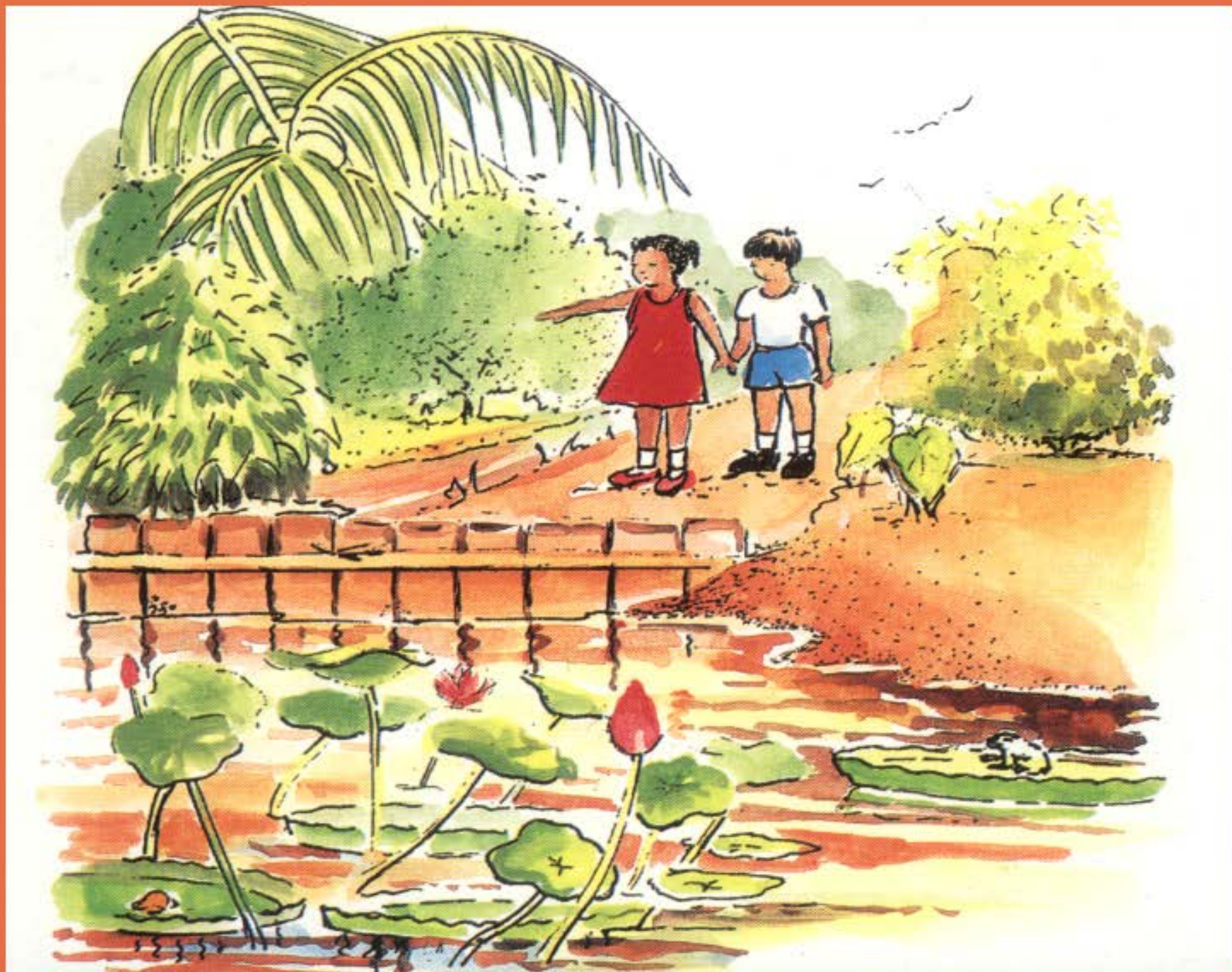


Science Around US Book 6



EASY PATH SERIES



A GOG/IDB Project

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BOOK 6

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NOT FOR SALE

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GOVERNMENT OF GUYANA

A COG/EFA-FTI Project

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

NOT FOR SALE

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CHAPTER 1 MAJOR ORGAN SYSTEMS OF THE HUMAN BODY

The human body can easily be called perfect because of the way in which its functions are carried out. The body is made up of many organs. Can you name some? Identify the ones in the picture.

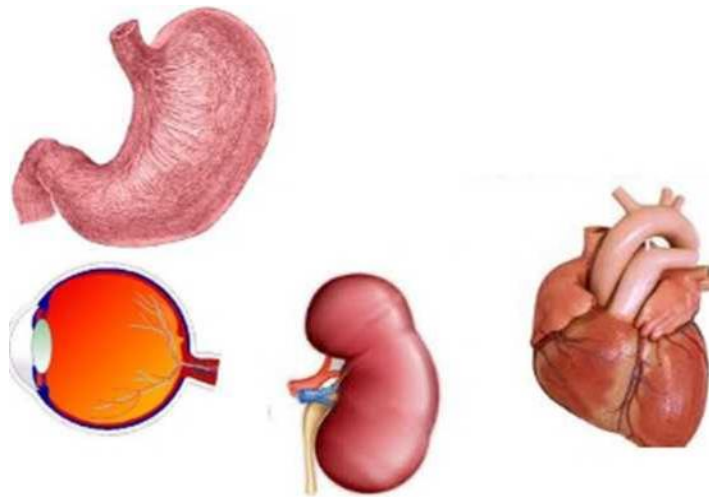


Diagram showing some organs found in the human body

These organs, in turn, work in groups to form the organ systems. A number of these systems are responsible for the proper functioning of the human body. Some major organ systems are

1. The Skeletal System
2. The Muscular System
3. The Digestive System
4. The Excretory System
5. The Respiratory System
6. The Circulatory System
7. The Nervous System
8. The Reproductive System

THE SKELETAL SYSTEM

The bony framework of the body is called the skeletal system. This system is made up of two hundred and six bones. The skeletal system supports the body and gives it its shape. It also protects the delicate organs inside our bodies. What does the skull protect? What part of the skeleton protects the heart and lungs? Red blood cells are made in the marrow of bones. The bones also store minerals for use by cells in other parts of the body. The places where bones meet are called joints.

THE MUSCULAR SYSTEM

The muscular system enables the whole or parts of the body to move.

Muscles work by contracting (getting shorter) or relaxing (getting longer).

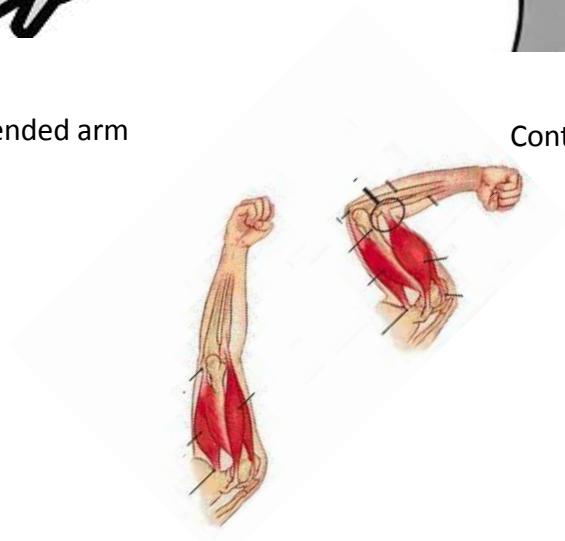
Muscles attached to the bones of the skeleton (called skeletal muscles) help the body to bend, remain erect, or move from place to place. We can bend or extend our arms owing to muscles.



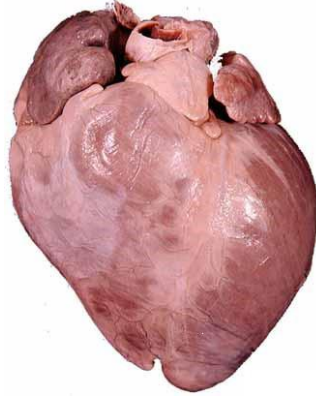
Extended arm



Contracted arm



The heart is a very muscular organ. The muscles of the heart (cardiac muscle) contract and relax to pump blood around the body. The blood vessels also have muscles which contract and relax to circulate the blood.



Picture of a Heart

Several other organs have muscles which move substances along them. Muscles in the digestive system move food along. Muscles of the stomach contract and relax to churn the food to aid digestion.

Activities

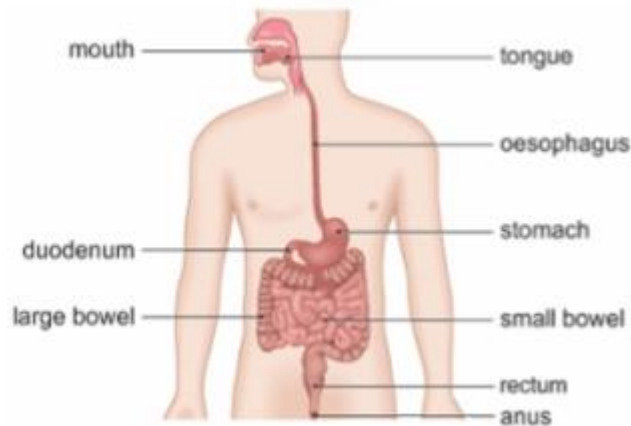
1. Extend your arm straight out.
2. Now contract it (bend it in/flex your muscle).

What observations did you make?

3. Carry out other body movements
 - a. Observe your friend's eye blinking
 - b. Discuss observations with your teacher

THE DIGESTIVE SYSTEM

What happens to food when it is eaten? Where does it go? The digestive system will help us to answer these questions.

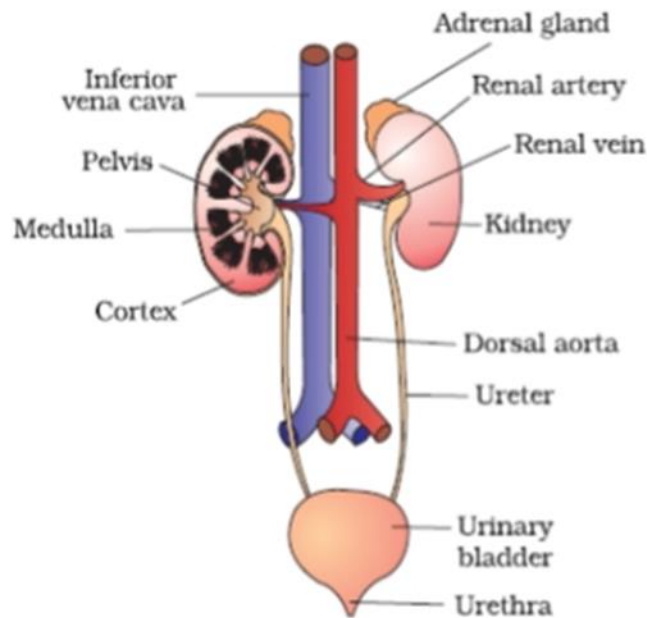


The digestive system

This system provides nutrients for the body. The organs in this system are the mouth, oesophagus, stomach, liver, pancreas, small intestine and large intestine. In the mouth, the teeth cut up the food and saliva from the salivary glands is added. The saliva begins the chemical breakdown of food. The food is then swallowed and goes down the oesophagus or gullet into the stomach.

Food in the stomach is tossed backward and forward while being acted upon by digestive juices. When broken up, the food and the gastric juices form a thick liquid which passes into the small intestine. Here, bile from the liver and juices from the pancreas and the small intestine are added to the food. The food is now in the form of a thin liquid. The nutrients which the body needs pass through the thin walls of the small intestine into the blood stream. This process is called absorption. The food which is not absorbed passes into the large intestine. Water is absorbed into the blood here. The remaining waste materials are stored here and later pass out through the anus as faeces.

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 ureters. Urine is stored in the bladder until it is passed out from the body.

Can you name another organ system that gets rid of waste matter? The skin also gets rid of waste in the form of sweat.

THE RESPIRATORY SYSTEM

All the cells in the body need oxygen. Oxygen is used to release energy in the cells. When this occurs, carbon dioxide is formed. Too much carbon dioxide is poisonous and must be gotten rid of. Oxygen is constantly taken in and carbon dioxide given off in an exchange called respiration.

The organs that help in this process make up the respiratory system. The organs are the nose, trachea and lungs.

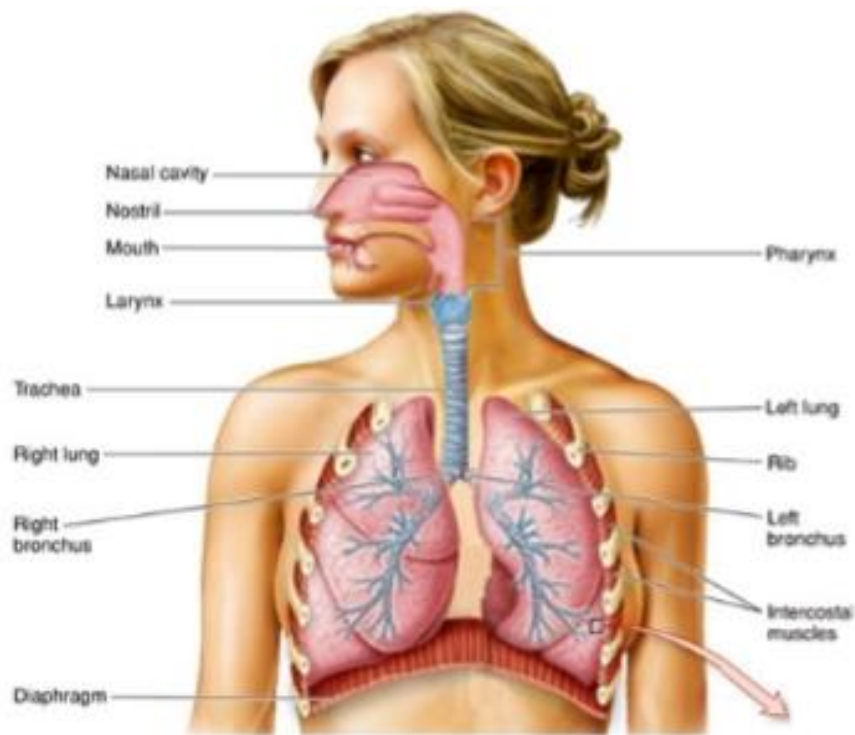


DIAGRAM SHOWING PARTS OF THE RESPIRATORY SYSTEM

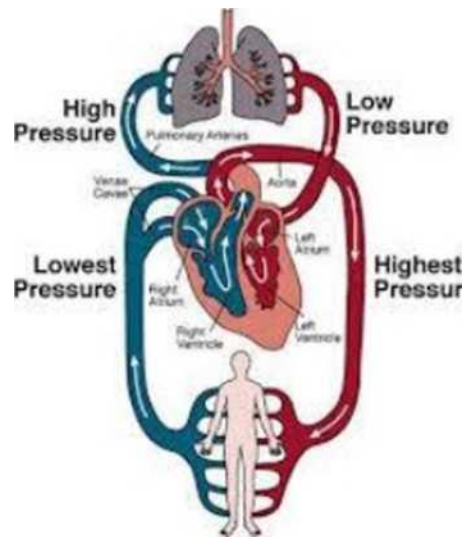
Air enters the nose or mouth and passes down the trachea or windpipe. It then travels into the lungs. In the lungs, oxygen is transferred from the air sacs to the blood. The blood carries the oxygen to all parts of the body. In turn carbon dioxide is released from the blood and enters the lungs. This waste gas leaves the body when we breathe out.

THE CIRCULATORY SYSTEM

Have you ever wondered what happens to the blood in your body? The blood goes around in your body and it makes a complete trip in half a minute. This trip is possible because of the **circulatory system**. The **heart**, **arteries**, **veins** and **capillaries** all make up the circulatory system.

The heart pumps blood around the body. The arteries take blood enriched with **oxygen** from the lungs to all parts of the body. In this way, too. **Nutrients** from the food we eat are taken to the

other parts of the body. The nutrients, oxygen and water pass through the thin walls of the capillaries. The veins take blood containing **carbon dioxide**, produced in the body, back to the heart. The heart pumps this blood to the lungs where the carbon dioxide is given up and breathed out.



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 happen 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.



THE REPRODUCTIVE SYSTEM

The Reproductive System is divided into the male reproductive system and the female reproductive system.

The male reproductive system mainly consists of the **penis** and **testes**.

The female reproductive system mainly consists of the **vulva, vagina, uterus (womb)** and **ovaries**.

Functions of the Reproductive System

Some functions of the reproductive system are:

- To produce egg (female reproductive system) and sperm cells (male reproductive system).
- To transport and sustain these cells.
- To nurture the developing offspring.
- To produce hormones.

MAIN PARTS OF THE MALE AND FEMALE REPRODUCTIVE SYSTEM

Parts of the Female Reproductive System

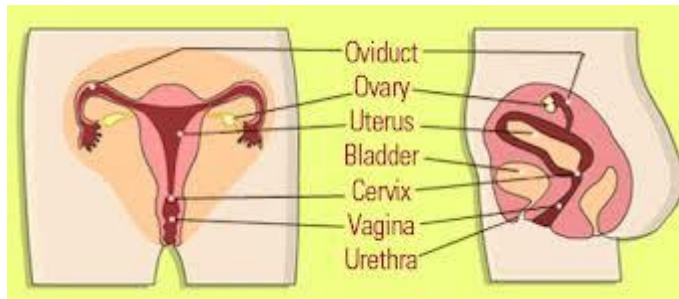
The main parts of the female reproductive system are the:

- oviduct
- ovary
- uterus
- bladder
- cervix
- vagina
- urethra
- fallopian tubes

The internal reproductive organs in the female include:

- **Vagina:** the vagina joins the cervix to the outside of the body.
- **Uterus (womb):** The uterus is part where the foetus develops. The uterus is divided into the two parts: the cervix and the corpus. The cervix is the narrow necklike passage forming the lower end of the uterus. The corpus can expand to hold a developing baby.
- **Ovaries:** The ovaries produce eggs and hormones. They are located on either side of the uterus.
- **Fallopian tubes:** These are narrow tubes conducting the egg from the ovary to the uterus. The fertilization of an egg by a sperm, which is known as conception, normally occurs in

the fallopian tubes. The fertilized egg then moves to the uterus, where it implants into the lining of the uterine wall.

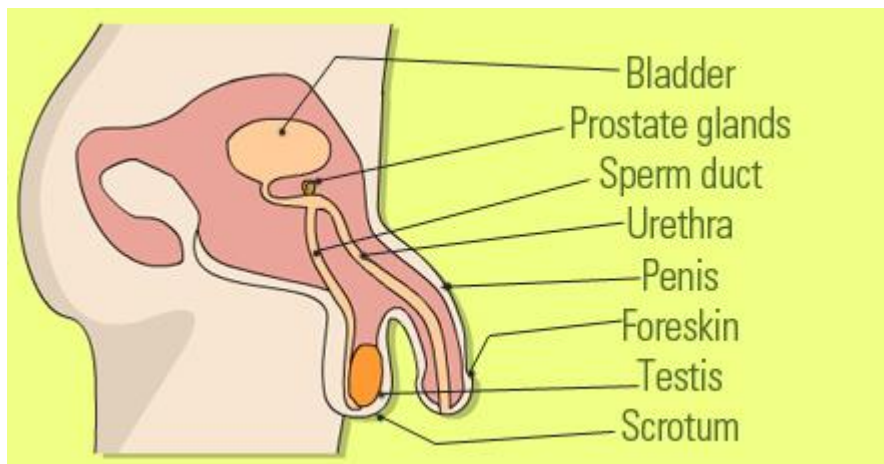


Parts of the Male Reproductive System

- bladder
- prostate glands
- penis
- sperm duct
- urethra
- testis
- scrotum

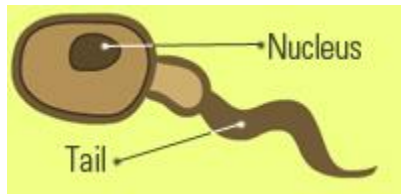
The male reproductive system

The male reproductive system includes the testes, prostate glands, sperm ducts, urethra and penis.



Sperm duct: During sexual intercourse, sperm cells released pass through the sperm ducts.

Testes: Males have two testes which are held in place by the scrotum. The scrotum is a bag of tough skin which hangs outside the body. The testes produce millions of male sex cells called sperm. Sperms are first produced at puberty. The testes also make male sex hormones. The diagram of a sperm is shown below. During the period of puberty, a boy's hormones affect the way his body develops.

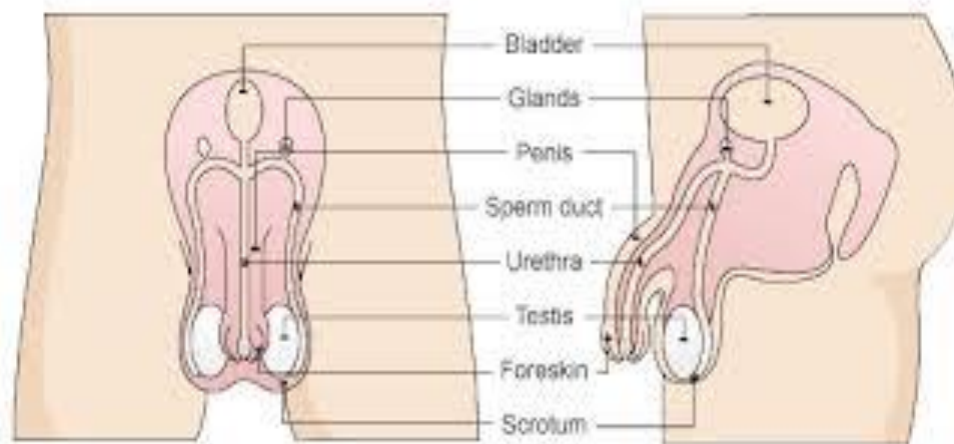


A Sperm

Prostate gland: The prostate gland secretes prostate fluid which is one of the components of semen. Semen is a mixture of sperm and fluids. The muscles of the prostate also help propel the seminal fluid through the urethra and into the vagina.

The Urethra: This is the tube inside the penis that carries urine or semen. It is the continuing part of the sperm duct.

The Penis: This is the external sexual organ of the human male. The job of the penis is to pass urine out of the man's body and to pass semen into the vagina of a woman during sexual intercourse.



The Male Reproductive System

Puberty changes in females

Some changes that occur in females at puberty are:

- Hips widen
- Appearance of acne
- Enlarging of breasts
- Narrow waist
- Pubic hair appears
- Increase in perspiration
- Voice deepens
- Mixed feelings resulting in mood swing

Puberty changes in males

- Shoulders widen
- Muscles develop
- Increase in perspiration
- Pubic hair appears
- Increase in sex hormones
- Voice deepens
- Mixed feelings resulting in mood swing

SEXUALLY TRANSMITTED DISEASES

These are infectious diseases that spread among persons mostly through intimate contact. Anyone can become infected.

These diseases can severely degrade the health of persons. If untreated, some sexually transmitted diseases (STDs) can cause a lot of damage. Persons can become infertile and some can even die.

Some Common STDs are:

- HIV and AIDS
- Gonorrhea
- Syphilis
- Chlamydia
- Genital Herpes
- Genital Warts
- Hepatitis B

HOW STDS SPREAD

STDs do not spread only through sexual intercourse. A person can become infected by the following ways:

- Through skin to skin contact with an infected area.
- The viruses or bacteria can enter through tiny cuts or tears in the mouth and anus.

Some of the things that increase a person's chances of getting an STD are:

- Sexual activity at a young age.
- Lots of sex partners.
- Unprotected sex.

Preventing and Treating STDs

As with many other diseases, prevention is key. It's much easier to prevent STDs than to treat them. The best way to prevent yourself from becoming infected from a sexually transmitted disease is to abstain from all types of sexual contact. Using a condom reduces the chance of contracting sexually transmitted diseases if you are going to have sexual intercourse.

How HIV/AIDS is contracted?

Acquired immunodeficiency syndrome (AIDS), a disease that makes it difficult for the body to fight off infectious diseases. The human immunodeficiency virus (HIV) causes AIDS by infecting and damaging part of the body's defenses against infection, namely the white blood cells.

How does someone become infected?

HIV can be spread through any type of unprotected sex if one of the partners has the virus. Someone can become infected even if only tiny amounts of these fluids are spread. Everyone who has unprotected sex with an infected person is at risk of contracting HIV, but people who already have another sexually transmitted disease (STD) are even more at risk.

HIV can be spread sexually from a male to a female, a female to a male, a male to a male, and a female to a female.

HIV can also be passed by sharing needles to inject drugs, steroids, for tattoos, piercings and body art. If someone who is infected with HIV uses a needle, tiny amounts of blood containing the virus can become attached to the needle. If someone else uses that same needle, they can become infected. You cannot get HIV from hugging, holding hands or other casual contact. The virus cannot be spread by sneezing or coughing.

Newborn babies are also at risk of getting HIV from their mother. They can become infected before birth, during birth and through breastfeeding. Women who receive treatment for HIV are less likely to transmit the virus to their babies. Special medicines are also given to babies born from infected mothers.

HOW TO PREVENT AIDS

Protecting Yourself

The best way to protect yourself from HIV is to abstain from sex and to not share needles.

Condoms help to prevent persons from contracting the virus. Condoms provide a barrier so body fluids cannot be shared during sexual activity.

Many places in Guyana have sites where persons can be tested for HIV. Ask your teacher.

EFFECTS OF HIV/AIDS

What HIV does to the body?

HIV is a virus which attacks the body's defense against diseases. When the defenses have become weak and other disease germs attack the body, one can no longer fight them. The person has AIDS.

Among the disease germs which infect HIV+ persons are those which cause colds, TB, malaria, fungus and other common infections.

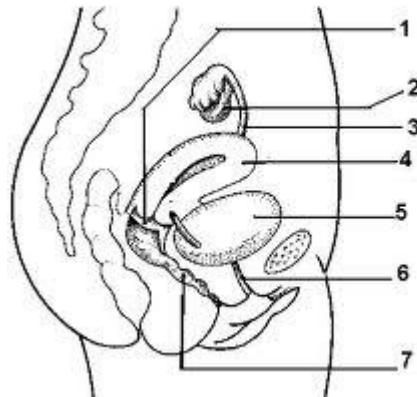
Eventually one of these diseases will cause the death of the person.

Persons with AIDS usually know they are going to die; this makes them feel sad. It also makes their families and friends sad and sometimes angry.

