

ACCELERATED LEARNING PROGRAM

SCIENCE

LEVEL 2



SECRETARIAT OF EDUCATION
NEW SUDAN

ACCELERATED LEARNING PROGRAM

SCIENCE

LEVEL 2

Secretariat of Education

New Sudan

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SUDAN BASIC EDUCATION PROGRAM

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Contents

Unit 1: Health Education	1
Unit 2: Water	8
Unit 3: Animals	14
Unit 4: Plants	19
Unit 5: Soil	32
Unit 6: Weather	38
Unit 7: Air	46
Unit 8: Light	49
Unit 9: Sounds	53
Unit 10: Heat	61
Unit 11: Earth and Space	66
Unit 12: Making Work Easier	69
Unit 13: Properties of Matter	73

UNIT 1

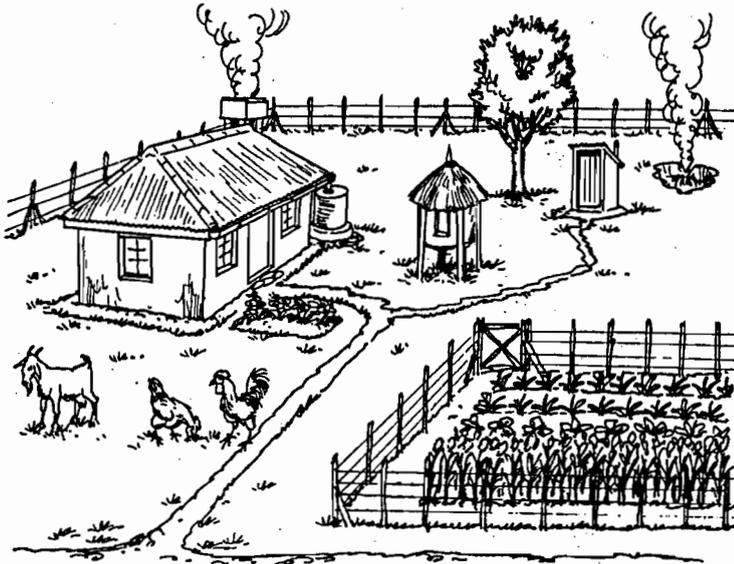
Health Education

1.1 The Environment

The word *environment* means surroundings. Everything around us, whether living or non-living, is part of our surroundings or environment. Your home environment includes the house, store, food granary, latrine, garden, trees and everything in the compound. Even the air and water are part of the environment.

Activity:

Look at the picture below. List all the things that are in the home environment.



The School Environment

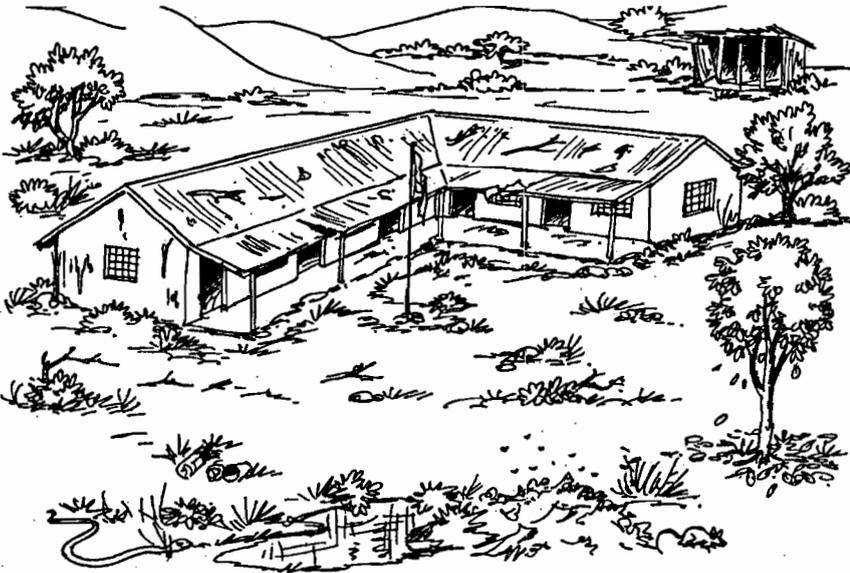
Let's look at the environment of our school. Would you like to learn in a dirty or a clean environment? Every student and teacher would like to have a clean school compound and classrooms.

Activity:

Look at this picture and say what should be cleaned and fixed.

In a dirty school environment we might see:

- unswept classrooms
- rubbish like paper, broken bottles and tins on the ground
- dirty water
- dirty latrines with flies
- rubbish on the roof
- long grass and bushes
- rats, snakes, mosquitoes and flies



1.2 Reasons for cleaning the environment

1. To remove dangerous objects

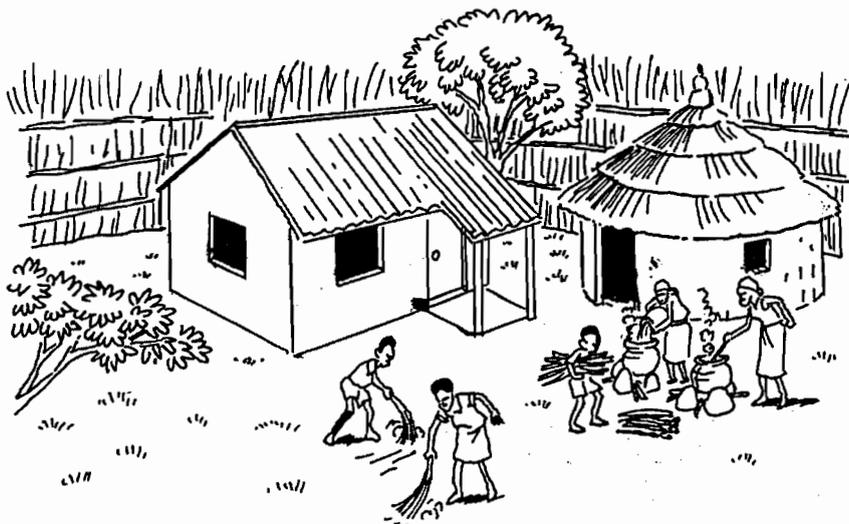
Things like stones, broken bottles, nails and wire can hurt people who step or fall on them. Dirty objects can cause cuts that may become infected.

2. To get rid of pests and disease carriers

Some pests such as bedbugs, rats, fleas, lice, ticks, flies and mosquitoes like to stay in dirty environments. These pests spread diseases such as stomach problems, malaria and some animal diseases. When the environment is clean the pests and disease carriers have no place to hide or breed.

3. To improve the appearance of the environment

Everybody likes to live in a clean and safe environment. People like to sit and play in a clean environment. You should make your environment clean and attractive so that it is pleasant to stay in.



Cleaning the compound

We make our homes and schools healthy and pleasant to live in by doing the following things:

- sweeping the rooms
- cutting brush and grass
- collecting rubbish

Questions:

1. What disease is caused by mosquitoes?
2. Why are broken bottles dangerous?
3. Is your school environment safe or dangerous?
4. Do you clean your compound every day?
5. List ways to improve your school environment.

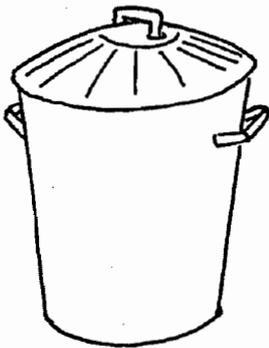
1.3 Disposal of rubbish

Dispose means to throw away or get rid of things. To dispose of rubbish means to get rid of rubbish.

After sweeping your home or school compound what do you do with the rubbish? There are several ways to dispose of rubbish. These are

- a) Using a dustbin
- b) Burning the rubbish
- c) Using a compost pit

After sweeping or collecting rubbish it can be placed in a dustbin. You should cover the dustbin to prevent flies and rats from getting into it. When the bin is full, it should be emptied into a pit or the rubbish should be burned.



Dustbin



burning rubbish in a pit

1.4 Compost pit

A good way to dispose of rubbish is to make compost. Compost is a natural fertilizer that will help plants grow. A compost pit is a large hole where waste material rots to make fertilizer. After cutting grass and bushes and collecting vegetable waste such as cabbage leaves, potato and banana peels, you can put them in the compost pit.

Following are the steps for making a compost pit:

1. Dig a large, wide pit.
2. Put vegetable matter in it.
3. Cover the layer of vegetable matter with grass or leaves. If you have animal manure it should be added.
4. Pour some water over the layer of vegetable matter and manure.
5. Put a layer of ashes and soil over the vegetable matter.
6. Repeat steps 2 to 5 until the pit is full.

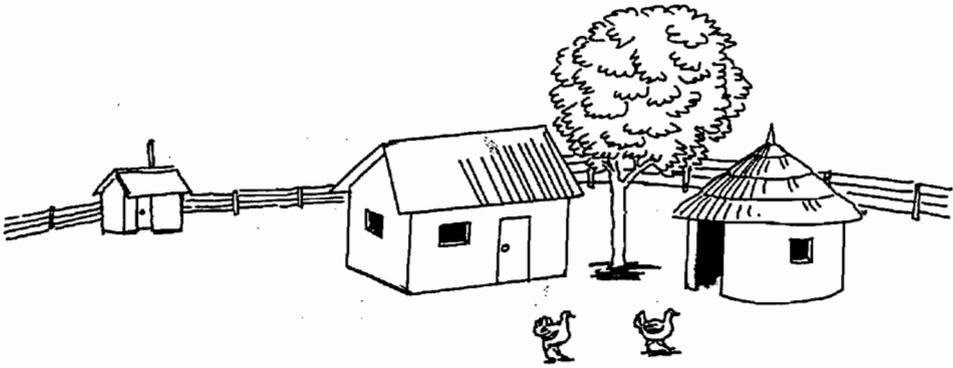


Leave the pit undisturbed for a few weeks, then mix the layers. Leave the pit undisturbed until the matter is broken down. The compost can then be used in the garden as fertilizer.

Activity:

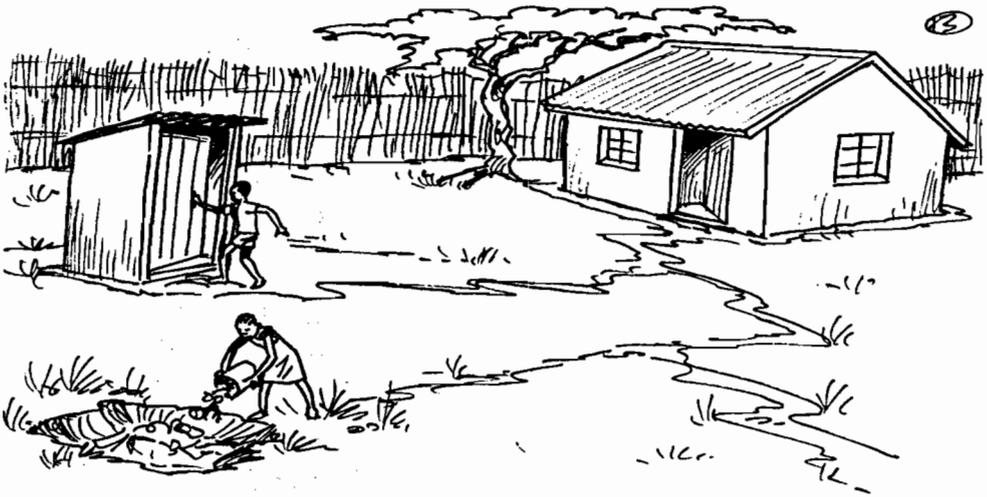
Ask your teacher to help you to make a compost pit or show you one which has already been made.

If you have a school garden you can use the compost as fertilizer, or make a compost pit at home to put on your garden. It will make your vegetables grow well. Use cow, goat, or chicken manure in the compost.



1.5 Importance of proper use of toilets and latrines

Why must we use toilets and latrines? How far from the house should latrines and toilets be built?



Germs multiply quickly in faeces (excreta) and rubbish. From there they spread to the food and water that we drink.

To prevent germs from spreading we should use latrines or toilets. The latrine or toilet should be cleaned every day and disinfected with ashes or disinfectants.

1.6 The dangers of incorrect rubbish disposal

After sweeping or collecting rubbish we have learnt that it should be disposed off correctly by placing it in a dustbin, in a compost pit, or by burning it.

We have also learnt that toilets and latrines must be used correctly. We should never put newspapers, leaves or plastic into the toilet or the pipes will get blocked. We must put only toilet paper in the latrine. We should also replace the cover after using the latrine.

Rubbish and using the latrine incorrectly will:

- a) Produce bad odors
- b) Be a breeding place for pests such as rats, flies and mosquitoes.
- c) Spread diseases such as cholera and dysentery
- d) Pollute the water and air
- e) Cause injury to people and animals

Activity:

Tell who cleans the following places and how they clean them:

1. Home compound
2. Classroom
3. School compound

Exercise: Fill in the blank spaces with the correct word.

1. The word *environment* means _____. This includes living and _____ things found there.
2. Litter in the compound, dirty latrines, rats, mosquitoes, broken bottles and stones are found in _____ school compounds.
3. We clean the environment to _____ harmful objects and also to control the _____ of pests and diseases.
4. We can keep our compound clean by _____ brush and _____.
5. Burning rubbish, using a compost pit and putting rubbish in a _____ are ways of _____ rubbish.

