch of sound.

Unit 3 Weather

3.1 Uses of water, minerals and manure in agriculture

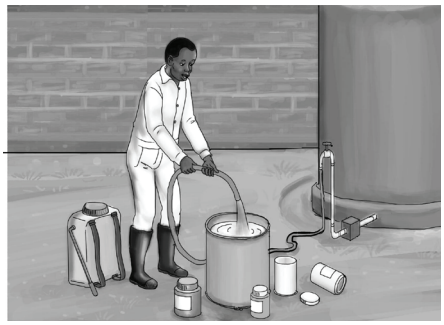
Activity 3.1 **Importance of water in agriculture**

Work in groups

Discuss what you can see in the pictures.

A

B



C

D

Learning points

The pictures above show some uses of water.

- Water cools the body of animals when they feel thirsty.

- Water forms the largest component of animal products especially milk.
- Some farmers keep fish in fish ponds. The fish ponds are filled with clean water. Water is a home for fish.
- We get a lot of farm produce when crops gets enough water.
- Farmers use water to mix farm chemicals.
- Farm equipments are cleaned using water.

Activity 3.2 Importance of manure in agriculture

As a class

1. Visit the school farm and observe how the crops are growing. What makes the plants look healthy?
2. Read the story below.

   During last holiday, Apai visited his grandmother. It was during the rainy season. His grandmother is a well-known farmer in the village. In the morning, his father would carry cow dung and chicken droppings with her wheelbarrow and take it to the farm.

Apai got surprised. He asked his grandmother, who explained

to him that it was manure. Her crops in the farm were green, healthy and flourishing. Apai decided to try this in his father's farm. From then on, his father started harvesting many crops from the farm.

3. What did you learn from the above story?

Learning points

- Manures are important to soil as they improve soil fertility. They add nutrients to the soil.
- Manures improve soil texture and structure, water retention capacity, soil drainage and capillarity.
- Manures are prepared from plant and animal remains.
- There are three types of manures. Green manure, farm yard manure and compost manure.
- Green manure is prepared from **leguminous** plants which are ploughed into the soil. After decomposing, green manure is formed.
- Farm yard manure is prepared from animal wastes like dung, droppings, urine and beddings.
- Compost manure is prepared from organic kitchen waste, wood ash and other types of wastes. They are heaped together and left to decay in a compost pit/ compost heap.
- Plants growing in fertile soils are generally healthy and gives good yields in areas where garbage is thrown.

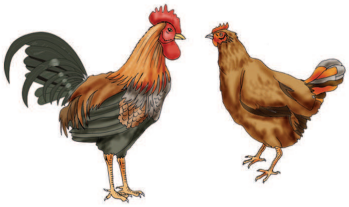
Activity 3.3 Uses of minerals in agriculture

Work in groups

A

B

C



D

Apart from food, what else contributed to the good health of crops and animals in the pictures above?

Learning points

- Minerals are useful in agriculture in many ways as seen in the picture above.
- They are used to improve soil fertility.
- They are also applied to soil to facilitate vegetative growth in crops like cabbages and kales.
- Minerals improve crop yields and animal products.
- The following table gives a summary of various minerals and their uses in animals.

Mineral	Uses
Calcium	For bone and teeth formation.
Magnesium	For energy production and improving nervous system.
Phosphorous	Development and maintenance of bones and teeth.
Sodium.	Regulation of body fluids and blood transportation.
Sulphur	For healthy skin and hair.
Copper	Protects the body against internal parasites.
Iron	For healthy blood cells.

Do research and come up with a table like the one above on

Check your progress 3.1

1. Fill the gaps in the passage below using appropriate words.

   Minerals help plants to perform different functions. They improve soil _____ and _____. They also improve water retention by _____ soil particles together.

2. Minerals also help in growth of _____ and _____ in plants.

3. Animals need different minerals in order to grow healthy. _____ helps in growth of bones and teeth. Fats and oil provide _____ and _____ in the body. Minerals are applied to soil to facilitate _____in vegetables.

4. State the functions of the following minerals in animals.

   (a) Iron

   (b) Phosphorous

   (c) Calcium

   (d) Sulphur

   (e) Sodium

Activity 3.4 Sources of water, manure and minerals for use in Agriculture

Class Activity

Class five pupils visited a nearby farm. They found the owner of the farm Mr Alal with his workers on the farm. Read the conversation between Mr Alal and the pupils with your partner.

Teacher: Good morning Mr Alal? These are class five pupils from our school.

Mr Alal: Thank you very much. Good morning pupils.

Pupil: Good morning Mr Alal. How do you do?

Mr Alal: How do you do too?

Teacher: We have come to know more about sources of water, minerals and manure for use in Agriculture.

Mr Alal: Thank you teacher. That is very good of you. Feel much welcome to our farm. As you can see, I have planted different types of crops. I mainly depend on rain water. This is especially during the rainy season.

Judy: Mr Alal,what do you do during the dry season?

Mr Alal: During the dry season, I irrigate my crops. I get water from the river just nearby the farm. On the raised side of the farm I have sunk a borehole where I also sometimes get water from, when the river dries up.

Bonny: Thank you very much Mr Alal. Can you please tell us where you get manure for the crops in your farm?

Mr Alal: As for manure, I get it from my livestock. I use livestock dung to prepare manure. This is called farmyard manure. I also use young leafy leguminous plants just about to flower to make manure. I dig a pit and bury them in the ground, where they rot and become manure. This manure from young leafy crops is called green manure. In addition, I use organic kitchen wastes to make manure. I dispose these kitchen wastes and bury them in a pit. After sometime,they rot and become manure. This type of manure is called compost manure. It is prepared in a compost pit.

Mary: Mr Alal, how do you use this manure in your farm?

Mr Alal: Manure is very important in the soil. It makes the soil fertile and also improves soil aeration. Manure also has got necessary nutrients to crops.

Kim: Mr Alal, where do you get minerals for your crops?

Mr Alal: Most minerals come from artificial fertilisers, for example, the CAN fertilisers contain calcium, ammonia and nitrogen, DAP contains ammonium and phosphorus. There are also other minerals which come from leguminous plants like groundnuts, cowpeas, desmodium among others. Leguminous plants are plants with swollen root nodules. These nodules on the roots of plants help in fixing nitrogen into the soil thus improving soil fertility.

Teacher: Thank you very much Mr Alal for the information. It has really helped us. I hope the pupils will use this to improve our farms at home .

Mr Alal: You are most welcome teacher.

Write a summary of what you learnt the conversation above. Compare your work with other class members.

Learning points

- Water used in agriculture come from the following sources:

  (a) rain
  (b) rivers
  (c) lakes
  (d) bore holes
  (e) ocean

- Water is used in the following ways in agriculture:
  (a) Irrigation.
  (b) Mixing of farm chemicals.
  (c) Cleaning of farm tools.
- The sources of manure in our farms include:
  (a) Livestock droppings (farmyard manure).
  (b) Organic kitchen waste like fruit peelings and food remains (compost manure).
  (c) Young leafy crop (green manure).
- Manure adds nutrients to soil, also improves soil aeration.
- Minerals used on farms come from artificial fertilisers. These minerals are nitrogen, phosphorus, iron, and ammonium.
- Leguminous plants have swellings (root nodules) that help in fixation of nitrogen into the soil.
- Minerals add nutrients to the soil.

Fun Corner!

Write on the manila paper the sources of water, minerals and manure used in agriculture.

Hang the manila paper on the walls of your class.