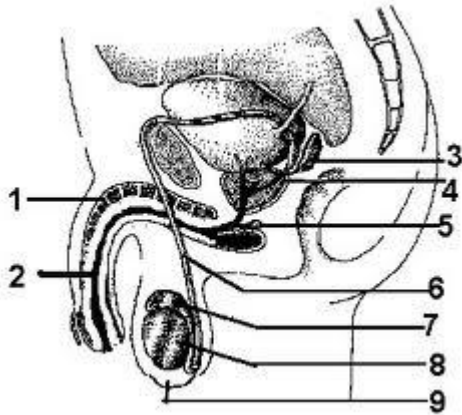
WHAT HAVE YOU LEARNT?

Match the words to the correct parts on each diagram.

Urethra, cervix, bladder, ovary, oviduct, vagina, uterus



Sperm duct, bladder, penis, scrotum, prostate gland, fore skin, testes, urethra



INTERRELATION OF THE SYSTEMS

Now that you have looked at the main organ systems you should be able to see that they are all interrelated. The nervous system is the control centre. If it were to break down, the others would be unable to function. In the same way all other systems depend on each other to function effectively. Can you tell how the digestive and circulatory systems relate with each other?

Can you imagine what would happen if something went wrong with your respiratory system? Think of other ways in which the systems will be affected if something goes wrong with any one of them.

THE EFFECTS OF MALFUNCTIONING SYSTEMS

In any machine when one part does not perform satisfactorily the whole machine is affected. In the same way the human body gets problems when one system is not functioning well. Can you tell what can go wrong with body systems? What do you think will happen to someone if one body system should fail? Body systems can malfunction because of disease. Have you ever had

the common cold? The common cold may lead to pneumonia which will affect your respiratory system. Injury can also cause systems to malfunction. Abuse of alcohol, cigarettes and drugs can also cause systems to malfunction severely. Sometimes when one system is not working well another system has to help with its functions. Can you name a system which can help another?

Since we are each responsible for our own health it is important that we take proper care of our bodies. If we want our bodies to function well we must practice good health habits. We must ensure that our homes and surroundings are clean. We must also make sure that we eat the right types of food and get enough rest and exercise. Sleep is very important for the organ systems.

SUMMARY

- The human body is made up of organ systems.
- The nervous system is the control centre.
- The circulatory system takes blood, oxygen and nutrients around the body.
- The respiratory system supplies oxygen to and removes carbon dioxide from the body.
- The digestive system provides nutrients for the body.
- The excretory system gets rid of waste matter.
- The skeletal system is a bony framework which supports the body.
- All organ systems are interrelated for the proper functioning of the body.
- Body systems can malfunction as a result of disease or injury.
- The reproductive System is made up the male and the female systems.
- The male reproductive system consists of the penis and testes.
- The female reproductive system consists of the vagina, uterus (womb) and ovaries.
- Reproduction in humans occurs through sexual intercourse.
- Fertilization occurs when the sperm fuses with the egg.
- The new human life begins in the uterus (womb).
- Sexual intercourse can lead to pregnancy, child birth and STDs.
- Maturity is important in making informed decisions before engaging in sexual intercourse.
- It is illegal to have to sex under the age of 16 years.
- Pregnancy can be prevented by abstinence and the use of contraceptives.
- STDs are contracted and spread through sexual intercourse.
- The HIV virus attacks the body until the body cannot fight against diseases.
- The spread of HIV/AIDS can be prevented.
- HIV/AIDS have physical, emotional and psychological effects on individuals, families and communities.

What have you learnt?

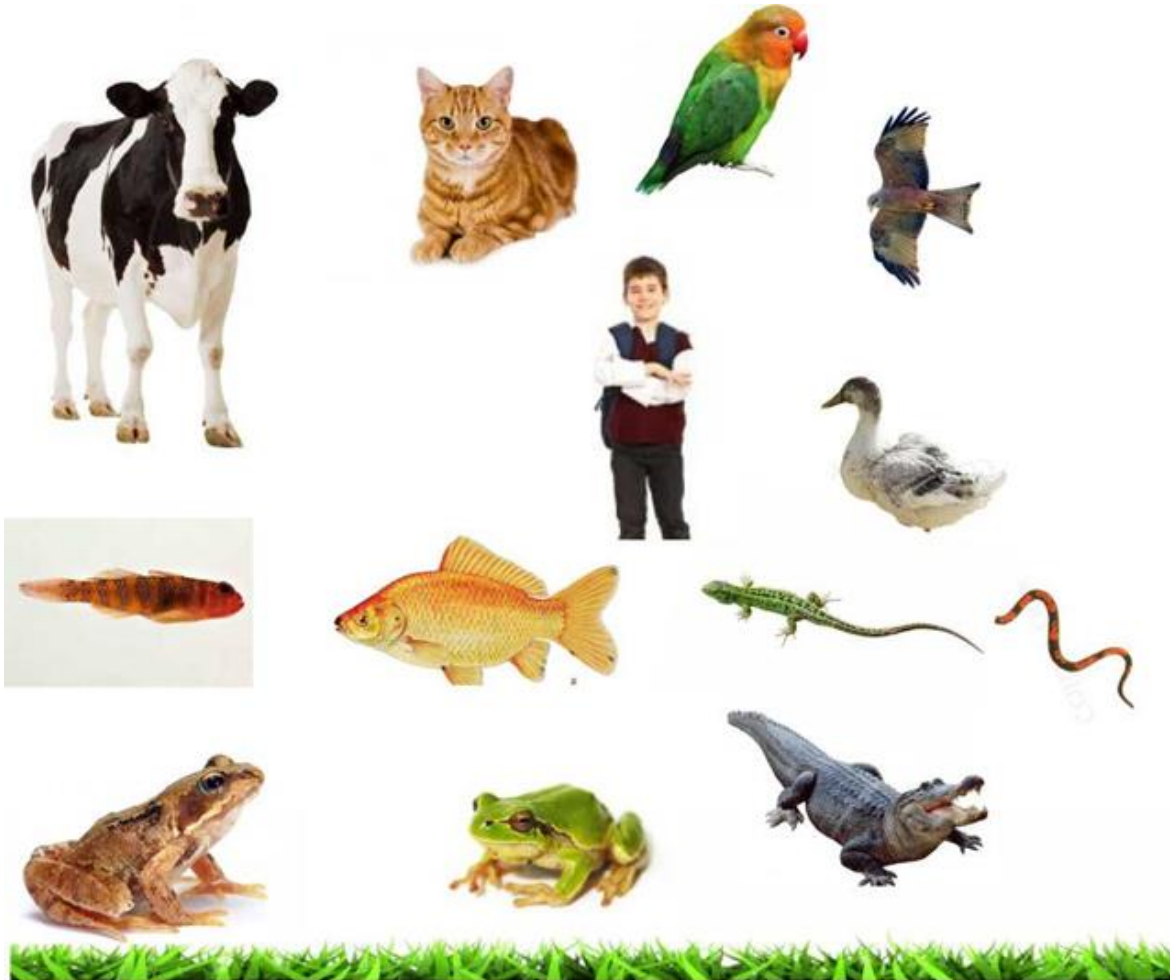
1. Match the organ with their organ systems:

Lungs skeletal kidneys respiratory skull nervous excretory brain

2. Complete: urea + water =
3. The main organ of excretion is the
4. Make models of the skeletal and respiratory systems.
5. Of the six organ systems, which one do you think you can do without? Give your reasons.
6. Which two systems get rid of waste?
7. Which system involves communication?
8. Find suitable books and read some more about the Organ Systems.

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?

Something to do

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			

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 on the next page.

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.

Name some invertebrates found around your home.

Name some other invertebrates.

THE FAMILY OF INVERTEBRATES

Invertebrates are found everywhere. They can 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, of wings and legs. We can group invertebrates using their common structures. Three of the main groups are:

- the arthropods,
- the molluscs and
- the worms.

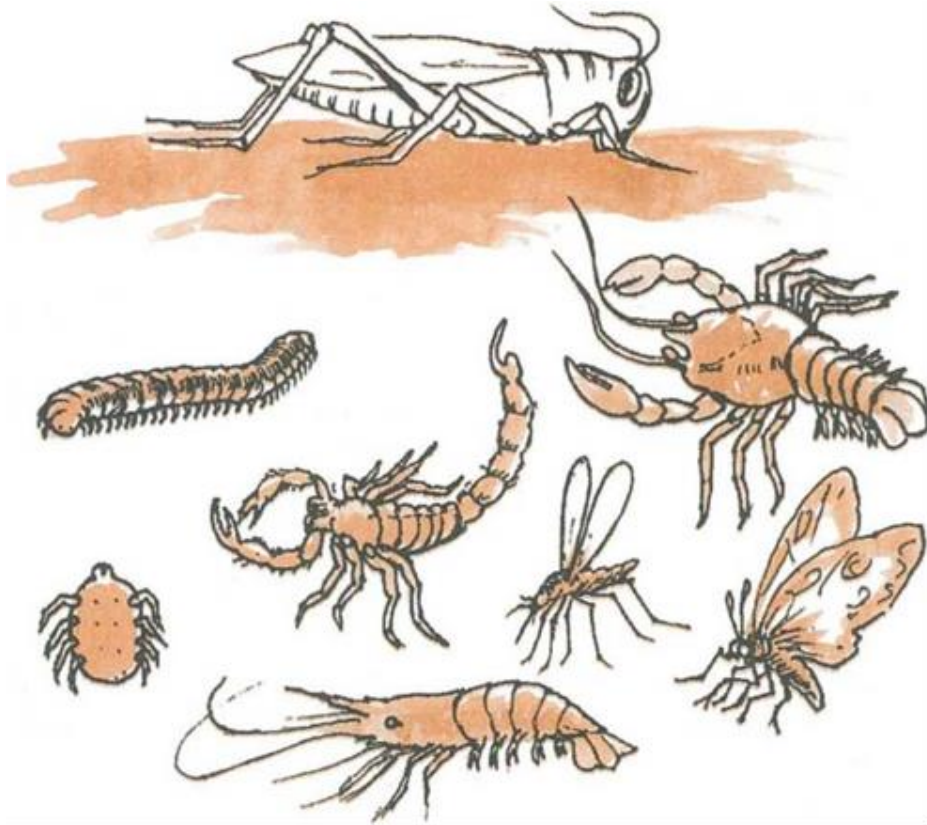


THE ARTHROPODS

Invertebrates with jointed legs and segmented bodies are called arthropods. Arthropods also have a hard covering outside their bodies.

The 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 many legs?

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

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

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

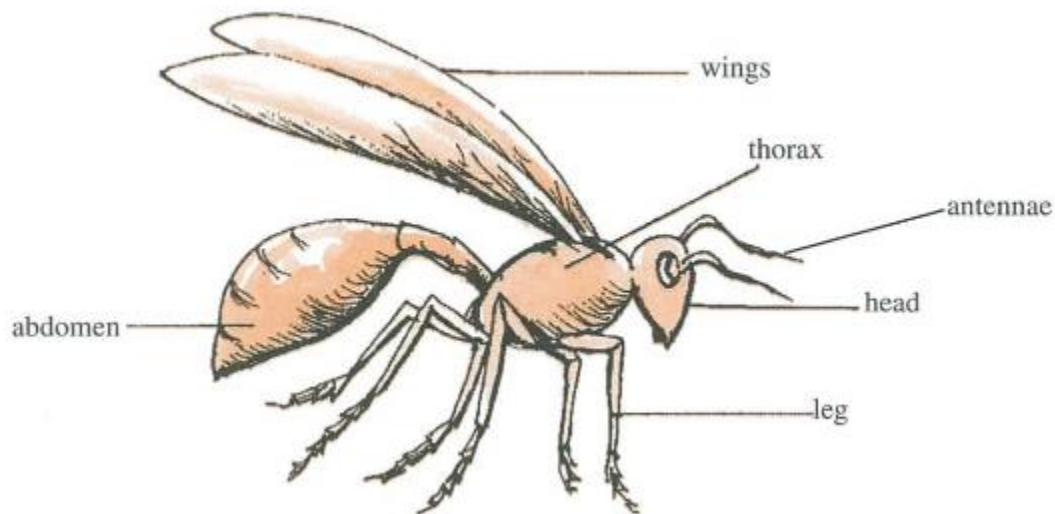
Key to Arthropods

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

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?

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**.

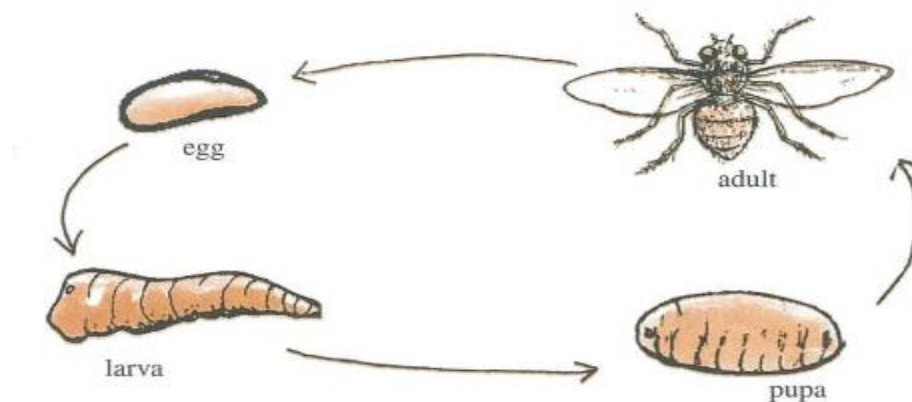
Insects breathe by tracheae.

Young insects do not look like the adult. Insects develop in stages. Some pass through more stages than others.

The housefly, butterfly and the mosquito undergo four stages in their development. These stages are **egg, larva, pupa** and **imago (or adult)**.

These insects undergo **complete metamorphosis**.

Life Cycle of a Housefly

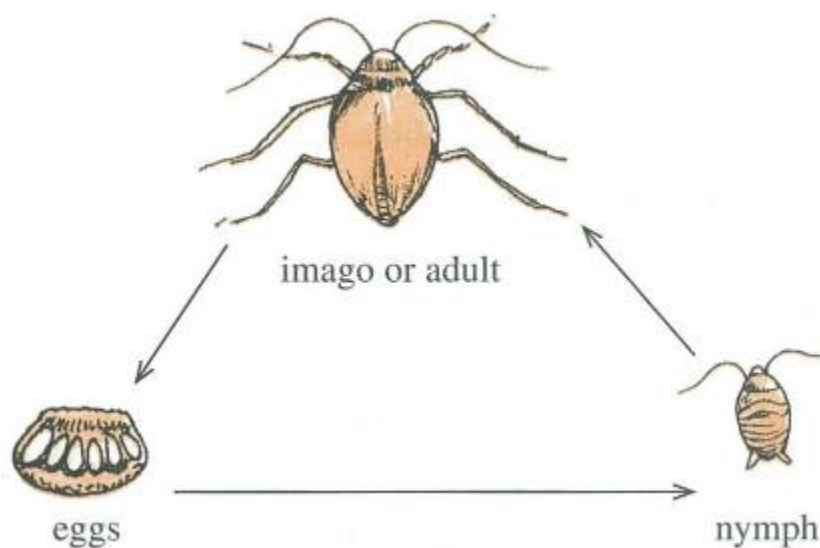


The growth and development of an insect from an egg to an adult is known as its life cycle or **metamorphosis**.

Insects which have the **egg, larva, pupa** and **imago** (or adult) stages are said to undergo a complete metamorphosis.

The housefly, mosquito and butterfly all undergo complete or gradual metamorphosis.

Life cycle of a cockroach

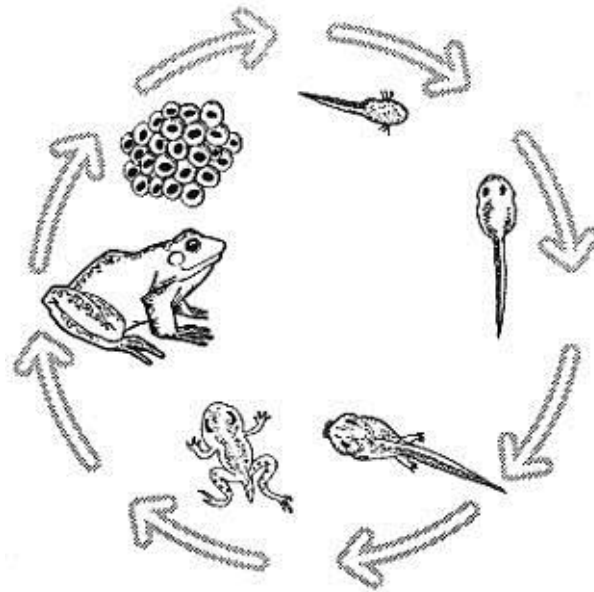


The cockroach and the grasshopper undergo **three** stages in their development. These stages are the **egg, nymph** and **imago (or adult)**. These insects undergo an **incomplete metamorphosis**.

Something to do

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.)

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



Life cycle of a toad

Frog and toads are amphibians and can live in water and on land. Most frogs or toads begin their life-cycle in water as the eggs can develop only under moist or wet conditions. The eggs hatch into the larval stage called tadpoles. The tadpoles live in water and develop into young frogs/toads.

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?

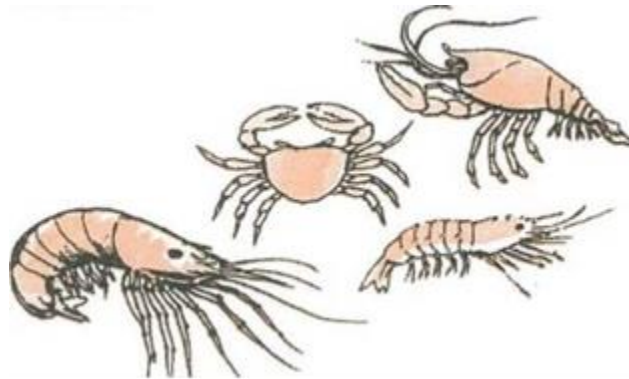
Do they have antennae?

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.

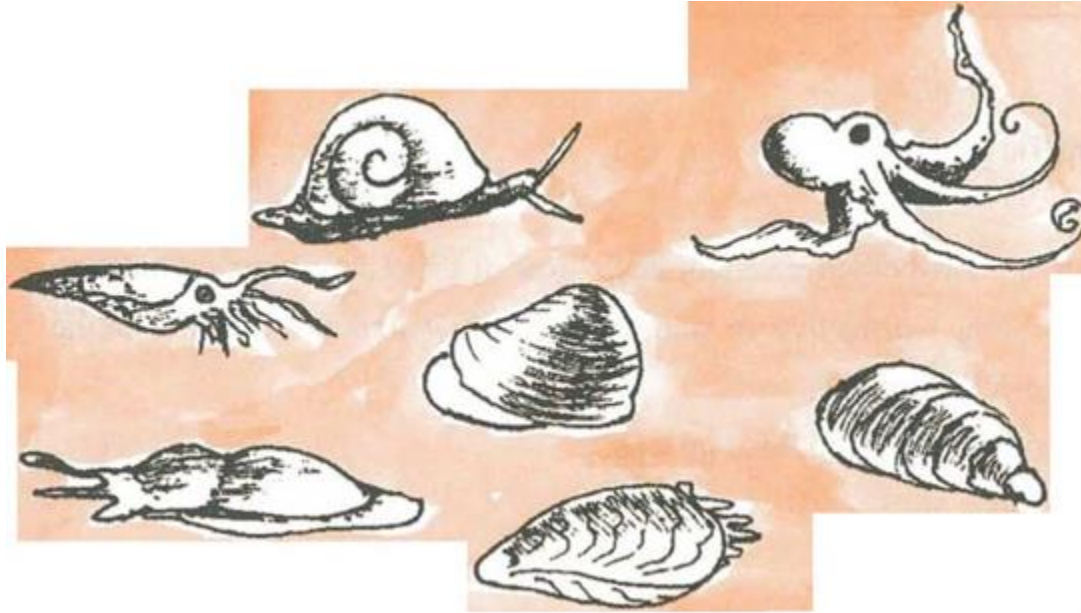
Can you see the segments? How many legs are attached to each segment?

Something to do

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?

MOLLUSCS

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



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

Some invertebrates have soft, slimy bodies covered with shells. They are called **molluscs**.

Snails, clams, oysters and mussels all have hard shells.

The squid and octopus do not have shells.

They have arms or tentacles. These protect them and help them to get food. Find out the number of tentacles that an octopus has.

Something to do

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.

What happens? 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.

Worms may be placed into three groups.

These groups are:

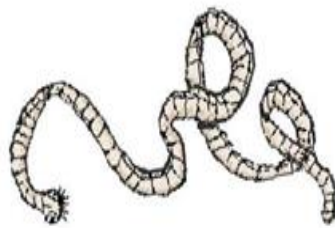
1. the flat worms,
2. the round worms and
3. the segmented worms.

Flat worms 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.

How does it help us?



blood fluke



tapeworm



flatworm

Do you know which animals sometimes have tape worms inside their bodies? Round worms are long and pointed at both ends. Hookworms and threadworms are round worms. They are parasites. 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.

Something to do

Things you need

- jar or bowl
- earthworms
- garden soil

1)

- A. Fill a jar or bowl with garden soil.
- B. Place some earthworms on the soil.
- C. Observe what happens.

2)

- A. Collect pictures of invertebrates.
- B. Paste these in a book with heading

‘My Book of Invertebrates’.

You may paste pictures under the three main groups of invertebrates.

HOW ANIMALS AFFECT HUMANS

Some of the effects animals have on humans are that they may:

- provide food and protection;
- help with work;
- spread disease;
- damage food crops.

Animals provide food for humans. We eat animals such as fish, chicken, pig (pork), and sheep (mutton). We also hunt and kill wild animals and eat their flesh. e.g. labba, iguana, deer.

Humans use dogs to protect them.



Some animals that help us to do work

Donkeys and horses pull carts. Bulls are used to plough farms.

Some animals that spread diseases are mosquitoes, rats, cockroaches and houseflies. Can you name some diseases spread by these animals?



Some animals that damage food crops are cricket, caterpillar, stink bug and grasshopper. Some ants eat the seeds from seed beds and boxes. Grasshoppers and caterpillars bite the leaves of plants. Snails scarp the surfaces of leaves and stems and feed on this material.



Animals also affect their environment in other ways through, for example, their feeding, making homes, and excreting waste

Animals eat plants in their environment e.g. cows eat grass. They make homes from the things in their environment e.g. birds build their nest with twigs which they get from the trees. When some animals excrete waste, the soil is fertilized e.g. we use the faeces of cows as manure.



SUMMARY

- Vertebrates are divided into five groups. These are mammals, reptiles, birds, fishes and amphibians
- 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.

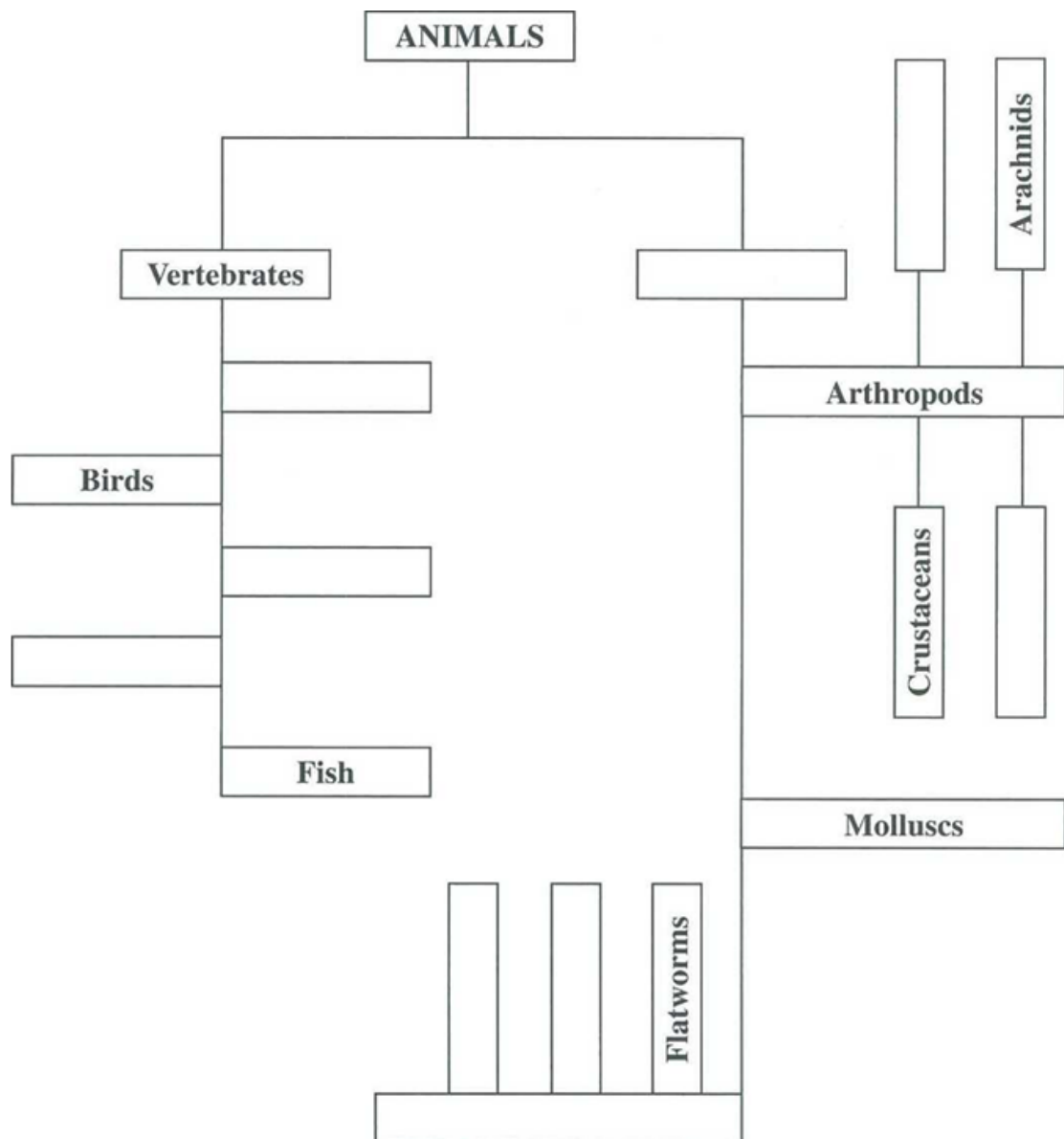
What have you learnt?

