BRIDGE COURSE MATERIALS FOR V CLASS TEACHERS OF KARNATAKA STATE

SUBJECT : SCIENCE

COORDINATOR

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(NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING)

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PREFACE

Class V is now brought under primary school section as per the changed policy of Education Department of the Government of Karnataka. As such the teachers who were teaching only upto IV class hitherto may be required to teach V class also. While there may be readiness on the part of the teacher, it is desirable that a teacher manual be provided to empower them with the required subject knowledge and suitable methodology. Hence this Bridge Course material in science was developed.

A training package on content and methodology of teaching science in Higher primary schools of Karnataka was already available in the Institute. The package was prepared in 2001 and distributed to some agencies. It was therefore felt that these things need not be repeated in the Bridge Course but only a reference be given at the required places. So the Bridge Course contains additional information within the scope of the textbook (Science for Class V) in terms of illustrations, activities and methodology of teaching. It is hoped that this material will be useful to the teachers.

The course material was developed as a result of series of workshops conducted at RIE, Mysore. The Bridge Course was simultaneously prepared in Mathematics and English also for which the Coordinators were Prof N M Rao and Dr Prema Raghavan respectively.

I thank all the participants and the others who have directly or indirectly helped in developing the course material.

Suggestions for improvement are welcome.

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CHAPTER I

CHARACTERS OF LIVING THINGS

I. Concepts:

1. Living things perform some activities which non-living things do not show.
2. All living things show basic characters like respiration, Nutrition, movement, growth, response to stimulus and reproduction.

II. Objectives: To enable the students

a) to identify living things.
b) to recognise respiration in living things.
c) to recognize movement in living things.
d) to observe growth.
e) to observe response to stimulus.
f) to understand the importance of nutrition.
g) to recognise importance of reproduction and life span.

III. Introduction

a) Motivation:

i) Teacher asks students to observe carefully a stone and lizard and list down observations.
ii) Count the chest movement of a student while sitting and after running.
iii) Observation of animals moving to collect food.
iv) Observation of different stages of germination of a seed.
v) Observation of animals & plants responding to stimulus.
vi) Observation of parts of plants that store food.
vii) Observation of picture of Cat and Kittens.

b) Scope in Daily life:

Students recognise that living things do some activities for survival.

IV. Teaching - Learning activities:

1. Teacher asks students to observe carefully the stone and a lizard and to identify the differences in them.
2. Teacher asks students to count rate breathing and asks students to run for short distance and then count rate of breathing.
3. Teachers asks students to blow air from water into clear lime water and explains that carbond-dioxide gas released while breathing turns lime water milky.
4. Students keep a lizard in an airtight bottle and observe after one day and come to the conclusion that without air/breathing, living things cannot survive.
5. Students keep sugar in a plate and after some time observe the ants moving round the plate carrying the crystals of sugar. The teacher explains how and why animals move from place to place.
6. Students collect carrot, radish, cabbage, potato, cauliflower and understand that the plants prepare their own food and the parts of few plants store food.
7. Teacher asks students to sow bean seed in the soil and to observe the stages in germination of seed after 3 – 4 days.
8. Teacher asks students to touch a 'touch-me-not' plant and a millipede and to observe the response in them after touching and then explains with illustration how living things respond to stimulus.
9. Teacher shows pictures of cat and kittens, mango plant and a mango tree and explains that living things produce young ones of their own kind.
10. Teacher explains about life span of plants and animals with illustrations and chart showing the life-span.

Activity to show growth in Plants:

Take a potted plant and water it daily. Measure the height of the plant and record it once a week. Also count the number of leaves and branches.

V. Evaluation

1. Classify the following vegetables into roots, fruits, flowers and leaves:
   Raddish, Carrot, Beetroot, Cabbage, Cauliflower, Tomato, Spinach
   Give two examples for each of the following:
   a) Biannuals (b) Annuals (c) Perannuals
   d) Response to stimulus

2. Find the parent: Activity Place, Picture of kitten to the left & to the right, picture of tiger, lion, cat, dog and Match it.

To Teachers :

1. Slow combustion takes place in the calls of living beings by using the food taken by nutrition and oxygen taken in by respiration. The process of oxidation of food in the presence of oxygen is called slow combustion

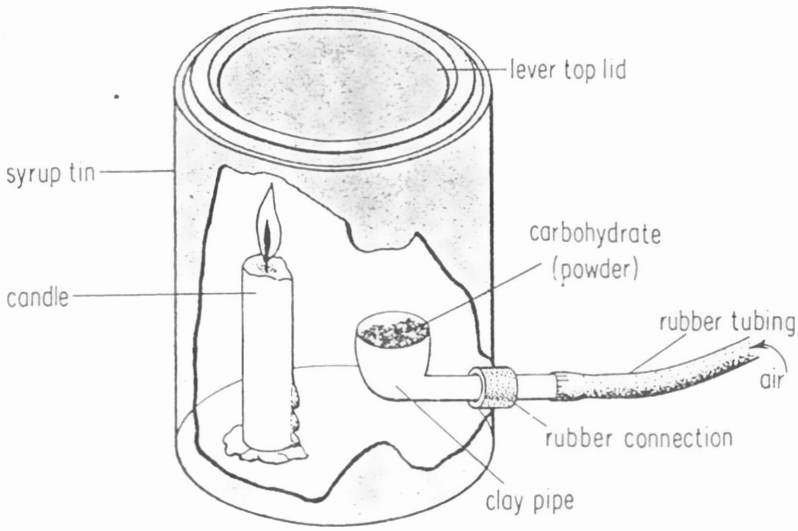
   $C_6H_{12}O_6 + O_2 \longrightarrow CO_2 + H_2O + \text{Heat.}$

   (glucose/food) End products

   Here importance of nutrition and respiration is to be understood.

2. Dry seeds are not non-living; they are living. They are in dormant condition and germinate into new plant in suitable environment.
3. Storage organs of plants : Ginger, potato, turmeric are underground stems, because they contain buds, nodes and internodes. Whereas beetroot, raddish, carrot, etc. are storage roots as they have root hairs.
4. Chemical changes that take place when the touch-me-not respond to stimulus (leaves fold when we touch).

Place a little dry custard powder, which is a carbohydrate in the bowl of a clay pipe (or thistle funnel - within the apparatus shown in Figure.



Apparatus for investigating energy release from
a Carbohydrate

Light the candle and press the lid on. Now pump a little air sharply down the rubber tubing and immediately pinch the tubing and hold to seal it. A bicycle pump or hand pump can be used in this experiment.

What happened ? What evidence is there that the carbohydrate was able to do work ? What did it release in order to achieve this ? How could

you confirm that simply blowing air into the tin did not produce the result observed ?

You can now realize that a carbohydrate is a source of energy, the energy being due to the chemicals within it. In what ways do you think the details of this experiment illustrate how the body uses carbohydrate to get work done ? What serious disadvantages would there be if, in real life, energy were released in the same way as in this experiment ?

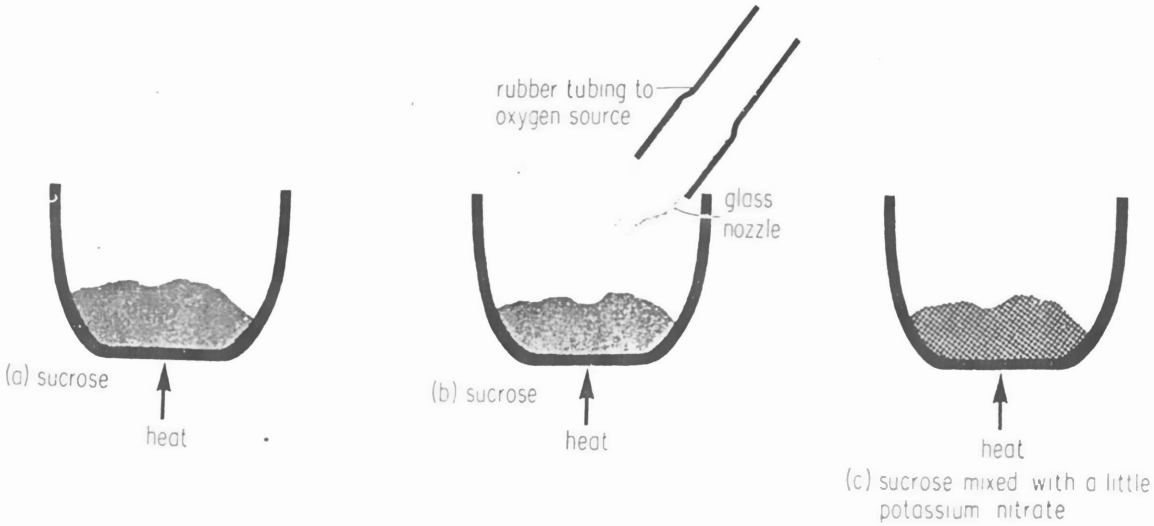
Clearly, other factors must be influencing the carbohydrate in the body to release its energy in such a way that cells and tissues are not damaged.

Helping energy release from a carbohydrate

In the following experiments you are going to use another well - known carbohydrate, ordinary table sugar, which is given the chemical name sucrose.

Place approximately equal quantities of sugar in three crucibles. Observe and compare the results of heating the three lots of sucrose under the different conditions described below and as shown in Figure.

In each case note carefully (i) the amount of heat required to start the reaction, and (ii) the speed and violence of the reaction.



Helping energy release from a carbohydrate

(a) Heat one crucible on a pipe clay triangle supported on a tripod stand. Heat gently at first, and then with a hotter flame. Remove the Bunsen burner when the sucrose bursts into flame.
Observe the details of the reaction.

(b) Repeat the experiment with the second crucible of sucrose, but in this case play a current of oxygen into the crucible, increasing the supply of the gas carefully as the sucrose bursts into flame.
Observe carefully and compare with (a).

(c) Mix a pinch of potassium nitrate with the sucrose in the third crucible. Heat as for (a).

Compare the reaction observed with the two previous ones.

In all three cases, what evidence was there that energy was released ? What effect did the oxygen gas and the nitrate have on the burning of the sucrose ?

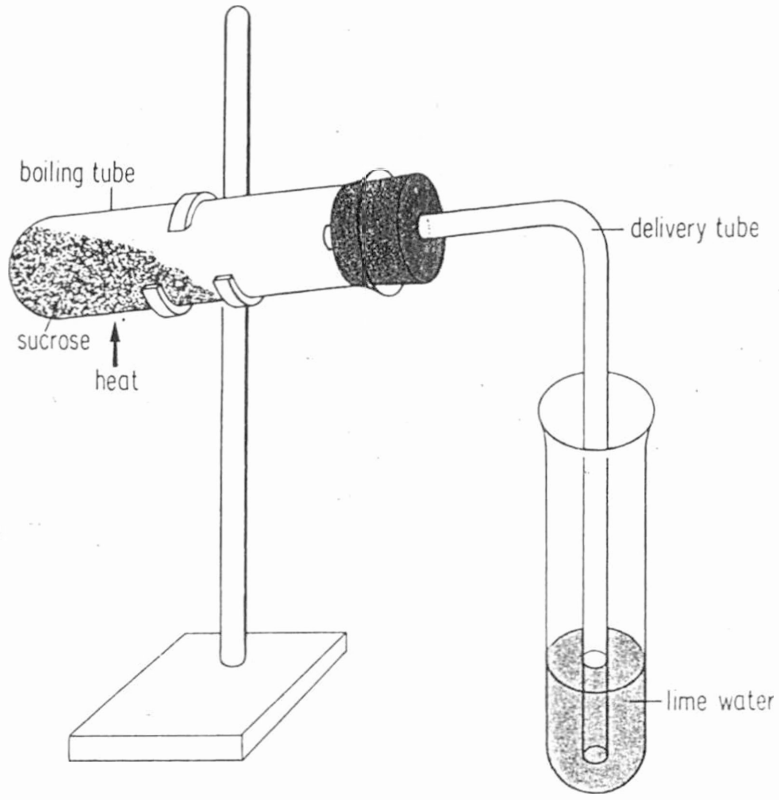
These experiments which you have carried out using laboratory apparatus may have given you some clues about the way in which our bodies obtain energy from food. The presence of oxygen allowed an easier release of energy, and so did the potassium nitrate. You know of course that in the process of breathing, air, which contains oxygen, is taken into our bodies. Could the oxygen be used, perhaps, to help to liberate the energy from its stored, chemical form, in food ? Are there perhaps substances in the body which influence the food to break down and given energy ?

Meanwhile, you may accept that there is some evidence that certain chemical changes do not require heat even to start them off. Such reactions are obviously of the type carried out within the cells of living things, where the controlled release of energy is essential.