3.2 Effects of lack of water, minerals and manure in agriculture

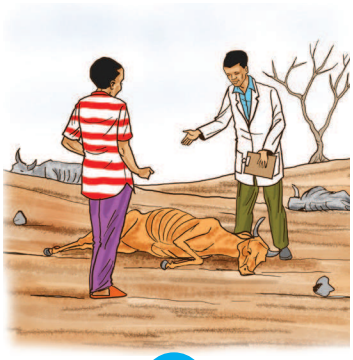
Activity 3.5 **Effects of lack of water in agriculture**

Work in groups

1. Study the pictures below.

A

B



C

2. Based on the pictures:
   (a) What happens to crops during the dry season?
   (b) How does the soil appear in hot weather?
   (c) How do cattle behave during dry season?

Learning points

- During dry seasons the soil dries up. It becomes very hard to dig. During this time, crops cannot grow well.
- Most of the crops dry and wither during dry seasons. This is because they do not get enough water. The level of production therefore decreases.
- During dry season, pasture for animals reduces. Cattle grow weak and therefore their level of production decreases. They may also die due to starvation.
- Cattle lack enough drinking water during dry season as well. Many of them die due to thirst.

Activity 3.6 Effects of lack of manure in agriculture

Work in groups

1. Read the story below.

One day in Kombo village, the chief called the villagers to a meeting. For the previous four months, the villagers had been producing few crops despite the heavy rains in that village. Most of the crops had been affected by diseases. The cattle had also been weak and most of them had been affected by diseases. The milk as well as meat production had decreased.

The chief invited agricultural officers from the state offices to come and talk to the villagers.

The officers explained to the farmers that the low production from the farms was due to weak soils in the area. The farmers had over-used the farms without giving the soil time to regain its fertility.

They also advised them to apply manure to the soil to improve fertility.

From then, Kombo villagers began producing a lot of agricultural produce and there was plenty of food.

2. Answer these questions

   (a) What was the problem affecting Kombo villagers?

   (b) Who was called to educate the villagers? Why was he/she called and not any other professional?

   (c) What solutions were given to the villagers?

Learning points

- When soils are used for too long, the minerals get used up (exhausted) and the soil becomes weak and infertile.
- These soils cannot support plant growth. The crops therefore are very weak and are prone to diseases. This leads to low produce or low quality of the products hence lowering the income.
- Lack of minerals to animals make their bodies weak. They are also likely to be affected by diseases which are very difficult to control.
- The quality of their products also reduce hence low income.

Activity 3.7 Effects of lack of minerals in agriculture

Work in pairs

Study the crop below.

What mineral is the crop likely to be lacking? What should the farmer do to prevent this from happening?

Learning points

- Manure make the soil fertile. They also improve the soil structure which supports plant growth.
- Lack of manures make the soil to lack certain minerals. This interferes with the healthy growth of plants.
- Infertile soil cannot support plant growth.
- The plants grow weak and their production reduces. This decreases the income for the farmer.

Fun Corner!

Draw a chart on a manila paper to show the effects of lack of water, manure and minerals in plants.

Check your progress 3.2

1. Write three effects of low water content in soils.
2. When cattle die due to lack of enough food and drinking water, this situation is called _____.
3. What makes minerals in the soil get used up? What should the farmers do?
4. How does lack of minerals in the soil affect crops?
5. State two effects of lack of manure in agriculture.

3.3 Simple weather instruments

Weather instruments include:

- Raingauge
- Windsock
- Air thermometer or liquid thermometer
- Windvane

Activity 3.8 **Constructing a simple raingauge**

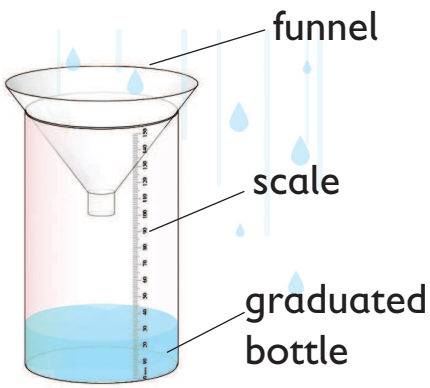
Work in groups

Materials needed

- Cellotape
- Plastic bottle
- A transparent container
- Small collecting bottle
- Manila paper for making scale

What to do

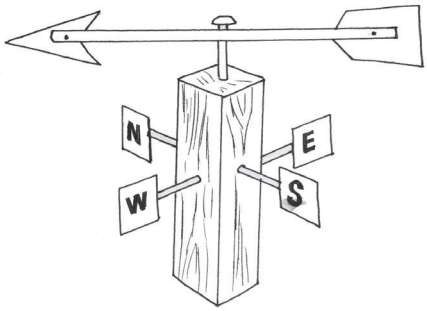
1. Cut off the top of the plastic bottle to make a funnel.
2. Make the scale using the manila paper and graduate it in millimeters (mm)
3. Attach the scale on the collecting bottle using the cello tape.



4. Place the graduated bottle inside the container and place the funnel at the top as shown in the picture above.

Activity 3.9 Constructing a simple windvane

Work in groups

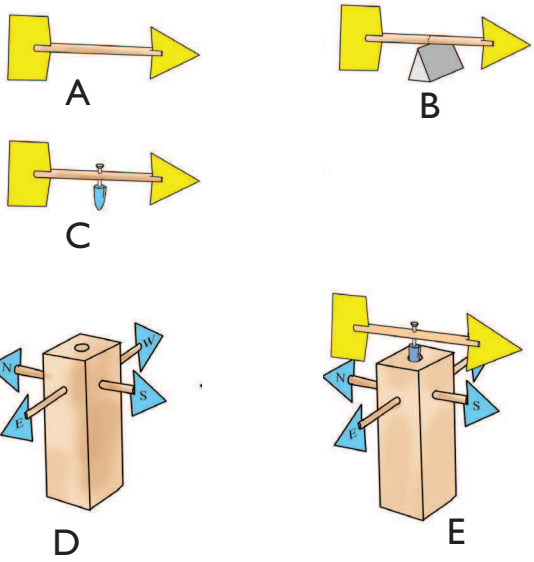


Materials needed

- Two metal sheets
- A piece of wood
- Two pieces of sticks
- Biro pen caps
- Long nail

What to do

1. Cut the metal sheets into an arrow and a tail.
2. Fix the arrow and the tails onto a piece of wood to make the vane as shown.



3. Cross the two pieces of sticks at right angles to make the compass.
4. Make a hole through the vane.
5. Insert the biro pen cap through the hole carefully.
6. Fix the compass and the vane on a piece of wood using the nail as shown.

   Note: Make sure the vane is rotating freely.

Activity 3.10 Constructing a simple windsock

Work in groups

Materials needed

- A strong polythene bag with strips
- A strong string and a wire
- A strong pole

What to do

1. Fix a wire on the wide open end of the polythene bag.
2. Make a hole at the other narrow end of the polythene bag.
3. Fix the polythene bag to the strong post using the strings.
4. Dig a hole and fix the pole strongly onto the ground.

Activity 3.11 Constructing a simple air thermometer

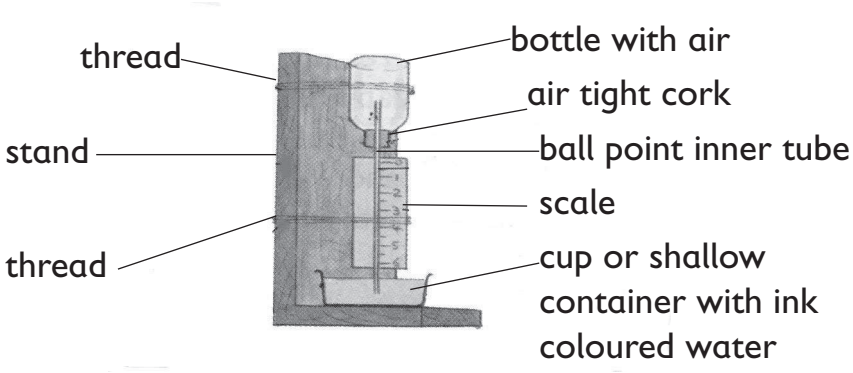
Work in groups

Materials needed

- Thin glass bottle
- Coloured liquid
- Straw/biro pen tube
- Cork
- Manila paper
- Cellotape
- Wooden stand
- String or rubber band

What to do:

1. Make a scale using the manila paper.
2. Make a hole through the cork and use it to cover the mouth of the glass bottle.
3. Insert the straw through the hole. Make sure the cork is air-tight.
4. Place the container with the coloured liquid at the base of the wooden stand.
5. Fix the glass bottle inverted on the stand. Use the rubber band with the other end dipped in the coloured water.
6. Fix the scale along the straw using rubber band. Note: The scale should read from top to bottom.



