

# Science Around US

## Book 5



Easy Path Series

A GOG/EFA-FTI Project



# Acknowledgements

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Rookmin Bisnauth

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SCIENCE AROUND US

BOOK 5

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GOVERNMENT OF GUYANA

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Easy Path Series

## FOREWORD

One welcomes the publication of this series of textbooks as part of the Primary Education Improvement Project funded by the Inter-American Development Bank and the Government of Guyana.

This series of texts has been long in planning, writing and producing. In the process however, many Guyanese have developed skills in textbook writing and publication. This will serve Education well in the future.

We congratulate all those responsible for the production of these texts. They have done a good job. Guyanese children at the Primary level, and, indeed, the society as a whole, will be the beneficiaries of their labour.

Thanks to the Inter-American Development Bank for its financial support. Primary Education in Guyana will benefit considerably with the availability of relevant reading material.

Hon. Priya Manickchand  
Minister of Education

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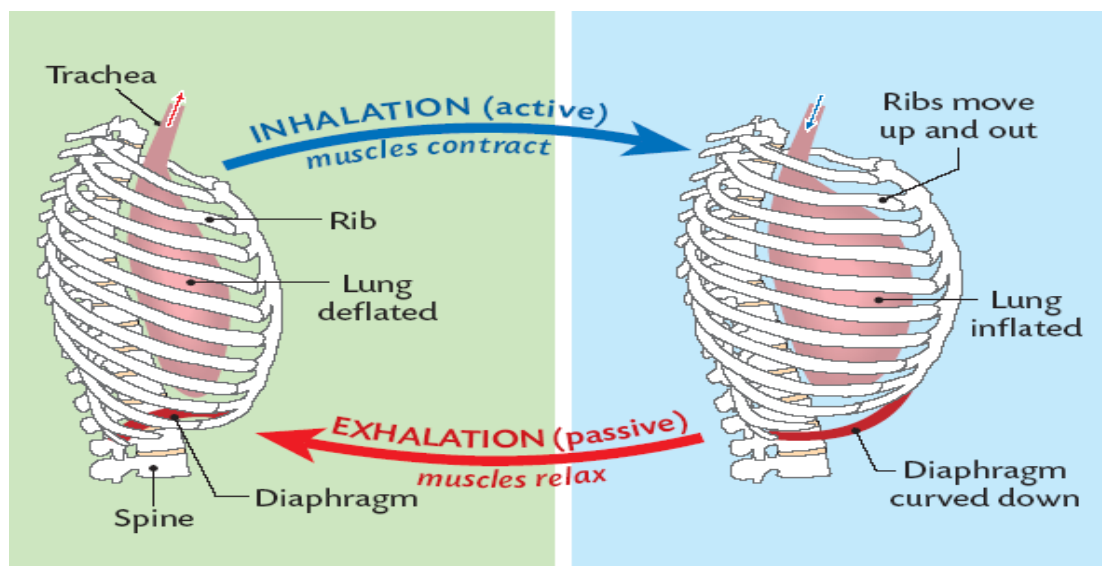
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## CHAPTER 1 THE HUMAN BODY

### EFFECTS OF EXERCISING ON BREATHING.

Our breathing rate increases when we exercise. This happens because the cells of our muscles need extra oxygen (and food) when we exercise. Our lungs will therefore work faster to supply more oxygen and go back to normal when we stop exercising.

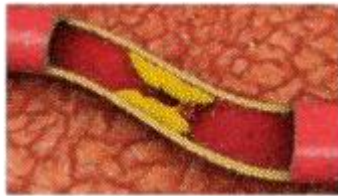


### EFFECTS OF EXERCISE ON HEART BEAT RATE

In children the heart beats about 100 to 120 times a minute. In grown people it beats about 70 to 90 times a minute. When we exercise the heart beats strongly and faster. The cells of our muscles need more (extra) food and oxygen when we exercise. So the heart must beat faster and harder (more strongly) to take more blood with food and oxygen to the muscles.

## EFFECTS OF HIGH-FAT DIETS

The blood travels around our bodies in blood vessels called arteries, veins and capillaries. Too much fat in our diets causes these vessels to become hardened and blocked. This leads to hypertension (high blood pressure) and can result in strokes and heart attacks.



**Clogged Artery**

## WASTE OF THE BODY

Cells of our bodies carry out many activities which involve use of various substances and production of wastes. The giving off or removal of wastes is called **excretion**. These waste products include **carbon dioxide**, **urine** and **sweat**. The blood collects waste products from cells and carries them to the structures/organs which excrete them. Carbon dioxide is brought to the lungs and is given off through the nose when we breathe out or exhale. Some wastes from the blood are collected by the kidneys. Wastes from the kidneys go to the bladder as urine, which is excreted.

Sweat is given off by the skin through perspiration.

## EFFECTS OF SMOKING

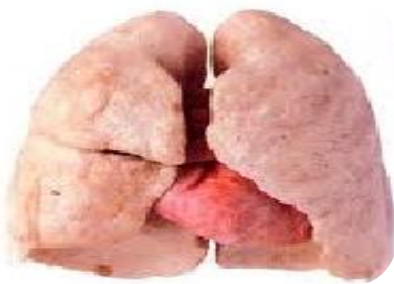
Cigarette smoke produces **nicotine, tar and carbon monoxide**.

Nicotine makes smoking habit-forming (addictive), raises heart rate and raises blood pressure.

Tar sticks to the cells in the lungs, thus causing damage, cancer, 'smokers cough' and reduction of oxygen-intake.

Carbon monoxide is the same gas present in car exhaust smoke. Carbon monoxide is poisonous since it prevents the blood from carrying oxygen. Carbon monoxide also causes: breathlessness; tiredness; babies being born with low birth weight when pregnant women smoke.

Other effects of smoking: stained lips and teeth; offensive breath; can damage relationships; reduces family income since smoking is an expensive habit; **passive smoking** endangers health of persons in the environment.



Non-smoker's  
lung



Smoker's lung

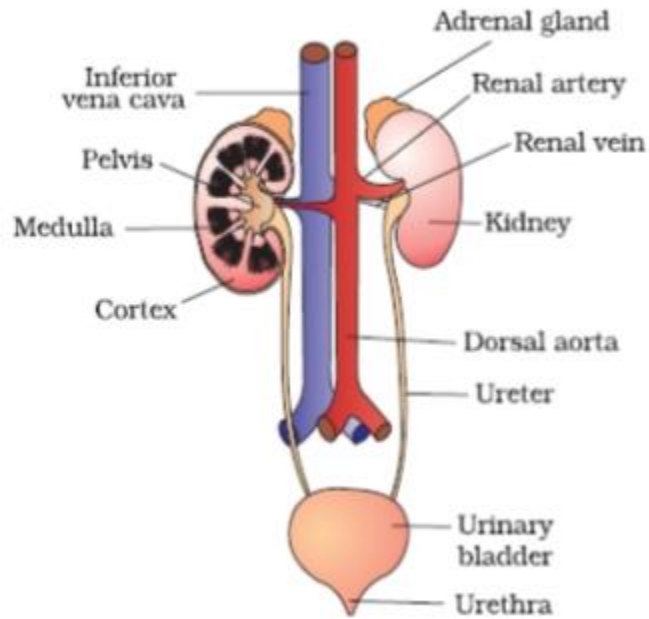
## EFFECTS OF DRUGS

We use drugs to treat diseases, promote healing, and relieve pain. If the drugs are not used properly some can cause severe health problems and even death. Patent medicines, over the counter (OTC) and prescribed drugs or medicines usually have beneficial effects. Drugs have expiry dates. It is important to read information on wrappers, labels and boxes.

Harmful or dangerous drugs alter the functions of the brain, are habit-forming (addictive), affect several bodily functions and social life. Harmful or dangerous drugs include alcohol, nicotine from tobacco, caffeine from coffee and tea, marijuana (ganga, “weed”, “joint”) and cocaine (coke, crack, “white lady”).

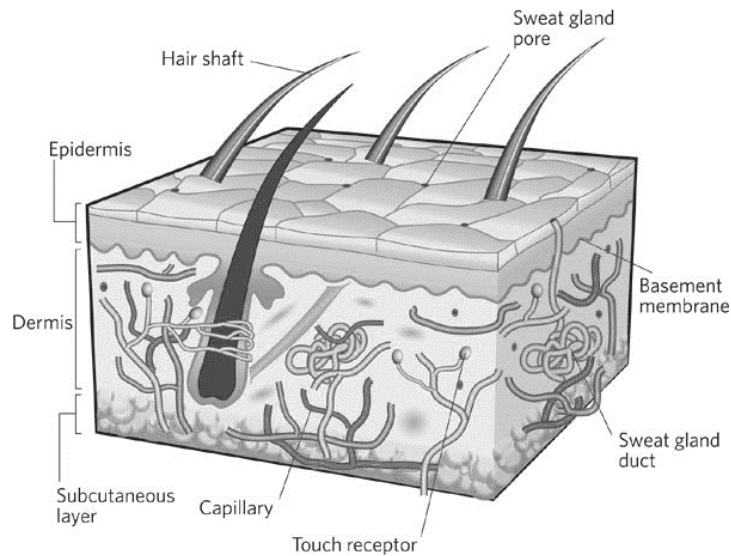
## THE EXCRETORY SYSTEM

Body wastes leave the body through the excretory system. The main organs in this system are the kidneys. Blood containing waste products is carried by the arteries to the kidneys. Waste products are filtered from the blood by very tiny tubes which are in the kidneys. These waste products are salts and urea. The urea and water come together to form urine. Urine passes from the kidneys to the bladder through two tubes called ureter. Urine is stored in the bladder until it is passed out from the body.



## The Excretory System

## THE SKIN



The skin, organ of touch is a continuous layer of tissue covering the entire body.

The skin is the largest organ of the body. The skin has three functions:-

1. to protect the tissues underneath from:-
  - a) mechanical injury
  - b) ultra-violet rays from the sun
  - c) bacterial infection
2. it contains numerous sensory receptors which are sensitive to:
  - a) hair movement
  - b) temperature i.e. 'hot or cold'
  - c) touch
  - d) pain
  - e) pressure
  - f) awareness of the environment
3. It regulates body temperature by getting rid of excess water through the pores.

The skin consists of:

- a) the epidermis which contains living and dead cells.
- b) The dermis which contains
  - blood capillaries



- nerve endings
- sweat glands

Beneath the dermis is a layer of fat which maintain the body heat.

Can you name another organ system that gets rid of the waste matter?

The lungs also get rid of waste in the form of carbon dioxide when we exhale.

## THE NERVOUS SYSTEM



The nervous system controls the body. Without it, you may live but you would not know it! It is this system which enables us to know what is happening around and which makes us think. The nervous system is made up of the brain, the spinal cord and nerves.

The nerves take messages to and from the brain and the spinal cord to all the parts of the body. These messages cause us to respond in some way: for example, “How hot it is!” or “I’ve been stung by a bee!” or “I just remembered what I did with your book!” What do you think would

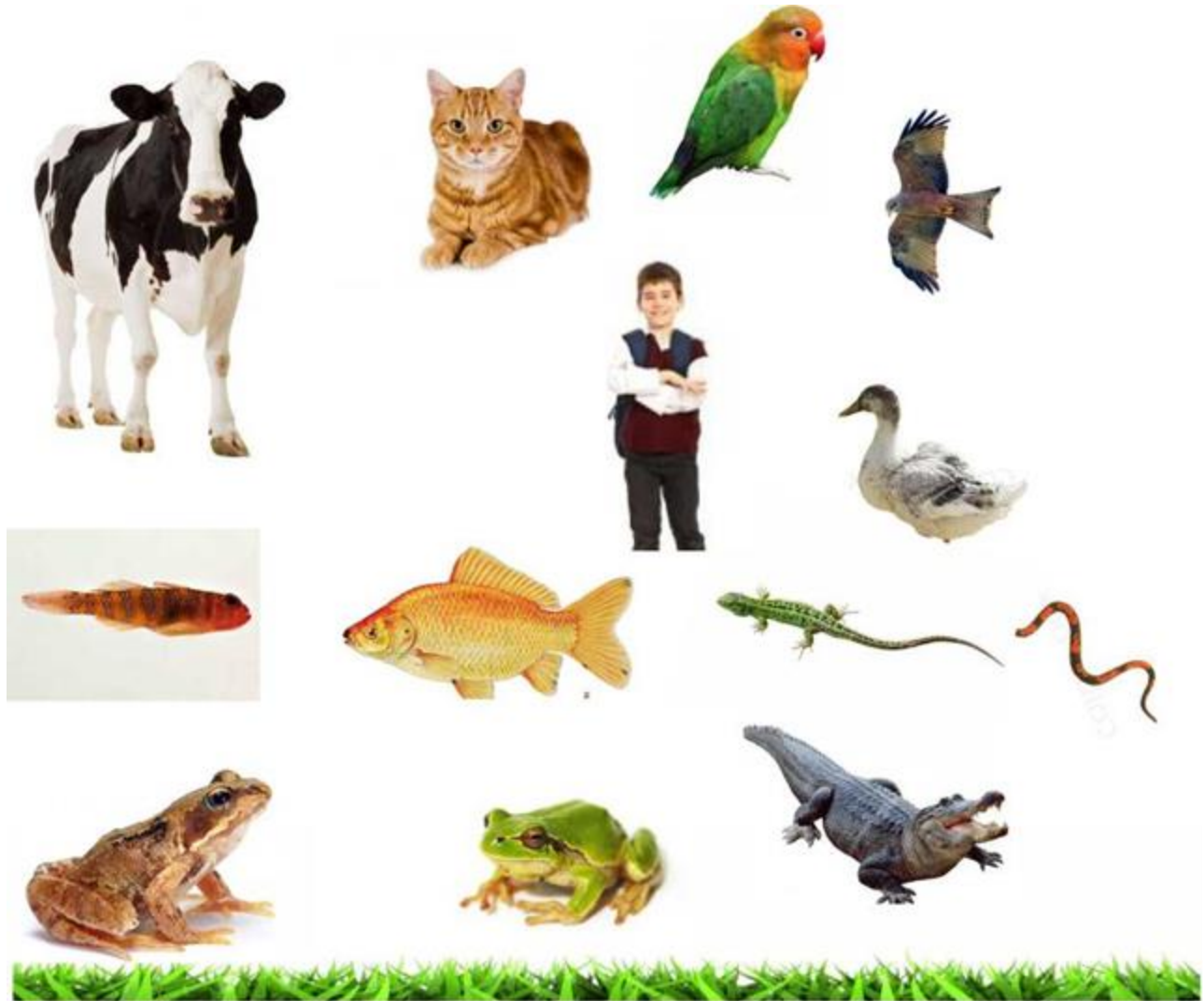
happened if the nerves were damaged? The nervous system is constantly at work, by day and by night. All the other body systems depend on it to function properly.

## SUMMARY

- Breathing rate and heart rate increases when exercising
- Eating high-fat diets can cause blood vessels to become hardened and blocked
- Excretion is the removal of waste matter.
  - Blood collects waste products from and carries it to the organs which excrete them. The excretory system is responsible for waste removal.
- Smoking is very dangerous for your health. It can lead to cancer.
- Some drugs are helpful to us if we use them correctly. They can treat diseases.
- Some drugs are dangerous to our health
- The skin is the organ of touch that covers our bodies. It protects the tissues underneath it and regulates body temperature.
- The Nervous system controls the body

## CHAPTER 2 ANIMALS AROUND US

### ANIMALS WITH BACKBONES



We have already learnt about animals with backbones.

Can you remember the special name given to this group of animals? How many different groups of vertebrates are there? Name them.

Do you remember which groups are egg-layers?

In what two ways are mammals different from the other groups?

Which group has dry, hard scales?

**Investigate Further:**

1. Study the table below.
2. Draw and complete it in your book.

Group	Body Covering	Breathing Organ	Born or Hatched
Mammal		lungs	
Bird	feathers		
Reptile			
Amphibian			hatched
Fish			

## AMPHIBIANS

Most amphibians spend part of their lives in fresh water and part on land. They are vertebrates that have no covering of scales or hair on their skin. Their skin is usually soft, thin, and moist and can absorb water. If they have limbs, amphibians generally have webbed feet with no claws.

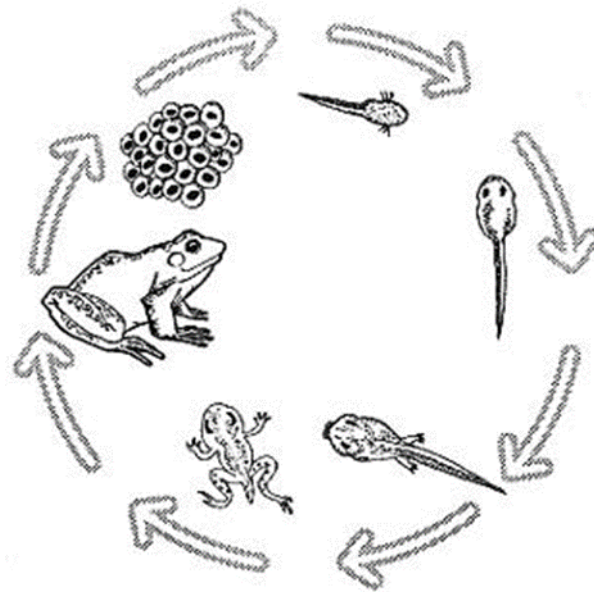
Frogs, toads, newts, salamanders, and caecilians are all amphibians.

Now let us look at the lifecycle of one class of vertebrate-Amphibian.

---

## LIFE CYCLE AND OF A TOAD

Most frogs or toads begin their life-cycle in water as the eggs can develop only under moist or wet conditions.



**Life cycle of toad**

The toad lays eggs in a string of jelly. A few hours after the eggs are laid the dark upper surface grows over the yolk. This makes the eggs appear black.

After a (1) day the egg lengthens within the jelly and becomes a tadpole with head, body and tail.

After two (2) days the tadpole wriggles clear and fixes itself to water weed or the jelly with sticky cement secreted by a V-shaped gland on the underside of the head. There is no mouth or sight pits mark the position of the eyes, ears and nostrils.

Within four (4) days the external gills begin to shrink and disappear, four (4) gills slits appear, and internal gills like those of the fish develop. An opercula fold soon appears in front of the slits and

grows backwards over them. The tadpole now breathes like a fish, and has a fish-like tail with a continuous fin. Muscle segments like those of a fish can also be seen in the tail.

After the end of twenty (20) days the edges of the operculum on the right become joined to the body, closing the gill slits. On the left side a spout-like opening through which water leaves the pharynx remains. The tadpole feeds actively and grows larger.

The first thirty five (35) days the hind-limbs appear as knobs at the base of the tail, and the fore-limbs are formed under cover of the operculum.

The hind legs are perfectly formed and the fore legs burst through the operculum. The tadpole becomes lighter in color and the eyes become prominent after thirty-eight (38) days.

Within forty five (45) days the mouth and the horny jaws appear. The lungs begin to develop and the tadpole comes to the surface to breathe. The internal gills gradually degenerate and the tail begins to be absorbed by the white cells in the blood. The little toad with a small tail can now leave the water, and feed on land on worms and insects.

## ANIMALS WITHOUT BACKBONES

Not all animals have backbones. There are many without backbones.

Many of these animals are all around us.

Can you name one such animal?

Look at the pictures below.

Which of the animals have backbones?

Which do not have backbones?





Animals without backbones are called **invertebrates**. The spider, grasshopper, earthworm, octopus, snail and housefly are all invertebrates. They are found everywhere.

Name some invertebrates found in your home.

Name some other invertebrates.

## THE FAMILY OF INVERTEBRATES

Invertebrates are of three main groups. These differ greatly in structure. Some are long with soft bodies. Some have jointed legs and bodies divided into parts. Still, others have soft bodies protected by a hard shell. Some invertebrates have wings and can fly. Most invertebrates have an external skeleton; a major difference is in their body appendages; the wings and legs. We can group invertebrates using their common structures. The main groups are:

- ❖ the molluscs
- ❖ the worms.
- ❖ the arthropods

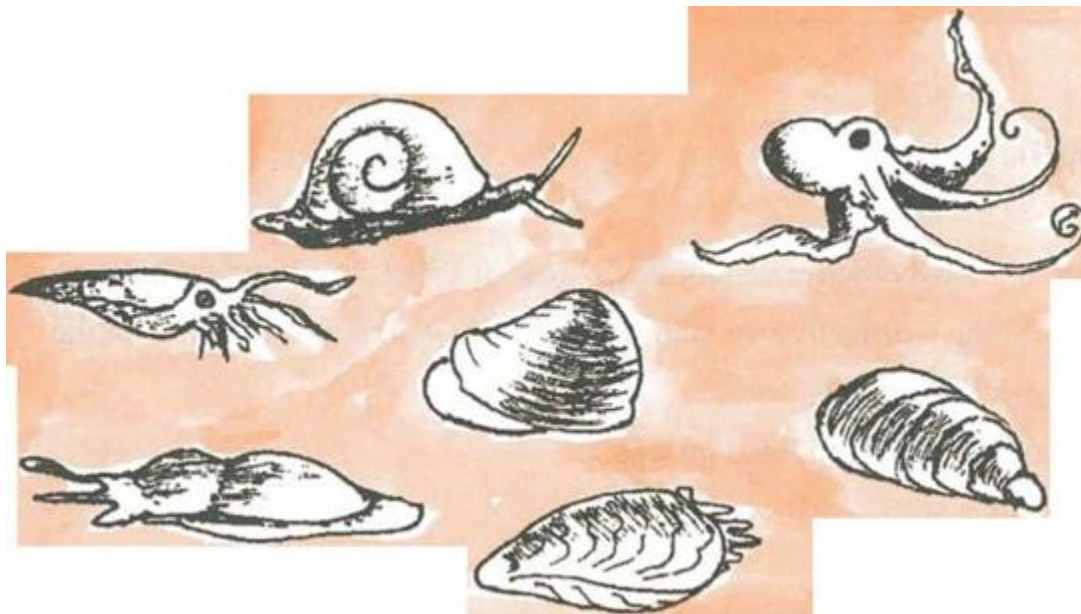


## MOLLUSCS

Some invertebrates have soft, slimy bodies covered with shells. These shells protect their bodies.

They are called **molluscs**. Snails, clams, oysters and mussels all have hard shells. Molluscs have muscular foot which they use to burrow in the sand or ocean floor.

In the pictures are some molluscs. Can you name them? Where are they found?



Have you ever touched a snail? How does it feel?

### Investigate Further:

1. Find a garden snail.
2. Half fill a flat dish with water and put the snail into the dish.
3. Observe the snail. Touch it.
4. What happens?
5. Why?

## WORMS

Worms are soft-bodied invertebrates. They have no wings or legs. Most of them have long, cylindrical bodies. Some worms live on land, a few live in water and some live in the bodies of other animals.

A worm has no eyes but can tell when it is near the surface, since one of its ends (anterior) is sensitive to bright light, which the worm avoids. A worm has no ears either. They perceive vibrations in the soil.

Worms may be placed into three groups.

These groups are:

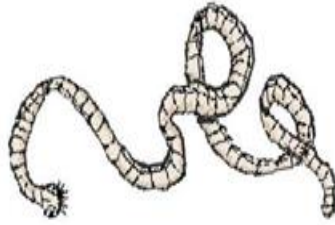
- ❖ the flat worms,
- ❖ the round worms and
- ❖ the segmented worms.

Flat worms have flat bodies and are mostly parasites. Parasites feed on other living things. The tape worm, fluke and planarian are flat worms. The tape worm and fluke are found in the bodies of other animals. The planarian feeds on dead animals. Flatworms are known to have their habitat in freshwater environment. During the day they can be found under rocks or in the mud.

How does it help us? Look at the worms below; can you name them?



blood fluke



tapeworm



flatworm

Do you know which animals sometimes have tape worms inside their bodies?

Most round worms are too small to be seen without a microscope. These worms are very numerous and live in many types of environments. Round worms are long and pointed at both ends. Their bodies are tube like in appearances. Hookworms and threadworms are round worms. They are parasites.

Many of these round worms harm other organisms in which they live and feed.

The earthworm, sandworm and leech are segmented worms. The bodies of these worms are divided into small parts or segments. Look carefully at these pictures. Can you see the segments?



Leeches are found in damp places. Sandworms may be found on the seashore. You may find lots of earthworms in your garden soil. The body system of an earthworm is more complex than that of other worms. Every earth worm has both male and female sex organ. They get air by breathing through their moist skin. Earthworms waste helps to enrich the soil.