A by-product of energy release

In the previous experiments you saw that energy was released, but you would also observe that the sucrose seemed to change in the course of the reaction. When the chemicals of sucrose break down to release energy, is there evidence of anything else being liberated ?

Place a small amount of sucrose, or some other carbohydrate such as starch, in a boiling tube, as shown in Figure. Support the boiling tube by means of a retort stand, and connect the delivery tube to allow any gas given off to bubble through the clear lime water. The latter always turns milky white if the gas carbon dioxide is present.



Apparatus to identify a by-product of energy release

Now heat the sucrose by playing the flame on the boiling tube gently at first, and then more strongly.

CHAPTER 2

DIFFERENCE BETWEEN PLANTS AND ANIMALS

I. Concepts:

1. Plants and animals have specific body parts.
2. Plants differ from that of animals in some aspects.
3. Animals can move from one place to another place –
   Plants are stationary.
4. Plants are producers and animals are Consumers.

II. Objectives: To enable the students

1. To identify the common differences between plants and animals.
2. To identify the similarities between plants and animals.
3. Plants can prepare their own food and animals cannot prepare their own food.

III. Introduction

a) Motivation

* Name the living things around you and group them into plant and animals.
* Observing the parts of the uprooted plant.
* Observing the body parts of animals.
* Prepare the list of all the food items we use and classify them into plant source and animals source.

b) Scope in daily life

* Child will be able to identify living things, their differences, their uses and classify them into plants and animals.

IV. Teaching-Learning Activities :

* Teacher asks the students to observe carefully the picture of a mango tree and a model of tiger and list down their different parts.
* Teacher asks the students to compare a rose plant and a dog and asks them how they get the food to grow.
* Teacher asks the students to observe the food of a Cow, Lion and Sparrow.
* Teacher asks the students to observe the movement of plants towards light.

V. Evaluation

* Classify the following into plant source and animal sources.

  Milk, egg, rice, Refined oil, Cod-liver Oil.
* Compare the movements of plants and animals giving examples.

CHAPTER 3

ADAPTATION OF PLANTS AND ANIMALS TO THEIR ENVIRONMENT

I. Concept:

1. Plants and animals adjust themselves to the surroundings in which they live.
2. Plants and animals undergo certain changes in their body structure and activity to adapt themselves to their environment/surroundings such as terrestrial, aquatic, aerial, desert, mountain and polar region.

II. Objectives: To enable the students

1. to understand that depending on their food habits, animals have special organs.
2. to observe the body structure of aquatic plants and animals, and understand their adjustment to their surrounding.
3. to recognize that webbed feet help in swimming in frogs and duck.
4. to acquire knowledge about the body structure of insects, birds and their aerial adaptation.
5. to understand the importance of thick fur in animals that live in mountain and polar region.
6. to observe and understand the modification of leaves in desert and mountain plants.
7. to understand adaptation of penguin to the polar region.

III. Introduction:

a) Motivation:

Narration of the story of Jackal and crane to explain about the food habits and their special organs.

IV. Scope in daily life :

The students identify that variety of plants and animals live in different environment and adjust themselves to the surrounding they live.

V. Teaching-Learning Activity :

1. Teacher shows the picture of a parrot eating a fruit and a cat holding a rat and asks students to observe their body parts which help to take food and later explains how the animals, & birds have special organs depending upon their food habits.

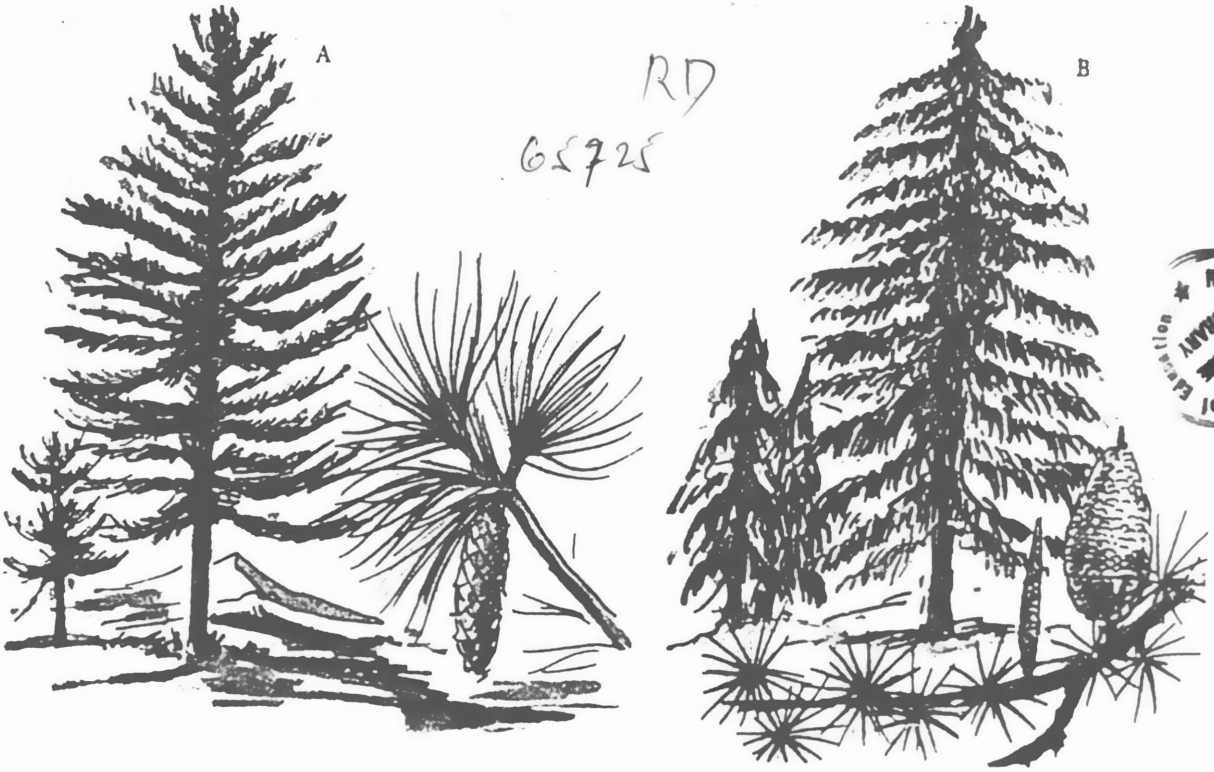
2. Teacher keeps a bottle of water with a live fish in it on the table and asks the students to observe the body parts of fish which help in movement. Later the teacher explains about the body structure and adaptation of gills in fishes. Similar examples of other aquatic animals like whale is given.

3. Teacher displays a nymphea or hydrilla plant and Hibiscus plant to the students to explain about spongy tissue and how it floats on water and compares with land plant.

4. Teacher compares the webbed feet of frogs and ducks to the oar of boat and explains how it helps them in swimming.

HOW LIVING THINGS ADAPT THEMSELVES

Structure of plants growing in cold region.



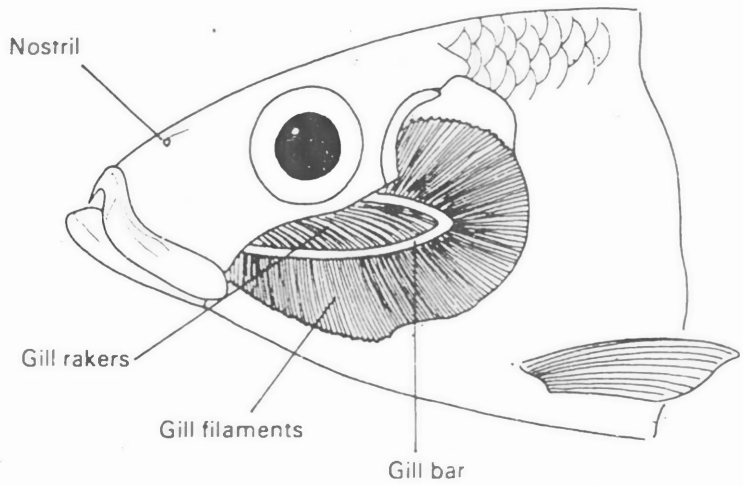
Pine Tree

A Garden of Water Plants

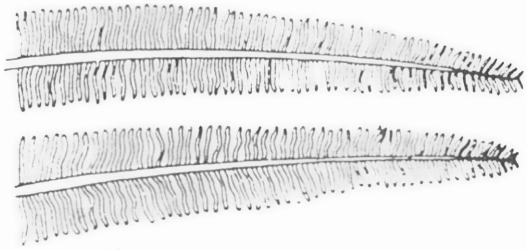
Put in some clean sand.
Put in water from a pond.
Put in some plants from a pond.
Or buy some aquarium plants.

Wait until the plants are growing.
Then add some pond snails and one
or two small fish.
Keep the water garden in a cool, light place.
Do not put it in bright sunlight.
Why does the water garden need light ?

Fish



Herring (operculum cut away to show gills)



Tips of gill filaments seen under the microscope

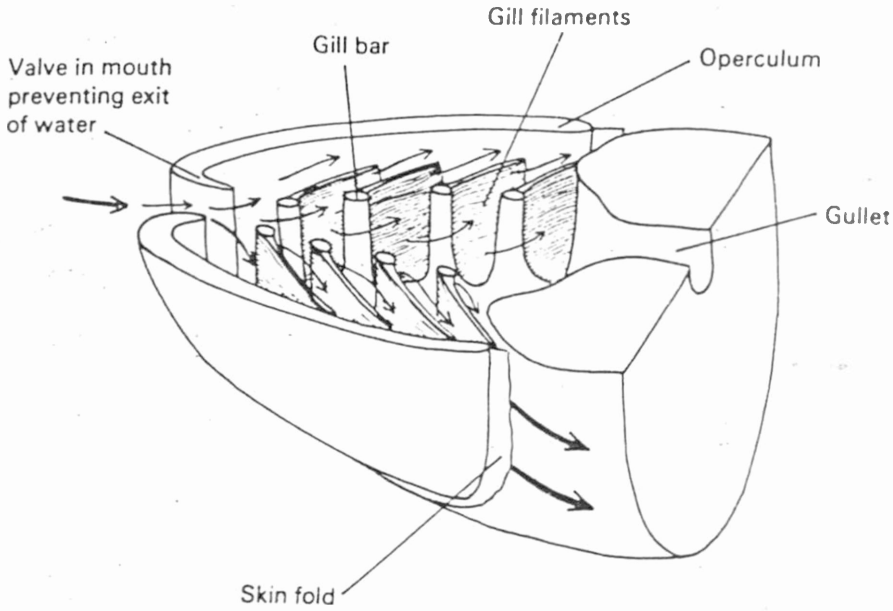


Diagram to show respiratory currents
(gill rakers not shown)

5. Teacher asks the students to list the flying organisms and find the common organ which helps in flight. Later teacher explains about the adaptation of birds and inspects in the air.
6. Teacher displays a fur dog model, pours water on it and shows to students that the inner part (skin) does not get wet.

With this illustration and observing the pictures of Yak, polar bear, are made to understand that the thick fur protects animals of mountain region and polar animals from cold.

7. By observing carefully a stem with thorns, in cactus and by observing the pictures of mountain plaints with needle shaped leaves, students differentiate and compare the adjustment of desert plants and mountain plants to their surrounding.

8. Teacher smears oil to a students left palm and pours ice cool water on both palm and asks the students what he senses by this. Student infers that the right palm is cooler than the left palm when ice cold water was poured. With this activity, the teacher explains that a layer of fat in the skin of penguin protects it from cold.

   Later the teacher explains about the modification of body parts of penguin to adjust to the polar region.

Changes over the Earth

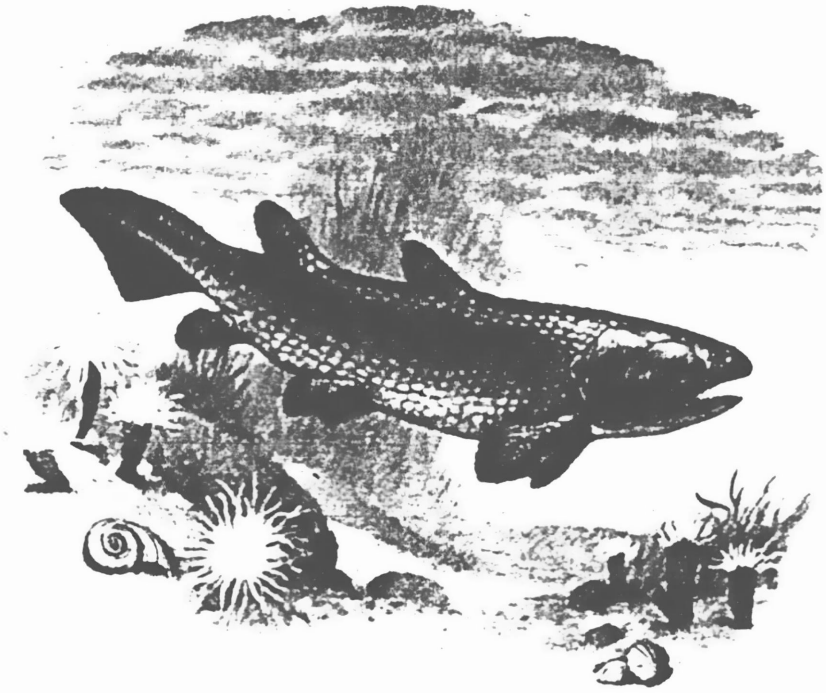
The Seas were full of different kinds of fish.