UNIT 2

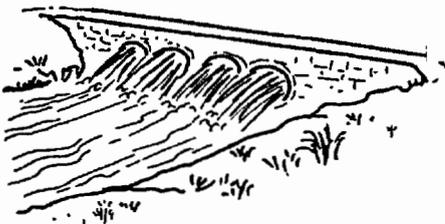
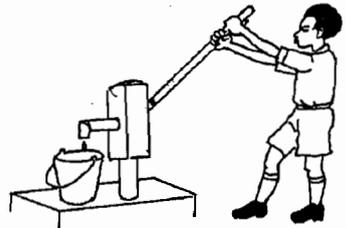
Water

Water is necessary for life. All animals and plants need water so they can live. Water can be a liquid or in the form of solid ice. There is also water in the air in the form of water vapour.

2.1 Sources of Water

Where do we get water from?

List down as many sources of water as possible, including what you see in the pictures below.



Questions:

1. Where do you get water for drinking at home
2. Where do you get water for bathing at home?
3. Where do you get water for drinking at school?

2.2 Common Uses of Water

We use water for many things. It's very important in our lives. How do we use water?



(a) We drink water



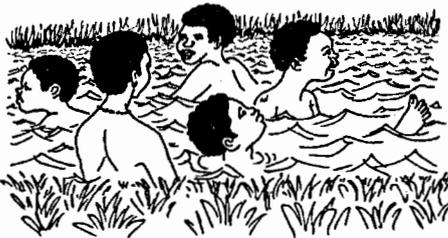
(b) We use it for cooking.



(c) We wash our clothes with water.



(d) We wash ourselves with water.



(e) We can swim in water.



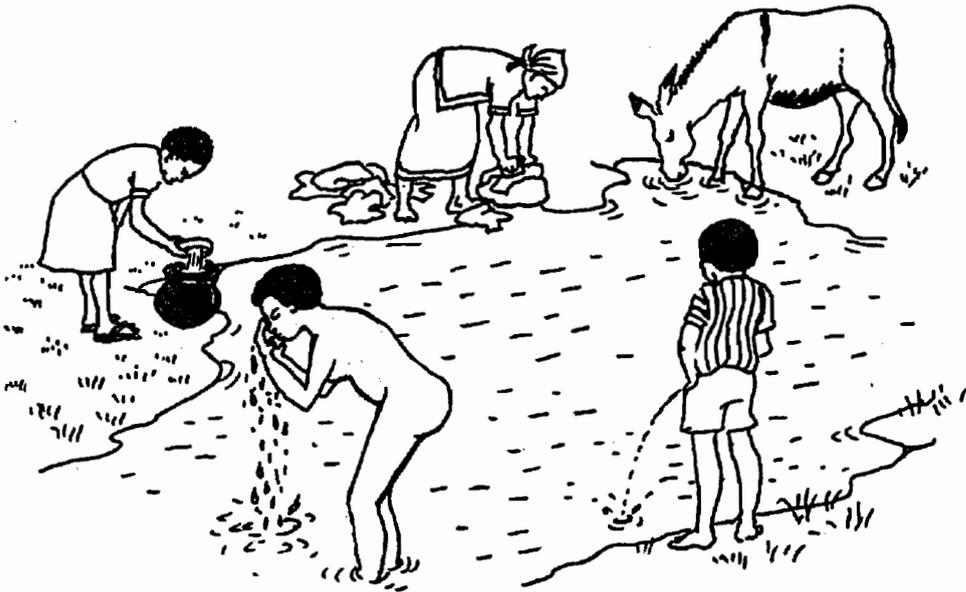
(f) Plants need water to grow.

2.3 Contaminated Water

Water that is not clean contains germs and other things that can make people and animals sick. This water needs to be made clean before it can be used.

Water usually becomes contaminated by people and animals urinating and defecating in it.

Water sources that are near toilets may also be contaminated. Diseases like dysentery and cholera are spread by human faeces, so if you drink contaminated water you can easily get diarrhoea. Soap from washing can also cause water to be contaminated. You should never drink water where people are bathing and washing clothes.



Questions:

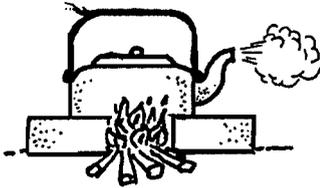
1. Look at the picture. Which people are contaminating the water? How are they contaminating it? Should the girl drink the water she is taking?
2. Name places in your community where the water may be contaminated.

2.4 Clean water comes from:

- a) rain
- b) the earth in the form of springs

Water that runs in streams or rivers, or that stands in ponds, swamps, dams and lakes is never clean and is not safe to drink. Water from wells may be safe or it may be unsafe. Water can be made clean and safe to drink by boiling, filtering and keeping it in a pot that is covered at all times.

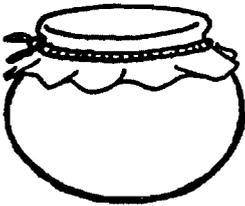
How to prepare drinking water:



1. Boil the water



2. Filter the water using a cloth



3. Keep the water in a covered container



4. Home-made filter made of sand, gravel and stones

You should always drink clean, boiled water.

Questions:

- 1. How long should you boil water to make it safe for drinking?
- 2. Why is it important to drink only clean water?
- 3. Is water from a well always safe to drink?
- 4. Do you think water from your well is safe to drink?

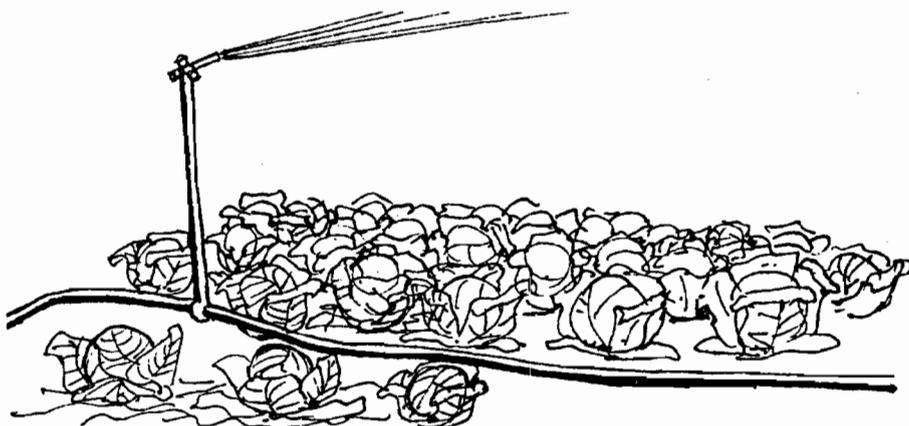
Exercise:

1. Muddy water can be filtered using _____
2. Dirty water can cause _____ and _____
3. Water should be _____ before drinking

2.4 Practical uses of water

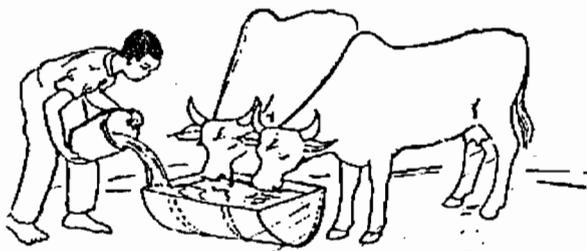
(a) Applying Water to Crops

Water is needed by plants/crops so they can grow. Water can be supplied to plants by irrigation or by rain.



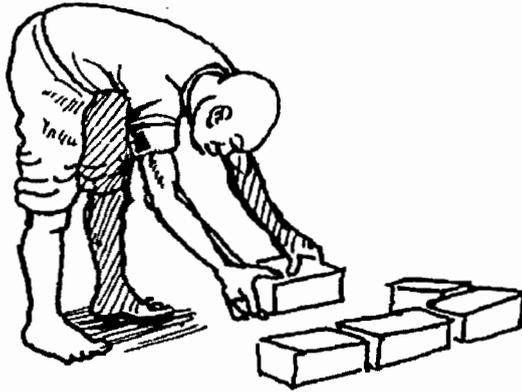
(b) Giving Water to Animals

Animals such as cows drink a lot of water. We must ensure that they get water everyday. We can give it to our animals to drink or they can find it themselves.



(c) Making Mud Bricks

We also use water to make mud bricks. Water, soil and straw are mixed to make bricks.



Questions:

1. Where do your animals drink water? Do you give them water or do they find it themselves?
 - a. cows
 - b. chickens
 - c. goats
2. Is there enough water for your garden from the rain?

UNIT 3

Animals

3.1 Classification of animals according to their eating habits

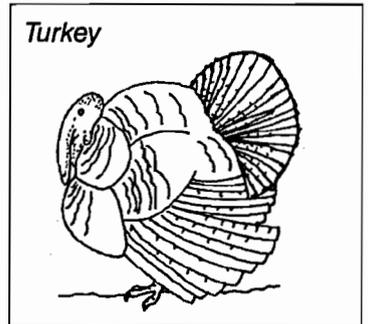
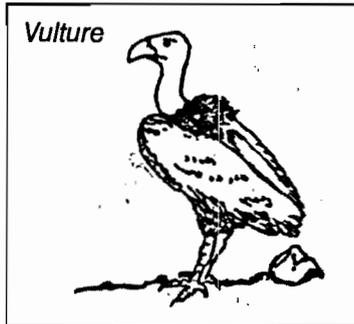
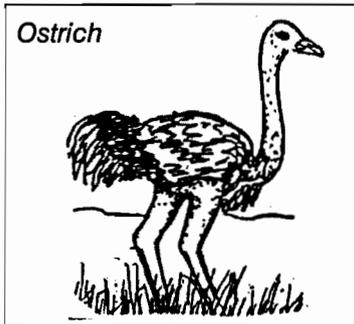
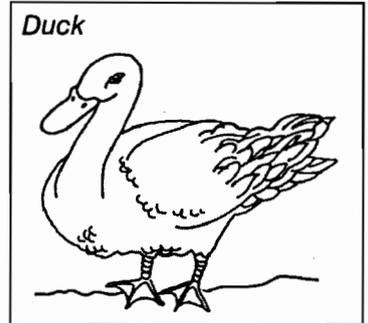
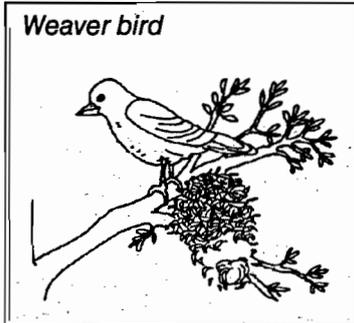
Animals can be grouped/classified according to their eating habits. The way of eating or feeding is a specific characteristic of animals.

(a) Birds

Some birds eat plants like grass, leaves, and seeds. Other birds like pelicans and kingfishers eat fish. They swim and catch fish which they swallow. Some birds catch and eat insects such as flies and termites while they are flying.

Activity:

Look at these pictures and say what each one eats and where they find their food.



(b) Insects

There are thousands of kinds of insects. Insects eat different kinds of food. Some insects, such as bees, are beneficial to us but some are harmful and eat our food crops.

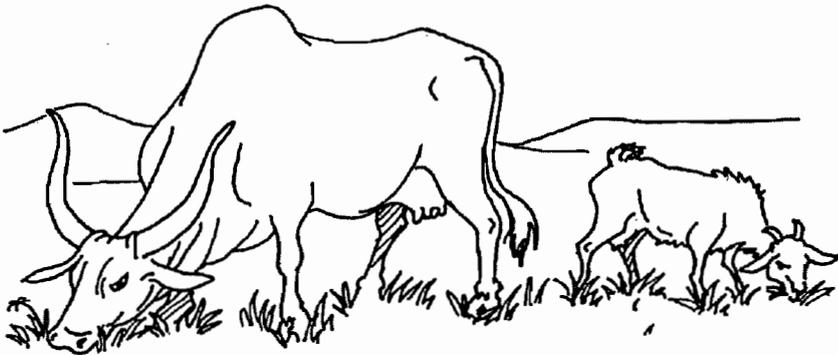
Activity:

Name different insects and what they eat.



(c) Herbivores (plants eaters)

Animals that eat plants are called herbivores. Herbivores eat grass, leaves and flowers. Examples of herbivores are cows, goats, zebras and elephants.



Activity:

Make a list of all the herbivores you know.

(d) Carnivores (meat eaters)

Some animals eat the meat of other animals. Animals that eat meat are called carnivores. Cheetahs and leopards are examples of carnivores. They chase gazelles and other kinds of antelope. When they catch them they tear them into pieces using their sharp teeth and claws, then eat the meat.

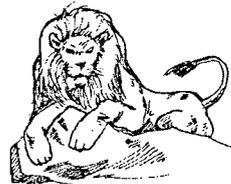
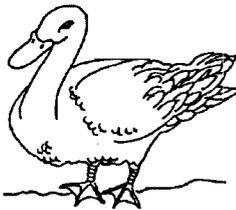
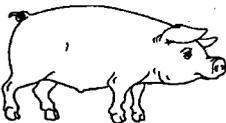
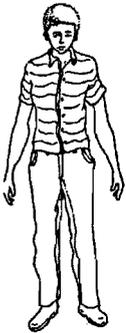


Activity:

1. List all the wild carnivores you know.
2. List all the domestic carnivores you know.

(e) Omnivores (plant and meat eaters)

Animals that eat both plants and meat are called omnivores. Examples include humans, pigs, rats and chimpanzees. Humans like to eat both plants and meat.



Activity:

Look at these pictures, which animals are herbivores, carnivores and omnivores. Say what each animal eats.

3.2 Animal Conservation

Animals are living things. They eat and grow and then after some time they die. Animals also reproduce. This means they give birth to young ones or lay eggs that hatch into baby animals.