### **Investigate Further:**

Things you need

- a jar or bowl
  - earthworms
  - garden soil
- 
- Fill a jar or bowl with garden soil.
  - Place some earthworms on the soil.

Observe what happens

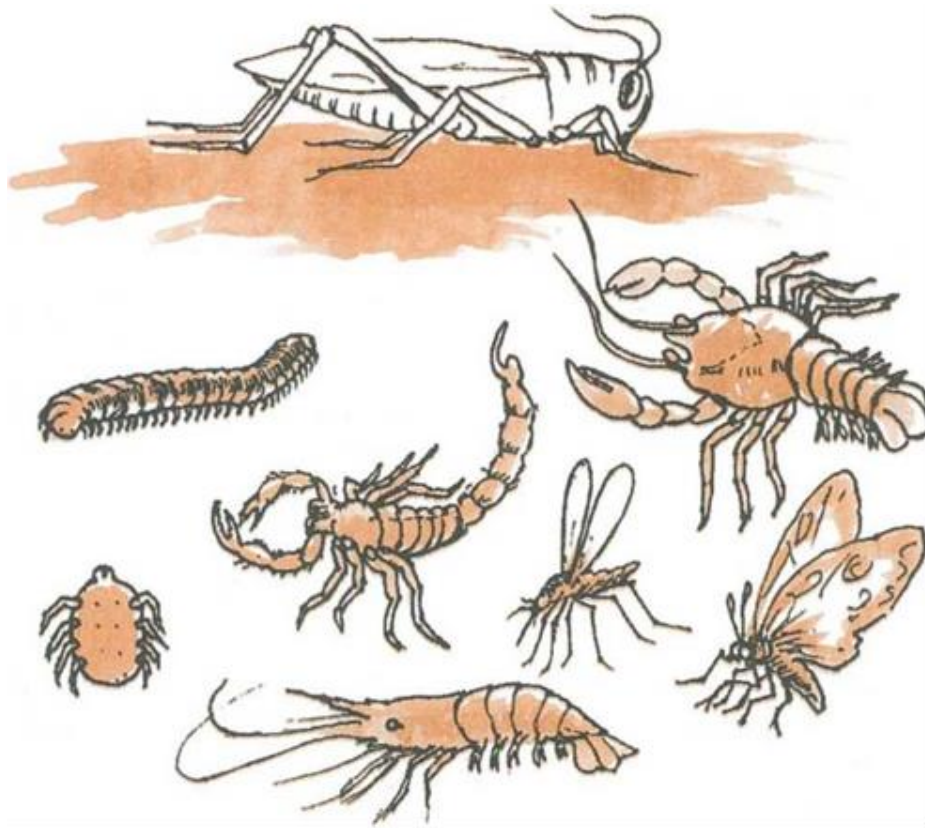
- Collect pictures of invertebrates.
- Paste these in a book with heading - 'My Book of Invertebrates'.

You may paste pictures under the three main groups of invertebrates

## THE ARTHROPODS

Invertebrates with jointed legs and segmented bodies are called arthropods. Arthropods also have a hard covering outside their bodies. This covering is an **external** skeleton.

Look at the legs of the arthropods below.



Do they all have the same number of legs?

Which have six legs? Which have eight legs?

Which have many legs?

Arthropods may be grouped according to the number of legs they have. There are four groups of arthropods. These are:

- ❖ arachnids,
- ❖ crustaceans and
- ❖ myriapods.
- ❖ insects,

Use this simple key below to find out to which group each of the arthropods belongs.

#### Key to Arthropods

1. Three pairs of legs	Insects
More than three pairs of legs	Go to 2
2. Four pairs of legs	Arachnids
More than four pairs of legs	Go to 3
3. Five to ten pairs of legs	Crustaceans
More than ten pairs of legs	Myriapods

## ARACHNIDS

Arachnids are arthropods with four pairs of walking legs. Look at these pictures.



How many walking legs has each of these?

Into how many parts is the body divided?

Have they antennae?

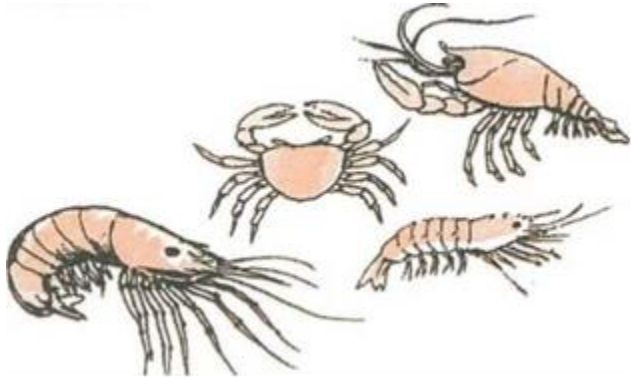
Arachnids have **eight** walking legs and bodies which are divided into two parts.

Ticks, scorpions, mites and spiders are arachnids. Like insects, arachnids breathe by tracheae.

How do arachnids differ from insects?



## CRUSTACEANS



Crabs, prawns, lobsters, barnacles and crayfish are all crustaceans. Where these are usually found?

How many legs has each? Do they all have hard shells?

You already know that the prawn has walking legs and swimming legs.

Find each set of legs. To which part are the walking legs attached?

Crustaceans usually live in water and have bodies which are divided into two parts.

They breathe by gills and usually have two pairs of antennae. Crustaceans have no wings.

## MYRIAPODS

Myriapods are the worm-like arthropods with many legs.

They live on land and burrow into the soil.

The millipede and centipede are myriapods.



millipede



centipede

Look carefully at the above pictures.

Can you see the segments? How many legs are attached to each segment?

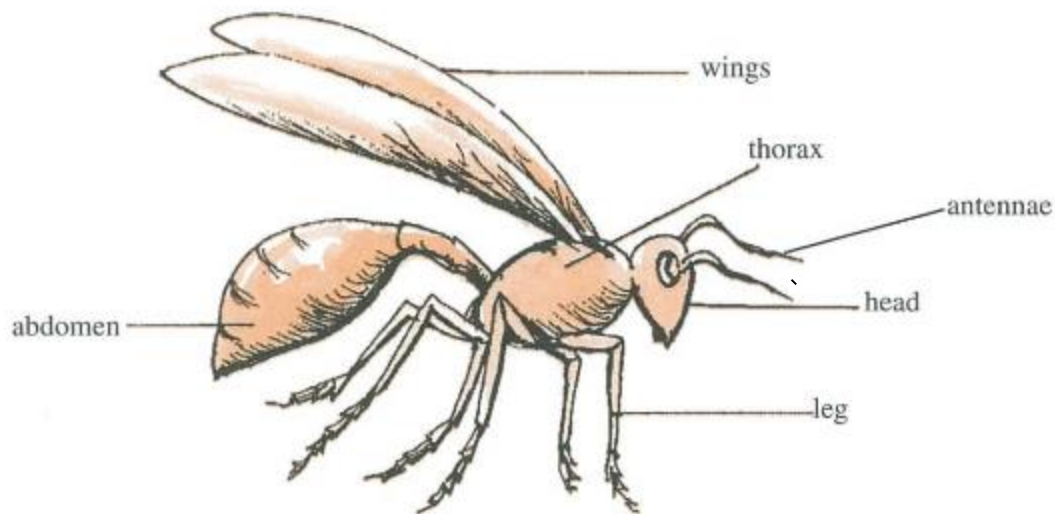
### **Investigate Further:**

1. Look for a millipede and put it on your desk.
2. Count the segments.  
Can you tell how many legs it has?
3. Watch it move. Touch it. What happens? Why?

## INSECTS

Insects are the largest group of arthropods. They may be found in the soil, in plants, on animals and even in your homes. Insects have **six** walking legs and one pair of feelers or antennae.

Look at this picture.



**Parts of an insect**

How many body parts has the housefly?

Name the parts.

To which part are the legs attached?

Look at the antennae. Where are they found?

Insects' body is divided into three parts: the head, the thorax and the abdomen

Some insects have one pair of wings; others have two pairs and some none at all.

Insects have tiny holes on their bodies called **spiracles**.

**Spiracles** allow air to get into breathing tubes called **tracheae**.

Insects breathe by tracheae.

---

## LIFE CYCLE OF INSECTS

Young insects do not look like the adult. Insects develop in stages. Some pass through more stages than others. The growth and development of an insect from an egg to an adult is known as its **life cycle or metamorphosis**. Insect metamorphosis is of two types complete and incomplete

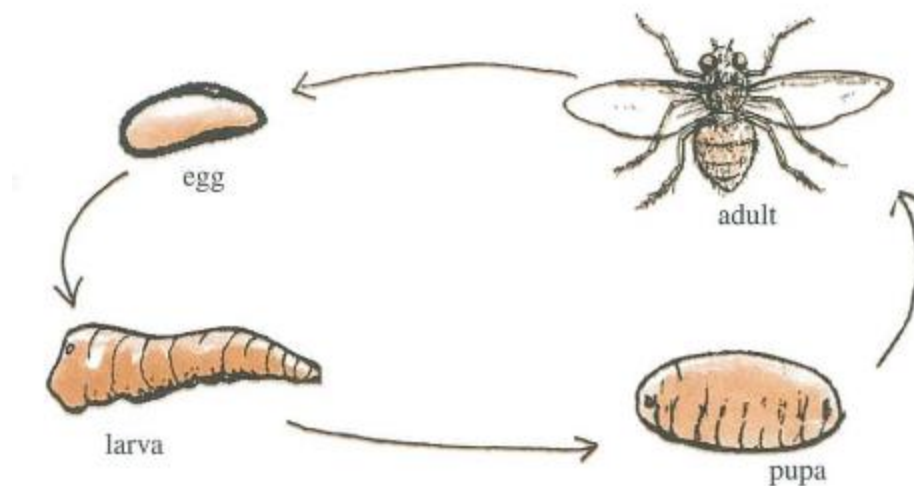
The housefly, butterfly, and the mosquito undergo four stages in their development. These stages are **egg, larva, pupa** and **imago (or adult)**. Some insects that undergo complete metamorphosis are housefly, butterfly, bees, wasps, beetles and the mosquito. The cockroach, termites, dragonfly and the grasshopper are two insects that undergo an incomplete metamorphosis.

### **Complete Metamorphosis**

Complete metamorphosis has four stages. These are egg, larva, pupa and adult.

## Life Cycle of a Housefly

The body of the housefly is divided into head; thorax and abdomen. These are gray with black streaks and are covered with hair. Female housefly lays five to six sets of eggs of 100 to 150 eggs. Each egg is 1 mm long.



The egg of a housefly takes about a day to hatch into a larva called a maggot. The maggot likes dampness but not light. After five days the maggot becomes a larva which is usually white in colour. It is during the course of this fifth to sixth day the larva becomes a pupa. Its colour changes to brown. The housefly emerges next.

### **Investigate Further:**

Practical works on the house fly

1. Examine a house fly with a lens; also examine the eggs, larva and pupa.
2. Remove a leg from a fly and examine it under the low power of the microscope. Note the bristles covering the leg and also the claws and sticky pad.

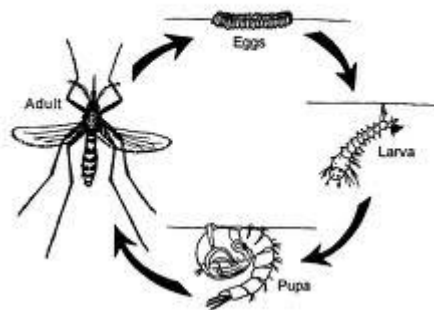
### **The Mosquito**

The mosquito has two wings. It is slender and small, and has a long sucking tube and long slender legs. Mosquitoes are found nearly everywhere. They are carriers of disease. Two types of mosquito are the anopheles and culex. Only the female mosquito sucks blood.

### **The Life Cycle of a Mosquito.**

Mosquito eggs are laid in still water such as swamps, pools or water collected in old pots or tins.

**Life Cycle of the Mosquito**



**Life cycle of a mosquito**

In these early stages the mosquito life cycle takes place in water. Between one to two days the larva escapes from the egg and enters the water. Within twelve days the larva becomes a pupa. After fourteen days the skin of the pupa splits and the mosquito climbs out.

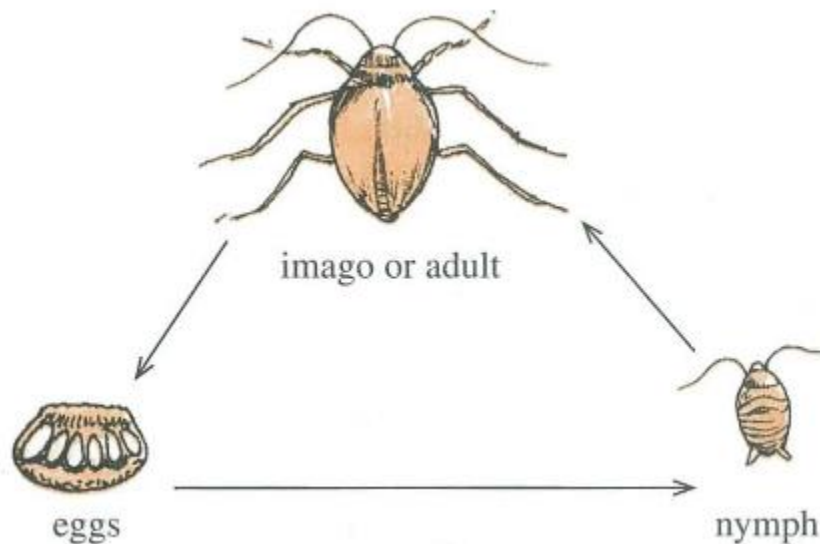
## Incomplete Metamorphosis

Incomplete metamorphosis has **three** stages. These stages are the **egg, nymph** and **imago (or adult)**. Some insects that undergo an incomplete metamorphosis are:

- cockroach
- grasshopper

### Life cycle of a cockroach

There are over 1,000 species of cockroach in the world and tropics. The body of the cockroach is about 4 cm long and is divided into three regions; the head, thorax and abdomen. The entire body of the cockroach is covered by a dark brown exoskeleton. The cockroaches in our homes are omnivorous. Cockroaches like sweet and starchy things.



The eggs of the cockroach are laid in their horny purse like case. Each case contains sixteen eggs which are arranged in two rows of eight. After a time these eggs hatch into nymphs. Nymphs are like adult like cockroaches except that they have no wings; are very small and colourless. The nymphs feed and become darker in colour and grow too big for their horny skin. These nymphs then grow a new softer skin under the old one. The old one then splits and is cast aside. The new skin soon becomes hard. This process is called moulting. Moulting happens six or seven times until the cockroach is fully grown.



**Investigate Further:**

1. look for a caterpillar
2. put it in a box with a net cover to let in air
3. feed it with leaves from the tree on which it was found
4. Observe it carefully; watch it change into a pupa and then a butterfly. (Do not be impatient. The changes will take some time.)



## SUMMARY

- Vertebrates are divided into five groups.
- Animals without backbones are called invertebrates.
- Three main groups of invertebrates are arthropods, molluscs and worms.
- Arthropods are invertebrates with jointed legs, segmented bodies and external skeletons.
- There are four groups of arthropods - insects, arachnids, crustaceans and myriapods.
- Insects have three main body parts and six legs.
- Metamorphosis is the development of an insect from egg to adult.
- Arachnids have eight legs and two main parts.
- Crustaceans have at least five pairs of legs.
- Myriapods are the many-legged arthropods.
- Molluscs have soft, slimy bodies protected by hard shells.
- Worms are placed into three groups - flatworms, roundworms and segmented worms.

### Let's Review

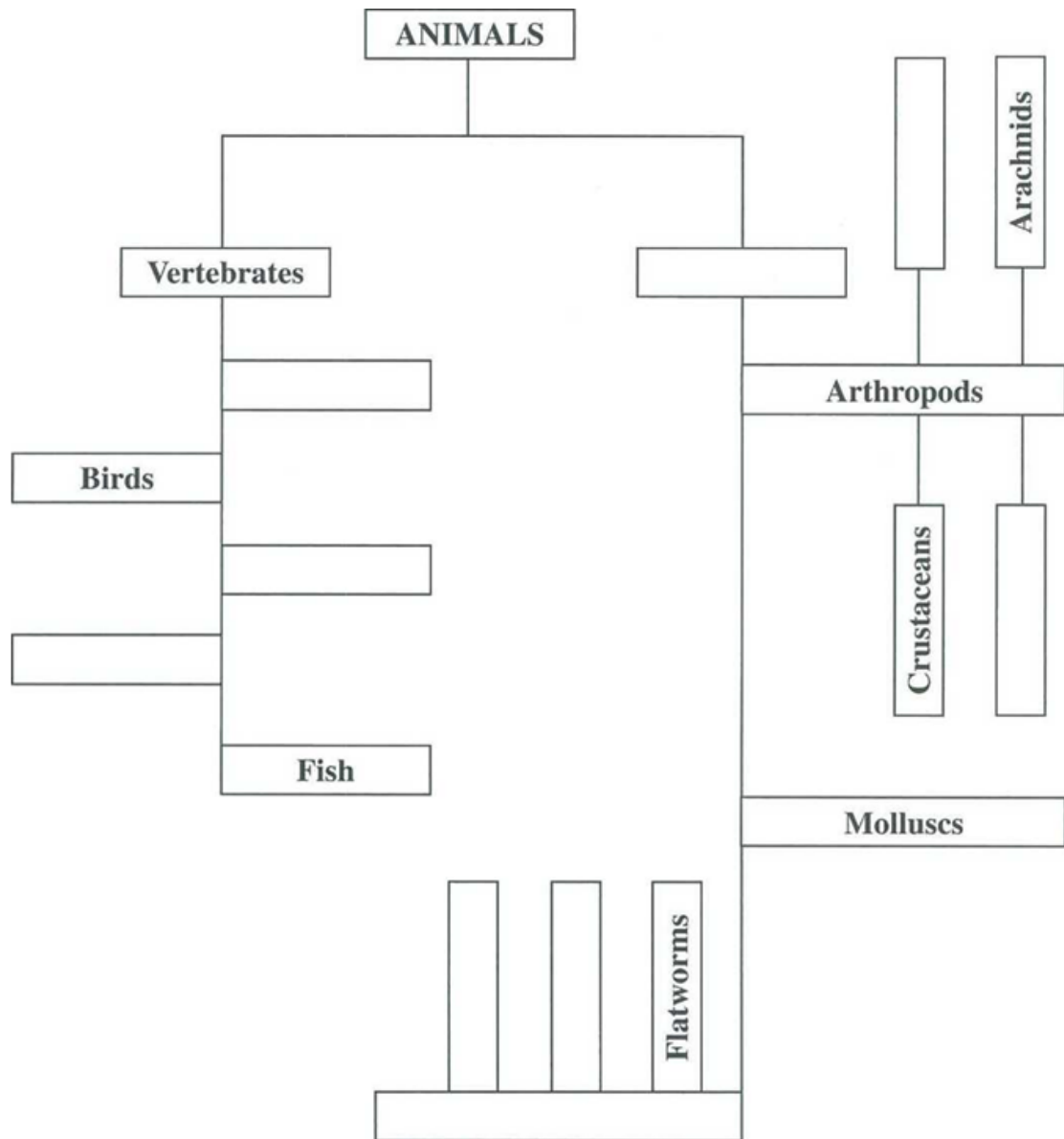
1. Name two animals which have hair and suckle their young.
2. Name two invertebrates which are parasites.
3. List two differences between insects and arachnids.

4. Find these invertebrates in the word search below -

ant, flea, louse, mite, octopus, spider, snail, slug, bee.

s	p	i	d	e	r	s
n	b	c	d	m	u	r
a	n	t	i	p	l	u
i	r	t	o	f	o	p
l	e	t	s	l	u	g
a	c	b	e	e	s	t
o	d	h	c	a	e	l

5. Complete the classification below



6. Complete the crossword

1	N		2	R	3		4			T	5	E	
			G		H								
6	S		U			7	T	T	E	8		G	
					R								
9							10	M		T			
	E			11									
				C		12			13	L			
14		L			15		S					16	B
				L						R			
	S		17		E	C							
							18	C			B		

### Clues

#### Across:

1. An animal without a backbone
6. A mollusc
7. A furry, long tailed mammal with webbed feet
9. A mammal that barks
12. Fishes breathe by them
14. A tiny insect found sometimes on dogs and cats
1. Segmented worm found in damp places
2. Crustaceans which we eat.

#### Down:

1. Vertebrates have bony skeletons \_\_\_\_\_ their bodies

2. Young birds are hatched from these
3. The legs of insects are attached to this part
4. A mammal that flies
5. A large bird of prey
8. It squeaks
10. Amphibians have soft skin.
11. Reptiles have a covering of dry, hard
13. The stage at which the insect feeds a lot.
14. Lives in water and has fins.
15. Insects commonly found on human hair.
16. Insects that suck on blood.

## CHAPTER 3 PLANTS AROUND US



Plants are found everywhere. They grow on land, in water, on other plant and even on rocks and old logs. They grow in hot places and cold places, in dry places and in moist places. They are of different varieties, colours, shapes and sizes. Plants are nature's factories, producing food and feeding the world.

They are beautiful, quiet and non-polluting. Human life cannot exist without them nor can any other animal.

### **Investigate Further:**

1. Take a walk around your neighbourhood.
2. Observe plants in flower gardens, in kitchen gardens, near the road side and in trenches.
3. Make a list of some plants you have observed under the headings –

Bear flowers    Do not bear flowers

Can you imagine a world without plants?

Plants can be put into two groups, those that bear flowers and those which do not bear flowers.

Plants which bear flowers are flowering plants. Plants which do not bear flowers are non-flowering plants.

## WHAT LEAVES DO

A leaf consists of three main parts:

- Lamina or leaf blade
- Petiole or leaf stalk
- The leaf base

If you look at the underside of leaves with a magnifying glass you will see many tiny spots. These tiny spots are holes. These holes are called **stomata**. The plant takes in air through the stomata. Excess water leaves the plant through the stomata in the leaves. Green leaves are food factories. In them, food for the plant is manufactured.

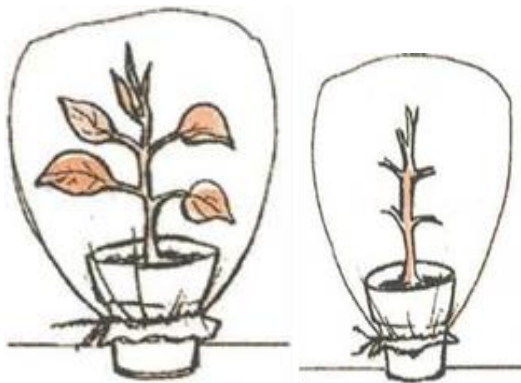
Let's find out in what other ways leaves are important to the plant.

### Investigate Further:

Things you need

- two small potted plants
- four plastic bags
- string
- Vaseline

1. Water both plants.
2. Take off all the leaves from one plant.
3. Coat the stem of each plant with vaseline.
4. Tie a plastic bag around each shoot as shown.

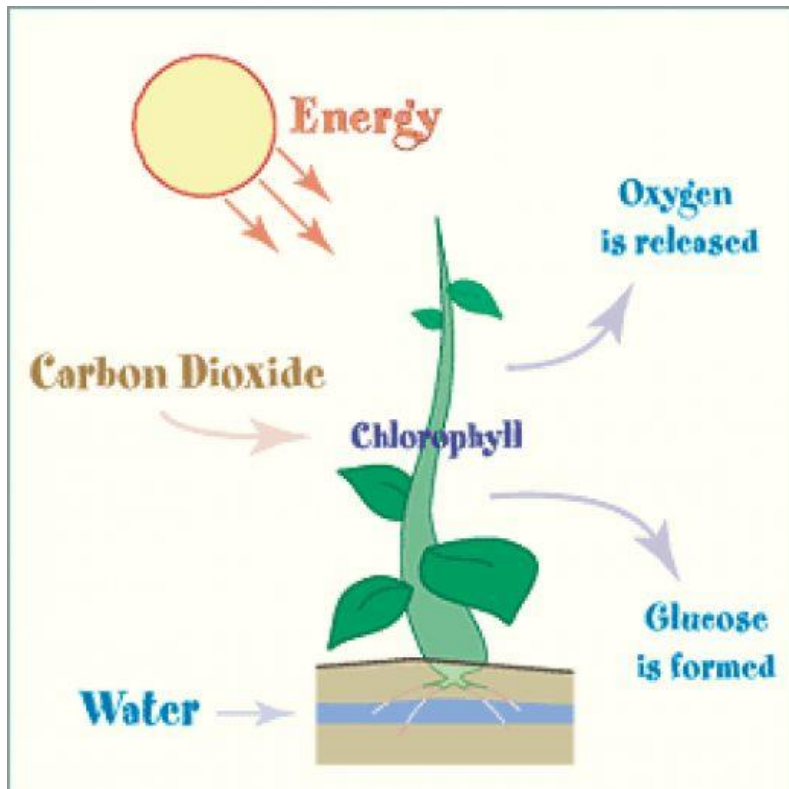


1. Leave the plants in sunlight for a few hours.
2. Observe then say what happens. From where did the water come?



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## PHOTOSYNTHESIS (PHOTO-LIGHT AND SYNTHESIS- BUILDING UP)



Plants are producers. They produce their own food by a process known as **photosynthesis**.