Some began to change.

Some fish grew bones and muscles in their fins.

These fish also grew lungs.

They began to move out of the water.



A Fish Out of Water

Lungfish had lungs and gills.

They could move and breathe on land.

They could swim and breathe in water.

They always laid their eggs in water.

They may have been the first land animals

Teacher should know:

1. Teacher should explain the students that not only terrestrial green plants prepare food and animals depend on plants for food, even the aquatic green floating plants like hydrilla, nymphea etc. prepare food by photosynthesis and aquatic animals depend upon them for food.

2. Whale is not a fish. It is a mammal and breathes with the help of lungs.

3. There is extreme cold and heat in deserts and even Camel has a layer of fat below the skin to avoid evaporation of water from its body and to protect from cold. Arabian Camel has one hump on the back and Bactrian, the Central, Asiatic species have 2 humps and store fat.

4. Insects, birds and microbes live in air. Insects and birds are visible. But microbes are invisible. Their presence can be explained to students by illustration how communicable diseases spread when a person sneezes or coughs. The microbes of these diseases are present in air.

Evaluation:

Teacher makes four corners: In one corner sand is put to show desert, in second corner a tub of water, in the third, mountain and polar region with soil and in the fourth corner, soil with twigs of plants pricked to it to show terrestrial area.

Flash cards containing pictures of Camel, Yak, lama, penguin, polar dog, fish, whale, hydrilla, hibiscus plant, lion, Reindeer, silver oak, fur, juniper and cactus are placed separately on the table. Teacher asks students to place each flash card in the environment they live.

CHAPTER 4
HUMAN BODY

I. Concepts:

1. Concept of a cell, tissue, organ, organ system.
2. Respiratory system, parts of the respiratory system and its function.
3. Digestive system parts of the digestive system and its function.
4. Circulatory system, Heart and functions of the heart.
5. Excretory system, Kidney, Skin.

II. Objectives: To enable the students to

1. acquire knowledge about human respiratory system.
2. recognise the different parts of respiratory system.
3. identify the function of each part of the respiratory system.
4. describe the role of mouth, stomach, intestine in digestion of food.
5. recognise different parts of heart.
6. identify arteries, veins and their functions.
7. describe the structure and functions of heart.
8. recognise the organs involved in excretion of different wastes.
9. Explain the structure and functions of Kidney.
10. Skills of drawing different system of human body.

III. Introduction:

a) Motivation

* Display the model/chart of internal organs of Human body.

b) Scope in daily life

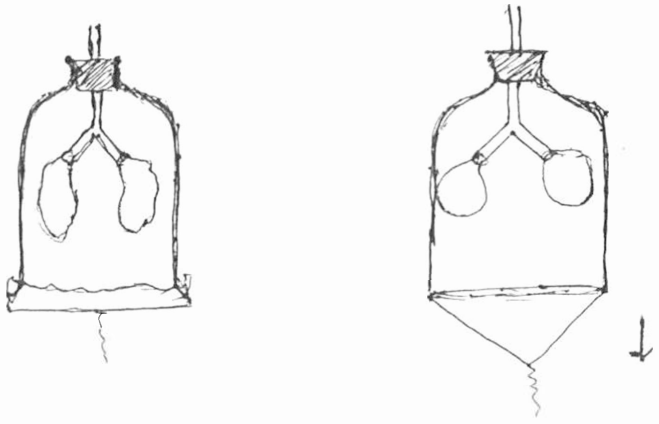
* Child will be able to identify different systems of human body and understand their different functions.

IV. Teaching Learning Activities:

* Teacher compares the Human body to a building built up by bricks and explain the organization of cells, tissues, organs and systems in a human body.

Cells Tissues Organs Systems Whole body

* Teacher asks a students to run from a distance and tell the students to observe the chest movement.
* Prepare a stethoscope to find out the heart beat.
* Teacher also demonstrates the process of respiration by the following experiment.



* Teacher displays charts, working or inert models (paper, Thermocoal, clay, plastic, cloth) Flannel board with paper cuttings of different organs and systems and explain the organization.

* For the respiratory system bring live specimen of sheep's hearts and show different parts.

V Evaluation:

* Mention the systems to which the following organs belong:
  heart, lungs, kidney, stomach, skin, intestine, air sacs, ventricles, liver.
* Join the part of organs with one another to form the system (paper cuttings and flannel board)

To Teachers

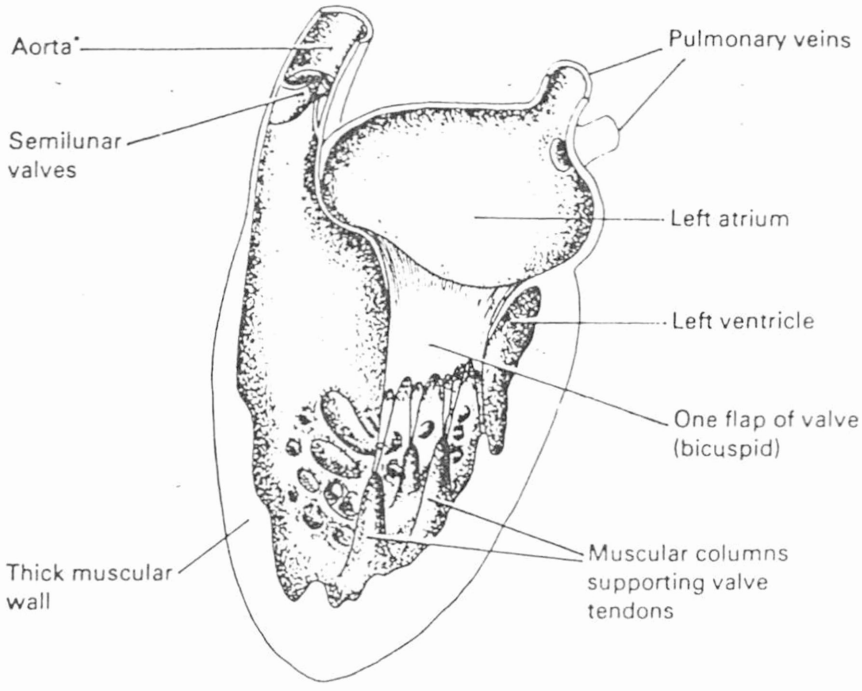
Ref: Elementary School Science and How to teach it.
Holt, Rinehart and Winston, IBC, New York.

* Tissues are made up of cells. A tissue is a group of similar cells working together for a specific job.

Efficient housekeeping requires the body to divide up the work into different departments just as the City Government or a large industrial plant does. These departments of the body are called systems.

Thus the Respiratory system is made up of the organs that supply oxygen and get rid of certain Wastes. All the organs concerned with preparing food for the use of the body are part of the digestive system. The circulatory system handles transportation of materials throughout the body. The excretory system is the sanitation department of the body, ridding the body of its wastes.

Blood and the Circulatory System



View of heart cut open

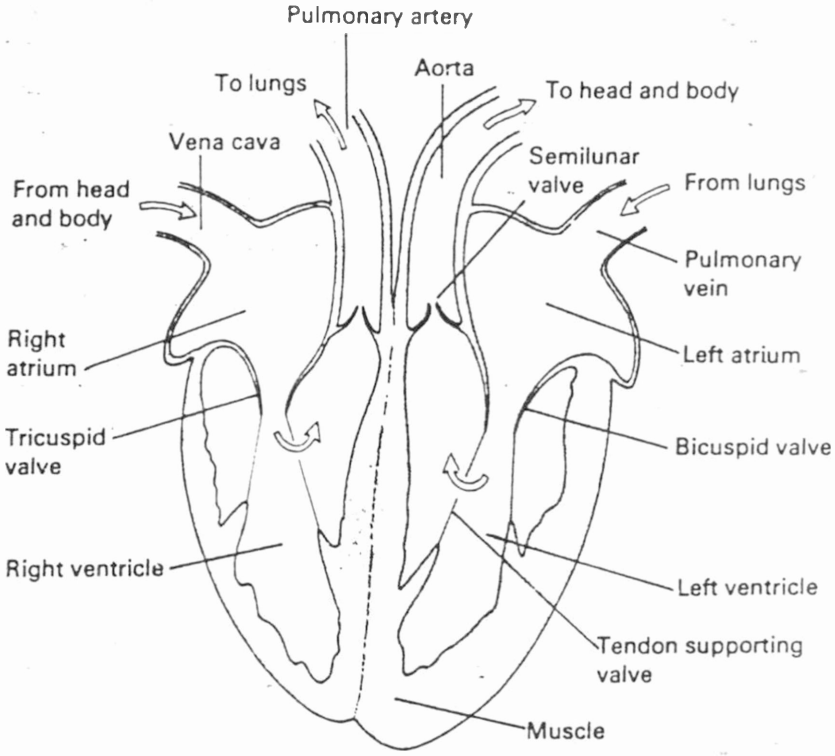


Diagram of heart, longitudinal section

Backflow of blood is prevented by a system of valves, which act in a similar way to the valves in the main veins. During diastole, blood in the aorta and the pulmonary arteries is prevented from returning into the relaxed ventricles by the closure of the pocket-like semilunar valves. So called because the flaps of tissue of which they consist are roughly half-moon shaped. During systole these valves open to allow blood to enter the arteries, while blood is prevented from passing back into the atria by the closure of the parachute-like bicuspid valve in the left ventricle and the tricuspid valve in the right.

In an adult person at rest, the heart contracts about 70 times a minute. But the rate increases to 100 or more during activity or excitement. The heart's rhythmic contraction is automatic and can proceed without valid conclusions.

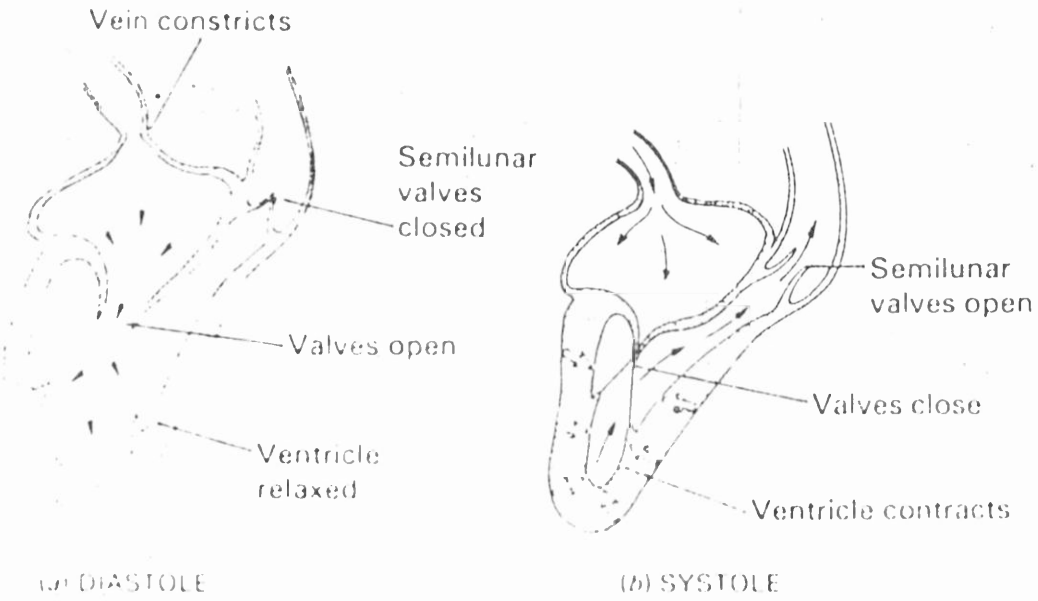


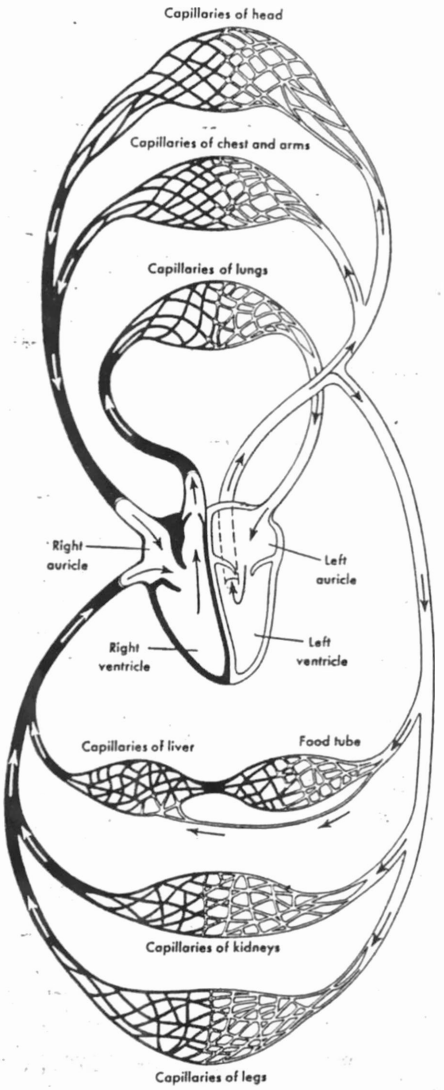
Diagram of heart beat (only right side shown)

At present, there seems to be almost unanimous agreement that heavy smoking (two or more packs of cigarettes a day) is harmful to the body. In this connection, we should point out the importance of periodic chest X rays. This is one of the most valuable health measures for early detection of tuberculosis and of lung cancer. In most countries, such X-rays are provided without cost by the American Tuberculosis and Health Association local chapters, in cooperation with the local health departments.