Activity 3.12 Constructing a simple liquid thermometer

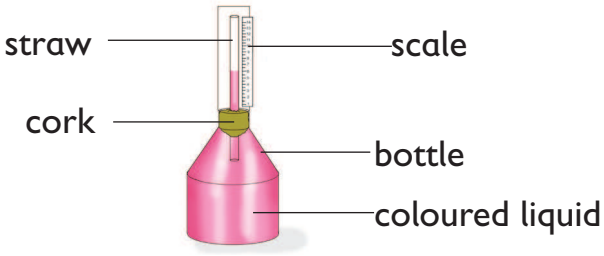
Work in groups

Materials needed

- Thin glass bottle with coloured liquid
- Cork
- Scale
- Straw
- Stand
- Cellotape

What to do

1. Make a hole through the cork
2. Carefully insert one end of the straw into the cork.
3. Place the cork at the mouth of the bottle with the coloured water. Make sure that the cork is air-tight. Ensure the straw goes into the liquid.
4. Place the bottle on the stand.
5. Fix the scale along the straw using the cellotape. Note: The scale should read from the bottom to the top.



Check your progress 3.3

1. Which materials would you use when making a simple raingauge?
2. List the steps followed when constructing a windvane.
3. When constructing a simple windsock, the purpose of the strings is to _____.
4. Which of the following materials is not necessary when constructing an air thermometer?

   A. Biro pen tube B. Glass bottle

   C. Metal sheet D. Manila paper

5. When constructing an air thermometer, the scale is fixedalong the straw using_____
6. Put a tick on the material necessary for constructing a liquid thermometer.

Material	Tick (√) appropriately
(a) Manila paper	
(b) Straw	
(c) Nails	
(d) Clear water	

Material	Tick (√) appropriately
(e) This glass bottle	
(f) Cellotape	
(g) Pieces of wire	

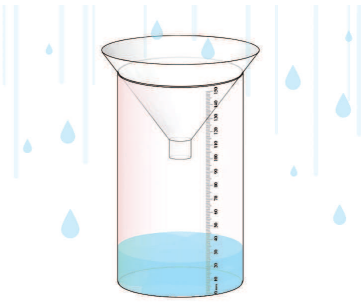
7. Draw and label a simple raingauge.

3.4 Using weather instruments to measure weather conditions

Activity 3.13 **Using a rain gauge**

Individual work

1. Use a raingauge to measure amount of rainfall for one week at home.



- Record your results in a table.

2. Repeat this for one month. Can you notice any trend in the amount of rainfall in your area?

Learning points

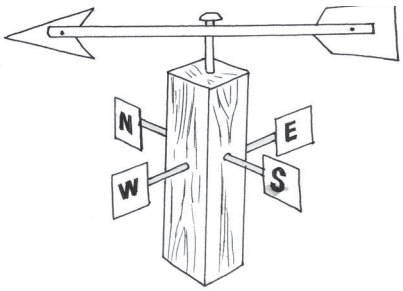
- A raingauge is used to measure the amount of rainfall in a place.
- It has a measuring jar which should be long and narrow to record the smallest amount of rainfall.

- It has a funnel which helps to collect rain water into the collecting jar.
- The raingauge is buried 15 cm underground to reduce the rate of evaporation and also to make it firm on the ground.
- The upper part should be 30 cm above the ground to prevent water from splashing into the funnel.
- The outer casing is made of metal or glass and painted white to last for long.
- The raingauge should be placed:
  - Away from tall buildings
  - In an open area away from tall trees.
- Amount of rainfall is measured in milimeters (mm).

Activity 3.14 Using a windvane

Individual work

1. Use the knowledge in Activity 3.9 to make and measure the direction of wind for a week.



2. Record your results daily in a table. In general, which is the wind direction in your home area?

Learning points

- A windvane is used to show the direction of wind.
- It has a compass with the four cardinal points to show direction.
- A biro pen cap is used as a pivot to help the vane to rotate freely.
- A windvane is placed in an open area free from tall buildings and trees.

Remember!

The arrow head of the windvane points into the direction where the wind is blowing from.

Activity 3.15 Using a windsock

Individual work

1. Make a windsock of your own. Follow the steps in Activity 3.10. Use the windsock to measure the strength of wind at home in a week.

2. Which day recorded the strongest wind?

Learning points

- A windsock is used to measure the strength and the direction of wind.
- The mouth of the windsock should be wide and open.

  The other end should be narrow and open.
- It is painted black and white for easy visibility.
- It is placed in an open area free from tall buildings and trees.

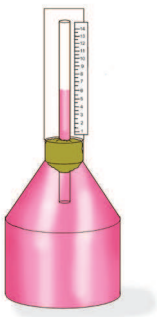
Remember!

Windsocks are used in airports to guide pilots on when it is safe to land.

Activity 3.16(a) Using a a simple liquid thermometer

Individual work

1. Make a simple liquid thermometer as explained in Activity 3.12.
2. Use the liquid thermometer to record atmospheric temperature of your home area for a week.



3. Repeat the above for one month and notice any trends.

Write them down.

Learning points

- A liquid thermometer is used to measure the temperature of a liquid in degrees Celsius (°C).
- Temperature refers to hotness or coldness of a place. The thermometer has a scale that reads from bottom to top. A coloured liquid is used for visibility.
- When the temperature is high, the level of the coloured liquid in the straw rises.
- When the temperature is low, the level of coloured water in the straw drops.

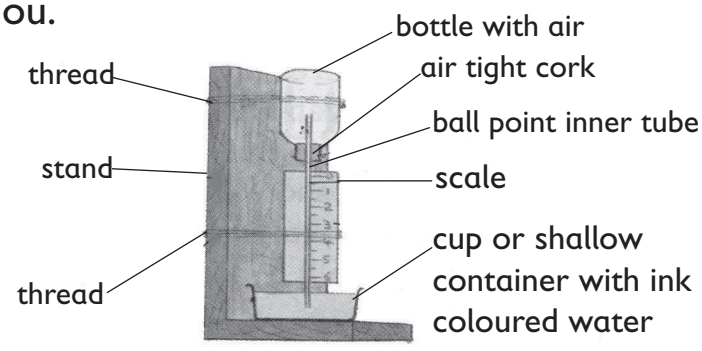
Remember!

For the instrument to work efficiently:
- Use a narrow straw.
- Use a thin-walled glass bottle.

Activity 3.16(b) Using an air thermometer

Individual work

1. Make an air thermometer as explained under Activity 3.11.
2. Use the thermometer to measure the temperature of air around you.



3. Record your results for a week.

Learning points

- An air thermometer measures the temperature of the surroundings in degrees celcius (°C). It has a scale that reads from top to bottom.
- When the temperature is high, air in the glass bottle gets heated, then it expands. It then pushes the level in the basin downwards.
- On a cold day, the level of the coloured water in the straw is high. The reverse is true on a hot day.

Remember!

The liquid and the air thermometers should be placed in a closed building away from harsh weather conditions like strong wind and very hot sunshine.

Check your progress 3.4

1. The amount of rainfall is measured using units called _____.
2. Why is the rain gauge buried 15 cm below the ground?
3. Match the weather instruments with the aspect of weather they measure.