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:

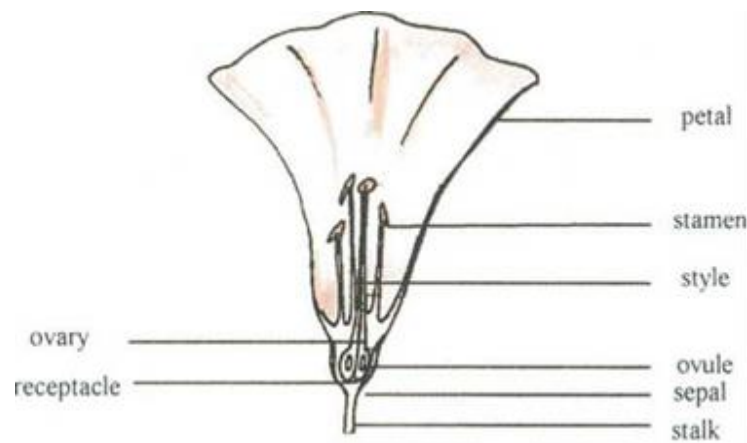
1. Vertebrates have bony skeletons _____ their bodies
2. Young birds are hatched from these _____

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 in human hair.
16. Insects that suck blood.

CHAPTER 3 FLOWERS AND REPRODUCTION

FLOWERS

Flowers are very important to plants. They are the reproductive organs of flowering plants. Let's look at the parts of the flower below.



Parts of a flower

Something to do

1. Collect a few flowers.
2. Observe them carefully and find the parts named below.
3. Choose one flower from your set.
 - ❖ 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?

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

What attaches the flower to the plant? Flower stalks connect the flowers to the plant. They may be long or short. They form a cup-like structure called the **receptacle**. The receptacle protects the young petals and other inner floral parts.

Petals may be fused together or free.



Free



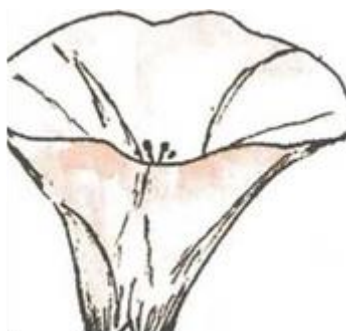
Fused



Receptacle

They may be brightly coloured or pale. Some petals are highly scented while others are not. Petals which are brightly coloured or highly scented attract insects and birds.

Let's look at other parts of the flower.



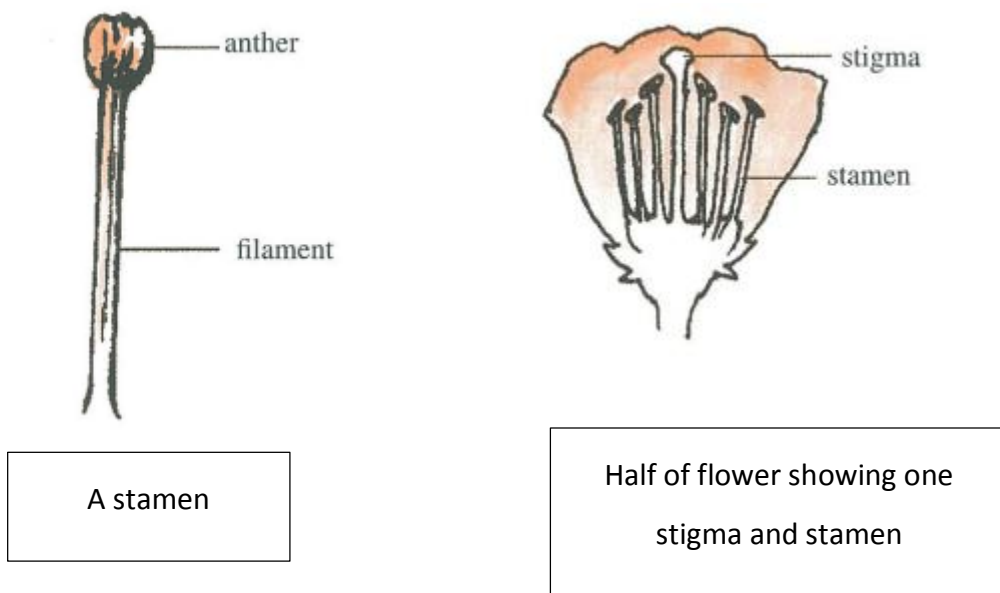
Look for other plants in your surroundings which have flowers with both male and female parts.

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?

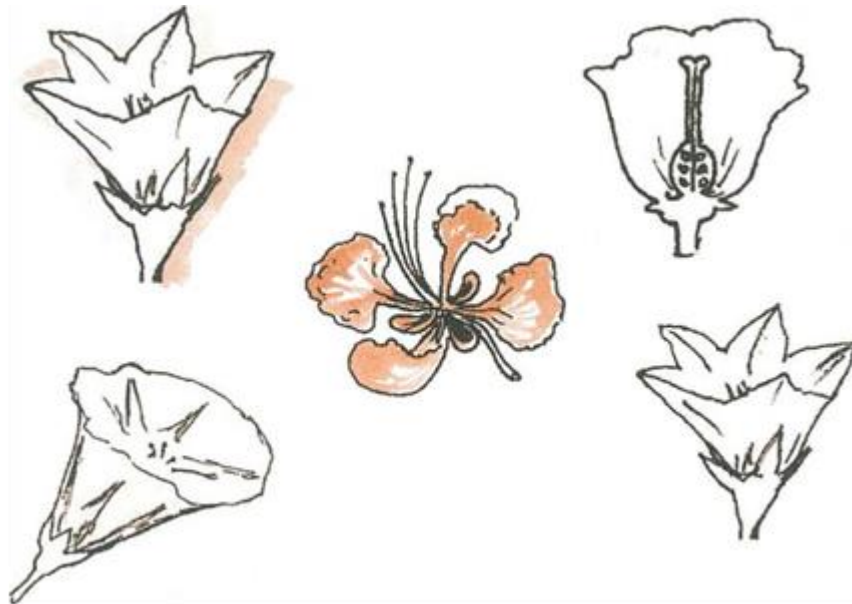


The filament and the anther make up the stamen. The stamen is the male reproductive part of the flower. A flower may have one stamen or more. The stamen is made up of the anther and filament. In the anther are sacs. Pollen grains are produced in these sacs. Most pollen grains are like yellow powder.

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. Ovules are found in the ovary.

Something to do

1. Collect at least two of these flowers.



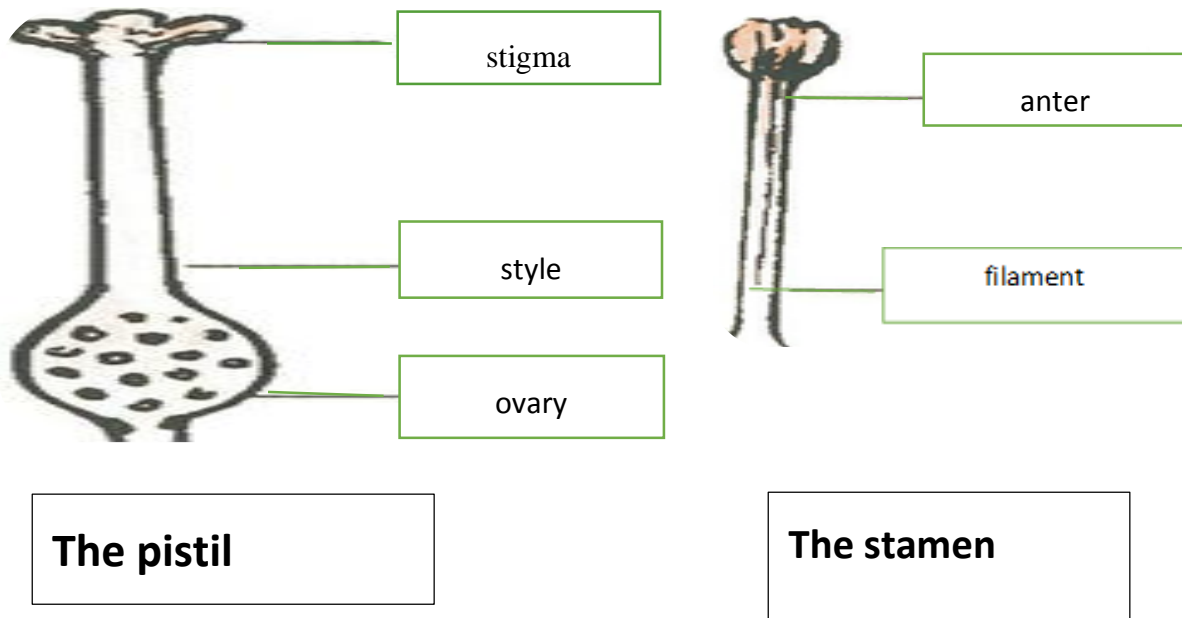
2. Look for the stamen. How many stamens are there on each flower? Can you see the pollen grains?
3. Dust some onto a sheet of paper
4. Look for the stigmas. Has the flower one or more than one stigma?
5. Carefully cut each flower in half. Can you find the ovary and ovules?
6. Draw at least two of these 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 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.



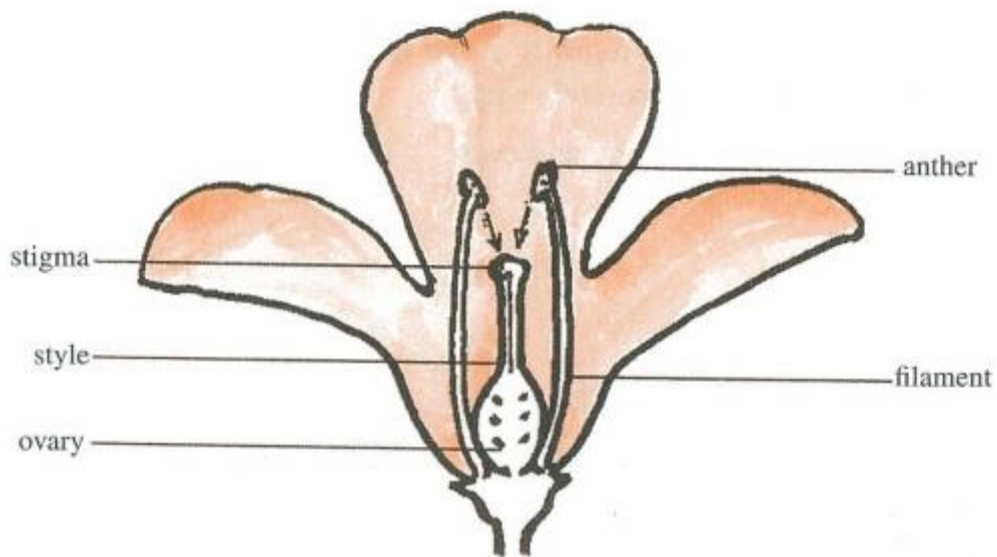
Pollen grains are produced in the anthers of the stamens. When the pollen sacs are ripe, they burst open and the pollen grains are exposed. They are usually carried from the anthers to the stigmas of the same plant or another of its kind. This transfer of pollen grains from anthers to stigmas is called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

Something to do

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

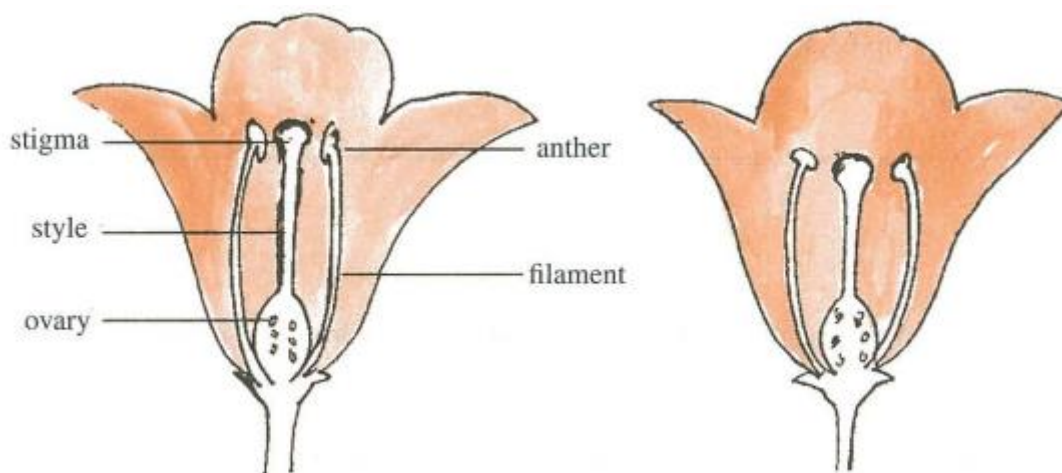
flower. Self-pollination also takes place when the pollen grains from one flower fall on to the stigma of another flower on the same plant.



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. The stamens of wind pollinated plants are large and they hang out of the flower. Lots of light pollen grains are produced by these flowers. The wind blows pollen off the anther and onto the stigma.



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 onto 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.

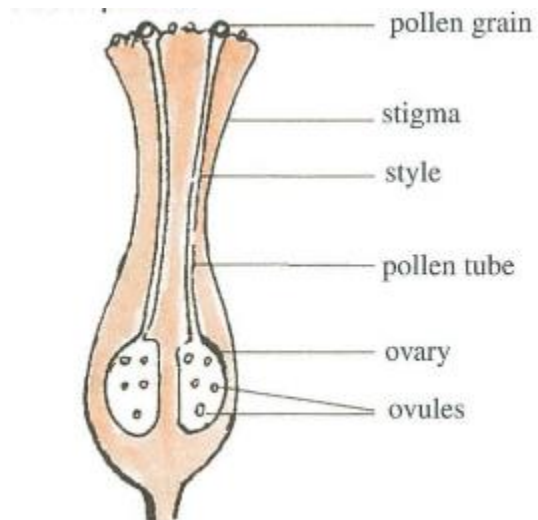
Something to do

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.



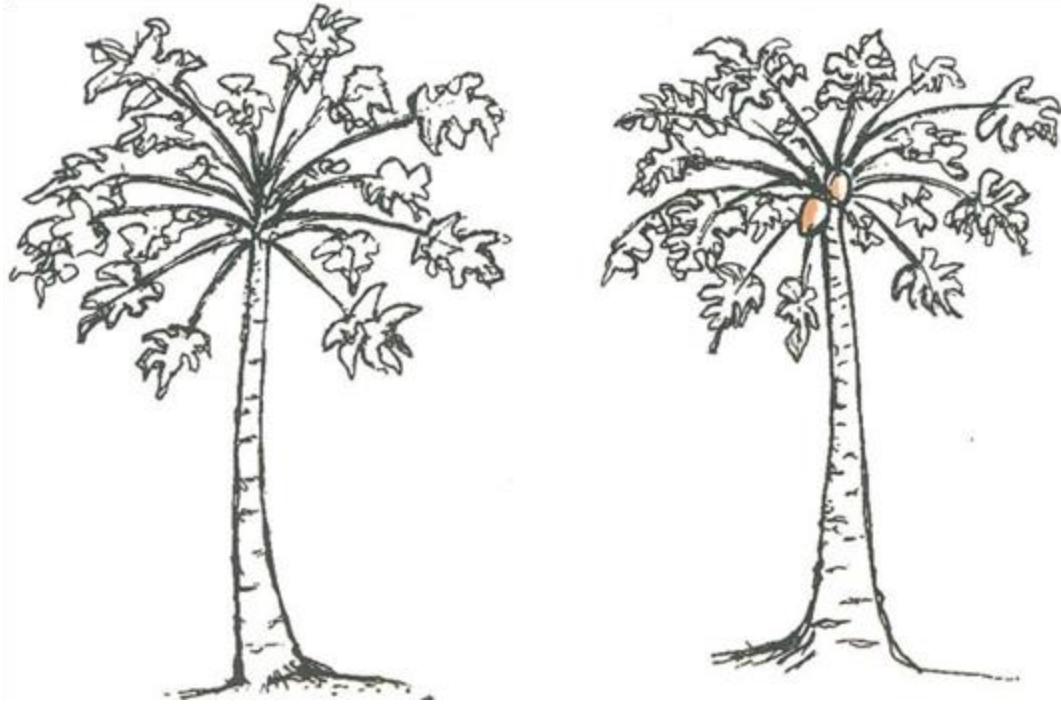
Something to do

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.

What have you learnt?

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

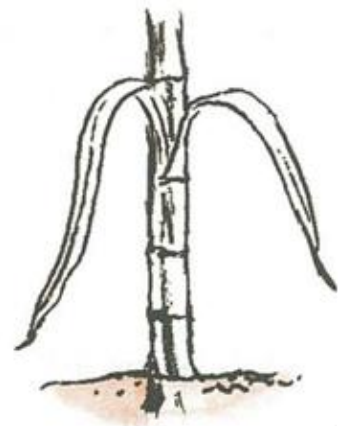
CHAPTER 4 PLANTS CAN PRODUCE NEW ONES

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.



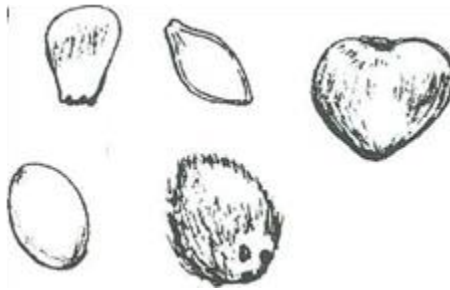
Leaf of life

Something to do

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.



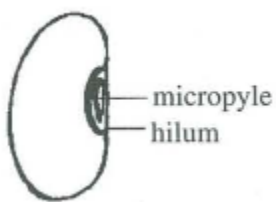
Something to do

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.

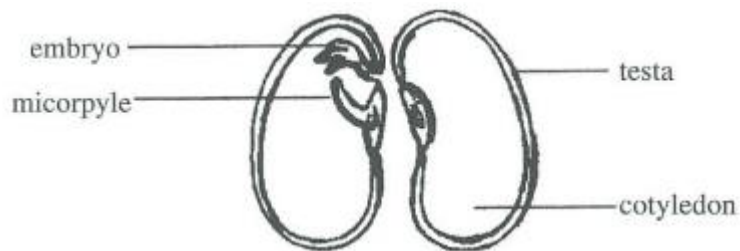
5. Draw the seeds you have listed.
6. Soak some of the seeds in water overnight.

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.

Something to do

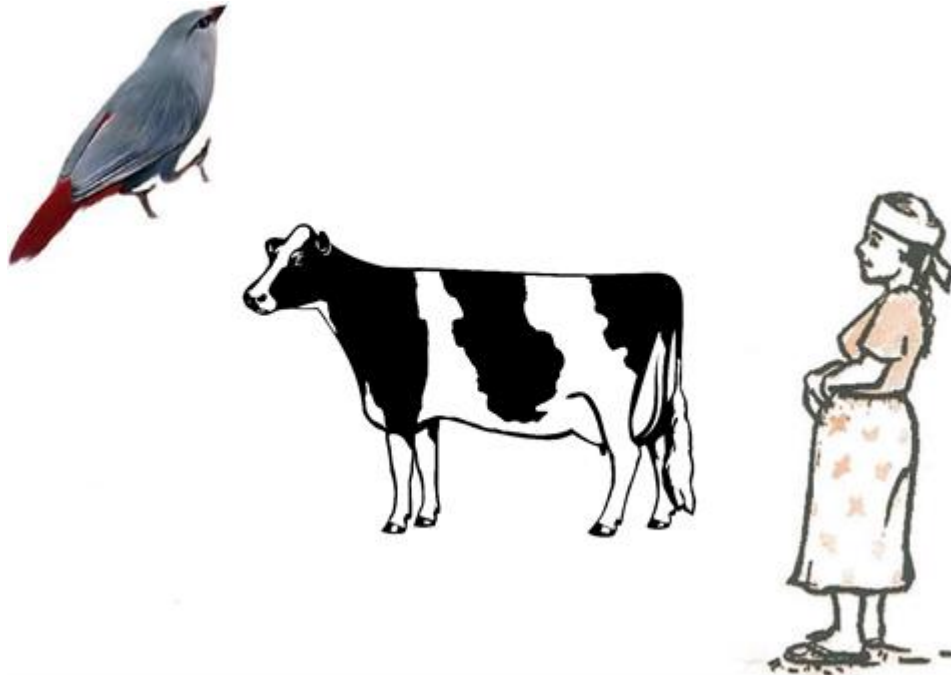
Draw some seeds and label the different parts.

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 buoyant 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.



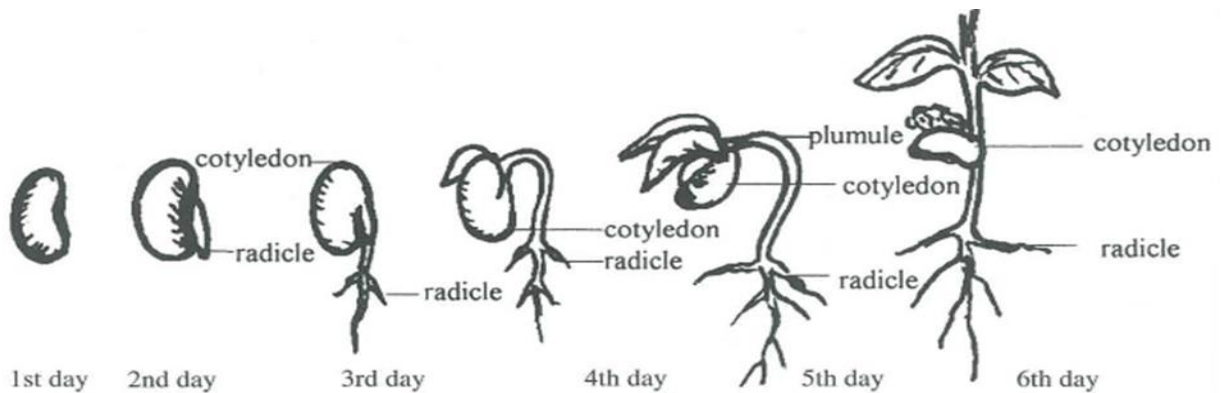
Something to do

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.



Something to do 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 testa, 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 5 ENVIRONMENT - ADAPTATIONS

Adaptations are special features that allow a plant or animal to live in a particular place or habitat.

ADAPTATION IN ANIMALS

Can you tell some things an animal must do to live in its environment? Animals must be able to find food and protect themselves if they are to survive in their environment. Animals which can do this successfully have adapted to their surroundings.

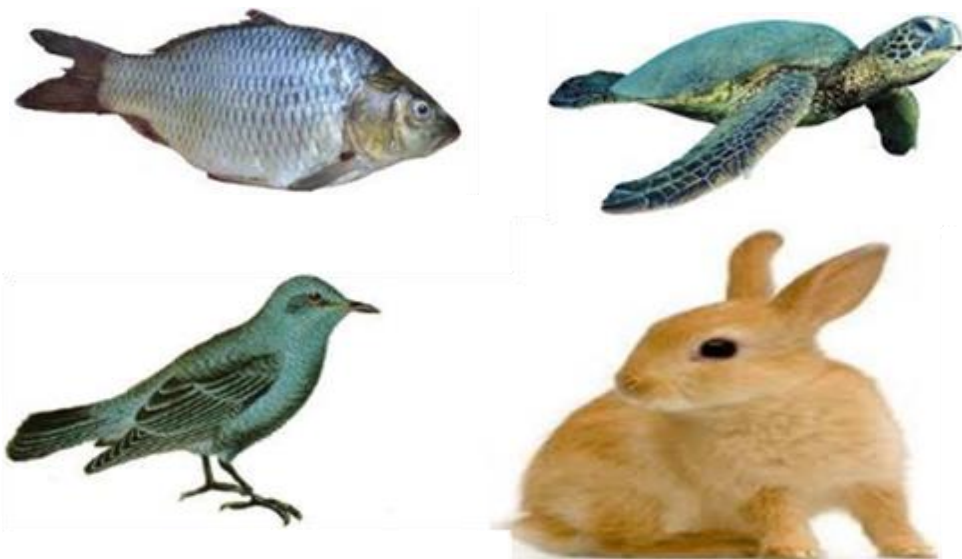
Anything that helps an animal live in its environment is called an **adaptation**. Animals may have body covering or body parts which are adapted for survival in their particular habitat.

Let's look at some of these adaptations.

COVERINGS

A body covering is an important adaptation. Skin is the outer covering of an animal's body. It is sensitive to change in temperature, and touch. This sensitivity makes the animal aware of changes in its surroundings. In addition to skin, many animals have another body covering.

Look at the animals below. What other covering does each have?



This added layer of body covering provides better protection for the animal



Fur is a coat of soft hair.

Some animals living in very cold environments have **thick** coats of fur. The fur traps air close to the animal's body which then warms the air. This warm air helps to keep the body of the animal at the correct temperature.

Quills are very stiff hairs. The hedgehog and the porcupine have quills. Look at the picture of the hedgehog. How do the quills protect the hedgehog from its predators? When the hedgehog senses danger, the quills stand erect. These sharp points will prick anyone who touches the hedgehog.



Feathers are found on birds. They are strong and very light. Feathers help birds to fly so that they find food or get away from their enemies. Some birds like the duck which dives or swims to get its food, have feathers which are heavily coated with a layer of oil. Oil makes the feathers waterproof. How does this help to keep the birds warm? Baby birds usually have soft feathers called down feathers.

This helps to keep them warm. Adult birds also have down feathers close to their bodies.

Scales are found on reptiles and most fish. Scales may be large or small, round or pointed.



Scales help to protect these animals.

Try slicing a fish with scales and a fish without scales. What do you observe? Which is easier to do?

Something to do

Things you need

- Different kinds of fish
- a knife

1. Collect a variety of scales.
2. Display in classroom with the names of the fish from which they came.

You may like to use the scales as decorations in your next craft project.

Shells are hard coverings that protect some animals. What does a snail do when it is touched?
How does the turtle behave when it senses danger? Is it easy for a predator to injure the armadillo?

Can you penetrate the shell covering?



Something to do

Things you need

- a snail
- a shallow dish with water

1. Put the snail in the dish.
2. Watch it move.
3. Touch the snail. What happens?
4. Pick up the snail. Touch its soft body.

Observe what happens.

FEET



Animals move about to find food in order to survive in their environment. Feet are used for movement. The feet of animals are adapted for different movements. Some animals use their feet for walking, running or jumping.