CIRCULATION - HOW MATERIAL IS TRANSPORTED AROUND THE BODY

The Heart : More than three hundred year ago William Harvey demonstrated that blood flows in a continuous, closed circuit through the body. This was the first time in history that an accurate concept of circulation was formed. Even now, when knowledge of circulation is widespread, we are awed at the marvels of the heart mechanism. Here is a living pump that pushes blood through thousands of miles of blood vessels, beating 100,000 times a day, every day of our lives.

The heart is a muscular pump about the size of your first. It is made of four compartments. The upper two are known as auricles, and the lower two as ventricles. The left ventricle is the largest chamber, making up three-quarters of the whole heart in size. Its muscle wall is three times as thick as that of the right ventricle. This difference is related to the job performed by each of these parts: the left ventricle must push the blood completely around the body, but the right ventricle pushes the blood only to the nearby lungs.



Blood moves around the body in a continuous closed circuit of arteries, veins, and capillaries, with the heart serving as a pump.

Around the Circulatory System: Let us start with the blood entering the right auricle and journey with it throughout the body until it makes a complete circuit. But before we do, let us take a quick look at our itinerary. Blood enters the right side of the heart from all parts of the boy, goes to the lungs, returns to the left side of the heart and then goes to all parts of the body. It is then returned to the right side of the heart and the trip starts all over again. Briefer yet – blood travels from the body to the right heart to left lungs to the left heart to the body. Notice that to make a complete round trip blood has to go through the heart twice. Now for the details.

Blood is brought to the right auricle by two veins, the venae cavae. This blood has come from every part of the body except the lungs. When the right auricle is filled with blood, the trapdoor or valve, as it is called, between it and the right ventricle opens, and the blood flows into the ventricle. The valve then closes and the right ventricle muscle contracts and sends the blood through arteries (blood vessels that carry blood away from the heart) to the lungs. In the air sacs of the lungs, the blood picks up oxygen and gets rid of carbon d dioxide and some water. The blood now goes back to the left side of the heart by means of veins blood vessels that return blood to the heart).

The oxygenated blood from the lungs enters the left auricle. When this fills, the valve between it and the ventricle opens and the blood flows into the left ventricle. The valve then closes, to prevent backflow of the blood, and the large muscle of the left ventricle contracts strongly. This sends the blood coursing throughout the body by way of the aorta, the largest blood vessel in the body. In the adult it is slightly thicker than a man's thumb. The aorta sends branches into the head and arms, and the main line continues down through the chest and abdomen and sends off a number of branches. It finally divides into two arteries that supply the legs.

The blood from the arteries is widely dispersed through a branching network that divides into millions of thin-walled capillaries to reach all the

tissues of the body. In the tissues, oxygen is transferred from the blood to the cells. Food and other needed materials also pass from the blood into the tissues. In return, the tissues give up to the blood their waste products. The capillary network reunites to form the veins, which then return the blood to the heart again by way of the venae carvae, the largest veins in the body. The cycle then starts over again. It has been estimated that takes about fifteen seconds for the blood to make one complete circuit of the body.

The tissues of the heart itself must receive oxygen and food and have their wastes removed in the same way as all other tissues. For this purpose, a special set of arteries branch off from the aorta and go immediately into the heart structure. These are the coronary arteries. The coronary veins bring the blood back from the heart tissues to rejoin the main circulation.

Blood : The blood stream is the distribution system of the body. This surging fluid carries food and oxygen to all the cells of the body. It receives and delivers many chemical products, such as the hormones. It collects wastes and brings them to the organs that remove them from the body. The blood also contains chemicals and cells that protect the body from disease. In addition, the blood has its own built-in system for plugging leaks in any of its pipes.

Blood is composed of cells and a liquid in which the cells are immersed. The cells are the red and white blood cells and the platelets. The liquid is the plasma.

The red corpuscles, as we noted previously in our study of tissues, are the oxygen carriers. These cells contain a red pigment called hemoglobin, a substance that enables the red cells to carry oxygen. The hemoglobin molecule contains an atom of iron. Lack of iron in the diet may lead to one type of anemia, a blood condition in which there is an insufficiency of

hemoglobin. In the lungs, the hemoglobin combines with oxygen. When the blood reaches the tissues of the body, the oxygen is released.

The white corpuscles may be regarded as the standing army of the body. One of their primary jobs is to fight off invading bacteria and other harmful microorganisms. This they do by engulfing the harmful organisms, digesting them, and thus destroying them. White corpuscles are able to leave the blood stream and move, much like an amoeba, to any part of the body where danger threatens. This has earned them the name of "wandering cells". Normally, there are about 6000 to10,000 white corpuscles in every cubic millimeter of blood. A cubic millimeter is a tiny drop. In this same drop there will be about five million red corpuscles.

The plasma is mainly composed of water, ion which many substances are dissolved. These include nutrients, antibodies (protective substances against disease), hormones, salt, and wastes. The adult human has about 6 quarts of blood. The donation of one point of this precious fluid to the Red Cross, for building up the nation's stockpile of plasma for emergencies, will not harm a healthy adult. The body replaces such losses quickly.

One of the protective mechanisms of the blood is clotting. Everyone has had the experience of cutting himself. Small cuts or scratches bleed for a few minutes and them, without any outside assistance, stop, and a hard clot forms. This prevents excessive loss of blood. In clotting, a blood protein called fibrinogen coagulates into thread like fibers that slow the outflow of blood, entrap the corpuscles, and thus form a clot.

The circulatory system is a closed system of arteries, veins, and capillaries. The capillaries, however, are thin-walled enough for some of the liquid part of the blood to pass through them and to bathe the tissues of the body. This escaped liquid, together with the white blood cells that have forced their way o out of the capillaries, make up the fluid called lymph.

Care of the Circulatory System : Care of the circulatory system is attracting increasing attention at the present time. Health statistics show that in the United States heart disease is the number one cause of death. Of course, part of this is the inevitable result of those measures that have enabled people to live longer. Circulatory ailments are particularly the problem of middle and old age, so in an aging population it is to be expected that these will become prominent health concerns. Although the toll is exacted in later life, it is during our younger years that we pave the way for an ailing or a healthy old age. The normal rules of healthy living apply with equal force to the heart and its blood vessels. These include a moderate, balanced diet, exercise in the fresh air and sunshine, sufficient sleep, freedom from excessive worry, and a periodic medical check-up.

Excretion – The Sanitation System of the Body

During normal activity of the body, waste products are formed. The chief wastes of the body are carbon dioxide, water, urea, and salts. Water and carbon dioxide are formed in every cell as a result of the oxidation of food to produce energy. We have already described how carbon dioxide is eliminated through the lungs. Water is disposed of in three places, the lungs, the skin, and the kidneys. The water exhaled from the lungs can be seen readily on a cold winter day. Sweat coming from the sweat glands of the skin is mostly water, together with some salt. This is brought to the sweat glands by the blood circulating in the skin. Evaporation of the sweat not only rids the body of excess water, but is a valuable way of cooling the body.

Urea is a product resulting from the breakdown of protein foods and of protoplasm. It is excreted chiefly by the kidneys. Each of the two kidneys has about a million microscopic filters. The blood flows through these filters and the urea, salts, and water are removed. These flow into the bladder as urine, which is eliminated from the body periodically. Urine gives valuable clues to body health. Among the substances for which urine is analysed are sugar

and albumen. Sugar in the urine may be indicative of diabetes. Albumen may signify that the kidneys are not functioning correctly.

Growth

Food supplies the primary building material of the body. Proteins and water, together with other food substances, are changed by the body cells into new living protoplasm. This change of food to protoplasm is called assimilation. As more protoplasm is formed, cells become larger and then divide to form more cells. This increase in the number of cells takes place by a process called mitosis. In mitosis, the hereditary units in the nucleus, the genes, are equally divided between the two new cells. The cytoplasm (the protoplasm outside the nucleus) also splits, and thus two new cells are formed that are identical to the original cell. In this way, an epithelial cell in the skin, splitting by mitosis, produces two new identical epithelial cells.

Some of the vitamins play an important part in regulating growth. Vitamin D, for instance, is needed for proper growth of the bones. Some of the hormones, the secretions of the endocrine glands, also have a role in growth regulation. We discuss these in another section.

CHAPTER 5

FOOD

I. Content :

1. We need food for three reasons :

   a) Food for growth
   b) Food for energy
   c) Food for health

2. The constituents of food are proteins, fats, carbohydrates, mineral salts, vitamins and water.
3. Balanced diet is necessary to be healthy.
4. Many deficiency diseases can be prevented by regular intake of nutritious food.
5. Food storage and preservation is essential because food substances are not grown in all places at all times and to prevent spoilage of food.
6. There are many methods of storage of food.
7. Microbes, insects, rats, cause damage and spoil of food.

II. Objectives :

To enable the students

- to understand the importance and function of food.
- to know the constituents of food.
- to identify the deficiency diseases.
- to acquire knowledge about food storage and preservation.
- to select suitable method to avoid actions of microbes, insects and rats.

III. Introduction:

a) Motivation

i) Make list of food items taken for breakfast and mention the source of foods plant origin and animal origin.

ii) Displaying pickles, jams, jellies, etc.

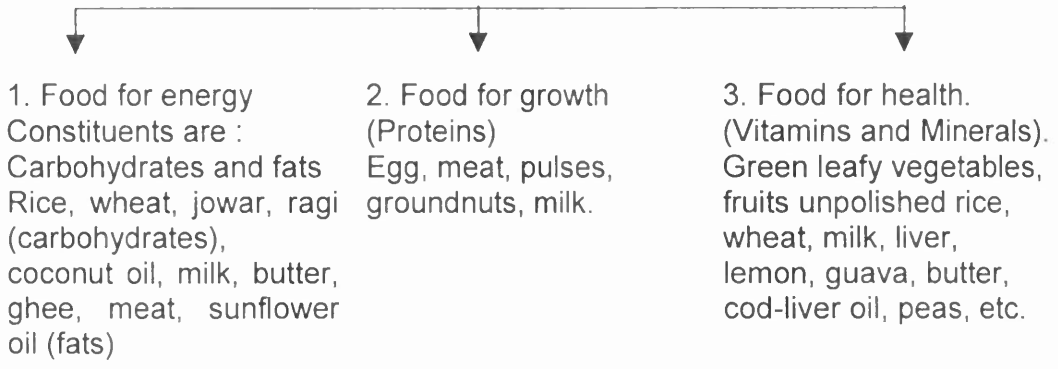
b) Scope in Daily Life

Students understand and identify different constituents of food and their importance in daily life. Students gain knowledge about the different

methods of food preservation used in their house. Students learn to protect food items.

III. Teaching-Learning Activity :

1. Prepare three large charts or three bulletin board panels. Head them as a) food for growth, b) food for energy, c) food for health. Have children cut food pictures from magazine and newspapers and place them on the appropriate charts. A discussion of the placement of each picture will quickly reveal the fact that many common food belong in several groups.
2. Specimens of vegetables, cereals, pulses, dry fruits, fish, meat, egg, etc. kept on table can be classified by students into the constituents of food such as proteins, fats carbohydrates, vitamins and minerals.
   Later group them as energy giving food, food for protection from diseases (health) and food for growth.