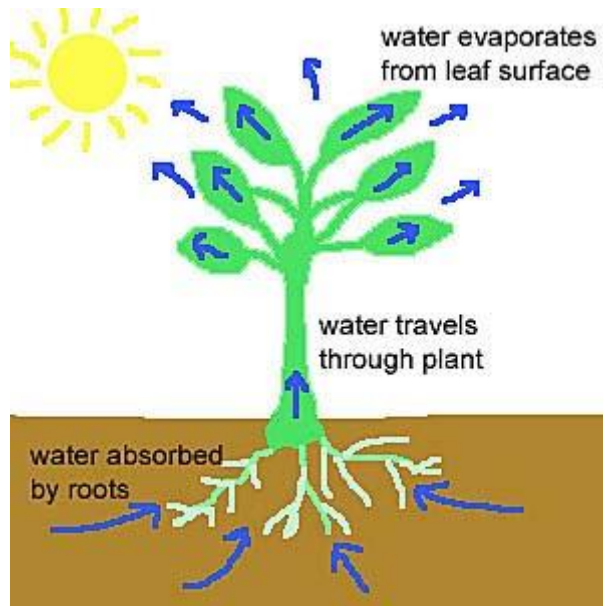
Photosynthesis takes place in the leaves of every green plant. A green substance called **chlorophyll** in the leaves of plants; traps the energy of sunlight. It is this action that causes the water in the leaves and a gas called carbon dioxide to be converted into sugar (glucose) and oxygen. The leaves of a plant make its food. The plant changes the sugar into starch to store its food.

To show that photosynthesis has taken place, leaves can be tested for the presence of starch.

Test for starch: When iodine solution is added to a starchy substance, e.g. potato, a blue-black colour is formed.

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## TRANSPIRATION



Plants need water to live. When plants are watered they will absorb not only water but also the nutrients that are dissolved into the water. The water from the soil will enter the plants through its roots. It will then travel up the stems to the plants leaves. The water is then contained in the spongy layer of the leaf. The leaves of the plants have many tiny pores (holes) called stomata. When these pores are opened, water escapes through them into the air as water vapour. This water vapour is lost to the surrounding air. This loss of water by the plant is known as transpiration.

When plants droop or wilt on hot days it is an indication that it has lost much water.

### **Investigate Further**

- Grow two pots of bean seedlings. Label them A and B
- Measure the height of seedling A and B
- Placed both pots of seedlings in a safe place
- Throughout this period water seedlings in A only
- Predict which seedlings will live and which will die.
- Observe both pots each day
- Make daily recordings of your observations on a simple chart.

Green leaves are food factories. In them, food for the plant is manufactured. Look at the leaves.

They are thick and fleshy. What do they store for the plant?

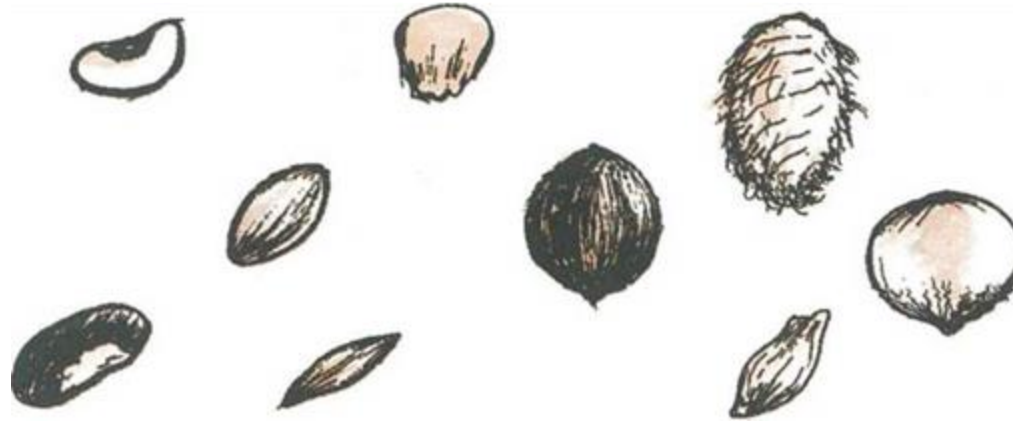


### **Investigate Further:**

Can you name other leaves which store food for the plant?

## GROUPING FLOWERING PLANTS

Look at these seeds. Can you remember which can be split into two parts and which cannot? If not, collect some of these seeds and find out.

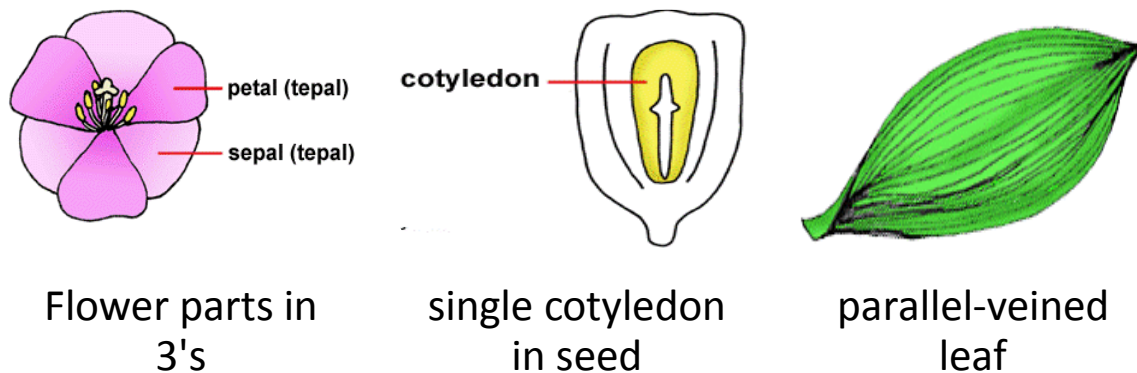


The peanut and red bean plants have seeds which can be split into two parts. Can you recall what each part is called? Both the peanut and red bean has two cotyledons. Plants which have seeds with two cotyledons are called **dicotyledons**. The corn and awara plants have seeds with one cotyledon. These plants are **monocotyledons**.

## Monocotyledonous plants

Monocotyledonous plants also have parallel-veined leaves and fibrous roots. Some examples are corn, coconut, rice and awara. Monocotyledon flowers are found in groups of threes and there is one pore in each pollen.

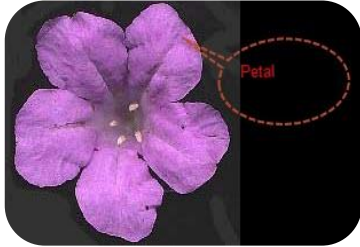
### Characteristics of monocotyledonous Plants



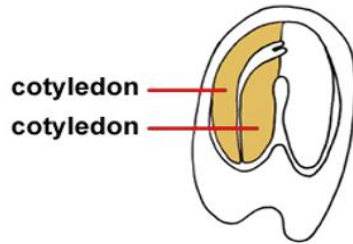
## Dicotyledonous plants

Dicotyledonous plants also have net-veined leaves and tap roots. Some examples are black-eye, bora, peanut and mango. The flowers of dicotyledon are in fours or fives while there are three pores in a pollen.

## Characteristics of Dicotyledonous Plants



Flower parts in  
4's or 5's



seed with two  
cotyledons

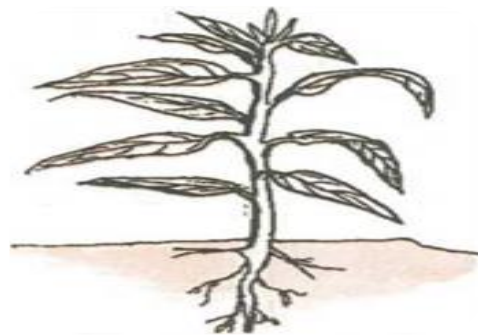


net veined leaf

Look at the two plants below.



coconut



mango

Compare the leaves, roots and seeds of these plants. Which has net-veined leaves? Which has parallel-veined leaves? Which has a tap root system? Which has a fibrous root system? Which plant has seeds with two cotyledons? Which plant has seeds with one cotyledon?

**Investigate Further:**

1. Take a walk around your neighbourhood.
2. Observe plants. Look at their leaves, roots and seeds.
3. Put your findings of at least six of these plants on a table like the one shown.

Plant	Type of Leaf	Root System	Number of Cotyledons	Plant Group
Mango	net-veined	tap root	two	dicotyledon

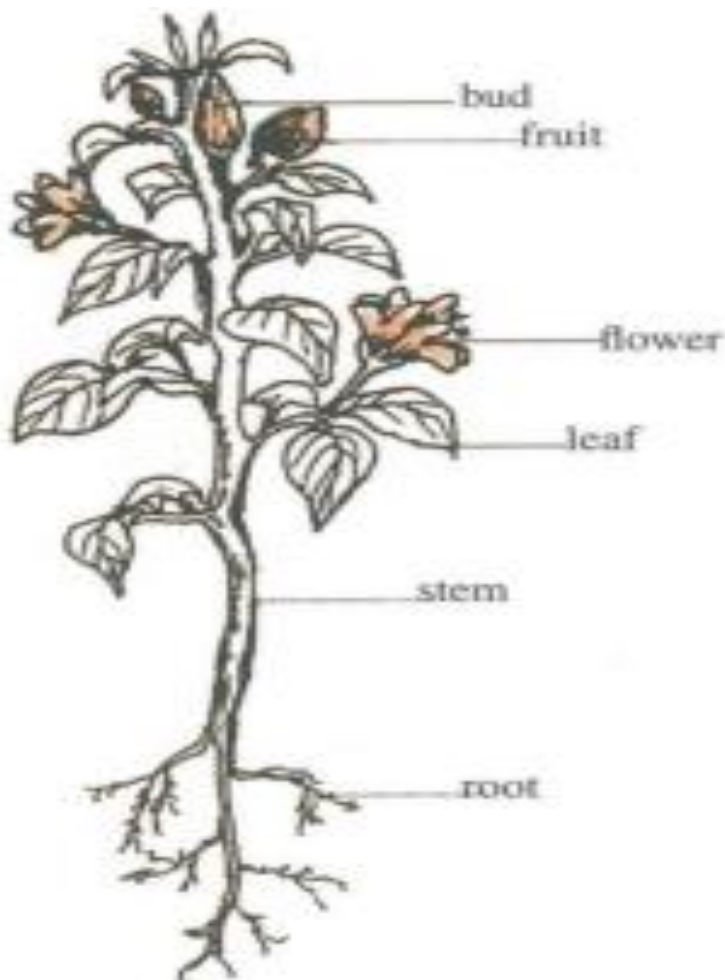
Study your table carefully. What have you discovered?

Can you tell if a plant is a monocotyledon or a dicotyledon by just looking at the leaves?

## A CLOSER LOOK AT FLOWERING PLANTS

### PARTS OF FLOWERING PLANT

Flowering plants have a shoot system and a root system. The shoot system is found above the ground and is made up of the stem, leaves, flowers, buds and fruit. The root system is found below the ground.





### **Investigate Further:**

1. Pull up a small plant.
2. Wash out the soil from the roots.
3. Look for buds. Has the plant fruit?
4. What colour is the stem?
5. Draw your plant and label each part.

## **SUMMARY**

- Plants around us can be put into two groups flowering plants and non-flowering plants.
- Flowering plants have flowers and seeds.
- Non-flowering plants do not bear flowers.
- Leaves take in air, give off excess water and some store food.
- Plants produce their food by a process known as photosynthesis.
  - Plants use sunlight and chlorophyll (the green pigment in leaves) to convert water and carbon dioxide into glucose.
- Plants may be classified as monocotyledons or dicotyledons according to the number of cotyledons present in the seed.

## CHAPTER 4 ENVIRONMENT



### THE DECAY OF PLANT AND ANIMAL MATERIALS

Materials from plants and animals are called **organic materials**. These materials include leaves, flowers, fruits, stems and roots of plants. Animal materials include their flesh, faeces, skin, hair, fur. Most of these organic materials rot or decay over a period of time. Similarly, when plants and animals die their bodies rot or decay over a longer period of time. This process of decay or decomposition causes substances that make up plants and animals to go back into the earth and the world. This decomposition is also referred to as the environment's recyclers.

### BIODEGRADABLE AND NON- BIODEGRADABLE

Materials such as fruits, paper, cardboard and cotton that decay within a short period of time are said to be **biodegradable**. Materials such as plastic, glass and metals which will not decay are said to be **non-bio degradable**.

# WASTES AND THEIR DISPOSAL

Human activities produce many wastes.

## Types of waste

1. **Domestic waste** -Garbage and litter from the home make up domestic wastes.



2. **Industrial wastes** -The wastes given off by factories include smoke, fumes, heat and poisonous chemicals.



3. **Agricultural wastes-** include manure, trash and plastic.



4. **Biological wastes-** Urine and faeces which are given off by the body.



### **Proper and safe methods of waste disposal**

Proper and safe methods of waste disposal are necessary to prevent pollution of the soil, water and air.

These methods include:

1. Proper collection and storage of wastes.



2. Recycling wastes that are reused in the manufacture of new materials and goods.

Biodegradable wastes e.g. grass and faeces, can be recycled to produce compost and biogas. Non-biodegradable wastes, e.g. glass and plastic, can also be recycled.



3. Burning combustible material
4. Proper disposal of faeces and urine
5. Filling up land, and useless ponds and trenches with wastes.
6. Proper management of sites with dumped wastes ('garbage dumps').

## CONSERVATION OF MATERIALS

Materials that we use in the home, school and at the workplace must be used properly and wisely so as to preserve them and prevent wastage. These materials include foodstuff, clothing, stationery, furniture, medicines and agricultural inputs. Other materials such as the soil, water and minerals are called natural **resources**. The wise use of materials and their preservation is called **conservation**.

## METHODS OF CONSERVATION

Some methods of conservation include:

- (a) using only the amount of materials needed
- (b) storing properly all unused materials
- (c) recycling materials eg. paper, glass, plastic, aluminium cans, as discussed in previous lesson



- (d) avoiding the pollution of land, water and other resources in the environment
- (e) making alternative use of some materials, containers, etc.

## POLLUTION

The improper use of materials, which results in harm to the environment leads to pollution.

Pollution is harmful waste or any unwanted substances released into the environment.

## TYPES OF POLLUTION

Pollution is often caused by man and affects land, water and air.

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### LAND POLLUTION

Land pollution often results from the improper disposal of wastes from human activities and from animals. This includes dumping of litter and use of agricultural chemicals.



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## WATER POLLUTION

Water is also polluted by litter, garbage and chemicals from factories and by oil spills.



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## AIR POLLUTION

Smoke from fires and vehicles and also toxic fumes from the burning of plastic and rubber pollute the air.





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## NOISE POLLUTION

Loud, unpleasant and unwanted sounds are called noise pollution



### Effects of noise pollution

Noise pollution can cause:

1. illness
2. deafness
3. heart attack
4. hypertension
5. stomach ulcers.

**Note:** There are laws to help reduce noise at work and during leisure time.

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## EFFECTS OF POLLUTION

Pollution of land results in foul odour/scent spread of diseases and reduction in soil fertility.

Contaminated water spreads diseases such as gastro-enteritis, typhoid, diarrhoea and cholera.

Polluted air results in smog and affects breathing by both plants and animals.

Damage to the ozone layer, which is the protective filtering layer of the atmosphere, allows more ultra-violet light to reach the Earth. This results in skin cancer and other diseases. Global warming and climate change also result.

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## PREVENTION OF POLLUTION

Pollution can be prevented by:

1. Proper disposal of wastes.
2. Reducing pesticide use
3. Restricting the use of agricultural chemicals
4. Keeping water ways clear of grass and weeds
5. Reducing or stopping the burning of plastics and rubber
6. Using treated petrol
7. Reducing the use of aerosol sprays.
8. Recycling resources and trash.
9. Careful monitoring of the environment.

## SUMMARY

- When plants and animals die, their bodies decay over a period of time
- Biodegradable materials decay within a short period of time
- Non-biodegradable materials will not decay
- Humans produce many types of wastes which includes domestic waste, industrial wastes, agricultural wastes and biological wastes. We must dispose of waste properly and safely. We can do so by storing them properly or recycling them.
- Conservation is the wise use of resources and their preservation. We can conserve on materials by using only the required amount, storing all unused material safely, recycling and making alternative uses for some materials
- Pollution is the presence or introduction of harmful or poisonous substances into the environment. The types of pollution are land pollution, water pollution, air pollution and noise pollution. The health of plants and animals can be negatively affected by pollution. We can prevent pollution to ensure our well-being.

## CHAPTER 5 WEATHER

Weather is the condition of atmosphere over a period of time. This period may be one day, one week or one month. The weather which includes the sun, rain and wind, affects humans, other animals, plants and the environment.



### EFFECTS OF WEATHER

**Effects of weather on man, environment and materials.**

1. The sun which provides heat and light helps plants and animals make food to grow and develop.
2. Rain provides water for drinking and other domestic purposes.

3. It also helps plants and animals to grow.
4. Too much rain can result in floods which can ruin homes and crops.
5. Very high tides have a similar effect.
6. Too little water results in drought which reduces the growth of crops and animals.
7. The wind keeps us cool. It helps birds and some animals to fly.
8. Strong winds can cause damage to life and property.
9. Very strong winds like hurricanes result in damage to buildings, crops, animals and humans.

## EFFECTS OF THE SUN, WATER AND WIND ON ROCKS.

The sun, water and wind cause rocks to break up into smaller pieces. This process is called **weathering**.



Some effects of weather on rocks are:

1. Heat from the sun causes rocks to expand during the day.
2. At nights the rocks cool down and get smaller.
3. When this expansion and contraction occur over a period of time the rocks crack and break up.
4. Rain and water falling on rocks over a long period of time cause some parts to wear away slowly. This can lead to the formation of cracks.
5. The wind can break off small pieces of rocks from larger ones.
6. It can also pick up small stones and sand and hit them against larger pieces of rocks thereby breaking them into smaller pieces.

## GLOBAL WARMING

The whole world is getting hotter which is mainly caused by air pollution. This is called global warming. The main gas in the atmosphere which causes global warming is carbon dioxide. It is released from the burning of coal, oil and gas. Carbon dioxide and some other gases act like a blanket, trapping the sun's heat like the glass in a greenhouse. This is known as the greenhouse effect and the gases which trap the heat are referred to as greenhouse gases.

The weather will change if global warming continues and this will affect life on earth. There will be droughts which will cause crop failure. There will also be more storms and hurricanes. The ice

at the north and south poles will melt and it will cause sea levels to rise. Coastal areas will be flooded.

## SUMMARY

- Weather is the condition of the atmosphere over a short period of time
- The weather has many effects on man, the environment and materials. It provides heat, light and water for plants and animals. Too much rainfall can result in floods. The sun, water and wind can cause rocks to break up into smaller pieces. This process is called weathering.
- Global warming is the result of air pollution. The increase in greenhouse gases in the atmosphere leads to an increase in the temperature of the earth.
- Global warming can cause sea levels to rise and also many droughts



## CHAPTER 6 MIXTURES

Do you remember what mixtures are? Mixtures are made up of two or more substances. They are physically combined and so can easily be split up. If rice is mixed with sugar, the rice can be easily separated from the mixture. Some mixtures may be called solutions, while some may be called suspensions, colloids or emulsion.

### SOLUTIONS

Quite frequently we speak of salt or sugar solutions, but what really is a solution? A solution is a mixture of two or more substances that are distributed evenly among themselves. It is the same throughout the mixture. When a solid dissolves in a liquid, a solution is formed. The substance which dissolves is the solute and the substance in which the substance dissolves is the solvent. Materials that do not dissolve are said to be insoluble. For example, sand is insoluble in water.

#### **Solute + solvent = solution**

For example, in a sugar solution, sugar is the solute and water is the solvent.

Water is a very common solvent, but it is not always used as a solvent. Some substances do not dissolve in water but in other substances e.g. acetone dissolves nail polish.



a bottle with  
sugar solution



a bowl containing  
a salt solution

We often think of solutions as solids being dissolved in liquids, but this is not always so.

Solutions can be:

- gases dissolved in gas,
- gases dissolved in liquids,
- liquids dissolved in liquids,
- solids dissolved in liquids, or
- solids dissolved in solids.

Brass is an example of a solid dissolved in a solid. It is zinc dissolved in copper.

## DISSOLVING SOLIDS FASTER IN LIQUIDS

Suppose two pieces of ice of the same size are put into separate containers, then one piece is broken into small pieces. The same quantity of water is poured into both containers. What do you think would happen to the ice? In which one will the ice melt faster?

### **Investigate Further:**

Things you need

- salt
  - water
  - bottles - one with cover and one without
1. Put the same amount of salt into each bottle.
  2. Pour same quantity of water into each bottle.
  3. Cover one and shake for a minute, then return it to the desk.
  4. Look at both of them after a few minutes. What do you observe? Give reasons for what you see.

### **Investigate Further:**

Things you need

- water hot and cold
  - sugar
  - two bottles with covers
1. Half-fill one bottle with one pint hot water and the other with one pint cold water.
  2. Label the bottles A and B.
  3. Put the same amount of sugar in each and leave them for three minutes.
  4. Cover the bottles. In which bottle has the sugar dissolved faster?

You would have noticed that solids dissolve faster in liquids in different ways. Breaking ice into small pieces helps it to melt faster. Shaking or stirring a liquid helps the dissolved particles to spread throughout the liquid at faster rate. Heating, too, makes a solid dissolve faster in liquids. Have you ever made drink with cold water? What happened to the sugar? Sugar dissolves slowly under cold conditions. When making hot tea do you notice that the sugar dissolves very quickly? Heat speeds up the rate at which solids dissolve in liquids.

You have discovered that when sugar is mixed with water it dissolves and forms a solution. Let us find out more about solutions.

### **Investigate Further:**

Things you need

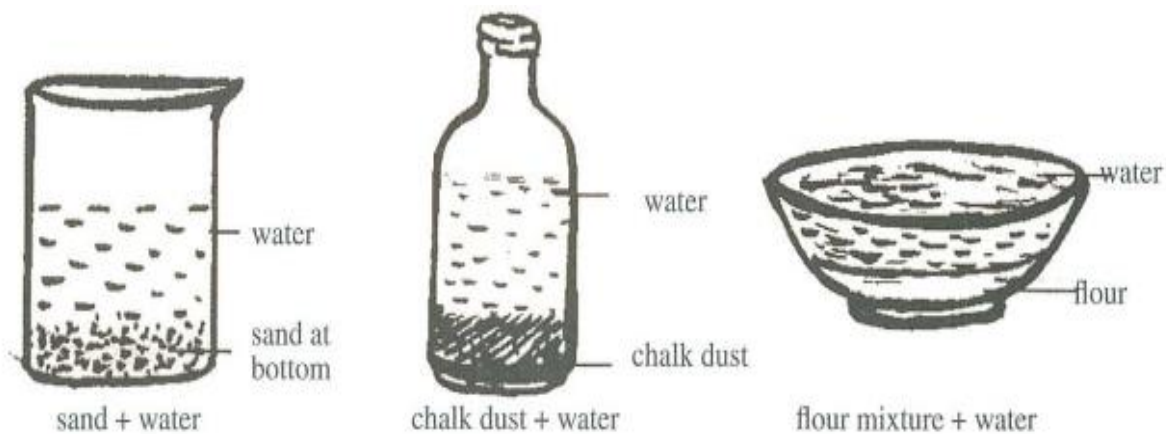
- water
  - container
  - sugar
1. Half fill a container with water.
  2. Add a pinch of sugar and stir. Observe what happens.
  3. Add more sugar and continue to stir. Look at it again and say what happens.
  4. Continue to add more and more sugar until all is used up.
  5. Leave it for a while. What have you noticed?