Instrument	Aspect of weather
Windvane	temperature
Rain gauge	strength and direction of wind
Thermometer	direction of wind
Windsock	amount of rainfall

4. What is the purpose of using a biro pen cap when constructing a windvane is to _____.
5. The arrow head of a wind vane points to the direction where the wind _____.
6. Why is a windsock painted black and white?
7. Where are windsocks mostly found? Why?
8. Temperature is measured in _____
9. The hotness or coldness of a body or place is called _____.
10. Why do we use coloured liquid in a thermometer? _____.

3.5 Wind and wind energy

(a) **Activity 3.17** **Presence of wind**

Work in pairs

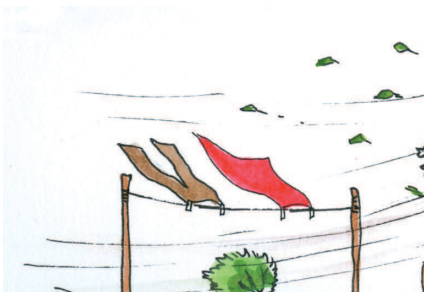
Materials needed

- Paper
- Pencil
- Thumbtack
- Scissors
- Thread
- Clothing hanger
- A heat source (sun-heated pan, lit table lamp, dryer, etc.)

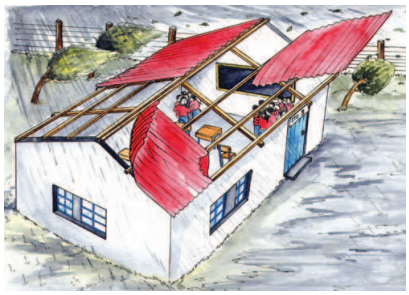
What to do

1. Draw a spiral shape on a piece of paper and cut it out.
2. Poke a hole in the center of the spiral with a thumbtack.
3. Push one end of the thread into the hole, tie it and attach the other end to the center of the clothing hanger.
4. Hold the hanging spiral several inches above a heat source.
   - Watch what happens.
   - Explain what you observe.
   - Did the spiral move?
5. Study the pictures below with your partner.

A



B



C

6. What do you see in the pictures? Discuss with your friend.

7. Fan yourself with a book as shown in the picture below.

(a) How do you feel?

(b) How do you feel when you sit under a tree shade on a hot windy day?

Learning points

- The above activities show that there is air around us.
- On a calm day, you cannot notice the presence of air because trees will be at a stand still.
- Sometimes, the air around us can be in motion. When air is in motion, it is called **wind**.
- When warm air moves upward, it pushed the bottom of the spiral and made it to spin. This is the same motion that causes wind. Warm air rises and **air pressure** under it reduces and cools air nearby to take its place. Wind is the sideways moving of air and is the cause of changing weather patterns.
- Wind is seen when:
  - Trees sway.
  - Clothes on a clothes line are blown off.
  - Dust particles and other light materials are carried away.

Fun Corner!

Make a kite and fly it during a windy day.

Remember!

Do not play in very strong wind. Strong wind can make tall trees to fall and also blow away roofs.

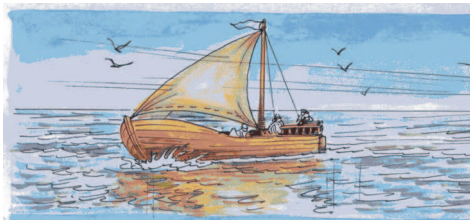
Uses of wind

(b) **Activity 3.17**

Work in pairs

1. Study these pictures.

A



B

- Which picture shows good effects of wind? Why?

2. Read the story below.

Amina's father is a farmer. They have a very big farm. On their farm they grow maize, beans and peas. Amina helps his parents in harvesting the produce during holiday.

After harvesting, they spread the beans and peas on sun to remove the grains from the ponds.

Then Amina's mother winnows the grains on a windy day. The chuff is blown away by wind and the grains are packed in sacks. They then sell some of the produce to earn money.

What did you learn from this story?

Learning points

- Wind is useful in many ways. Wind is used for winnowing. This is a method of separating chuff from seeds. When winnowing , the light particles (chuff) are blown away by wind leaving the heavy particles (seeds) behind.
- Boats and canoes also use wind to move on water. They have sails which are blown by wind making the boats and canoes to move.

Fun Corner!

Draw and colour a canoe sailing in water.

Check your progress 3.5

1. It is believed that wind is an effective renewable energy source. Explain why.
2. Fill in the blank spaces in the dialogue below.

   Koti: Hi Keti?

   Keti: Hi too Koti. How do you feel?

   Koti: Am fine, just enjoying the fresh air.

   Keti: Ah! That's good. It is fun. Look how the trees are _____beautifully!

   Koti: That shows that there is a strong _____ blowing.

   Keti: Waoh! Let me go and pick my ___to fly it outside.

   Koti: Teacher told us that we should not play in _____wind.

Keti: But wind is good. My mother _____her grains on windy days.

Koti: Yes, but wind can _____tall tress and _____ away roofs.

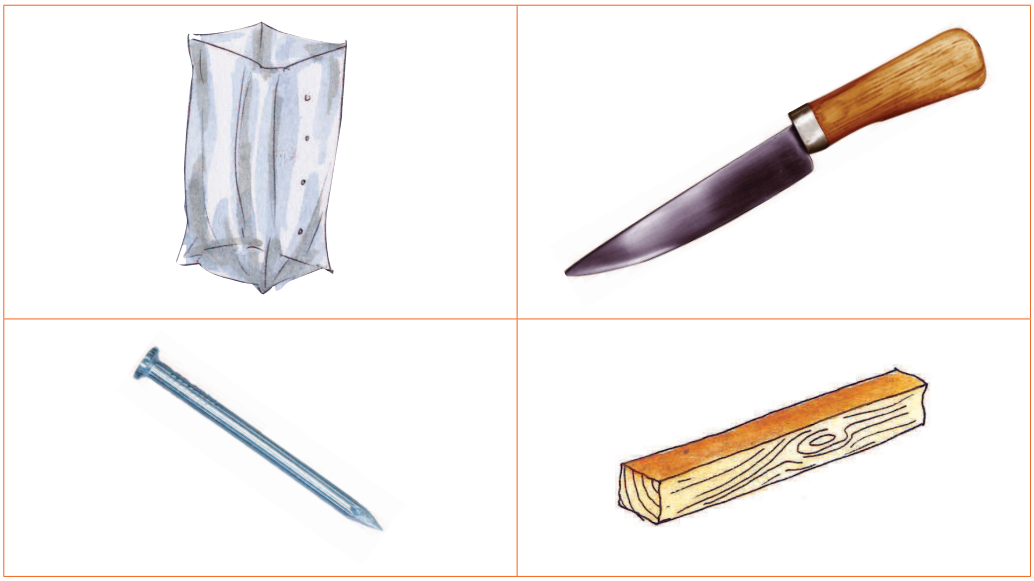
Keti: Exactly, but remember _____and _____sail on water using wind.

Koti: Wind is important to our lives.

Keti: Very true.

Activity 3.18 Making a simple propeller

Materials needed



What to do

1. Cut the tin along its height into small strips. Spread the strips.
2. Make a hole at the bottom of the tin such that the nail moves freely in the hole.
3. Fix the propeller on the piece of wood.

4. Place the propeller in the direction of wind then run. What happens?

Learning points

You made a wind propeller in the Activity above. It works in a similar way like a windmill.

- In areas where there is no electricity, wind can be used to produce electricity. This is done using wind mills.
- Windmills are blades made using light materials. These blades are fixed on tall posts.
- As the blades rotate, they turn on a generator which produces electricity.

Check your progress 3.6

1. Why do you think wind is an effective renewable energy source?
2. Which of the following moves by use of wind?

   A. Ship B. Aeroplane

   C. Canoe D. Bicycle

3. The best day to carry out winnowing is on a _____ day.
4. During winnowing, light particles that are blown away by wind are called_____.