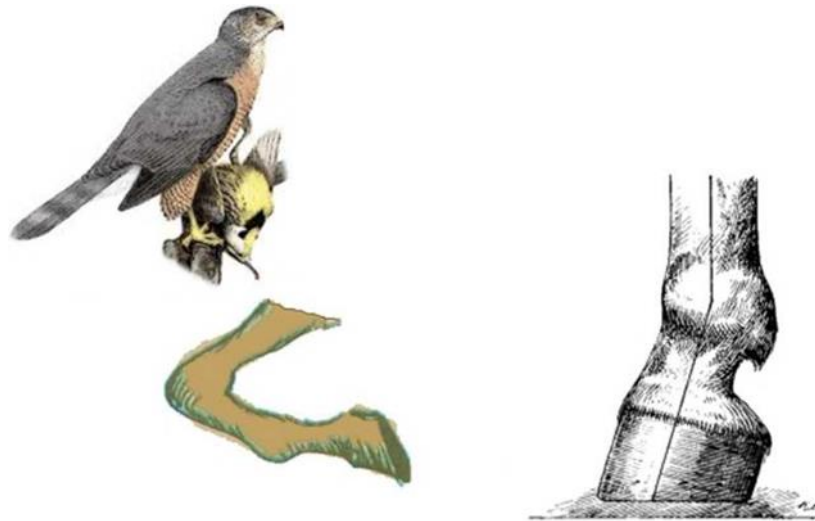
The feet of some animals are used not only for movement but also for defense. Some animals use their feet to help them to swim or climb. What are the feet of the frog used for?



Look at the hind limbs of the frog. How is it different from its forelimbs? Animals which hop have hind limbs which are larger than their forelimbs. Name some other animals that hop. The hind legs of the frog also have long toes which are joined by skin.

Feet with toes joined by skin are called webbed feet. The frog's feet help it to get a good grip on muddy surfaces. They are also used like paddles when the frog is swimming. Look at the webbed feet of the duck. How is this adaptation useful to the duck for getting food? Find out the name of some other animals with webbed feet.

The cat's feet have claws. How do these help the cat to get its food? Look at the eagle. How are its feet adapted for catching and holding its prey? Observe carefully the feet of the horse and the camel.



How are they different? The horse's feet are adapted for movement on hard surfaces. The camel's hoofs are specially adapted for walking on loose sand. Its hoofs provide a broader surface which enables firmer contact with the ground.

Something to do

Things you need

- a pair of shoes with narrow heels
- shoes with flat heels

1. Walk on sand or soft ground with the narrow heeled shoes. Observe what happens.
2. Repeat using the flat shoes.

What did you discover? It was easier walking in the flat heeled shoes than in the high heeled ones.

In the same way the flat hoofs of the camel make it easy for it to walk on the loose, desert sand.

Something to do

Things you need

- pictures of animals

- paste

1. Choose three animals with different kinds of feet.
2. Paste each kind on a different page in your Science Book.
3. Write beneath each picture the different ways in which these feet are adapted for the animal's survival.

WINGS

Birds use their wings to fly from place to place in search of food. Some birds fly to a warm climate when their environment becomes cold. Wings may also be used to help birds escape from their predators.



Look at the picture. What type of adaptation is the bird using to escape from its predator?

BEAKS

Birds have mouthparts called beaks or bills. Look carefully at the beaks of the birds below.

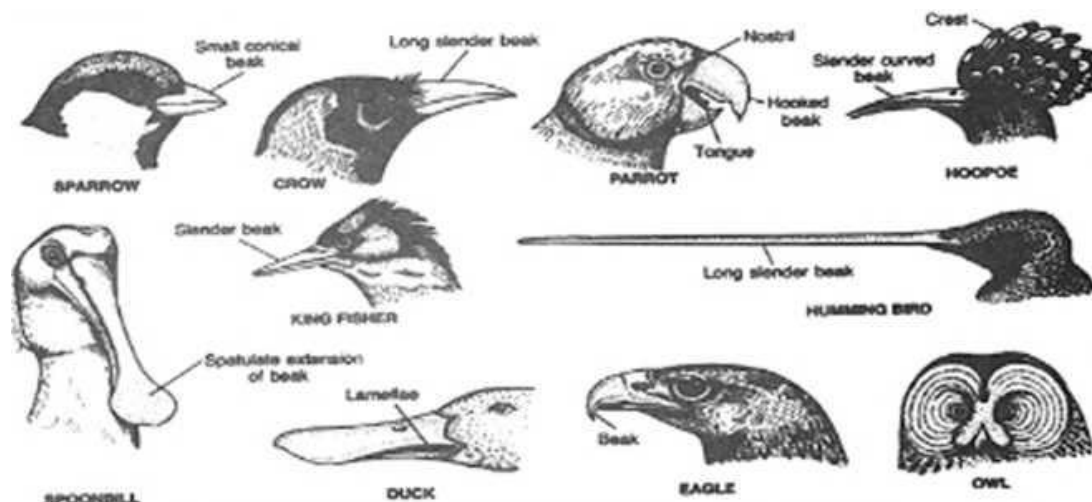


Diagram showing birds with different beaks

Try to describe each beak. Why do you think each beak has a different shape?

A beak is an adaptation that relates to a bird's diet. Some birds have flat, spoon-like bills which arc like strainers. These bills grip small, slippery water animals and also strain the muddy water so as to retain anything that is edible. Some birds eat small seeds. They have short, pointed, conical beaks. The sharp, curved beaks of some birds help them to kill and tear the meat from the body of their prey.

Birds which spear fish have long, pointed beaks which are very strong. Study the pictures of the birds shown.

Can you tell what each catches?

Something to do

Things you need

- pictures of birds
- cardboard

- markers
- paste

1. Draw up chart as shown.

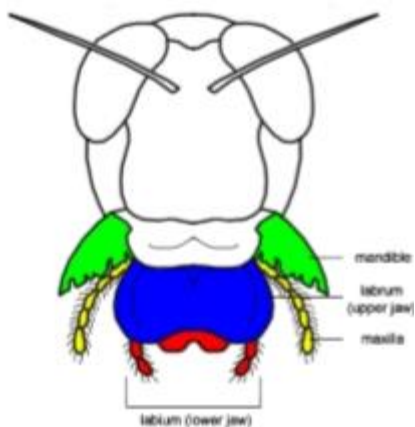
Eats flesh	Eats small seeds	Spears and catches fish	Eats small water animals and weeds

2. Paste the pictures in the appropriate columns.

3. Write the name of the bird under each picture.

MOUTHPARTS OF INSECTS

Some insects have mouthparts adapted for chewing. Others have for piercing and sucking. Look at the mouthparts of these insects.



Which insect cuts and chews leaves?

Which insect sucks nectar from flowers?

Which pierces the skin and sucks blood?

Find out the names of other insects which have either chewing, piercing or sucking mouthparts.

TONGUES

What helps the lizard to catch its food? Some animals have long sticky tongues.

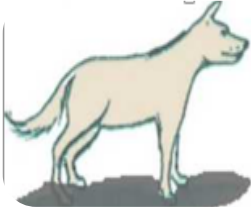


Long sticky tongues are used for trapping insects. The lizard, frog and anteater eat insects. Their tongues are long and sticky.

TEETH

Which of the animals below eat plants only?

Which of them eat mainly meat?



Dog



Reindeer

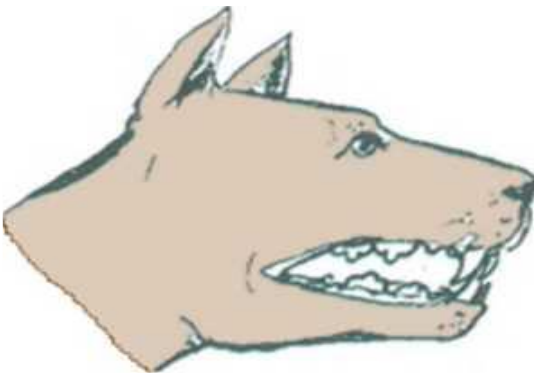


Horse



Lion

Let's find out how the teeth of these animals are adapted for their different diets.



Dog



Horse

Study the pictures above.

Describe the teeth of the dog. Name some other animals with teeth similar to those of the dog. Cats, tigers, lions and dogs are meat eaters or carnivores. They have sharp, pointed teeth to tear the meat they eat. Is the horse's teeth different from the dog's teeth? Why are they different? Does the horse have pointed teeth? What shape are its front teeth? What are its flat, back teeth used for?

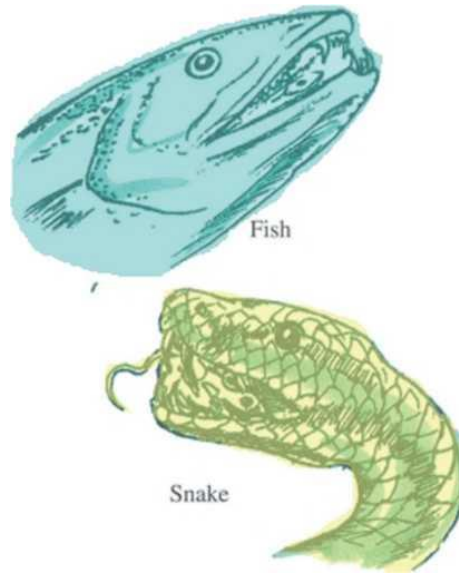
Animals like the sheep, goat, deer and horse are herbivores. They have sharp, front teeth for biting and flat, back teeth for chewing and grinding the plants they eat.

Name some other herbivores.



Man has teeth adapted for eating both plants and meat. Man is an omnivore. Look at the teeth above. Can you find the biting teeth, the tearing teeth and the teeth for grinding?

Find out the names of some animals which are omnivores and which have teeth suited to their diet.



Some animals swallow their food without chewing. The snake swallows its food. It does not have chewing teeth.

The snake has teeth which are curved inwards. These serve to hold its prey and to prevent it from escaping.

Something to do

1. Collect the teeth of some animals.
2. Group them according to their use.
3. Label and display them.

ADAPTATION IN PLANTS

Plants have adaptations to help them survive (live and grow) in a specific area. These adaptations might make it very difficult for the plant to survive in a different place. This explains why certain plants are found in one area, but not in another. For example, you wouldn't see a cactus living in the Arctic nor would you see lots of really tall trees living in grasslands.

The Desert

Did you ever visit a desert? A desert is very dry and it is also mostly hot. There is little rainfall. The soil is often sandy or rocky and unable to hold much water. Plants are exposed to extreme temperatures and drought conditions. Plants must cope with extensive water loss.

Desert Plant Adaptations

- Some plants store water in their stems or leaves;
- Some plants have no leaves or small seasonal leaves that only grow after it rains. This helps to reduce water loss during photosynthesis. The process of photosynthesis occurs in the green stems of the leafless plants.
- Plants have long root systems that go deep into the ground to absorb water or they spread out wide.
- Leaves with hair help shade the plant, reducing water loss. Other plants have leaves that turn throughout the day to expose a minimum surface area to the heat.
- Plants have spines on them which discourage animals from eating them for water.
- The stems and leaves have a waxy coating which helps to reduce water loss.
- Flowers that open at night lure pollinators who are more likely to be active during the cooler night.
- Slower growing requires less energy. The plants don't have to make as much food and therefore do not lose as much water.

The cactus is an example of a plant that lives in the desert



The Tropical Rainforest

The tropical rainforest is hot and it rains a lot. The water can cause problems such as promoting the growth of bacteria and fungi which could be harmful to plants. The heavy rainfall can cause flooding and soil erosion. The plants in the tropical rainforest grow quickly using up organic material left from decomposing plants and animals. Little sunlight is able to penetrate the forest floor in the tropical rainforest. There is a great amount of diversity in plant species in the tropical rainforest.

Tropical Rainforest Plant Adaptations

- The plants have waxy surfaces and drip tips which allow water to run off. This discourages the growth of bacteria and fungi.
- Plants are held in the shallow soil by buttresses, prop and stilt roots.
- To reach sunlight, some plants grow on other plants.
- To aid pollination, the flowers on the forest floor are designed to lure animal pollinators.

- Plants have shallow roots which enable them to absorb nutrients from the top level of the soil.

Plant Adaptations in Water

- Air spaces are present in the leaves of some plants which help to hold the plant in the water.
- Water, nutrients and dissolved gases are absorbed through the leaves directly in submerged plants.
- The roots are only needed to anchor the plant, not for absorption. As such roots and root hairs are reduced or absent.
- Some plants have leaves that float on the surface of the water which exposes them to sunlight.
- In order to move with water currents, underwater leaves and stems are flexible.



SUMMARY

Animal adaptations

- An adaptation is anything that helps an animal to live successfully in its environment.
- A body covering is an important adaptation.
- Skin is the outer covering of an animal's body.
- Fur, quills, feathers, scales and shells are added body coverings for better protection.
- Body parts of animals are also adapted for their survival.
- Feet and wings are adapted for movement, to help catch prey, or for protection.
- Animals have mouthparts which are adapted for getting food.

Plant adaptations

- Plants have adaptations to help them survive (live and grow) in a specific area
- Some plants have adaptations to live in deserts, tropical rainforests and in water. Different features such as their water storage capacity, root structure and waxy surfaces help them to survive in their habitats.

What have you learnt?

1. What do animals need for survival in their particular environment?
2. Match the animals with their coverings.

Quills	Ducklings
Feathers	Rabbit
Fur	Snake
Scales	Porcupine
Shell	Turtle

3. Write a short account on how the duck is adapted for survival in the environment.

CHAPTER 6 ANIMALS AND PLANTS OF THE RAINFOREST

Here are some plants and animals of the rainforest, can you name them?



Name three other plants found in the rain forest.



Name three other animals found in the rain forest.

Rainforests have an abundance of plants and animals for the following reasons:

- **Climate:** Rainforests are located in the tropical regions. As such they receive a lot of sunlight. Sunlight is required by plants for the process of photosynthesis. As there is a lot of sunlight, there is a lot of energy in the rainforest. The abundance of energy supports an abundance of plant and animal species.
- **Canopy:** Rainforests have a canopy structure which provides many places for plants and animals to live and grow. It offers many sources of food and shelter.

LAYERS OF THE RAINFOREST

The rainforest is divided into several layers

Emergent Layer

- The tallest trees are the emergents. They can grow as high as 200 feet above the forest floor and some have trunks that measure up to 16 feet around. Most of the emergent are broad-leaved, hardwood evergreens.

Canopy Layer

- The canopy layer is the primary layer of the forest. It forms a roof over the two underlying layers. Most of the canopy trees have smooth, oval leaves that come to a point.

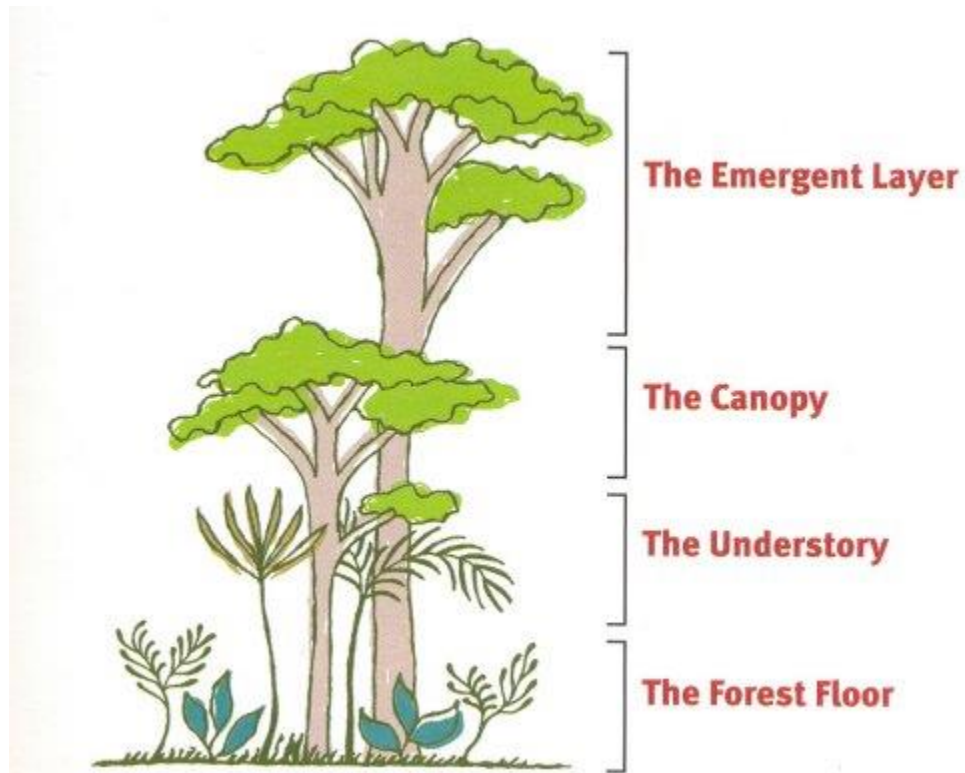
Understory Layer

- This layer is located under the canopy layer and as consequence, it receives little sunlight. As such the plants have to grow larger leaves to reach sunlight.

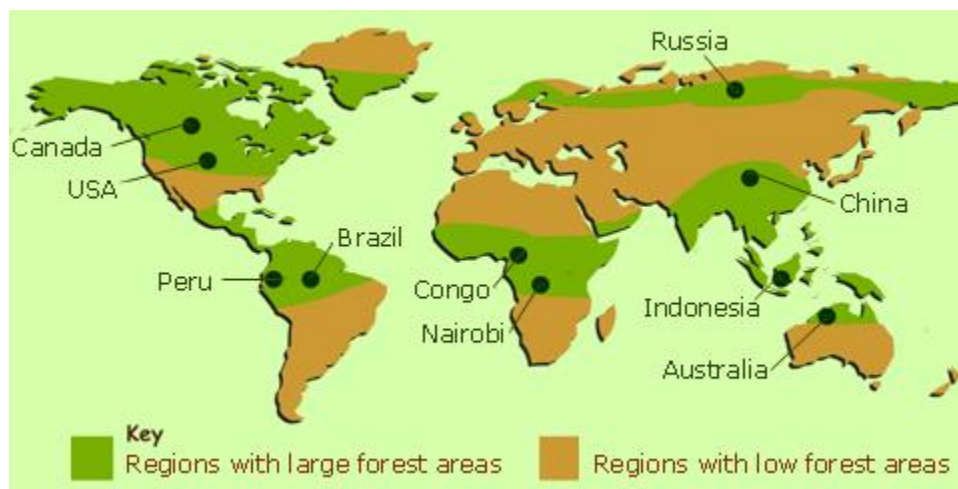
Forest Floor

- Sunlight is scarce in this layer restricting plant life to low growing species such as moss.

Diagram Showing layers of the Rain Forest.



FOREST PRESERVATION



Forests are hugely important for life on earth. This is because it serves as an ecosystem, and sustains life for millions of animals, birds and animals that live in the rivers and streams running

through these forests. It also does a lot of good to the atmosphere in climate control, as well as supplying oxygen for human sustenance.

IMPORTANCE OF FORESTS

Trees are important to all animals. Without them no animal would exist. How are the trees important to the animals in the picture below? Can you name some other animals that make their homes in trees? Name some wild animals that live in our forests.

Tribes of people live in the Amazon and Congo forests. Everything they use comes from the forest. The food they eat, the clothing they wear and the materials to make their houses all come from the forest. These people do not usually live there for very long.

Forests are cold, dark and damp under the trees.



Forests are important, too, in preventing floods. The tops of the many trees together make a good cover. This cover allows only a small amount of rain to reach the ground. When it rains the water runs off in steady streams thus preventing flooding. Forests also help in preventing erosion. When it rains the drops of water do not hit the ground with great force. This prevents the soil from being washed away. At the same time the water that does fall is soaked up on the soft, spongy ground. This water is stored and takes a while to flow away. In this way the forest helps to save water.

USES OF TREES

Look at the pictures below. Which of these come from trees?



The trees in a forest are used in many ways. We get logs to make boards which in turn are used for building houses and other wooden articles. Wood can be used as fuel to cook food. Many people in hot countries like to wear cotton clothes. We get cotton from the cotton plant. Paper is made from the pulp of some trees. Parts of some trees, too, are used as medicines. Can you name a few trees that are used as medicines? What parts of the trees are used to make the medicines?

Here is a story in pictures for you. See how well you can tell and write it.



We see then, that trees are very useful to us. In order for us to use trees we sometimes have to cut them down.

When the trees in a forest are cut down both humans and other animals are affected. Can you tell in what way or ways? How do you think the sun affects places that do not have shade?

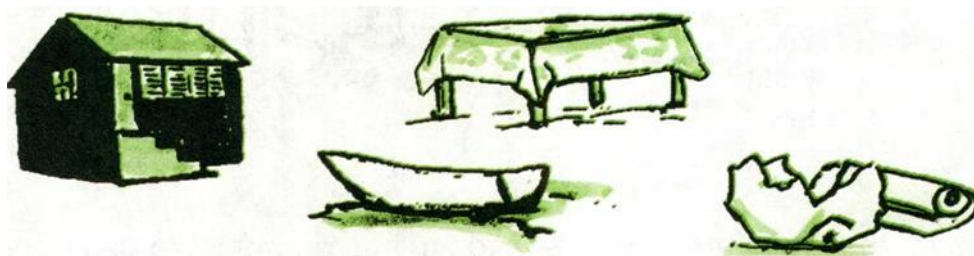
Since the trees in a forest are so useful to us we must be careful in the way we use them.

Controlling The Destruction Of Forests

What do you think would happen if all the trees in a forest were cut down or destroyed? Sometimes young trees are thrown down when older ones are cut for lumber. We also do other things that help to destroy forests. A forest fire can be started by a carelessly dropped cigarette.



We can also help to control the destruction of forests by using materials other than those that are products of the forest.



Can you name the materials that were used to make the articles in the pictures? You see then, that instead of using wood to make everything we can use concrete, clay bricks, plastic or fibre glass. Can you name a material from which paper can be made? Recycling paper also helps to reduce the number of trees used to make paper.

Nowadays, people practice reforestation. That is, they plant young trees when old ones are cut down.

SUMMARY

- Trees are important for animals to exist.
- Forests provide homes, food and shelter for some animals.
- Forests help to prevent floods, reducing erosion and save water.
- Some people depend entirely on the forest for their livelihood.
- People are affected when trees are cut down.
- People can control the destruction of forests by using materials other than those from the forest and by planting young trees when old ones are cut down.

Things to do

Use the words to complete the diagram below

Canopy

Forest floor

Emergent

Understory



CHAPTER 7 WEATHER

WHAT IS WEATHER?



A



B



C

Look at the pictures. What are the children doing? What kind of day is it in picture A? What is the family doing in picture B? How would you describe the day? Why are the leaves swaying in picture C? What is happening to the clothes on the line? Look through the window of your classroom.

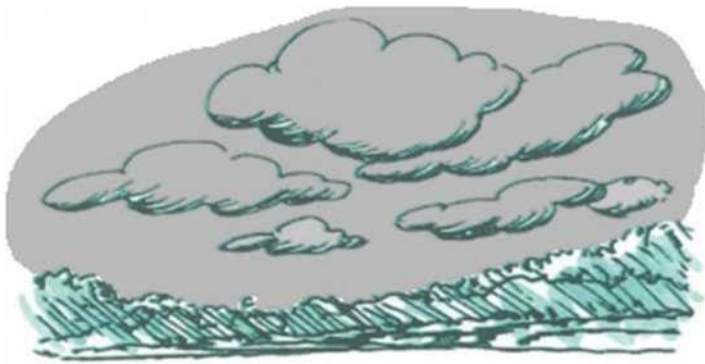
Describe the day.

When we talk about clouds, wind, sun and rain we are talking about the signs of weather. Weather pattern is the condition of the atmosphere over a period of time. This may be one day. One week or one month. Sometimes weather conditions change. We can predict the weather by looking up in the sky. When the sky is all blue and there are no clouds, the weather will be sunny. When dark clouds are in the sky the weather will be rainy.

Something to do

1. Make a weather chart.
2. Place it in your classroom.
3. Predict the weather for a day.
4. Compare your prediction with the actual weather for the day.

HOW WEATHER CONDITIONS CAN AFFECT PEOPLE'S LIVES



Look at the picture above. What kind of a day do you think it would be?

What would you do if you have to go to school? Do you think it would be wise to play cricket when you see these weather conditions? Would you advise mother to do her laundry on such a day? Is it wise for a pilot to fly on a day like this? What advice would you give to a fisherman who has to go out to sea? The weather affects the things that people do from day to day.

If one expects rain he or she should carry a rain coat or umbrella. The pilot or captain should not fly or sail if a heavy rainfall or a storm is predicted. Heavy rainfall may cause flooding especially in low lying areas of Guyana. People in such areas have to be careful when there is a flood. They have to protect their crops and their livestock.

Some heavy winds may also develop into hurricanes. Hurricanes are not experienced in Guyana but in some other countries.

WATER

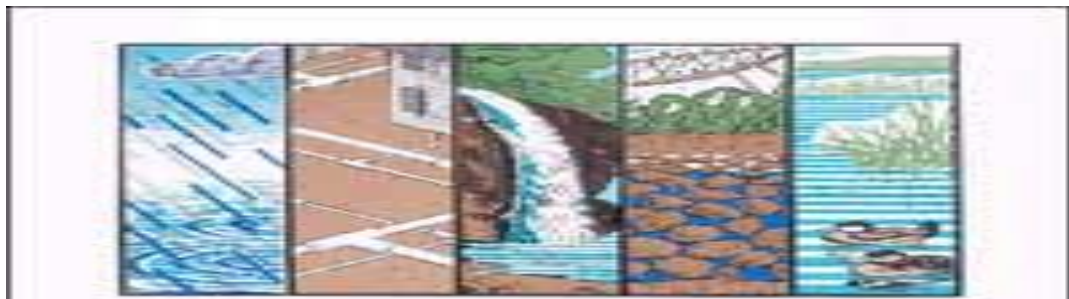
The presence of water makes life possible on earth. Nearly 75% of the earth's surface is covered with water. Water is also found below the surface of the earth, and the air as water vapour.

The bodies of plants and animals also contain water. In fact, about 70% of the human body is water. Water is indeed quite essential for life.

SOURCES OF WATER

We obtain our fresh water supply from sources such as :

- Lakes
- Rivers
- Springs
- Ponds
- Wells
- Rain
- Seas
- Trenches



Rain Water:

Rain water collects on the earth in the form of surface water and underground water.

Surface Water:

Water present on the surface of the earth in the form of oceans, rivers, lakes, ponds and streams is called surface water. The water in rivers and lakes comes from rain and melting of snow on mountains. Rivers flow into the sea.

Underground Water:

Some of the rainwater seeps through the soil on to the non-porous rocks below. This is underground water. Sometimes due to high pressure, this water sprouts out in the form of springs. It can be obtained by digging wells, sinking tube wells, etc.

USES OF WATER

There are many uses of water. It is vital for life.

Some common uses of water are:

- Watering lawns
- Washing cars, wares, house etc.
- Watering plants
- Cooking
- Drinking
- Transportation

What else do you use water for?

