SCIENCE

STANDARD EIGHT

TERM II

Note to the teacher...

As we present this revised edition of the Science Textbook, we would like to express our deepest gratitude to the learners and the teaching community for their enthusiastic responses.

In science some concepts could be subject to change from time to time as new theories and principles are constantly being evolved.

We have tried to present facts and concepts of science (both concrete and abstract) in a visually appealing manner without detracting from the content.

Activity based learning is now accepted as the basis of science education. These activities should be regarded as a means for open-ended investigation rather than for verification of principles/content given in the textbook has been designed to facilitate low-cost activities and experiments using locally available materials. With a view to streamlining the activities, we have now segregated them into three groups:

- **I Do -** activities to be done by an individual learner.
- **We Do -** activities to be done by a group of learners. and
- **We Observe -** activities to be demonstrated by the teacher.

The third group of activities have a higher degree of difficulty or require careful handling as it may involve dealing with chemicals, electricity etc.,

The **"More to know"** snippets in the text represents some unusual and interesting facts or information *in which the students need not be examined.*

The evaluation section is nothing but another space for learning in a different manner. As the focus is on understanding, rote learning is to be discouraged thoroughly. Application of learnt ideas, problem solving skills and critical thinking is to be encouraged. There could be scope for more than one answer to a question, which should be acknowledged always.

To facilitate further reference, books and websites have been suggested at the end of each lesson. Suggestions and constructive criticism are most welcome. Valuable suggestions will be duly incorporated.

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1. BODY MOVEMENTS

1.1. HUMAN BODY AND ITS MOVEMENTS

Observe the pictures. What activities do the people in the pictures perform? How do they perform those activities?

Human body performs all these activities with the help of the movements of bones and muscles.

Human body is made up of a very important framework of bones which is known as the skeletal system and it is associated with muscles.

How do muscles and bones work?

Most of the muscles help in the movement of various parts of the body and some help the body stay upright. Muscles cannot push, they can only pull. Many of them work in pairs. They are attached to bones by tendons. Tendons are thick strands or sheets of connective tissues. A muscle tightens and becomes shortened while pulling the bone attached to it. When it relaxes the other muscle tightens and the bone moves back.

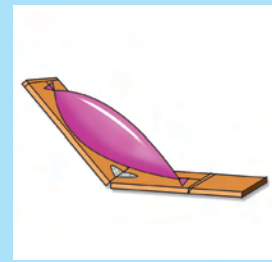
ACTIVITY 1.1 **I DO**

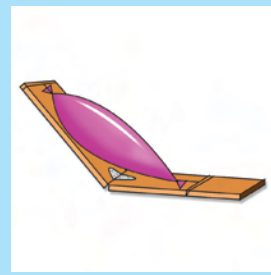
Building a model showing the working of arm muscle.

I need: Two pieces of wood or wooden scales, broad sticking tape and a balloon.

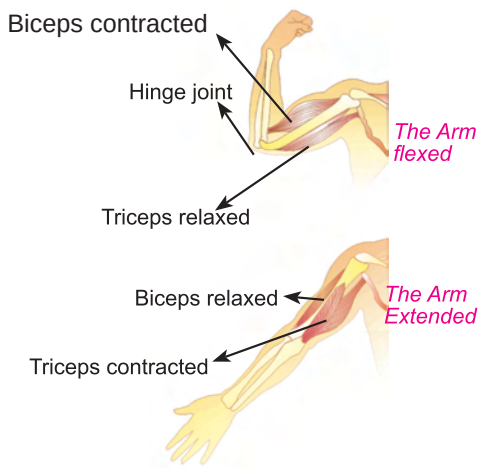
Procedure:

1. I Join two scales at one end with the sticking tape.
2. I blow a long balloon to a quarter full.
3. I tie both the ends of the balloon to the wooden pieces on either side. The balloon represents the biceps muscle.
4. I open and close the two scales.
5. I observe and record the size and shape of the balloon .





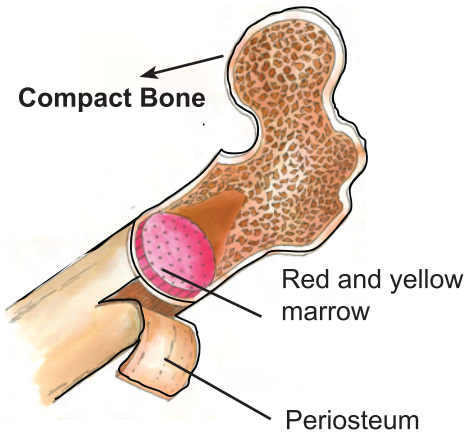
In the figure, the movement of the elbow joint shows how the two muscles- biceps and triceps work antagonistically (in opposite directions) to bend (flex) and stretch (extend) the arm at the hinge joint of the elbow. The muscle that lies above



the upper arm is the biceps. Muscle on the back of the upper arm is triceps. The bicep muscles can be seen and felt bulged when you flex your arm at the elbow and get relaxed, when you extend your arms. Likewise, when you straighten(extend) the arms, the tricep muscles at the back of the upper arm get contracted and when you flex the arms they get relaxed.

Bone is a hard, greyish-white substance of which, two-thirds is composed of inorganic matter or minerals like Calcium, Phosphate and Carbonate. They make the bone more brittle. The remaining one-third is organic matter.

Bones are not solid. They have a strong outer layer of light weight compact bone which is spongy inside. In the centre, a soft marrow is present which produces new Red Blood Cells (RBC) and White Blood Cells (WBC) for the blood. Bones protect and maintain the body's delicate vital organs like brain, lungs, heart, etc. Almost all the bones of the body may be classified into four main types, on the basis of their shape. Bones have a strong membranous covering over its surface like the skin and this outer layer is called periosteum.



A section through thigh bone or femur

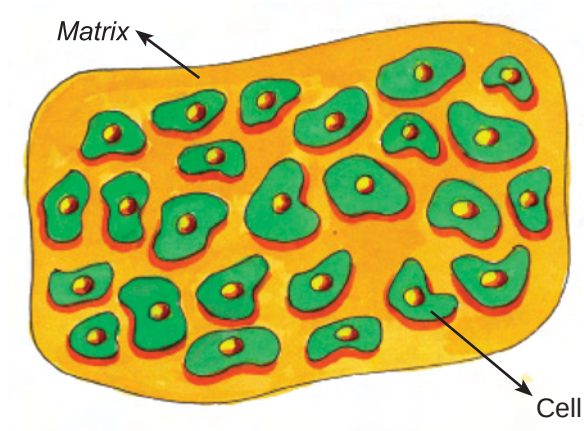
S.No.	Shape	Example
1.	Long Bones	Bones of thighs, legs, toes, arm, forearm and fingers
2.	Short Bones	Wrist and ankle
3.	Flat Bones	Cranial bones, scapula clavicle and sternum
4.	Irregular Bones	Vertebrae coccyx and certain skull facial bones

1.2. JOINTS AND TYPES OF JOINTS

Bones fit together at the joints and are held firmly by ligaments. The ligament is a fibrous form of connective tissue.

What is a Joint?

A joint is a point of contact between the bones and the cartilage and between the bones and teeth. The structure of the joint reflects its function.



Structure of cartilage

ACTIVITY 1.2 **I DO**

- I rotate my arms.
- I fold and stretch my hands.
- I twist my wrists right and left.
- I turn my head to one side and then to the other side. (left and right)
- I open my mouth wide and then close it.

Now, I name the joints and muscles involved, when I do these actions.

Types of Joints

Some joints permit no movement, others permit slight movements and still others afford considerable movements.

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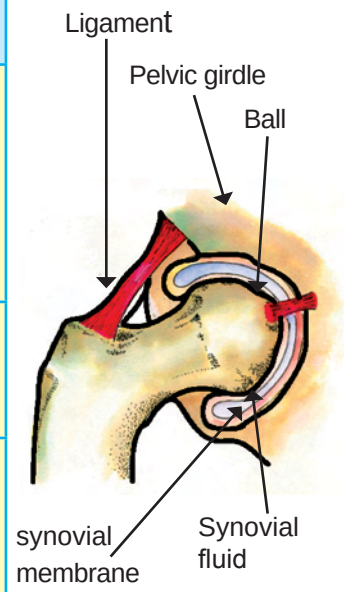
S. No.	Name of the joint	Nature	Example
1.	Fibrous Joints	Bones are held together by fibrous connective tissue with no synovial cavity. These joints include immovable sutures	skull bone, between calf bone and tibia.
2.	Cartilagenous joints	Bones are held together by cartilage with no synovial cavity	earbones, tip of nose sternum
3.	Synovial Joints	All synovial joints are freely movable in selected directions and contain synovial cavity, articular cartilage and a synovial membrane.	hip joint, shoulder joint, elbow, atlas and axis, tarsal bones



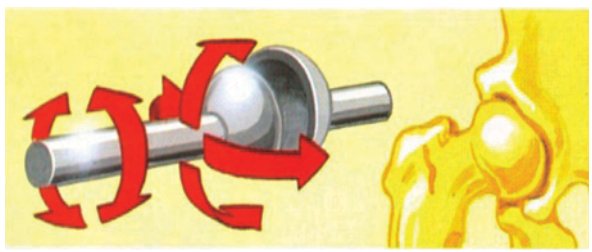
A typical synovial joint at the hip

Some Synovial Joints

Ball and Socket Joint

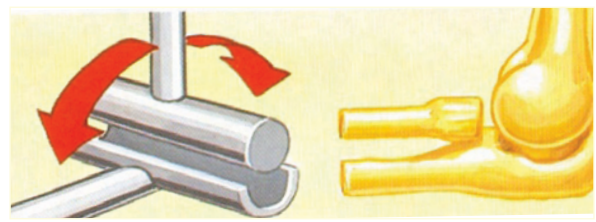
Example:- Hip joint and Shoulder Joints.

It consists of a ball like surface of one bone fitted into a cup-like cavity of another bone.



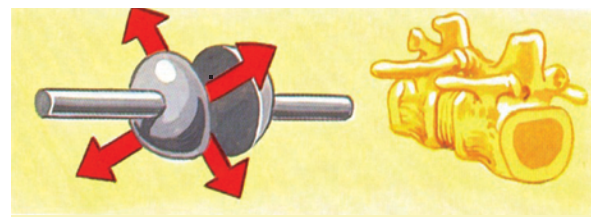
Hinge Joint

Example:- Elbow and ankle. It is one in which the convex surface of one bone fits into the concave surface of another bone.



Gliding Joint

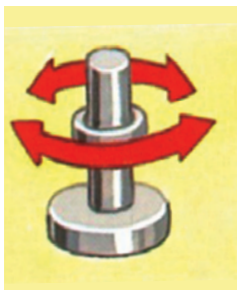
Example:- Tarsal bones, the sternum and the clavicle. The articulating surface of bone in these joints is usually flat. Movement is not around an axis.



Pivot Joint

Example : Atlas and Axis

This joint allows us to turn our head from side to side. It is one in which a rounded, pointed or conical surface of one bone articulates within a ring formed partly by a ligament.



1.3. SKELETON

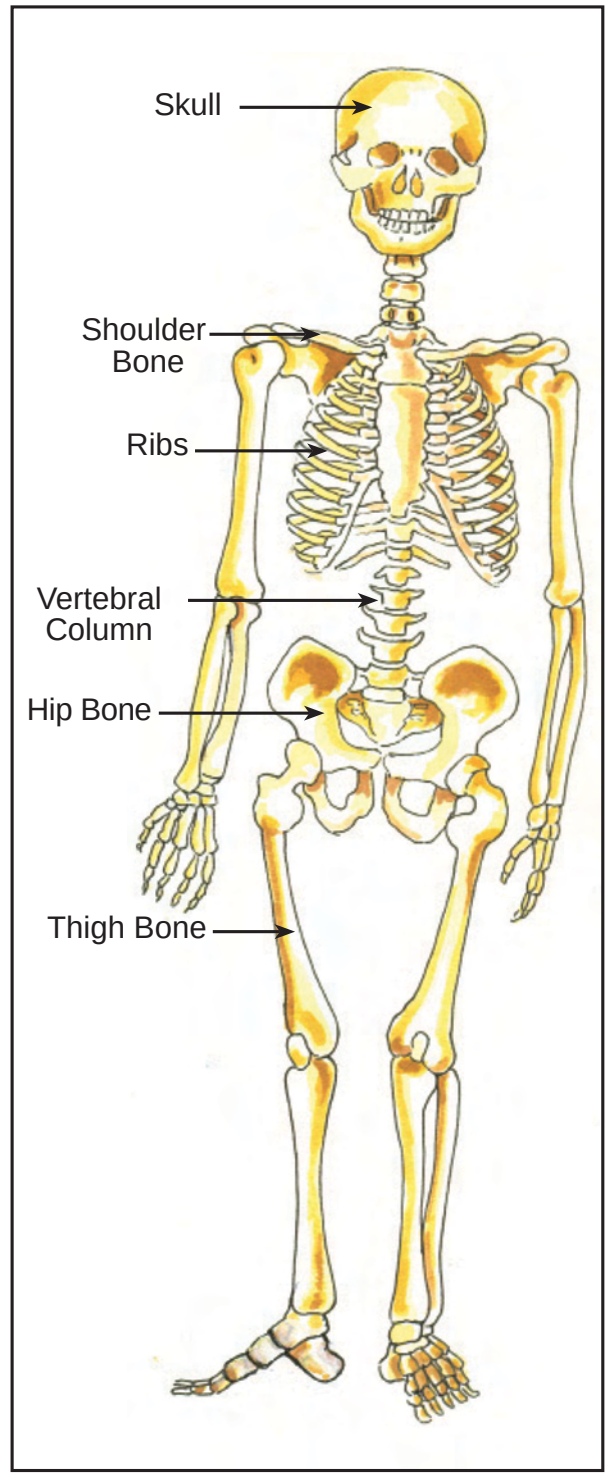
We studied that the Skeletal System is instrumental in performing movements such as walking, running, etc. We shall observe the divisions of the Skeletal System, in this unit.

Can we count all the bones in the human skeleton?

Yes, we can. The adult human skeleton consists of 206 bones. They are classified into axial skeleton and appendicular skeleton.

ACTIVITY 1.3	WE OBSERVE
We observe the mounted adult human skeleton in the biology lab.	

HUMAN SKELETON



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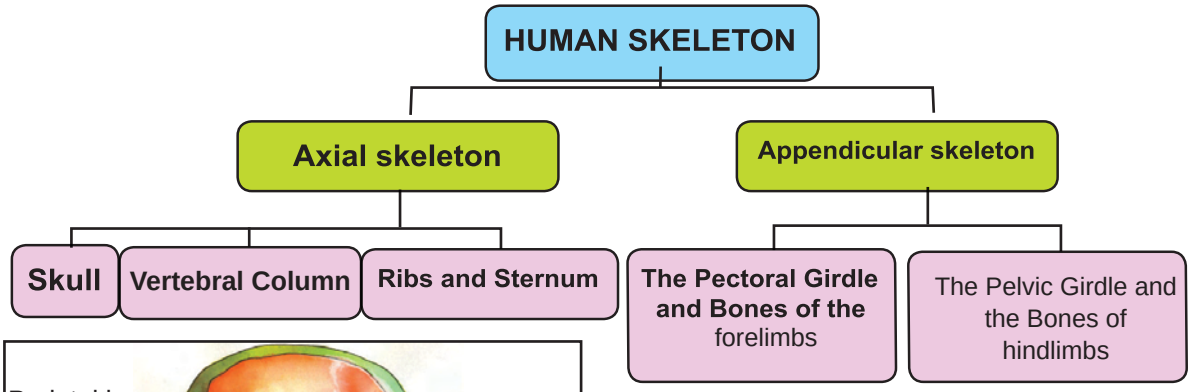
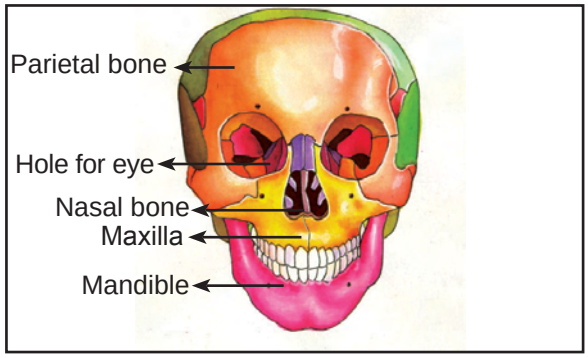
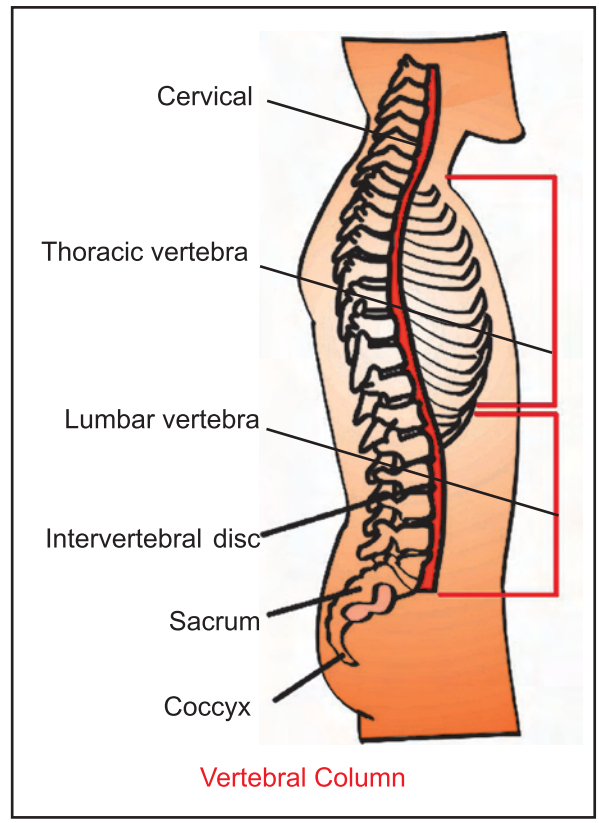




Axial Skeleton

The vertebral column has a characteristic curve. It has five distinct regions. They are listed below:

1. The cervical Region (neck region) consisting of seven vertebrae.
2. The thoracic Region (chest region) consisting of twelve vertebrae.
3. The lumbar Region (Abdominal region) consisting of five vertebrae.