5. Put a tick on the activities that show use of wind and cross on the activities that do not show use of wind.

Activity	
(a) Drying grains on sun	_____
(b) Sailing a boat	_____
(b) Flying a kite	_____
(c) Cutting tree using an axe	_____
(e) Winnowing	_____

6. A _____is a device that can produce electricity using wind.

3.6 Rotation of the earth

Activity 3.19 **Rotation of the earth**

Materials needed

Balls, stick and pens

What to do

1. Form a circle.
2. One learner to stand in the middle of the group.
3. The learner will pierce the ball with the stick, and then hold them up.
4. Another learner to identify or mark a spot on the ball.
5. The learner in the middle of the group to spin the stick slowly so that the mark goes round. Are all of you able to identify the spot marked at once?

Learning points

- Rotation is spinning a body on its axis.
- The Earth rotates on its axis. An axis is an imaginary line that runs from the top to the bottom of a body.
- The Earth takes 24 hours to make one complete rotation.

- The Earth rotates on the clockwise direction (East to West)

Fun Corner!

Draw and colour the Earth on its axis on a manila paper. Hang it on the wall of the classroom.

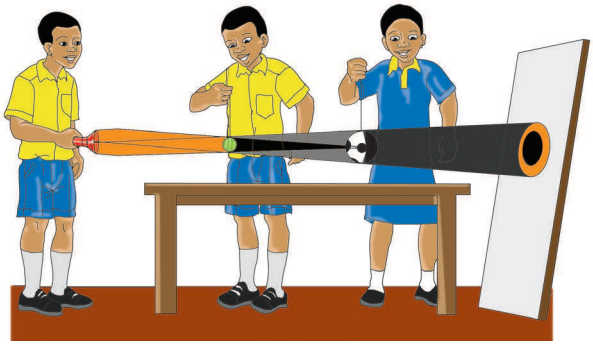
Activity 3.20 Finding what happens to cause day and night

Materials needed

- A ball
- String
- A torch (source of light)

What to do

1. Hang the ball using a string.
2. Light the torch towards the direction of the ball as shown in the picture below. What can you see?



3. Move outside and observe your shadow on a sunny morning.
4. Repeat this in the evening.

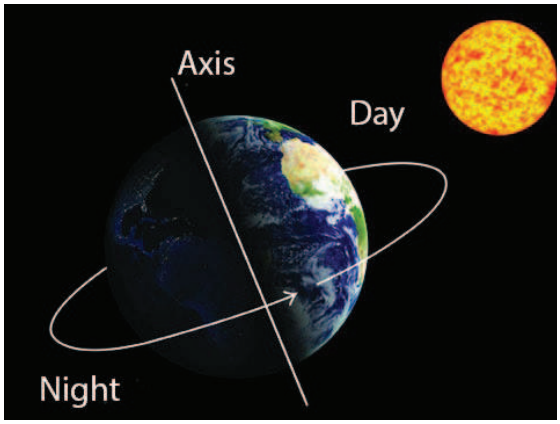
   • What difference did you note?

   • Why do you think this model links to day and night. How about shadow formation?

Learning points

- When a torch is lit towards the direction of the ball, a shadow is formed behind the ball.
- The part facing the torch appears brightly while the part behind the ball appears dark.
- Similarly, on a sunny day, the part of your body facing the sun is bright while the other side appears dark, where the shadow is formed. Further, the position of the shadow changes in the evening.

- As the earth rotates, the part of the Earth facing the sun is bright. That is during **day time**. The part of the Earth away from the sun appears dark. That is during the **night.**
- During the day, we are on the part of the earth that faces the Sun while during the night, we are on the shadow of the Earth, away from the Sun.



- In the morning, the sun rises in the East and slowly moves and in the evening it sets in the West. This shows that the Earth is rotating.

Remember!

The Sun does not move. It is the Earth that rotates. When on one part of the earth is day time, the other part will be at night. This explains the differences in time in various places on Earth.

As the earth rotates it slowly goes round the sun.

Check your progress 3.7

1. The earth rotates on its _____for a period of____ hours.
2. Write 'yes' or 'no' to the following statements.
   (a) The earth rotates from West to East _____.
   (b) The part of the earth facing the sun is day time _____
   (c) The sun goes round the earth _____
3. Draw the Earth and show the position of the sun, day and night.

Unit 4 Tools and Materials

4.1 Common simple tools and their classification

Activity 4.1 Importance of different tools

Work in pairs

Try carrying out the activities in the pictures below.

A1

A2

B1

B2

In which case was it easier to draw water from the well? A1 or A2? Why is this the case? How about B1 and B2? Where was it easier to cut the piece of cloth? Based on your discovery, what do you think is the importance of simple tools such as pulley and pair of scissors?

Activity 4.2 Making work easier

Work in pairs:

1. Try carrying the sack of potatoes as shown in picture A below. Let your friend do it using a wheelbarrow as shown in picture B.

A

B

2. Scoop some sand using your hand. Let your friend use spade to do the same.

3. Change roles with your friend and repeat the activities above. In which case was it easier to perform the task. What does this tell you about simple tools?

Learning points

Simple tools enable people to do work with **less effort** and with **greater speed**. Simple tools are simple devices that change the amount and direction of force in order to make work easier.

Examples of common simple tools and machines

Activity 4.3 Tools and machines

Individually:

1. Look at these pictures.

- Do you know the things in the pictures?

2. Your teacher will now provide you with the tools above. Observe the tools carefully. Try using them.

3. Describe how you used each tool. What does this tell you about the tools?

Remember!

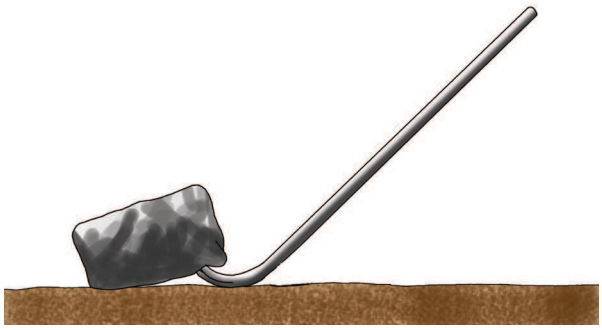
We should always buy quality machines and tools. Cheap tools or machines may cause accidents. They may also get spoilt quickly making it expensive in the long run. Handle all machines with care while using them or when sorting them.

Learning points

Tools can be put in **different groups** depending on what they are used for and how they are used. The various groups include:

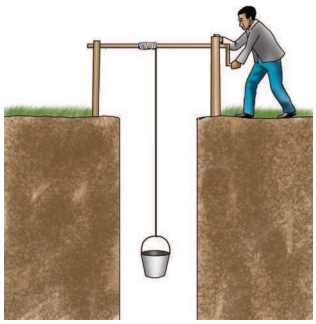
- Levers
- Wheel and axle
- Pulleys
- Inclined planes
- Wedges
- Screws

- A **lever** is a rigid bar resting on a central point called **pivot** or **fulcrum**. It is used to move heavy loads or firmly fixed loads. An example is a **crow bar**.



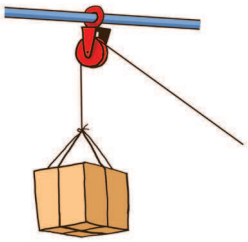
Crow bar

- The **wheel** and **axle** is a simple machine that has two wheels-one large and a smaller one fixed together. Examples include a door handle, a steering wheel and a windlass.



Wheel and axle

- **Pulleys** - a pulley is a wheel that rotates around an axle which has a groove where a rope or a string fits.
- An **inclined plane** - this is any device with a sloping surface. Examples of inclined planes are: staircase, a ladder, a meandering road on a steep hill, a ramp among others.