We should take good care of animals we keep at home such as cows, goats, camels, donkeys, dogs and cats. We should also care for wild animals such as antelope, snakes, lions, fish and birds so that they don't become extinct. If an animal becomes extinct it means that all its members have died and it will never exist on earth again.



(a) Conservation means to take care of or to protect something so that it can continue to exist.

Animal conservation means taking care of or protecting all animals so that they aren't destroyed but reserved for generations to come.

What would happen if people killed all the antelope in Sudan? When our children grew up they would never be able to see an antelope. This means that we should conserve animals so that people can see them, learn about them and enjoy looking at them in the future.

How can we conserve animals? We can do it by:

- a) protecting the environment e.g. rivers where they drink, the air they breath, the food they eat, and their habitat (forests, rivers).
- b) not killing the animals
- c) not disturbing them in their habitat.

Some animals such as rhinos have been killed to the extent that only a few are left. We should conserve them by teaching everyone not to kill them or destroy their habitat.

(b) The Importance of Conservation

Conservation of animals is very important to us for the following reasons:

- a) Animals are beautiful to watch.
- b) We can learn many things about them.
- c) Some of them provide meat or do work for us.
- d) They provide hides, skins and wool for shoes and clothing.
- e) They attract visitors (tourists) from other countries who bring money into the country.
- f) We inherited them from our forefathers so we should leave them for future generations.
- g) it's important to maintain the proper balance of animals and plants so that an area doesn't become degraded.

Activities:

1. Ask older people in your area about animals that have disappeared from the area. Try to think of reasons why they have disappeared.
2. Think of places in your area where the habitat of wild animals is being destroyed. What can you do to help stop this destruction?

UNIT 4

Plants

Plants produce seeds. One plant can produce one or many seeds. There are different types of seeds. The main differences are seen in their colour, size and shape.

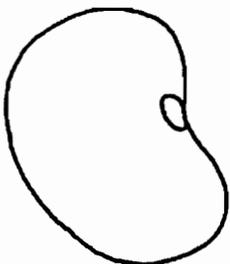
4.1 The Structure of Seeds.

Look at the pictures. Name the seeds shown.

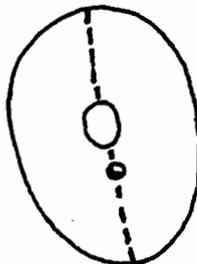


A bean seed

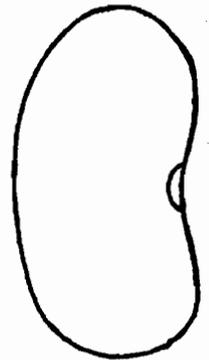
Your teacher will give you some seeds. Examine a bean seed and relate it to the pictures.



(a)

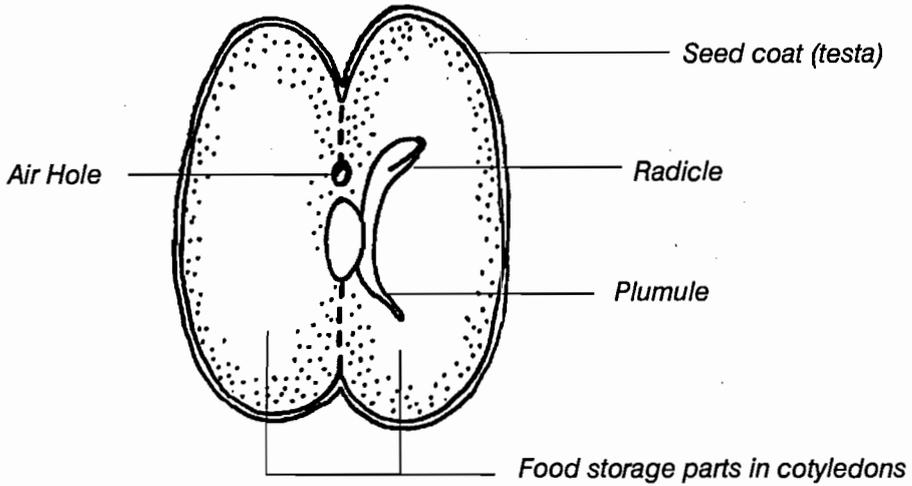


(b)



(c)

(d)

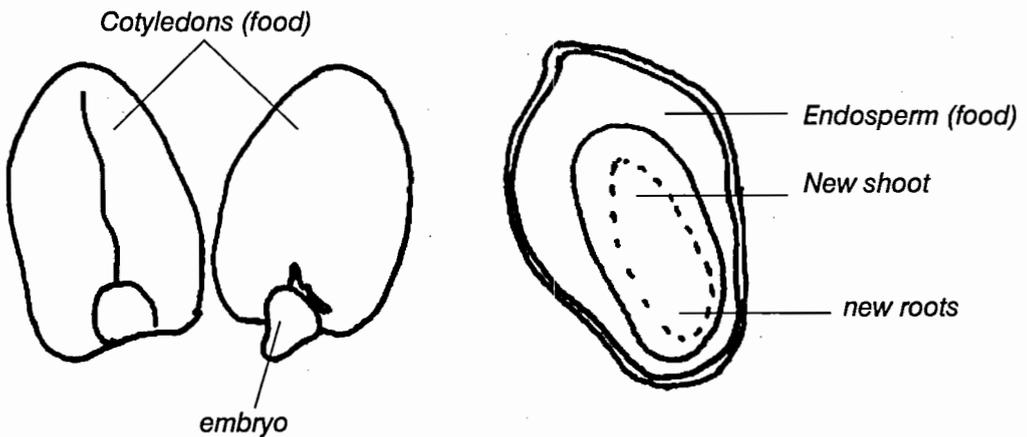


Suggest the functions of the following parts of the seed:

- (i) Seed coat
- (ii) Air hole
- (iii) Storage parts (cotyledons)
- (iv) Radicle
- (v) Plumule

A maize seed

Look at the following picture. A maize seed has a structure that is different from a bean seed.



Write the differences between a bean seed and a maize seed.

Bean seed	Maize seed

4.2 Types of Seeds

Look at seeds of beans, groundnuts, maize and dura or sorghum.

Which of these seeds have two separate storage parts or cotyledons?

Using this answer classify the seeds as monocotyledons and dicotyledons.

Seeds with one cotyledon are monocotyledons like maize, rice, dura. Seeds with two separate cotyledons are dicotyledons like bean and mango seeds.

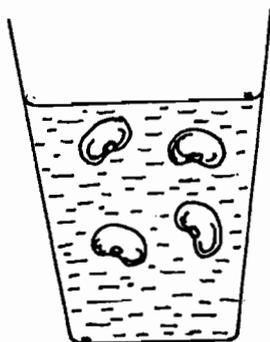
4.3 Germination of seeds

When seeds are planted and all the conditions necessary for them to grow are present, they start to grow. When a seed starts to grow into a plant, it's called *germination*.

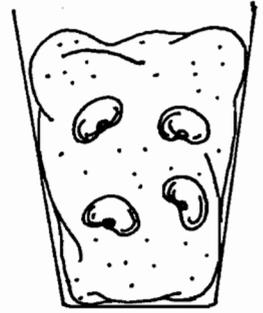
Activity:

Try to make seeds germinate with the following method:

- Take some dry seeds such as maize, bean, pea or millet.
- Soak the seeds in water for 24 hours.



- c) Get a plate, drinking glass or glass jar. Put a piece of cloth, paper or cotton wool inside it.
- d) Pour water on the cloth, paper or cotton.
- e) Put the seeds you have soaked in the container and place it in a warm dark place.
- f) Leave the container for three or four days. Keep checking to make sure that the cloth or cotton is wet all the time. If it becomes dry, add a little water to make it damp.

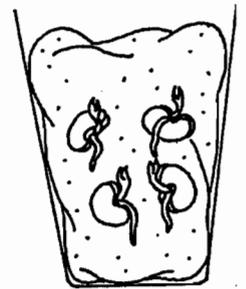


What do you observe after a few days?
How many of your seeds have germinated?

Stages of germination

Germination happens in stages. The four main stages are as follows:

1. The seed swells. This is because it absorbs water.
2. A young root appears.
3. The young shoot grows upwards.
4. The first leaves appear.



4.4 Conditions for Germination

Water, warmth and air are essential for the germination of seeds. Seeds absorb water and then start to germinate. Seeds need warm surroundings before they can grow after they have absorbed water. Air is also essential for germination.

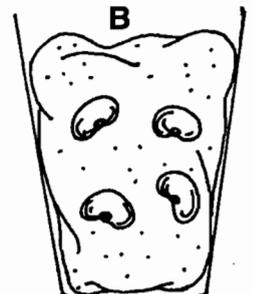
Following are some experiments that will prove these facts:

Science Experiments

1. Water

To find out if water is needed for germination of seeds take two containers and some healthy bean seeds.

In one container, container **B**, put a dry piece of cloth and place four bean seeds in it. In the other, container **A**, place a wet piece of cloth and put four beans in it.



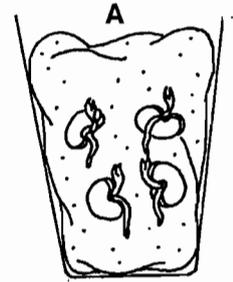
Put both containers in a warm dark place.

Keep the cloth in container **A** moist but leave the cloth in container **B** dry. What do you observe after a few days?

Bean seeds in container **A** have begun to germinate. The bean seeds in **B** have not germinated.

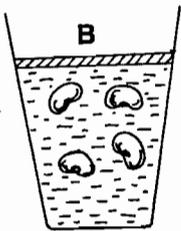
The only difference between the two containers is that **B** had no water while **A** had water.

This shows that bean seeds need water to germinate.



2. Air

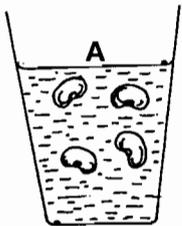
To find out if air is necessary for the germination of seeds take two containers **A** and **B** and some healthy bean seeds.



In container **A**, put some bean seeds and add some ordinary water.

In container **B** put water which has been boiled for some time. Boiling takes the air out of water. After the boiled water in **B** has cooled, put in some bean seeds.

Now, very carefully, pour a thin layer of oil on the surface of the water in container **B**. This oil will prevent air from getting into the water so the bean seeds in container **B** will not have air.



Leave the two containers for several days, then see if there are any changes in the seeds. You may see that bean seeds in **A** have started to germinate while those in **B** have not.

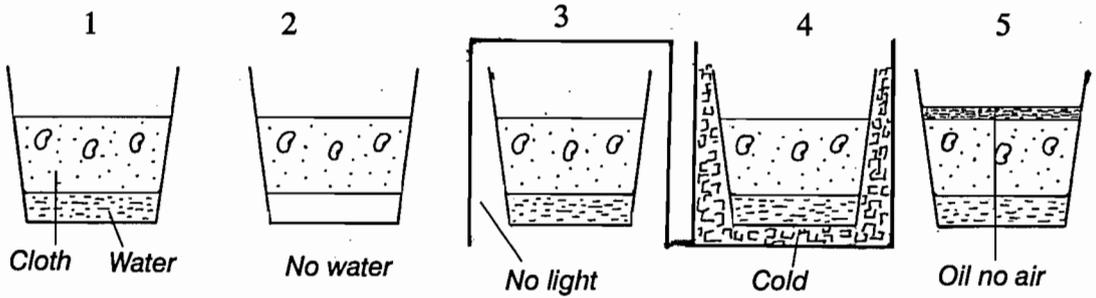
The only difference between the two containers is that seeds in container **A** had air while those in **B** had no air. This shows that seeds need air before they can germinate.

3. Warmth

Place seeds in container **A** in a refrigerator or in a very cool place. Examine the seeds after seven days. Have the seeds germinated? Why not?

Conclusion of experiments:

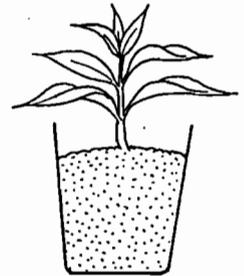
Look at the following picture and explain what will happen in each number. Number 1 is called a control in an experiment because it has normal conditions. The control is used to compare with other results.



4.5 Feeding of plants

All living things, whether animals or plants, need food to stay alive and grow. Plants do not feed like animals. Instead, they make their own food in their leaves. For a plant to make its own food, it requires:

- a) Water
- b) Air (Carbon dioxide)
- c) Minerals
- d) Sunlight



How does a plant obtain the things listed above?

Water and minerals come from the soil and are taken in through the roots. They then pass through the stem to reach the leaves.

Air enters the plant through tiny holes in the leaves and sunlight enters the plant through the surface of the leaves.

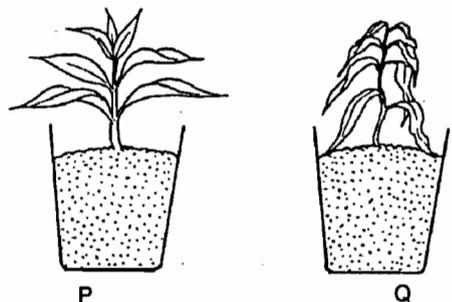
You may have noticed that farmers put animal manure or chemical fertilisers on their crops. Manure and fertilisers contain minerals that help the plants grow quickly and be healthy. A plant that lacks water and minerals does not grow well.

Science Experiment:

You can find out if plants grow better when they have minerals. Take two bean seedlings of the same size growing in two tins **P** and **Q**. Add some manure to tin **P**. Do not add manure to tin **Q**.

After 15 days, observe the bean plants in the two tins. Which plant is bigger and more healthy?

Give reasons why this is so.