Activity for deficiency diseases.

Food for health are vitamins and minerals. Students prepare large charts showing types of vitamins, source and deficiency disease.

Types of Vitamins	Sources	Deficiency Disease
Vitamin A	Milk products, carrot and green leafy vegetables.	Night blindness
Vitamin B1	Unpolished rice, wheat, green vegetables.	Beri Beri
Vitamin B2	Milk, peas, beans, egg, sprouted seeds.	Problems in eye, nose.

Types of Vitamins	Sources	Deficiency Disease
Vitamin B7	Fish, vegetable, milk and green vegetables.	Problems in intestine and nervous system.
Vitamin B12	Vegetables, egg, milk.	Anaemia.
Vitamin C	Orange, gooseberry, guava papaya.	'Scurvy' (Inflammation of gums leads to bleeding. Teeth become loose, general weakness is seen in muscles and joints.
Vitamin D	Liver, egg, milk, butter, cod-liver oil, and sunlight.	'Rickets' (In young children bones are soft and bend quickly and leads to deformity. Rib cage shrinks, enamel of the teeth will be soft and grow slow.
Vitamin E	Egg, peas, milk, butter and green vegetables.	Skin and reproductive systems are affected.
Minerals i) Calcium	Milk, milk products and green vegetables.	Helps in clotting of blood and in growth of bones and teeth.
ii) Iron	Meat, egg, wheat, peas.	'anemia'.
iii) Iodine	Sea fishes and sea water, iodized salt, etc.	Goiter, Cretinism

4. Teacher displays sample of green chilies and dry chilies and ask students to observe after 4-5 days. students find that green chilies get decayed and learn about the importance of drying and make list of food items that can be preserved by drying.

5. Students observe pickles, (mango, lemon, carrot, etc. preserved by salting), morbas, jams, jellies (preserved in sugar) and know that few food items can be preserved in salt and sugar also. Fish is preserved by salting and drying.
6. Teacher also explains about the food items stored in refrigerators and in cold storage.
7. Teacher explains how exposed food gets spoiled by microbes, flies, cockroaches, beetles, insects, and rats and how food is stored. Keep slice of bread in moist place for a week and then observe.

Evaluation :

1. List out different methods used in preserving following food items : Chillies, groundnut, grapes, milk, fish, mango, cheese.
2. Through Art : Have children with textbook open draw picture of 'A good lunch' or 'A good dinner' in which there is atleast one food from each of the constituents of food.

You know that we should eat food from all the major food groups. But how do you know how much food a child of your age should eat ?

Do this Activity

The table given below contains information about the amount of different foodstuffs that children of various age groups should eat. Study the content and find out what kind of food you should eat everyday. Find out how much food a vegetarian and a non-vegetarian should eat.

Food	Age Groups			
	7 – 9 years		10 – 12 years	
	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)
Cereals	250	250	320	320
Pulses (dals)	70	60	60	60
Green leafy vegetables	75	75	100	100
Other vegetables, roots and tubers.	50	50	50	50
Fruits	50	50	50	50
Milk	250	200	250	200
Fats and oils	30	30	35	35
Meat, fish and egg	-	30	-	30
Sugar and jaggery.	50	50	50	50

*Courtesy : ICMR

Compare this chart with your own food intake. Find out whether your food intake is adequate and whether you are eating a balanced diet to grow and remain healthy and strong.

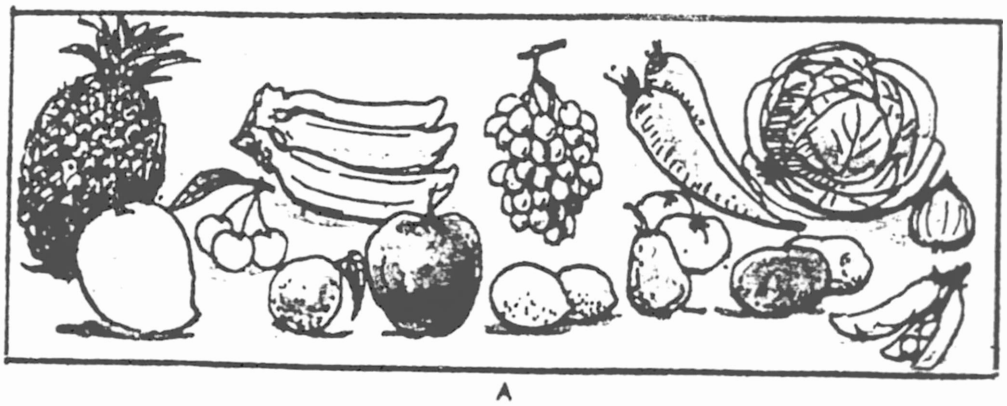
Nutrients found in food stuffs have different functions. List the functions of proteins, carbohydrates, fats, minerals and vitamins.

Evaluation for food chapter and Diseases and its prevention.

Deficiency Diseases

You have learnt that to remain healthy and strong one must eat the right kind of food. Foodstuffs contain a variety of nutrients. However, each food stuff is rich in one or the other kind of nutrient.

Look at the picture. Identify the main nutrients contained in each group of food stuffs. Find out which kind of nutrient is missing in each of the food stuffs shown here.



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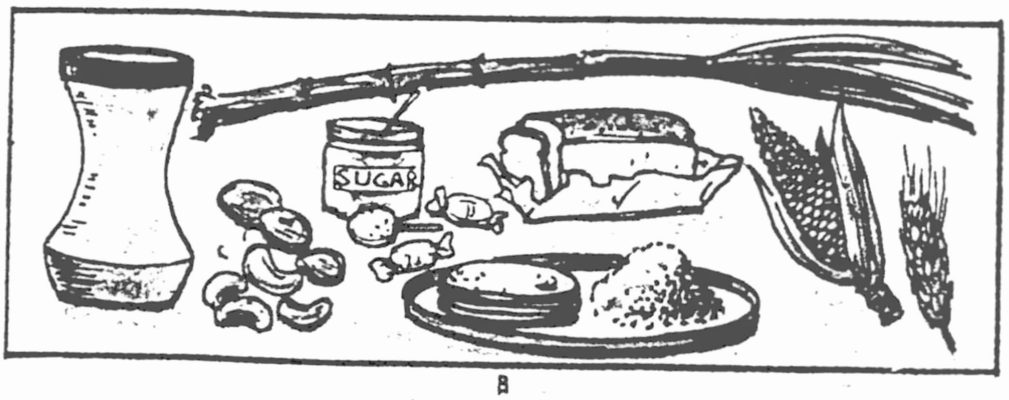

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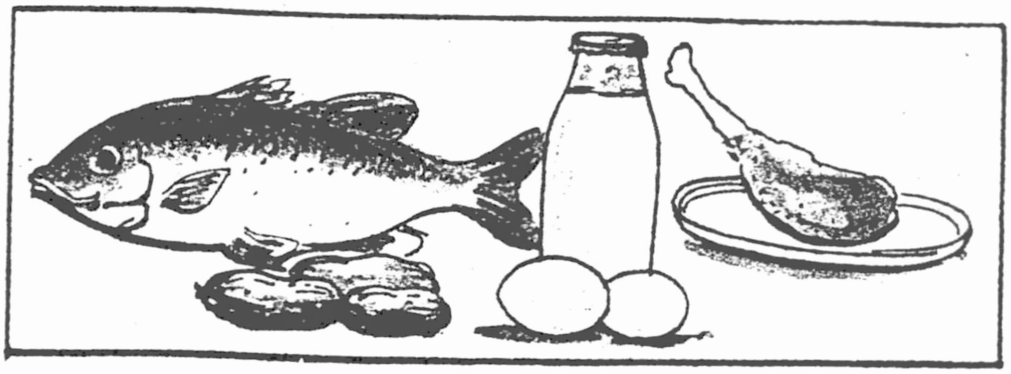


CHAPTER 6

DISEASES AND THEIR PREVENTION

I. Concepts :

1. Diseases are caused by some micro organisms like bacteria, virus or protozoans.
2. Some diseases are also caused by the deficiency of some nutrients. These are called deficiency diseases.
3. Diseases that spread from one person to another is called communicable diseases.
4. Communicable diseases spread through contaminated air, water, food, insects and direct contact.
5. Different processes protect our body from diseases by immunity – natural, acquired and artificial.

II. Objectives : To enable the students to

1. Acquire knowledge about the various types of diseases.
2. Recognize the types of diseases caused and the symptoms.
3. Cite examples for communicable, deficiency diseases.
4. Apply the knowledge in their daily life to solve health problems.

III. Introduction:

a) Motivation

Visit to a primary health centre nearby and ask the students to observe the fosters related to different diseases and if possible see the patients also.

b) Scope in Daily Life

Students will be aware of communicable diseases so that they take proper care of the patients who suffer from communicable disease.

IV. Teaching-learning Activities:

- Teacher shows photographs of diseased children for eg. Malnutrition, Elephantiasis, Leprosy, Polio and discusses about the diseases.
- Teacher also points out the symptoms of each disease.

Name of the disease	Caused by	Trans-mitted by	Symptoms	Preventive measures to be taken
Cough, cold, Tuberculosis, chicken pox.	Microbes (virus)	Air	Leaking of nose	While sneezing or coughing, we must cover with kerchief.
Typhoid, Cholera.	Microbes (Bacteria).	Water	Fever and dysentry	Should drink pure water (boiled water) and take clean food, vaccination.
Malaria	Protozoans	Insects (Anaphilis Mosquito)	Shivering and fever	Should keep the house and surroundings clean. Use mosquito curtains.
Eczema, Leprosy	Contact	Direct contact with persons	Itching, red skin with patch	Should not come in contact with such persons.

Prevention of Diseases :

- Teacher shows the Immunity Card brought from a Health Centre and explain different processes which protect our body from diseases.

Natural Immunity	Acquired Immunity	Artificial Immunity
Inherited from parents.	Antibodies are produced to fight against the germs that cause disease.	By vaccination and Inoculation. I) BCG, ii) Triple Antigen, iii) Polio drops, iv) Anti Rabies, v) Hepetitis 'B', vi) Anti Typhoid.

Evaluation:

How do the following diseases spread? Malaria, Leprosy, Tuberculosis, Cholera, Chicken pox, Typhoid, Dysentery.

Referęnce : Understanding science

By – Joe Boyd and Walter Whitelaw.

Useful Microbes

An understanding of science can help people use technology to solve food problems. Living things are useful in technology. For example, very small microbes (which are usually just a single cell) can be used to make food, medicines and fuels. The two most useful types of microbes are moulds (fungi) and bacteria.

Food

People have been using microbes to make some foods for a very long time.

Beer has been brewed for 5000 years. Wild yeast, a single-cell fungus found on the surface of some cereal seed, turns the sugars in the seed into alcohol.

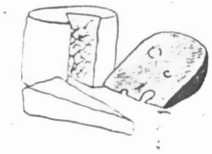
Bread making is another ancient industry. Bakers' yeast is added to the dough. It changes the sugar into alcohol and the gas carbon dioxide. The gas makes the dough rise. When the bread is baked, the alcohol is boiled away.

Nearly five hundred years ago, the Aztecs of South America made cakes from microscopic one-celled plants which they collected from shallow lakes.

As people learnt more about microbes, new technology was invented so that they could be used to produce a wide range of products. Today the food industry uses many different microbes.

Bacteria turn milk into curds.

Bacteria turn milk into cheese.
Certain moulds give blue cheese
Its special flavour.



Bacteria change beer into
Malt vinegar.

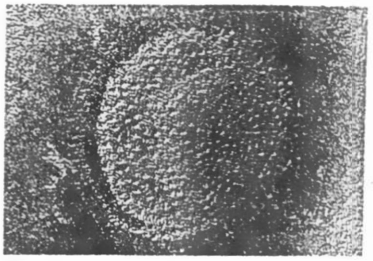
Quorn is a type of protein made from
Mould. It is used to replace meat in some
foods.

Body Defences (Acquired Immunity)

Even when you are fit you can wake up in the morning feeling unwell. Very often it is because you have some sort of infection. Infections can be caused by bacteria, fungi and viruses. These are all types of microbes.

Food poisoning can be caused by salmonella bacteria

Athlete's foot is caused by a fungus

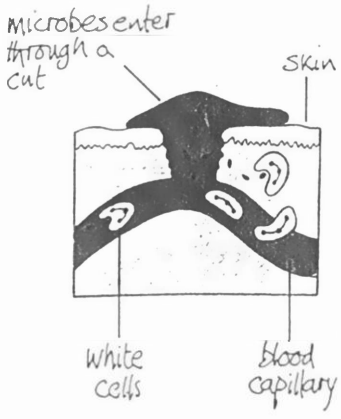


Flu is caused by a virus [Magnified 350 000 times]

Your body has a defense system that can fight off most infections. Your skin and blood are part of this defense system.