HELPING TO MAKE WATER PURE

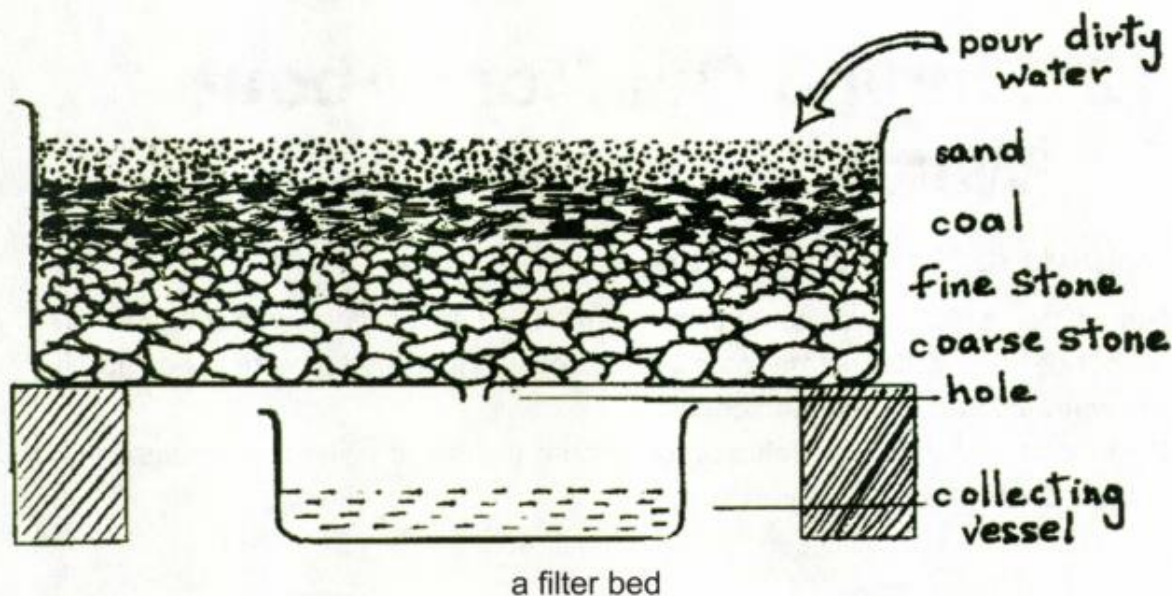
Rain water is clear and has no taste or smell. When it collects in trenches and other bodies of water, some materials dissolve in it. These materials help to give the water its taste, smell and colour.

If you look around your neighbourhood you will observe water that smells and has colour. Do not taste it!



Sometimes people help to make water impure. They do this by keeping their surroundings untidy. They also dump refuse in nearby trenches and ponds. They pollute the water. Is the water you use at home tasteless, colourless and without smell? If not, how can you make it safe for use? The easiest and safest way to make water safe for drinking is by boiling. Boiling kills germs that can be dangerous to us. However, boiling does not remove solid materials that may be suspended in water. A simple way to remove these suspended materials is by filtering.

A filter is used to remove solid substances from water. A kitchen strainer may be used as a filter. Filter paper may also be used. A filter only allows the water from a suspension to pass through. The solid materials (or sediment) are left behind on the filter. Another way by which you can filter water is using a filter bed.

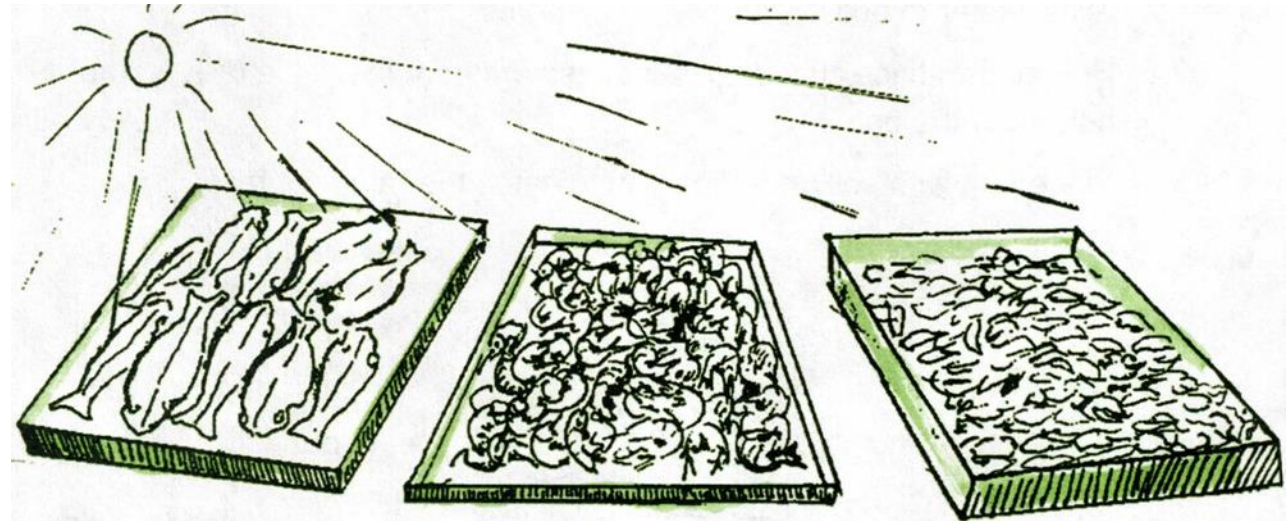


Water comes and goes

When water is continually heated, it is gradually lost to the air and appears to dry up. We say it evaporates. This drying up process is called evaporation. Water evaporates at the surface of the

liquid. When the water evaporates we cannot see it. The liquid water becomes a gas called water vapour.

Water is always evaporating from the surfaces of rivers, creeks, lakes, pools, trenches and other such bodies of water. Water also evaporates from the wet clothes which we hang out to dry.



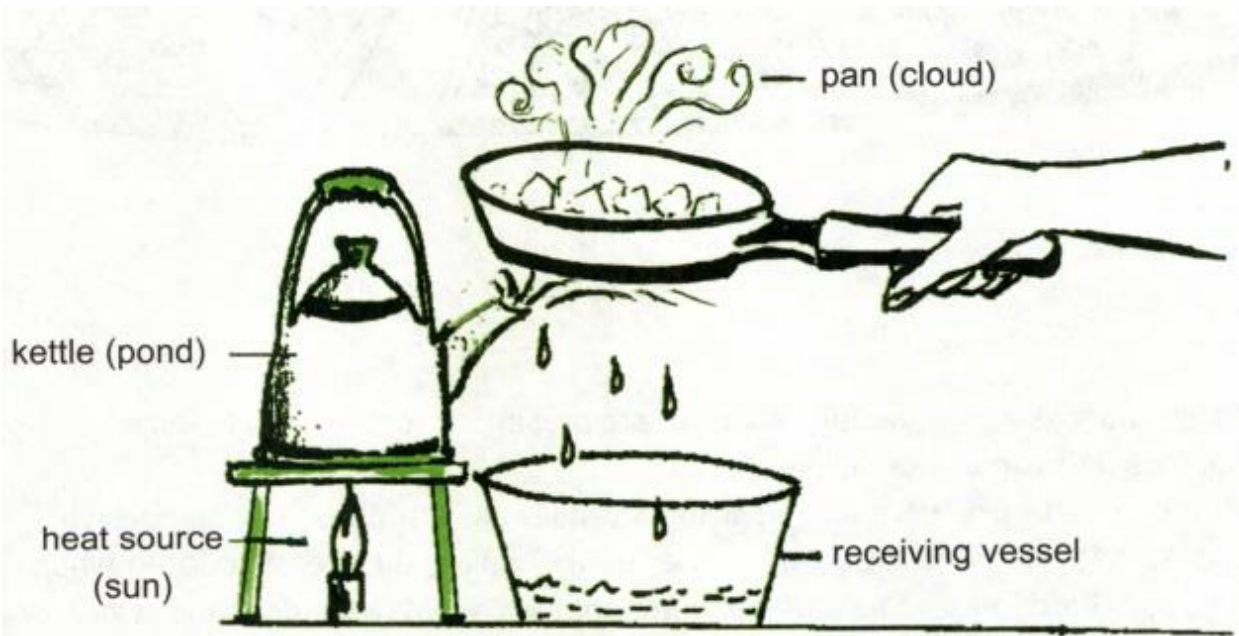
Evaporation is very important when we are preserving foods like fish, fruits, shrimps and some vegetables.

Sometimes in dry weather the water from lakes, trenches, ponds and creeks gets less and less until it disappears. Have you ever wondered where it goes? Suddenly it rains and the water comes back. Where does this water come from?

Something to do Things you need

soil in a flat pan labelled Earth pan with pieces of ice labelled cloud kettle with a spout labelled pond a heat source

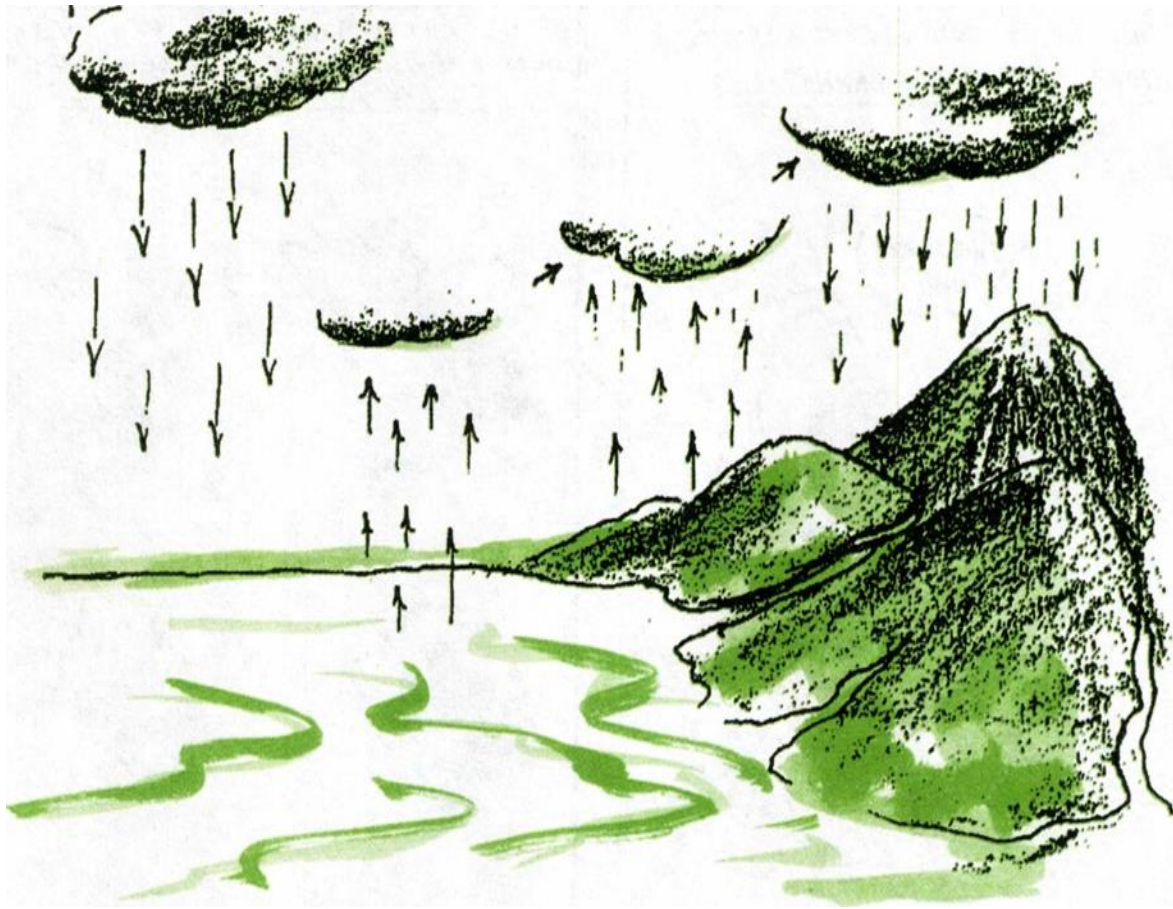
1. Put the water in a kettle and place over, heat. Allow water to boil.
2. Hold pan with ice cubes so that the steam from the kettle falls on the bottom of the pan.
3. Place pan with soil under ice pan to catch the rain as it falls. Let us find out. You may ask your teacher to help you.



The sun's heat is continually causing the water from lakes, trenches, rivers and other bodies of water to evaporate becoming water vapour.

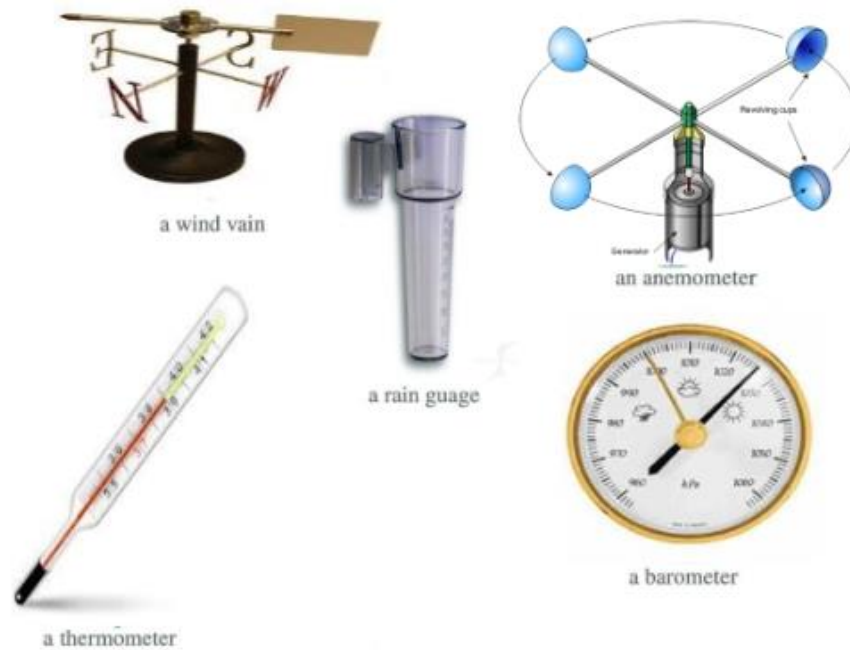
The water vapour which is invisible, rises high into the atmosphere where the air is cooler. The water vapour cools and becomes tiny droplets around tiny dust particles in the air. These droplets join together to form clouds, which, when too heavy, fall to the earth as rain.

The water runs off the land and finds its way back to the lakes, river, streams and so on. It then evaporates into the air, forms clouds and then falls to the earth as rain again. This happens over and over again. This process is called Water Cycle. It is one of the most important natural cycles on Earth.



The Water Cycle

MEASURING WEATHER CONDITIONS



Look at the instruments above. What are they used for? Who will use these instruments? Who is a meteorologist? What is his job? These instruments are used to measure weather.

- A thermometer is used to measure temperature.
- An anemometer is used to measure the speed of wind.
- A rain gauge is used to measure rain fall.
- A windvane is used to show the direction from which the wind blows.
- A barometer is used to measure atmospheric pressure.

A meteorologist is a person who studies and forecasts weather conditions. He or she collects information of the weather by using these instruments.

Something to do

1. You may visit a meteorological station to observe how instruments are used to predict weather.
2. Make an improvised rain gauge to put in your science corner

SUMMARY

- Weather pattern is the condition of the atmosphere over a period of time.
- Weather conditions may cause damage to crops and affect people's social lives e.g. Heavy rain can cause Hooding which may destroy crops and houses.
- An anemometer, a thermometer, a rain gauge, a wind-vane and a barometer are instruments used to forecast weather conditions.
- A meteorologist studies and forecasts weather conditions.

What have you learnt?

1. What is meant by weather?
2. Name the factors which affect weather.
3. A person who predicts weather conditions is a _____.
4. An instrument used to measure rainfall is a _____
5. What advice would you give to a friend who wants to travel by air to Lethem during a rainy day? Why?

CHAPTER 8 ELEMENTS - MIXTURES AND COMPOUNDS

In lessons done earlier we learnt that two or more substances can form mixtures of different kinds. Do you remember the different kinds of mixtures? Remember that a mixture is a substance which can be separated into individual parts. Two or more elements can form a mixture.

SEPARATING MIXTURES

Something to do

Things you need

- iron filings
 - sulphur
 - container
 - magnet
 - a piece of stick
1. Place some sulphur into the container.
 2. Add some iron filings to it.
 3. Stir them together then shake vigorously.

What do you have? You have made a mixture of sulphur and iron.

4. Now pass a magnet over the mixture. What happens?

Why did this happen?

The iron filings were separated from the sulphur because the two substances just came together but were not combined chemically. Why was the magnet able to pick up the iron filings?

Look at the pictures and talk about them.



Solutions and mixtures involving liquids can be separated by evaporation and chromatography.

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.

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

COMPOUNDS

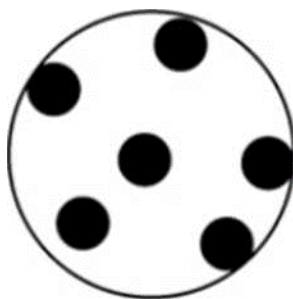
From the last experiment you noticed that the two substances were separated from each other. Do you think that this will always happen when two or more elements are mixed together? Sometimes when two or more elements are mixed together they form a new substance. The new substance is called a compound.

A compound is formed when elements combine chemically. In this way the individual elements cannot be separated. Can you name a compound? Water is a compound and so are cooking salt and sugar. Water is a compound because it is made up of two gases, hydrogen and oxygen. The two combine in a certain way to form a water molecule. The water molecule is liquid.

Every molecule of sugar has the same properties as any other molecule of sugar.

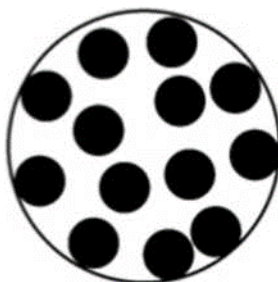
THE BEHAVIOUR OF MOLECULES

Molecules in a substance bump into each other and bounce off in different directions. The movements of these molecules indicate the state of matter of substances.



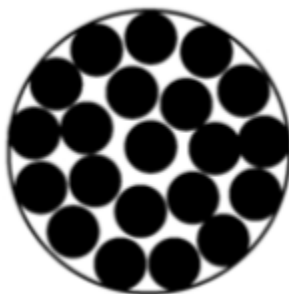
Molecules in a gas

How do molecules in a gas behave? They move very quickly and remain far apart from each other. The movement of the molecules causes a gas not to have a definite shape.



Molecules in a liquid

Molecules in a liquid are closer together than those in a gas. They tend to pull towards each other thus giving liquids a definite size but not a definite shape. Liquids tend to spread out and they take the shape of their containers.

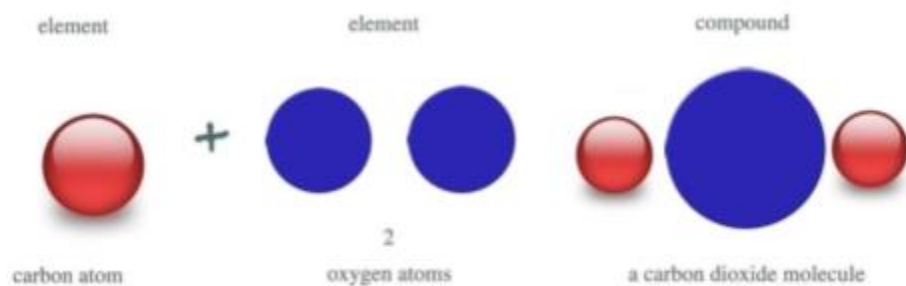


Molecules in a solid

Here is a diagram showing how molecules are arranged in solids. In a solid, the molecules are so close together that they do not seem to be able to move around much. The attraction between solid molecules is so great that the shape is fixed.

You have learnt that compounds are made of different elements and that elements have symbols to represent them. These symbols were given by chemists who thought it was more convenient to use symbols than names of each element. Similarly chemists have combined the symbols of elements that make up the compound they want to represent. This combination of symbols for a compound is called a chemical formula. A chemical formula shows which elements are in a compound and also the number of atoms that each element contains. The formula for carbon dioxide is CO_2 . The 2 in the formula means that there are two atoms of oxygen for every atom of carbon.

Look at this carbon dioxide molecule.



NAME	FORMULA
Water	H ₂ O
Table or cooking salt	NaCl
Carbon dioxide	CO ₂
Sucrose	C ₁₂ H ₂₂ O ₁₁
Baking powder	NaHCO ₃
Acetic Acid	CH ₃ COOH

Name the compounds and name the elements in each of them. Name other compounds and find out their chemical formula. You need not learn them now.

MATERIALS AND THEIR USES

Different materials have different physical properties. The properties of a material determines its use. Some examples are:

- Iron- is strong, hard and conducts heat. It is thus used to make pans, tools, engine parts etc.



- Rubber- rubber is soft, water- resistant, flexible, light, does not conduct electricity. It is used for making boots, bicycle tubes and balloons.



SUMMARY

- The components of a mixture can be separated.
- The elements in a compound cannot be separated easily. A new substance is formed.
- An atom is the smallest part of an element.
- All molecules are made up of atoms.
- The movements of molecules and the attraction between them indicate their state of matter.
- Compounds are represented by chemical formula.
- Chemical formulae of substances tell the number of elements and the number of atoms of each element.

What Have You Learnt?

1. Which two of these elements when mixed together form a mixture? Oxygen, iron filings and sulphur.
2. The molecules of a substance are arranged far apart from each other. The substance is most likely milk or oxygen?
3. What is the chemical formula for cooking salt?
4. How many atoms are in the compound, sugar?
5. Which of these is a compound? Salt, water, gold.
6. What determines whether something is a gas, liquid or solid?
7. Draw a diagram to show the arrangement of molecules in a solid.

CHAPTER 9 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!

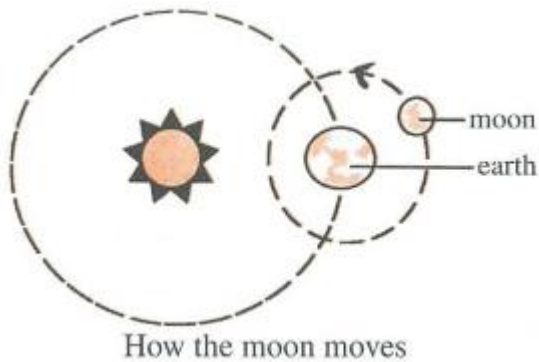
J. Cumberbatch

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:

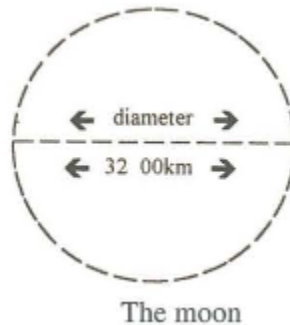
- i. To find out more about the weather
- ii. For better communication,
- iii. For navigation,
- iv. For scientific investigation and
- v. For military purposes



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 of them gravity on the earth. It therefore means that if you weigh 24 kg on Earth, you will be j of 24 kg on the moon. What is of 24 kg? 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).

Something to do

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 Observation	of 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			
7			

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.

Something to do

Things you need

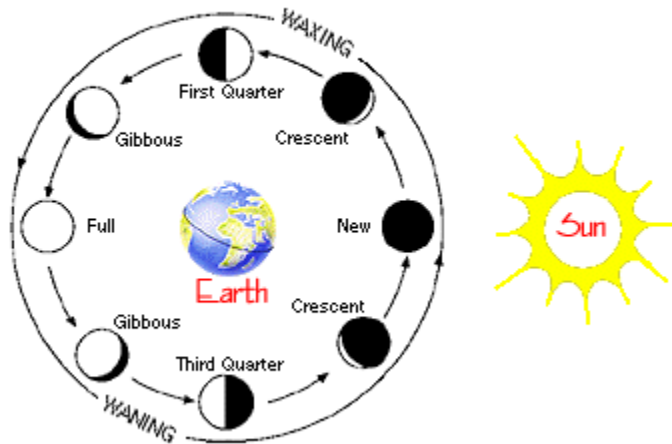
- an old calendar
- a pair of scissors

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 as seen from Earth



Waxing

This occurs as the Moon moves from New Moon to Full Moon. It is when the moon appears to increase in size.

Waning

This occurs as the Moon moves from Full Moon to New Moon. It is when the Moon appears to decrease in size.

Lunar Month

This is the time taken by the moon to move from one New Moon to the next.

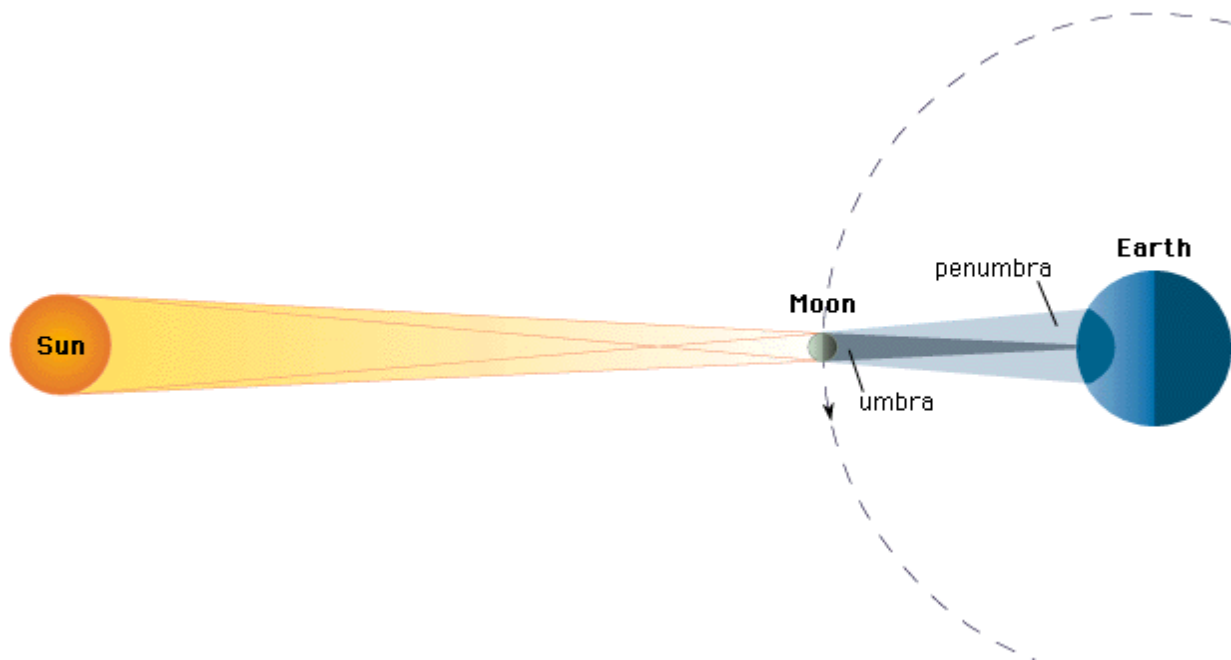
Eclipses

Sometimes a bright sunny day suddenly turns as dark as a moonlit night for a few minutes, and then becomes sunny again. Have you observed this/ Sometimes on a bright full moon night, the Moon suddenly becomes only faintly visible for a few hours, and then it glows brightly again. These happenings are due to the shadows cast by the Moon on the Earth and are known as Eclipses.