4.6 Production and storage of food

Plants make food in their leaves. Some of the food is used by different parts of the plant for growth. The rest is stored. Plants store food in different places:

- Some plants store food in their roots e.g. carrot.
- Some plants store food in their stems e.g. sugarcane.
- Some plants store food in their seeds e.g. maize, beans, rice and wheat.

Photosynthesis

Plants make their own food from the chlorophyll in their leaves in the presence of the sunlight. The process is called photosynthesis. Plants use the food they make to live and grow. Chlorophyll builds sugar and starch from carbon dioxide in the air and water in the leaves, using sunlight for energy.

Food stored in cotyledons

Food stored in the cotyledons is used by a new plant for its first growth until it produces leaves to make its own food by photosynthesis.

Activity:

Go to the school garden, farm and the local market. Observe the plants and seeds you see there. Write down the name of the plant and the part of the plant where food is stored in the following table:

Name of plant	Part in which food is stored
e.g. pumpkin	fruit
1.	
2.	
3.	
4.	

Exercise:

1. Plants and _____ are living things.
2. Cattle, goats and camels obtain their food from _____.
3. Plants which have two storage parts in their seeds are _____.
4. For seeds to germinate they need _____, _____ and _____.
5. Plants make their own food in their _____.
6. A plant takes in _____ and _____ through the roots.
7. Bean and maize seeds store food in the _____.

4.7 Classification of plants

There are many kinds of plants around us. If you look around your home you will see different kinds of plants. If you look at plants on your way to school you will observe many plants on both sides of the road. There are more plants in the school compound.

Some plants look alike, others look different. Plants that have similar characteristics can be put in one group, while those with different characteristics can be put in another group. This kind of grouping is called classification.

We can divide plants into two main groups depending on whether they produce flowers or not. The two groups are:

- a) Flowering plants
- b) Non-flowering plants

Flowering plants all produce flowers which develop into fruit and seeds. Flowering plants can either be monocots or dicots. Following is a list of common flowering plants:

1. Flowering plants

Monocots

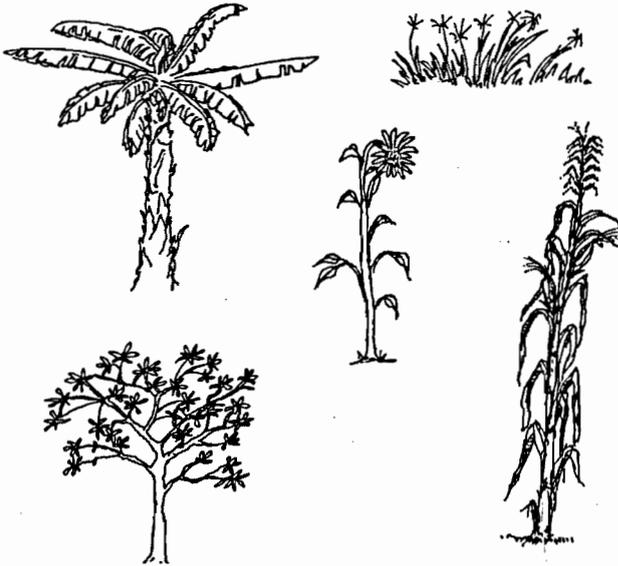
Maize
Wheat
Coconut
Sugarcane
Napier grass

Dicots

Bean
Pea
Acacia
Potato
Mango

Activity:

Look at these pictures and identify the plant. Do you know if it's a monocot or a dicot?



Complete the table below with plants from your locality

Monocots	Dicots

Science Activity:

Go out of your classroom, observe and collect different types of plants. Answer these questions:

- a) Which plants have flowers?
- b) Which have fruit?
- c) In which plants can you see seeds?
- d) Which plants do not have flowers, fruit or seeds?
- e) Identify as many of the plants as possible.

Ask your teacher to help you identify each of the plants. You may then mount the plants in your classroom.

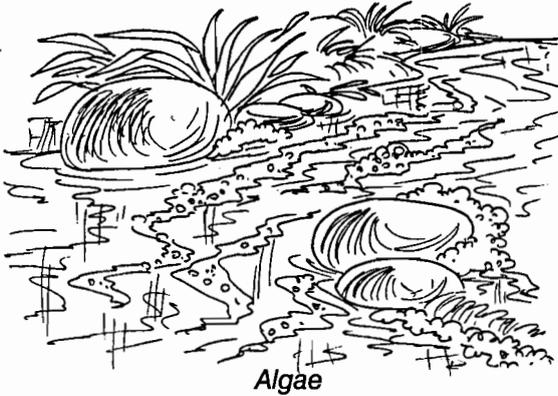
2. Non-flowering plants

There are many kinds of non-flowering plants including the following:

- a) Algae
- b) Mosses
- c) Ferns
- d) Conifers (cypress, pine, etc.)
- e) Lichens

Algae

These are green plants and can make their own food. They grow in water. They have no roots, stems or leaves. They are long green threads that float on water or grow on the bottom of rivers, lakes, or the sea.



Lichens

A lichen consists of an alga and a fungus living together. Some lichens are flat while others are threadlike. They grow on the bark of trees or on bare rocks.



Mosses

These are small green plants which can be seen growing on damp walls, stone roofs and tree trunks. They have small stems and leaves. They only grow in moist places.

Ferns

These are green plants with leaves, stems and roots. They grow in wet places or in the shade of other plants. They produce spores instead of seeds.



Ferns

Conifers

These are large green plants but they do not produce flowers. They have large stems and deep roots. Their leaves are needle-like. They produce cones which contain naked seeds. Examples are pine, cedar, fir and cypress.



Conifer

Science Activity:

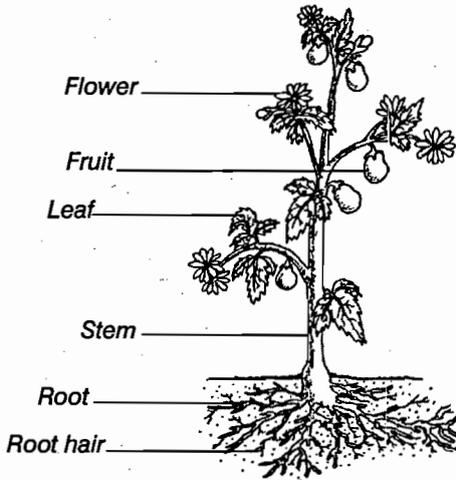
- a) Go out of your classroom and look for and collect examples of non-flowering plants on the bark of trees, bare rocks, in moist places, in the shade of other trees and by the banks of rivers.
- b) Bring the plants back to your classroom. Try to identify each one, then draw pictures of them.

Questions:

1. Do any of these plants grow in a dry environment?
2. Try to explain how each of these plants reproduce.

4.8 Functions of different parts of flowering plants

Look at the picture below which shows the parts of a plant. Name the main parts of the plant.



The stem holds the plant upright. It has branches, leaves, flowers, fruit and buds. Roots hold the plant in the ground. Root hairs absorb water and minerals from the soil. Some roots of plants like cassava and sweet potatoes can be eaten.

Leaves are green in colour. Food for the plant is made in the leaves. Some flowers have a sweet smell to attract insects for pollination. Flowers develop into fruit and seeds.

Science Activity:

Look for a small plant such as a bean or pea which has all the plant parts. Pour water around its base and wait for 10 to 15 minutes for the water to soak into the soil. This will help to make it easier for you to uproot the whole plant.

Uproot the whole plant. Take care not to damage the roots or other parts of the plant. Observe each part of the plant. What does each part do? Draw the whole plant and label the parts. If the plant is not damaged, replant it. Cover it with soil and mulch, then pour water around its base.

Questions:

1. What are the functions of the following?
 - (a) leaves
 - (b) roots
 - (c) stem
 - (d) root hair
 - (e) flower
 - (f) fruit
 - (g) seeds
2. What would happen to a plant if all the leaves and branches were cut off?
3. What would probably happen if all the roots of a plant were cut off?

Exercise:

1. Name the two main plant groups found in New Sudan.
2. Give two examples of conifers.
3. State two differences between a bean plant and a fern.
4. Name three places where mosses are commonly found.
5. Coniferous plants produce _____.
6. Examples of monocots are _____ and _____ while examples of _____ are sunflower and cotton.
7. Non-flowering green plants such as cypress produce seeds contained in _____.
8. The green matter in leaves is called _____. It helps leaves to make _____.
9. The _____ of a plant helps to anchor it firmly on the ground while the _____ absorb _____ and water from the soil.
10. The _____ is the reproductive part of the plant.

UNIT 5

Soil

5.1 The Composition of soil

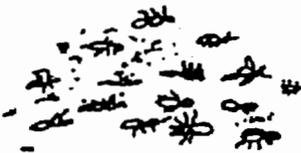
Soil contains many things.

Dig a hole in the ground and take out some soil.

Spread the soil on the ground and examine it to see what is there.



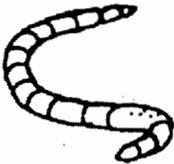
This picture has some of the things you'll see in the soil:



Dead insects



Small seeds, some already germinating



Earthworms



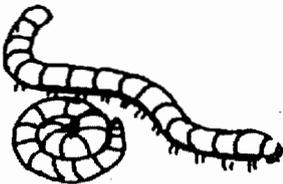
Ants



Leaves



Gravel and small stones

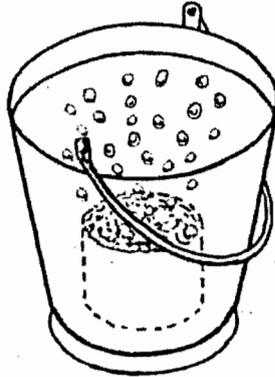


Millipedes

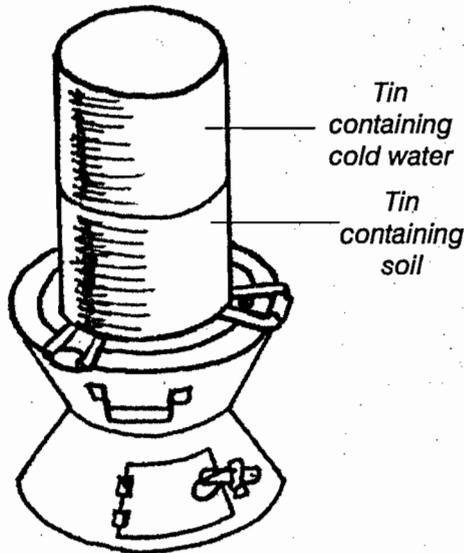


Roots

If the soil is wet we can conclude that water is also present in the soil. We can show that the soil contains air by putting some in a tin and lowering it into water in a bucket.



Using the simple materials shown below we can show that even dry soil contains water. Look for droplets on the underside of the tin containing cold water.



Uses of Soil

Soil can be used in many ways:

1. Growing plants

We plant seeds in soil. The seeds grow into big plants. Without soil the seeds cannot grow. Good soil like loam is very important for plant growth because it contains organic matter and minerals.

Activity:

Look at the pictures below showing the steps for planting a garden. Explain the steps to the class. What other things do you have to do in a garden that aren't shown in the pictures?



1. Clearing the bush.



4. Planting seeds in the garden



2. Digging the soil



5. Watering the seedlings in the garden



3. Marking planting lines in the garden



6. Applying mulch to the seedlings in the garden

2. Growing seeds

We plant seeds in soil and the seeds grow into big plants. Without soil the seeds cannot grow. Good soil is very important for plant growth.

The best soil for growing seeds is loam. It's good to plant seeds in a nursery bed before they are put in the garden. The nursery bed will protect the young seedlings from wind, strong light, and high temperatures.



Activities:

1. Explain what a nursery bed is.
2. Draw a picture of a nursery bed.
3. Make a nursery bed in your school compound

3. Building Walls and Houses

Look at these two pictures. They show two kinds of houses: a mud house and a cement block house.

We use soil to make mud houses and mud brick houses, but soil isn't used in cement blocks. Cement blocks are made of sand, stones, water and cement. Blocks made of cement are very strong. Bricks are also made of clay. Bricks are baked until they turn red or brown. This makes the bricks stronger.



A mud house



A cement block house

Questions

1. What kinds of houses are made with soil?
2. Is soil put in cement blocks?
3. What are cement blocks made from?

4. Modelling with soil

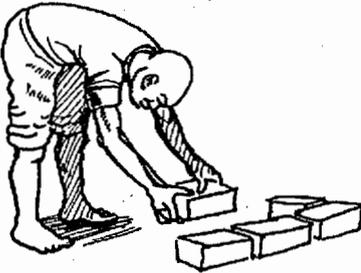
We can use soil for modelling people, cars, houses, trees, cups, plates, pots and many other things. What things can you model? The best soil for modelling is clay.

What is the person doing? He or she is making a clay pot. If clay pots are baked in a hot oven they will be very strong. They can hold water and soil and even be used for cooking.



5. Making pots and bricks

Look at the pictures below:



A man laying bricks



A plant growing in a pot of soil

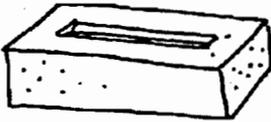


A woman making pots with clay

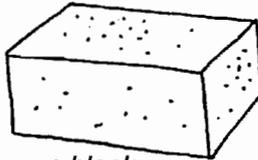
These people are making bricks and pots. What are the bricks and pots made of? List as many uses for pots as possible.