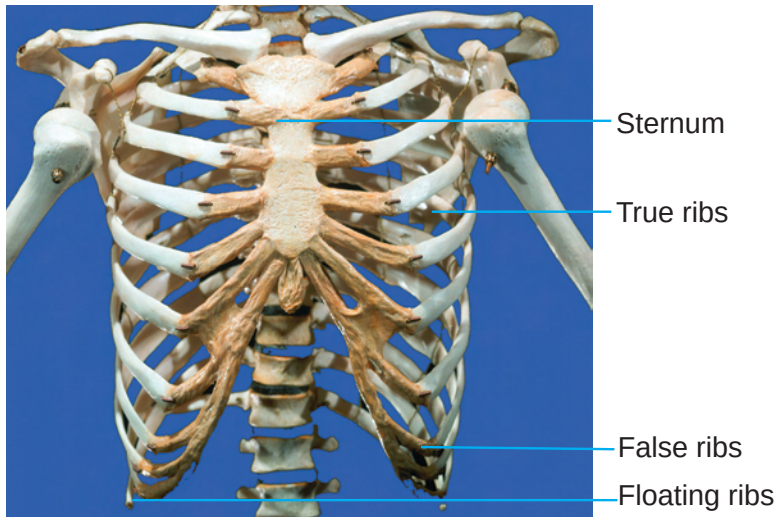
Vertebral Column

Atlas and Axis

4. The Sacral Region (Hip region) consisting of five vertebrae.
5. The Coccygeal Region (vestigial region) consisting of four vertebrae. They are rudimentary.

Ribs and Sternum (Rib cage)

It protects the vital organs like lungs, heart, etc. There are twelve pairs of ribs.



Ribs and Sternum

The ribs at the sides, the sternum in the front and the backbone together form the "chest box".

The first seven pairs of ribs are directly attached to the sternum and are called 'true ribs'.

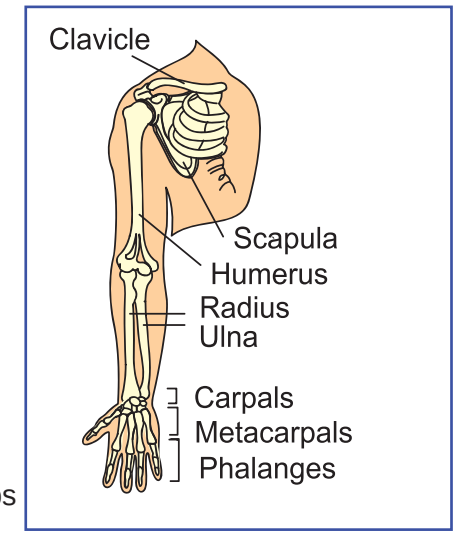
The next three pairs of ribs which are not directly attached to the sternum are called 'false ribs'.

The last two pairs of ribs (11th and 12th) are short and are not attached to the sternum. They are called 'floating ribs'.

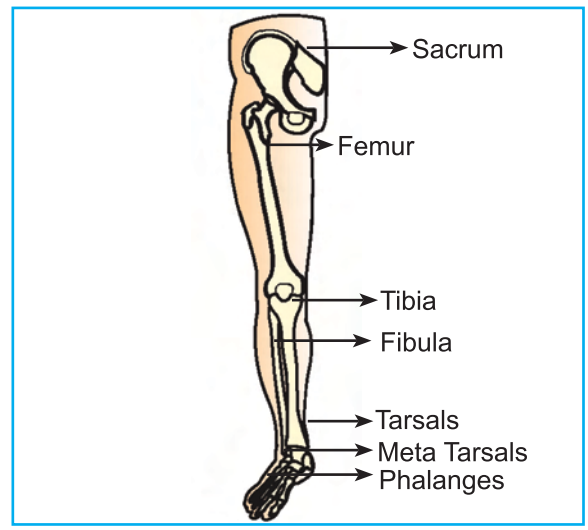
Appendicular Skeleton

The appendicular skeleton includes the pectoral and pelvic girdles and the bones of the limbs (arms and leg bones).

Regions of the Skeleton	No. of Bones
Axial	80
Appendicular	126
Total	206



Right pectoral girdle and upper arm



Right pelvic girdle and lower limb bones

MORE TO KNOW

The largest and the smallest bones in our body.

- The largest bone in the human body is the thigh bone or femur. It is about 45cm long in an average man.
- The smallest bone is the stapes. It is found inside the human ear.

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ACTIVITY 1.4 **I DO**

I shall help the bone builders to keep away from the bone busters.

I look at each word in the middle column and analyse. If it is good for my bones, I write the word under 'bone builder'. If it is not good for my bones, I write the word under 'bone buster'.

BONE BUILDER	WHAT AM I	BONE BUSTER
	Sunshine	
	Alcohol	
	Weight bearing exercise	
	Dark leafy vegetable	
	Cigarette Smoke	
	Calcium	
	Slippery place	
	Vitamin D	
	Milk	

Functions of the Skeletal System

Support: Provides framework and supports the soft tissues of the body.

Protection: Protects many vital internal organs like brain, heart and lungs.

Movement facilitation : Bones serve as levers and enable us make movements.

Storage of minerals: Stores minerals like calcium, phosphate and carbonate.

Production of blood cells: The marrow produces the RBC, WBC and blood platelets.

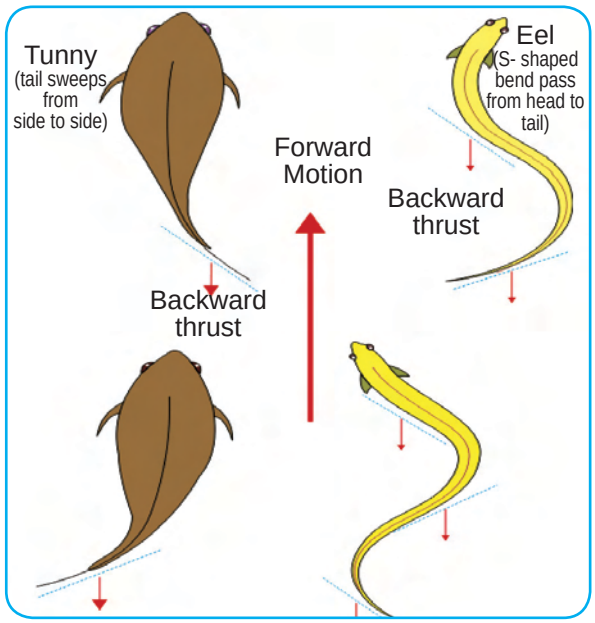
3.4. MOVEMENT OF ANIMALS

Animals move from one place to another in response to different stimuli-in search of food and shelter, in order to mate and to escape from predators. These movements are enabled by muscular actions in response to stimuli. Various kinds of organs like cilia, flagella, appendages, fins, limbs, setae, muscular feet and wings are present in animals to help them perform these movements.

Fishes

Fishes live only in water. Their stream lined bodies are best suited for locomotion in water. Fins are their locomotory organs. The fins are also adapted to move efficiently through the water. Most fishes swim by waving their tails from side to side (eg. Tunny fish). Some fishes, such as plaice and flounders are flat. When these fishes swim, they move up and down.

The eel is a fish with a long body. It swims by moving its whole body from side to side. Bony fish possess swim-bladders, which are filled with gas or air.They are hydrostatic in function. By moving

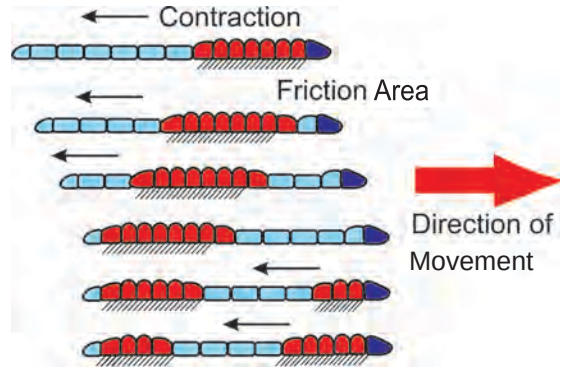


Swimming Movements

certain fins, fishes can change directions. They can go up and down, from left to right or from right to left.

Earthworms

Earthworms move with the help of body muscles (both circular and longitudinal muscles) and setae. The setae can be projected or withdrawn with the help of protractor and retractor muscles in setae sacs. These setae provide a grip for the animal to move on the surface of the soil. The earthworm moves at the rate of 25cm per minute. The nervous system coordinates the activities of the circular and the longitudinal muscles. So, the contraction of any layer of muscle brings about relaxation of the



Movement of the earthworm

other muscle layers. The coelomic fluid serves as a hydraulic skeleton because a decrease in its pressure results in the relaxation of muscles.

The earthworms can move on smooth and hard surfaces like glass by using mucus as adhesive because the setae cannot anchor to the substratum.

ACTIVITY 1.5 **I DO**

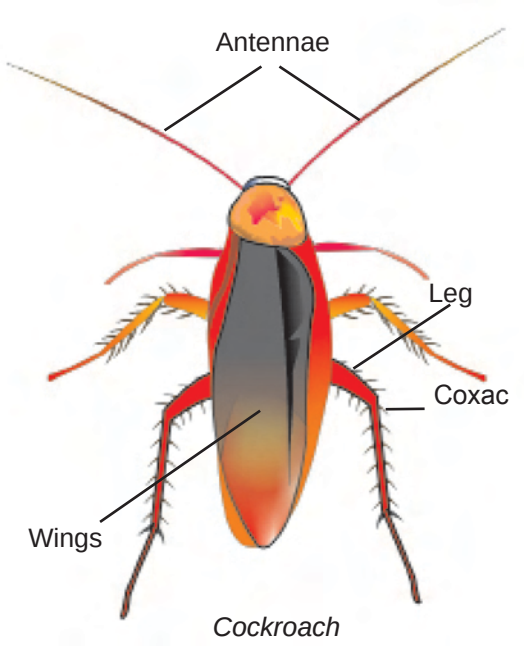
I take two earthworms. I place one on a glass slide and the other one on a rough surface. I observe which one moves faster and I record the reason.

Cockroach

The cockroach is a swift runner as well as a flier.

It has six legs which are helpful in walking or running. When the cockroach is at rest, the coxae of the legs lie back against the body and the first pair of legs are directed forward. The hind legs are stretched

out to the posterior and the middle legs take whatever position is convenient. During locomotion, the first pair of legs is directed forward which determines the



Cockroach

movement of the insect during walking or running. The Thorax bears two pairs of wings. The forewings are elytra and they form a protective covering. The hindwing is membranous and is used for flight.

Snake

Movement of the snake

Many snakes use a S-shaped movement, known as undulatory locomotion, when they travel on land and in water. Starting at the neck, a snake contracts its muscles thrusting its body from side to side, creating a series of curves. In water, this motion easily propels a snake forward because each contraction pushes against the water. On land, a snake usually finds resistance points on the surface such as rocks, branches or dents and uses its scales to push on the points all at once, thrusting the snake forward.

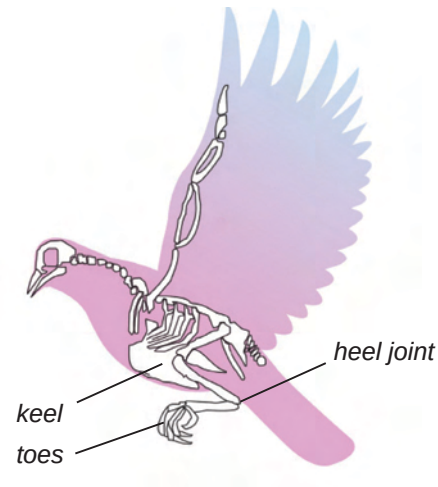
MORE TO KNOW

Support and Movement of some Invertebrates

- Roundworms are fluid-filled with muscles directed longitudinally, permitting lashing movements only.
- Certain molluscs make use of the hydrostatic property to perform digging movements with the muscular foot.
- In molluscs, external shells are formed from the material continuously secreted by the mantle and they take several forms.

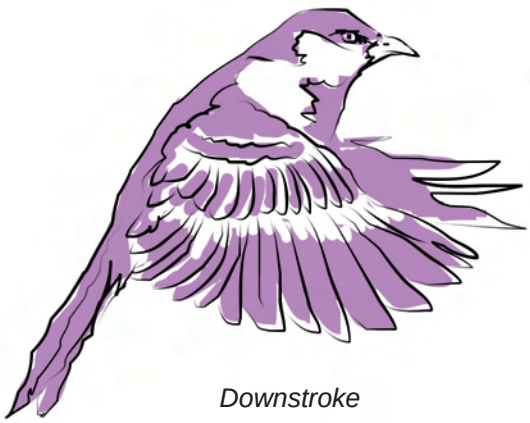
Birds

Birds are best suited for the aerial mode of life. The body is streamlined and thus offers the least amount of



resistance for movement in the air. Their wings are modified forelimbs. The light weight of the body facilitates easy flight. This is brought about by the hollow (pneumatic) bones and the air sacs in the cavities of bones. The powerful flight muscles are anchored to a bony flap on its chest. The flap is called keel. The powerful pectoral muscles serve in pulling the wings downwards and upwards.

The following pictures show how most of the birds fly.



Downstroke

Upstroke

Downstroke

On the downstroke of the wing, the feathers overlap so that no air can get through and the bird can push itself along through the air.

Upstroke

On the upstroke, the feathers twist open. So air passes through, allowing the bird to lift its wings easily.

Landing

The bird lands by spreading out its wings and tail as a brake.

Landing

ACTIVITY 1.6 **I DO**

I see birds fly with the help of wings and feathers. I collect feathers of different types of birds and paste them in my scrapbook.

DOWN FEATHER

QUILL FEATHER

TAIL FEATHER

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EVALUATION

1.Choose the word that is different from the others in the following and give reason.

a. Clavicle b. Skull c. Femur d. Ball and socket

2. Name the joint that enables the movement of head from side to side.

3. Fill in the blanks:

a) A tendon connects a _____ to a _____.

b) Earthworms move with the help of body muscles and _____.

c) Bones have a layer of strong outer covering called _____.

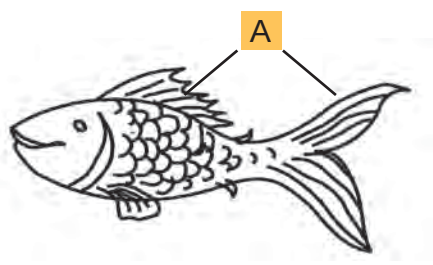
4. Which one of the following is not matched correctly?

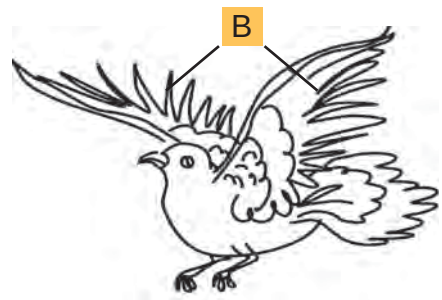
A	B
1. Hip joint	Ball and socket
2. Hinge joint	Atlas and Axis
3. Gliding joint	Tarsal bones

5. The skeletal system has many other functions besides helping in movements. Do you know what they are?

- Formation of blood cells
- _____
- _____

6. Identify parts A and B and state their functions:





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7. Draw the given diagram and label the following parts.

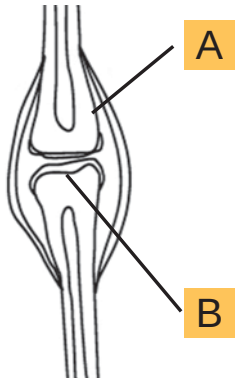
a) Ball

b) Periosteum

c) Yellow marrow

d) Compact bone

8. Copy the diagram of the human joint. Name the joint, label part A and B and write their functions.



9. Give reason:

a. The movement of animals is based on their skeletal system.

b. Exercise or physical activity is one of the essential requirements for longlife.

FURTHER REFERENCE

Books

Modern zoology- Dr. Ramesh Gupta - Prakash Publications.

Human anatomy- T.S. Ramanathan - S. Chand and Company Ltd.

Webliography:

http//en.wikipedia.org/wiki/cell-(biology)

http://www.enchantedlearning.com/subjects/anatomy/skeleton/skelprintout.shtml

2. AIR, WATER AND SOIL POLLUTION

Air, water and land are the most important natural resources. Human beings are responsible for changing the environment to fulfill their needs of food, clothing, housing, transport and industry. Human beings damage the healthy environment by uncontrolled activities. Most of the environmental problems are related to the increase in population, development in agriculture, transport and industry.