Eclipse of the Sun

When the Moon passes between the sun and earth, it blocks out the sunlight and casts a shadow on a certain region of the earth. The people in this region cannot see the sun. This is known as the eclipse of the sun. It does not last very long nor does it occur regularly at once.

Diagram Showing a Solar Eclipse.

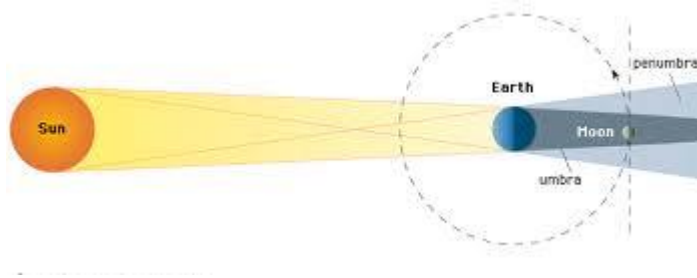


Eclipse of the Moon

When the sun shines on the earth, it casts a long shadow on the other side of it. If the moon, travelling round the earth, goes into this shadow, it will be hidden. This is called the eclipse of the moon. It does not last for more than two hours and then the moon moves out of the Earth's shadow.

The eclipse of the moon does not happen regularly. There will be none for some years and the other years there may be two or three a year. This is because the moon does not always pass through the shadow of the earth. Sometimes it passes under or above the shadow.

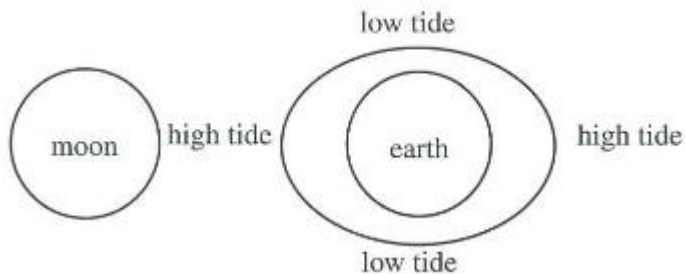
Diagram Showing a Lunar Eclipse



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.



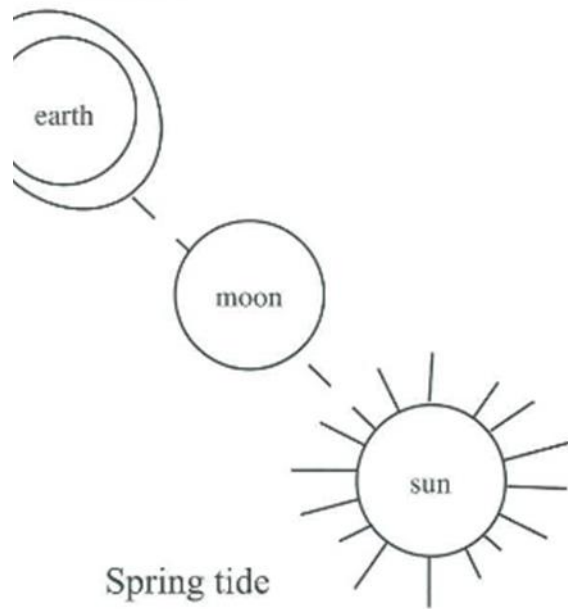
Because the gravity of the moon affects the solid part of the earth too, the earth is pulled slightly towards the moon also. This causes high tides on the opposite side, too. Look at the diagram, and you will see that there are high tides on two

opposite sides of the earth.

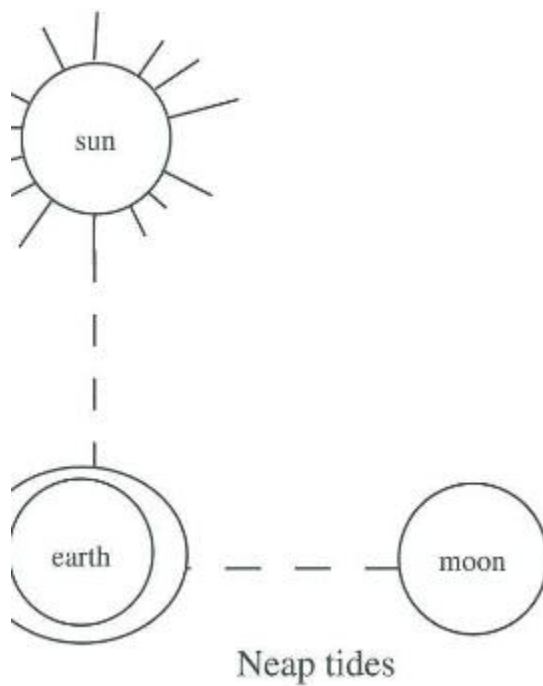
What kind of tide do you think would be on the other two sides?

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° 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 $29\frac{1}{2}$ 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 $\frac{1}{6}$ 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

What have you learnt?

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

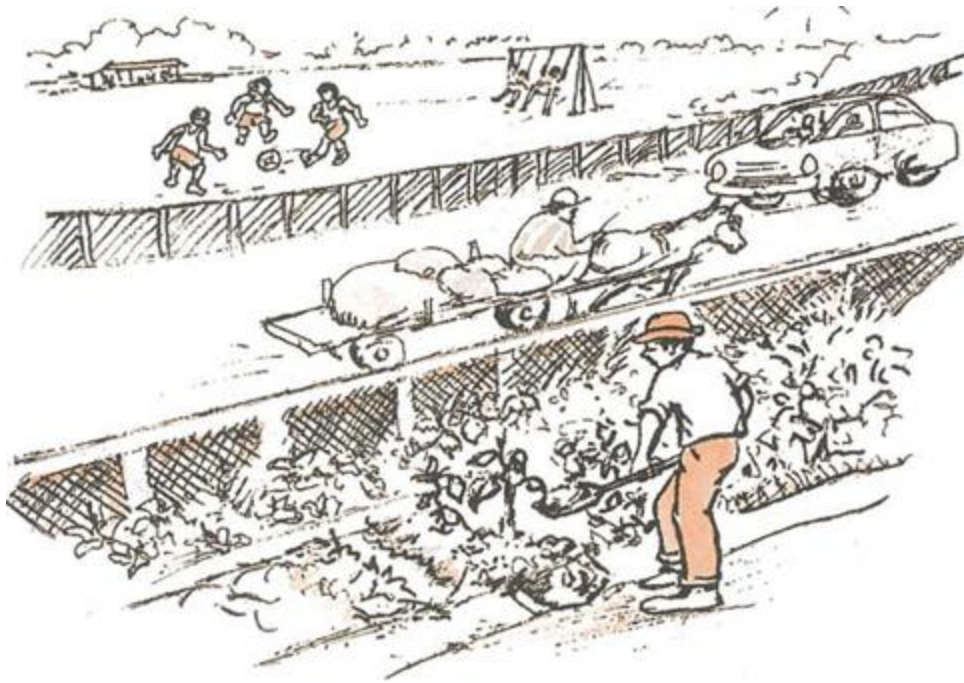
6. If John weighs 42 kg on Earth, on the Moon he would weigh _____ kg.

- (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 10 ENERGY AROUND US



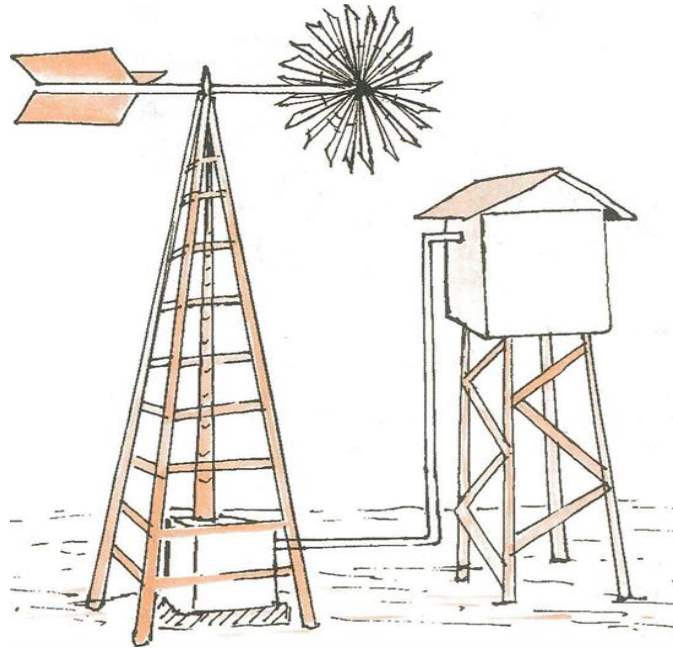
WHAT IS ENERGY?

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

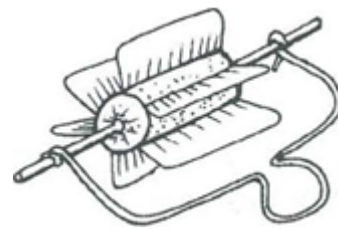
Running water is also another source of energy.

Something to do

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.

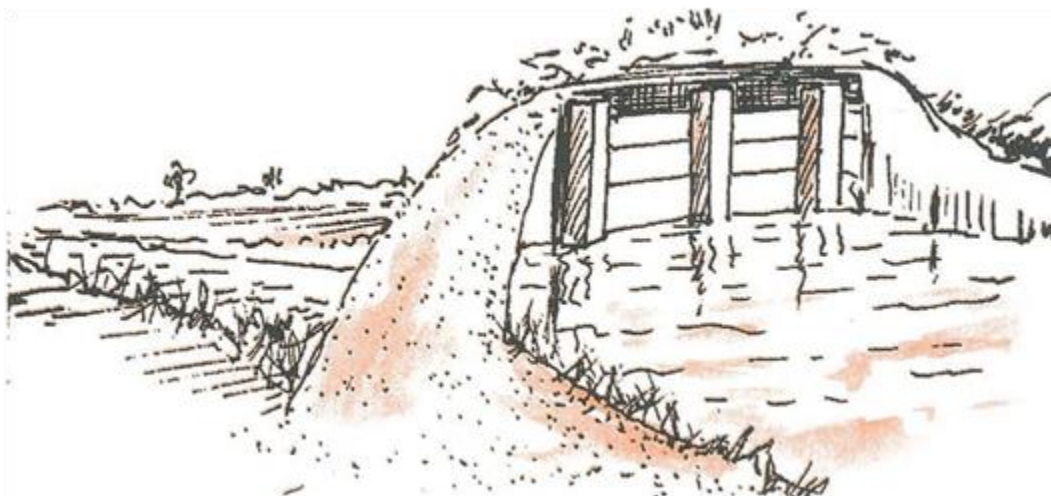
Another source of energy is fuel which comes from plants. These are coal, oil and gas. Today scientists have made great progress and are now using "Atomic Energy" to work ships and steam engines.



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.

CHAPTER 11 ELECTRICITY

Electricity is a form of energy. It is difficult to explain what it is but we can see what it does. Look at the pictures below and list the equipment that uses electricity.



Draw a table like the one shown below and complete it.

Electrical Appliances	What Electricity Makes Them Do
Iron	provide heat
electric fan	turn a motor

blender	
Radio	
hair dryer	
hot plate	
reading lamp	
television	give sounds and show pictures

From completing the above table you will find out that electricity can cause heat, light, sound, make things move and even make pictures. Electricity can also affect our bodies that is it can cause shock. This means that our muscles are affected and cannot move away from the source of electricity easily. Try to find out more about this.

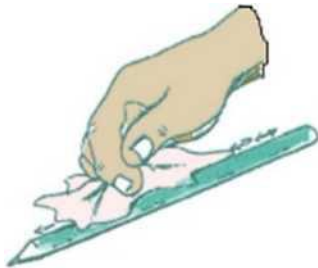
TWO KINDS OF ELECTRICITY

All matter is made up of tiny particles called atoms, but what are atoms really made up of? Let us find out.

Something to do

Things you need

- pieces of tissue paper
- ball point pen (plastic)
- woollen material
- scissors



1. Use the scissors to cut the tissue into very little pieces.
2. Rub the plastic pen up and down with the woollen material.
3. Hold the pen near to the pieces of paper and observe what happens.

Were the pieces of paper picked up by the pen? The nibbling of the plastic pen with the woollen material has caused both of them to become charged or electrified. This means that they both can attract some other small object. What really happens is that 'small bits' of the atoms of these materials are rubbed on or off. These 'small bits' of materials are called electrons. When the pen is rubbed with the woollen material the wool loses some electrons and becomes positively charged while the pen gains electrons and becomes negatively charged. We must note, however, that electrons are just rubbed on or off the surfaces of these materials. They do not move and go

anywhere. We say they are static. The rubbing of the woollen material on the plastic pen has produced static electricity. Plastic and wood do not allow their electrons to move. They do not conduct electricity. They are called non-conductors or insulators.

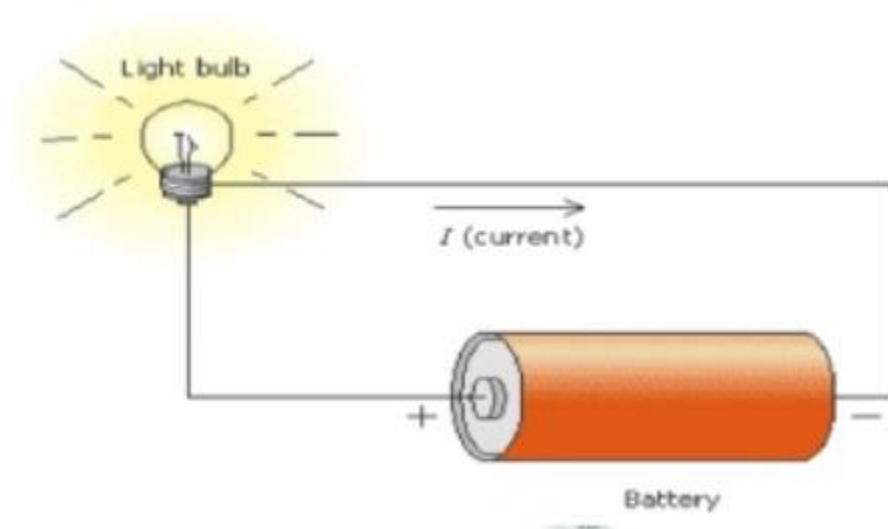


Diagram of a Simple Electric Circuit

Metals also have atoms. Their “tiny bits” of atoms are free to move but not by rubbing them with any material. It is really the electrons that move. The movement of electrons is called current electricity. Metals which allow their electrons to move or which allow electricity to pass through them are called conductors of electricity. Gold, copper, silver and aluminium are good examples of conductors of electricity. Copper and aluminium are made into wires and used to conduct electricity.

What causes electrons to move? Before electrons can move they must be ‘pushed’ or must receive energy. This ‘push’ is supplied by generators and batteries. This ‘push’ is measured in volts. A torch light cell has a ‘push’ of 1.5 volts. A cycle generator has 6 or 12 volts. Generators that supply large amounts of electricity produce many thousands of volts. When electrons receive energy from batteries or generators, they move through the conducting wires to the bulb and return to the generator or battery to receive more energy. This process continues over and over again.

THE CIRCUIT

An electrical circuit is the path through which current flows. A simple circuit is made up of conducting wires, a battery or cells, a bulb and a switch. The cells or battery store current. The conductors allow current to flow through them. The bulb uses the current while the switch controls the current. The following diagram shows what a circuit looks like.

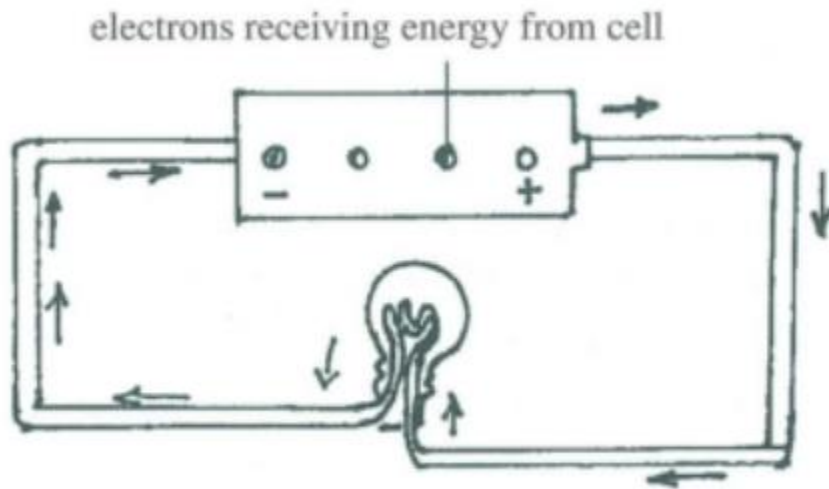


DIAGRAM SHOWING A SIMPLE ELECTRIC CIRCUIT

The arrow indicates the flow of current when the switch is closed. When the switch is open the circuit is broken and current does not flow. Switches are normally connected to the positive end of the wire.

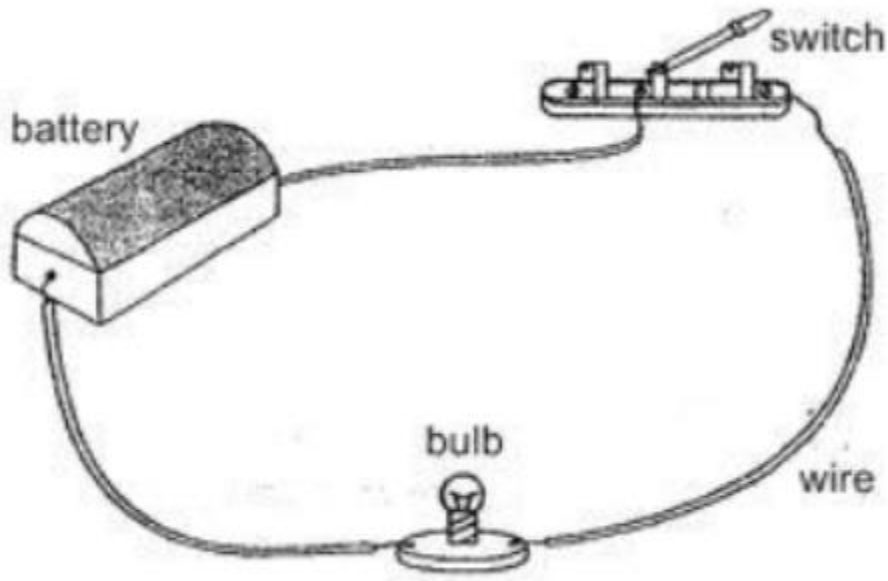


DIAGRAM SHOWING A SIMPLE ELECTRIC CIRCUIT

Something to do

Things you need

- batteries
 - bulbs
 - wires
 - materials such as aluminium wire, copper, plastic, wood, cloth, salt,
 - dish with water.
1. Make circuits as shown in the circuit diagram.
 2. Test materials like plastic, wood, copper and aluminium and classify them as conductors and insulators.
 3. Display your results in a table.
 4. In a dish of water place the positive and negative ends of the wire in the circuit and observe what happens.
 5. Add salt and again observe what happens.

NB. Be careful NOT to touch the water with your bare hand.

ELECTRICITY IN HOUSES

Electricity to our homes comes from power stations or power plants. The electricity provided is produced in very high volts. From the stations, electricity is sent to sub-stations. Here transformers are used to raise the voltage very high for distribution to various areas or smaller sub-stations. These second sub-stations distribute the electricity at a lower voltage to poles. On the poles are transformers which 'step down' the voltage to the domestic lines. The domestic lines carry voltages ranging from 110 to 240. The domestic lines are connected to homes.

In the homes are meters for measuring how much electricity is used. This is done in units called kilowatt hours (kWh). The following diagrams illustrate the distribution of electricity from the main station to consumers.

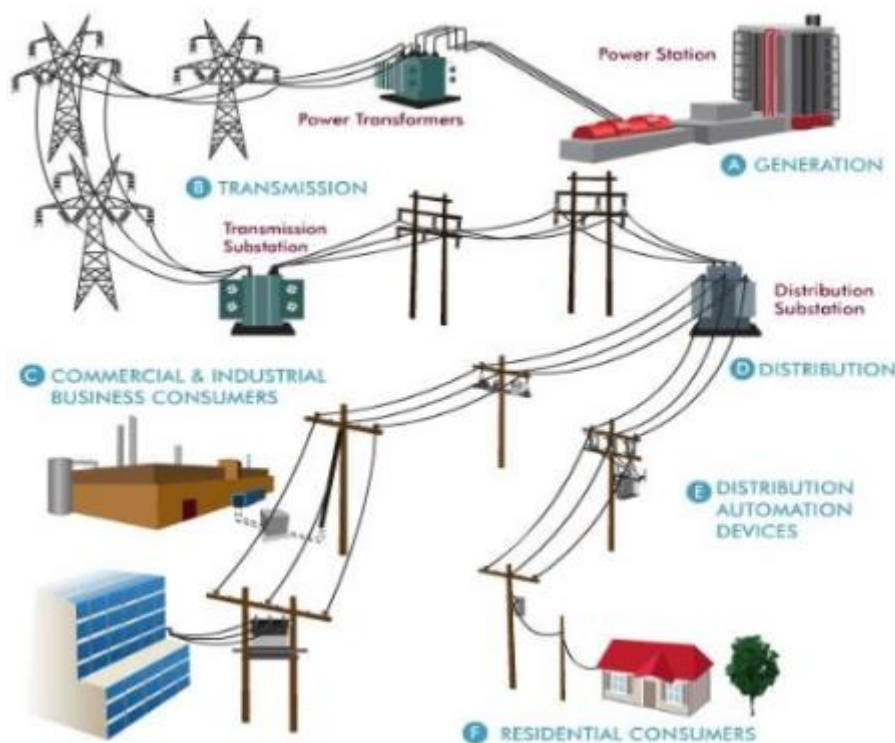


Diagram showing distribution of electricity from the main station to consumers

When the domestic line goes to the home it is connected to a main switch then, to a fuse panel then to the meter which records the amount of electricity being used.

From the meter the lines are connected to the appliances in use.

SAFETY IN USING ELECTRICITY

Electricity used in our homes can be extremely dangerous. The following rules should help you to avoid its danger.

1. Never use electricity from mains to do experiments.
2. Never put anything other than a plug in an electrical point.
3. Do not use faulty electrical appliances.
4. Never touch an electrical switch with wet hands.
5. Never expose electrical wires.
6. Never change an electrical fuse - let a qualified person do it.

SUMMARY

- Electricity is a form of energy.
- Two types of electricity are static electricity and current electricity.
- We can see the effects of electricity by what it does.
- Electricity is supplied by batteries and generators.
- Materials which do not allow electricity to flow through them are called insulators. Conductors allow electricity to flow through them.
- A circuit is a path through which current flows.
- The switch controls the current in the circuit.
- Electricity supply from power stations is broken down to smaller voltage by transformers.
- The amount of electricity used is measured in Kilowatt hours.
- Lines supplying electricity to homes are from 110 volts to 240 volts.
- The domestic lines are connected to fuse panels before reaching appliances in the home.
- Electricity is dangerous - always follow the safety rules.

What Have You Learnt?

Complete the following by filling in the blank spaces.

1. The rubbing of a woollen material on a piece of plastic produces electricity.
2. The "tiny bits" of atoms that are rubbed off are called_____.
3. The electricity supplied to a bulb can produce heat and _____.
4. Copper, silver and gold can conduct electricity. They are called _____ of electricity.
5. The amount of electricity used in our homes is measured in_____.
6. The switch is used to _____ current in a circuit.
7. The current in a circuit flows from _____ to_____.
8. The 'push' of electric current is measured in_____.

9. Each torch light cell is usually _____ volts.
10. Domestic supply lines are usually 110 and _____ volts.

CHAPTER 12 FORCES

INTRODUCTION TO FORCES

What is a force?

A force can be a push or a pull. It is not something you can see or touch, but can see it in action.

What is Mass?

Mass is how heavy something is without gravity. It is measured in kilograms (kg) or grams (g). The mass of an object is the same no matter where on earth or in space it is.

What is Weight?

Weight is a force caused by gravity. Because it is a force, it is also measured in Newtons (N). It is the gravitational force between the object and the Earth. An object will have greater weight if it has more mass.

Mass and weight are two different things!

What is Gravity?

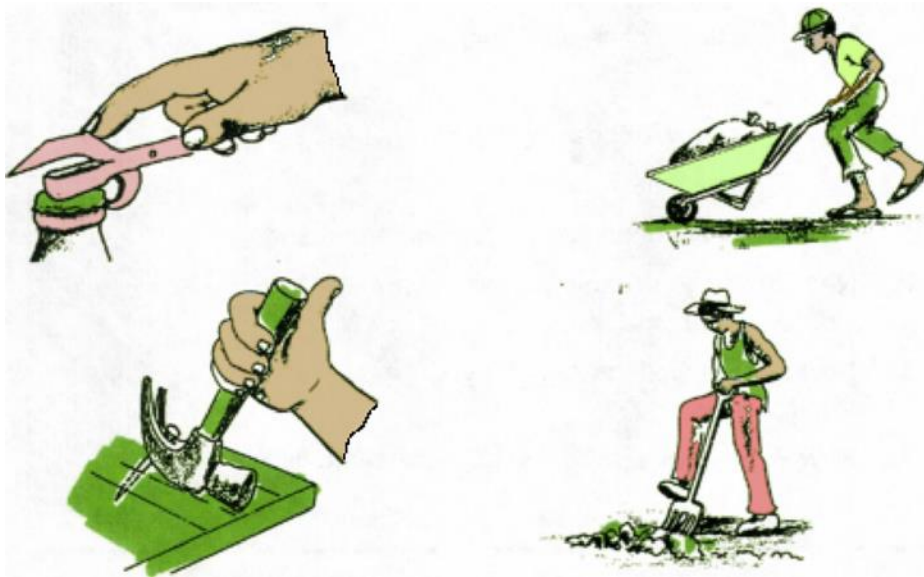
There is a force called gravity which all objects have. It causes all objects to be attracted towards each other.