5.3 Soil products

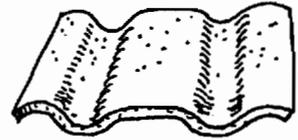
Many things are made from the soil. Look around to see as many things as you can made from soil.



a brick



a block



a tile

Exercise: *Explain what these things are made of and how they are made:*

- a. pots
- b. mud bricks
- c. cement bricks or blocks

6.1 Effects of the weather

Weather is an interesting topic to study because it affects our daily lives. Wind, rain, sunshine and temperature are all different aspects of the weather. Many of our activities are influenced by the weather. For example, when it is raining we don't go outside. We stay in the house. If we go outside we use an umbrella or raincoat to keep off the rain. Some people put on gumboots instead of ordinary shoes. When it is cold we wear a heavy sweater or a jacket.



A cold, wet day

When it is hot many people stay outdoors. They wear very light vests, T-shirts or sleeveless blouses or shirts. People prefer to drink cold water or juice instead of hot tea or coffee.

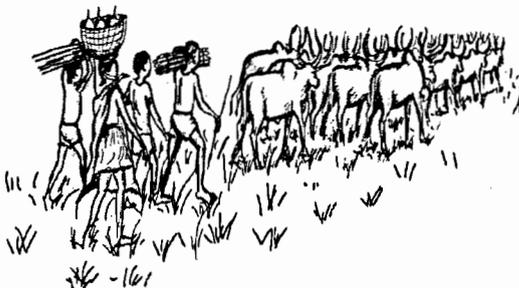
Weather also affects other important events around us. Farmers prepare their land when it is dry. They plant seeds. Crops grow well if there is enough rain. If there is no rain there is drought and crops do not grow. When there is too much rain we get floods.



A hot, dry day

Migration

In the dry season, people with cattle move to the camps (toich) and young children go to live there to benefit from the milk.



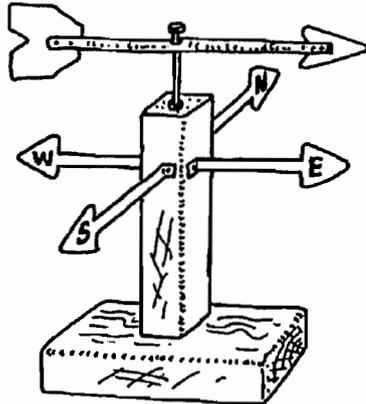
Questions:

1. What is one belief you have about the weather?
2. What do you know about migration with cattle?
3. What kind of weather do you like the most? Why do you like it?

6.2 Wind instruments and their uses

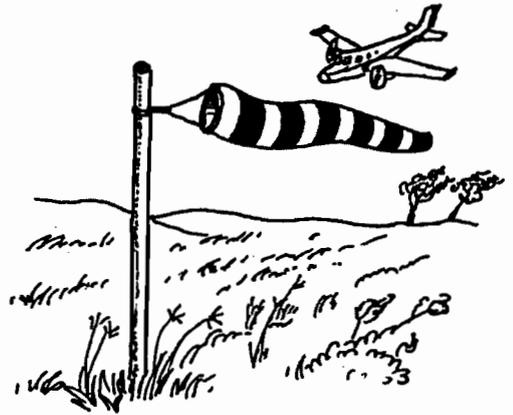
a) Wind vane

A wind vane shows the direction from which the wind is blowing. If the arrowhead of a wind vane points in the northwest direction, the wind is blowing from that direction. A wind vane does not point to the direction which the wind is blowing to.



b) Windsock

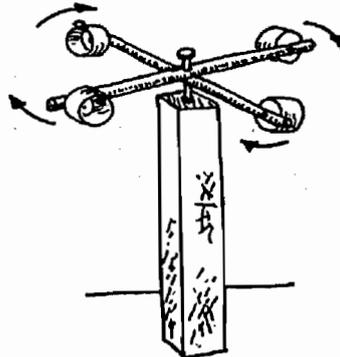
A windsock is commonly found at Meteorological stations and air fields. It shows the direction in which the wind is blowing. It also shows how strong the wind is. Windsocks have black and white coloured bands which help pilots locate the windsock more easily from their aeroplanes.



c) Anemometer

Sometimes it is very calm and there is no wind blowing. At other times the wind blows slowly and sometimes it blows very fast. An anemometer is an instrument that measures the speed of wind.

When people know how fast the wind is blowing, the information can be used to tell if there will be a storm. They can take the necessary steps to protect themselves and their houses, granaries and farm structures.



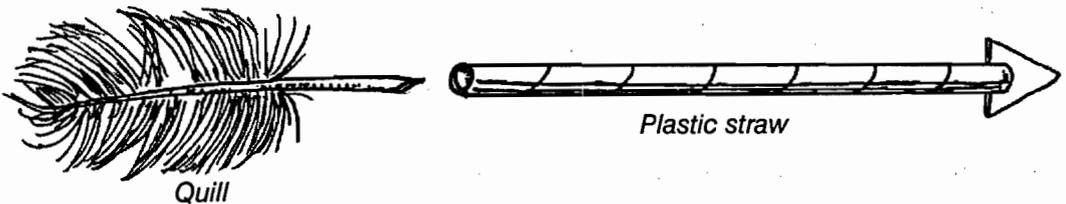
An Anemometer

6.3 Construction of a wind vane

You can make your own wind instruments and use them to measure aspects of the wind.

To make a simple wind vane you need the following materials: a pin, a big nail, a feather, tin of sand, a stick, pieces of thin wood, a straw, some metal foil, small nails and a block of wood.

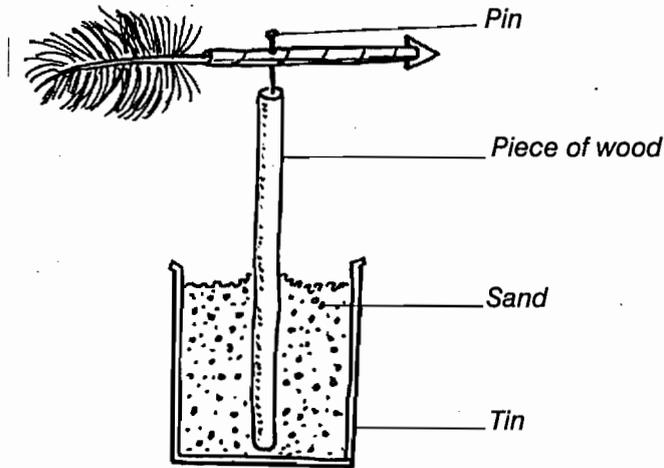
1. Insert the quill of the feather into the plastic drinking straw.



2. Using the pin, fix the straw on top of the stick as shown. Ensure that the straw can rotate freely round the pin.

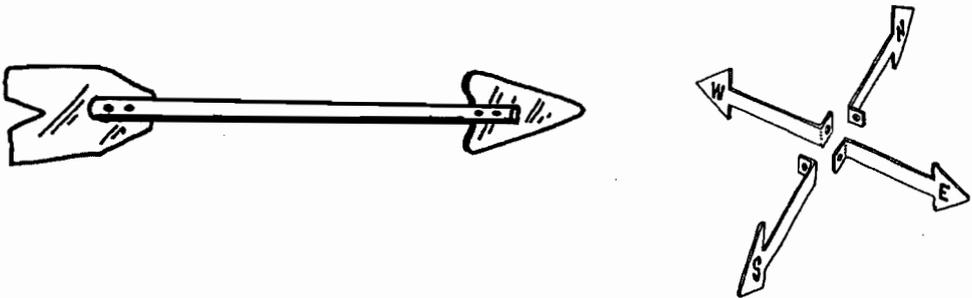
3. Plant the stick in a tin of sand.

4. Place your wind vane in an open place above the ground. Observe the wind vane and write the wind direction in the morning, afternoon and evening.



Making a strong wind vane

Cut two thin sheets of metal foil or plywood into a tail and arrowhead. Use a double sheet for the tail to make it heavier than the arrowhead. Fix the two to a thin stick with a hole in the middle. Cut four pieces of tin foil to show the wind direction.



Make a wooden stand. Fix the metal pieces to show wind direction. Using a nail fix the vane to the wooden stand. Ensure that the vane can rotate freely. Fix your wind vane on top of a building free from any obstruction.

Observe and record the direction from which the wind is blowing, morning, noon and evening for 7 days.

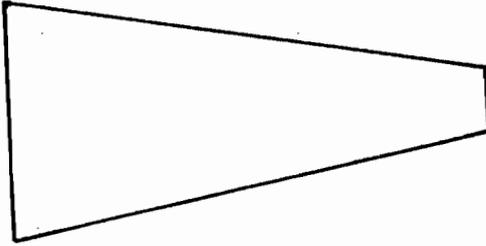
6.4 Making a Windsock

To make a windsock you need a long thick wire, a canvas cloth, black and white paint, a paint brush, a firmly fixed pole, nails, thread, sewing needle, and scissors.

Steps:

1. Cut the canvas cloth as shown below.

If you cannot get a large piece of cloth, you can use a smaller one

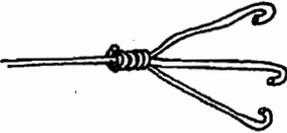
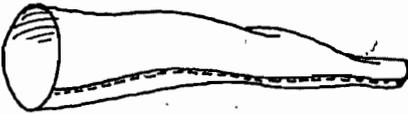


measuring 60cm x 100cm x 15cm.

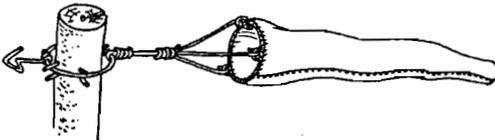
2. Sew the two long ends together neatly to form a tube.

3. Fold a wire and sew it to the front of the sock.

4. Fold three wires as shown and fix them on to the wire at the mouth of the



sock so that whole sock looks like this.



Tie the sock with a wire around a pole which is fixed firmly to the ground. Fix a wire to make a pointer as shown. Paint bands of black and white on the cloth. Use your windsock to show:

- 1) Wind direction
- 2) Strength of wind

Activities:

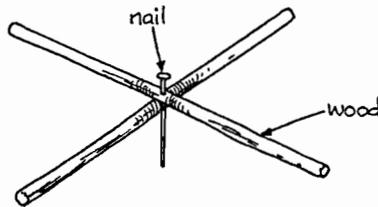
1. Observe your windsock. Draw two diagrams to show how the windsock looks when there is no wind and when there is a very strong wind blowing.
2. Where should you place your windsock? Give a reason for your answer.

6.5 Making an anemometer

You need the following materials: small nails, pen casing and four small plastic cups, four thin pieces of wood, a big nail and a block of wood.

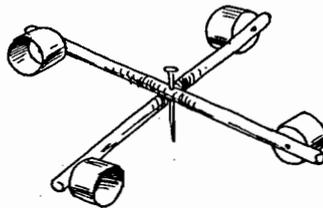
Step 1

Mount two thin pieces of wood on one another and nail them together to form a cross.



Step 2

Nail a cup to each end of the cross as shown. All the cups should face the same direction.

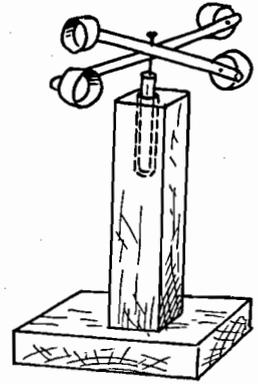


Step 3

Make a small hole through the centre of the block of wood so that the pen casing can fit in.

Step 4

Assemble the apparatus to make a complete anemometer as shown. Ensure that the pieces of wood on which cups are fitted can rotate freely. Fix your anemometer to a roof or tall pole where it can trap wind without obstruction.



Activities:

Observe how the cups rotate.

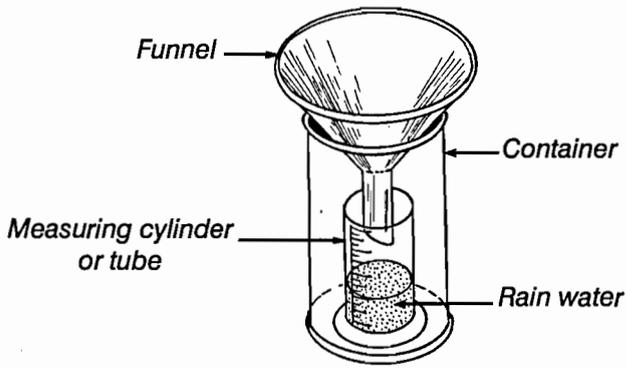
When do they turn very slowly?

What can you say about wind speed when the cups are turning round and round very fast?

6.6 Measuring Rain

A Rain Gauge

A rain gauge is used to measure the amount of rain that falls in a certain place within a set period of time. You may, for example, want to see how much rain falls in 24 hours. The tube or cylinder is marked in millimetres. If the mouth of the funnel is 10 times the width of the tube, then the water level in the tube needs to be divided by 10. The tube is placed inside a larger container so that if the tube overflows you can first measure the water in the tube, then tip it out and pour the overflow into it to be measured. The total rainfall equals the sum of the two measurements.



Constructing a rain gauge

Look at the diagram of a rain gauge. What different parts can you see? What materials do you need to make one?

Activity:

Work in a small group to make a rain gauge. The next time it rains measure the amount of rainfall. Record your finding. If it is the rainy season measure the rainfall each day for a week.

Questions:

1. Why is a gauge usually placed on the ground away from buildings and trees?
2. How can people benefit from measuring rain?

Air is made up of a mixture of gases. Gases are made of tiny particles of different types. The gases present in air are; oxygen, nitrogen, carbon dioxide and other minor gases.