2.1. AIR POLLUTION

Air pollution is the outcome of any change in the composition of air, either by physical or chemical methods that cause harmful effects on health.

2.1.1. Sources of Air Pollution

There are two sources namely,

1. Natural sources
2. Man-made (anthropogenic) sources.

Natural sources

Volcanic eruption, forest fire, sea salt sprays, biological decay, photochemical oxidation of terpenes, marshes, pollen grains, and spores are some natural sources. Radioactive minerals present in the earth's crust are the sources of radioactivity in the atmosphere.

Man-made sources

Industrial emissions, vehicles, aeroplanes, power-stations, burning of fuels, etc.,are man-made sources.

Air pollution is caused mainly due to burning of fuels to run vehicles and the smoke emanating from chimneys of factories and power stations.

Air contains 20.9% Oxygen, 78% Nitrogen, 0.03% Carbon Dioxide, Neon, Krypton, Hydrogen and Water vapour in small quantities.

Vehicles cause 50% of the air pollution in India.

The Greenhouse Effect

Some of the infrared radiation from the earth passes through the atmosphere but most of it is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. This warms up the Earth's surface and the lower atmosphere.

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Air Pollutants

The following table shows a few air pollutants and their effects on human health and environment.

S.NO.	NAME OF THE AIR POLLUTANTS	SOURCES	EFFECTS
1.	Carbon monoxide	Combustion of fuels	It reacts with haemoglobin in human blood forming carboxy-haemoglobin. It may lead to death.
2.	Carbon dioxide	Burning of coal/ timber	It leads to global warming.
3.	Nitrogen oxides	Automobile exhausts	It causes acid rain.
4.	Sulphur dioxide	Burning of sulphur	It causes irritation in the eyes, lung cancer and asthma.

Acid Rain

Oxides of nitrogen, sulphur, and carbon produced by combustion of coal, petroleum, etc,. dissolve in atmospheric water vapour. They form their corresponding acids like nitric acid, sulphuric acid, etc., and reach the earth's surface as acid rain.

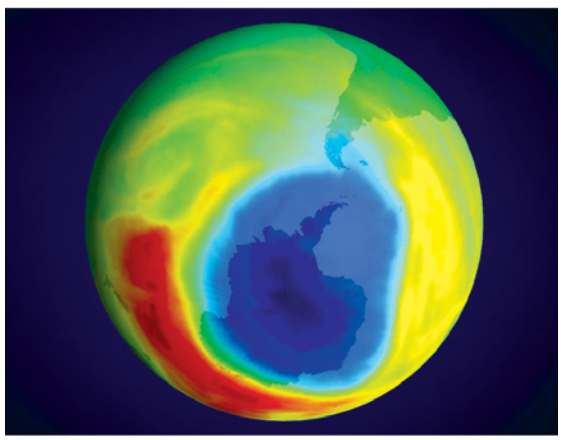
Effects of acid rain

- It irritates the eyes and the skin of human beings.
- It inhibits germination and growth of seedlings.
- It affects the fertility of soil, destroys plant and aquatic life.
- It causes corrosion of many buildings, bridges, etc.,

The increase in the concentration of greenhouse gases (CO_2, methane) in the atmosphere allows radiations of short wavelength reflect back to earth. The consequent increase in the global mean temperature due to greenhouse gases is called global warming.

Ozone Depletion

Ozone is a colourless gas, found in the upper atmosphere (stratosphere) and is highly beneficial. The Ozone layer is thinning due to the emission of pollutants into the atmosphere. Holes caused in the ozone layer allow the harmful UV rays to reach the earth.



Ozone hole

ACTIVITY 2.1 **I DO**

After I travel around the city by a two wheeler, bus or an auto, I wipe my face, neck and below my nose with a tissue paper and I record my observation.

Control of air pollution

Air pollution can be minimized by following ways:

Use of crude oil should be avoided and use of high quality fuels, unleaded petrol, bio-diesel and Compressed Natural Gas (CNG) should be recommended.

Use of automobiles should be minimized. Industrial smoke must be filtered before releasing it into the atmosphere. Planting of more trees to get pure air (O_2) and reduce the CO_2 content in the environment.

2.2. WATER POLLUTION

Water is said to be polluted, when there are undesirable changes in the physical, chemical and biological conditions of water that make it unfit for human consumption.

Water becomes polluted in many ways:

- Stagnant water becomes polluted day by day. It gives out a foul smell and mosquitoes breed there in large numbers causing malaria.
- Pond water get polluted due to human activities like bathing and washing clothes.

ACTIVITY 2.2 **WE DO**

We collect samples of drinking water and the water we use for bathing and washing. We pour the samples in transparent containers and label them. We compare the samples for smell, acidity and colour. We tabulate our observation.

- Do you feel that both the samples are safe for consumption?
- If not, give reason and find out a solution.

2.2.1. Sources of water pollution

Water pollution reduces the amount of pure fresh water that is available for agriculture, drinking, cleaning, swimming and fishing. The pollutants that affect water come mainly from industries, farms and sewage systems. Industries dump huge amounts of waste products into water bodies.

Wastes from farms include animal waste, fertilizers and pesticides. Most of these materials drain off from fields into nearby water bodies. Sewage systems carry waste from homes, offices and industries into water bodies.

Hot water released into water bodies can also upset the natural cycle. This is called thermal pollution. Hot water can kill aquatic animals and plants that can survive only in low temperature. It also reduces the amount of dissolved oxygen in water. Mostly heated water comes from industries and power plants that use water for their cooling towers.

Control and preventive measures

- Treating waste in effluent treatment plant before it is discharged into the water bodies.
- Reusing the treated water either for gardening or cooling purpose, wherever possible.
- Over usage of water should be prevented.
- Wash clothes at a place away from the well.

Water Pollution

2.3. PURIFICATION OF WATER

Cleaning of waste water is a process of removing pollutants before it enters a water body. This process of waste water treatment is commonly known as Sewage Treatment.

What is sewage?

Sewage is waste water released by homes, industries, hospitals, offices and other users. It also includes rain water that runs down the streets during a storm or heavy rain.

2.4. LAND POLLUTION

Pollution of the earth's natural land surface by industrial, commercial, domestic and agricultural waste is called land pollution. Throwing waste materials like plastic objects, animal waste, dye effluent, trash and garbage causes land pollution.

Waste Water Treatment Plant

Treatment of waste water involves physical, chemical and biological processes.

1. At first, waste water is passed through bar screens.
2. Large objects like sticks, cans and plastic packets are removed.
3. The water is then passed through a grit chamber in which sand is removed.
4. The water is then allowed to settle in a large tank.
5. Solid materials settle at the bottom.
6. Then the water is transferred to the next tank through a skimmer. This skimmer removes the floating solids like oil and grease.
7. Next, air is pumped through water in an aeration tank to help aerobic bacteria to grow. The bacteria consume unwanted matters that still remain in water.
8. The treated water has a very low level of organic material and suspended matter. It is discharged into a river.

Waste water treatment plant

2.5. SOURCES OF LAND POLLUTION

Land is polluted by excessive usage of fertilisers, pesticides, sewage wastes and factory wastes. It is mainly polluted by garbage.

Some land pollutants, called hazardous wastes cannot be disposed easily. Chemicals used in dry cleaning are examples of such wastes. Proper disposal of hazardous wastes is vital to maintain a safe and healthy environment.

The use of excessive amounts of fertilizers may decrease the productivity of the soil. Pesticides destroy the insects that harm crops, but pesticides may also destroy other helpful organisms in the soil.

Much damage to soil is caused by erosion. Erosion is the wearing away of soil. It can result from removal of trees and other plants that hold soil in place. Wind can then easily blow the soil away and rain water can wash it away. Careless farming methods, clearing of land for construction projects such as laying of roads and real estate development also cause pollution.

Garbage should never be allowed to accumulate either at home or on the roads, especially during the rainy season.

2.6. SCIENCE TODAY- BIOPOL

The trade name of the fully biodegradable plastic material naturally produced by the micro-organism is Alcaligens. This plastic is homopolymer i.e. Poly Hydroxy Butyrate (PHB).

Bioplastic is a form of plastic derived from renewable biomass sources such as vegetable oils, corn starch and pea starch, by the action of microorganisms.

The Eumycetes and the Schizomycetes microorganisms are responsible for degradation.

Bioplastics are biodegradable, biocompatible and renewable.

Uses of bioplastics

Bioplastics are used in many ways such as packaging, agriculture and medicine.

Packaging : Trays and containers for fruits, eggs, meat and bottles for soft drinks.

Agriculture : Plant pots used for flowering and vegetable plants.

Medicine : To produce artificial heart valves, tooth reconstruction, bone fracture plates and artificial skin.

DO YOU KNOW?

Waterwatch

Is there any water body near your house or your school? It could be a small pond, stream, lake, river, or even an ocean. Take a closer look at it. Always seek the **help of your parents or teachers.**

Are there any unwanted materials floating on the water surface? How dirty are the banks? Are there any sewage pipes leading to the water body? Do people dump garbage around the water? Do they bathe or wash clothes there? Do they bathe their cattle, wash

SCIENCE

ACTIVITY 2.3 WE DO

Making of Bioplastic:

Materials Required:

1. Cornstarch powder 2.Glycerine 3. Vinegar 4. Water

Method:

1. We took a nonstick vessel. We put a tablespoon of cornstarch powder in it and added four tablespoons of water to it. We stirred it with a spatula and then added one teaspoon of Glycerine along with one teaspoon of Vinegar. We mixed everything thoroughly and heated the mixture slowly on a stove.
2. At first, a paste like substance was formed. Then, it turned into a jelly like substance. We waited until the bubbles settled and the substance became clear. Then we stopped heating. We poured it into a hard plastic tray and spread it. We allowed it for a day to dry. Thus we obtained bioplastic.

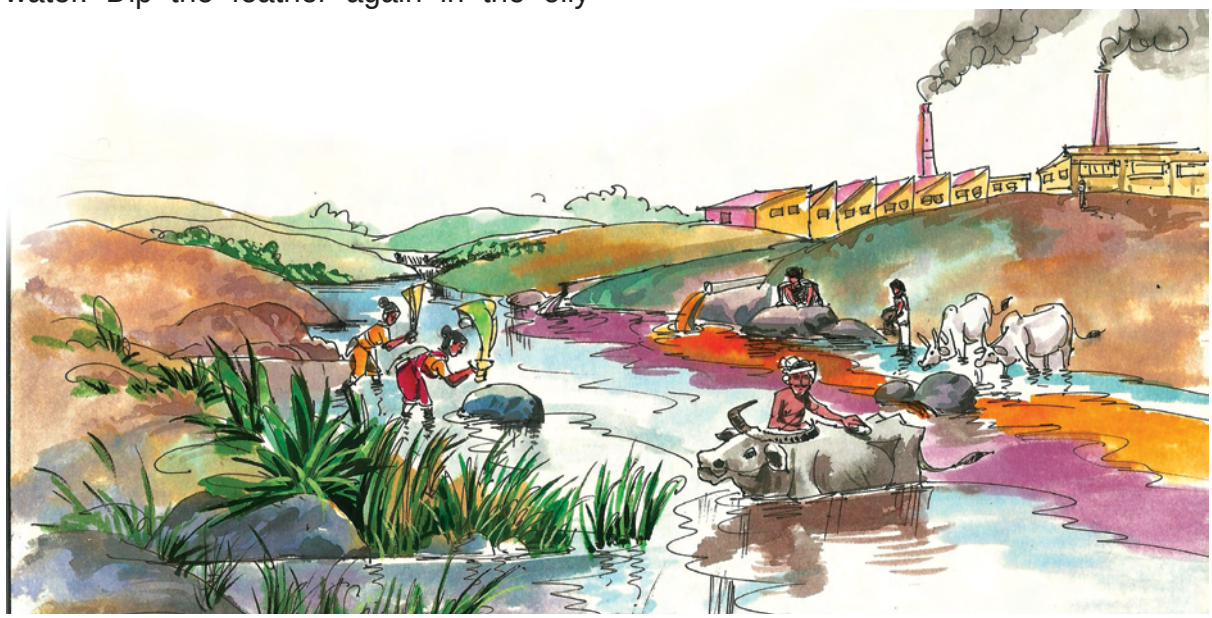
trucks or trackors? Do you see fields or factories around the water?

Pollution Patrol

What can oil in the water do to a bird? Try to find this out. Take a feather of a bird. Feel it, look at it and examine it with a hand glass or magnifying glass. Sketch what you see.

Now dip the feather into water for a couple of minutes. Take it out. Feel it, look at it and examine it with a hand lens. Note down your observations.

Then add some cooking oil to the water. Dip the feather again in the oily water. Take it out and once again feel and examine it. Does it feel and look different? How would a bird with oily feathers be affected?



Polluting the Planet

1. Over a million tons of oil are deliberately discharged into the world's oceans every year by tankers, during the routine cleaning of their tanks.
2. Fertilizers help crops grow fast but they also poison rivers and streams.
3. A seabird that gets covered in oil is obviously in great distress because oil destroys the waxy covering of its feathers and so, the feathers get waterlogged. This often cause the bird to drown or die of cold.

4. Gases like sulphur dioxide released from power stations and factories kill many species of lichens and mosses.
5. Pesticides make birds lay eggs with unnaturally thin shells.
6. Today, literally tens of thousands of pollutants are present in air, water and soil and they are incorporated into plant and animal tissues.

Air Pollution

7. Pollution is no longer a local or even a national phenomenon. It is a global problem.
8. The release of Chloro Fluro Carbon (CFC) from refrigerators has caused the breakdown of the ozone layer. It causes skin cancer.
9. Coral reefs are damaged.

MORE TO KNOW

It has been suggested that we should plant eucalyptus trees all along the sewage ponds. These trees absorb surplus waste water rapidly and release pure water vapour into the atmosphere.

ACTIVITY 2.4 WE DO

With the help of our teacher or by browsing the internet, we find out whether there is any international agreement to control global warming.

We divide into groups and discuss, how we could help ourselves to reduce air pollution.

1. We imagine ourselves to be members of the municipal body of our town.
2. We make a list of measures that would help our town to ensure supply of clean water to all its residents.
3. Then we prepare a brief speech on global warming and one from each group delivers the speech to our class.

Solution

Small contributions on our part can make a huge difference in the state of the environment. Always remember these three R's and follow them in your day-to -day life.

- Reduce
- Recycle
- Reuse

Environment provides a very close association and high degree of inter-dependence between the living and non-living components of the earth. Among all the non-living components, water is an essential factor. The world is heading towards a water crisis due to natural and man-made hazards. To

SCIENCE

Water (Prevention and control of pollution) Act, 1974.
Air (Prevention and control of pollution) Act, 1981.
Environment (Protection) Act, 1986.

save our earth, we have to plant more trees growing more trees, will increase rainfall and will provide a good climate to live. The oxygen content will also increase. This will save our children from the evil effects of pollution.

"Save trees - Save lives"

EVALUATION

I. Answer the following:

1. You are expected to leave behind a good environment for your future generation. In that case, which one of the following fuels, will you use now for cooking?
   [Wood, Cow dung, LPG, Kerosene, Gobar gas]
2. Think of the ways in which you can use each of these things:
   (a used paper envelope, an old greeting card, an empty ghee tin)
3. Rita and Aruna went out to eat ice cream. Rita dropped the empty paper cup in the dustbin. Aruna threw her cup away on the road. If you had been there, what would you have done? Why?
4. A group of children went to a park on a picnic. When they returned home, they left behind some empty tins and bottles, wasted crumbs of food, used paper plates and napkins. Which of these things would decompose and become part of the soil? What would happen to the rest? What should the children have done with these things?
5. Ramu collects sheets from old calendars that are blank on one side. Why does he do this? What do you think he will use these sheets for?
6. Outbreaks of Water-borne diseases are common after heavy rainfall, especially in poor rural areas. Name any two water borne diseases.

II. State reasons for the following:

1. Trees growing near a factory often gather a lot of dust on their leaves.
2. When trees on the hillside are cut down, there is the danger of soil erosion on the hill.
3. It is dangerous to throw harmful chemical substances into rivers.
4. The water you drink now-a-days is not safe.
5. Urbanization and industrialization increase global warming.

III. Investigate the following:

1. Do you know how the solid waste from your house is disposed off?
2. How is it collected and segregated?
3. Where does it go thereafter?
4. All of you must have heard the name "EXNORA'. Collect details about various activities of that organisation.

IV. Classify the following waste materials found in your house under the given heads:

1. Plastic bags 2. Cooking waste 3. Milk sachets 4. Glass pieces 5. Metal clips 6. Thermocoal 7. Tissue paper 8. Leather chappals 9. old clothes 10. saw dust 11. Electrical wire.

Biodegradable	Non biodegradable

V. Complete the list of the various places of air pollution which you come across in your daily life.

1. Home (mosquito repellants etc,)
2. Industrial area
3. Harbour
4. Tourist spot
5. Dump yard
6. _____
7. _____
8. _____
9. _____
10. _____

VI. Debate on : The advantages and disadvantages of Nuclear Power Stations.

FURTHER REFERENCE

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World science- Bay books Pollution - Macmillan

Webliography:

www. kidsforsavingearth.org, www. tiki.oneworld.net

3. ATOMIC STRUCTURE

We see several things in the above picture. All these living and non-living things are made up of matter. Atoms are the building blocks of all matter. Atoms are extremely small in size and are expressed in terms of 10^{-10} m (1 A°). Let us learn how the great scientists and philosophers of ancient times described the structure of atoms.