Single-fixed pulley

- **Wedges** - a wedge is an object with one sharp cutting edge. Examples of wedges are knife, axe and chisel.

Knife

Chisel

- **Screws** – A screw is a metal rod with a raised thread running round it. Screws are used to hold or join pieces of metals or wood together. Screws are also used in jacks to raise heavy objects like cars.

Screw jack

Work to do

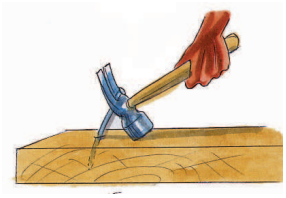
Read through and summarise the text above in your notebook using a table.

Activity 4.4 Common tools and their uses

Individually:

Study the drawings in the table below then fill the missing information. The first one has been done for you.

Table 4.1. Examples of common simple tools and their uses

Name of tool	Drawing	Use
Claw Hammer		Driving or removing nails from wood
		
		
		

Name of tool	Drawing	Use
		
		

Remember!

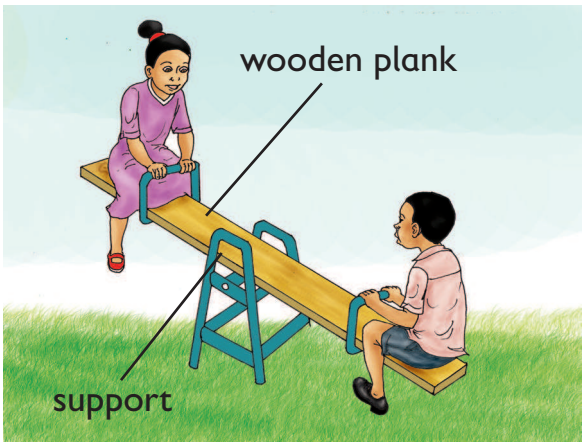
We should dress well when working with simple machines and tools to avoid dangers associated with them.

Classes of simple tools

Activity 4.5 Classes of simple tools

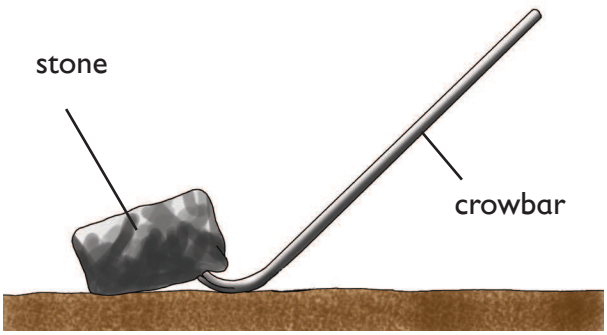
Work in pairs:

1. Practice playing on a see-saw as shown below with a friend.



- Why did you go down and your friend up?

2. Move the support towards your end and try to balance. What happens? Try to balance the wooden plank alone. What happens?
3. Back in class, try balancing a pencil and a pen assuming the pen is the support. Repeat this several times while shifting the position of the pen. What can you conclude from these findings?
4. Now, try moving a stone using a crow-bar as shown below.



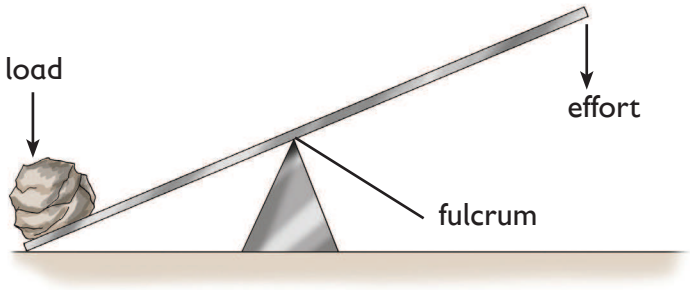
- Were you able to move the stone? How would it compare if you do not use a crowbar?

Learning points

The see-saw and the crowbar are examples of simple tools known as levers. A **lever** is a stiff bar with a fixed turning point called **fulcrum** or **pivot**. A lever was one of the first simple machines to be discovered in life.

Parts of the lever

A lever is made up of effort, fulcrum and load. These parts are shown in the diagram below.

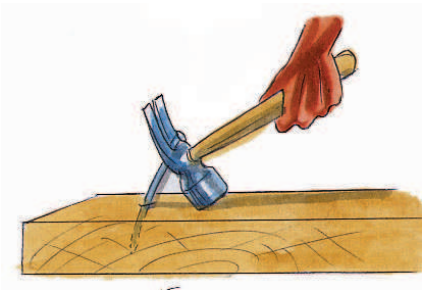


Depending on the position of these parts, levers are put into different groups.

Activity 4.6 Position of load, effort or falcrum

Work in groups:

1. Try removing a piece of nail from wood as shown below using a claw hammer.



2. Open a bottle of soda using a bottle opener as shown below.

3. Scoop sand using a spade as shown below.

Study Questions:

1. In the three cases above,
   (a) Where did you apply the energy to lift the load?
   (b) Where was the turning point of the tool?
   (c) How about load itself?
2. Draw a diagram to show the positions above.
3. Find out more about the types of levers based on the positions of the three things above. Come up with table like the one below.

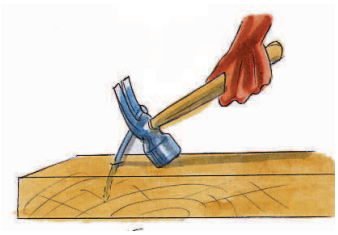
Position of load, effort or fulcrum	Examples

Learning points

The turning point of a lever is called **pivot** or (**fulcrum**), the force applied to the lever is called **effort.** The resistance against the force applied is called the **load**. Levers are put into three classes depending on the position of the fulcrum, effort or load.

a) First class levers

In first class levers, the fulcrum is between the load and the effort. The pictures below are examples of first class levers.



A

B

Examples of first-class levers in use

Now, look at the pictures again. Note the position of load, effort and fulcrum. Draw the diagrams in your notebook and label these parts.

Work to do

Find out other tools which belong to this group. Write the list down in your notebook.

b) Second-class lever

In this class of levers, the load is between the effort and the fulcrum. Look at the pictures below. Identify the position of load, effort and fulcrum. Draw and label these positions in your notebook.

A

B

Examples of a second-class lever in use

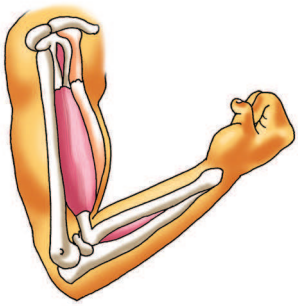
Work to do

Find out other tools which belong to this group. Write the list down in your notebook.

c) Third-class levers

In this class, the effort is between the load and the fulcrum. Look at the pictures below. Can you identify the position of load, effort and fulcrum? Draw the pictures in your notebook and label these parts.

A



B

Examples of third-class levers

Work to do

Find out other tools which belong to this group. Write the list down in your notebook.

Activity 4.7

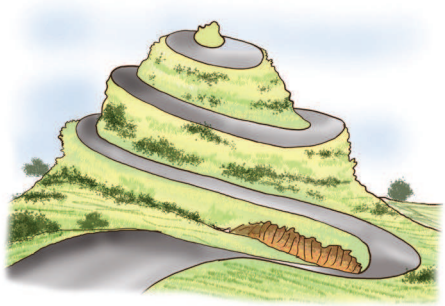
Work in pairs:

1. Collect a variety of simple tools and machines named above for example bottle opener, crowbar, fishing rod, tweezers, nut-cracker, tin opener, tennis racket, broom among others.
2. Practice using the tools and machines, the correct way.
3. As you use the tool or machine, note the position of fulcrum, load and effort. Based on this, group the tools and machines as shown in the table below.