When as much solute as possible is dissolved in a certain amount of solvent, we say that the solution is **saturated**. What has happened to the sugar and the water you have stirred together?

You have made a saturated solution. If some of the liquid in a saturated solution evaporates, the remaining liquid is left with more solute than it can dissolve. Crystals are then formed at the bottom.

## SUSPENSIONS

In some liquids the solid particles do not dissolve totally, and can be seen with the naked eye. These liquids are called **suspensions** as the particles are not evenly distributed throughout the liquid. Chalk and Milk of Magnesia form suspensions in water. After a while the solid particles settle near to the bottom of the container.



## SEPARATING MIXTURES

When salt and water are mixed together a solution is formed. The salt disappears. It dissolves in the liquid. The water becomes salty. Can we get back the salt? Can we get back the water?

### **Investigate Further:**

Things you need

- salt
- water
- heat source
- metal container

1. Pour some water into the container.
2. Put in some salt and stir the liquid. What have you made?
3. Put the mixture into the metal container and cover it.
4. Rest it on the heat source and observe what happens.

### **Evaporation**

In mixtures, the individual substances can be separated.

You have just separated salt and water. The process used is called evaporation. Evaporation can be used to separate the components of a solution. When the solution is heated, the solvent turns

into a vapour and is lost to the atmosphere. The solute remains in the dish. This occurs freely at a specific temperature called the boiling point of liquid. If you take a solution of salt and water and evaporate it, the water boils off leaving the salt. Evaporating is one method used to separate mixtures.

Look at the diagram below. This is how evaporating can be done.



## Filtration

How would you separate a mixture of sand and water or some liquid blue and rice grains? These mixtures are separated by filtering. When mixtures are filtered, the solids remain on the filter paper and the liquids pass through the filter. Filtering will not remove dissolved material. The solid part left is called the **residue** and the liquid part is the **filtrate**. Which is the residue and which is the filtrate below?



**Filtration:** is used to separate any un-dissolved solid from a solution or from a solvent (like a suspension). Remember the sand and salt mixture? If you added water and dissolve the salt you can separate the sand by filtration. Some mixtures have to be filtered and evaporated in order to get back all the substances. Name substances like these.

We can use other methods to separate different kinds of mixtures.

**Some of these methods are:**

**Sieving-** a device with meshes through which finer particles of a mixture (as of ashes, flour) of various sizes may be passed to separate them from coarser ones, through which the liquid may be drained from liquid-containing material.

**Hand picking-**this method involves separating materials one from the other by just using the hands. Peas and rice can be separated this way. (include images of method)

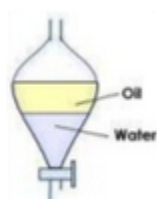
**Decanting-** this method of separation mostly include a solid and a liquid. Pebbles and water is an example of this method.(include images of method)



**Crystallization-** Crystallization is the process where crystals are formed from the evaporation of a solution. Leave a jar of water saturated with sugar or salt in the open. Examine the jar when the water has evaporated. Touch the solid particles seen. How does it feel? These solid particles are called crystals.

**Distillation-** distillation is a method used for separating mixtures based on differences in the conditions to change the components of the mixture. Distillation can be used to separate liquids which have different boiling points e.g. ethanol and water.

**Floatation-** floatation is a technique used to separate a substance with a different density to that of the other substance e.g. oil and water. Oil and water can be placed in a separating funnel and separated. Oil is less dense than water and as such it floats on water. The water is let out at the bottom of the separating funnel and the oil remains inside.



**Magnetism-** magnets can be used to separate some substances. Iron filings and sand is an example of this method of separation.

**Chromatography-** is a method which is used to separate mixtures like dyes in an ink. The dyes must be soluble in the solvent that is used. Common solvents include water, alcohol and acetone (also used as nail polish remover).

The dyes in the ink are soluble in the solvent and as the solvent soaks up the paper it carries the dye with it. The most soluble dye travels the up the paper. The ink separates into individual dyes used to make it, producing coloured patterns on the paper. This is known as a 'chromatogram'.

Chromatography as a separation technique allows solution or mixture to seep through an adsorbent so each compound becomes adsorbed into a separate layer

### **Sedimentation-**

How would you separate a mixture of sand and salt? Can it be done? How? Add water to the mixture of sand and salt and filter it. You will see that the sand remains on the filter paper while the salt solution goes into the bottle. Evaporate the solution and you will get back the salt. There are mixtures which are separated in this way. Think about them.

If some iron filings get into some sugar by accident, what would you do to get them out?

**Mixtures:** Matters can be divided into pure substances and mixtures. A pure substance can be an element or a compound which is made up of one substance only. For example common salt sodium chloride. It is pure if there are no impurities in it (like sand or dirt, or other chemicals such as potassium chloride). However, if you add some sand to it, you will have a mixture. Think about how you can separate the sand and salt to get them back in the pure state.

Mixtures can homogenous, which is a big word meaning the same throughout. For example Kool-Aid- drink – the first glass taste the same as the same as the last, so it must be the same throughout. But mixtures can also be heterogeneous, which means not the same throughout. For

example if you leave pure orange juice pulp in it in the fridge, the pulp will settle to the bottom and will not be the same throughout the juice.

This also includes mechanical mixtures such as the sand and salt from above.

**Solutions:** are mixtures of a solid called the solute which is completely dissolved in a liquid called the solvent.

The solute may also be a liquid or gas. Shandy and Green Sands contains small amounts of ethanol dissolved in water; ethanol is an alcohol which is liquid. Soft drinks have carbon dioxide gas dissolved in them – you always see the bubbles when you open drink.

**Suspensions:** are mixtures of finely divided insoluble solid with a liquid. The solid particles dispersed throughout the liquid. Suspensions therefore look cloudy, and the solid particles settle if left undisturbed. The suspension must be stirred or shaken to distribute the particles. Orange juice and some medications are suspensions. If you mix chalk dust and water and leave it, the chalk dust eventually settle to the bottom of the container.

Many milk drinks and other mixed drinks are suspensions.

**Colloids:** are mixtures which have characteristics that are between a solution and a suspension. The particles of a colloid are larger than those in a solution and a suspension. The particles of a colloid are larger than those in a solution but smaller than the ones in a suspension. Common examples of colloids are in suspension. Common examples of colloids are inks, glues, gels, paints, whipped cream, salad dressing and soap suds.

**Separation:** when we have a mixture we may want to get the substances back in pure state.

There are several techniques which can be used to do this included chromatography, filtration, evaporation and distillation.

Separation funnels and magnets can also be used.

### **Investigate Further:**

Things you need

- sugar
- iron filings
- filter paper
- funnel
- bottle
- container

1. Mix the iron filings with the sugar,
2. Pass a magnet over the mixture and observe what happens. Suggest reasons why it happens.
3. Remove the iron filings from the magnet and add it to the sugar again and mix them together.
4. Add some water to the mixture and stir it.
5. Filter and observe what happens. Discuss your observations.

## SUMMARY

- Mixtures undergo physical changes.
- Mixtures may be solutions or suspensions.
- When a substance completely dissolves in another, a solution is formed.
- When no more of the solute will dissolve the solution is called
- A saturated solution.
- Some mixtures are called suspensions.
- In suspensions solids do not completely dissolve, they settle at the bottom.
- Separation of mixtures can be done by evaporating, filtering or using a magnet.

### Let's Review:

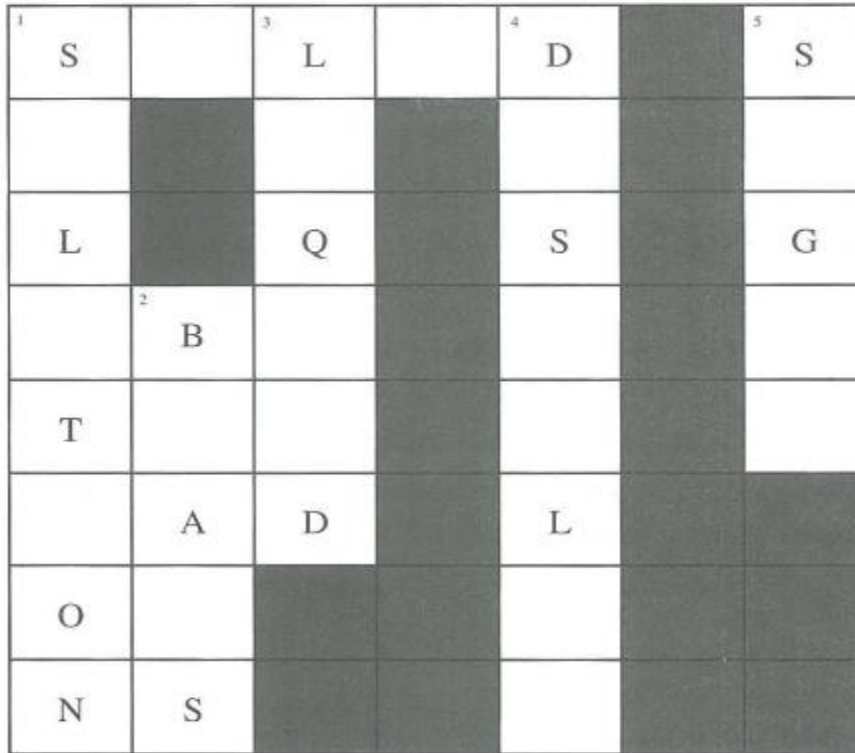
1. Complete these sentences.
2. When sugar is put into water it \_\_\_\_\_
3. A solid solution is \_\_\_\_\_
4. Mixtures undergo \_\_\_\_\_ changes.
5. A magnet can be used to separate a mixture of sugar and \_\_\_\_\_
6. Filtering can separate a mixture of water and \_\_\_\_\_

(sand, sugar)

7. Which two substances form a solution?

flour   water   salt

8. Which is the solvent in a salt solution?



Across

1. In what state is brick?

Down

1. A mixture of a solute and a solvent.
2. It is formed from a mixture of zinc and copper.
3. Its shape is not fixed.
4. Solutes are substances which can
5. It is in crystal form.

## CHAPTER 7 OUR NEAREST NEIGHBOUR IN SPACE

Let's look at the moon.

Read this poem.

Our Moon

It glimmers in the velvet sky

It shines some nights, I know not why

It comes and goes as it may please

Just like the wandering wind or breeze.

That silver moon hides some of its light

And only the stars shine on those nights

That moon belongs to Earth, I think,

I wonder, is it made of glass or zinc?

"Where does it go?" we ask those older

"Beyond," they say, and "hither and thither"



It traverses the sky from east to west

Only the moon knows these things best!

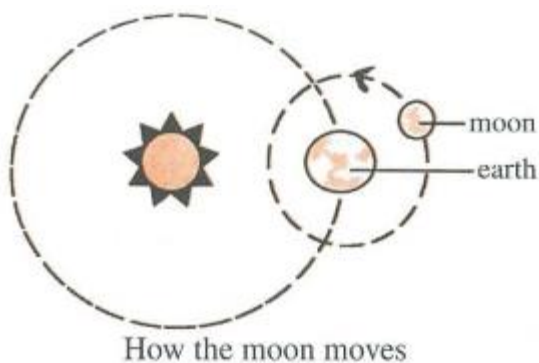
J. Cumberbatch

What fascinates you most about the moon? Where does the moon go when we do not see it?

Do people in Trinidad see the same moon that we in Guyana see?

You must have looked into the sky and seen our moon. It is very beautiful, especially when it is big and round. For many many years scientists have been interested in the moon. They have been studying it for a very long. These special scientists are called astronomers. Some of them have even visited the moon. Since the year, 1959, astronauts from the United States of America and from Russia have been visiting the moon. Thus our knowledge of the moon has increased over the years.

Earth has only one moon. This moon is also known as a satellite. Satellites are heavenly objects which go around planets.



The moon travels anti-clockwise around the earth.

The moon goes around the earth as the earth itself revolves around the sun. Our moon is a natural satellite. Those satellites made by humans, and put into orbit around the earth, are man-made, or

artificial satellites. These artificial satellites are machines launched into space over the past few



decades by several countries. These man-made satellites do not carry people. They vary in shape, size and friction. They do all sorts of jobs.

They may be used:

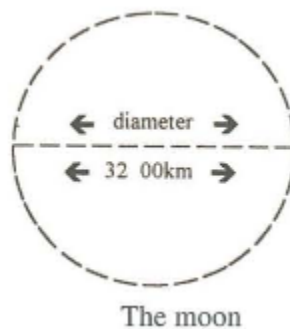
- i. To find out more about the weather
- ii. For better communication,
- iii. For navigation,
- iv. For scientific investigation and
- v. For military purposes



## A CLOSER LOOK AT OUR MOON

The moon is our closest neighbour in space.

It is spherical just like the sun and its planets. It is 3200 km in diameter and is approximately 384 000 km away from Earth.



Look at the moon. What do you see? Some people say that they see a man in the moon, some say that they see spots and so on. On the moon there are mountains, valleys, seas and craters.

(The seas are really plains of rock and dust and the craters are large holes.) So we see that the moon is not as smooth as it may appear to us on earth.

No water nor air can be found on the moon. Do you think that it would be easy for people to chat or to light a fire there? Can plants and animals live on the moon? No life can exist on the moon as there is no water nor air there. What do you think temperatures taken there would be?

On the moon there is not much gravity. The gravity on the moon is  $\frac{1}{6}$  of the gravity on the earth.

It therefore means that if you weigh 240 N on Earth, you will be  $\frac{1}{6}$  of 240 N on the moon. What is  $\frac{1}{6}$  of 240 N? That is light. Light objects would float around on the moon. A person would be able to jump very long distances there, too. There is not as much gravity on the moon to pull you down as soon as you jump.

### **Light on the Moon**

From what does the moon get its light? Does it have a lighting plant or any such system? The moon really gets its light from the sun. So the moonlight that we see at night is really reflected sunlight. The light bounces off the moon and shines on the earth.

Only half of the surface of the moon is seen by the earth. The moon orbits the earth showing one side only. We see only the lighted parts of the moon.

The moon orbits the earth once in approximately 29 days.

The moon makes a complete orbit in about 28 days (a lunar month).

### Investigate Further:

1. Look at the moon each night for about four weeks.
2. Record the time you looked and the shape of the moon each night.
3. Observe and record its position in the sky. The table below will help you.

Day	Time of Observation	Shape	Where in the sky
1	e.g. 7 p.m.	e.g.e	e.g. high up in the sky
3			
4			
5			
6			

Do you know the answers to these questions?

- I. In what direction does the moon move across the sky?
- II. Does the moon really move across the sky?
- III. Does the moon rise at the same time each day?

The moon orbits the earth once in approximately 29 1/2 days.

Sometimes the entire lighted half of the moon is seen. Sometimes smaller portions are seen and sometimes no part is seen at all. Indeed the moon seems to change its shape.

The different parts of the moon that are seen vary from night to night. It is these different portions of light that are referred to as the phases of the moon.

The moon phases begin with the new moon which we cannot see in the night sky. The next phase is the crescent when only a small part of the moon is visible. The half-moon appears next. As the moon is getting fuller, the phase is called gibbous. When the whole moon is seen it is called full moon. The phases that follow show the moon beginning to get smaller and so goes through the gibbous, half-moon and crescent stages again until the new moon phase is entered once more.

**Let's investigate as we explore:**

Things you need

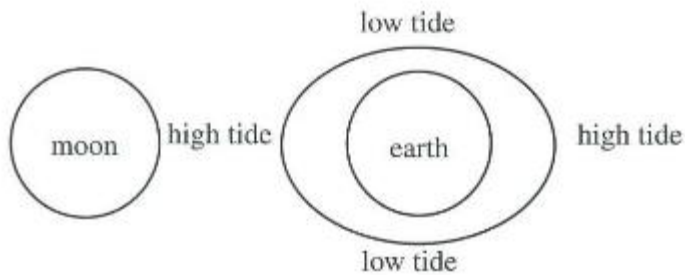
- an old calendar
  - a pair of scissors
1. Cut out the different shapes (phases) of the moon from a calendar.
  2. Paste them into your science book.
  3. Label them to indicate what they are.

The moon's cycle begins with the new moon phase. Different names are given to the different phases of the moon. When there is a new moon, the moon is not seen. The lighted portion is not facing the earth. More and more of the lighted portions of the moon are seen gradually until the full moon is seen. You see all of the lighted side of the moon at full moon, then gradually less and less of the lighted portion is seen. The phases repeat themselves again and again.

## THE MOON AND THE TIDES

The gravity of the sun and the moon influences both the liquid and solid parts of the earth. Why does the gravity of the moon influence the earth more than that of the sun?

As the moon revolves the earth, it acts on the waters facing it. The waters are pulled towards the moon, causing high tides there.



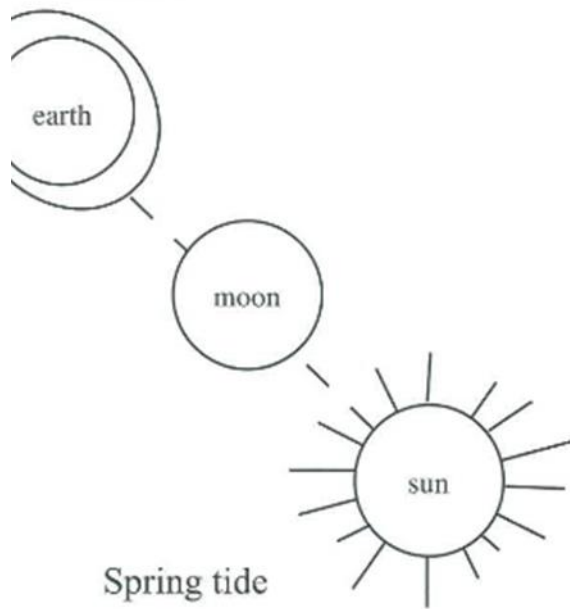
Because the gravity of the moon affects the solid part of the earth too, the earth is pulled slightly towards the moon also. This causes high tides on the opposite side, too. Look at the diagram, and you

will see that there are high tides on two opposite sides of the earth.

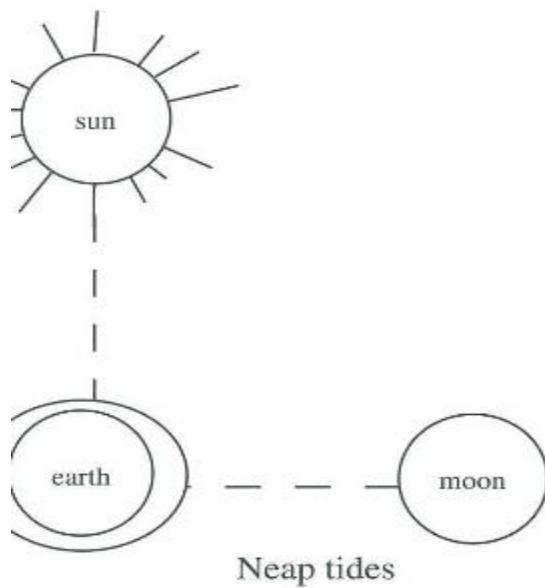
What kind of tide do you think would be on the other two sides?

Around the earth from place to place, high tide is followed by low tide as the earth rotates. Every 24 hours every place experiences high tides twice and low tides twice.

When the moon and the sun are in a straight line with the earth a very high tide is experienced. This is called spring tide.



Sometimes the moon as seen from the earth, is  $90^\circ$  to the sun. Because the gravity of both the sun and the moon are acting on the earth, there is not much difference between the high and low tides of the earth. The tides are almost uniform around the earth and are known as neap tides.



Knowledge of the tides is of great practical importance to mariners and fishermen. What other kinds of people benefit from knowledge of the tides? Very often in the newspapers, on the radio and on the television, there are reports and forecasts about the tides.

## SUMMARY

- Earth has only one moon. It is our closest neighbor in space.
- Astronomers are scientists who study the moon.
- Satellites are heavenly objects which go around planets.
- The moon travels around the Earth in an anticlockwise direction. It takes approximately 29 1/2 days to do so.
- The moon is approximately 384000 km away from the Earth.
- On the moon are mountains, valley, seas and craters.
- No water nor air can be found on the moon.
- Objects on the moon weigh 1/6 of what they would weigh on the Earth.
- We see only the lighted portions of the moon, thus we get moon phases.
- The moon and sun affect the tides

### Let's Review:

1. Write True or False
  - (a) Earth has three moons.
  - (b) Some people live on the moon.
  - (c) The moon always has the same shape.
  - (d) Both the sun and the moon affect the tides.
  - (e) The moon gives off its own light.



2. Pretend that you were on a visit to the moon.

Write a short story about how you felt, what you did and your experiences there.

3. Artificial satellites are not really used.

- (a) in weather forecasts.
- (b) for better communication.
- (c) for mathematical calculations.
- (d) for scientific investigation.
- (e) for military purposes.

4. The moon is shaped like a/an

- (a) egg
- (b) sphere
- (c) sickle
- (d) boat
- (e) circle

5. The craters on the moon are really large

- (a) spots
- (b) seas

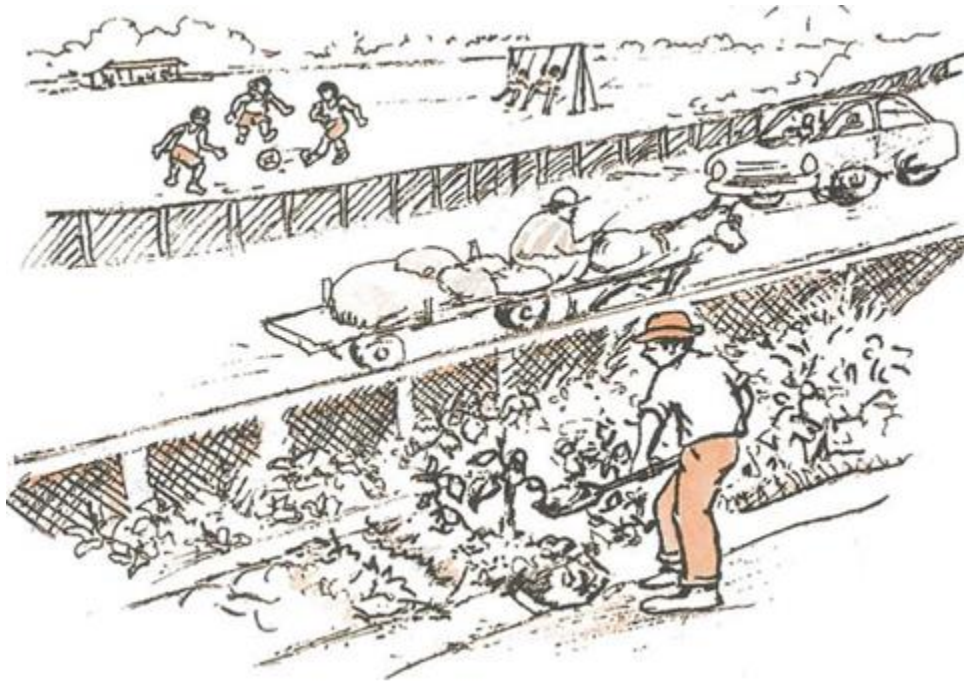
- (c) holes
- (d) rocks
- (e) mountains

6. If John weighs 42 kg on Earth, on the Moon he would weigh            kg.

- (a) 6
- (b) 7
- (c) 36
- (d) 42
- (e) 48

7. Explain why it would be really difficult to light a fire on the moon.

## CHAPTER 8 ENERGY AROUND US



### WHAT IS ENERGY?

Look at the picture above. Talk about what is happening in the playground, road and garden.

Persons are working, playing, running and walking. All these activities require energy. Energy is the ability to do work. Plants also need energy to grow. Where does energy come from?

## SOURCES OF ENERGY

The main source of energy is the sun. Millions of years ago giant plants and large forests were buried under the earth during earth-quakes. These plants were changed to food by the heat of the sun. Today we have radios, watches, calculators and many other equipment which use the sun's direct energy. We call this Solar Energy.

With the study of science and the increase of knowledge, man has learnt to harness the forces of nature to do work. Look at the picture below and identify how wind is used as a source of energy.