3.1. ANCIENT VIEWS ON ATOMIC STRUCTURE

Ancient scholars and philosophers in India, believed that matter consisted of ultimate minute indivisible particles(anu). They further argued that the combination of two or three atoms form a material. This idea is the same as the idea of molecules. Later, in about 400 BC, the Greek Philosopher Democritus, also proposed that matter is made up of atoms. The word **'atom'** was coined because these small particles of matter were assumed to be indivisible. In Greek language, atom means **'incapability of being cut'.**

We know that, the smallest portion of a word which is further indivisible is called a letter. Similarly, if we break a magnesium ribbon into several fragments, at one stage it cannot be broken further into smaller particles. This indivisible smallest particle of an element is called an atom.

3.2. LAWS OF CHEMICAL COMBINATION

The ideas of these philosophers were not universally accepted because there was no experimental evidence to support them. Scientists continued

to accumulate the data and as time passed, more and more observations and views regarding the qualitative and quantitative aspects of matter were noticed. These observations led to some general statements which are now known as the **Laws of Chemical Combination.** They include:

1. Law of Conservation of Mass
2. Law of Definite Proportion
3. Law of Reciprocal Proportion
4. Law of Multiple Proportion and
5. Gay Lussac's Law of Combining Volume

Let us discuss the first two laws of chemical combination.

3.2.1 Law of Conservation of Mass: (LAVOISIER 1774)

Is there any change in mass, when a physical change takes place?

Activity 3.1 — We Observe

Put a cube of ice in a clear tightly closed conical flask and weigh it. Leave the flask for some time. Now you observe the flask. The ice cube melts and becomes water. This is a physical change. After sometime, weigh the flask again. What do you notice?

You notice that there is no change in mass. Hence, during a physical change the total mass of the matter remains the same.

Does any change in mass occur when a chemical change (chemical reaction) takes place?

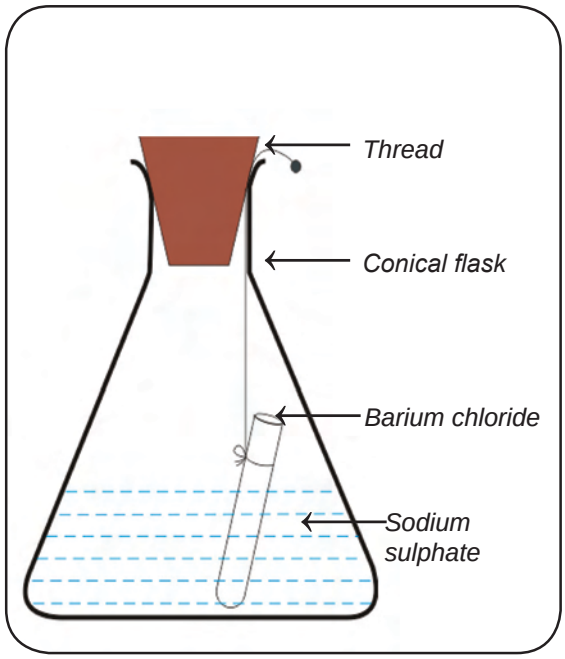
Activity 3.2 — We Observe

Prepare 5% of barium chloride (5g of $BaCl_2$ in 100 ml of water) and sodium sulphate solutions separately. Take some solution of sodium sulphate in a conical flask and some solution of barium chloride in a test tube. Hang the test tube in the conical flask . Weigh the flask with its contents. Note down the weight.

Now mix the two solutions by tilting and swirling the flask. Shake well. Weigh the flask, after the chemical reaction has taken place. Note down the weight. Record your observation, when the reaction between the two solutions take place.

What happens in the conical flask when the two solutions are mixed? Does the weight of the flask remain the same before and after the chemical reaction? What do you conclude from this experiment?

The barium chloride solution reacts with the sodium sulphate solution to form a white precipitate of barium sulphate and sodium chloride.



The mass of the flask before and after the chemical reaction is found to be the same.

From the conclusions drawn from the above activities, the Law of Conservation of Mass can be stated thus: “Mass can neither be created nor destroyed during a physical or a chemical change”.

In other words, the total mass of material present after a physical change chemical reaction is just the same as the total mass before the physical change chemical reaction.

3.2.2. Law of Definite Proportions: (PROUST 1779)

Joseph Proust noticed that all the compounds were compounds of two or more elements and each such compound had the same elements in same proportions, irrespective of where the compound came from or who prepared it. For example, water obtained from different sources like rain, well, sea, and river will always consist of the same two elements hydrogen and oxygen, in the ratio 1:8 by mass. Similarly, the mode of preparation of compounds may be different but their composition will never change. It will be in a fixed ratio. Hence, the Law of Definite Proportions can be stated as. "A pure chemical compound prepared by any method consists of the same elements combined together in a fixed proportion by mass".

Joseph Louis Proust ***(1754 - 1826)***

3.3. DALTON’S ATOMIC THEORY

Keeping in view, the law of chemical combinations and the work of Greek philosophers, a meaningful atomic theory was finally proposed by a British school teacher, John Dalton between the years (1803 and 1807). His theory was based on the following postulates:

1. Matter is made up of small, indivisible particles called atoms.

2. Atoms can neither be created nor destroyed.
3. Atoms of the same element are identical in all respects.
4. Atoms of different elements are different in all respects.
5. Atoms of different elements may combine with each other in a fixed simple whole number ratio to form “compound atoms” (or molecules).
6. The atom is the smallest particle of matter that takes part in a chemical reaction.

3.3.1. Merits of Dalton’s Atomic Theory

1. It gave a satisfactory explanation for the laws of chemical combinations. (law of conservation of mass and law of definite proportions)
2. It explained most of the properties of gases and liquids known at that time.

3.3.2. Demerits of Dalton’s Atomic Theory

1. It failed to explain why the atoms of different elements differ in their size, mass and valency.
2. It failed to explain how and why atoms of different elements combine to form compounds.
3. It did not explain the nature of binding forces that hold the atoms together in a compound.
4. It could not clearly distinguish between an atom and a molecule.

John Dalton, son of a poor weaver, began his career as a village school teacher at the age of 12. He became the principal of the school seven years later. In 1793, he moved to Manchester to teach Physics, Chemistry and Mathematics in a college.He proposed his atomic theory in 1803. He carefully recorded each day, the temperature, pressure and amount of rainfall from his youth till the end. He was a meticulous meteorologist.

3.4. ELECTRICAL NATURE OF MATTER

Before proceeding to understand the composition of an atom, it is better to learn the electrical nature of matter. Let's get to know the electrical nature of matter, by carrying out the following activities.

Activity 3.3 **I Do**

I need: Bits of paper, a plastic comb, a glass rod, a piece of silk cloth and an inflated balloon.

1. I take a few bits of paper and place them on the table. I comb my dry hair repeatedly with a plastic comb. Immediately I bring the comb close to small bits of paper. I am able to notice the comb _____ small pieces of paper.
2. I rub a glass rod with silk cloth and bring it near an inflated balloon. I am able to see the glass rod _____ the inflated balloon.

From these activities, we can conclude that on rubbing together, two objects become electrically charged. Where does this charge come from? This question can be answered by knowing that an atom consists of charged particles.

The first direct experimental evidence to prove the electrical nature of matter came from Michael Faraday. He demonstrated through his experiments that electricity is composed of particles called **'atoms of electricity'.**

It was George Johnstone Stoney, an Irish Physicist, who first proposed the term **'electron'** for 'atom of electricity' in 1891.His contribution to research in this area laid the foundations for the eventual discovery of particles by J.J. Thomson in 1897.

3.5. DISCOVERY OF FUNDAMENTAL PARTICLES

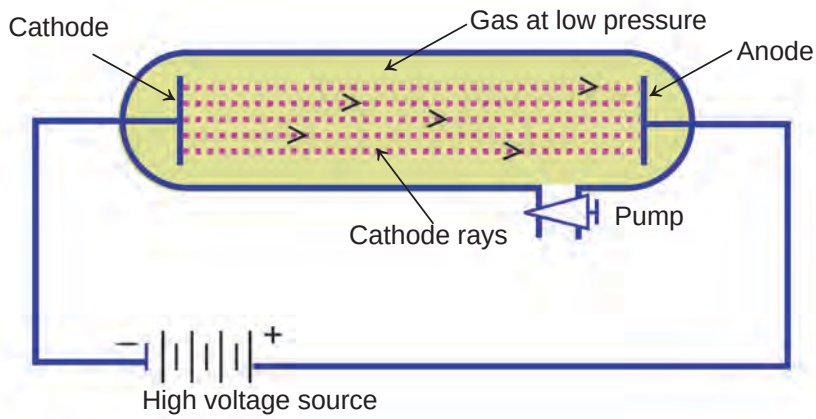
The experiment that was conducted to investigate the phenomenon that takes place when high voltage is applied to a tube containing gas at low pressure, laid the foundation to the discovery of fundamental particles.

In 1878, Sir William Crookes, while conducting an experiment using a discharge tube, found certain visible rays travelling between two metal electrodes. These rays are known as Crooke's Rays or Cathode Rays. The discharge tube used in the experiment is now referred to as Crookes tube or more popularly as Cathode Ray Tube **(CRT)**. It is a long glass tube filled with gas and sealed at both the ends. It consists of two metal plates (which act as electrodes) connected with high voltage. The electrode which is connected to the

MORE TO KNOW

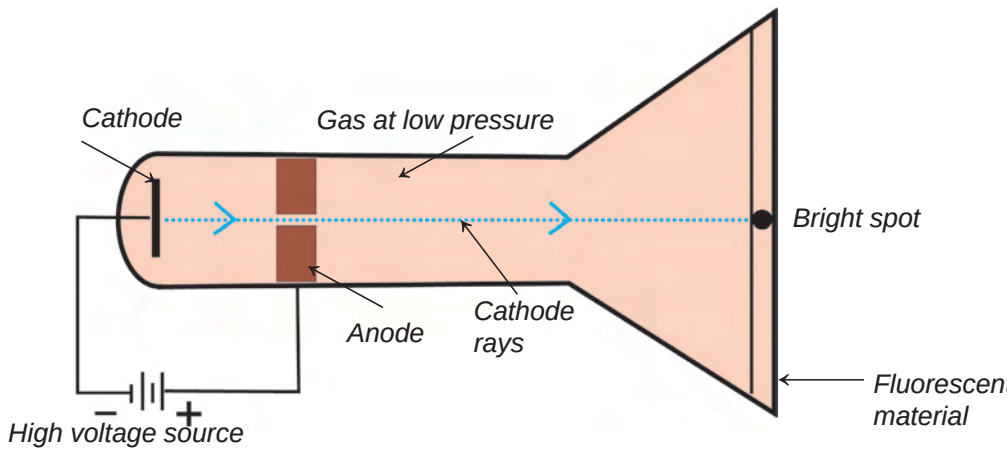
The fact that air is a poor conductor of electricity is a blessing in disguise for us. Imagine what would have happened if air had been a good conductor of electricity. All of us would have got electrocuted, when a minor spark was produced by accident.

negative terminal of the battery is called the cathode (negative electrode). The electrode connected to the positive terminal is called the anode (positive electrode). There is a side tube which is connected to a pump. The pump is used to lower the pressure inside the discharge tube.



3.5.1. Discovery of electron

Later, J.J. Thomson found that when a high voltage of 10,000 V was applied between the electrodes present in a partially evacuated cathode ray tube at a pressure of 0.01mm of mercury, a bright spot of light was formed on the screen coated with a fluorescent material placed at the other end of the tube. The fluorescent material coated on the screen started to glow because it was struck by the ray, which originated from the cathode. Since these rays were emitted by the cathode, he called these rays as cathode rays. Later, he named them 'electrons'.



MORE TO KNOW

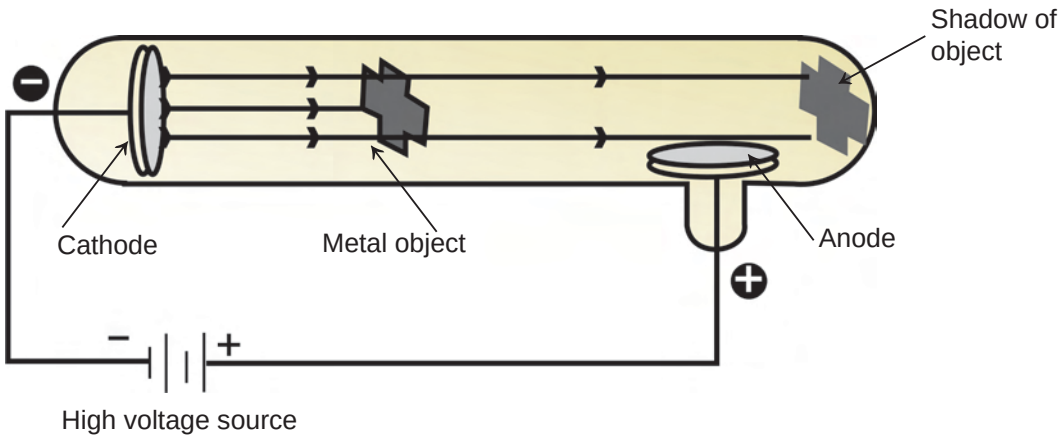
FLUORESCENT MATERIAL : When invisible radiation falls on materials like zinc sulphide, they emit a visible light (or glow). This is called fluorescent material.

3.5.2. Properties of Cathode rays

J.J. Thomson and others studied the properties of cathode rays by conducting the following experiments.

Experiment 1

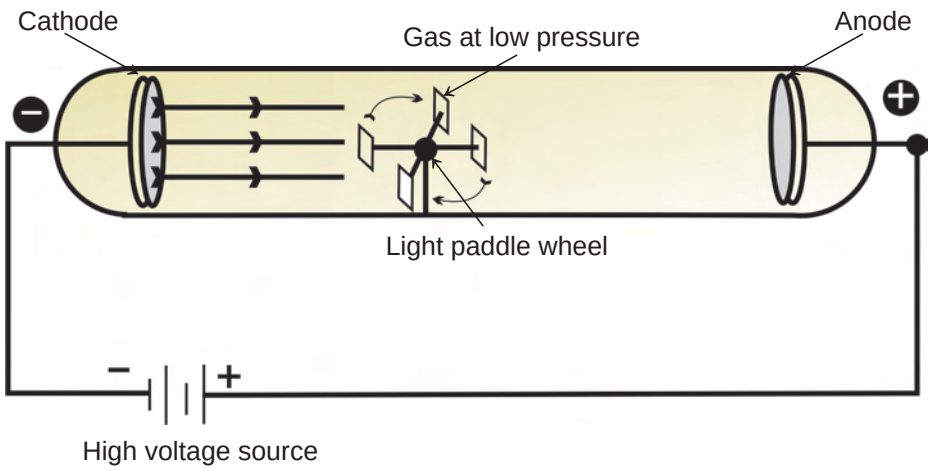
Cathode rays fall on a small object which is placed in between the cathode and the anode. A shadow of the same size and shape as that of the object is observed on the wall, opposite to the cathode.



Conclusion: Cathode rays travel in straight lines parallel to each other.

Experiment 2

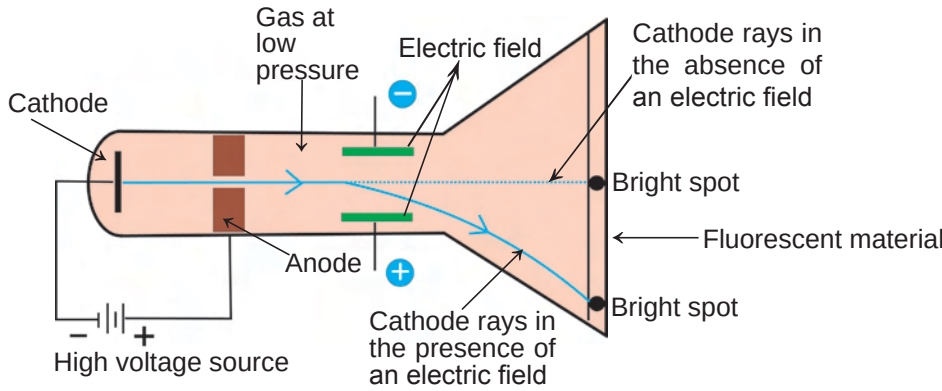
When cathode rays fall on a light paddle wheel which is placed in between the cathode and the anode, the wheel starts rotating.



Conclusion: Cathode rays are made up of small particles that have mass and kinetic energy.

Experiment 3

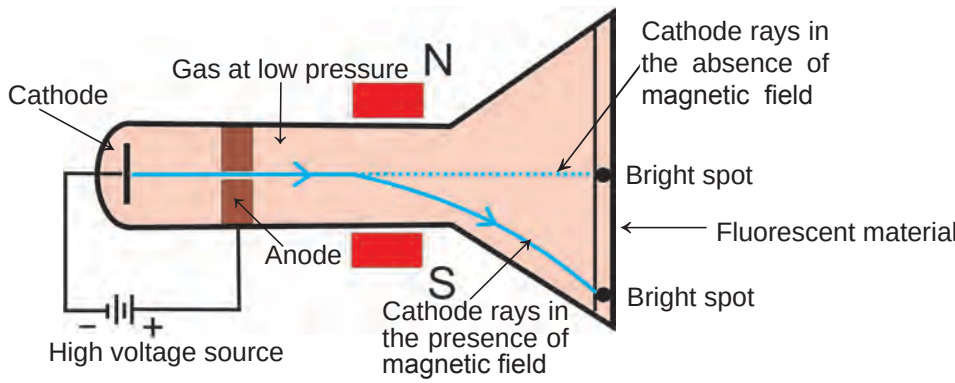
When cathode rays are passed through an electric field, they are deflected towards the positive plate of the electric field.