7.1 Air supports burning

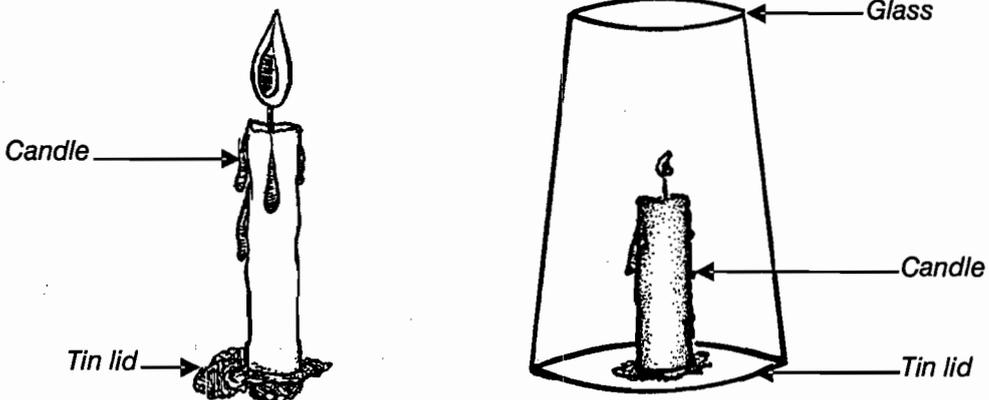
Air supports burning. Think about these questions:

- Why should you put a lid on a pan of cooking oil that has caught fire?
- Why should you wrap a person whose clothes are burning in a blanket?
It is because burning cannot occur without air.

You can prove this by conducting a simple experiment. You will need 2 candles, matches, 2 plates or tin lids and a tea glass.

Light one candle and drop some wax onto the plate or lid to fix it upright. Do the same with the second one. Put both candles in a sheltered spot away from the wind. Now place the tea glass upside down over one burning candle.

- what happens?
- how long does each candle continue to burn?
- why did the candle covered with the glass go out?



7.2 The importance of Nitrogen

Nitrogen gas is one of the components of air, but it is not necessary for breathing. If there was no nitrogen in the air all processes like burning and rusting would be much faster. We would even breath faster if there were no nitrogen in the air.

Nitrogen isn't used by animals but it's important to plants. Nitrogen is important to plants for the following reasons:

- i It is used in the formation of chlorophyll.
- ii It improves the quality and quantity of leafy crops such as cabbage, spinach and grass.
- iii It is a constituent of protein.

A lack of nitrogen will lead to the following happening in plants:

- i It will slow the growth of plants.
- ii There will be restricted root development.
- iii There will be yellowing and loss of leaves.
- iv There will be premature ripening of fruits or seeds.

Questions:

1. Is nitrogen more important for animals or plants?
2. How can nitrogen improve crops?
3. How can we increase the amount of nitrogen crops?

7.3 The importance of oxygen

Oxygen is the most important gas in the air. Most living things need oxygen to survive. Oxygen is also necessary for burning and rusting.

(1) Breathing

All living things need air to live. Both animals and plants breathe air in and out in order to live.

Why does your chest become larger when you breathe in? When you breathe in, air fills your lungs and pushes them outward.

Why does your chest become smaller when you breathe out? When you breath out, air goes out of your body.



When animals and plants stop breathing, it means they have no life in them. They are dead.

Cooling effect

Moving air, or wind, is very useful to us because it cools our bodies and stops us from feeling hot. What do you think are the feelings of the two men in the picture?



(2) Combustion (burning)

Oxygen is necessary for burning. Without oxygen nothing will burn. When things burn, the products are carbon dioxide, water, heat, energy and light.

Science Activity:

Things needed: four transparent containers of different size and an equal number of short candles all the same size.

1. Set the candles in a row
2. Light the candles
3. Cover the candles with the various containers at the same time

Which candle went out first, second, last?

Questions:

1. List all the reasons why air is important.
2. Compare how animals and plants use air.
3. What is produced when something burns?

Light is one of the many forms of energy. It is very important to us because we need it to see things around us. Plants need light so that they can make food by the process of photosynthesis.

- 1) Go into a room which is completely dark. Open your eyes wide. Can you see anything? Why not?
- 2) Now open all the doors and windows. Can you see things in the room now? Why?

1.1 Transparent Objects/Materials

Which of the following materials allow light to pass through them?

- (a) plain glass
- (b) clear water in a glass
- (c) clear plastics
- (d) cellophane paper

Things that allow light to pass through them are called **transparent** materials. You can see through them.

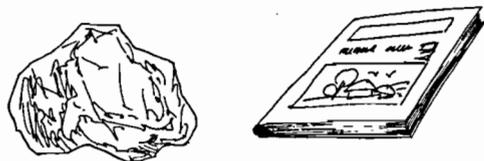
1.2 Opaque Substances/ Materials

Most of the things around you in the classroom and at home do not allow light to pass through them. Place a pencil under your exercise book. Can you see the pencil? Why not?

If you cover a nail with ash you cannot see the nail. If you place a coin under a stone no one can see it. A snake hiding under a rock cannot be seen. This is because ash, stones and rocks do not allow light to pass through them.

Things that don't allow light to pass through them are called **opaque**. Examples of opaque materials are:

- 1) Timber
- 2) Stone
- 3) Metal
- 4) Bricks
- 5) Thick wool and cotton

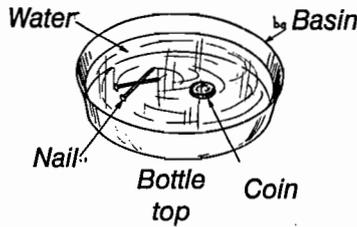


Opaque materials

- 6) Ashes and soil
- 7) Cow dung
- 8) People

Science Activities:

1. Drop a coin or a nail into a basin of clean water. Can you see it at the bottom of the basin? Water allows light to pass through it and that is why you are able to see the objects dropped in the water.
2. Place a sheet of clear glass over the front cover of your exercise book. Can you read what is written on the book? Does clear glass allow light to pass through it?
3. Obtain a clear plastic bag. Put several things in it such as a small ball, a pencil, a ruler an eraser, a handkerchief, socks and a cap. Show the bag to a friend and ask him or her to tell you the names of the things in the bag. How was he or she able to name the things in the bag?



1.3 Translucent materials

There are some materials that you cannot see through but allow a little light to pass through them. They're called **translucent**.

Science Activity:

- 1) Take a sheet of white paper from your exercise book. Can you see through it? Is it transparent?



- 2) Now take a lighted candle and place it on a table or desk. Hold your paper about a metre from the candle. Can you see the candle flame through the paper? Move the candle near the paper. Can you see the outline of the flame through the paper?
- 3) Take the same piece of paper. Smear a little cooking oil or kerosene over half the paper. Now place the paper near the lighted candle. Can you see the flame moving clearly through the part of the paper on which you smeared oil?

Tracing paper is very similar to the part of the paper on which you smeared oil. These are examples of materials that are translucent.

Exercise 1:

Look for as many things as you can. Place them on a table or on the ground. Take one at a time. Find out if each is transparent, translucent or opaque. Write down your findings in a table like the following:

Transparent	Opaque	Translucent
1.		
2.		
3.		
4.		
5.		

Exercise 2:

1. Things that do not allow any light to pass through them are _____.
2. _____ materials are not transparent but allow some light to pass through.
3. Clear water and glass are examples of _____ materials.
4. Write two uses of each material that allow light to pass through.

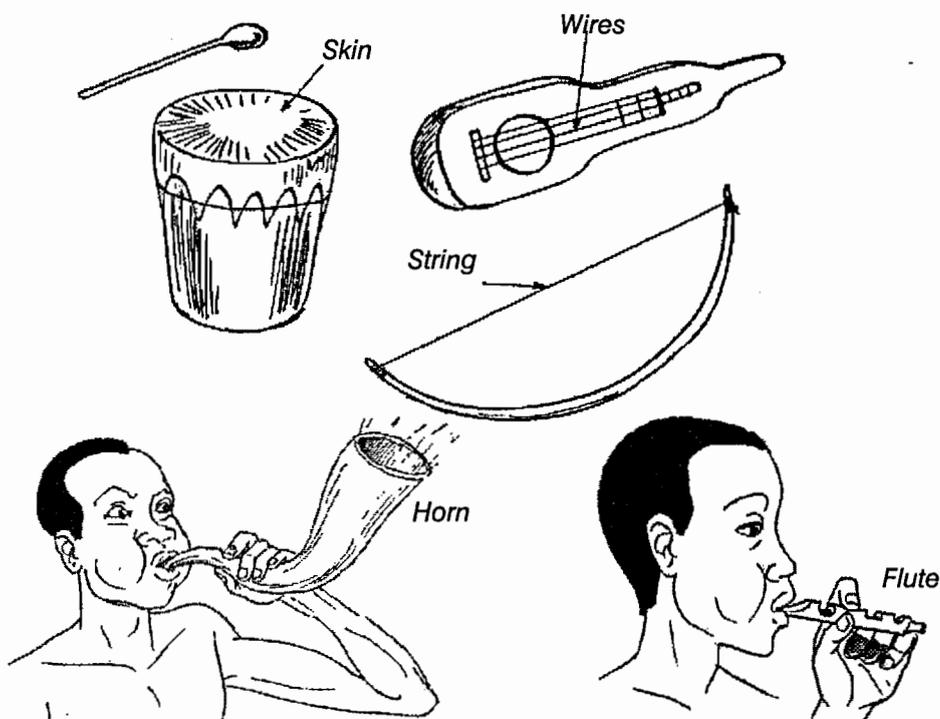
UNIT 9

Sound

Sound is a form of energy which is detected by our ears. Sound can be noisy (unpleasant) or musical (pleasant). We use sound to communicate when we talk. Anything that shakes or moves or when it is struck can produce a sound.

9.1 Sources of Sound

When you blow a horn, flute or whistle, air moves rapidly and vibrates to produce a sound. Similarly, when air passes through your voice box in your throat, sound is produced. This is because the voice box contains thin folds of skin called vocal cords. When they vibrate sound is produced. The sound may be in the form of talking, laughing, singing, shouting or even crying.



Science Activity:

Make a flute, a whistle, a bow and a guitar. Make sounds using each instrument. Name the part or object which vibrates to produce sound in each instrument.

9.2 Types of Sound

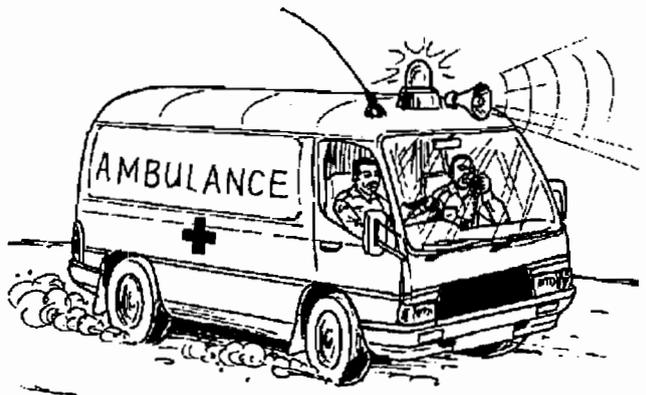
Types of Sound	Uses of Sound
Traditional horn	Message of danger, war
Traditional drums	Message of funerals, dancing rhythms
Bells	Calls, awareness and warning
Ambulance siren	Danger, awareness, alert, accidents
Fire brigade bell or siren	Fire outbreak
Security alarm	Thieves around or other danger
Police vehicle	Police going to crime or accident

Activity:

Sounds are used to pass information or to communicate messages.

What do the following sounds tell us?

1. You are playing football, netball or volleyball in the field and the referee blows the whistle. What do you do?
2. It is 3.00 o'clock in the morning and you are asleep. You are woken up by the sharp and loud sounds of your neighbours screaming and shouting woo-woou! wooo-wo! woo-wo!
3. You are walking to school and as you approach the gate the school bell rings.
4. As you are seated in the classroom you hear a loud noise. A few minutes later you hear the siren from an ambulance driving past the school gate.
5. At night your dog barks and runs toward the gate of your compound.
6. You are all asleep and then you hear a cock crow.



Each of the sounds made in examples 1 to 6 has a special meaning which is communicated to us. Some sounds like in number 3 and 4 warn us that there is danger. Sounds made in number 5 alert us that there is a stranger, an animal or thief near the compound.

Questions:

1. When one pupil answers a question and the rest clap their hands, what message does it give?
2. What message is communicated when a horn is blown at night?
3. Name two sounds made in your home area that have a special meaning.

Exercise:

1. Objects produce sound when they _____.
2. In a bow the sound comes from the _____.
3. The voice box in a person contains folds of thin skin called _____. They produce sound.
4. The rapid movement of _____ inside a flute makes sound.

9.3 Echoes

In level 1 when working with mirrors and other smooth shiny objects, you observed that when light strikes a mirror it bounces back. The bouncing back of light is called reflection.

Sound can also be reflected. When a sound hits an object, it bounces back and can be heard again after a few seconds. Reflected sound is called an echo.

Science Activities:

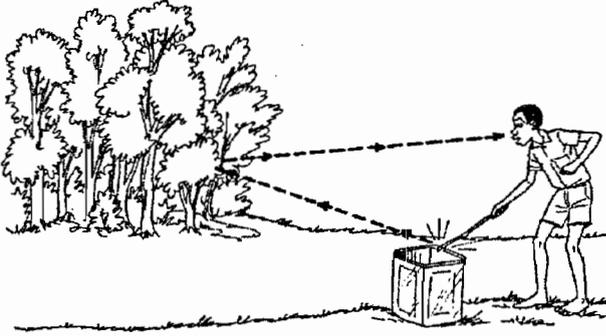
For these activities you need a metal rod and a large empty tin container.