**A source of Energy**

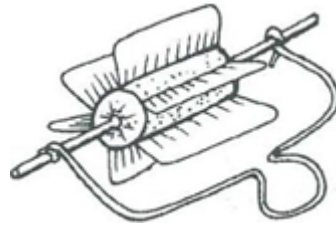
Running water is also another source of energy.

### Investigate Further:

You can make a model water wheel.

Things you need

- cork or empty thread spool
- cycle spoke
- pliers
- stiff wire
- water from a tap
- card



1. Use stiff wire to make a stand for water wheel as shown in diagram.
2. Push the spoke through thread spool or cork.
3. Cut 6 pieces of cardboard about 3 cm by 4 cm.
4. Cut slots in the spool or cork.
5. Fasten cards into slots made on spool or cork.
6. Mount wheel on stand.
7. Place wheel under a running stream of tap water and observe what happens.

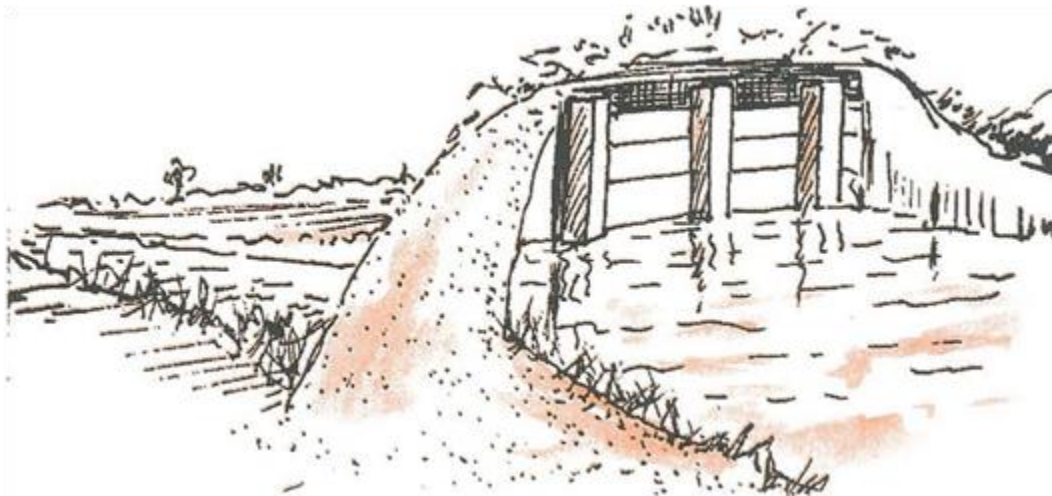
Another source of energy is fuel which comes from plants. These are coal, oil and gas. Today scientists have made great progress and are now using "Atomic Energy" to work ships and steam engines.



## TWO KINDS OF ENERGY

Basically there are two kinds of energy, potential and kinetic.

**Potential energy** is found in a body because of its position. When water is stored above a dam it has potential energy. Look at the diagram below which illustrates this.



Also if a clock spring is wound it has potential energy.

**Kinetic energy** is found in any moving body. When the water above the dam is released and starts to move it will do work. The water from the tap that turns the water wheel also has kinetic energy. Potential energy can be converted to kinetic energy.

## SEVERAL FORMS OF ENERGY

Energy also exists in several forms. From the sun we obtain **light energy** and heat energy. When fuel such as diesel is used to enable engines to work, there are several forms of energy in use. The energy from the fuel is called **chemical energy**. The energy used to turn the wheels of the engine is called **mechanical energy**. While the engine is in use the heat given off is **heat energy**. The engine turning the generator produces current which is **electrical energy**. Here we have chemical energy being changed to mechanical energy and eventually to electrical energy.

The generator supplies electricity which can light bulbs, heat irons, turn motors and many other things. One form of energy can be therefore converted to another. Can you list the forms of energy present when a man is riding a bicycle with its generator on?



## ENERGY USED IN THE HOME

We need a lot of energy to do the work in the home. Energy is need for cooking, lighting, washing, sewing, ironing and for the television and radio. Make a chart like the one below. Try to find out where the energy comes from

Work	Energy supplied by
Lighting	Fuel, electricity
Cooking	
Washing	
Sewing	
Television	
Radio	
Ironing	



## ENERGY CONSERVATION

Most of the energy used for our daily activities comes from fossil fuels. Can you remember what they are? Fossil fuels were formed millions of years ago.

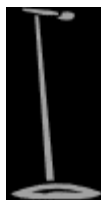
They are being used up and not replaced.

Scientists have been searching for new sources of energy. So far, Solar and nuclear energy have been discovered. These are very expensive to produce. It is therefore necessary to use the limited amount we have wisely. Discuss ways to prevent wastage of our limited resources of energy.

## SOUND

Sound is a form of energy. Sounds are made or produced as things move back and forth or vibrate.

We can sometimes see and feel these vibrations.



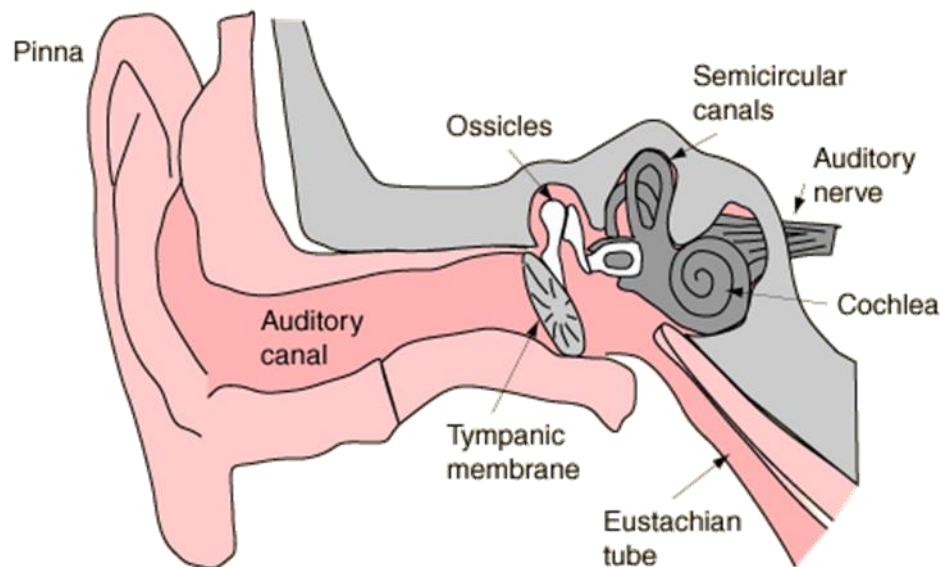
## HOW SOUND TRAVELS?

Sound travels from the source, through a medium to the receiver. The source is where the sound is produced. The medium may be a solid, liquid or gas. Air is the most common medium. The receiver is the person or thing that receives the sound, for example, the ears of animals. Sound travels in all directions; out to the side, down and up. Sound travels better and faster through solids and liquids than through the air

Sound can be hard, soft, high or low.

---

### ORGAN OF SOUND-THE EAR



We hear sounds with our ears. Sound vibrations are collected by our ear-flaps and pass along the ear canal. These vibrations make the thin skin-like ear drum vibrate. The vibrations pass through the rest of the ear, that is, the middle ear to the inner ear, and messages are sent by nerves to the brain. The brain interprets the vibrations as sounds. All this happens very, very quickly.

## Care of the ear

The ear and its parts are important. We must take great care of them.

The following guidelines will help us.

1. Never push things in our ears as this can damage the ear drum and lead to deafness.
2. Hairs in the ear keep out dirt. The outer end of the ear canal can be cleaned by an oiled cotton swab or 'q-tip'.
3. Wax is produced in the ear canal to clean and moisten it. Excess wax can cause partial deafness or 'buzzing' in the ear and should be removed by a doctor or nurse.
4. Avoid too loud sounds as they can damage the ear drum and lead to deafness.

## HOW WE SEE

The eye is shaped like a ball. Light comes into the eye from an object. Without light we cannot see. The light passes through the part of the eye called the pupil. The light is focused by the lens onto the back of the eye to form an image. This image causes messages to be sent along a nerve to the brain. The brain interprets the messages and we see the object we are looking at.

## Care of the eyes

Our eyes are very important. In taking care of them we should do the following:

1. Never push things into the eye.
2. Never rub eyes with hands.
3. In very bright light, protect eyes with sunglasses.

4. Wash eyes with clean water.
5. If you cannot see things clearly, have the doctor test your eyes.
6. If you need to wear spectacles, then wear them.
7. If eyes are red and itchy, go to the clinic or doctor.
8. Do not strain eyes by working in dim light.
9. Do not look at welding flashes or the sun.

#### Light travels faster than sound

Light travels faster than sound. For example, we would see the light of an approaching vehicle before we hear the sound of its engine. Also, we would see lightning before we hear the thunder.

At the beginning of a race, we see the flame of the starter's pistol before we hear its sound. Also, if the starter blows a whistle and waves a flag at the same time, we see the flag waved before we hear the whistle.

## SUMMARY

- Energy is the ability to do work
- The sun, water, wind and fuel are all sources of energy
- Coal, oil and gas are fossil fuels.
- Fossil fuel is being used up and not replaced.
- There are two kinds of energy - kinetic and potential.
- Energy can be in many forms - electrical, chemical, heat, light and mechanical.
- Energy should be conserved because the fossil fuels being used are limited.
- Energy is neither created nor destroyed.
- Atomic and solar energy are expensive to produce.

### Let's Review:

#### Word search

Find these words below: work, energy, form, solar, water, fuel, kinetic, potential, heat, oil, chemical

s	o	l	a	r	f	f	o	p
r	a	l	o	s	o	l	i	o
w	k	r	o	w	r	i	f	t
a	i	r	o	w	m	g	o	e
t	n	w	o	r	n	h	g	n
e	n	e	r	g	y	t	y	t
r	t	a	e	h	e	t	a	i
e	i	g	t	f	u	e	l	a
t	c	h	e	m	i	c	a	l

1. What kind of energy does
  - (a) the wound spring of a watch have?
  - (b) a man on the top of a mountain have?
2. What kind of energy is involved when
  - (a) a torch is lighted?
  - (b) a bell is rung?
3. How can we conserve energy in the home?

## CHAPTER 9 MEASURING FORCES

Forces are measured by force measurers or spring balances and are expressed in Newtons (N).

However, it is more common to have scales and balances that measure mass.

### CONVERSION OF MASS TO FORCE

Measured mass can be converted to force (weight).

A mass of 1 kilogram (kg) exerts a force of 10 Newtons (N).

Thus  $1 \text{ kg} = 10 \text{ N}$ .

## CHAPTER 10 FRICTION

### WHAT IS FRICTION?

Push a book on the surface of a desk. You can see that it moves and then finally stops. What causes it to stop? Take two pieces of board with smooth polished surfaces and slide them over each other. What happens? Take two pieces of sand paper and rub them against each other. Do they move easily? What prevents them from doing so? Friction is that force that can hold back objects with rough surfaces when they are rubbed against each other.

### WHAT CAUSES FRICTION?

1. When you stroke a smooth object, there is little friction. A lot of friction is experienced when you stroke something that is rough.
2. Friction occurs when rough surfaces are rubbed against each other.

#### **Effects of increasing and decreasing forces**

Forces (pushes, pulls, twists and turns) make things go. An increase in forces can cause an increase in motion. Similarly, a decrease in forces would result in reduced motion and the body may even stop or come to rest.

#### **The effects of friction**

Whenever one object moves over another, friction tends to resist or stop the movement. On a polished floor there is very little friction and so an object will move quickly along it and take



longer before it stops. Friction will increase or decrease according to the roughness or smoothness of the objects. On a gravel road there is a lot of friction and an object will move along it slowly and stop more quickly due to friction. Friction can be reduced by polishing the surfaces, oiling or greasing and using rollers or ball bearings. Friction is a very common force and it also helps in movement without slipping or sliding. For example, frictions between tyres and the road and of our footwear and the road or floor enable movement of a vehicle and walking or running respectively. Friction of the brakes on a wheel enables stopping of a vehicle

### **Investigate Further:**

Things you need

- smooth, polished pieces of wood
- rough pieces of wood
- hand lens

1. Rub the polished pieces of board together and observe what happens.
2. Do the same with the rough pieces. Which is harder to do? Why?

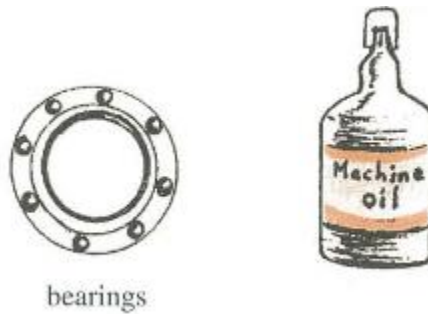
Now take the hand lens and observe the surfaces of both pieces of board. What do you notice?

Is there any difference between them?

Rub your hands together. Do you feel the heat? The heat is caused by friction. Use a pump to put air into your cycle wheel, or inflate a balloon with a balloon pump. Do you feel the heat again?

Friction produces heat.

We can see, then, that friction can be overcome or reduced by using polished surfaces, using rollers, balls and grease or oil. Here are some examples of objects that are used to overcome friction in everyday life.



## THE ADVANTAGES AND DISADVANTAGES OF FRICTION

Have you ever tried walking on a polished floor with a new pair of shoes? Have you ever tried to walk on a slippery surface? If you try you must be careful or you may slide. Friction therefore helps us to walk. It helps vehicles with tyres to move and even stop. Remember it is the force that holds back two objects rubbing against each other.

On the other hand because of friction our shoes and the tyres of vehicles get worn. Remember that friction also produces heat.

Do you remember what happened when you rubbed your hands together and when you used the pump? When parts of machines rub against each other they get hot and expand. Parts would get tight and press harder against each other. This would cause the parts to become worn and damaged.

There is friction when a match is rubbed against the dark rough side of a matchbox. The friction causes heat which sets fire to the match.

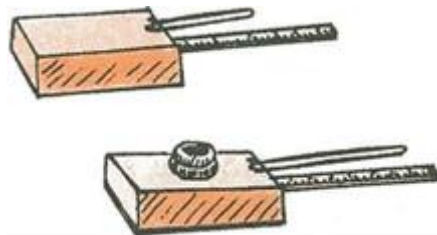
We have seen that rubbing surfaces together can cause friction.

Friction is also caused by the weight of an object pressing against a surface

### **Investigate Further:**

Things you need

- a ruler
- weights
- a block of wood nail
- rubber band



1. Fix nail and rubber band to blocks of wood as shown in diagram.
2. Record the length of rubber when the wooden block alone is moved.
3. Record the length of the rubber band when the weight is added.

Which block took more force to move? Explain why this was so.

You would have noticed that the block that had the weight took more force to move. This was because the friction was greater. It was greater because the two surfaces were pressed harder against each other because of the heavier weight. Would a block of the same weight but harder surface have more friction? Try to find out.

## OVERCOMING FRICTION

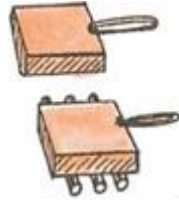
Let us find out how we can overcome friction

### **Investigate Further:**

Things you need

- a smooth table
- polished and rough pieces of wood (block) of the same size.
- rubber band
- ruler
- oil
- grease
- nail
- round pencils

1. Affix a rubber band onto a wooden block as shown in diagram.



2. Pull rough wooden block on surface of table and when it starts to move measure the length of the rubber band.
3. Repeat no.2 with polished pieces of wooden block. Which takes more effort or force to move? Does the polished surface reduce friction?
4. Use the rough block and measure the length of the rubber band when it starts to move.
5. Place about three round pencils under the rough wooden block and record the length of the rubber band as it starts to move. Which block takes less force to move? Why?
6. Use the polished block to find out the length of the rubber band as it starts to move.

## SUMMARY

- Friction occurs when two rough surfaces are rubbed together. It is the force that holds the objects back.
- Friction will decrease or increase according to the roughness or smoothness of the objects.
- Increased weight of objects pressing each other can increase friction.
- Friction can be overcome by polishing surfaces, oiling or greasing and using rollers or ball bearings.
- Friction helps in movement.
- Friction can wear away parts of engines and our shoes too.

### Let's Review:

Answer the questions in complete sentences.

1. Why do our shoes and the tyres of vehicles wear away?
2. Why do we oil our cycles and machines?
3. Why do smooth surfaces rubbing together result in less friction?
4. If there are two pieces of smooth blocks, one weighing 6 kg and the other, 3 kg, which will have more friction when rubbed over the same surface?
5. Which will produce less friction - a newspaper or a clean concrete floor?

## CHAPTER 11 FLOWERS AND REPRODUCTION

### THE FLOWER

Flowers are very important to flowering plants. They enable plants to produce new plants.

Flowers are the reproductive part of the plant.

Take a walk around your neighbourhood. Observe the many flowers. Note the different colours.

Why do you think these flowers are brightly coloured?

Some plants can be recognized by its flower. Some flowers grow singly while some grow so closely that the many flowers look like one. Such flowers are called composite flower.



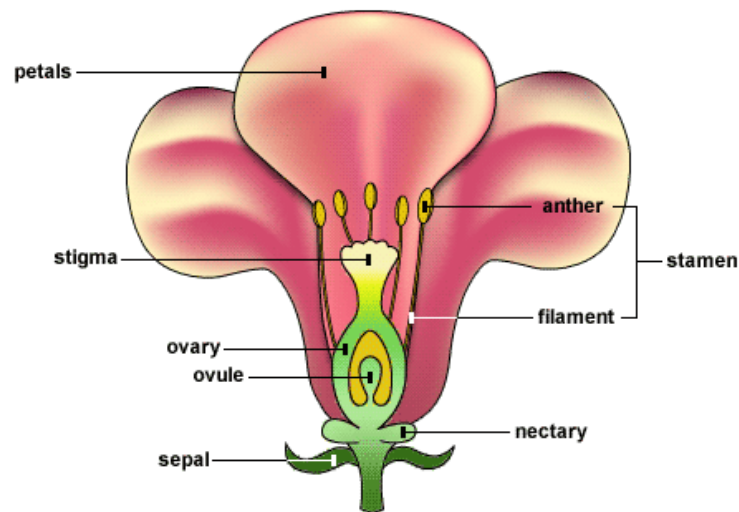
Flowers are very important to plants. They are the reproductive organs of flowering plants. In fact every flower is equipped with parts that take part in the production of fruits and seeds.

## A simple flower

Do you know the different parts that make up a simple flower?

Each flower is attached to the stem by a flower stalk. Flowers may occur singly each with its own flower stalk or they may appear in clusters to form an inflorescence.

Let's look at the parts of the flower below.



**Diagram of a flower**

### Investigate Further:

1. Collect a few flowers.
2. Observe them carefully and find the parts named below.
3. Choose one flower from your set. Study the chosen flower.
4. Now answer the questions that follow.



How many petals does it have? Are the petals joined, fused or free?

How many sepals does your flower have? Are they fused together or free?

Can you find the receptacle? Is your flower stalk long or short?

What colour is it?

5. Draw your flower and label the stalk, receptacle, petals and sepals.

A flower usually has different parts; of which can be grouped as floral and reproductive.

These are:

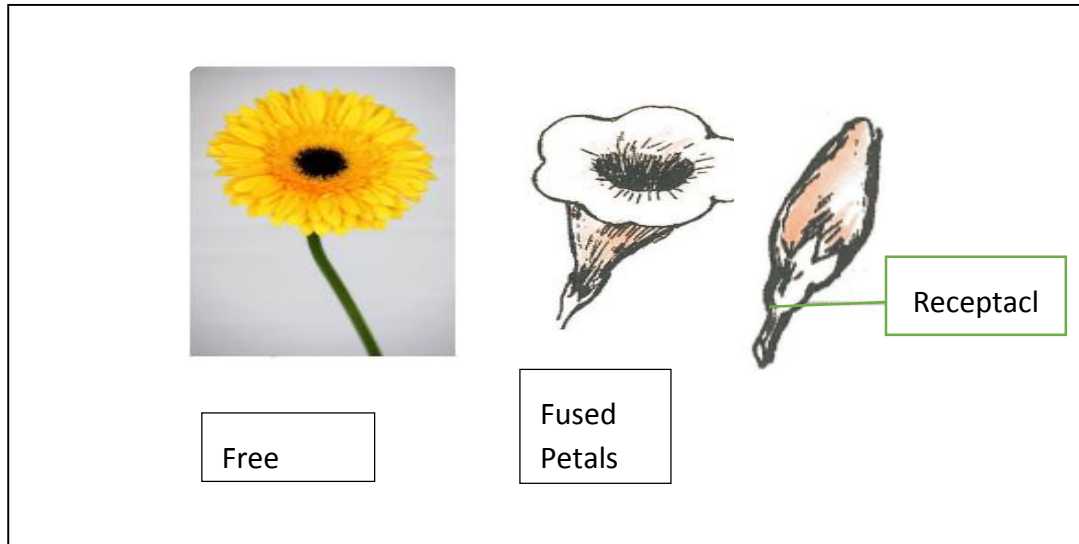
#### **Floral Parts**

- **The Receptacle:** The flower stalk is a long thin structure; of which one end connects the flower to the stem or branch and the other end which is thicker and spongy is called the receptacle. The main purpose of the receptacle is to serve as a base for the attachment of the floral parts.

Some receptacles are cup like in appearance.

- **The Sepals:** These are located at the lowest outermost part of the receptacle. They form a ring of small leaf-like structure that forms the outer support of the petals. Collectively sepals are known as calyx. Sepals may be free or joined to form a tube known as the calyx tube. It is these sepals that form the outer coat for an opened bud. Sepals protect the young floral parts inside while the flower is in the bud stage.
- **Petals:** The petals of a flower may be fused together or free. They are usually brightly coloured. Petals can be four, five or more in a flower. Petals which are brightly coloured or highly-scented attract insects and birds. Some petals are highly-scented while others

are not. Collectively petals are known as the corolla. These may be of varying shapes and sizes. The main purpose of petals is to attract birds and insects.

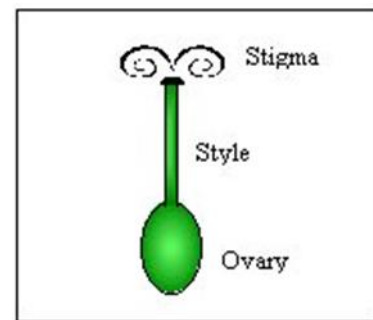
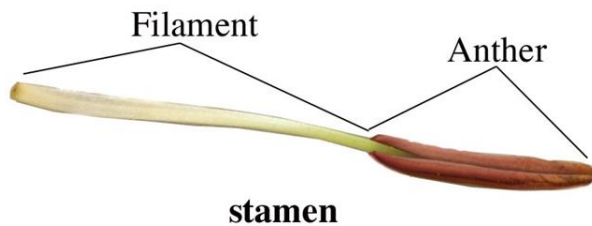


- **Stamens:** The stamens are rings of long, thin structures which lie just inside the petals. They are the male reproductive parts of the flower. There may be any number of stamens in a flower—from three to more than twenty. Each stamen is made up of two parts; a stalk like structure named the filament, and the **anther** at the tip of the filament. Different kinds of flowers have different types of stamens. In most stamens, the filaments are usually green, long, and slender. Their job is to hold up the anthers. Sometimes the filaments are very short or absent. When they are absent, the anthers are attached directly to the petals. The anthers come in different shapes and sizes. The anthers may also be joined in different places to the filaments. Whatever an anther looks like, it is like a sac containing pollen grains. Most anthers are made up of four chambers which contain the pollen grains. These chambers are called **pollen sacs**. When the pollen grains are ripe enough to leave the anther, the pollen sacs

burst open. The pollen grains then fall out. Pollen grains are yellow in colour and look like very fine powder.

Each pollen grain is a very tiny yellow structure. The pollen grains of different flowers do not look alike. Some are large and others are small by comparison. They have different shapes too. Some pollen grains have a smooth outer covering while others have a spiny one.

**-Pistil:** The pistil is the structure which lies in the centre of the flower. It is the female reproductive part of the flower and consists of three parts: **ovary**, **style**, and **stigma**.



The ovary is at the lowest end of the pistil. Inside the ovary are the **ovules**. The ovary is the part of the flower which grows into a fruit, while the ovules become its seeds. Like anthers, ovaries are made up of chambers. Some ovaries have three chambers while others have only one.