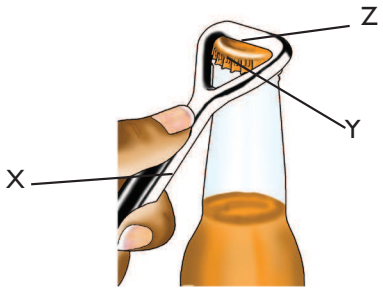
1st class levers	2nd class levers	3rd class levers

Check your progress 4.1

1. What is a simple tool and how does it help to make work easier?
2. Visit a construction site and list the simple tools used there.
3. Why do you think roads on a steep mountain are always constructed in a meandering manner as shown below?



4. How would your community benefit from a windlass?
5. What is a lever?
6. Look at the diagram below. Can you label the parts named X,Y and Z?



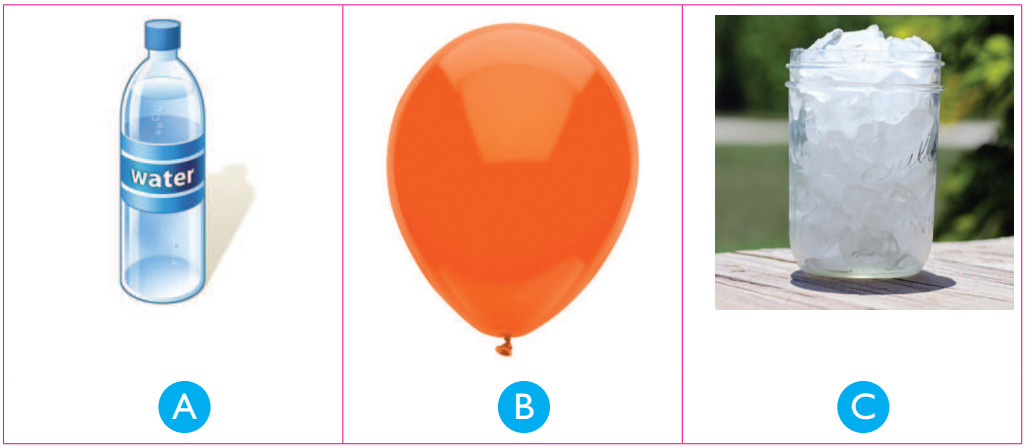
7. How would you know whether a given machine is
   a) First class lever?
   b) Second class lever?
   c) Third class lever?
8. A ladder is an example of _____ (lever, inclined plane).

4.2 Behaviour of materials under different temperatures

Activity 4.8

Individually:

1. Look at the things in the pictures below.
2. Do you know them?



What is the difference between the things in the pictures? Give some properties of each. Based on the pictures, what do you think you will learn in this section?

Activity 4.9 Properties of matter

Work in groups:

Materials needed

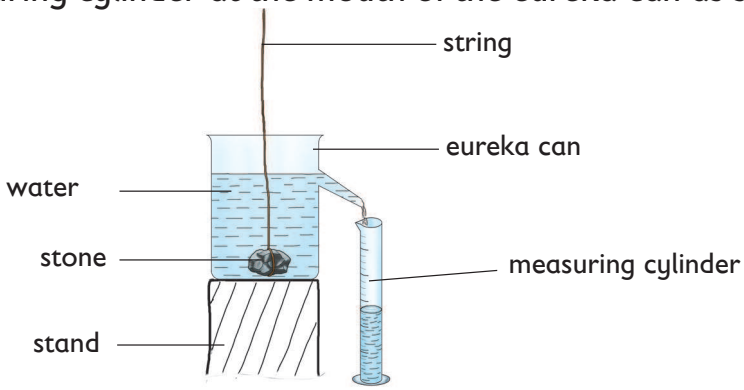
Bottle of water, two balloons, stone, electronic balance, exercise book, a measuring cylinder, a wooden plank, strings, a stick, eureka can, nail, pin.

What to do

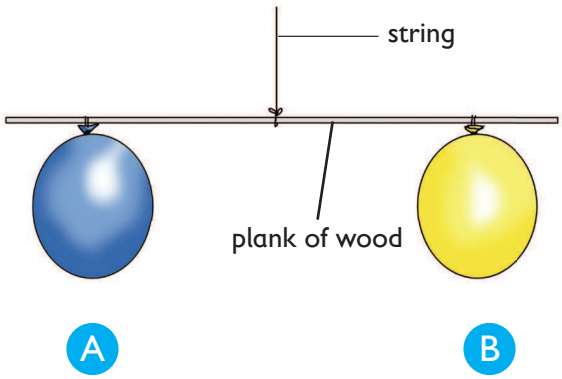
1. Weigh the mass of the bottle of water and stone using the electronic balance. Record their masses in a table like the one shown below.

Item	Mass(g)
Bottle of water	
Stone	

2. Open the bottle of water. Pour the water into the measuring cylinder. Record the volume of the water.
3. Pour some water in a eureka can until it overflows. Place the measuring cylinder at the mouth of the eureka can as shown below.



4. Tie the stone using a string then immerse it into the water inside the eureka can.
   - Record the volume of the water in the measuring cylinder. What does it represent?
5. Blow air into the two balloons until they are equal in shape and size.
6. Tie the two balloons using a piece of string. Suspend them on the plank of wood as shown below.



7. Prick one balloon (A) using a pin. What happens? Why is this the case?

Based on the results of these experiments, what can you conclude?

Learning points

Matter is anything that occupies **space** and **has mass** or **weight**. The above substances are made up of matter. When they were weighed, every material gave a certain mass. You also managed to measure the volume of water and that of the stone using eureka can. When air was deflated from the balloon, its mass dropped. As a result, the balance tilted to the side with balloon **B**. This was because the air escaped leading to the drop in mass. All the things in these experiments are **examples of matter**. Therefore, anything that occupies space and has mass is referred to as matter. Matter is found in three states, that is **solids**, **liquids** and **gases**.

Properties of the three states of matter

Activity 4.10 The three states of matter

Work in pairs:

Materials needed

Water, juice, stone, wood, cooking oil, book, soil, milk, methylated spirit, air in an inflated balloon.

What to do

1. Try to pour the things above. Which ones flows? Which ones do not? Why?
2. Compress the things using your hands as shown below.

- Were you able to compress the things? Why?

3. Come up with a table like the one below.

Things that flow	Things that do not flow	Things that compress	Things that do not compress

4. Feel the weight of each item above. Which is heavier? Why?
5. Discuss the findings in this activity. Write a report and present to the other class members.

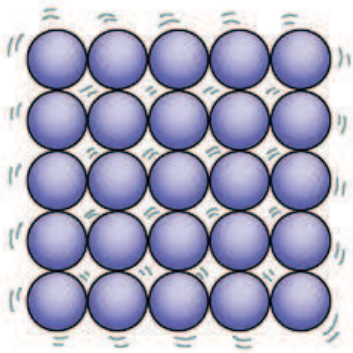
Learning points

The experiments above show the various properties of the different states of matter.

In summary:

a) Properties of solids are:

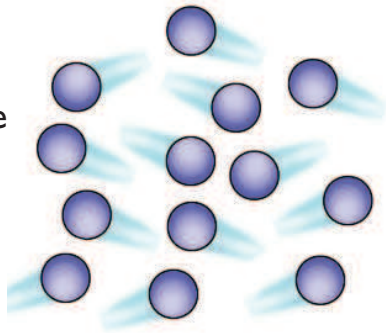
1. Have definite shape.
2. Have definite volume.
3. Have definite mass.
4. Do not flow.
5. Cannot be compressed.
6. Particles in solids are closely packed together.