1. Go inside a large building. While standing at the entrance strike the empty tin sharply several times.
How many sounds can you hear?

You hear the sound as you strike the tin, but after a second or two you hear the second sound. This second sound is the echo. It is a sound reflected by the walls of the building which bounces back to be heard again as an echo.

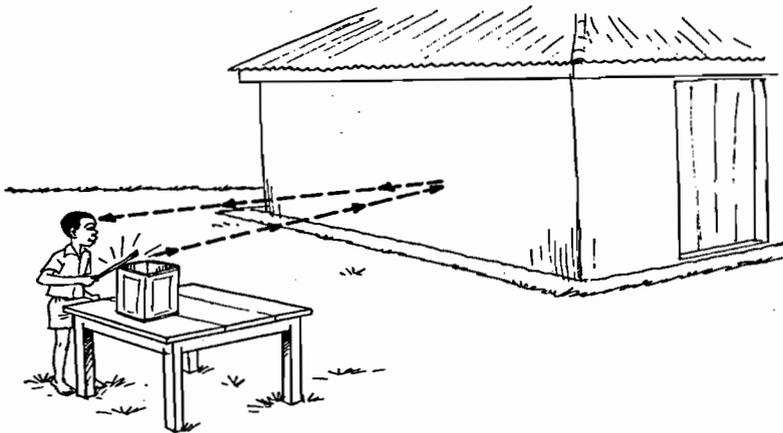
2. Go to a place near a forest. Strike the metal can several times. Listen carefully. How many sounds can you hear?

Sound hits the trees in the forest and bounces back. It is heard after a few seconds as an echo.



3. Go to a place where there are many buildings. Stand about 50 metres away from the wall of a house. Facing the wall, strike your tin several times. Listen carefully to similar sounds coming from the direction of the buildings. These are reflected sounds. They are called echoes.

An echo takes a few seconds before it can be heard. This is because sound takes time to travel from the metal can to the wall and then back to our ears.

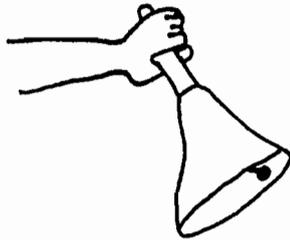


9.5 How sound travels through different substances

How sound travels through solids

Science Activities:

1. Let one of the learners scream from a distance. Can the rest of the learners hear this scream? Can you tell the direction of this scream?
2. Let one of the learners ring a bell at the farthest corner of your school compound. Can you hear the sound of the bell? Can you tell from which direction is the sound coming?

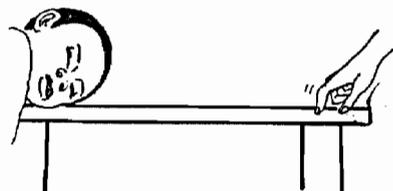


3. Tap the ground with a stick and let a friend listen by putting his or her ear on the ground. Can you hear the sound travelling through the earth? Can you tell where the sound is coming from?



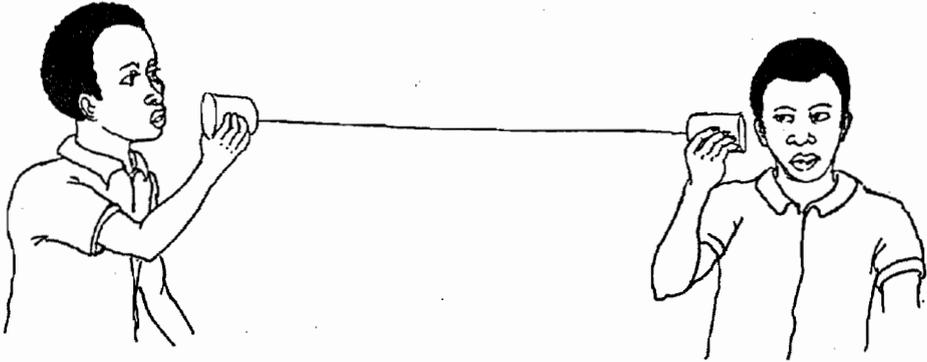
4. Knock at the classroom door. Did you hear the knock? From which direction did the sound come? What do we use to locate the direction of sounds?

We are able to hear sounds coming from different directions because sound travels through the air. Sound can also travel through solids like wood and metal.



Science Activities:

1. Place a stick of wood about half a hand long near your ear. Scratch or tap the far end a few times. Can you hear anything?
Repeat with a metal rod. Do you think sound travels better through wood or metal?
2. Make a string telephone using two tins.
 - a) Punch a small hole in each of the tins.
 - b) Insert and tie a string of cotton onto each tin.
 - c) Hold one tin to your mouth and one tin to your neighbour's ears. Talk to one another.
 - d) Repeat using copper or iron wire instead of cotton thread.



Is there any difference between the sound that passes through the wire and through the cotton thread? Which one works better?

How Sound travels through liquid

Sound travels through liquid by vibration of liquid particles.

Science Activity:

Do you think sound travels faster through solids or liquids?

When you visit a pond or a swimming pool and go swimming:

- a) Let your classmate strike 2 stones together under the water about one or two metres away from you.
- c) Describe how you hear the sound.
- d) Compare this with what you hear through copper or iron wire.

How sound travel through air.

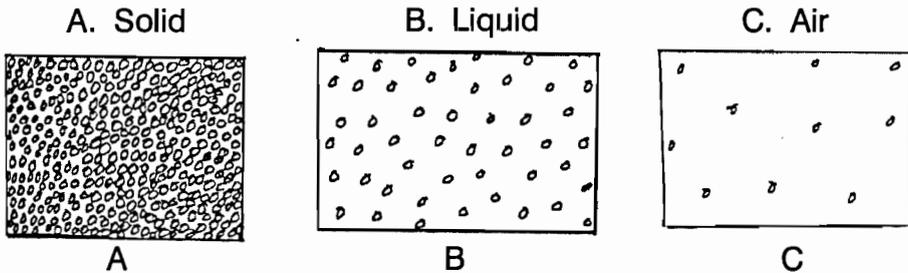
Sound travels through air by vibration of air particles.

Science Activity:

- Speak to your classmate about 20 steps away.
- Speak your classmate again using the tin telephone.
- Describe the difference.

Do you think sound travels faster through air, water or solids?

Look at diagrams A, B and C



Comparison of how sound travels

Sound travels the fastest through solids. The particles in solids vibrate in fixed positions and allow sound waves to pass through them quickly.

The particles in liquids are further apart and move around each other as sound waves pass through. Sound waves pass through liquids more slowly.

Because particles in air are far apart and moving freely, sound travels through air the slowest.

Exercise 1:

1. Sounds travel through _____, _____, and _____
2. It travels in solid _____
liquid _____
air _____

Exercise 2:

1. A drum makes a _____ sound while a _____ makes a high sound.
2. You can make sound by striking some objects, _____ others and blowing others such as _____.
3. When a very short but tight wire is plucked a _____ sound is produced.
4. Bottles of the same _____ make a similar sound when struck by a spoon.
5. A bottle containing a lot of water will produce a _____ sound than a similar bottle containing a _____ amount of water.
6. A long wire when fixed tightly between two nails makes a _____ sound compared to a short wire.
7. Reflected sound is called an _____.
8. An echo is heard a few seconds after a sound is made because sound takes _____ to travel to the wall or forest and back.

UNIT 10

Heat

10.1 Burning

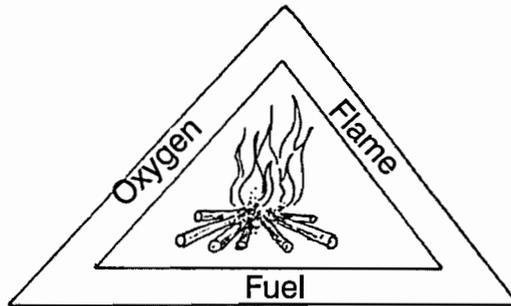
Burning cannot take place unless these three things are present.

- 1) Fuel
- 2) Oxygen in the air
- 3) A source of heat

Things that burn are called fuels. Wood and charcoal are solid fuels and paraffin is liquid fuel. Some gases such as natural gas are used as a gaseous fuel for cooking and lighting.

When there is no oxygen no burning can take place. Sometimes we blow air to start something burning. When it is too cold or wet it is difficult start a fire.

Fuel burns in air to produce a flame (heat). Other products of burning are light and ashes.



(a) Things that burn

In the table below list fuels in your locality.

Solid	Liquid	Gas fuel

Questions:

1. What are the three conditions necessary for burning to take place?
2. Identify products of burning.
3. Is wood a solid or liquid fuel?

(b) Changes of State

When you look around, you can see that many things in the room and outside are solids, liquids or gases. For example your pencil is in a solid state. The water or milk you drink is in a liquid state, but the air you put in the football is in a gaseous state.

Many things can change from one state to another. This is often the result of temperature change.

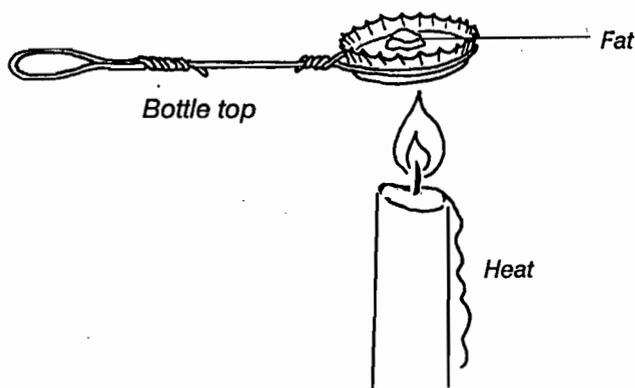
Solid \longrightarrow liquid

Liquid \longrightarrow gas

Liquid \longrightarrow solid

Science Activity:

- a) Fix a bottle top to a wire as in the drawing.
- b) Place a small bit of each of these things in turn to the bottle top: wax, honey, fat, sugar, water, ice.
- c) Heat them with a source of fire such as a candle.
- d) How does each change its state?



Exercise:

1. Solid wax changes to _____ when heated.
2. Solid fat _____ when heated
3. Water _____ when heated
4. Solids change to _____
(gas, liquid)
5. Liquids change to _____
(gas, liquid)

10.2. Measurement of Temperature

If we want to know if something is hot or cold we touch it. Touch the hand of your classmate. Is it hot or cold? When you leave an iron nail in the sun it becomes hot. At night it becomes cold. During the day the nail has absorbed heat from the sun while at night it loses some of the heat.

When you put your finger in warm water you feel the heat and when you put your finger in cold water or on some ice, you feel cold.

We use thermometers to measure temperature. Your teacher will show you a thermometer used to measure the hotness and coldness of water and air. By reading the thermometer he or she can tell you the temperature today.

If you are sick, the doctor checks the temperature of your body. The doctor has a special thermometer for measuring the temperature of our body.



Activity:

Put water of different temperatures in three containers

- 1) cold water
- 2) lukewarm water
- 3) warm water

Place your hand in each container. Start with 1, then 2 and 3.

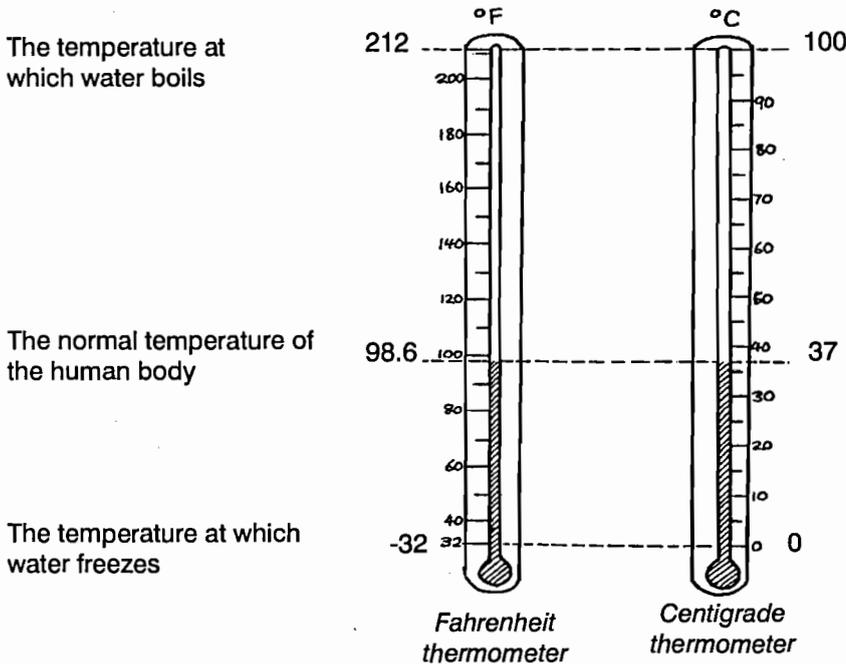
Wait a minute, then feel the water from 3 to 1.

Describe the temperatures you feel. Can you feel the temperatures change?

Reading a Thermometer

There are two types of thermometers: Fahrenheit and Centigrade.

Centigrade thermometers are used in most countries of the world while a few countries still use Fahrenheit. Compare the two kinds of thermometers:



Exercise 1: Fill in the table by looking at the thermometers

	Centigrade	Fahrenheit
The temperature at which water freezes		
The temperature at which water boils		
The normal temperature of the human body		

- (1) Count the divisions (degrees) of a Centigrade thermometer
- (2) Next count the divisions of a Fahrenheit thermometer
- (3) Which of the two thermometers is easier to read and why?
- (4) The liquid used in thermometers are _____ and _____ (mercury, coloured alcohol)

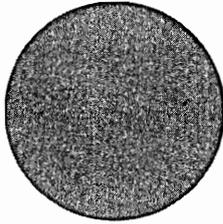
Exercise 2:

1. In New Sudan we use _____ thermometers.
2. On a hot day the temperature is around _____
3. If you are sick and have a fever your temperature is over _____.