Ovaries of different flowers contain different numbers of ovules in their chambers. Some ovaries have many ovules and others have only a few. There are ovaries which have only one ovule each.

Sometimes the ovules are joined to the centre of the ovaries and in other cases; they are joined to the walls. The ovules grow by receiving food through the walls of the ovary.

Above the ovary is a stalk, known as the style. Some styles are long and others are short. Some are curved while others are straight. Most flowers have one style leading out from the ovary, but there are a few which have more than one style. Both the style and the ovary are usually green.

**At the tip of the style lies one or more sticky stigmas.** Some flowers have one stigma while others have more. Some stigmas are rounded while others are long or branched. Some are hairy while others are smooth. Some are broad and flat while others may be very small and difficult to see. Many stigmas are yellow but a few are green or red. The stigmas receive pollen grains from the stamens.

### **Investigate Further:**

#### **To identify the reproductive parts of a flower**

#### **A**

- 1** Observe the male reproductive parts of the flower with a hand lens. Identify the filament and anther.
- 2** With the help of your teacher, cut the anther horizontally into half using a razor blade. Observe and identify the pollen grains with a hand lens.
- 3** Draw the male reproductive parts of the flower in your scrap book. Label the parts you have identified.

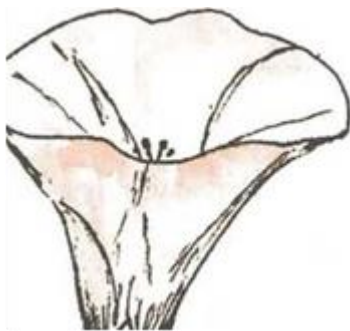
## B

**1** Observe the female reproductive parts of the flower with a hand lens. Identify the style and stigma.

**2** With the help of your teacher, cut the ovary into half-length wise using a razor blade. Observe and identify the ovule with a hand lens. Can you count how many ovules there are?

**3** Draw the female reproductive parts of the flower in your scrap book. Label the parts you have identified.

Let's look at other parts of the flower.



Look for other plants in your surroundings which have flowers with both male and female parts.

## MORE ABOUT FLOWERS

You have been looking at flowers which have the stamen and pistil on the **same flower**.

Some plants however bear both types of flowers - male flowers and female flowers.

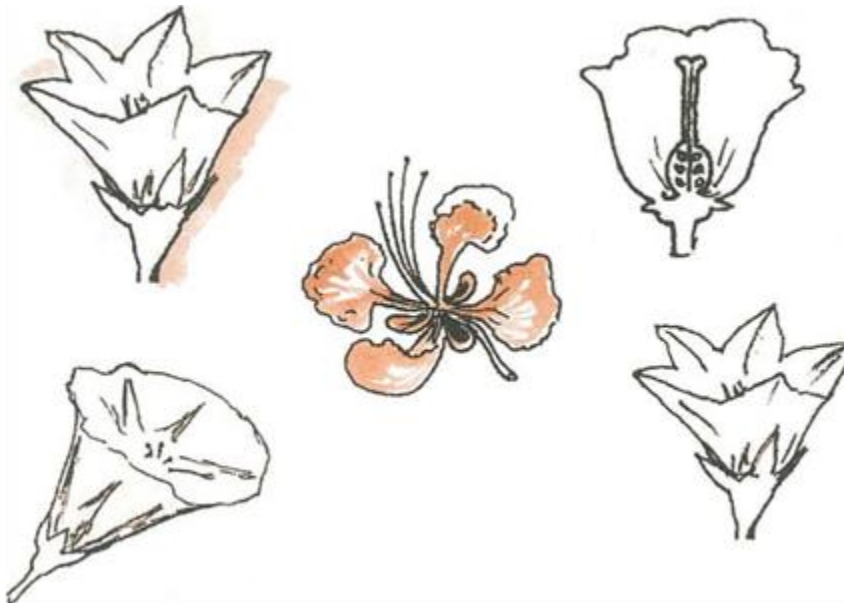
Look at some flowers. Can you tell which ones are male flowers and which ones are female flowers?

The filament and the anther make up the stamen. The stamen is the male reproductive part of the flower. A flower may have one stamen or more. The stamen is made up of the anther and filament. In the anther are sacs. Pollen grains are produced in these sacs. Most pollen grains are like yellow powder.

The stigma, style and ovary make up the **pistil**. The stigmas may be sticky or hairy to receive the pollen grains. The ovary may develop into a fruit while the ovules become seeds. In the ovary are found ovules

**Investigate Further:**

1. Collect at least two of these flowers.



2. Look for the stamen. How many stamens are there on each flower? Can you see the pollen grains?
3. Dust some onto a sheet of paper

4. Look for the stigmas. Has the flower one or more than one stigma?
5. Carefully cut each flower in half. Can you find the ovary and ovules?
6. Draw at least two of these half flowers in your Science book and name the parts of the flower.

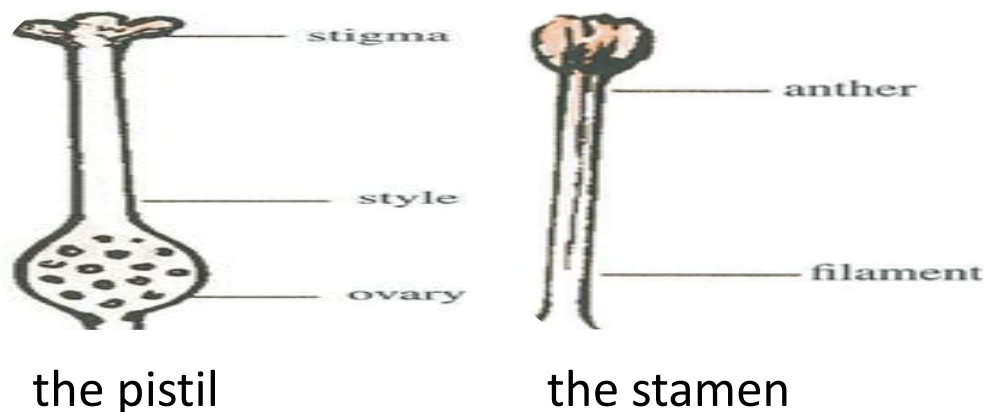
## FLOWERING PLANTS PRODUCE YOUNG ONES

All living things produce young ones of their kind.

This is called reproduction. Flowering plants bear flowers which may develop into fruits with seeds. From these seeds we may get new plants. The main function of the flower then, is to reproduce.

## POLLINATION

You already know that a flower has many parts and that each part has a special function. The pistil or female part and the stamen or male part are important in the process of reproduction.

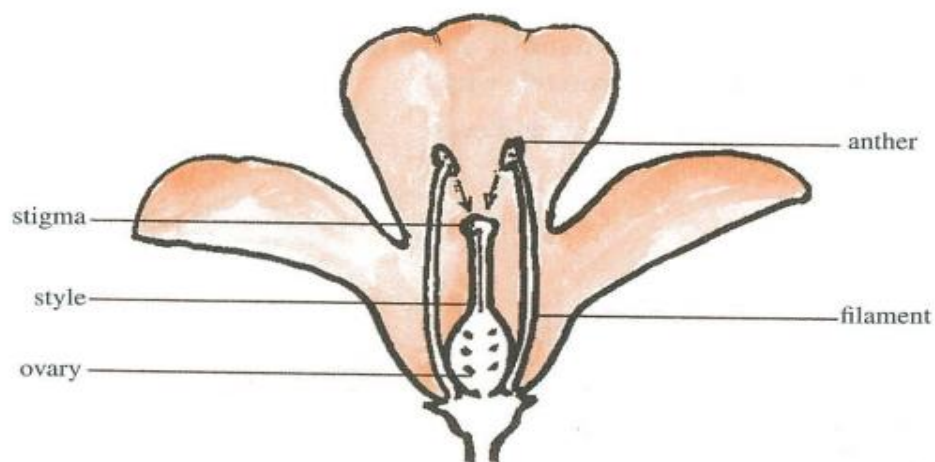


Pollen grains are produced in the anthers of the stamens. When the pollen sacs are ripe, they burst open and the pollen grains are exposed. They are usually carried from the anthers to the stigmas of the same plant or another of its kind. This transfer of pollen grains from anthers to stigmas is called pollination. The pollen grains may be carried by insects, animals, wind and even water.

### Investigate Further:

1. Observe insects and animals visiting flowers.
2. Make a list of insects and animals and the names of flowers they visit.
3. Find the pistil and stamens of as many flowers as you can.

There are two types of pollination. These are **self-pollination** and **cross -pollination**. Self-pollination takes place when the pollen grains of one flower fall on to the stigma of the same flower. Self-pollination also takes place when the pollen grains from one flower fall on to the stigma of another flower on the same plant.

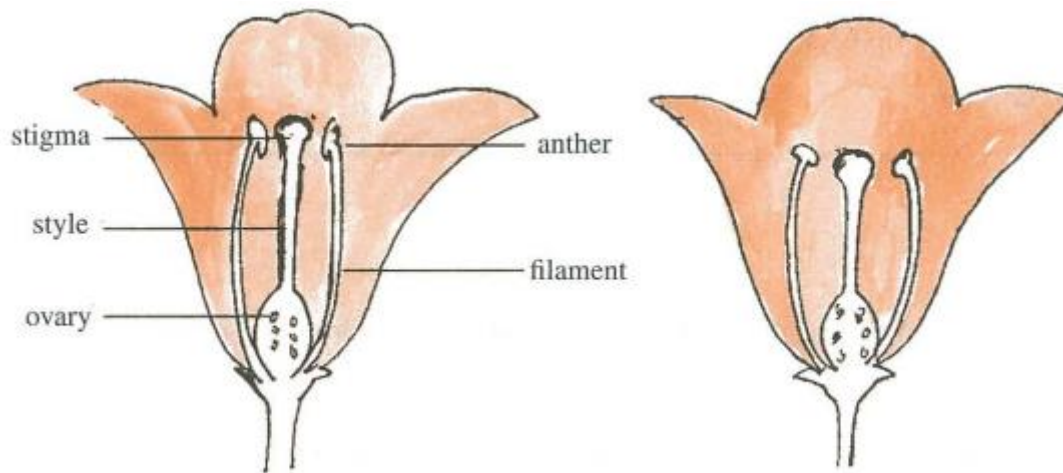


**Self-Pollination**



Cross pollination takes place when the pollen grains from the anther of a flower get on to the stigma of the same kind of flower on another plant.

Wind, insects, animals and water help in cross pollination.



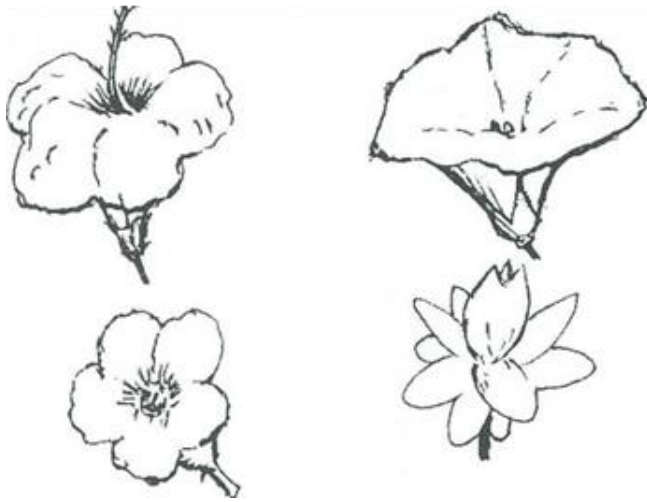
### **Cross pollination**

Flowers which are pollinated by wind usually have large anthers which produce large quantities of pollen. Can you tell why?

Some wind-pollinated plants are grasses, rice and corn.



Insect-pollinated flowers are usually brightly coloured. Some of them are also usually sweetly scented. The colours and the scents usually attract insects to the flowers. The pollen grains stick on to the bodies of the insects when they visit to gather **nectar**. These grains are then rubbed off on to the stigmas of other flowers the insects may visit. Can you name some insects and small birds that visit flowers? Some insect-pollinated flowers are genip, mango, pumpkin and tomato flowers



Do you recognise these flowers? Name them.

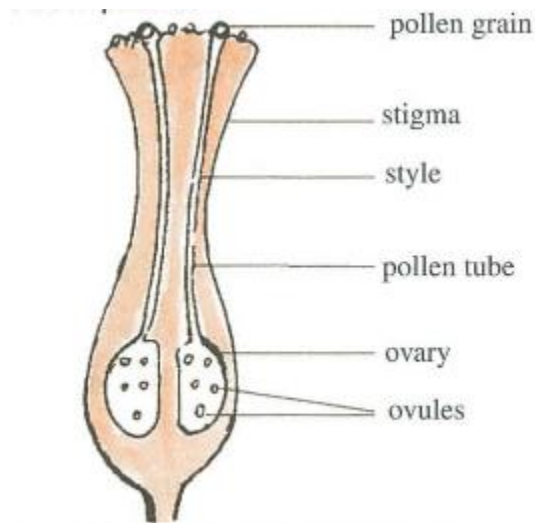
**Investigate Further:**

1. Try to pollinate pumpkin flowers by hand. Observe what happens.
2. Investigate what happens when the pollen grains from one plant get on to the stigma of a flower from a different kind of a plant.
3. List two differences between wind and insect pollinated flowers.

## FERTILIZATION

What do you think happens after pollination?

When pollen grains reach the correct stigmas they produce pollen tubes. These tubes grow down into the ovary (one pollen grain will produce one pollen tube). These pollen tubes grow towards the ovules in the ovary. When a tube reaches an ovule they unite or join together. This union is known as fertilization. The egg has been fertilized and will now grow. The ovules and ovary grow larger. The ovary becomes the fruit and the ovules become seeds. From these seeds we may get new plants.



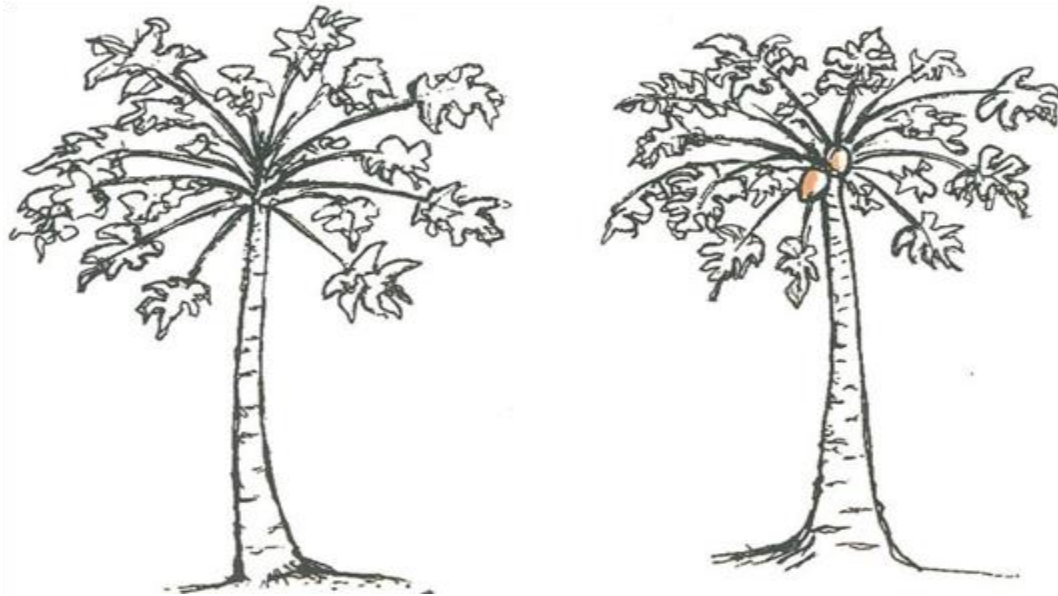
### Investigate Further:

1. Observe flowers after pollination and look for the growth of the fruit.
2. Record observations.

Pollination and fertilization are important because they help to reproduce new plants. Without plants there will be no animal life on earth. From plants, too, animals get their food and shelter.

The pumpkin, cucumber and squash plants all bear male and female flowers on the same plant.

Try to find some other plants which bear both male and female flowers. Have you ever wondered why some plants bear flowers but never produce fruits?



### **Papaw plants**

Some papaw plants bear male flowers only while others bear female flowers. The male flowers have stamens while the female flowers have the pistils.

The plant bearing the female flowers produces the fruit.

Try to find some other plants which bear male and female flowers on separate trees.

## SUMMARY

- The main function of the flower is reproduction
- Pollination is the transfer of pollen grains from the stamen to the stigma
- The pistil and the stamen are the reproductive parts of the flower.
- There are two types of pollination.
- Self-pollination is the transfer of pollen grains of one flower to the stigma of the same flower or another flower on the same plant.
- Cross-pollination takes place when the pollen grains are transferred from one flower to another of the same kind on another plant.
- Agents of pollination are wind, water, insects and animals.
- The union between the pollen grains and ovules is called fertilization.
- After fertilization the fruit and seeds develop.
- Pollination and fertilization are important to life.

### Let's Review

In your own words tell the story of a mango plant from the time it was a flower.

## CHAPTER 12 PLANTS CAN PRODUCE NEW ONES

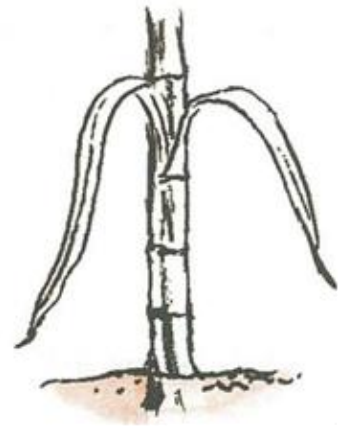
### ALL FLOWERING PLANTS DO NOT COME FROM SEEDS

All flowering plants do not depend on seeds for reproduction. Some new plants can be grown from stems. Some are also grown from roots and leaves. Plants like cassava and sugar cane are grown from stem cuttings. Can you name some more? Stems like ginger, eddo and onions grow under the ground.



We get new plants from these stems too. Banana and plantain trees are grown from special stems known as suckers.





Look at the pictures and say what they are. How do the plants in the pictures reproduce?

Can you name a plant that reproduces from its roots? The leaf of life can produce from its leaves.



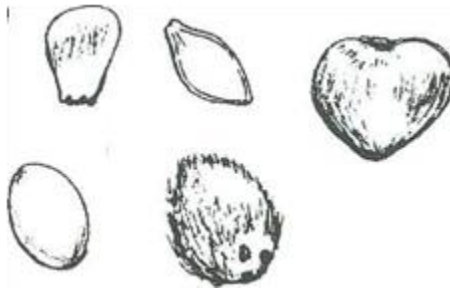
**Leaf of life**

### **Investigate Further:**

1. Collect onions, eddoes, ginger and cactus leaves and try to grow new plants from them.
2. Observe the growth.
3. Record your observations.

## **A SEED HAS MANY PARTS**

Seeds come in different shapes and sizes. Some are hard and some are soft but they all have the same parts. In order for us to name the parts we must look at seeds.



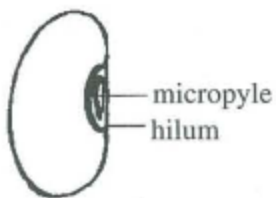
### **Investigate Further:**

1. Collect as many different kinds of seeds as you can.
2. Group the seeds in any way you like.
3. Name the seeds.
4. Make a list of the seeds.
5. Draw the seeds you have listed.
6. Soak some of the seeds in water overnight.

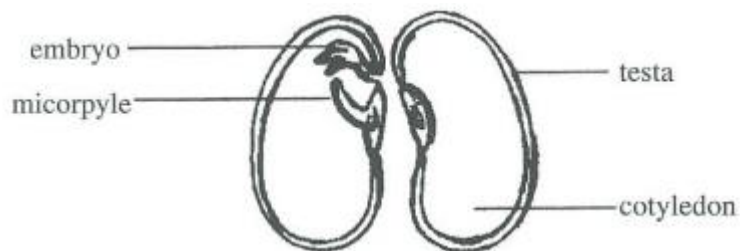


Now that you have looked at some seeds let us name the parts. Look at a bean seed. Do you see the part that is dark in colour? This is the part that was attached to the fruit. This part is called the hilum. Take a soaked bean seed and squeeze it gently.

Can you see the tiny opening through which the water comes? This opening is the micropyle. It lets water into the seed before it can grow. Carefully divide the seed into halves.



That outer covering is the testa. The testa protects the seed from diseases and insects.



Can you see the embryo? The embryo is the young plant. The embryo is made up of the radicle or young root and the plumule or young shoot. The two fleshy halves of the seed are cotyledons. They store food to feed the young plant until it can make its own. Some seeds, like corn, have one cotyledon.

### **Investigate Further:**

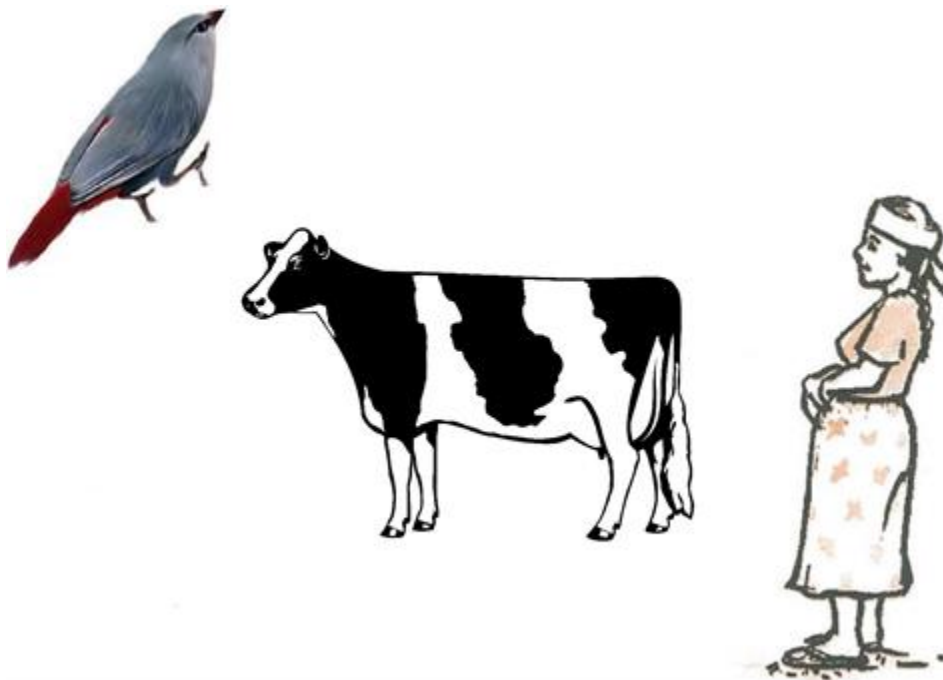
Draw some seeds and label the different parts.

## WAYS BY WHICH SEEDS ARE SCATTERED

Do you know the story of Johnny Appleseed, the man who planted apple seeds wherever he went? Why do you think he did this? Imagine a world where all the mango trees grew in one place and all the coconut trees were in one place and so on. What a world it would have been!

Seeds give rise to new plants and it is important that seeds get to new places to grow. When this happens the plants get more space and light and so are healthier. It is for these reasons that seeds are dispersed or scattered.

Agents of dispersal are **wind**, **water** and **animals**.



Some seeds are scattered when the ripe fruit bursts open. One such fruit is the baby banana



**Baby banana**

Have you ever seen the silk cotton seed fly about? This is one seed that is scattered by the wind. Seeds that are scattered by the wind are usually small and light. Can you name some? Others have wing-like structures which allow them to be easily carried by the wind. Some seeds are bouyant and can be carried long distances by water. The coconut is one of these.

Sometimes you see plants growing on electric wires. Do you ever wonder how the seeds got there? The seeds were taken by birds. Birds eat fruits and sometimes they swallow the seeds. They eventually pass out these seeds in their droppings. Sometimes the seeds stick on to their beaks. These seeds drop off when the birds clean their beaks. It is in these different ways that the seed of small fruits, peppers and the bird vine can be dispersed.

Many fruits are eaten by animals and the seeds are either dropped or thrown away. Some animals swallow the seeds of some fruits.



These seeds are passed out in the faeces far away from the parent plants. Some seeds, like castor oil, have burrs that stick on to the hair of animals.