The gravitational force increases with the mass of an object. The greater the mass of an object, the greater the gravitational force.

MACHINES AT WORK

SIMPLE MACHINES

Looking at Machines



Look at the tools above. Let us name them. Have you ever used any of them? What are they used for? Now draw a table like the one below and complete it.

Machines	What they are used for
paint brush hammer	Fainting

Machines are useful

Something to do Things you need

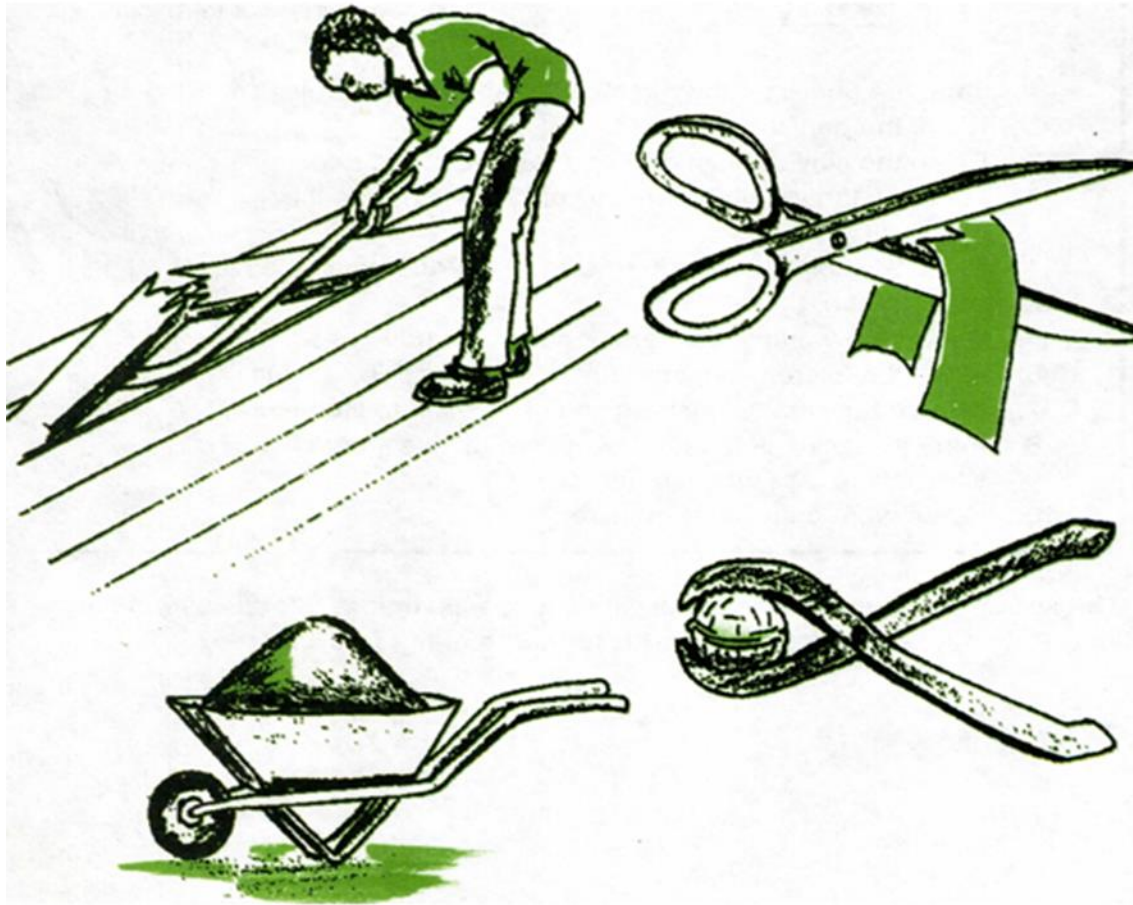
- a bottle of aerated drink
 - a drink opener
 - a piece of board with nails on it
 - a hammer
1. Try taking out the drink cap with your bare hands.
 2. Now try doing the same with an opener. How easily it comes out!
 3. Now try taking off the nail with your bare hands. What happens?
 4. Now use a hammer. Do you have the same difficulty?

In both of the examples above you have made the work easier by using a tool. A tool that is used to make work easier is called a simple machine. A simple machine has few or no moving parts. Let us find out what are the parts of this simple machine.

LEVERS

In the picture , the spoon is used to open the tin. The cover of the tin is called the load. The edge of the tin where the spoon handle rests is called the fulcrum or pivot. This is usually the point around which movement takes place. The force applied to the spoon to open the tin is called the effort. A machine of this type is called a lever. Here are pictures of some other levers. Can you find the load, fulcrum and effort?





A lever is a simple but very useful machine. Let us find out some more about levers.

Something to do

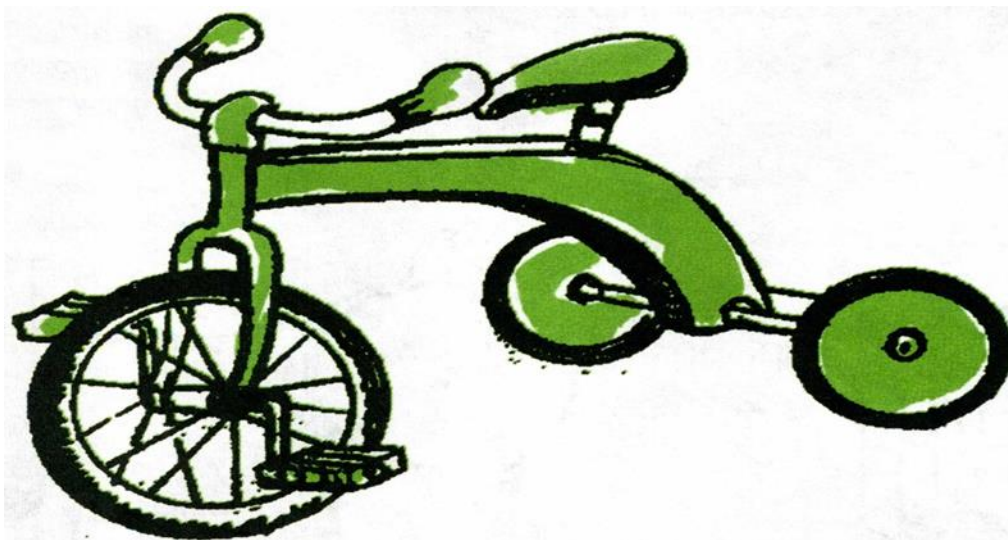
Things you will need

- a match box
- a pencil
- ten washers or coins of equal size
- a ball of plasticine or clay
- masking tape

1. Tape the pencil on the match box and place the ruler on top of the pencil
2. Place the clay or plasticine on one side of the ruler
3. Measure the length of the clay or plasticine from the fulcrum.
4. Place the coins on the other side of the ruler to lift the clay or plasticine.
5. Record how many washers or coins you have used.
6. Move the fulcrum closer to the ball of clay or plasticine.
7. Record how many washers you have used to lift the clay.
8. If the plasticine is the load, what are the washers called?
9. When were less washers used?
10. When were more washers used?

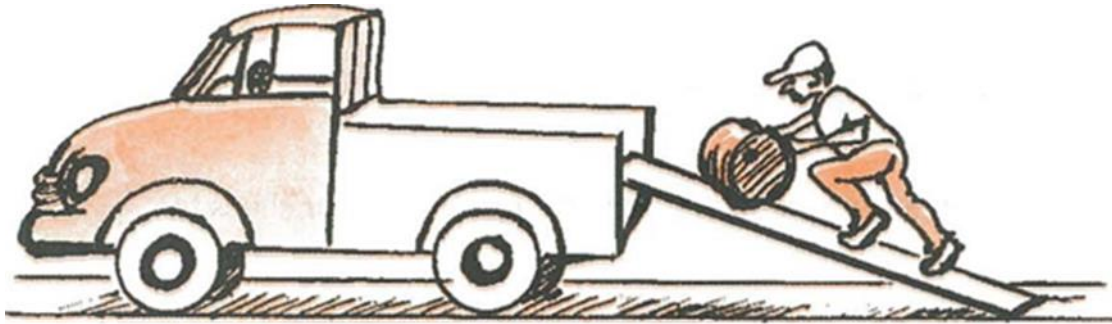
The above experiment tells us that with a longer lever less effort is used to lift a load. This happens when the effort is further from the fulcrum.

THE WHEEL AND AXLE



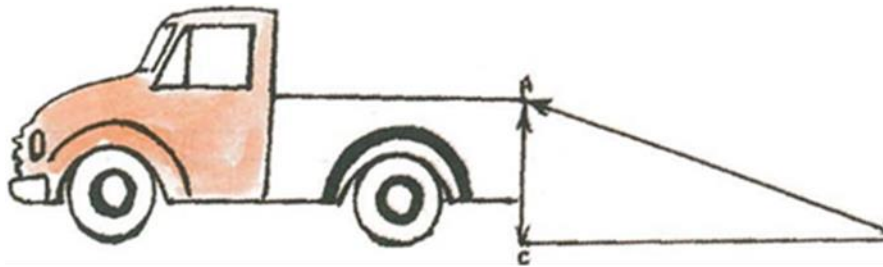
The wheel and axle is another simple machine. List things in your surroundings that have wheels. If there were no wheels how would cars or cycles move? Can you imagine the world without wheels?

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.

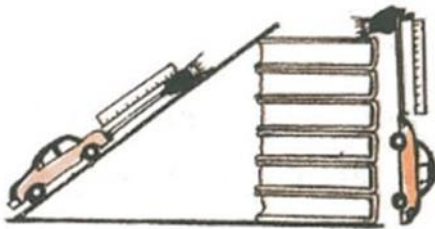
Something to do

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?

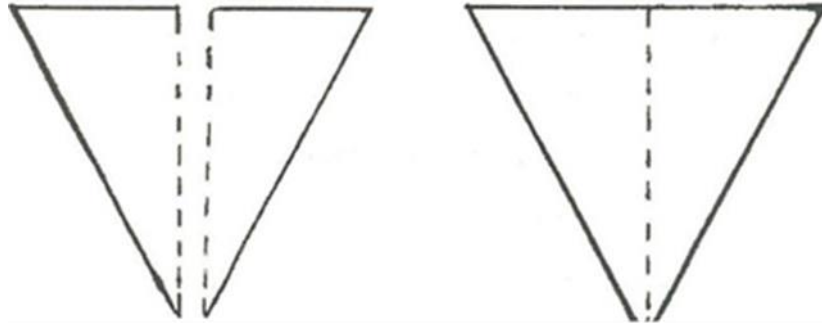
THE WEDGE

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

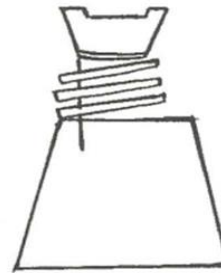


Tools such as chisels, knives, axes and cutlasses are all examples of wedges.

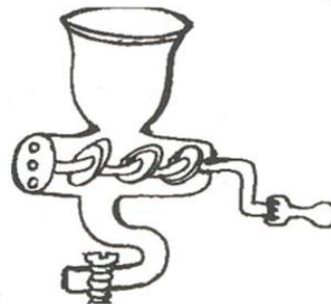
THE SCREW



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

Something to do

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

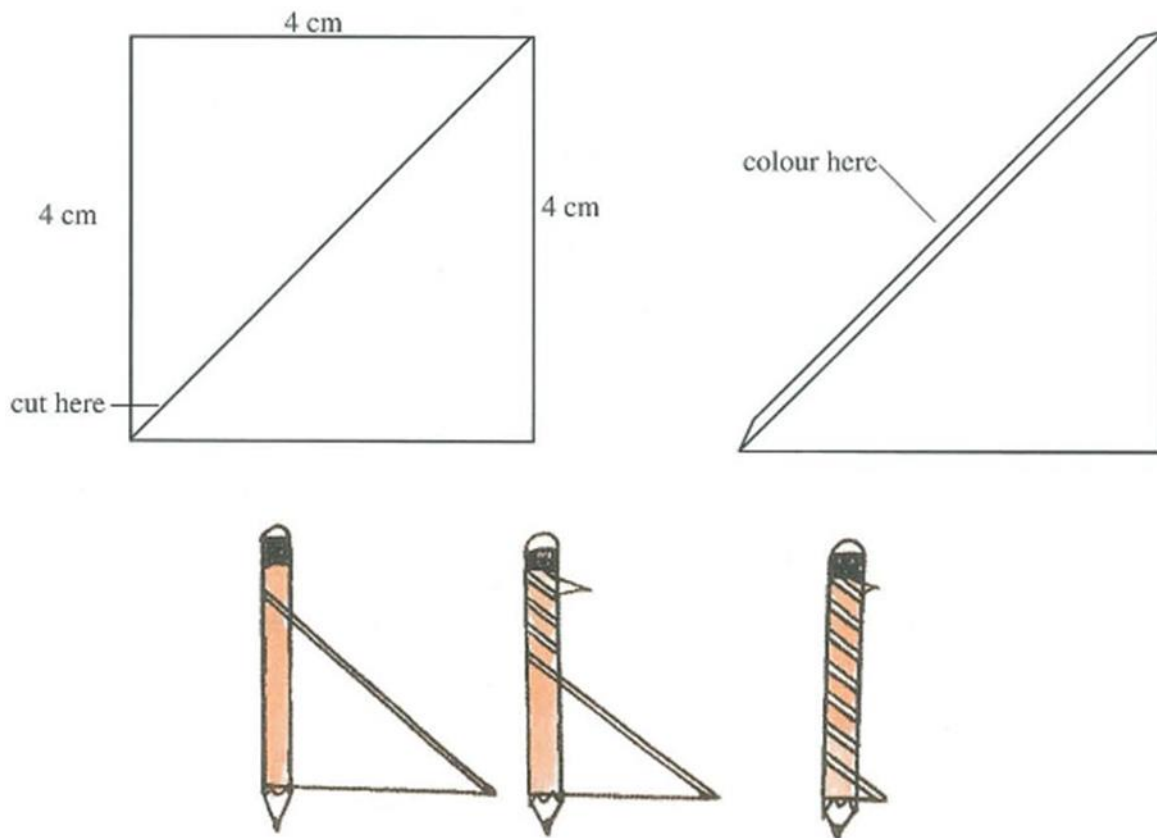
Things you need

- 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.

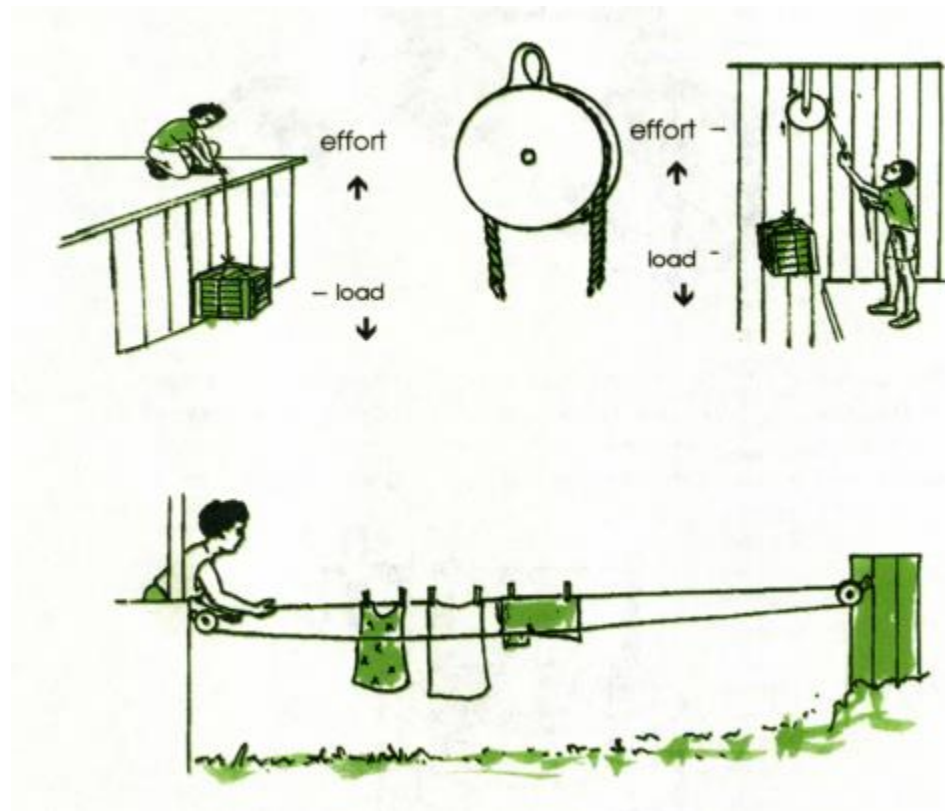
You will have two inclined planes.

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.

THE PULLEY

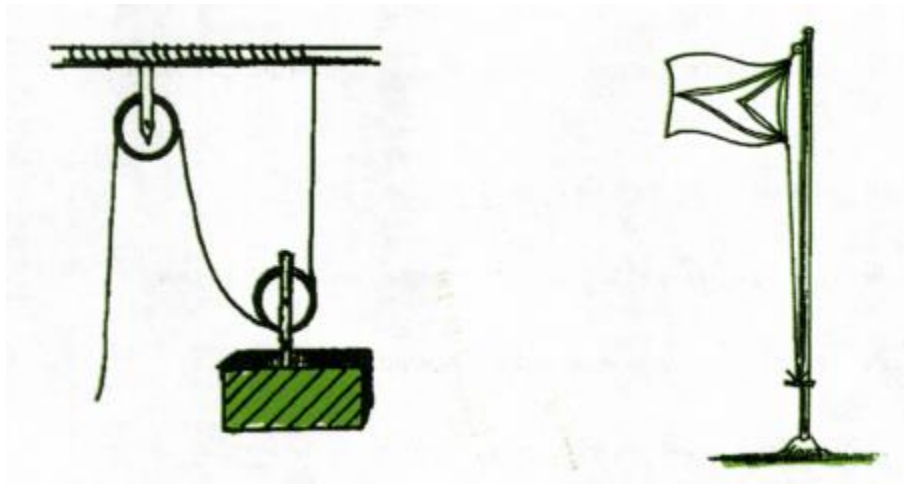


It is easier to pull a weight down than to lift it up.

The pulley is a grooved wheel.

Pulleys are used to lift heavy loads to high places. They pulley makes work easier by making it more convenient when lifting a load. Is it not easier to pull things down than to pull them up?

Here are other examples where pulleys are used to make work easier.



Care of Machines

Most machines are made from metals. They rust easily. Some wear away and are damaged. If they are not cared they would not last long. Dust and dirt get on them when they are used.

They should be cleaned and oiled regularly, before and after use.

How Machines Work

Simple machines need energy to do work. This energy is supplied by the food the person using the machine eats.

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.
- Machines are devices or tools that help to make work easier.
- A simple machine has few parts – load, fulcrum and effort.
- The crowbar, see-saw, scissors and wheel barrow are examples of levers.
- The wheel and axle also makes work easier.
- Less effort is used to lift a load when more than one pulley is used.
- Machines when cleaned and oiled regularly last longer.
- The energy used to work simple machines may be supplied by the food we eat.

What have you learnt?

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.

WHAT ARE COMPOUND MACHINES?

In Books four and five we had learnt about simple machines. Can you name some of them? A simple machine is made up of few moving parts or no moving parts.

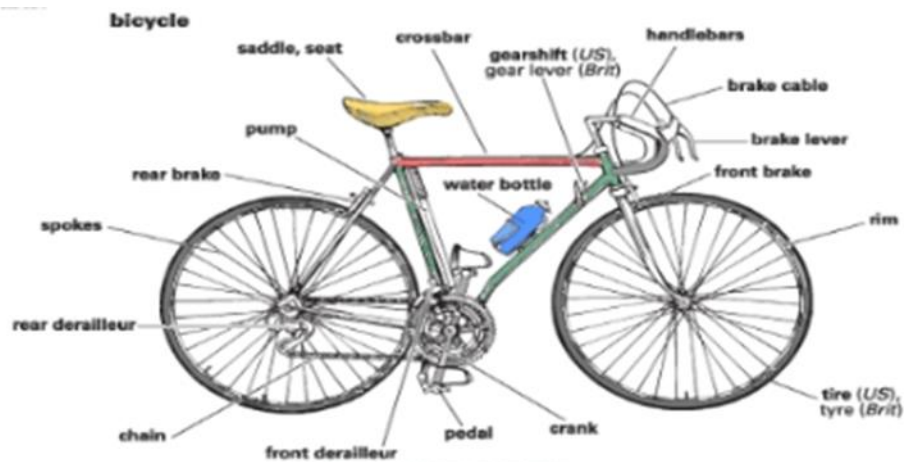


DIAGRAM OF A BICYCLE

The picture above is a compound machine. It is made up of a number of simple machines. It has wheels, levers, screws and inclined planes. List the various parts of the bicycle. Which simple machines does each part listed represent?

You can arrange your answer in a table like the one shown below.

Bicycle parts	Types of Simple machines
Wheel Gear wheel Brakes Bolts	Wheel and Axle

What have you found out about compound machines?



Machines used in the home



Machines used in the office



Machines used in the factory



Machines used on the farm



Machines used for transportation

Look at the pictures on the previous page. Name them and some others that you have seen. Can you identify some simple machines that are put together to make them?

Uses Of Compound Machines

Machines are used in almost every area in man's life. We have seen that there are machines in the office, fields and factories. Many machines have been invented for sports and exercises. Compound machines can help us to do our work quickly and in a more organised way.

Do you know that it is through the invention of machines that we can have an abundance of food, books and vehicles?

CARE AND USE OF MACHINES

Machines are costly and therefore must be cared. Some are very dangerous and can cause serious damage and harm if we are ignorant about them. We must follow safety rules when using them. They should be cared for and properly maintained.

Something to do

Things you need

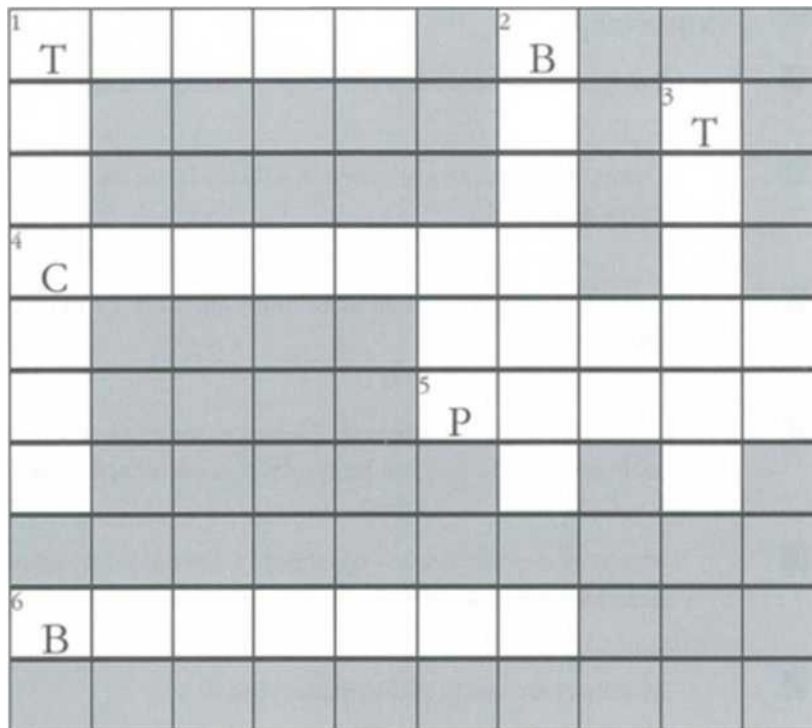
- pictures of machines used in factories, fields, office, homes and schools.
 - scrap book - you can make one from clean newsprint
 - paste
 - scissors
 - markers
1. Label your book cover e.g. My Book About Machines Used in the Home.
 2. At top of the first page write 'Machines Used in the Home'.
 3. Paste all the pictures of the machines that are used in the home.
 4. Label the machine and indicate what it is used for.
 5. Do this for all the pictures you have collected for the other areas.
 6. Display your scrap book e.g. during your school's open day.

SUMMARY

- Compound machines are made up of simple machines.
- Compound machines are used in offices, factories, schools farms and fields.
- Compound machines help us to finish our work quickly and neatly.
- The use of these machines enables us to have adequate food, tools and time to rest and be involved in social activities.
- Machines are dangerous - we should learn the safety rules before handling them.
- Machines are costly and should be cared.

What have you learnt?

Complete the cross word puzzle by following the clues down and across.



CLUES - DOWN

1. Used to plough fields
2. Has two wheels
3. Have carriages

CLUES ACROSS

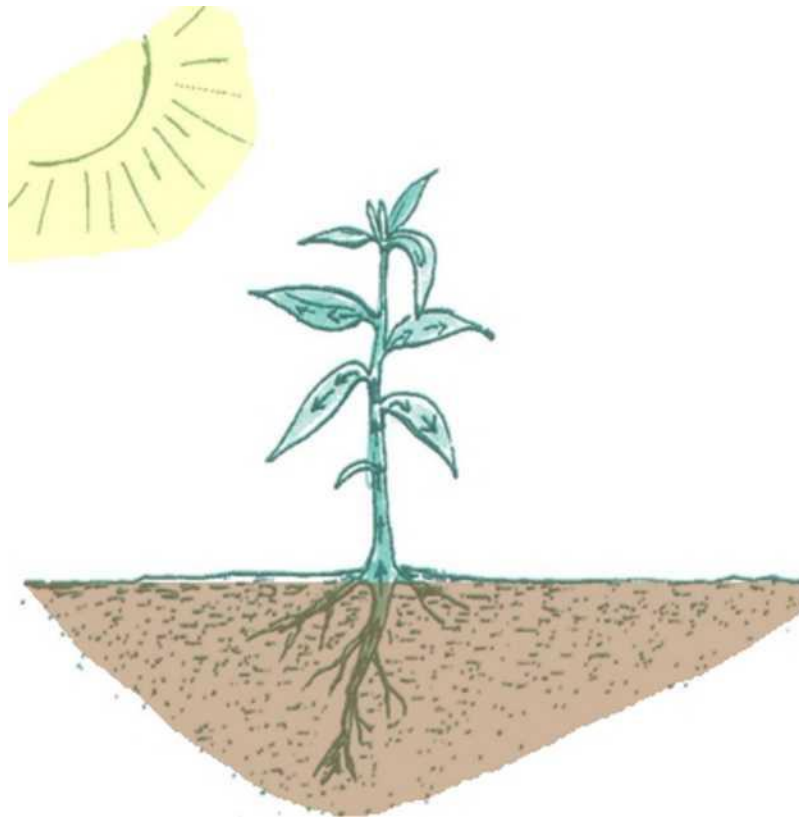
1. Used for transport
4. Cuts rice in field
5. Transport in air
6. Does not have tyre wheels

QUESTIONS

1. Name the part of the cycle that has a wheel and axle.
2. The bolts used in machines are examples of
 - (a) pulleys
 - (b) levers
 - (c) wedges
 - (d) screws

CHAPTER 13 HOW PLANTS MAKE FOOD

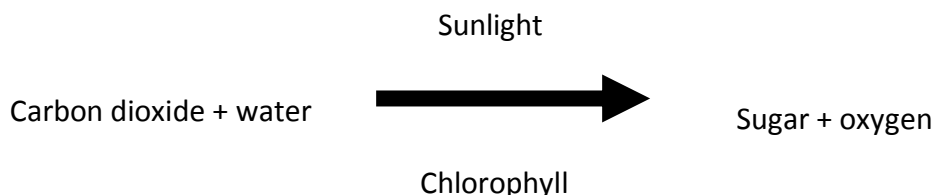
All living things need food in order to survive. How do living things get their food? Plants make their own food while animals depend on plants and other animals for their food. How do plants make their food? You have learnt that the roots of flowering plants take in water and certain minerals from the soil, and also that leaves obtain carbon dioxide from the air around them. What do plants do with these substances to change them into food?