Conclusion: Cathode rays are negatively charged particles.

Experiment 4

When cathode rays are passed through a magnetic field, the deflection of the rays is seen perpendicular to the applied magnetic field.



Conclusion: The direction of deflection indicates that the cathode rays consist of negatively charged particles. These negatively charged particles are called **electrons.**

Experiment 5

These experiments are repeated using different gases / different cathodes in the discharge tube. The properties of cathode rays do not undergo any change.

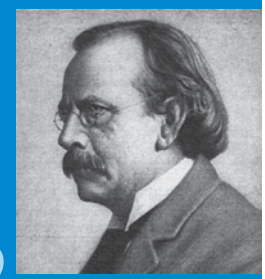
Conclusion: The nature of the cathode rays does not depend on the nature of the gas filled inside the tube or the cathode used.

Now, shall we write the properties of cathode rays from the conclusions?

List the properties of cathode rays.

1.
2.
3.
4.
5.

"J.J. Thomson a British Scientist, is credited with the discovery of electrons and isotopes"

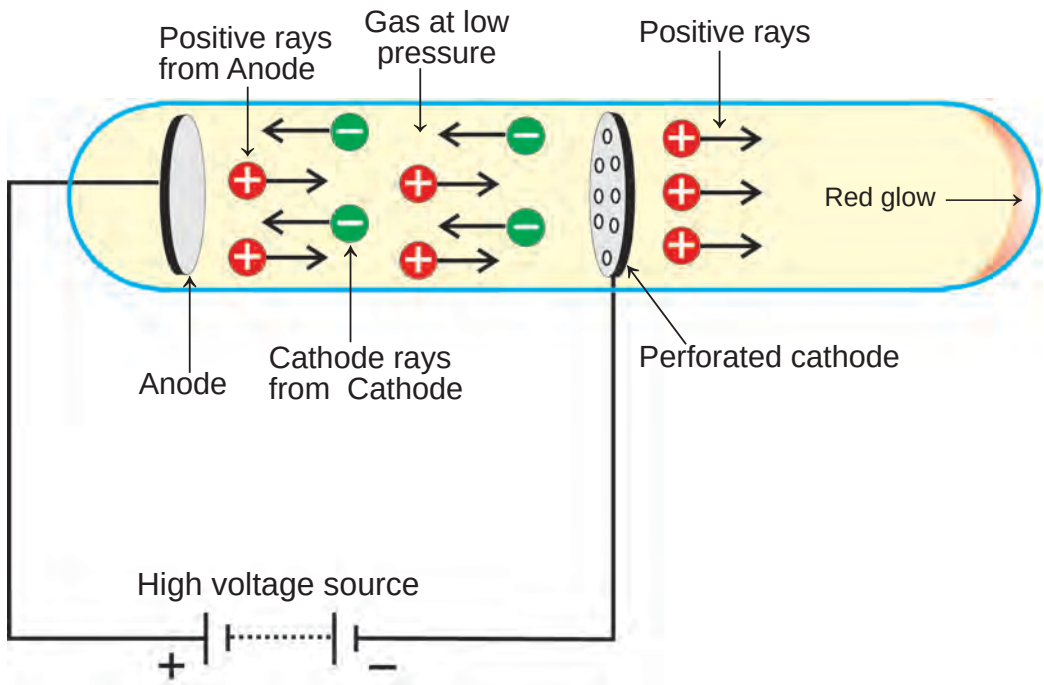


3.5.3. Discovery of protons

The presence of positively charged particles in the atom has been precisely predicted by Goldstein based on the conception that the atom being electrically neutral in nature, should necessarily possess positively charged particles to balance the negatively charged electrons.

Goldstein's Experiment (1886)

Goldstein repeated the cathode ray experiment by using a perforated cathode. On applying a high voltage under low pressure, he observed a faint red glow on the wall behind the cathode. Since these rays originated from the



SCIENCE

anode, they were called anode rays or canal rays or positive rays. Anode rays were found as a stream of positively charged particles.

When hydrogen gas was taken in a discharge tube, the positively charged particles obtained from the hydrogen gas were called PROTONS. Each of these protons are produced when one electron is removed from one hydrogen atom.

$$H \longrightarrow \underset{\text{Proton}}{H^+} + \underset{\text{Electron}}{e^-}$$

Thus, proton can be defined as an hydrogen ion (H^+) (Ions are charged particles).

3.5.3.1 Properties of Anode Rays

1. Anode rays travel in straight lines.
2. Since they rotate the light paddle wheel placed in their path, they consist of material particles.
3. Anode rays are deflected by electric and magnetic fields. Since they are deflected towards the negatively charged plate, they consist of positively charged particles.
4. The properties of anode rays depend upon the nature of gas taken in the discharge tube.
5. The mass of the particle is the same as the atomic mass of the gas inside the discharge tube.

3.5.4. Properties of fundamental particles

Particle	mass (atomic mass unit)	Relative charge
ELECTRON(e)	0.00054 a.m.u	-1
PROTON(p)	1.00778 a.m.u.	+1

3.6. WHY ATOMIC MODEL?

The study of the electrical phenomenon in gases led to the historic conclusion that atom is divisible and is made up of

Electrons and Protons

The study of the properties of the fundamental particles, the electrons and protons, led to the conception of various atom models.

An atom model is the description that depicts the arrangement of various fundamental particles inside an atom. The systematic study of various atomic models gives us an insight into the understanding of the primary structure of an atom.

3.6.1. Thomson's Atomic Model (1904)

Thomson's Atomic Model can be compared to a watermelon or a ripened guava. The red edible portion of the watermelon represents the positive

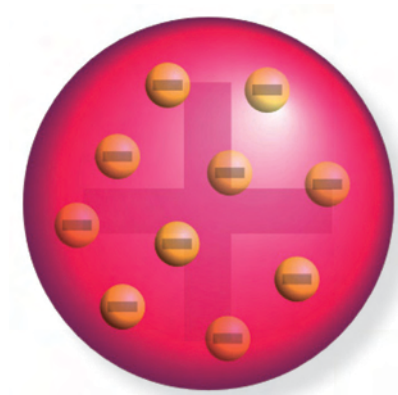
sphere. The black seeds look like the electrons embedded in an atom.

According to J.J. Thomson,

1. An atom consists of a positively charged sphere with electrons embedded in it.
2. The positive and negative charges are equal in magnitude; hence the atom as a whole is electrically neutral.

Thomson's scientific model of the atom is popularly known as the 'plum pudding' model.

3.6.2. Limitation of Thomson's model



Thomson's model could successfully explain the electrical neutrality of atom. However, it failed to explain how the positively charged sphere is shielded from the negatively charged electrons without getting neutralised. Apart from electrons and protons, an atom contains a neutral particle called the neutron. You will learn more about neutrons in higher classes.

SCIENCE

EVALUATION

I. Choose the correct answer:

1) The same proportion of carbon and oxygen in the carbon dioxide obtained from different sources proves the law of_____

a) reciprocal proportion b) definite proportion c) multiple proportion

2) In water, hydrogen and oxygen are combined in the ratio of ____by mass.

a) 1:8 b) 8:1 c) 2:3

3) Which one of the following is a wrong statement, regarding the postulates of Dalton's Atomic Theory.

a) Matter is made up of small indivisible particles called atoms.

b) Atoms of the same element are different in all respects.

c) Atoms of different elements are different in all respects.

4) Dalton's Atomic Theory successfully explained the Law of _____ .

i) Conservation of Mass

ii) Definite Proportions

iii) Radioactivity

iv) Multiple Proportions

a) (i), (ii) and (iii) b) (i),(iii) and (iv) c) (i) ,(ii) and (iv)

5) Based on the Thomson's model of an atom, say which of the following statements are correct.

i) The positive charge is assumed to be uniformly distributed over the atom.

ii) The electrons are uniformly distributed in the positively charged sphere.

iii) The electrons attract each other to stabilize the atom.

iv) The mass of the atom is assumed to be uniformly distributed over the atom.

a) (i) ,(ii) and (iv) b) (i),(ii) and (iii) c) (i) and (iii)

II. Fill in the blanks:

1. _____is a negatively charged particle. (Electron/Proton)
2. Proton is deflected towards the___ charged plate. (positively, negatively)

III. Match the entries of column I with the appropriate entries of column II and column III: (Double matching)

Property (Column I)	Cathode rays (Column II)	Anode rays (Column III)
i) Type of charge present	a) independent	A) positive charge
ii) Particle present	b) negative charge	B) dependent
iii) Nature of gas taken in the discharge tube	c) cathode	C) proton
iv) Origin	d) electron	D) anode

IV. Identify the wrong statement regarding the properties of cathode rays and correct it.

1. Cathode rays are made up of large particles with mass and kinetic energy.
2. Cathode rays are deflected by the magnetic field.
3. Cathode rays depend on the nature of the gas inside the tube.

V. Explore and answer:

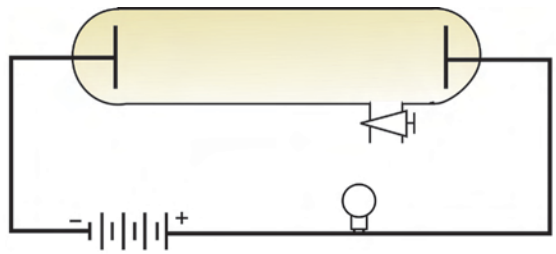
1. Why does a light paddle wheel placed in the path of cathode rays begin to rotate, when cathode rays fall on it?
2. a) What happens in the discharge tube, if high voltage is applied at a gas pressure of 760 mm mercury?

   b) What will happen if the pressure is reduced to 0.01mm of mercury?
3. How can we prove that the electrons carry negative charge?
4. Selvi took a conical flask, put some ice cubes into it and closed it with a stopper. Then, she found the weight of the conical flask using a balance. Its weight was 150 g. After sometime, ice started melting and turned into water. She weighed the flask again. The weight was 150 g. What inference would you draw from this experiment?
5. Kannagi, Goutam, David, and Saleem collected different samples of water from a well, a pond, a river and underground water. All these samples were sent to a testing laboratory. The test result showed the ratio of hydrogen to oxygen as 1:8.
   a) What conclusion would you draw from the above experiment?
   b) Which law of chemical combination does it obey?
6. The postulates of Dalton's law are given below:
   a) Atom can neither be created nor destroyed.
   b) Atoms of different elements may combine with each other in a fixed simple whole number ratio to form compound atoms.

   i. Which postulate of Dalton's atomic theory is based on the Law of Definite Proportions?

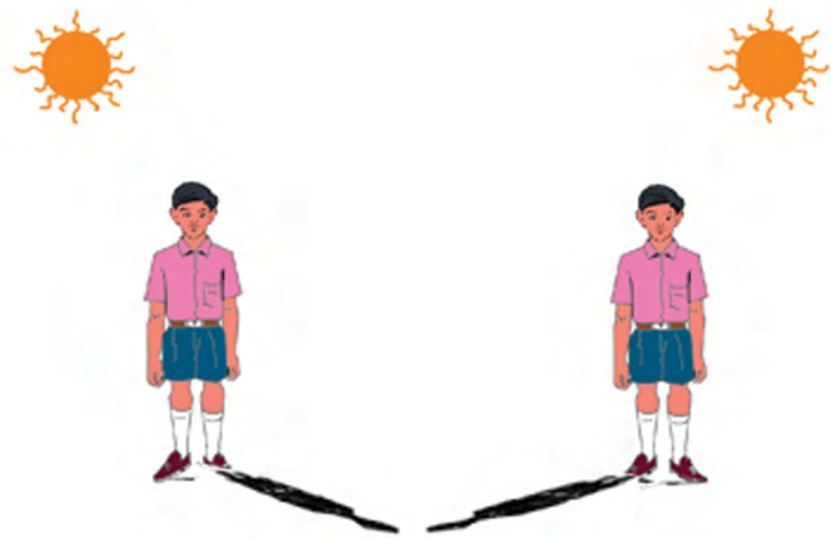
   ii. Which postulate of Dalton's Atomic Theory is based on the Law of Conservation of Mass?

7. Rani prepared carbon monoxide in the laboratory. It contained 15g of carbon and 20g of oxygen. Ram also prepared carbon monoxide but using another method. It contained 42.9% of carbon. Show that the data of Rani and Ram are in accordance with the Law of Definite Proportions.
8. Cathode rays fall on a small object between the cathode and the anode. A shadow of the same size and shape as that of the object is observed on the wall opposite to the cathode. What conclusion can you draw from the above statement regarding the properties of cathode rays?
9. Gomathi filled a discharge tube with a particular gas and connected it as shown in the figure.



She applied high voltage but the bulb did not glow. What should Gomathi do to make the bulb glow?

10. Observe the size and direction of your shadow, when you stand in the sunlight in the morning and in the evening.

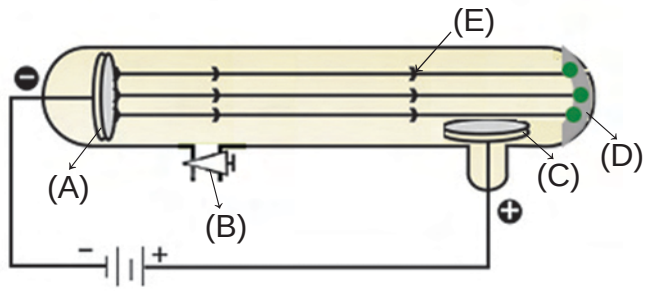


(i) Is the length of your shadow the same as your height?

(ii) What is the direction of the shadow? Does it fall in the direction of the source of light or in the direction opposite to the light source?

(iii) Compare the nature of the shadow formed in this activity with that of the shadow formed when an object is kept in the path of the cathode rays.

11. (i) Sketch and label the parts A,B,C,D and E in the figure given below:



(ii) What is the purpose of B?

(iii) What is the function of D?

12. Cathode and Anode rays are negatively and positively charged particles respectively. They travel in a direction opposite to each other. Why don't they get neutralized?

13. Why did Thomson assume that electrons are embedded in a positively charged sphere? Why did he not assume that they are positively charged particles embedded in a negatively charged sphere?

Project Work:

Construct a model of Thomson's atom using a cardboard, chart paper cut in round shape, gum, cotton, red colour sketch pen /water colour and dry black watermelon seeds or black beads. Label the model and display it in your classroom. Write a brief description of the Thomson's model.

FURTHER REFERENCE

Book

Inorganic Chemistry – P.L.Soni - Sultan Chand and Sons

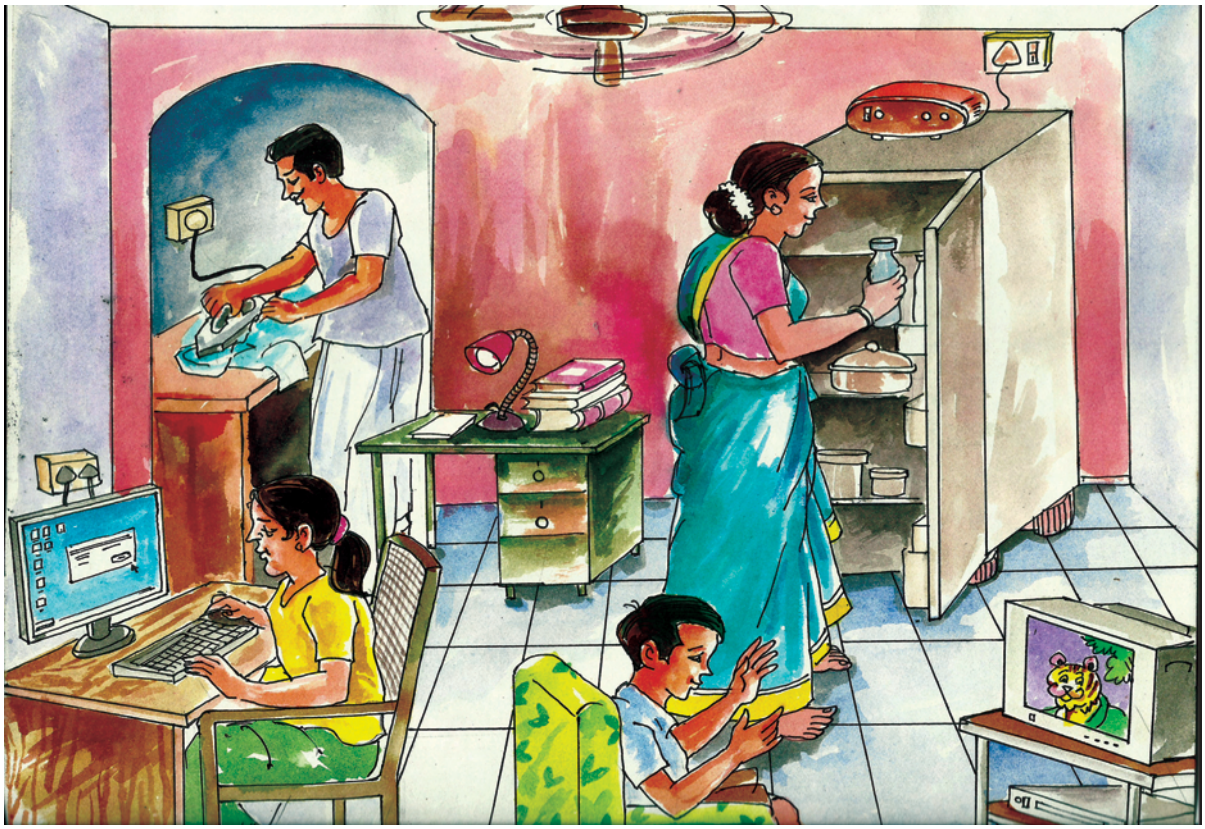
Webliography

http://www.chem4kids.com/files-atom-structure

http://www.world of teaching.com/powerpoints/atomic%20structure

hhtp://www.about.chem

4. ELECTRICITY AND HEAT



Murugan went to Anand's house last Sunday. He pressed the doorbell and waited. Anand opened the door and invited him inside. The scene in Anand's house is depicted in the picture. What do you see in the picture? Can you imagine how your life would be without electricity?