These seeds are taken away by the animals and dropped off away from the parent plant.

Humans also help in the dispersal of castor oil seeds. They plant seeds where they want to and sometimes they just throw away seeds.

Examples of these are rice, peanuts, papaws and oranges.



### **Investigate Further:**

Make and complete a table like the one below

name of seed		method of dispersal
grass	seed	Wind
water lily	seed	
papaw		

## WE CAN GET SOME NEW PLANTS FROM SEEDS

As we have already learnt seeds are scattered by wind, water and animals. If the conditions are right they will grow into new plants. This development of a seed into a new plant is called germination. Seeds need air, water and warmth to germinate

### Investigate Further:

Things you need

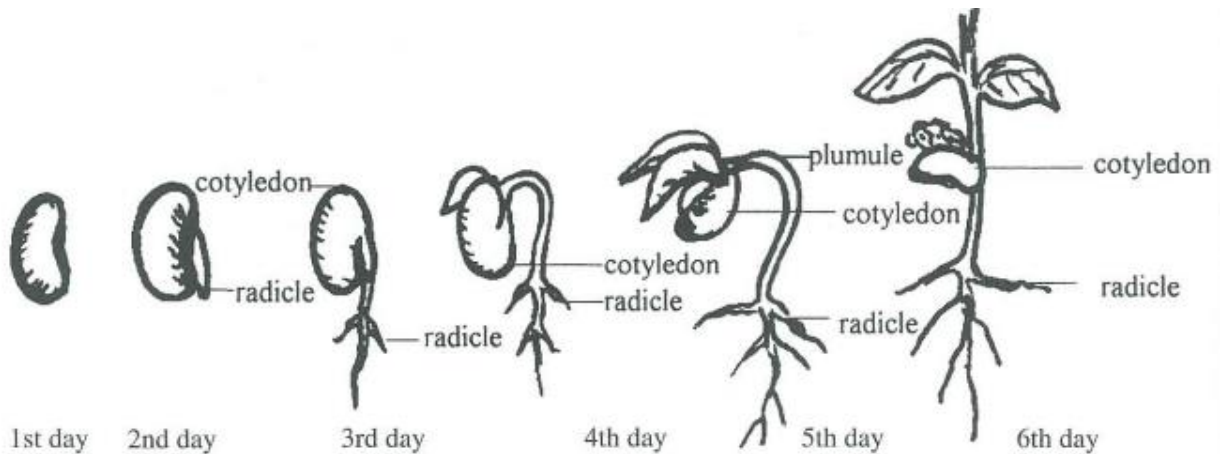
- jam jars
- some cotton wool
- some dried bora seeds
- a glass jar larger than the jam jars
- water

1. Label the jars 1, 2, 3, 4.
2. Put cotton wool along the inside of all the jars.
3. Place some seeds between the cotton wool and the side of the jars.
4. Pour some water into jars 2, 3 and 4.

5. Leave no.1 without water.
6. Cover jar no.2 with larger jar.
7. Put jar no.3 in the refrigerator.
8. No.4 will be left as it is.
9. Observe all the jars everyday without changing the conditions.

Record your observations by drawing and writing

The seeds in jar no.4 were given air, water and warmth. This is why they germinated. What were the ones in no.2 deprived of? In no.1 they had no water and no.3 no warmth.



## SUMMARY

- All new flowering plants do not come from seeds.
- We can get new plants from stems, roots and leaves.
- The parts of a seed are tests, hilum, micropyle, embryo and cotyledon
- When seeds are scattered new plants get more light and space.
- Agents of dispersal are wind, water and animals. Humans also help in dispersal of seeds
- The development of a seed into a new plant is called germination. Conditions necessary for germination are air, water and warmth.

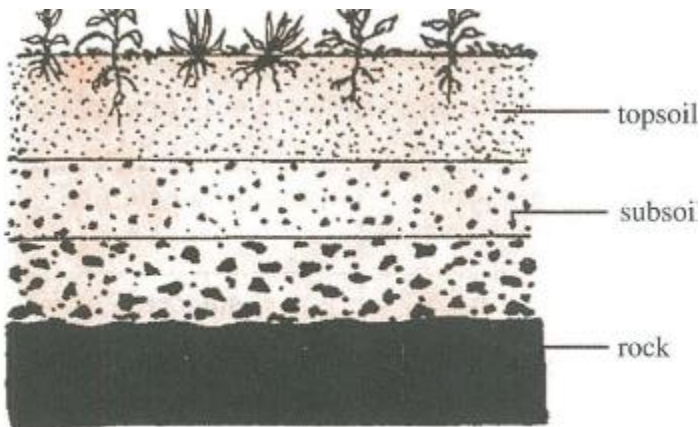
### What have you learnt?

1. Complete the table to show how we get some plants.

plants	how they produce
plantain	sucker
hibiscus	roots
aloe	sucker

2. Imagine you are a kiskadee. Tell how you help in the dispersal of bird vine seeds.
3. What part of the embryo appears first?
4. Why are the cotyledons useful?
5. What part of the plant grows above the ground?

## CHAPTER 13 SOILS



A side view of soil

What is soil?

Where is it found?

Soil is that part of the earth's crust that supports plant life. Soil could be up to about thirty or forty centimeters deep. Below the soil is the underlying rock from which soil is formed. When the surface is removed a series of layers is exposed. The top layer is usually thin and is called the top soil. Under the top soil is the subsoil consisting of gravel, stones, sand and clay. Further down is the rock.



In the diagrams you can see what this layer looks like.

Is soil important to us?

Can you list some uses of soil?

Do you have a kitchen garden?

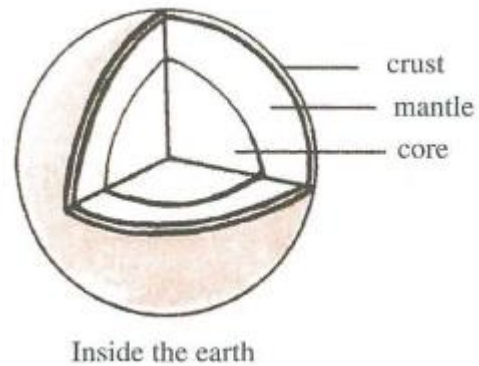
Let's take a look at the soil found in your garden.

### **Investigate Further:**

Things you need

- trowel or small spoon
  - a tray or flat container
1. Dig up some garden soil.
  2. Observe it carefully.
  3. List the things you find in the soil.

In the soil you may have found the decayed remains of animals. You may have found material like leaves, roots and barks of trees, too. This is called humus. Some soils may have lots of humus while others may have none or very little.



## TYPES OF SOIL

All soils are not similar to the soil found in your kitchen garden. Soils differ in many ways. They may differ in colour, smell, size and the texture of the particles

### Investigate Further:

Things you need

Three different types of soils, A, B and C.

1. Examine each type of soil carefully.
2. Complete the table below.

Soil	Colour	Smell	Size of particles	How does it feel	Has it much, little, no humus
A					
B					
C					

---

## CLAYEY SOIL



The size of soil particles is very important. Clayey soil is made up of very tiny particles. It feels very sticky when wet and does not let water pass through easily. There are also few air spaces.

Rice, sugar cane, coconuts and bananas need lots of water while growing. Do you think these will grow well in clayey soil?

However, during the dry seasons clayey soil becomes very hard and large cracks can be seen. It is now difficult for plant roots to grow through it. Can you name some areas in our country where clayey soils can be found?

---

## SANDY SOIL



Sandy soil feels quite rough and dry. Why is this so? Pour some water on some sandy soil. What do you observe? Many plants will not grow in sandy

soil. The soil particles are large and water flows through quickly. There are also large air spaces.

This kind of soil has little humus. Peanuts and pineapples grow well in sandy soil.

---

## LOAM SOIL

### **Investigate Further:**

Things you need

- a container with holes at the bottom
- sandy soil
- clayey soil
- Some humus or dried animal manure

1. In the container mix some sand, clayey soil and humus together.
2. Water it. What do you observe?
3. Use this soil to plant a small decorative plant for your classroom.

A mixture of sandy soil and clayey soil together with humus is called loam. Our garden soil usually has lots of humus. Green vegetables like bora, calalu, lettuce and tomatoes grow best in this type of soil.

## SUMMARY

- Soil is the outermost layer of the earth where plants grow.
- It has many uses
- Humus is the decayed remains of plants and animals found in the soil
- Some soils are sandy soil, clayey soil and loam
- Clayey soil feels sticky when wet, does not let water pass through easily and has few air spaces. The particles are small.
- Sandy soil feels rough and dry, water passes through it easily.
- Loam is a mixture of sand, clay and humus.

### Let's Review

1. Complete these

- (a) Soil is used for \_\_\_\_\_ and \_\_\_\_\_
- (b) \_\_\_\_\_ is the decayed remains of plants and animals.
- (c) The best soil for your kitchen garden is \_\_\_\_\_

2. Match these

**Soil**

**Crop**

Clayey

Calalu

Sandy

Sugar cane

Loam

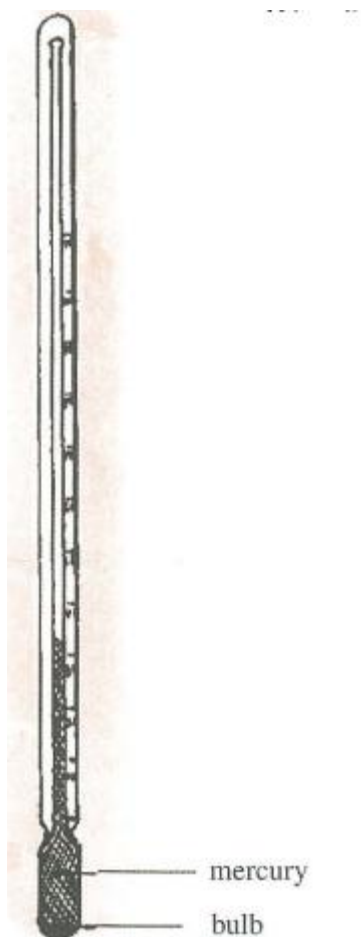
Peanuts

Ochroes

3. In which type of soil will

(a) roots rot easily?

(b) roots have to grow deeper in search of water?



## CHAPTER 14 HOW HOT IT IS

### WHAT IS TEMPERATURE?

Temperature is how hot or cold a thing is.

In everyday language, we can say it is warm, cold, hot, and sometimes we say it is very cold or very hot. In science, it is not enough to say warm or hot.

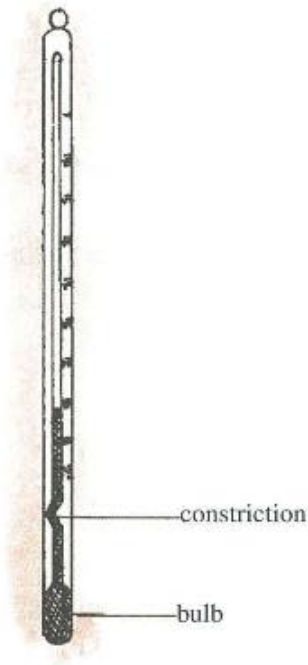
We therefore have to say directly how hot it is. The instrument we use to find this out is called a thermometer.

We often need to know how hot or cold the day is, or how hot the oven is before we put in our cake to bake. Many foods

must be cooked at a certain heat. The thermometer measures all these temperatures.

The thermometer is made up of a long narrow tube of glass with a hole passing through it. The hole is closed at one end and it widens at the other, to form a “bulb”. In the long narrow tube and bulb can be found mercury. Mercury is a metal found in its liquid state at room temperature. Mercury expands when heated and contracts when cooled. On the side of the thermometer are markings showing the exact temperature.

## USING THE THERMOMETER



In the diagram on the previous page is a laboratory thermometer. Can you recall some of the places where temperature is often measured? In hospitals and clinics a special thermometer is used to measure temperature. It is called the clinical thermometer. This type is used to measure the temperature of our bodies. It is made up of the same materials as the laboratory thermometer but measures temperature from  $35^{\circ}\text{C}$  to  $43^{\circ}\text{C}$ .

Here is the diagram of a clinical thermometer.

What is your body temperature when you are quite well? The average temperature of the body of most persons is  $37^{\circ}\text{C}$ . ( $37^{\circ}\text{C}$  is read thirty-seven degrees Celsius.)

### Investigate Further:

Things you need

- thermometer
- water
- tin
- heat source

1. Half-fill the tin with water.
2. Place the thermometer in the container.
3. Put the container on the fire and leave it to boil.





4. Read the temperature when the water is boiling.

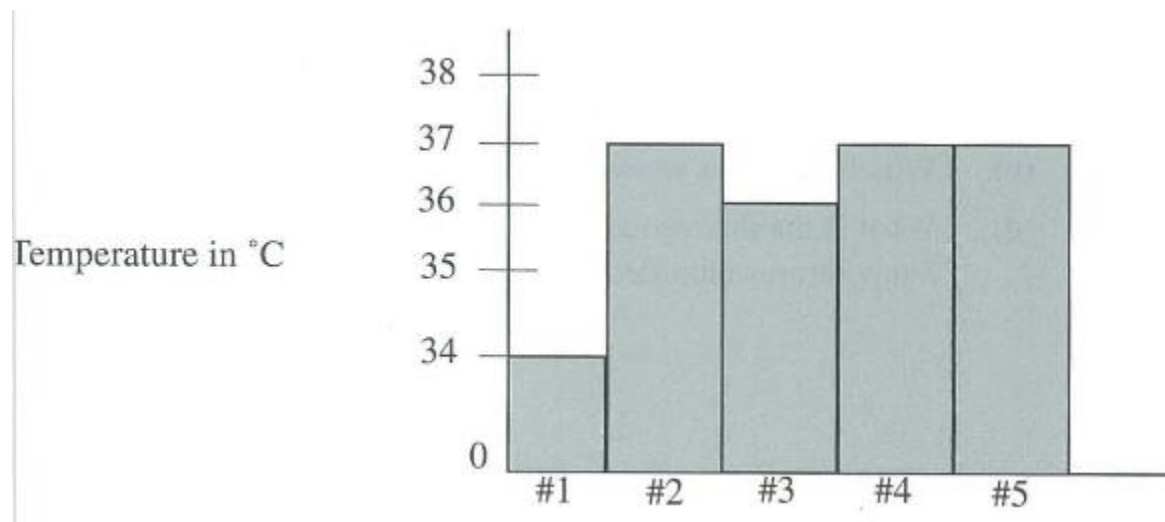
Why shouldn't the thermometer be put into the water when it is boiling?

The temperature at which pure water boils is 100°C. At what temperature do you think water will freeze? Try to find out.

Perhaps your teacher can record the temperatures of various groups of pupils in the class. You can also draw a graph to represent them. Here is what your table and graph may look like.

Group A

Names of Pupils	Temperature in °C
1. Joan	34
2. Trevor	37
3. Mary	36
4. Ravi	37
5. Nevada	37



Graph showing temperatures of some pupils in the class

**Investigate Further:**

Things you need

- thermometer
- a sheet of cardboard
- pencil
- ruler

You can probably work in groups of five.

1. Make a chart like the one shown below and record the temperature inside and outside of school.

Days of the week	Temperature in °C	
	Inside	Outside
Monday		
Tuesday		
Wednesday		
Thursday		

2. Draw two graphs, one for inside and one for outside.
3. Answer the following questions from your table and graph.
  - (a) Which was the highest temperature recorded?
  - (b) Which day was the coldest?
  - (c) Which two days showed the same temperature?
  - (d) What is the difference between the highest and lowest temperatures recorded?

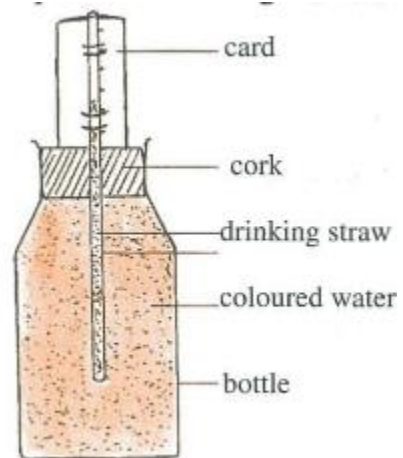
### **Investigate Further:**

(B)Let's make a thermometer.

Things you need

- a transparent drinking straw
- cork with hole in it
- small bottle
- small piece of tape
- coloured water

1. Fill the bottle with coloured water right to the top.
2. Push the straw through the hole in the cork and put the cork into the bottle. You will notice some water will come out of the straw.
3. Tilt the bottle and pour water out of the bottle until it is half-way up- the straw.
4. Cut two slots in the cork and fit it over the straw as shown in the diagram below.
5. Check the temperature on a thermometer and mark that temperature at the water level on the card.
6. Check when the temperature changes, and do the same as was done in number 5.



**A Home-made Thermometer**

## SUMMARY

- Temperature is how hot or cold an object is.
- The instrument used to measure temperature is called the thermometer.
- In the thermometer the liquid metal, mercury can be found.
- Two types of thermometers are the laboratory and clinical thermometers. Mercury expands when heated and contracts when cooled.

### Let's Review

1. What does the word 'contract' mean?
2. Which type of thermometer is used in the hospitals and clinics?
3. Which has a higher temperature - boiling water or ice?
4. What liquid other than mercury can be used in thermometers?
5. The normal body temperature of human beings is \_\_\_\_\_ °C.

0      37      40      100      212

6. When someone's temperature is described as being high, it means that the person may have \_\_\_\_\_

## CHAPTER 15 MATTER AND CHANGE

### FREEZING

Do you know what happens when water is placed into the freezing compartment of a refrigerator? It changes into the solid, ice. When a substance freezes it changes from its liquid state to a solid state. Freezing changes some liquids from their liquid state to a solid state. Name some other liquids which change to solids when they are frozen. Do you know that some liquids do not change to solids when they are placed into a freezing compartment?

#### **Investigate Further:**

Things you need

- lemonade
  - rum
  - methylated spirits
  - gin or high wine
  - beer
  - metal containers or jam jars
1. Pour the same amount of each of the substances named into individual containers.
  2. Put them all into the freezing compartment at the same time.
  3. Take them all out at the same time and observe.

4. Discuss your observations. Suggest reasons for what happens.
5. Now classify the substances under these two headings.

Changes to solid	Remains a liquid

You should have noticed that the substances rum, gin and high wine did not change.

#### **Investigate Further:**

Things you need

- alcoholic substances - rum, gin
  - metal container with lid partially attached
  - matches
1. Pour some rum into the container.
  2. Light a match and throw on it.
  3. Repeat with the gin and observe again. Be careful and have an adult with you!



In both experiments did you observe that there was a flame when the lighted match was thrown on it. Alcohol is an inflammable substance. Inflammable substances can cause fires. Find out what is used in heat sources in laboratory and why it is used.

## BACKWARDS AND FORWARDS

You may have also noticed from earlier experiments that when heated, some solids melted, changing to liquid when they were heated. These liquids then changed back to solids when they cooled. Butter, vaseline and lard were some substances that behaved in this way. Name other substances which behave in the same way as those already named.

## PHYSICAL CHANGE

From the experiments it was observed that some substances can change from one state to another and change back to the original state. When changes like these occur we say that the change is reversible. A reversible change is considered to be a physical change.

What is a physical change? A physical change occurs when there is change in the size or shape of a substance. No new substance is formed. Cutting paper, stretching a rubber band, and bending a piece of wire are all examples of physical changes.

### **Investigate Further:**

Things you need

- a cake of soap
- water
- cloth
- a cake of blue
- paper
- scissors or razor blade
- containers

1. Rub the soap on a piece of wet cloth.

What happens to the soap? Is it exactly the same size?

2. Cut the paper in any shape. Is the paper the same size?
3. Place the cake of blue in a container with a table spoonful of water. You will find that the substances remain. They have changed in shape and size. Think of other ways in which you can make physical changes.

When something heats or cools it also changes physically. Heat causes most things to increase in size (expand) and cooling causes most things to get smaller (contract). Let us find this out for ourselves.

### **Investigate Further:**

Things you need

- bottle with metal screw cover
- hot water
- cold water
- containers

1. Cover the bottle very tightly.
2. Turn it downwards in the container with cold water and leave it for five minutes.
3. Try to get the cover off. Were you able to do so?
4. Now turn it downwards in the container with hot water for the same time.
5. Try to open it. Did you get it open?
6. Write a statement in your Science book about what you have observed.

What is the shiny substance in a thermometer called? What happens to the mercury when the thermometer is put in hot or cold water?

The mercury in the thermometer expands and contracts. When does it expand and when does it contract?

## NEW SUBSTANCES

When butter melts it changes to a liquid then changes back to a solid when cooled. Similarly if a piece of cloth is cut it remains the same cloth with a different length. Do you think this happens for all solids?

Some substances melt when heated and change back to solids when cooled. This is a physical change. However, there are some substances which behave differently. What happens to the wood or paper when it is burnt? Can you get back the substance you began with after cooking it? When we change a substance in any way and cannot get it back, we call the change a chemical change. In a chemical change a new substance is formed. It now has different properties.

## SUMMARY

- Freezing can change some liquids to solids.
- Alcoholic substances do not change when placed in a freezing compartment.
- Heating causes some substances to expand and cooling causes some substances to contract.
- No new substance is produced when a physical change occurs.
- A physical change can occur without heat.
- A new substance is produced when a chemical change occurs.
- When a chemical change occurs there is almost always a permanent change. This is not easily reversed.

### **Investigate Further:**

Things you need

- heat source
  - long pointer
1. Put end of pointer in fire for a second or two.
  2. Let fire burn on pointer for a few more seconds.
  3. Extinguish the fire carefully.
  4. Observe what happens.

Can you get back the piece of pointer that was burnt?

**Let's Review:**

1. Which of these will change from a liquid to a solid by freezing?

oil      drink    high wine

2. What change occurs when a piece of cloth is burnt?

3. Name three substances which can change to liquid when they are heated.

4. A substance changed from a solid to a liquid then changed back to a solid.

Which of these is it most likely to be?

paper   wood   ghee.

5. Carry out two experiments to show a chemical change.

6. What happens to butter when it is left exposed to the sun?

7. Which group of substances will show chemical changes when heated?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

## CHAPTER 16 MAGNETISM IS A FORCE THAT CAN WORK FOR US

### WHAT IS A MAGNET?

You have already learnt that magnets can attract objects such as pins, needles or nails. What really is a magnet? Of what is it made? A magnet is an object that will attract objects that are made of iron and steel. These objects are **magnetic**. A magnet will not attract objects made of copper, lead or zinc. The objects that are not attracted are **non-magnetic**. Collect a variety of objects.

Put them under the headings magnetic and non-magnetic substances as shown in the table below.

Magnetic substances	Non-magnetic substances

Use a magnet to check your answers.

Magnets have different shapes. Look at the magnets in the diagram below.



Look at the magnets in the picture. What shapes do they have? What do we call the ends of the magnets? The two ends of any magnet are called the **poles**.

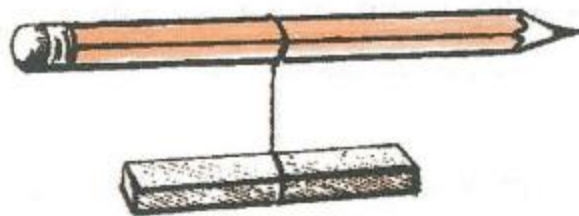


**Investigate Further:**

Things you need

- bar magnets
- pencils
- strings

1. Tie the bar magnet with a string to a pencil as shown in the diagram.





2. Suspend it in the air. What do you observe?
3. Try this several times.

When the magnet stops swinging it points in a north to south direction. The end of the magnet which points towards the north is called the North Pole or north-seeking pole. The end of the magnet which points towards the south is called the South Pole or the south-seeking pole.

## WHERE DO FORCES ACT?

**All** magnets have two poles. Let's find out what happens when a magnet is placed in a box of pins.

### **Investigate Further:**

Things you need

- pins in a box
  - horse shoe and bar magnets
1. Dip the bar or horse shoe magnet into the box with the pins.
  2. Which part of the magnets has the most pins?

The pins are found mostly at the ends of both magnets. This is so because the pull of magnets is greatest at the poles. The greatest force of attraction of a magnet is always found at the poles. A magnet's force is not spread evenly throughout the magnet.

## PUSH AND PULL OF MAGNETS

Magnets attract magnetic substances towards them. What happens when the poles of magnets are placed near each other?