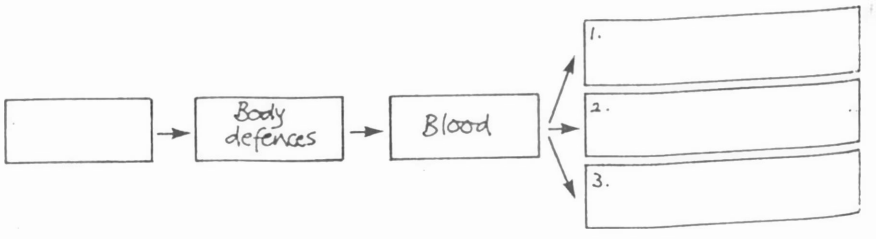
- Skin prevents microbes from entering your body. When this barrier is broken, blood quickly clots to seal with wound with a scab.
- Blood contains red and white cells. Red cells carry oxygen to all parts of the body. It is the job of the white cells to attack, digest and destroy invading microbes.

Your blood also carries special proteins called antibodies. They recognize microbes in the blood and destroy them or make them easier for the white cells to find.



1. Make a table showing :
   - three types of microbes
   - descriptions of the infections they cause

2. Copy and complete the flow diagram below.



Malnutrition

The investigation of the effects of food on development is one of the world's most important studies. In many countries, most of the population do not have enough of any kind of food, and as a result many of the children either die or do not develop normally. In other countries, some food is available, but not the correct type, and as a result of this the children suffer from many serious diseases. The figure shows the effect that different feeding can have on humans. The tiny Indian child is 3 years old and weighs 6.4 kg. She is seriously retarded, both mentally and physically by the effects of lack of food. By contrast the other little girl is only 1 ½ years old and weighs 10.8 kg. The work of many biological scientists is directed towards trying to overcome food shortages which lead to abnormal and unhealthy development.

Looking back at Chapter 6

1. Development is a carefully controlled process and the conditions at each developmental stage tend to be kept constant.
2. All embryos must be fed until they can make or find their own food.
3. Most organisms receive a store of food from their parents. Mammal embryos are fed within the mother's body.
4. There are many different patterns of life, but these can be classified into a few basic types.
5. Development can be changed by altering the environment.

CHAPTER-7

THE FIRST AID

I Concept:

1) Help or treatment given to a person who is injured due to falling, burns or any other accident before getting the doctor's help is called first aid.

2) No disease can be cured by superstition.

3) The fractured part must be tied and immobilized.

4) Oral rehydration salt (O.R.S) should be given to avoid dehydration.

5) T.T. injection should be given if a person is wounded by rusted things.

II Objectives:

1) To enable the students to identify the injuries which can be attended to by first aid.

2) To give suitable help or treatment to injured person immediately.

3) Not to believe in superstitions.

4) To be careful and get correct information while using home-made medicines.

III Introduction:

a) Motivation:

1) Recalling the injuries the student had faced recently & the first aid given at that time.

2) A student narrating an accident, which a student saw.

b) Scope in daily life:

Students make list of various injuries they have seen & faced and tells about the first aid given at that time.

IV Teaching-Learning Activity:

1) To test the previous knowledge of the students, teacher displays few things on the table. The things include cotton, dettol, tincture of iodine, bandage cloth, burnol, scale, cloth, bamboo stick, towel etc and asks students to which injuries and role.

2) Later with illustrations, examples and role play, teacher explains about first aid.

   a) Ex:--Role play for wounds and bleeding:-

      Teacher pours red ink on the thumb of one student (other students will not be aware of this) & asks the student to act like an injured person screaming with pain. Then the teacher cleans the thumb & dresses it with cotton by applying ointment.

   b) Role play of fainting.

      Here teacher tells about superstitions & no disease can be cured by superstitions.

   c) Role play of fractured legs:

      A running boy falling & screaming with pain.

      Here the teacher demonstrates how a long scale or stick is used as a support to the fractured part, tied and immobilized.

      (Note:- Students & teachers need rehearsal of the role play activities)

3) Teacher displays picture of person drowned & the first aid and artificial respiration given to him, & explains step by step about the first aid given to that person.

4) Teacher explains that not only injuries, but first aid treatment can be given even to diseases like diarrhea which is a common disease among small children, and also for fever.

Evaluation:

1) Activity: Teacher asks all the students to make a first aid box and to keep useful items to be used in first aid in it.
2) Prepare oral rehydration salt (O.R.S) at home & write down its uses.

Teacher should know

1) Teacher should tell students that turmeric powder can be used for only small wounds (not for deep cuts) as it is an antiseptic. But mud, sugar, teapowder etc should not be sprinkled on the wound or bleeding part.
2) T.T. injection should be given to the person who is wounded by rusted things.
3) First and for burns:
   a) Chemical burns: Flash with copious amounts of water. If damage to the skin has resulted a suitable dressing should be applied by a qualified person.
   b) Heat burns: It can be tissue damage due to direct contact with internal source of heat and from conduction of heat from the tissue damaged by the external heat source to the neighbouring tissue. The second effect causes damage to the deeper tissues.

Management of burns

I. Cool the injury as rapidly as possible by immersion in cold water, irrigating with running cold water or by the application of ice-packs.

II. After thorough cooling, apply a dry, sterile dressing to the wound.

III. Remove promptly anything of a constricting nature, ex: rings, bangles, belts, shoes etc.

DO NOT apply any lotions, ointments or oily dressings.

DO NOT prick blisters.

4. First aid for Eye Injuries:

When the injury is due to a solid object skilled attention should be obtained immediately. If the injury is due to a splash of corrosive liquid the eye should be held open and washed with copious amounts of pure water. The pain suffered by the casualty may require physical force to be applied before this can be done.

5. Treatment of shock:

Shock is a state of collapse which is fatal if not brought under control and which may result from physical or emotional injury. It is awakening of the blood circulation caused by either severe loss of blood or the pooling of blood in the abdominal region resulting in an inadequate supply to the brain and other vital centers.

Symptoms may include: faintness, giddiness, complaint of blurred vision, collapse, pallor, clammy or cold skin or the breaking into a sweat & anxiety. The patient should be laid down and if possible the feet raised higher than the head.

Treatment:

Reassure the patient and allay his anxiety. Make the patient comfortable and carry out any other necessary treatment, but do not move the patient unnecessarily. Get the patient to the hospital, as quickly as possible-a blood transfusion may be necessary.

Reference: ' A safety hand book for Science Teachers'.- By K.Everett and E.W.Jenkins.

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Communicable Diseases

Garbage thrown here and there also decays. Flies breed in such decaying matter. They also sit on exposed excreta or stool. Then they carry the germs. When they sit on the exposed food it gets contaminated. Thus these infect the food.

Diarrhoea is a common disease that spreads through contaminated food and water. Even if the food and water are safe, unhygienic handling, of unclean hands and utensils can infect them with these germs. Diarrhoea and cause loss of water and salts from the body. You have learnt earlier how to prevent dehydration. Here you see a child with the signs and symptoms of dehydration. If there is a case of Diarrhoea in your family, remember you can prevent dehydration by giving child **Oral Rehydration Solution (ORS).** You can also give him/her coconut water, soup, etc.

CHAPTER 8

AIR

Concepts:

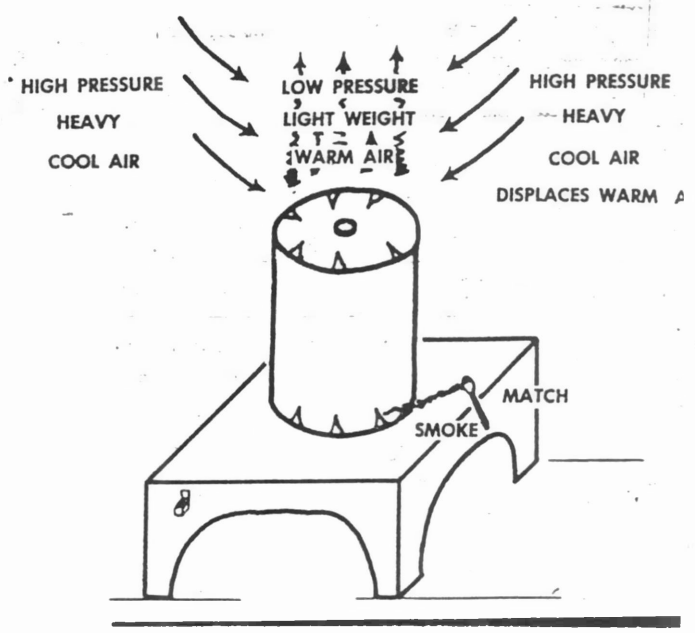
1. Air exerts pressure.
2. The pressure of air changes.
3. Changes in atmosphere determine the weather.
4. The Sun, the air and water play leading roles in weather.
5. Sun is the prime source of energy.
6. Unequal distribution of the sun's heat on the earth has a profound effect on weather.
7. Air serves to distribute heat and water round the earth.
8. Large masses of cold and warm air influence the weather of the World.

Objectives:

To enable the students to:

1. recognize that air exerts pressure on all sides.
2. observe the changes in air/pressure and its effects.
3. understand that the Sun air and water play leading roles in weather.
4. recognise that sun is the prime source of energy for the weather.
5. acquire the knowledge that unequal distribution of the sun's heat has a profound effect on the weather.
6. recognise that air serves to distribute heat and water round the earth.
7. interpret that large masses of cold and warm air influence the weather of the world.

Activity:



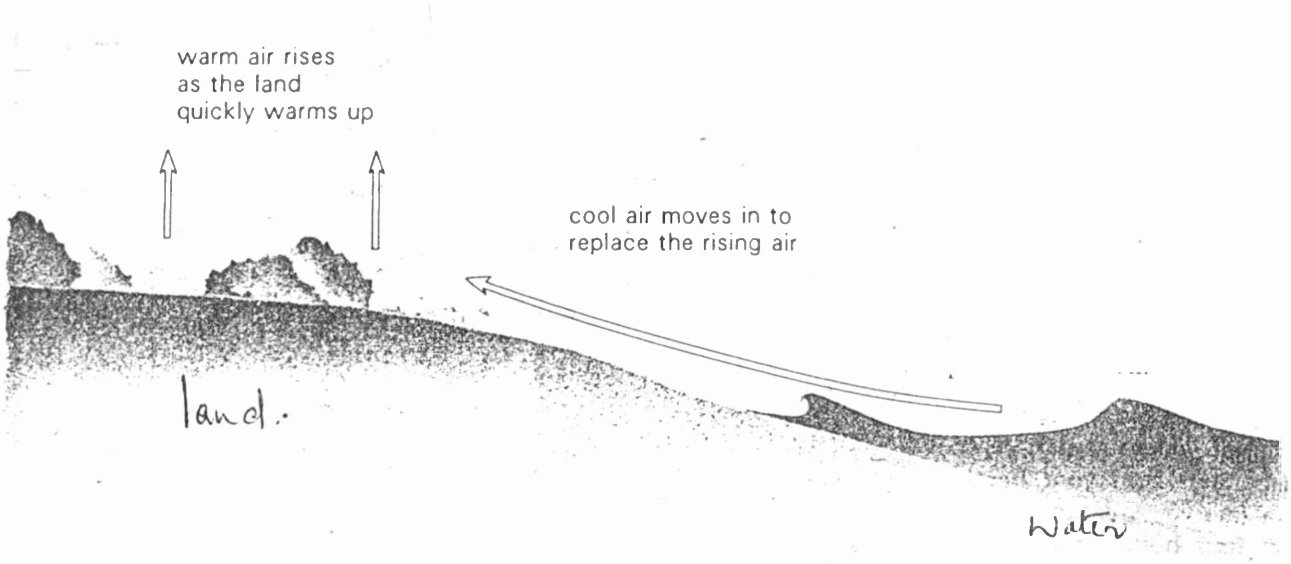
Materials: Hot plate, tin can, light weight seeds or bits of cotton, and a puncture type can opener.

Procedure: Puncture several holes in the top and sides of a tin can and place the open end over the burner of a hot plate as illustrated in the figure. Place the light weight seed or cotton bits over the holes of the can and observe what happens.

Discussion / Response:

The light weight seeds or bits of cotton will appear to float up above the top of the tin can. The burner of the hot plate heats the air inside the can, causing it to expand, become lighter, and be forced upward by the cool air which displaces it. As the air inside the can is heated and forced upward, a low pressure area is created inside the can. The heavier cooler air of the higher pressure rushes into the tin can through the low side holes as shown in the figure. This movement of heavier, high pressure air to light weight low pressure air causes winds. The flow of cooler air through the sides at the lower end of the can, can be detected by using burning matches as shown in the diagram.