Electricity plays a very important role in our daily life. It is a form of energy that helps us in many ways. Most of the comforts of modern life would not be there, if there is no electricity.

MORE TO KNOW

We are often advised to avoid handling electrical appliances with wet hands. Why? Water, with dissolved salts in it, is a good conductor of electricity. Our body is composed of 70% water with dissolved substances. This makes us good conductors of electricity. This is why we should not touch live electric wires with bare hands.

Wearing rubber gloves and rubber shoes will insulate us from electric shock to a certain extent.

The electricity that we use in our houses, schools and factories is obtained from power stations. (A power station is a place where electricity is produced on a large scale by using various sources of energy like water, wind, heat etc.) We obtain a small amount of electricity from batteries and cells.

The electric power thus produced is used through circuits and controlled by switches.

4.1. THREE KINDS OF CIRCUITS

The flow of current requires a closed conducting path. This path is made by connecting a cell or a battery, a switch (key) and a bulb by means of wires. This closed conducting path is known as an electric circuit. Recall your experience of drawing a circuit with symbols of the components.

Simple circuit

A circuit made up of a cell, a switch and a bulb is known as a simple circuit. When the switch is put on, the bulb glows. This is because there is a continuous or closed path for the electric current to flow.

Series and Parallel Circuits

Murugan and Ramu are friends. One day, they were discussing the formation of a circuit. They were very eager to construct a circuit with more than one bulb. They tried and constructed a circuit with three bulbs in two different ways. Let us also try to construct this circuit.

ACTIVITY 4.1 **I DO**

I need: Two 1.5V cells, pieces of insulated wire, 3 torch bulbs with holders and a key.

1. I remove the insulation at both ends of the wires, so that about 1 cm of the metal portion is exposed.
2. I join the two 1.5V cells. Now it becomes a battery.
3. I connect one end of a wire to the positive end of the battery.
4. I connect the other end of this wire to the three torch bulb holders placed end to end.
5. I connect the end of the third bulb holder to a key, which in turn is connected to the negative end of the battery.
6. I close the key.
7. I see the three bulbs glowing.
8. Now, I remove one of the bulbs from its holder. I see that the other bulbs do not glow.

This is my first circuit. Now, let me dismantle this circuit and construct another circuit.

1. I connect the ends of each torch bulb holder to the positive and negative ends of the battery separately.

2. I see the three bulbs glowing.

3. I remove one of the bulbs from its holder.

4. I see the other bulbs still glowing.

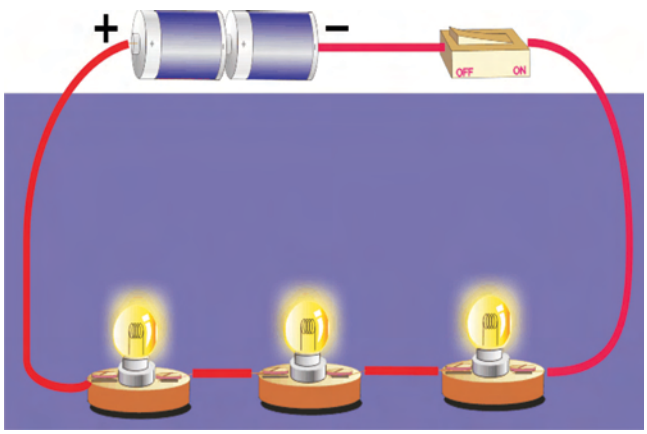
Observation:

In the first circuit, the bulbs are connected end to end. The current does not flow, when the circuit gets disconnected at any part.

In the second circuit, the bulbs are connected separately to the battery. The current has many paths to flow.

Series Circuit

The first circuit as described above is given here. When you look at the circuit, it is obvious that the bulbs are connected end to end. This type of circuit is known as series circuit. Here the current can flow only in one direction and the same amount of electric current flows through all the bulbs.

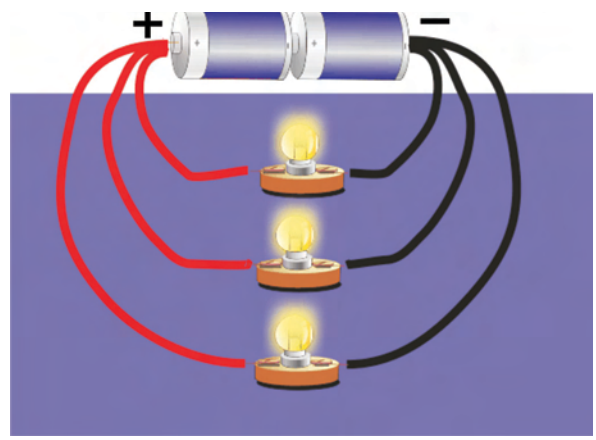


What happens when one of the bulbs in the circuit is removed or fused? The other bulbs do not glow because the circuit is not complete now.

Parallel Circuit

Observe the second circuit. Here each bulb is connected to the battery terminals by separate wires. This type of circuit is known as parallel circuit. In this circuit, different amount of current passes through the bulbs.

What happens when one of the bulbs in the circuit is removed or fuses off? The other bulbs continue to glow because they have separate conducting paths.



MORE TO KNOW

The electrical appliances in our houses are all connected in a parallel circuit. It is done so because only in a parallel circuit, current flows through each appliance separately. Even if we switch off any of the appliances, the others will continue to work.

Try yourself

1. Draw a series circuit and a parallel circuit with three bulbs in it, using only the symbols of the components.
2. Draw a series circuit and a parallel circuit with two cells and four bulbs.

4.2. CONDUCTION OF ELECTRICITY IN LIQUIDS

We know that the metals like copper, aluminium, iron, gold, etc. allow electric current to pass through them. They are called Conductors.

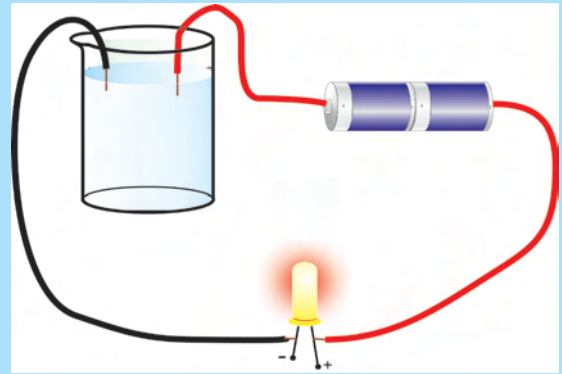
Materials like wood, plastic, rubber, glass etc. do not allow electric current to pass through them. They are called Insulators.

What about liquids?. Do they conduct electricity? Let us verify this through an activity.

ACTIVITY 4.2 WE OBSERVE

Construct a circuit using two cells, an LED and connecting wires. Immerse the two free ends of the wires into a beaker containing water or any liquid without touching each other. If the LED glows, the liquid conducts electricity. If the LED does not glow, the liquid does not conduct electricity.

If the brightness of the LED glow is high, than those liquids are good conductors. If the brightness of the LED is low, it indicates that less current is flowing through those liquids and they are poor conductors of electricity. If the LED does not glow, it denotes that such liquids are insulators.



Repeat the experiment with the following liquids and test their electrical conductivity.

Liquid	Brightness of the LED (high/ low/ does not glow)	Good/ poor conductor / insulator
Common salt solution		
Hydro-chloric acid		
Lemon juice		
Milk		

From the above table, we find that some liquids are good conductors of electricity and some are poor conductors.

Repeat the experiment to test the conduction of electricity through

distilled water. What do you observe? Does distilled water (pure water) conduct electricity? No, it does not because it is an insulator. When a pinch of salt is dissolved in distilled water, you obtain a salt solution. It becomes a good conductor of electricity.

The water we get from sources such as taps, hand pumps, wells and ponds is not pure. It contains some small amount of natural salts and so, this water is a good conductor of electricity.

Aqueous solutions of acids, bases and salts are good conductors of electricity. But the level of conductivity varies from one liquid to another.

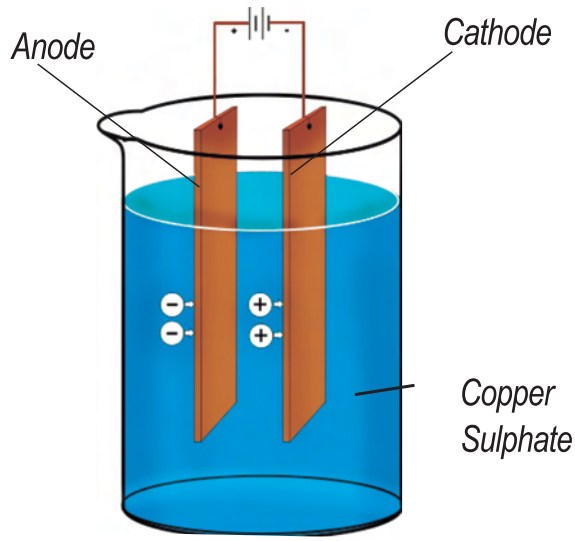
4.3. CHEMICAL EFFECTS OF ELECTRIC CURRENT

What happens when current is passed through liquids / solutions? The current will cause a chemical change, when it is passed through solutions. This is known as chemical effect of electric current.

Let us take copper sulphate solution in a beaker. Immerse two copper plates into the solution. One plate is connected to the positive end of a battery (known as anode) and the other plate is connected to the negative end of the battery (known as cathode).

When current passes through the solution, it splits up into positive copper ions and negative sulphate ions. The positive copper ions are attracted towards the cathode and get deposited on the cathode. The negative sulphate ions are attracted towards the anode and react with copper in the anode converting it into copper sulphate.

This shows that electric current has a chemical effect on copper sulphate and it brings about a chemical change. This process is known as electrolysis.



The two conductors that are immersed in the solution where the current enters and exits the solution are called **electrodes** (the copper plates in the above activity).

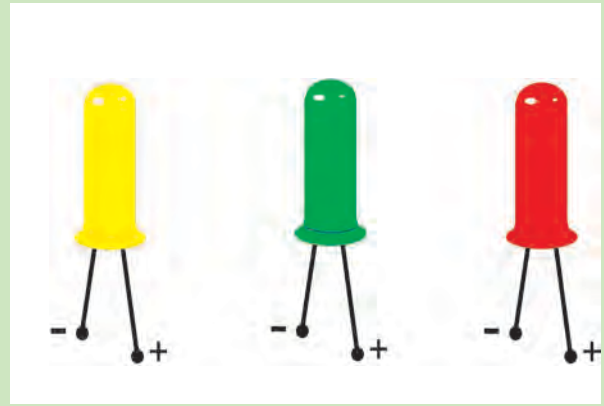
A substance that conducts electric current either in the form of a solution or in a fused state is called an **electrolyte** (copper sulphate solution in the above activity).

The process by which an electrolyte is decomposed with the help of electricity is called **electrolysis.**

MORE TO KNOW

LIGHT EMITTING DIODE (LED)

An electric bulb is used in the electric circuit to confirm the flow of current in the circuit. However, the electric bulb may not glow if the flow of current is weak. So we use an LED instead of an electric bulb. LED is Light Emitting Diode made up of semiconductor materials. A very small amount of current is sufficient to make an LED glow. LEDs are available in electrical shops. They have two legs, one short and one long. The short leg is to be connected to the negative terminal and the long leg to the positive terminal. LEDs are available in different colours such as red, green, yellow, blue, white and are increasingly being used in many applications. LEDs are greatly used for lighting.



4.4. APPLICATIONS OF CHEMICAL EFFECTS OF ELECTRIC CURRENT

The two common applications of chemical effect of current are:

Electrorefining: This is a process by which metals like gold and silver are refined or purified.

Electroplating: This is a process in which a layer of one metal is coated over another metal by electrolysis.

4.4.1. Electroplating

Have you ever seen gold plated jewellery (imitation jewellery)?. They are made by electroplating gold on cheaper metals like silver to make them look more attractive.

What is electroplating? The process of depositing a thin layer of a metal on any conducting surface by the method of electrolysis is known as **electroplating.**

In electroplating, the article (metal) to be coated is taken as the cathode. The metal to be deposited over it would be the anode and the appropriate solution, the electrolyte.

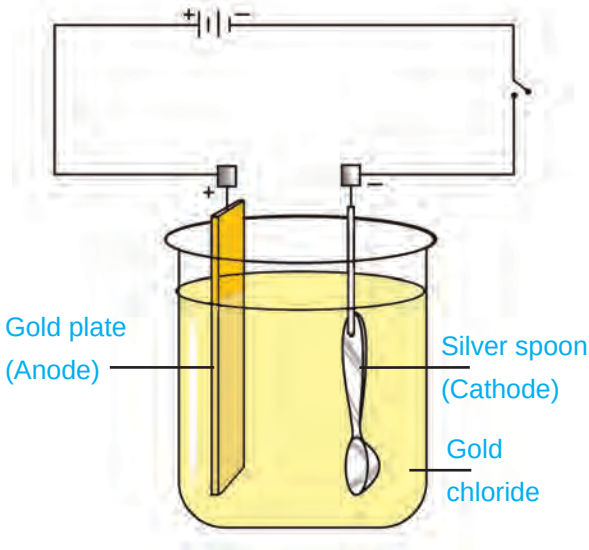
Electroplating a silver spoon with gold

To coat a silver spoon with gold, acidified solution of the metal to be coated (gold chloride with hydro-chloric acid) is taken as electrolyte and the article to be electroplated(silver spoon) is taken as cathode.

A thick plate of the metal to be deposited (gold plate) is taken as anode.

The silver spoon is cleaned with dilute acid solution to remove the oxide layer from its surface and washed in running water until it is free from the acid.

The silver spoon thus cleaned (taken as cathode) is suspended into



the acidified gold chloride solution (electrolyte) kept in a beaker. A thick plate of gold (taken as anode) is also suspended into the gold chloride solution. The circuit is completed using a battery and key. Current is passed through it for about 15 minutes. Then the electrodes are removed from the solution. The silver spoon will look like a gold spoon.

Uses of Electroplating

Look at the pictures. What do you find? Electroplating is very useful and is widely used in industries. For example, chromium plating is done on many objects like car parts, wheel rims and bath taps. Silver plating is used on tableware and electrical contacts; it is also done on engine bearings.

MORE TO KNOW

Zinc coated iron is called Galvanized Iron (GI). This iron is used in water taps (GI pipes), since they have high resistance to corrosion.

To be electroplated	Cathode	Anode	Electrolyte
Zinc	Iron	Zinc	Zinc sulphate
Silver	Iron	Silver	Silver nitrate
Gold	Silver	Gold	Gold chloride

Silver Ring : before and after gold plating

The most extensive use of gold plating is on jewellery and watch cases. Zinc coatings prevent the corrosion of steel articles, while nickel and chromium coated articles are used in automobiles and household appliances.

4.5. ELECTRIC CHARGES AT REST

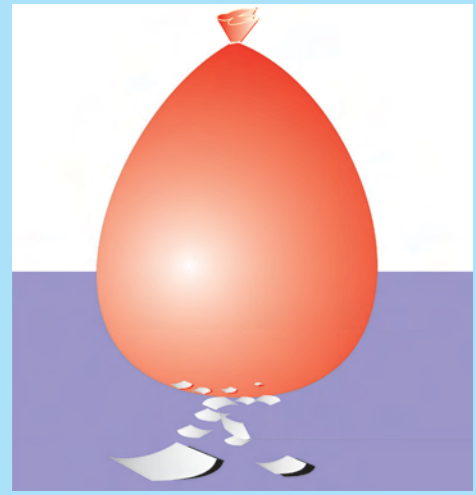
The most dramatic natural phenomenon we observe on the earth is lightning. Lightning is an electric spark. We also see sparks on an electric pole, when wires become loose. These phenomena are quite common. How do they occur? What is the reason behind it? Actually in ancient times, people did not understand the cause of lightning. But now, we know that lightning is caused by the accumulation of electrical charges in the cloud. Let us learn about electric charges.

One day, Murugan was getting ready to go to school. He combed his hair (before applying oil) with a plastic comb and placed it on the table. Suddenly, he noticed a small piece of paper that was lying on the table was attracted towards the comb. He wondered why the comb attracted the paper?. He repeated the act and found that it happened again. He also noted that the comb did not attract the paper, when it was not used to comb the hair. Murugan was confused and when he went to school, he asked his science teacher about it. The teacher explained it through different activities. Let us perform them and learn the principle behind these activities .