### Investigate Further:

Things you need

- bar magnets
- 1. Mark the north and south poles of two bar magnets.
- 2. Put any two poles together. And observe carefully what happens.
- 3. Repeat this with two other poles.

The two **unlike** poles of the magnets came together. They **attracted** each other. The two **like** poles of the magnets pushed each other away. They **repelled** each other. Two like poles, when put together, repel or push away from each other. The behaviour of these magnets is always the same with all magnets.

Complete the table by putting a tick (✓) where necessary.

Poles placed near each other	Repulsion	Attraction
South, South		
South, North		
North, North		
North, South		

When an object is attracted by a magnet, the greatest force is found at the poles. What do we call this magnetic force? Let's find out.

### **Investigate Further:**

Things you need

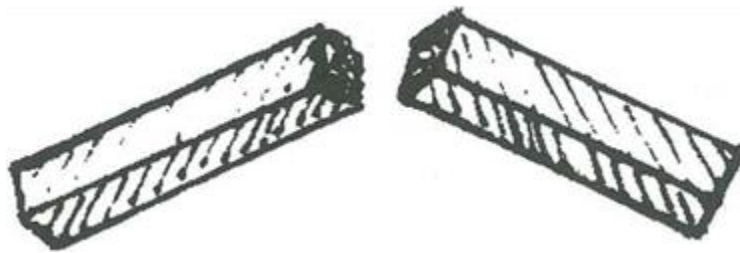
- some iron filings
  - a piece of cardboard about 30 cm<sup>2</sup>.
1. Place a bar or horse shoe magnet on a desk or a table.
  2. Cover it with the cardboard.
  3. Sprinkle iron filings on the cardboard and tap it gently.

What shapes do you see?

When an object is attracted by a magnet, it is within the field of a magnet. The area around a magnet in which the magnetic force can be felt is called the **magnetic field**. Do you know that the earth is a huge magnet?

## MAKING NEW MAGNETS

If a magnet is broken into two pieces, the magnet is not destroyed. The two pieces form two new magnets.



**Magnet broken into two pieces**

You can make your own magnet without breaking any other magnet.

### **Investigate Further:**

Things you need

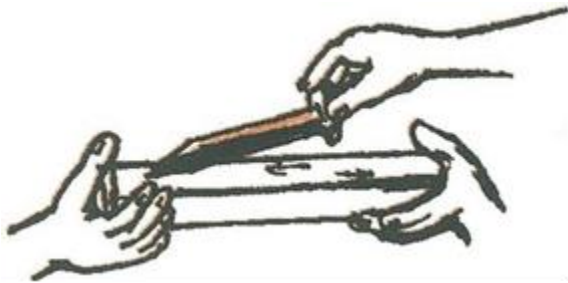
- an iron nail
- a bar magnet

1. Rub the nail with the bar magnet along the length.
2. Each stroke must be made slowly in one direction.

Make about 30 strokes.

Put the nail near to some paper clips or pins. Are the paper clips or the pins attracted to the nails?

Your magnetised nail will not stay forever as a magnet. It is a temporary magnet. Another way to magnetise the nail is to place it in contact with a magnet. After a time, the nail will become magnetised.



## DESTROYING MAGNETS

The nail which you made into a magnet can lose its magnetism.

### **Investigate Further:**

Things you need

- a hammer
- a magnetised nail

1. Hold the magnetised nail in an east to west direction.
2. Strike the nail several times at the side with a hammer.

Take the nail and try to pick up a pin or a paper clip. What happens?

The nail is not a magnet any more. The magnetism in it has been destroyed by the constant hitting. Magnets can also lose their magnetism by heating them until they get red hot. Magnets can be destroyed by heating and by the constant hitting. Find out other ways by which your temporary magnet can lose its magnetism.

## MAGNETS AT WORK

Magnets are found all around us. They are used in many appliances that are in our homes.



Look at the pictures above. How are magnets used in them? Magnets are found in the head set of a telephone.

The compass has a needle in it. This needle is actually a magnet. When the needle moves it keeps pointing toward the north. Who do you think will use compass? The stickers on the refrigerator have magnets. These magnets help the stickers to stick on to the sides and to the door. The doors of refrigerators have magnetised rubber in them. These magnetised rubber strips allow the door to have a tight fit. Cut out pictures of some appliances which make use of magnets and paste them in your science note book.

## SUMMARY

- Magnets are objects that will attract other objects that are made of iron or steel.
- A magnet has two poles - north and south.
- The poles of a magnet exert more magnetic force than any other part of the magnet.
- Magnets are found in equipment that are used in many homes.

### Let's Review:

Which of these will a magnet attract: wood, paper, iron, plastic, paper-clips?

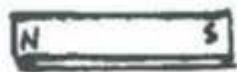
1. How many poles have a magnet and what are they called?
2. Describe how you would make a temporary magnet.
3. When you drop a magnet into a box of small nails or pins, to which area do almost all of the nails or pins cling? Why is this so?
4. Name two persons who need to use a compass.
5. Which of these pairs of magnets show the behaviour of magnets when they are placed together?



A



B



C



D



## CHAPTER 17 ELECTRICITY TO OUR HOMES

### WHAT IS ELECTRICITY?

Have you ever stopped to think how the things in your refrigerator become cold, or how water becomes ice? How does a refrigerator work? How does it get its energy?



Look at the pictures above. What helps the refrigerator to preserve the things in it? Suppose there is a power outage for about four days, what would happen to the things in the refrigerator? What do you get from the fluorescent tube? How does it get its light?

What helps us to see on the television? How do we get sound from the radio? How do all the appliances in your home get their energy? These appliances must have some source of energy in order for them to work. They all get their energy from electricity. This electricity is supplied to

our homes through wires which are attached to posts outside of our homes. We cannot see the electricity when it gets into our homes. We know it is there because we can see the things it can do. Electricity is used mainly to produce heat, light and sound. Electricity is a form of energy.

You know that electricity is a form of energy and many appliances make use of it. There are different types of electricity. Let us find out about them. Every object on earth is made up of atoms. What is an atom?

### **Investigate Further:**

Things you need

- a piece of chalk

Take a piece of chalk and break it up into small pieces until the tiniest piece cannot be broken any more.

Did you observe that when the chalk is broken, a tiny piece is left that cannot be broken? Why is this so? The smallest part which cannot be broken up is called an atom. An atom is the tiniest part of a pure substance on earth. An atom is made up of electrons, protons and neutrons. Electricity is made up of electrons which carry small charges.

### **Investigate Further:**

Things you need

- a plastic comb
  - some pieces of paper
1. Put the pieces of paper on your desk.
  2. Rub the comb vigorously through your hair.
  3. Put the comb about one centimetre away from the paper on the desk.
  4. What do you observe?

Pieces of paper would be attracted to the comb. Why is this so? When materials are rubbed against each other, they develop some magnetic qualities. These magnetic qualities are electric charges. These charges may be positive (+) or negative (-). Charged bodies have static electricity. The comb is charged by the constant rubbing of it through your hair. The negative charges of the comb attract the positive charges of the paper. Lightning and thunder are caused by static electricity. Find out some other situations that involve static electricity.

Can you name some other sources of electricity?

The electricity that is produced in our homes for all our appliances to work is called current electricity. Current electricity is produced by moving electrical charges. Current electricity for our homes flows from the power station through wires. The path along which the current flows is called a circuit.

You have learnt that appliances in your homes such as radios, televisions, refrigerators or fans use electricity to do work.

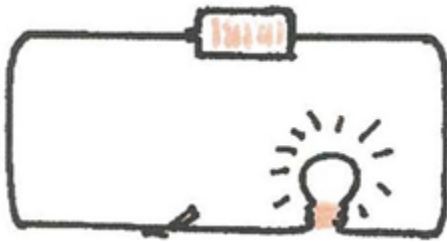
## MAKING AN ELECTRIC CIRCUIT



**Investigate Further:**

Things you need

- torchlight battery
- a bulb
- pieces of electric wire
- switch



Look at the circuit in the picture and make one like it. Demonstrate how you would use it.

Electricity is very useful in our homes and offices. It is used in schools and factories, but it can be very dangerous, when not used properly. It can cause fire in our homes and it can destroy our appliances



Look at the picture. Discuss what has happened. How can we prevent this from happening? Where should the boy fly his kite? Have you ever heard about anyone touching an electrical appliance with wet hands? What happened? Here are some safety rules that we can follow when using electricity.

1. Do not play with electrical appliances.
2. Stay away from electric wires that have fallen to the ground.
3. Do not touch exposed /wires.
4. Do not use electrical appliances with wet hands.
5. Always fly your kites in the open field far from high voltage poles.
6. Do not plug in or out appliances when switches are on.

Electricity travels by wires into our homes. Large generators are used by the power station to produce electricity. This electricity is now sent along wires which are attached to poles planted on the streets.

## SUMMARY

- Electricity is a form of energy.
- Static electricity can be caused by rubbing.
- Current electricity is produced by moving electrical charges.
- Current electricity can be obtained from generators and batteries.
- Electricity can be useful and harmful.

### Let's Review:

Unscramble these words to find answers to the following questions.

TASTIC URCNTER CUITCIR

1. Electricity that is obtained by rubbing is called \_\_\_\_\_ electricity.
2. Most appliances in your homes use \_\_\_\_\_ electricity.
3. The path along which an electric current flows is called a \_\_\_\_\_.
4. One day, Mervyn was cleaning the chalkboard with a wooden duster.

While rubbing it, he noticed that the duster stuck to the chalkboard.

Explain why this happened.

One day while Mother was walking, her clothes stuck to her stockings.

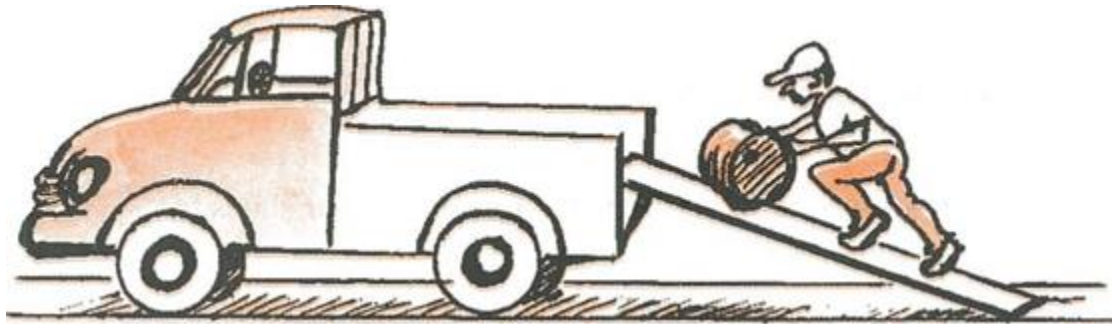
Explain why this happened.

## CHAPTER 18 MACHINES MAKE WORK EASIER

In Book Four we learnt that a machine is a tool or instrument that makes work easier to do. Can you name some of them? How do they make work easier? Some of them increase force used while others make it more convenient to lift loads. With the use of simple machines man has made tremendous progress.

We are going to find out more about other simple machines and how they make work easier.

### THE INCLINED PLANE

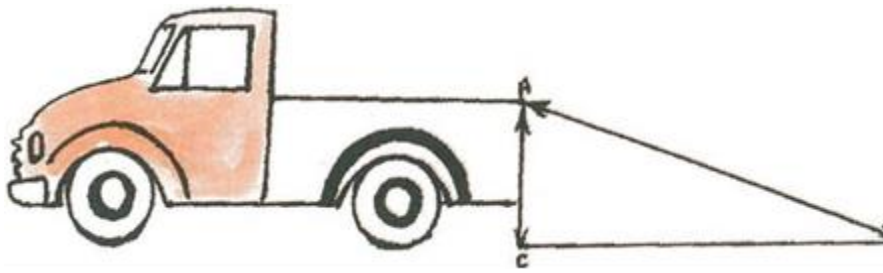


Look at the picture above. What is the man doing? Have you ever seen this happen? The man is using a plank to get a heavy barrel up the truck. This device is called an inclined plane. It is a sloping surface that makes it easier to push or roll a heavy load up instead of lifting it.

In this system, less effort is used to lift the load but the load has to be carried a longer distance.

Look at the illustration below and measure the distance of the ramp to the truck.





Distance AC represents the height up the truck; AB represents the distance up the truck using a ramp. Another example of inclined plane is a slide in a playfield when one end is up.

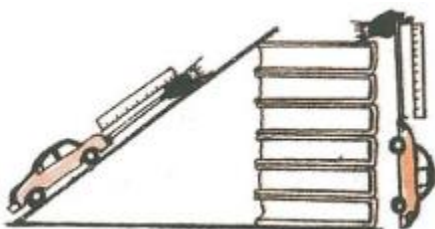


**Investigate Further:**

Things you need

- a pile of books
- a small toy car
- a stiff piece of cardboard
- a rubber band
- a ruler

1. Arrange the pieces of equipment as shown in the diagram.



2. Measure the length of the rubber band in both cases and find out when the rubber band stretches the most. In which case is more effort used to move the car to the top of the books?

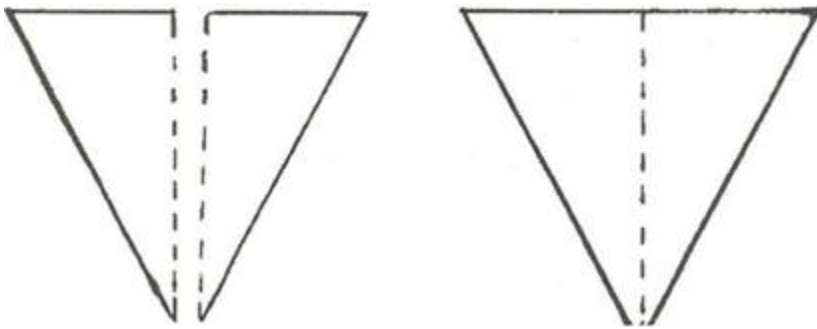
## THE WEDGE

Another simple machine that was discovered very early in human history was the wedge. The early cave dwellers used a sharpened piece of stone as an axe to split wood.



## A FLINT AXE

This flint axe was used by early man. A wedge is made up of two inclined planes put together.



## A WEDGE

A wedge is used to force two pieces of wood apart. Look at the diagram on the next page showing how the wedge is used to split pieces of wood.



**Wedge being used**



Tools such as chisels, knives, axes and cutlasses are all examples of wedges.

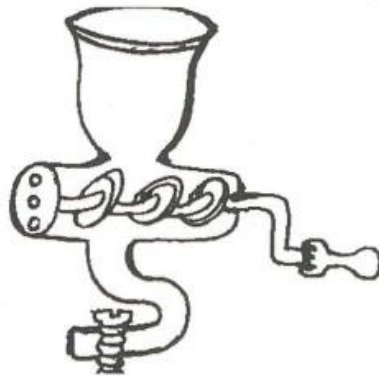
## THE SCREW



The screw



The jack



The meat grinder

### Examples of screws

Another example of the simple machine is called the screw. Look at the pictures above. Can you tell what they are used for? They are all examples of the screw. Let us find out a little more about the screw. A screw is an inclined plane wrapped around a post or cylinder. The inclined plane forms the "thread" of the screw. The distance from one thread to another is called the 'pitch' of the screw. Every time a screw is given one complete turn, it moves up or down one pitch.

Look at the diagram. It shows the pitch.



**Pitch of screw**

**Investigate Further:**

Let us find out how an inclined plane can be made into a screw.

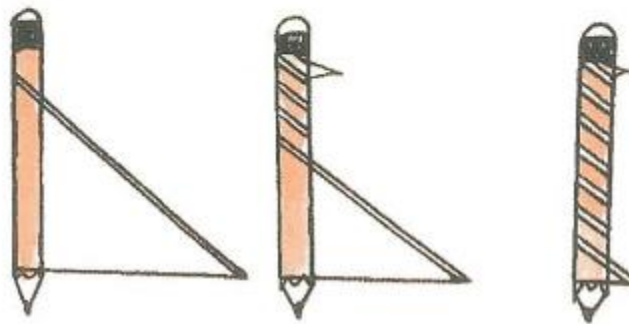
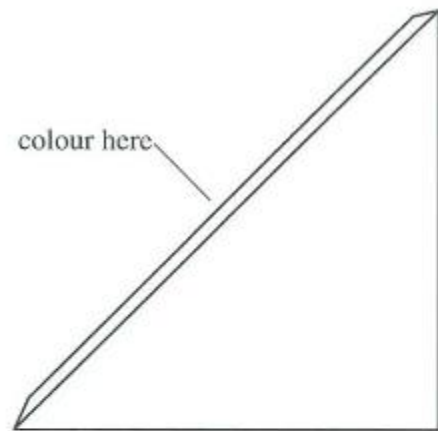
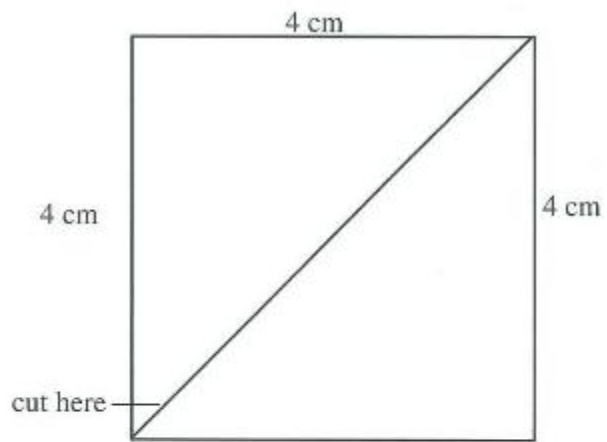
Things you need

- a piece of paper 4cm by 4cm,
- a marker
- 2 sharpened pencils
- Scissors

1. Cut the 4 cm x 4 cm across as shown in the diagram.

You will have two inclined planes.

2. Colour the cut edge with the marker.
3. Wrap the inclined plane on the pencil.
4. Use the other pencil point and run it along the coloured edge of the inclined plane.



It will climb up the pencil using the inclined plane.

## SUMMARY

- The inclined plane is a sloping surface.
- The ramp and playground slide are examples of inclined planes.
- The wedge is made up of two inclined planes.
- The screw is an inclined plane wrapped around a cylinder or post.

### Let's Review:

1. The axe and cutlass are examples of a

a) lever.

b) wedge.

c) pulley.

d) screw.

2. Which of the following is used to lift objects to a high place? A screw B wedge C inclined plane D lever

3. Find the machines in the puzzle.

x a b e f y s a

y w e d g e c r

z i e v e r r e

p u l l e y e y

r a m p s i w x

4. Name three simple devices that use the screw.

5. Name three simple devices that use the inclined plane.



## CHAPTER 19 OUR SENSE ORGANS

Sense organs provide us with ability to:

- a) Hear
- b) Taste
- c) Smell
- d) See
- e) Touch

organ	Sense
1. Ears	Hearing
2. Eyes	Sight
3. Nose	Smell
4. Tongue	Taste
5. skin	Touch

## ORGAN OF TASTE



The tongue is the main organ of taste. It is covered with small bumps called **papilla**.

Organ of the taste is called the taste buds. The taste buds allow us to experience bitter, sour, salt and sweet.

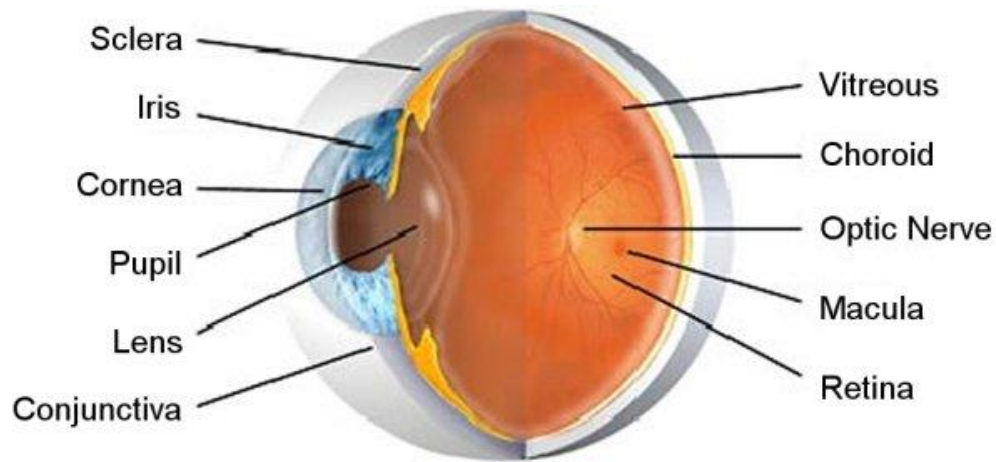
## ORGAN OF SMELL



The nose, the organ of smell, has many sensitive nerve endings. Odours are carried by air and travel into the nostrils.

Messages or impulses are carried by the olfactory nerve fibres to the brain which then interprets whether the odours are pleasant or unpleasant.

## ORGAN OF SIGHT



The organ of sight is the eye.

The eye is a firm soft ball set in orbits.

The bones of the cheek and forehead protect the eye.

The white part is the eyeball. The coloured part is the iris.

In the middle of the eye is an opening called the pupil.

Muscles in the iris cause the eye to expand or contract depending on the amount of light available.

Covering the eye is a transparent material called the cornea.

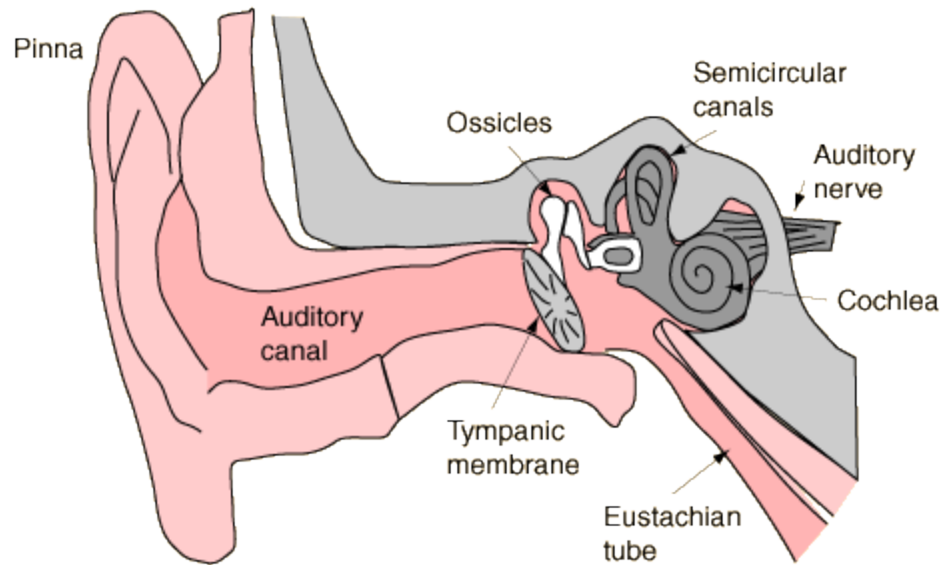
The cornea protects the pupil from dust and dirt.

Behind the pupil is the lens.

At the back of the eye ball is a lining called the retina.

Images are received on the retina in an upside-down or inverted position.

## THE EAR



The organ of hearing sound is the ear.

The parts of the ear work together to receive sound waves from the air to make hearing possible.

The ear is divided into the:-

1. outer ear
2. middle ear
3. inner ear

The **outer ear** is made up of two parts:

The **auricle** or **pinna** is the fleshy part that is seen, it is made up of cartilage or gristle. The auricle collects sound and directs them to **auditory canal**, which contains a secretion (very much like bees wax), which traps dust and tiny insects and prevents infection.

The middle ear is an air filled cavity in the skull. It contains three tiny bones, namely:

- The Malleus    hammer
- The Incus      anvil
- The stapes     stirrup

Together these bones are called **the Ossicles** and are the tiniest bones in the body. The **Stirrup** or **Stapes** is the smallest of the three, having the size of **a rice grain**.

Sound waves cause the eardrum to vibrate, which in turn causes the ossicles to vibrate.

A tube, the Eustachian tube leads from the middle ear to the throat.

The oval window closes off the middle ear from the inner ear.

From the middle ear, sound waves pass into **the inner ear**, which is filled with liquid.

The vibrations of the ossicles are transmitted to the liquid, which in turn transmits the vibration to a coiled up tube called the **cochlea**

The cochlea transmits the sound waves to the brain via the **auditory nerve**.

The brain interprets the sounds and recognizes it.



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