11.1 The Moon

Revolution of the Moon

The moon is much smaller than the earth. The earth is about four times bigger than the moon.

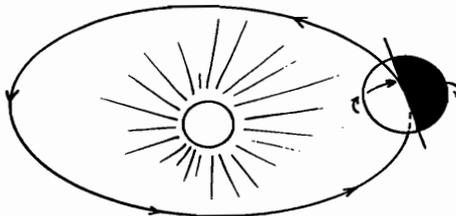


Earth



Moon

The moon revolves around the earth every 28 days. This is why we see it every month rising from the west and setting in the east. We can see the moon at night and sometimes in the morning when the sun is rising.

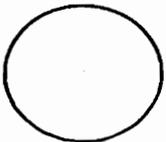


The earth's orbit and moon's orbit

Science Activity:

Look at the sky every evening and observe the shape of the moon. Draw the shape of the moon as it appears every evening until it disappears. Do this every evening at about 8.00 p.m.

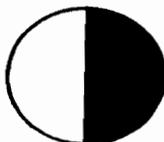
You should see the following shapes or phases of the moon:



Full moon



Gibbous



Half moon



Crescent moon



New moon

Why do we see different sizes of the moon? The shape of the moon remains the same round shape. The moon is not like the sun, however, it does not give off its own light and heat. It only reflects light from the sun.

Do you remember in book 1 we used objects to reflect light? The moon does the same. When only a little sunlight falls on the moon we see the crescent because the crescent part of the moon reflects the sunlight. When half of the moon faces the sun, it appears as half a ball, reflecting the sun's rays.

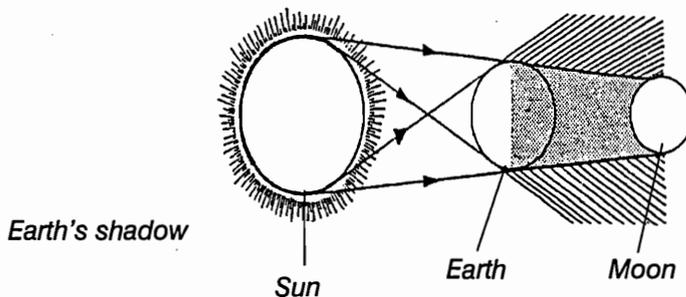
When the moon is opposite the sun, the sun's rays fall on the whole moon. Therefore what do we see?

Questions:

1. Put in order of size: earth, sun, moon
2. Which phase of the moon did you see last night?
3. Which phase of the moon is the brightest?

11.2 Eclipse

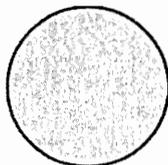
(a) Eclipse of the Moon (Lunar Eclipse)



A lunar eclipse happens when

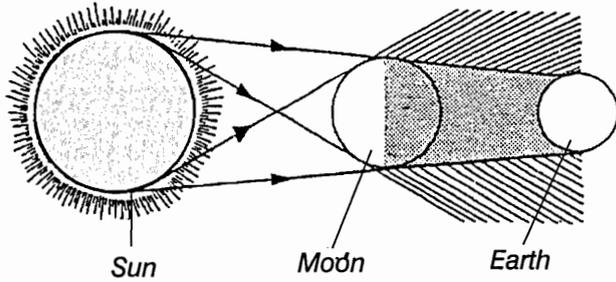
- The earth is between the sun and the moon
- The sun, earth and the moon are in straight row/line

The full moon appears reddish because it is in the shadow of the earth.



Reddish moon

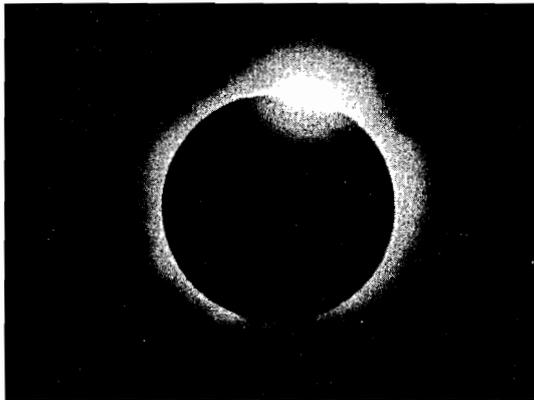
(b) Eclipse of the Sun (Solar Eclipse)



A solar eclipse happens when

- The moon is between the sun and the earth
- The sun, the moon and earth are in straight row

You cannot see the sun because the moon is covering it, but rays appear along the edge of the shadow.



A Solar Eclipse

Science Activity:

Make a model of a lunar eclipse.

- a) Hang a large ball from the ceiling. This is the earth.
- b) Put a small ball on a stand that can rotate around the earth. This is the moon.
- c) Use a strong torch to be the sun. Try to think of how you can show the lunar eclipse.

Questions:

1. The eclipse of the sun takes place when the _____ is between the (earth, moon) and the (earth, sun)
2. What should you use when looking at the eclipse of the sun? Why?
3. The eclipse of the moon takes place when the _____ is between the (sun, moon) and the (moon, earth)
4. An eclipse can take place when all three; the sun, the moon and the earth, are in (straight, opposite) lines.
5. Have you ever seen an eclipse of the sun or moon?

UNIT 12

Making Work Easier

Different people do different jobs. Some people carry heavy loads on their heads or shoulders. Others lift heavy stones and timber at building sites. Carpenters work with wood and tools to make doors, beds and other furniture. For work to be done easily we need to have tools. They make difficult work easier to do.

In Level 1 you read about simple machines such as a wheelbarrow, a cart, a ladder and a winch. Now you will learn about tools that are commonly used in the local community to make work easier to do.

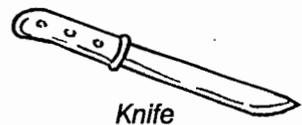
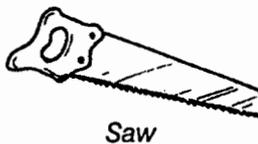
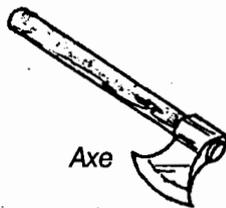
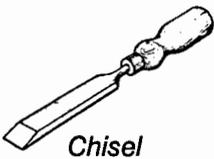
12.1 Common Simple tools

Write down the different types of work done by:

- 1) Yourself at home and at school
- 2) Your neighbours
- 3) People in the local trading centre

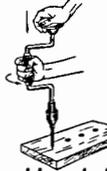
From what you have written down, which types of work are easy to do and which are more difficult? Do you use any tools for each type of work? Name the simple machines and tools that you use to make work easier.

Here are some common tools. What is each one of them used for?

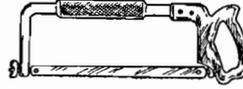




Hammer



Hand drill



Hacksaw



Mallet

12.2 Description of simple common tools

- Knife:** A knife is made of a long metal blade sharpened on one side and tapering at the end. It is used for cutting things.
- Chisel:** A chisel is made of hard metal which tapers at the end. It is used for digging holes in pieces of wood when making furniture.
- Wedge/axe:** A wedge is a sloping piece of metal or a piece of wood. An axe is an example of a wedge.
- Mallet:** A mallet is a wooden hammer with a long handle. It is used to hit wooden pegs and joints and other non-metallic objects that require hammering.
- Screwdriver:** The tip of the screwdriver is thinner than the rest of the handle. It is used to drive in or remove screws. Screws have a groove in the middle into which the screwdriver fits.

12.3 Construction of simple common tools

You can make your own tools and use them to make your work easier. Make the following tools in this way:

1. Chisel

You need a long, thick nail. A 15 cm long nail would be the best. You also need a file, a round piece of wood, a knife and a hacksaw.

- Cut off the tip of the nail using a hacksaw blade.
- Flatten one side of the tip of the nail using a file so that it forms a sloping edge.
- Drill a hole in the piece of wood. Cut off the top part of the nail and push it into the piece of wood. Smoothen the handle with the knife.

2. Mallet

To make a mallet you need a block of wood, a saw, a chisel, a hammer and a wooden handle.

- 1) Using the saw cut the block of wood into a rectangular shape measuring 10 cm by 6 cm.
- 2) Using the chisel dig out a square hole of about 3 cm x 5 cm in the block of wood.
- 3) Trim the handle to make it slightly larger than the hole, so that it fits in the hole tightly using some force.

Your mallet is now ready to use. Don't use it to hammer nails or hit other objects made of metal. It can only be used to hit wooden objects.

3. Screwdriver

To make a screwdriver you need a 15cm long nail, a hacksaw, a hammer, a file, a knife and a piece of wood.

- 1) Cut off the sharp tip of the nail using the hacksaw.
- 2) Using the hammer hit the tip of the nail against some metal or hard stone to flatten it.
- 3) Sharpen the tip of the nail on both sides.
- 4) Cut off the head of the nail and sharpen the flat end.
- 5) Push the nail into the wooden handle and hammer it gently.
- 6) Trim the tip of the nail. Now your screwdriver is ready.

4. Knife

To make a knife you need a metal blade, a file, a hammer, a drill, short broadheaded nails and two thin pieces of wood.

- 1) Cut a 25cm long blade from your long metal piece.
- 2) Drill three small holes in one end.
- 3) Place the two pieces of wood on either side of the blade.
- 4) Mark the position of the holes on the wood.
- 5) Drill holes in the wood at the same position as on the metal blade.
- 6) Join the blade and the two pieces of wood using the broad-headed nails.
- 7) Flatten the sharp ends of the nails with a hammer so that they hold the wooden pieces firmly together.
- 8) Trim the wooden pieces with another sharp knife to make a handle.
- 9) Cut the tip of the blade at an angle using the hacksaw. Your knife is now ready to use.

Exercise:

1. A _____ is used to dig out holes in a block of wood.
2. A tool used to drive screws into a piece of wood is called a _____.
3. To cut off the tip of a nail a _____ is the best tool to use.
4. We use an _____ to split pieces of wood.
5. Write three uses of a wedge.
6. To make very narrow holes in a metal blade or piece of wood a _____ is used.
7. A _____ is used to hammer objects made of wood.
8. To drive _____ into wood a hammer is used.

UNIT 13

Properties of Matter

13.1 Sinking and Floating of Objects on Water

What happens to things that fall into the water? Some things sink into the water and cannot be seen on the surface again. Other things such as feathers stay on top of the water. These things float. What kind of things sink and which things float?

Science Activity:

You will need: a basin or bucket, water and a variety of objects such as bottle tops, nails, paper, leaves, rubbers, small sticks, plastic material, stones, needles, glass, hair and so on.

- Put water in the basin or bucket. Do not fill it completely.
- Take a nail and place it on the water. Observe what happens to the nail.
- Place a feather on the water. What happens to it?
- Put all the objects that you have on the water one at a time. What happens to each object?



13.2 Objects which sink and objects which float on water

Check in the basin for the objects which are floating on the water. Write them down in the table. Observe the things that are at the bottom of the basin. These are objects that sink in water. Write them down in this table.

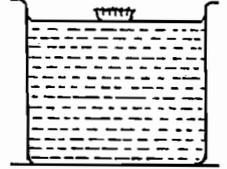
Objects that float	Objects that sink
Feather	Nail

13.3 What makes some objects float and others sink in water?

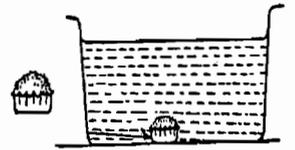
- Take a feather and a nail.
- Are they made of the same materials? Do they have the same weight?
- Are they the same shape? Are they the same size?

Different materials have different characteristics. Objects float or sink because of:

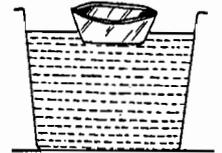
- The **Material** which the object is made of. Objects made of materials such as metal and stone sink in water. Objects made of materials such as rubber, paper, plastic and wood float.



- The **Weight** of the object. Objects that are heavy usually sink in water. Metal and stones are heavy so they sink. Objects made of rubber, plastic and wood are light so they float.

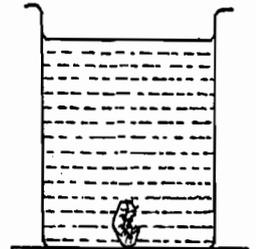


- The **Shape** of the object. Put a bottle top in a basin of water. Does it float? Now put some sand in it. What happens to the bottle top? Because of the weight the bottle top sinks.



The shape of an object can make it float or sink. Metals usually sink but if a piece of metal is made into a shape like a boat it will float.

If you put a bottle top on water it floats. If you crush the bottle top and put it on water it sinks. This is because its shape has changed and it cannot float.



Exercise:

1. Some objects _____ when placed on top of water while others _____.
2. Nails, pins and _____ sink but cork, rubber and _____ float on water.
3. When a bottle top is placed on water it _____.
4. If the same bottle top is _____ then placed on top of water it sinks.
5. One of the things which make objects float or sink is their _____.
6. A piece of wood, which is the same size as a stone, will float while the stone _____.
7. An object made of plastic is very light but an object made of iron or other metal is _____.
8. Characteristics that make an object float or sink are type of material, _____ and _____ of the object.



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