ACTIVITY 4.3 I DO

I need: A balloon, a few bits of paper, a piece of wool.

I place a few bits of paper on a table. I bring an inflated balloon near the paper bits. The paper bits are at rest.

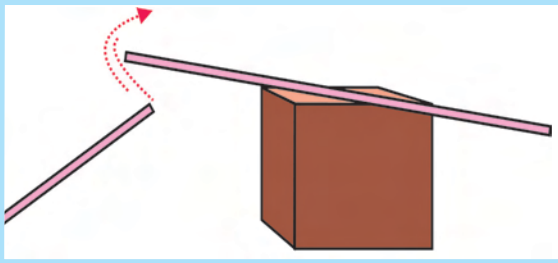


Now I rub the balloon with a piece of wool and bring it near the bits of paper.I find the paper bits jump and stick to the balloon.

ACTIVITY 4.4 **I DO**

I need: Two plastic straws, a piece of wool, a wooden block.

I take a plastic straw, rub it with a piece of wool and place it on the wooden block. I take another straw, rub it with the piece of wool and bring it near the first straw. I notice the straws repel each other.



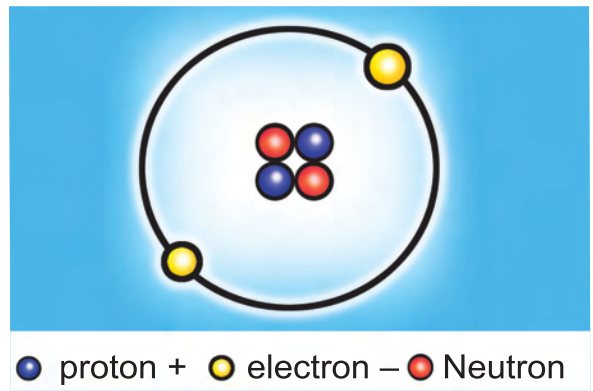
From the above activities, we can easily conclude that both the balloon and the straw undergo some change when they are rubbed with a woollen material. They acquire a property known as an electric charge. This is because there is a transfer of charges between themselves due to friction; ie., in each case the object gets charged by rubbing. These objects are called charged objects.

All these things happen because of static electricity. Static electricity is the accumulation of electrical charges on the surface of a non-conducting material. It is called “static” because there is no current flow. What is a charge? To understand ‘charge’, we have to look at things on an extremely small scale. Everything we see around us is made of atoms.

The atom is made of 3 types of particles. They are: (i) electrons (ii) protons (iii) neutrons. The electron is negatively charged, the proton is positively charged and the neutron has no charge, it is neutral.

Atoms usually have equal number of positive and negative charges(protons and electrons). Hence, an atom is electrically neutral. This is why most objects around us are electrically neutral.

An atom is said to be electrically charged, when the number of protons and the number of electrons is not equal. When the number of protons is higher than the number of electrons, the object is said to be positively charged. When the



number of electrons is more than the number of protons, the object is said to be negatively charged. Hence the charged objects can either have positive charge or negative charge.

We notice that during the process of charging, only electrons are transferred from one object to another, while protons and neutrons are tightly bound to the nucleus of an atom and do not come out of the atom.

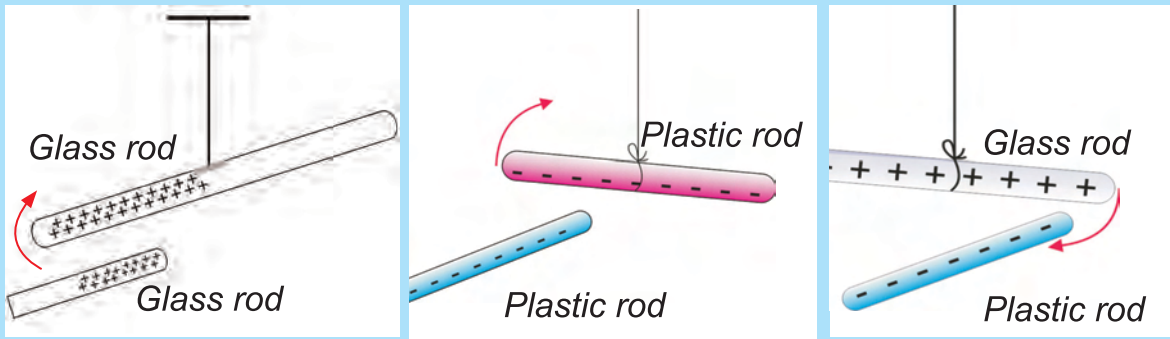
4.5.1. Types of charges

ACTIVITY 4.5 **WE OBSERVE**

Take a glass rod and rub it with a piece of dry silk. Suspend this glass rod from its middle with a silk thread. Bring it close to another glass rod which is also rubbed with a silk piece. What happens?

Now rub a plastic rod with a piece of wool. Suspend the plastic rod from its middle with a silk thread. Bring it close to another plastic rod that is also rubbed with wool. What happens?

We observe that in the above two cases the suspended rods repel each other. Now bring the rubbed plastic rod near the suspended glass rod and watch what happens? We notice that the glass rod and the plastic rod get attracted towards each other.



We have learnt that an object can be charged by rubbing. Do all bodies get the same kind of charge? Let us answer this question by performing the above activity.

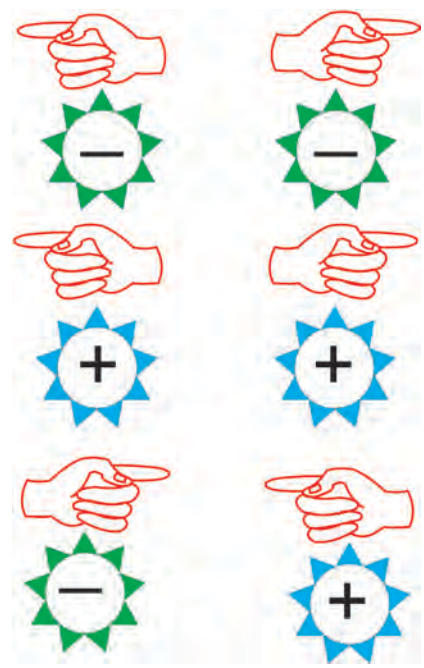
From those activities we can conclude that

1. There are two kinds of charges.

   a). Positive charge - the charge that is acquired by the glass rod when rubbed with silk

   b). Negative charge – the charge that is acquired by the plastic rod when rubbed with wool

2. There exists a force between the two charges.



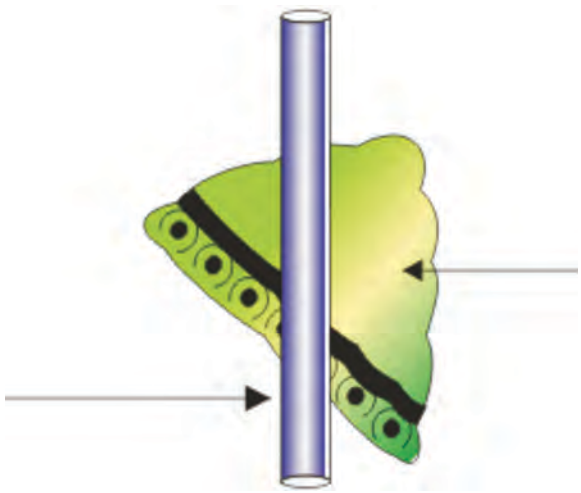
3. Like charges (positive and positive) or (negative and negative) repel each other.
4. Unlike charges (positive and negative) attract each other.

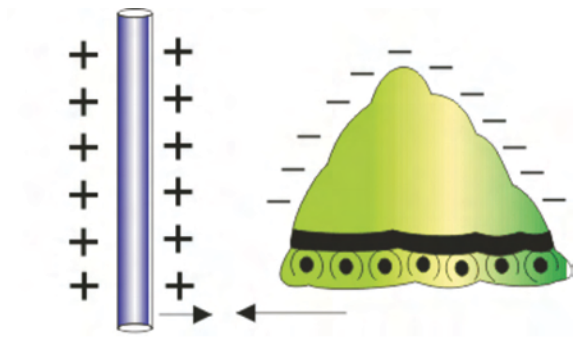
4.5.2. Transfer of Charges

Let us study certain methods by which an object can be charged.

Charging by Friction

We have already learnt that objects get charged, when they are rubbed with suitable objects. How do they get charged?



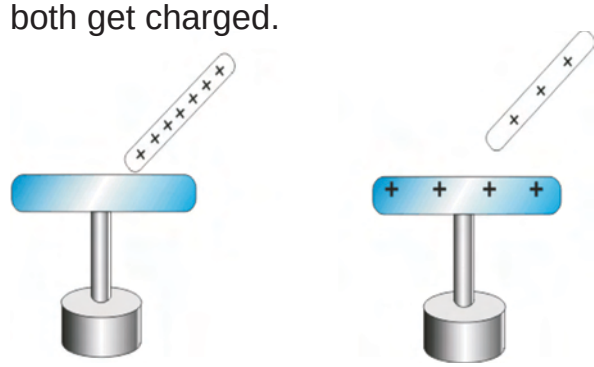


When an object is rubbed with another object, the atoms in the objects get rubbed and a transfer of electrons takes place between the atoms of the two objects. One object loses electrons, while the other gains electrons. Thus, the gain of electrons or loss of electrons makes both the objects charged.

Charging by Conduction

An object can also be charged by simply touching it with an electrically charged object. This process of charging is called charging by conduction.

When a charged body is placed in contact with another body, charges get transferred to the other body and both get charged.



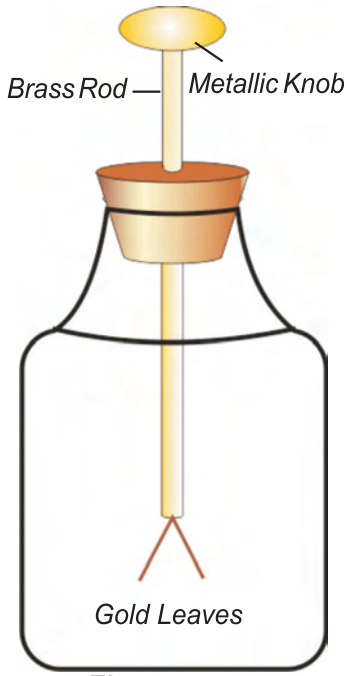
Charging by Induction

A neutral object can be charged even without touching the neutral body with a charged body. This type of charging is called charging by induction. This is done by bringing a charged body say positively charged, just close to the neutral body. When this is done, the side closer to the charged body gets an opposite charge i.e. negative charge

and the farther side gets the same charge (positive charge). When you touch the farther side with hands and remove the charged body, the neutral body gets charged negatively. Here no transfer of electrons takes place between the objects.

Electroscope

An electroscope is a device used to detect and measure electric charges.



Electroscope

MORE TO KNOW

When a charged body comes into contact with a body which is not charged, the electric charges jump from the charged body to the uncharged body till the charges on both the bodies become equal. This process is called discharging.

It works on the principle of transfer of charges by Conduction or Induction.

An electroscope is made up of a metallic rod (usually brass) placed inside a glass jar. The upper end of the rod has a metallic knob and the lower end of the rod has two thin metallic leaves hanging parallel to each other. They are called leaves because they are very thin. The early electroscopes used gold leaves and so they were called gold leaf electroscopes.

When a charged object touches the knob of the electroscope, the charge is transferred to the knob because of conduction. This charge is then transferred to the gold leaves through the metal rod.

The leaves, now repel each other (because they have similar charges)

MORE TO KNOW

Connecting a charged object to the earth with the help of conducting wires or physical contact is called Earthing. The earth is considered to be a huge reservoir of electrons. Depending upon the charge on the object, the earth provides or accepts electrons from a charged object connected to it.

Many electrically operated devices in our homes (E.g. washing machines, refrigerators wet grinders etc.,) have earth connection. This will protect humans from fatal electric shocks and will save the appliances from damage.

and separate out. By observing this we can check, if a body carries charge.

We can also find the nature of the charge by charging the gold leaf electroscope by induction.

4.5.3. Story of Lightning and Thunder

Lightning is an awe inspiring display of electricity in nature. You might have seen lightning during thunderstorms. Lightning occurs because of a massive electric charge flowing from cloud to cloud, from one part of the cloud to another or from the cloud to the ground.

Thunder clouds (rain clouds) carry electric charges and these charges separate out within the cloud. The lower portion of a cloud generally carries negative charges and the upper portion carries positive charges.

These charges inside the clouds build up. They cannot flow from one cloud to another or to the ground because the air between them acts as an insulator, but when huge amount of charges build up, the insulating property of the air suddenly breaks down. As a result, an electric discharge takes place between two oppositely charged clouds or between a charged cloud and the surface of the earth. This causes the flash of lightning that we see in the sky.

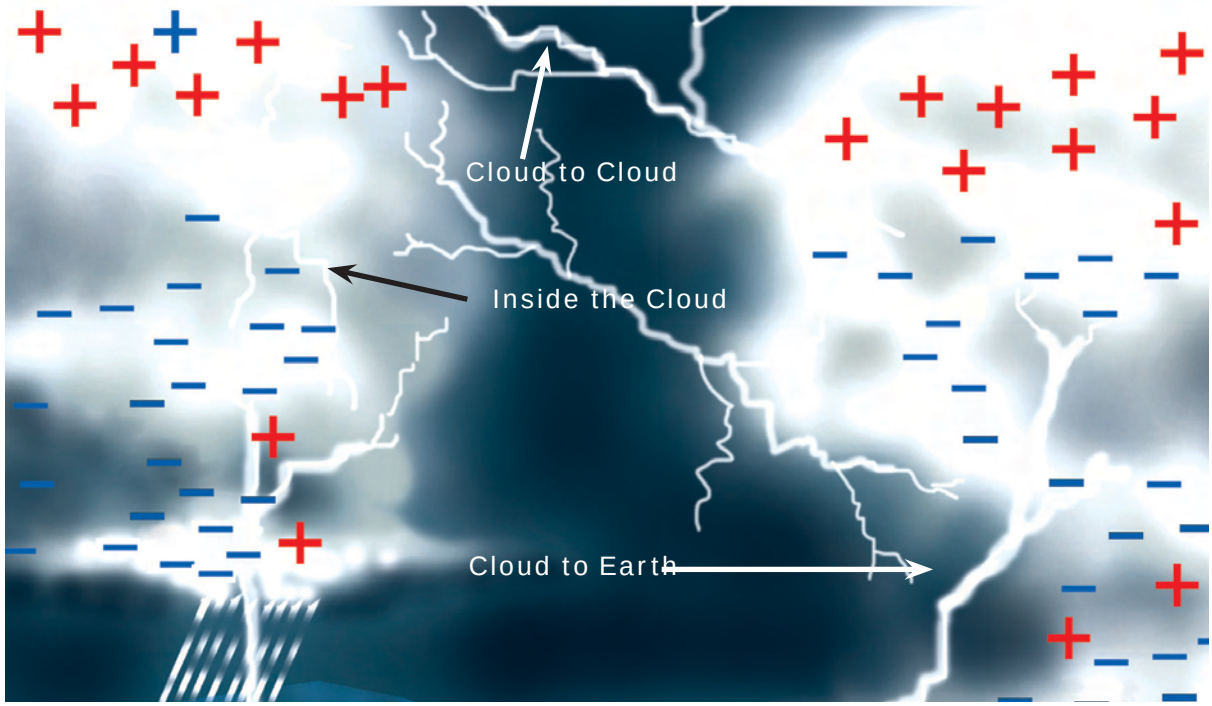
The enormous amount of heat produced during lightning causes the air to suddenly expand and vibrate. This vibration is the cause of thunder.

4.5.4. Lightning-Safety

Lightning is a high energy electric discharge. It strikes the earth with a lot of energy and heat. It could be very dangerous. Therefore, we must know how to protect ourselves during thunderstorms. Some safety measures that could be taken are

1. Do not take shelter under a tree during thunderstorms. If the tree gets struck by lightning, it could catch fire and can cause great harm to you.
2. Take shelter inside buildings, cars or buses.
3. Do not run across large open fields or high grounds.
4. If you can't find a safe place, you should crouch down in a low-lying place.

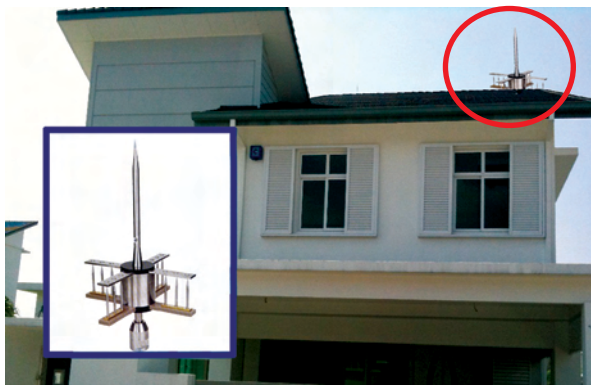
SCIENCE



Benjamin Franklin carried out the famous 'Kite Experiment' to prove that lightning is an electrical phenomenon. He flew a kite in the sky on a stormy day and tied the other end of the kite string to a metal key. Lightning struck and electricity got transferred to the metal key. Franklin was fortunate enough to have been saved from a massive electric shock.