What does this picture show?

Look at the picture. What is it showing? Plants use the energy from the sun to make their food. How do plants get the sun's energy? The green leaves and other green parts of plants contain a substance called chlorophyll. This chlorophyll gives the leaves their green colour. Chlorophyll traps some of the light energy from the sun. The plant combines light, energy, carbon dioxide and water to make sugar and oxygen. During this process, oxygen produced is given off into the atmosphere. This process by which green parts of plants use sunlight to manufacture food for

the plant is called photosynthesis. The word photosynthesis can be broken up into two parts; photo and synthesis. Photo involves light and synthesis means putting together. The process of photosynthesis can be written as follows:



The oxygen which is given off is used up by animals and plants for the process of respiration. The rate of photosynthesis is greater during the day because more light is available. Chlorophyll, carbon dioxide and water are also essential for photosynthesis. The food that is made during photosynthesis travels from the leaves to the stems of the plants. The stems take the food to all parts of the plants. How do we know that the leaves have made food for the plants? Let's find out.

Something to do

Things you need

- | | |
|---------------|-------------|
| •green leaves | •containers |
| • heat source | • test tube |
| •water | •iodine |
| • alcohol | |

1. Pick leaves from plants which have been in sunlight for a few hours.
2. Put one of the leaves in boiled water.
3. Put some water in a container and heat the water to boiling point.

4. Half fill the test tube with alcohol and place it in the container with the boiled water. Put the leaf in the test tube with the alcohol.
5. Take out the leaf and wash it in cold water then place a drop of iodine solution on it.
6. What do you observe?

The leaf becomes blue-black. This is because starch is present in the leaf.

HOW PLANTS GET OXYGEN

Living things respire by taking in oxygen and giving out carbon dioxide and water vapour. During the process of respiration the chemical energy stored in foods (mainly carbohydrates) is set free. Plants also respire. Oxygen diffuses from the air through tiny holes in the leaf called stomata. Water vapour and carbon dioxide also diffuse out of the plants through the stomata. Respiration in plants goes on all the time.

The formula for respiration can be written as follows:



HOW IS WATER GIVEN OFF BY PLANTS?

You have learnt that leaves manufacture food for plants but what else can leaves do for the plants?

Let's find out.

Something to do

Things you need

- two potted plants

- twine or string
 - plastic bags
1. Water the soil of the potted plants with the same amount of water.
 2. Place the pots into plastic bags and tie the necks using the strings or twine.
 3. Place another plastic bag around the shoot part of one of the plants.
 4. Take out all the leaves from the second plant and place a plastic bag round the stem. Tie it with a string.
 5. Place the two plants where they can get sunlight.

What have you observed?

Drops of water are found on the inside of the plastic bags. But more droplets of water are found in the plastic bags that have the plant with all its leaves. This water passes through the tiny holes on leaves called stomata. The process by which it is given off through the stomata of leaves is called transpiration. During the process of transpiration the water that is lost helps to cool the plants.

SUMMARY

- Plants make their own food.
- Chlorophyll is the green colouring matter found in the plant.
- The process by which plants make food is called photosynthesis.
- Sunlight, chlorophyll, carbon dioxide and water are necessary for photosynthesis.
- During the process of photosynthesis oxygen is given off in the air.
- Respiration is the process by which digested food is broken down using oxygen and energy and carbon dioxide are released.
- Transpiration is the process by which plants give off excess water through the stomata of the leaves.

What Have You Learnt?

1. The green colouring in leaves is called _____
2. Which gas is given off in the air during the process of photosynthesis?
3. Name the things that are necessary for photosynthesis.
4. Do all plants make food? Why?
5. What is meant by transpiration?
6. The tiny openings found on leaves are called _____

CHAPTER 14 REFUSE DISPOSAL

WASTE MUST BE DISPOSED OF

Everyone dumps it because it is useless. It is unsightly to look at and needs to be got rid of. This is refuse. It is the breeding place for rats, cockroaches, houseflies and other creatures. These pests help in the spread of harmful diseases. It is therefore important that we dispose of refuse in an appropriate manner.



REFUSE CAN BE GROUPED

There are different kinds of waste. Can you name some waste matter that you have at home? This waste is usually collected in bins or garbage bags. Sometimes schools, offices have bits of paper and pencil shavings. This waste is usually called litter. Litter may be collected in waste paper boxes or baskets. Garbage and litter are domestic waste.



Waste material from factories is called industrial waste. Can you name waste materials that come from factories? Some business places dump empty crates, empty plastic bottles and cans on the roadway. This is certainly undesirable.

Something to do

Complete this table

Domestic waste	Industrial waste
banana skins	wood shavings

HOW TO DISPOSE OF REFUSE



In the pictures above you can see that refuse can be disposed of in several ways. Can you name these ways?

How do you get rid of refuse?

If you live in the city you collect refuse in bins or in garbage bags. The garbage bags and refuse from the bins are collected by the City Council or Municipality. This refuse is then burnt in the incinerator or used to fill some old. Useless ponds, trenches or land. If you live in the country then you can burn your own refuse. Burning is the best way to get rid of waste.

If you cannot burn refuse then you may bury it. This will be possible in rural areas where there is much land space.

You may have seen people filling up useless ponds and trenches with refuse too. You may try this if there are low spots in your yard.

Something to do

1. Collect pictures of refuse.
2. Group them and paste them in your scrapbook under the headings -

Domestic Waste Industrial Waste

SUMMARY

Refuse is useless waste.

Refuse can be the breeding ground of harmful creatures. Refuse can be of several types.

Garbage, litter and industrial waste are all types of refuse.

Refuse can be disposed of by burning, burying and filling up useless ponds, trenches and land.

What Have You Learnt?

1. Complete this table

source	waste	means of disposal
restaurant	garbage	burning, burying
joiner's workshop	industrial waste	burning, filling ponds
school	litter	

2. Make a poster which shows ways in which people should deal with refuse.

3. Compose a slogan for keeping the surroundings clean.

CHAPTER 15 WE ARE IN EVERYTHING

Everything in the world is made up of matter. Water, rocks, air, wind, sand, oil the moon and the stars are all made up of matter. All living things, too, are made up of matter. Scientists who studied matter have discovered that some of these substances cannot be broken into anything simpler or any other substance.

These substances are called elements. Take a piece of copper wire or a piece of sulphur. Cut them separately into very tiny pieces. What do you have? Do you notice that the sulphur still remains sulphur and the copper still remains copper?

Elements are building blocks of matter. There are over one hundred known elements on Earth. Each of these elements is different from all the others. Matter is just different combinations of these elements. They can combine in thousands of ways. Sometimes these combinations can be separated into individual elements.

The smallest part of an element is called an atom. Each element is made up of its own kind of atom. For example, the element. Hydrogen is made up of Hydrogen atoms only. Chlorine is made up of only chlorine atoms. Oxygen, too is made up of nothing but oxygen atoms. Atoms are invisible substances, they cannot be seen.

WHAT IS AN ATOM?

An atom is composed of three particles. These particles are the proton, neutron and electron. A proton has one positive electrical charge. An electron has one negative electrical charge. A neutron has no electrical charge. Protons and neutrons form the nucleus of the atom. Electrons move around the outside of the nucleus. The electrical properties of each particle determine how it behaves



Diagram of an atom

Elements exist in three forms -liquid, solid and gas. Living things make use of oxygen and carbon dioxide in the air. In what state of matter are they? Iodine is a solid which can be dissolved and used on cuts, bruises and for other purposes. Iodine is an element. Aluminium, too, is an element. In what state is it?

All elements are alike in some way. They are all simple substances containing nothing but that particular element. Look at these elements.



Elements can be divided into two major groups: metals and non-metals. Do you know what a metal is? Have you ever held a piece of copper wire or a piece of aluminium over a lighted piece

of paper? What happened? How are zinc, silver and copper alike? They are all metals. Metals are usually shiny substances and they make a sound when struck. Some other metals are gold and iron. Can you name a few more? Mercury, too, is a metal, but it is different from other metals. Find out what makes it different. Where can you find mercury? Since metals are shiny substances, what then will you say about non-metals?

Here are some non-metals, oxygen, carbon, iodine and sulphur. Find out the names of other non-metals.

SOME COMMON ELEMENTS

You had learnt earlier that there are over 100 known elements. You also learnt the names of some of them. Some of these elements are used in our daily lives and are already known to us.

Elements are studied by special scientists who are called chemists. The chemists made a short way to represent these elements. They therefore devised symbols for their names.

Below is a table which gives the names of some common elements and their symbols.

ELEMENTS	SYMBOLS
Aluminium	Al
Carbon	C
Chlorine	Cl
Copper	Cu
Hydrogen	H
Gold	Au
Iodine	I
Lead	Pb
Oxygen	O
Sodium	Na
Sulphur	S
Zinc	Zn
Silver	Ag
Mercury	Hg
Tin	Sn
Nitrogen	N
Potassium	K
Phosphorous	P

Find out as much as you can about each of these elements. Group them into the three states of matter. You may try to remember some of them.

Here is another table showing some elements, their uses and where they are found.

ELEMENTS	USED FOR	FOUND IN
Hydrogen	fuel, making water, margarine	all living things
Chlorine	Purifying water, plastic	salt
Carbon	charcoal, lead pencils jewelry, industrial diamonds	coal, petroleum all living things
Nitrogen	fertilizers, explosives	air, all living things
Iron	making steel	minerals: haematite, magnetite
Aluminium	lightweight aeroplanes, foil, pots, spoons	ore: bauxite
Gold Silver	jewelry, computers cutlery photographic film	mineral: gold minerals: salt argentite

Name five other elements, draw up a table like the one above and complete it

SUMMARY

- Matter is made of both living and non-living things.
- Elements are substances which cannot be broken down any simpler and still be the same substance.
- Elements are building blocks of matter.
- An atom is the smallest part of an element.
- An atom is made up of three particles: the proton, electron and neutron. A proton has a positive electrical charge and an electron has a negative electrical charge.
- Elements exist in three forms.
- Elements can be represented by symbols.
- Elements are all found in matter.
- Elements can be classified as metals and non-metals.
- Mercury is a unique metal.

What Have You Learnt?

1. What is the name given to the smallest particle of an element?
2. Give the symbols for the elements, mercury and lead.
3. Which of these is a non-metal-oxygen, gold or tin?
4. Mark hit a substance and a sound was heard. It is most likely to be:

Sulphur, Aluminium, Oxygen.
5. Protons and neutrons form the _____ of an atom.
6. What are the states into which all matter can be grouped?
7. Write two ways by which we can identify a metal.

Write True or False.

8. Zinc is made up of gold atoms.
9. The symbol for the element Sodium is S.
10. Carbon dioxide is an element.
11. One of the substances in fertilizer is nitrogen.
12. Find the names of five elements in this puzzle by looking across and down.

p	E	S	N	O	Y	R	V
O	L	E	A	D	S	M	T
X	C	A	R	B	O	N	Y
Y	Z	L	N	C	D	O	N
G	O	L	D	E	I	Y	U
E	R	Y	N	S	T	U	R
N	I	T	R	O	C	E	N
O	C	O	P	P	E	R	K

CHAPTER 16 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.

Sources of sound energy



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

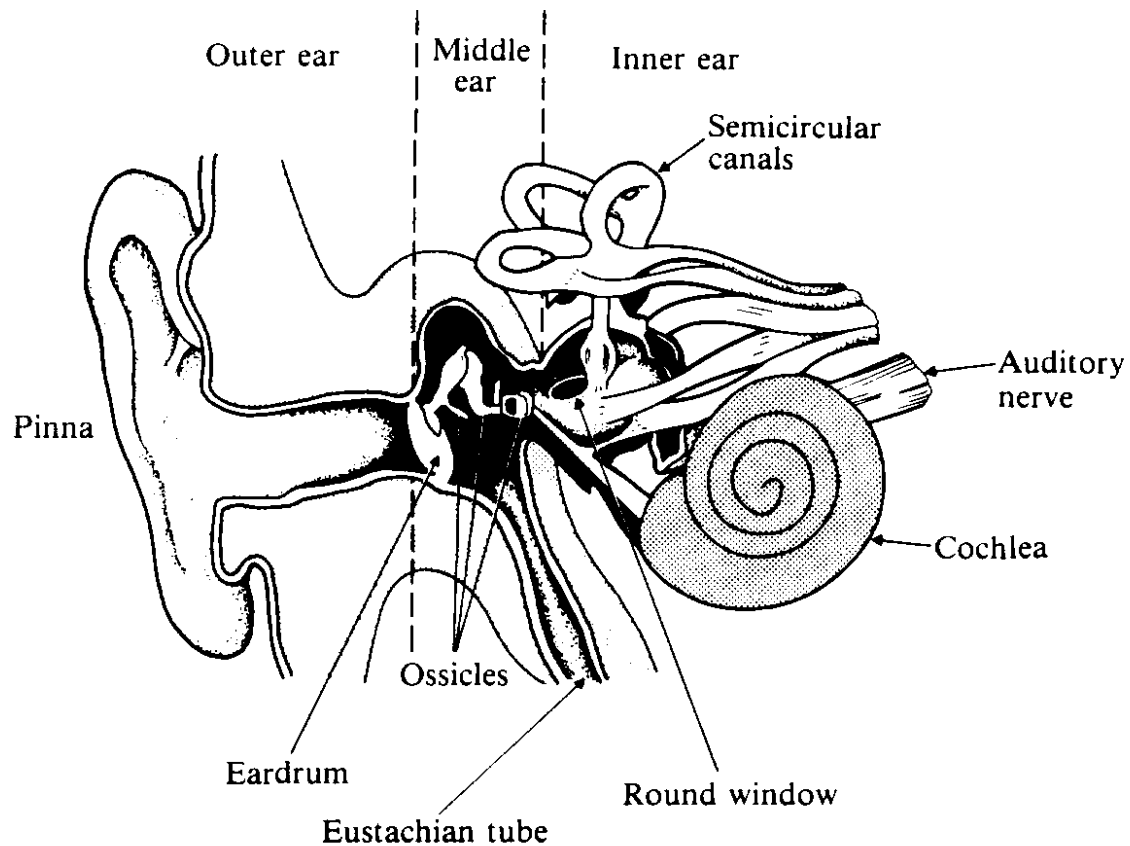


Diagram of the Human Ear

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.

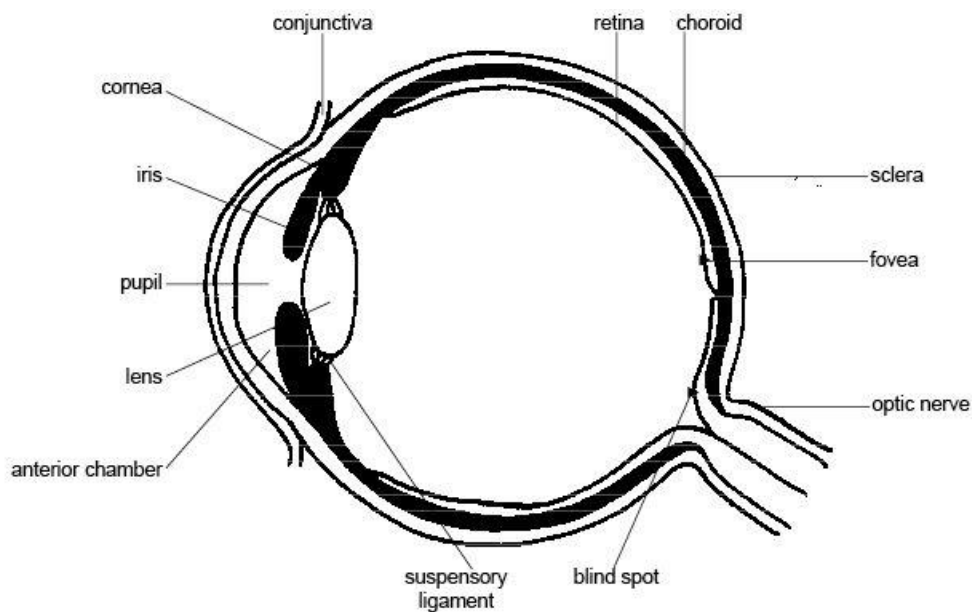
The following guidelines will help us.

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.

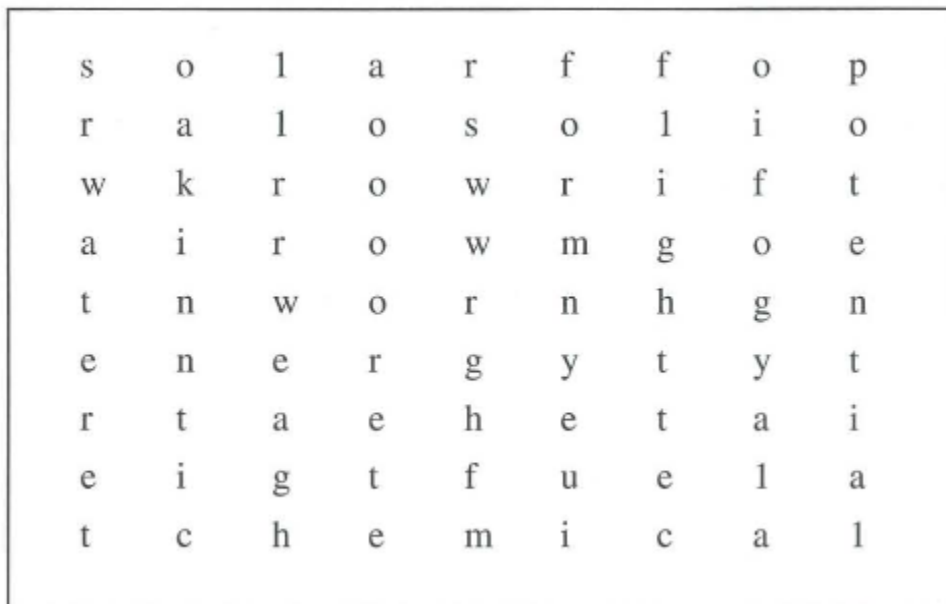
SUMMARY

- 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.

What have you learnt?

1. Word search

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



2. What kind of energy does

- (a) the wound spring of a watch have?

(b) a man on the top of a mountain have?

3. What kind of energy is involved when

(a) a torch is lighted?

(b) a bell is rung?

4. How can we conserve energy in the home?

CHAPTER 17 WHAT IS A MAGNET?

In Book 5 we discovered how magnets behave. Can you remember from what materials magnets are made? What are magnets used for and how are they made? How can you prevent them from being damaged? If you can answer all the questions asked then let us go on to find out something more about magnets. If not, you can read the chapter on Magnetism in Book 5. The different shapes of magnets that were used and observed were all made in factories. In this chapter we will make magnets in our classroom.

MAKING MAGNETS BY INDUCTION

A number of methods can be used to induce magnetism. When we induce magnetism in a material made up of a piece of iron or steel we are really magnetising that material.

Something to do

Things you need

- a permanent magnet
- paper clips



- Touch one paper clip with the magnet.
- Add a second paper clip to the first by touching it with the first paper clip.
- Repeat number two until a chain of about six clips has been formed.
- Remove the magnet from the first clip and observe what happens.
- Take one of these clips and try to pick up another by touching it. What happens?

You would have noticed that the paper clips no longer attracted each other. They remained magnets only when the magnet was attracting them.

MAKING MAGNETS BY HAMMERING



Something to do

Things you need

- a piece of steel bar 60cm long and 2cm in diameter
 - hammer
 - iron filings
1. Hold the steel bar in a North to South direction.
 2. Strike the south end about 20 times with the hammer.
 3. Hold the bar near to the iron filings and observe what happens.

You would have noticed that the bar attracted the iron filings.

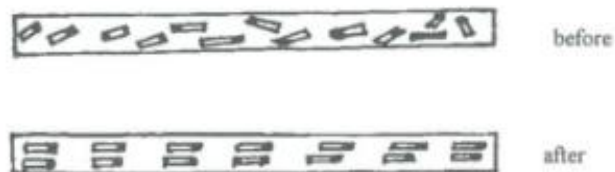
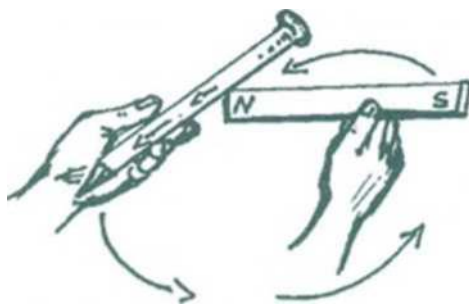


DIAGRAM SHOWING IRON BAR BEFORE AND AFTER BEING HIT BY A HAMMER

Striking the iron bar held in a north to south direction causes the "tiny bits" or atoms which make up the bar to be arranged in a uniform direction of north to south.

MAKING MAGNETS BY STROKING

Something to do



Try this activity.

The arrows indicate the direction in which the stroking is done. Another simple way of making magnets is by stroking.

Something to do

Things you need

- a large nail
 - a permanent magnet
 - paper clips
1. Using one pole of the magnet stroke the nail in one direction for about 20 times as shown in the diagram.
 2. Now try your magnet on the paper clips and observe what happens.

You will notice that the clips are attracted to the nail. The magnets made by attaching the permanent magnet, hitting with the hammer, and stroking the nail in one direction only, are all called temporary magnets. This is so because the magnetism, produced in these ways does not last long. The objects lose almost all of their magnetism eventually. Some materials do not lose

their magnetism readily. These materials can become permanent magnets. When a permanent magnet is used to magnetise materials, the permanent magnet does not lose its magnetism regardless of the number of magnets made.

ELECTROMAGNETS

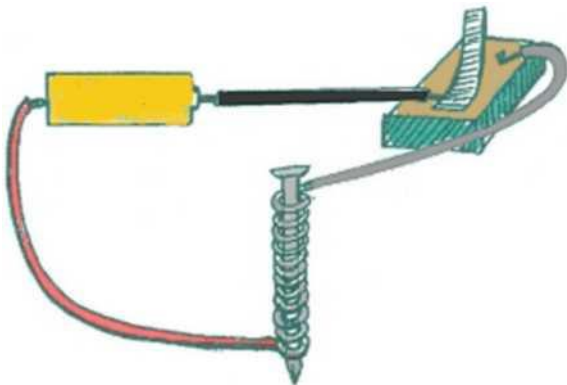
Another way of making magnets is by the use of electricity.

When this is done the magnets thus made are called electromagnets

Something to do

Things you need

- 3 dry cells
- a switch
- paper clips
- a large iron nail
- insulated wire



1. Cut the wire into two pieces, one long and one short.
2. Remove about 1 cm of the plastic covering from the ends of the two pieces of wire.
3. Connect the short piece to the positive end of the dry cell and the switch.

4. Wrap the wire ten times around the nail as shown so that an unwrapped piece of wire is left at each end.
5. Connect one end of this wire to the negative end of the cell and the other to the switch.
6. Put on the switch by pressing it down and then hold the nail near to the paper clips and observe what happens.
7. Count the number of paper clips that are attracted

MAKING MAGNETS STRONGER

Magnets can be made stronger and so can hold or attract more clips. This can be done in two ways.

First the number of turns of wire on the nail can be doubled. Care must be taken to ensure that all turns are in the same direction. Secondly magnets can be made stronger by increasing the number of cells used. The following diagram illustrates how this can be done.

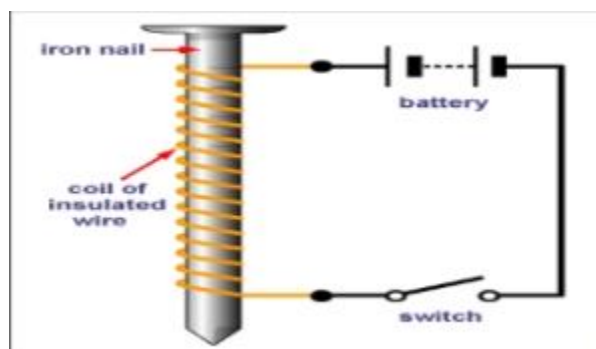


Diagram showing Electromagnetism

A very interesting activity to do, is to find out if the strength of the magnets made is doubled when we double the number of turns of wire and when two cells are used. This can be done by finding how many clips were attracted when the stronger and weaker magnets were made. The making of an electromagnet shows that electricity and magnetism are related.

USES OF ELECTROMAGNETS

Electromagnets have a number of uses. Electric bells, electric motors and many other electric gadgets use electromagnets. A very outstanding use of the electromagnet is in the dockyard where heavy steel plates and steel girders have to be unloaded from ships.



Unloading in a dockyard

SUMMARY

- Magnets can be made from materials that are made of iron and steel.
- Magnets can be made by induction and this includes attaching a permanent magnet to pieces of iron and steel - stroking and hitting a bar on one end held in a north to south direction.
- Magnets made using electricity are called electromagnets. There are temporary and permanent magnets.
- Electromagnets are used in electric bells, motors and many other devices.

What Have You Learnt?

1. What is a temporary magnet?
2. What is a permanent magnet?
3. Name some devices that contain permanent magnets.
4. An electromagnet is a permanent magnet. (T / F)
5. List two ways in which electromagnets can be made stronger.
6. Which of the following is most suitable for making a permanent magnet?
 - A. iron
 - B. steel
 - C. zinc
 - D. aluminium

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