Winds are caused by convection currents



During the day, the land warms up more than the sea. This is because it takes a lot of heat to raise its temperature by a small amount. The warm air over the land rises. Cool air over the sea move to replace it. So during the day breezes tend to blow from the sea on to the land.

At night the land cools down faster than the sea. The warmer air over the sea rises. Cold air over the land moves into replace it. So during the night, breezes tend to blow from the land to the sea.

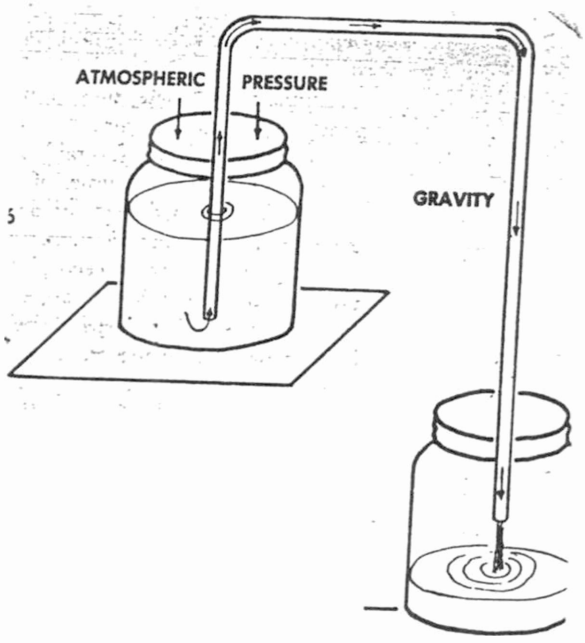
This happens on a large scale, too. The air near the equator heats up more than the air near the poles. The hot air over the equator rises. Cooler air from the north and south moves into replace it. This sets up air movements and causes winds.

A Siphon Operates with Atmospheric pressure

Activity:

Materials: 2 glass jars, clear plastic hose, vegetable colouring and water.

Procedure: Fill one Jar with water and add some vegetable colouring. Place the jar of water on a desk and an empty jar on the floor. Put one end of the plastic hose in the jar of water and put the other end to your lips. Suck on the tube as you would with a straw and observe the coloured water as it is drawn into the tube. As it get within a few inches of your lips, remove the tube from your lips and quickly place it in the empty jar. What happens ? Why ?



Discussion / Response : As the air is drawn from the tube, the water is forced into the tube to fill the partial vacuum. The atmospheric pressure is pushing down on the surface in the jar, which forces the water in the tube when the partial vacuum is created. The water continues to flow through the tube aided by gravity, which exerts a greater force on the longer column of water emptying into the lower jar than it does on the shorter column of water leading from the upper jar. It is the force of water in the longer tube that makes the water continue to flow. Atmospheric pressure on the upper jar is great enough to keep the short tube full.

What would happen to the flow of water if the lower jar was raised above the upper jar before the latter was emptied ?

What would happen to the flow of water if the two jars were at the same level ?

Siphons make convenient devices for transferring liquids from one container to an other if they are too heavy to pour. Siphons are also used to draw out liquids from containers without disturbing sediment, which might have accumulated at the bottom of the jar.

Uses of Air :

a) Divers need oxygen to breathe under water. Air dissolved in water is not sufficient for breathing. It is sufficient for aquatic animals. So they carry oxygen cylinders along for breathing under water.

b) Mountaineers carry oxygen cylinders for breathing.

As we go higher from the sea level, the quantity of air gets scarce. The air on the high mountains is not enough for breathing.

c) Astronauts too carry oxygen cylinders along with them.

As the Astronauts move away from the earth in their space crafts they will have no air to breathe because there is no air in outer space.

Student Responses :

The students realize the importance of air. They become aware of the fact that air is not distributed equally at all heights. There is very little air in water for humans to breathe. Sun, water and the air around us has made the weather.

Evaluation:

1. How are winds caused during day time by the sea side ?
2. What are the different things that influence the weather ?
3. How are siphons useful in everyday life ?
4. Why do mountaineers carry oxygen cylinders along which they climb mountains ?

CHAPTER 9

WORK - SIMPLE MACHINES

Introduction :

Machines do much of our work in our daily lives. Walk down a street or a country side, you will see machines lifting, pushing, pulling, digging,etc. Watch machines at work in a kitchen – scraping, chopping, beating, cracking, squeezing, slicing etc. Visit a factory to see machines cutting, pounding, rolling conveying, twisting. Watch children at play see sawing, sliding, swinging, rolling.

Until two centuries ago, the muscles of man and of the beasts he pressed into service were the largest single source of power. As recently as a century ago, we had no electrical appliances, no auto mobiles.

Concepts :

1. Machines make work easier, some gain force, some speed, some change the direction of a force.

2. Work is done when force is exerted through a distance.

3. Disregarding the losses due to friction, the work put into a machine equals the work put out.

4. Six simple types of machines include lever, the pulley, the wheel and axle, the inclined plane, the wedge and the screw.

5. Man has invented machines to harness the energy of the wind, falling water, burning fuel, the sun and the atom.

Objectives :

To enable the students to:

1. list the various machines we use in our everyday living.
2. identify the machines and see how they help to do the work.
3. recognize the various machines and show how they work.
4. critically examine to find out what makes the machines move.

III. Introduction :

a) *Motivation*

1. Name machines that help to

a) lift c) grind e) dig

b) pull d) chop f) carry

2. What machine would you use to

a) drive nail into a wall : _____

b) to cut wood : _____

c) to lift water from a well : _____

3. Name two machines that work with the help of

a) electricity c) by water e) muscles

b) by wind d) by springs

b) Scope in daily life

The pupil will be able to identify the various machines that are used everyday. He will become more conscious of the importance of machines. It would make him wonder what life would be without these machines.

IV. Teaching – Learning Activities :

The age in which we live is frequently called the machine age. Most people think of a machine as being a complicated piece of mechanism. But however machines can always be shown to be applications of a limited number of basic mechanical principles.

Activity 1 :

Suggest each child report to the class two machines he has seen at work. To make it interesting, suggest they try to find machines that no one else would think of reporting. Some of the places they may look for are kitchen, garage, a cobbler's shop, a printers shop, a tailor, a Carpenter, a jeweler, a building in progress etc.

When pupils report their observations, a list may be compiled, entitled – "Machines we have seen".

The list will raise questions and doubts about machines and how they work.

The questions may be listed for answering as the study proceeds.

Activity 2:

If there is a building project in progress near the school, pupils may visit it as a group to see

a) which machines are being used.

b) What kind of work they do ? Whether they

   a) lift b) cut c) dig

c) How do they do this work ?

d) What kind of force is used to operate the machines ?

   a) electricity b) diesel c) force of muscles.

e) How could the work be done had the machines not been invented ?

Activity 3

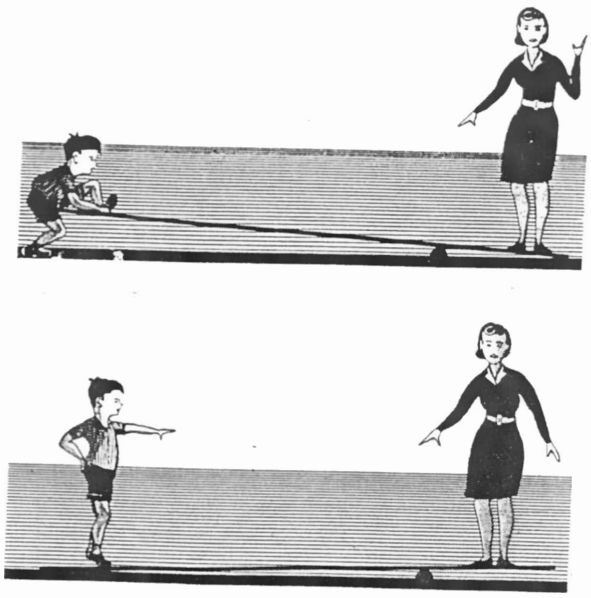
Studying the Lever

Children are amused when they are told that they can lift their teacher. The only material they need for a teacher lifting machine is a block of wood and a plank about six feet long. The block is placed under the plank and near one of its ends. The teacher stands on the short end of the plank; the child is delighted to find that we can lift his teacher by pushing down on the other end. In using this device, which is a lever the child is realising the purpose of a machine, that of increasing force.

If the block is placed one foot away from the end where the teacher is standing, the child who will be five feet away from the block need exert a downward push of only 25 lbs to lift a 125 lbs teacher. The effectiveness of the child's muscle is multiplied five fold. The supporting block furnishes the pivot point or the fulcrum for the lever. The child's part of the lever is five times as long as the teacher's and his force is five times effective.

Is this magic ? It looks as if we are getting something for nothing here – a 125 pound return for an investment of 25 pounds.

Activity:



Materials: Large block of cement (stone), an iron rod, two blocks of wood or bricks.

Procedure : Have one or two of the strongest boys in the classroom attempt to lift one end of the cement block one inch from the floor. (Be careful let them not strain themselves). Then have a small girl in the class room attempt to lift the same cement block with a lever as illustrated above. can she do it ?

Response : The boys may or may not be able to lift the block depending upon their age. Nevertheless, the small girl should be able to lift the cement block up several inches using one hand or one finger with the lever.

A lever is another basic simple machine of which there are many uses.

Activity: Fun with lever.

Materials : a see-saw, a light weight child and a heavy weight child.
Procedure : Have a heavy child bit on one end of the sea-saw and lift a light child on the other. What can be done to balance the see-saw.

Discussion:

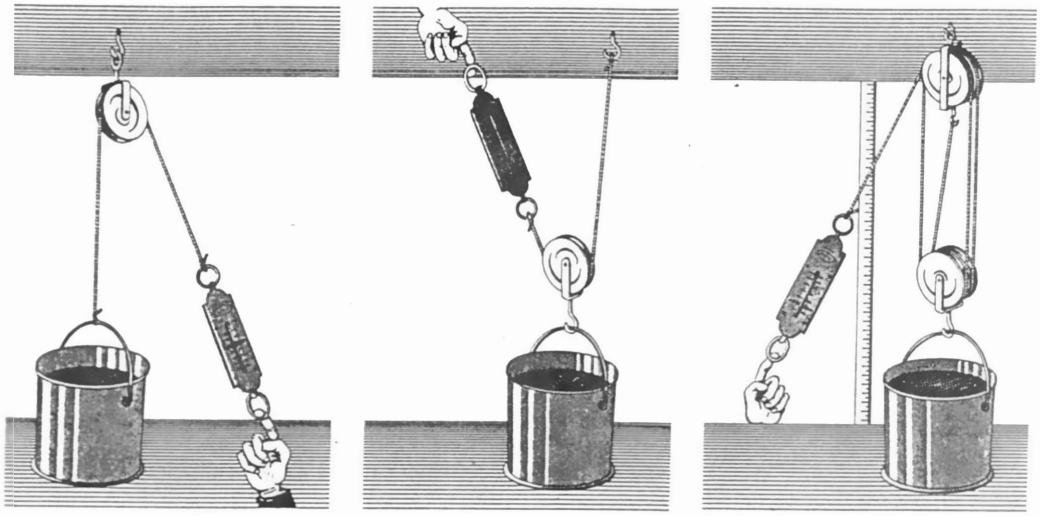
If the heavy child moves towards the centre of the board, the balance point can be reached. If the length of the board on the side of the light child is increased and shortened on the side of the heavy child's side the see saw can be balanced in this way.

If the see saw is in a fixed position, pupils will move on their own instead.

Pulley : A specialized Wheel

Activity:

A flagpole is a convenient device for the teacher to show the pupils the use of a fixed pulley. They may observe the way in which the rope is placed through the pulley and see the advantage of a fixed pulley in getting the flag to the top of the pole. Help them see the relationship between the distance that the force (hand pulling the rope) moves down and the distance that the resistance (the flag) moves us. Fixed pulleys do not save force. They are just convenient.



Pulleys can lift heavy things. They are a great asset. Help the children understand how pulleys operate.