Arrangement of particles in a solid

b) Properties of liquids are:

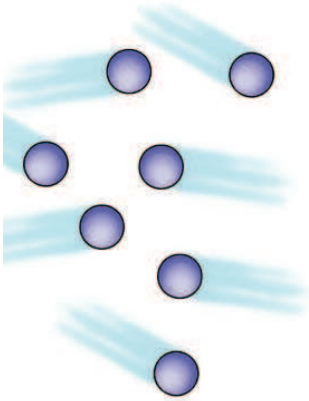
1. Have no definite shape but take the shape of the container.
2. Have definite volume.
3. Have definite mass.
4. Easily flows.
5. Can be compressed but not easily.
6. The particles in liquids are not closely packed.



Arrangement of particles in a liquid

c) Properties of gases are:

1. Have mass.
2. No definite shape. Instead, they spread in all directions.
3. Lack definite volume.
4. Can be compressed easily.
5. The particles in gases are far apart.



Arrangement of particles in a gases

Effects of change of temperature in liquids

Activity 4.11 **Experiment to investigate the physical changes in water and ice**

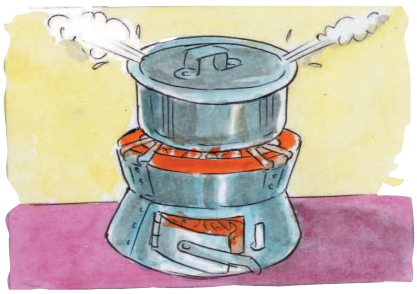
Work in groups:

Materials needed

Water in a freezer, clock, source of heat, tin with lid or metallic beaker, thermometer, ice cubes, test-tube.

What to do

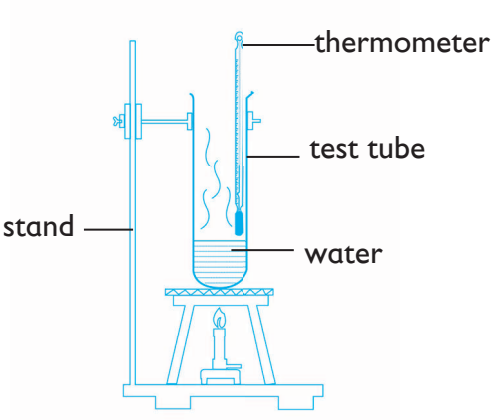
1. Put some water in a tin with the lid. Heat the water for some time. What happens to the water?
2. Allow the water to boil for some time. Remove the lid and observe its underside. What can you see?



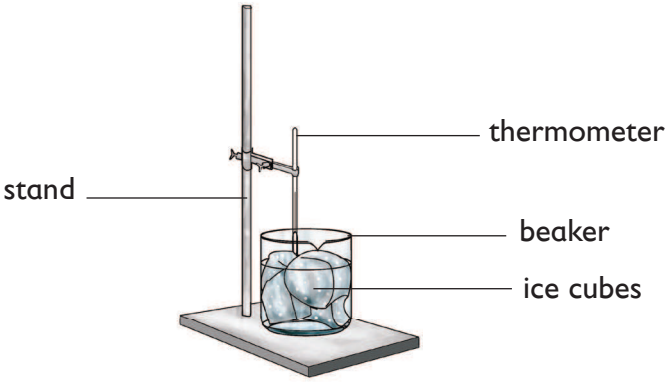
3. Leave some ice in a bowl under direct sunlight. Observe what happens after sometime.

4. Put some water in a bottle then place the bottle in a deep freezer. Observe the water after sometime. What forms?

5. Put some water in a test tube, boil the water, but this time; insert a thermometer as shown alongside.
   - Record the temperature at which the water boils.



6. Repeat step 5 above but this time use ice cubes as shown below.



   - Record the temperature at which the ice melts.

Answer these questions:

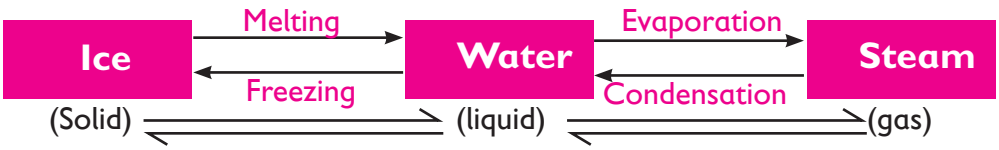
a) What changes occur in ice and water vapour when heated and when cooled?

b) What makes the changes to occur?

c) What is the boiling point of water?

d) What is the melting point of ice?

Therefore, in general:



Note: Ice melts as the temperature rises to form liquid water. **Melting point** is the temperature at which a substance changes from solid to liquid. From Activity 4.11 you may have realised that the ice melted at **0°C**. This is the melting point of ice. On the other hand, boiling or evaporation is the change of state from liquid to gaseous state. When water is heated, it boils to form water vapour. Again, from Activity 4.11 you may have realised that the water boiled at **100°C**, this is the boiling point of water.

Effect of change of temperature in solids

Activity 4.12 **What happens when naphthalene and iodine are heated?**

Class work:

Materials needed

- Naphthalene solid
- Iodine solid
- A transparent tin with lid or funnel
- Source of heat
- Bottle top

What to do

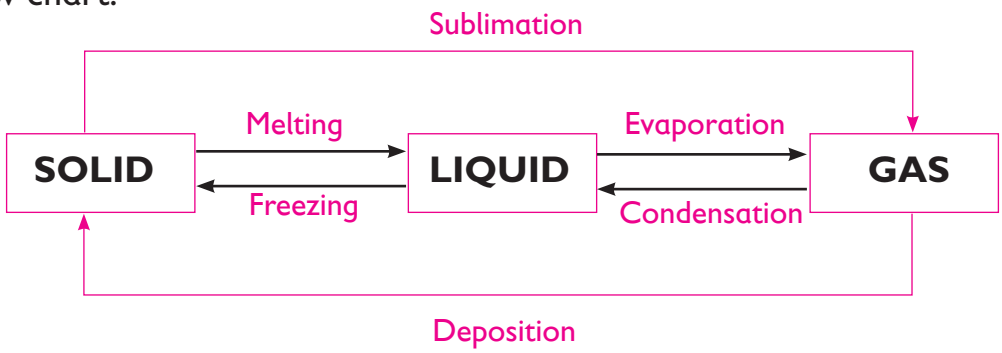
1. Put some iodine solid in the transparent tin. Cover the tin with the lid.
2. Put the tin on top of the source of heat. Heat the solid for some time. What happens?

3. Remove the source of heat then allow the apparatus to cool as you observe the lid. What can you see?
4. Put some naphthalene in the bottle top then heat. What happens?
5. Continue heating for some time. What happens?
6. Now, remove the source of heat and allow the material in the bottle top to cool. What happens?

Learning points

From the experiment on iodine we can conclude that matter can be transformed from solid to gaseous state directly without undergoing liquid state. Solid iodine when heated, changes to vapour directly. This is called **sublimation**. On the other hand, iodine vapour when cooled (as seen on the lid) forms iodine solid without going through the liquid state. This is called **deposition**. Also, when naphthalene is heated, it changes to liquid at 80°C. This is called **melting.** Further heating leads to formation of a gas at 140°C. This is called **evaporation**. The vapour when cooled changes back to liquid. This is **condensation**. Further, when the liquid is cooled, it changes to solid. This is known as **freezing**.

The transformations above can be summarised as shown in the following flow chart.



Work to do

Think about other things that undergo above processes. Come up with a table.

Check your progress 4.2

1. You are provided with a stand, thermometer, test tube and ice. Draw a diagram that shows physical changes of ice to water. Include all the apparatus.
2. Using experimental examples, explain the meaning of 'change of state.'
3. Relate properties of gases to the uses. Use oxygen as an example.
4. Solid state of water is _____ whereas its gaseous state is _____.
5. How is boiling point and melting point of water important in real life?
6. Differentiate between give examples where appropriate:
   a) sublimation and deposition.
   b) evaporation and condensation.
   c) melting and freezing.