Lightning Arrester

In order to protect tall buildings from lightning, a device called the lightning arrester is used. It was invented by Benjamin Franklin. It is a metal rod with pointed edges. It is fixed at the top of the building to be protected. This rod is connected to the ground with the help of a conducting cable. The lower end of the cable is connected to a copper plate buried deep into the earth. Lightning strikes the rod and the electric charges are carried harmlessly to the ground through the cable.



4.6. HEAT

Ram, invites Murugan, who lives in Chennai, to spend a few days with him in ooty during summer. Murugan goes to Ooty and they talk about the weather. Now read the dialogue between the two friends.

Murugan :

"Ram! It is very hot in Chennai. The temperature there is about 40°C."

Ram:

"Even Ooty is hot these days. The temperature is about 27°C."

Murugan:

"Oh! that's not too hot Ram"

Ram:

"Of course, it is. Normally, we experience an average of 17°C throughout the year. So, 27°C is unusual and hot for us."

Murugan :

"In Chennai, 27°C is normal temperature. I enjoy the climate here. Thank you for inviting me to spend my summer holidays with you in Ooty."

From the above conversation, we understand that what appears to be hot to Ram does not seem so hot to Murugan. It is that the same with cold climate too. What appears cold to one person may not seem so cold to an other. Thus, we can say that the terms 'hot' and 'cold' are relative. We usually get an idea of how hot or cold an object is, by touching it. Temperature cannot be measured accurately this way. Scientists have defined the quantity of temperature that gives the measure of hotness or coldness of a body.

Heat is defined as a form of energy which flows from a body at higher temperature to a body at a lower temperature. Temperature is measured by using thermometers.

4.6.1. Effects of heat:

The sun is a major source of heat. Without heat from the sun, it would be difficult for any form of life to survive

on this earth. We experience various effects of heat in our daily life: Wet clothes drying in the sun, burning of a candle or an oil lamp, ice melting in a glass of water and food getting cooked.

Let us study each of these effects in detail.

(i) Rise of temperature

The temperature of a body rises when it is heated. On the other hand the temperature falls, when heat is taken away from it. Hence heating changes the temperature of a substance. Different substances require different amount of heat to attain the same rise in temperature.

Example: Oil gets heated up faster than water.

(ii) Change of state

When we heat a solid, it begins to melt at a certain temperature known as melting point and becomes a liquid. Similarly, when a liquid is heated it begins to boil at a particular temperature called its boiling point and becomes a gas. we understand that a change of state occurs when substances are heated.

(iii) Change in physical properties

Heat changes the physical properties of a substance. For E.g. Zinc, is brittle and hard at room temperature. It becomes soft and flexible when heated

to a high temperature. Iron, on being heated becomes malleable and can be easily mouled into any shape. The electrical resistance of a conductor increases on heating. A magnet loses its magnetism on being heated.

(iv) Chemical change

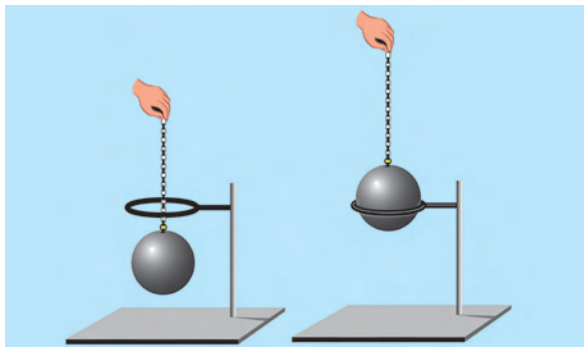
Heat accelerates chemical processes. Calcium carbonate decomposes on heating.

(v) Expansion

Substances expand on heating and contract on cooling.

Expansion of solids

You can demonstrate this by a simple activity known as 'ball and ring experiment'. Take a metal ring and an iron ball. The diameter of the ball should be in such a way that it could just pass through the ring at room temperature. When the ball is heated in a flame and then placed on the ring, it would not pass through it.



This experiment shows that the ball expands on heating. It can also be observed that the ball will pass through the ring, after it gets cooled.

From the above activity, we can infer that solids expand on heating. When the temperature of a substance is increased, its molecules or atoms, on an average move faster and further apart. The result is an expansion of the substance. This is called 'Thermal Expansion'.

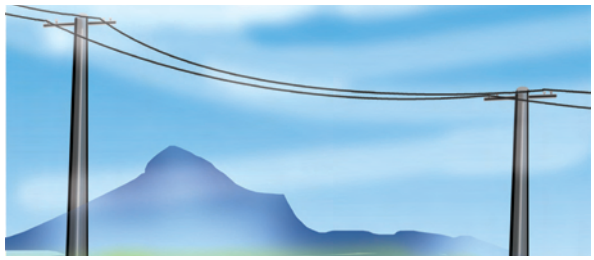
Except a few substances, all solids, liquids and gases expand on heating. Expansion takes place in all three states of a substance. For the same amount of heat given, solids expand the least, while gases expand the most.

Thermal expansion finds a large variety of applications in our daily life.

1. When railway lines are laid, some space is left between the two rails (made of iron) to allow for their expansion during summer. If this is not done, the rails would expand and bend, thereby causing derailment of trains.

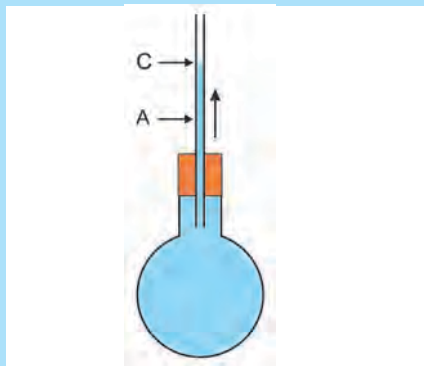
2. The telephone wires between two poles sag in summer and go taut (stretched tightly) in winter. The wires are laid in such a way that

they are allowed to expand or contract.



3. A glass stopper stuck in the neck of a bottle can be loosened by slightly warming the neck of the bottle. The neck alone expands but not the stopper. Similar is the case with the pen.
4. A thick glass tumbler usually cracks, if a very hot or cold liquid is poured into it. Glass is a bad conductor of heat. The inner surface of the glass expands more than the outer surface, when a hot or cold liquid is poured into it. Due to this unequal expansion, the glass cracks.

ACTIVITY 4.6 **WE OBSERVE**



Take a glass flask fitted with a one-holed stopper. Insert a thin glass tube and mark the water level in it as A. Now, heat it for a few minutes. There will be a steady rise in the water level. Note the water level and mark it as C. This shows that liquids expand on heating.

Expansion of liquids

Like solids, liquids also expand appreciably, when they are heated. A liquid has a definite volume but it has no definite shape. Therefore, only volume expansion is taken into account. The expansion of liquids is greater than that of solids.

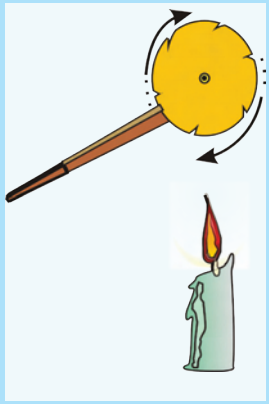
Expansion of gases

When the temperature of a gas increases on heating, its volume increases and it expands. Do you know why tyres filled tightly with air, burst in hot summers? It is because the air inside the tyre expands due to heat.

Let us explain this with an activity

A balloon fixed to the neck of a bottle blows up, when the bottle is placed in a bowl of hot water. When it is taken out of the bowl, the balloon contracts. This is mainly because of the expansion of air inside the balloon due to heating.

ACTIVITY 4.7 **I DO**



I need a thin metal foil, a needle and a candle.

I take the thin metal foil and fix it at the tip of the needle, so that it can rotate. I place this arrangement just above the flame of a burning candle.

I see the metal foil slowly rotating.

Observation: The air above the candle flame gets heated and the warm air that moves up makes the foil rotate.

4.7.TRANSFER OF HEAT

We have learnt that heat always flows from a higher temperature to a lower temperature. There are three different ways in which heat is transferred from one body to the other.

They are:

(i) Conduction
(ii) Convection
(iii) Radiation.

Conduction of heat

Heat flows from one object to the other, when they are in contact with each other. For example, a metal spoon left in hot water absorbs heat from the water and becomes hot. If you touch the metal spoon now, you will feel the heat. This method of transfer of heat from a body at a higher temperature to a body at a lower temperature, when they are in direct contact is called thermal conduction.

Convection

When fluids (liquid and gas) are heated, the molecules closer to the source of heat get heated first and expand, thereby decreasing the density of the liquid. The lighter molecules rise up and the cooler and heavier molecules come down. This is called convection. Thus, convection is the transfer of heat due to the actual movement of particles.

ACTIVITY 4.8 **I DO**

I need: A glass beaker, cold water, potassium permanganate crystals, a spirit lamp.

I take a beaker of cold water and put some potassium permanganate crystals in it. I slowly heat the water. I can see the colour rising through the water.

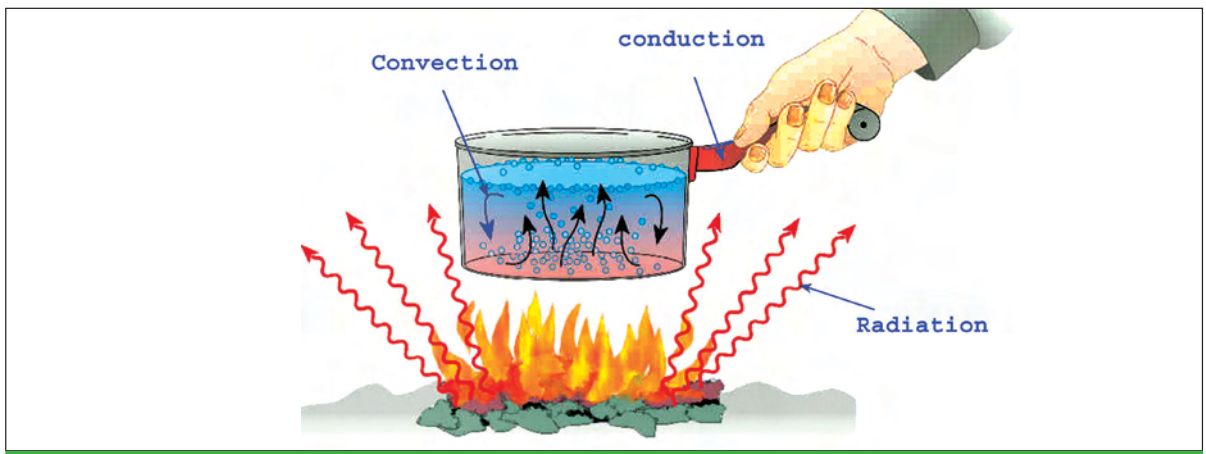
Observation: The water molecules rise up because of heating.

SCIENCE

Radiation

The sun is far away from the earth. Most of the space between the sun and the earth is empty, but still the warmth of the sun reaches the earth. The heat of the sun cannot reach us by conduction or convection, as there are practically no molecules between the sun and the earth to carry the heat through.

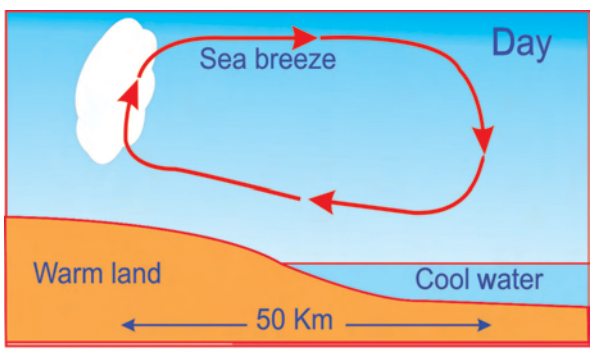
The process by which heat is transferred without the help of any material or medium is called **radiation.**

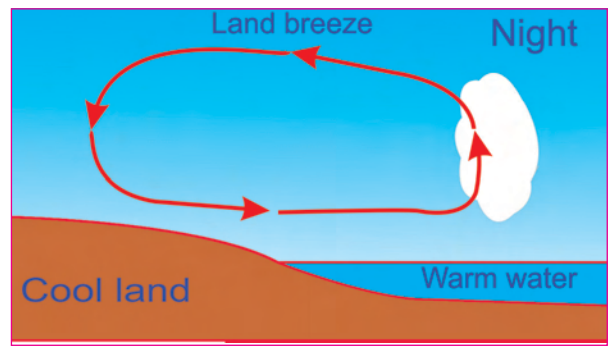


MORE TO KNOW

Winds are caused by convection currents. During the day, the land warms up more than the sea. The warm air over the land rises and the cold air from the sea moves in to replace it. So during the day, breeze blows from the sea to the land. This is sea breeze.

At night, the land cools down faster than the sea. The warmer air over the sea rises. Cold air over the land moves in to replace it . So during the night, breeze blows from the land on to the sea. This is land breeze.





EVALUATION

I. Choose the best answer:

1. The object to be electroplated is made as the _____ .

   a) Cathode b) Anode c) Cathode or Anode d) None

2. A body with excess of electrons is _____.

   a) positively charged b) neutral
   c) negatively charged d) positively and negatively charged

3. Charging a body by simply touching it is called _____.

   a) conduction b) charging by friction
   c) induction d) All the above

4. The lower portion of a charged cloud generally carries _____.

   a) a positive charge b) a negative charge c) air d) no charge

5. The degree of hotness or coldness of a body is _____.

   a) temperature b) coldness c) thermometer d) heat

II. Fill in the blanks:

1. Current produces _____ change, when it is passed through solutions.
2. The device used to detect and measure electric charges is _____.
3. The flow of current requires a _____.
4. Most liquids that conduct electricity are solutions of _____, _____and _____.
5. "The process of depositing a layer of any desired metal on another material by means of electricity is called Electroplating". This process involves the principle of _____.
6. The _____of the body rises, when it is heated.
7. The process by which heat is transferred without the help of any material medium is called _____.

III. Match the following

i) Lightning	___	transfer of heat
ii) Weak electric current	___	attract each other
iii) Conduction	___	lightning arrester
iv) Opposite charges	___	LEDs can be used

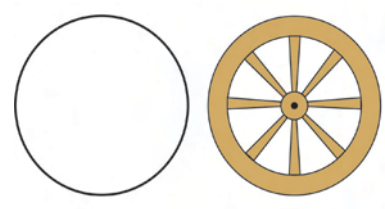
SCIENCE

IV. Correct the given statements:

1. In a series circuit, if one of the bulbs is removed, the other bulbs will glow.
2. Materials which allow electric current to pass through them are called Insulators.
3. The plate which is connected to the negative end of a battery is known as Anode.
4. When lightning accurs, we should run across large open fields.
5. Solids expand more than liquids.

V. Explore and answer:

1. Does pure water conduct electricity? If not, what can we do to make it conduct?
2. Standing on a steel chair, Prem tried to change the fused bulb in his house. His father advised him to use a wooden chair. Why ?
3. Based on the property of conduction of current, find the odd one out:
   i. silver, platinum, sodium, wood
   ii. plastic, matchstick, paper, safety pin
   iii. salt solution, pure water, lemon juice, hydrochloric acid
4. Swetha rubbed a plastic ruler on her hair, then took the ruler close to bits of paper. The bits of paper were attracted to the ruler. But when Geetha tried the same with a metal ruler, the bits of paper did not stick to it. Could you explain the reason?
5. It was a cold winter morning, when Geetha went for a walk. She saw some people sitting around a fire built from the waste materials around them. Why were they sitting round the fire? Explain the process of heat transfer that occurs there.
6. There was a heavy rain with thunderstorms. Vijay was in his house with his brother. Vijay told to his brother that thunder is caused due to collision of two clouds. Do you think Vijay is right? Why?
7. Jaya wants to fix an iron ring on a wooden wheel, but the wooden wheel is of the same size as the iron ring. Could you help Jaya fix the ring ?



8. Petrol tankers plying on highways often have metal chains attached to that drag along the road. Could you say why?

9. Some children are playing in the playground. Suddenly clouds gather in the sky and there is thunder and lightning. What should they do now? The children should_____. Choose the correct answer.

   a. run to their houses b. stand under a tree
   c. just stand at their places d. squat down

10. During the process of electrolysis, why is the metal to be electroplated always taken as cathode.

11. Normally we use water to extinguish fire. If the fire is sparked by an electrical short circuit, we should not use water. Why is it so?

Project Work

Make your own electroscope

Take a glass bottle, a piece of stiff card,a thin aluminium foil of 4cm x 1/2 cm, cellotape,10cm long thick insulated copper wire, a comb, a piece of silk or cotton cloth. Cut out a circular piece of stiff paper to fit the mouth of the bottle. Remove about one inch of insulation from both ends of the wire.Bend one end of the wire by 90°. Fold the aluminium foil and suspend it inside the bottle as shown in the diagram. Push the wire through the centre of the stiff card such that it fits tightly. Now tape the card into position over the bottle, as shown in the figure. Rub the comb vigorously on your hair. It becomes charged now. Gently touch the top of the wire with the comb and then move it away. We can see the thin leaves of the foil diverge.This is because the charges from the comb are carried through the wire to the foil. Since both the leaves of the foil get the same kind of charge, they repel. Remember, all the experiments with electroscopes will work well when done on a cold, dry day.

FURTHER REFERENCE

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‘I can, I did’

Student’s Activity Record

Subject:

Sl. No	Date	Lesson No.	Topic of the Lesson	Activities	Remarks