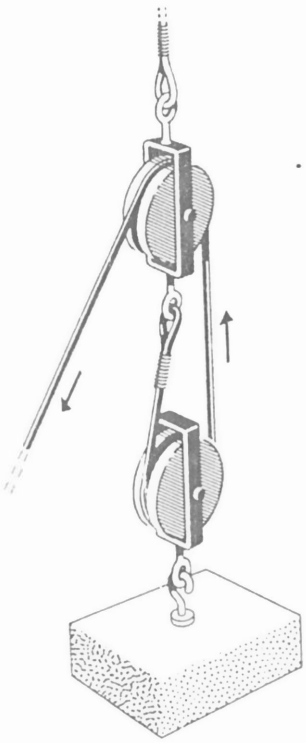
Activity:

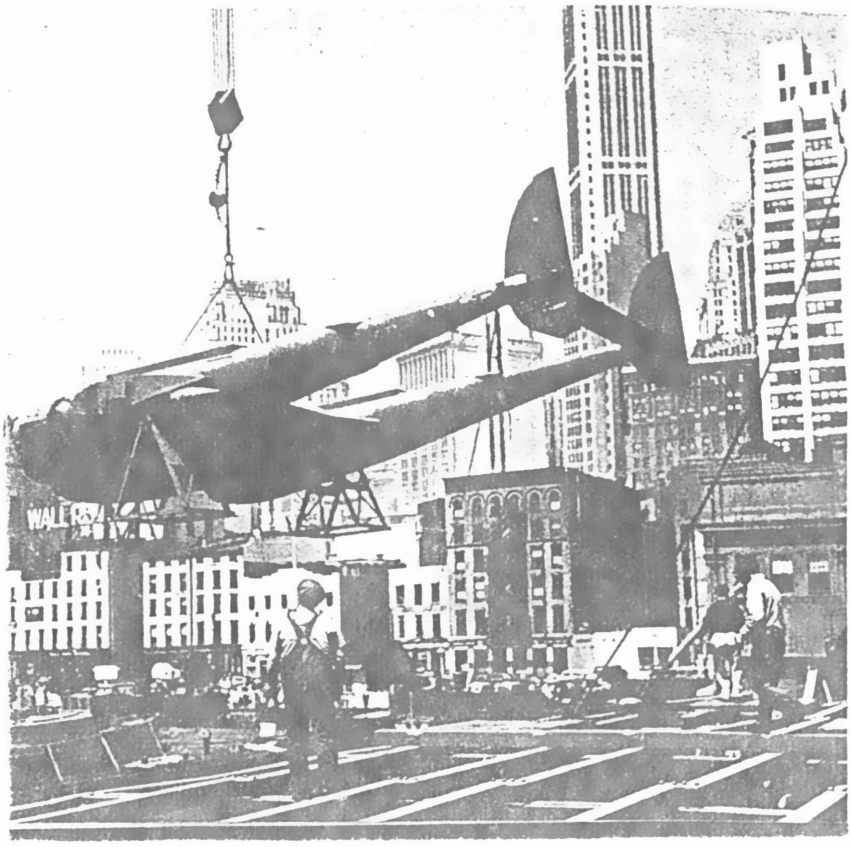
Pulleys may be made using simple objects such as buttons, valve tube, clips, needle, thread, a candle to heat. Follow the diagrams and make different kinds of pulleys.

In order to understand how pulleys are used. Pupils should arrange small pulleys as shown in illustrations. It is important for them to see that in these pulley arrangements, force is exchanged for distance. That is, much rope is pulled through the pulleys (distance) in order to make the weight easier to lift. Again they may observe to see the relationship between the

distance that the force moves down and the distance that the resistance moves up, measuring to see the exact relationship is important.

Use a spring balance to show how the use of pulleys





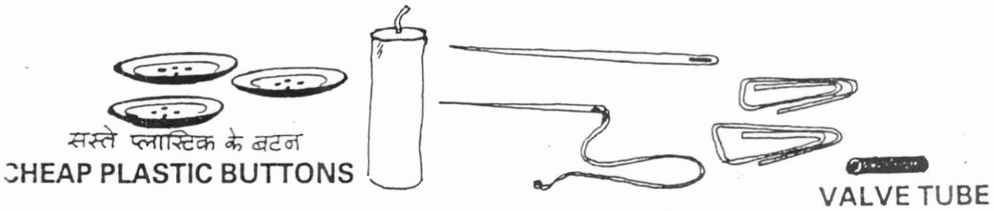
There are many uses of pulleys on the water front.

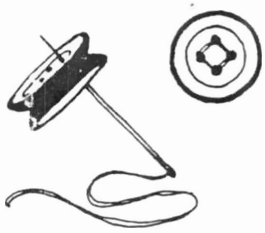
Reduces the amount of force necessary to lift the weight. Use a spring to weight an object. Note the readings on the scale. Now use a block of two pulleys at the top and two at the bottom and attach a spring scale to the rope that will be pulled. Lift the weight. Against read the scale. Use different weights. Note the reading of the scale.

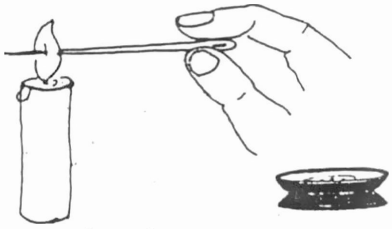
Diagrams.

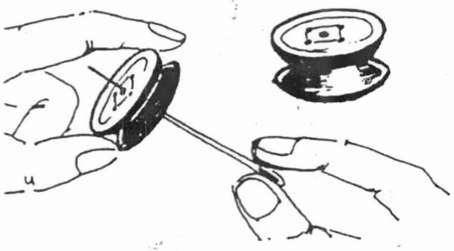
How to design pulleys

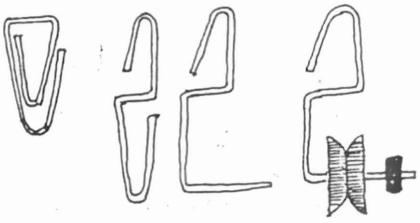
BUTTON PULLEY





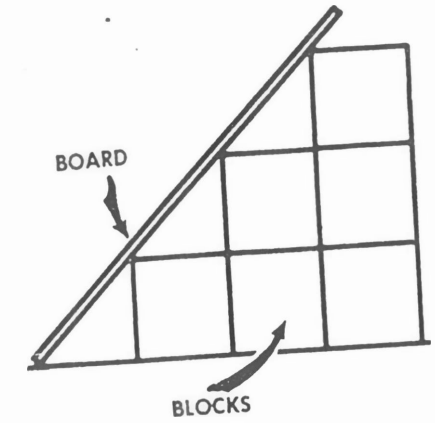


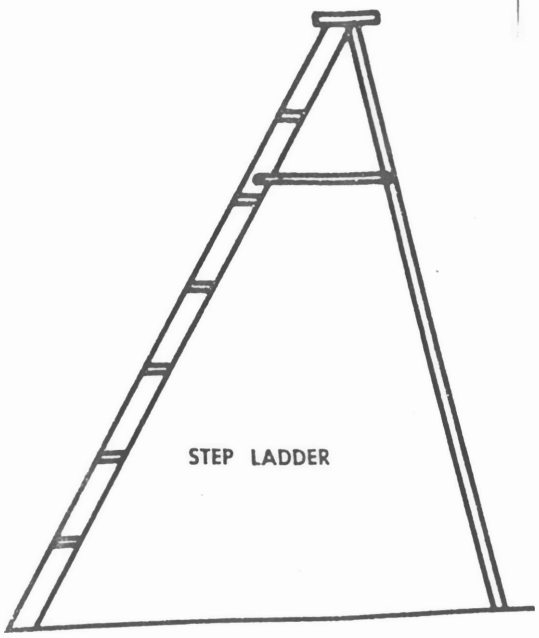


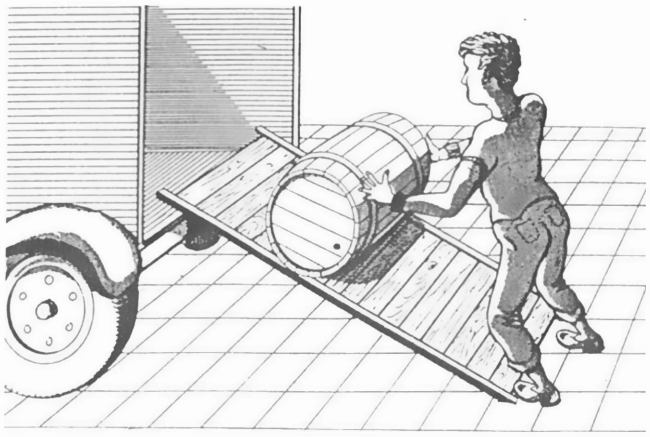


Inclined Plane

Examples of Inclined Planes

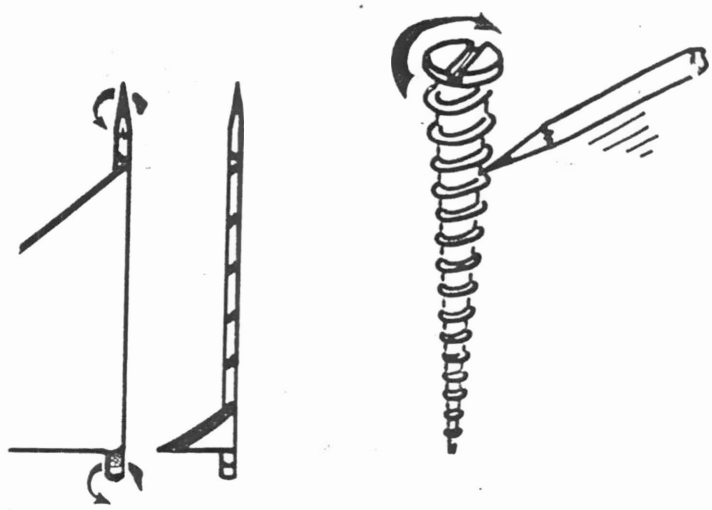






Pupils find inclined planes in their neighbourhood. Pupils make with a board and some books and use a load to pull it up. If they attach a spring balance they can tell how much pull is needed. This may be compared with how much force it takes to lift the loading the same distance without the use of the inclined plane.

When the inclined plane is used, the distance is greater and the force may be less. The distance is great and the force may be less. If the slope is very steep, the distance is less, but more force may be needed.



(a) (b)

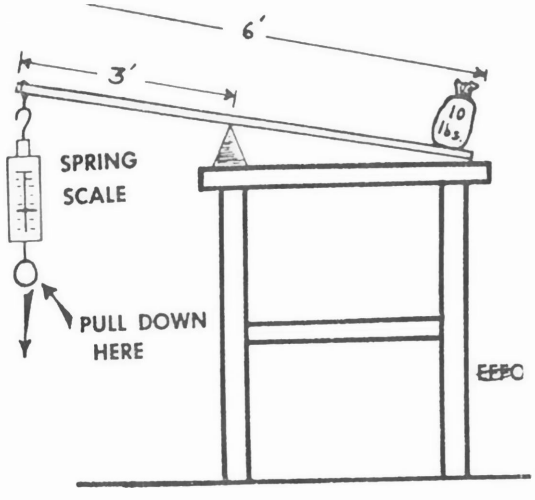
Evaluation:

1. Identify the following:

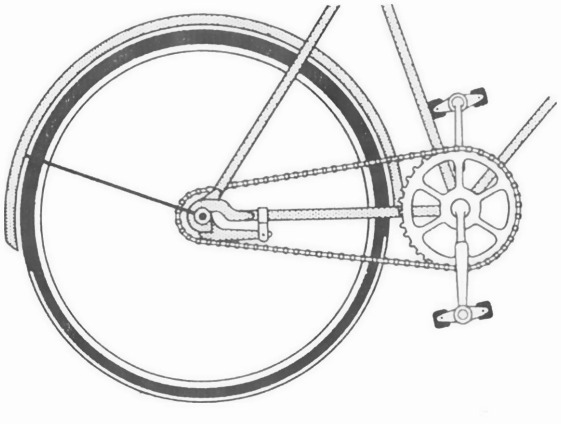
a) Effort

b) Load

c) Fulcrum

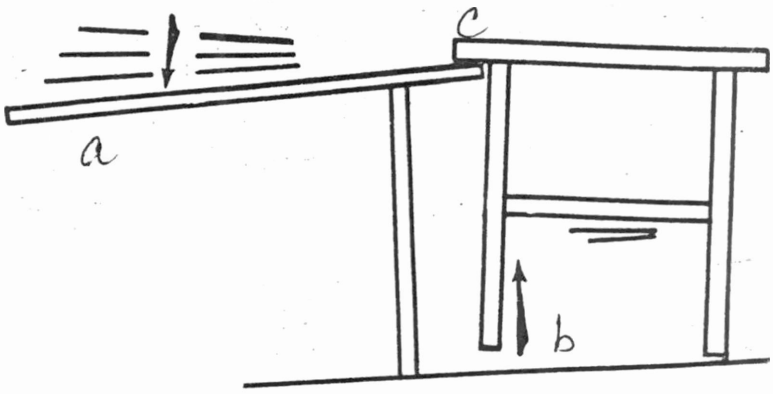


2. How many simple machines can you identify in this bicycle ?



3. a) Where is the effort applied ?

a) _____ b) _____ c) _____

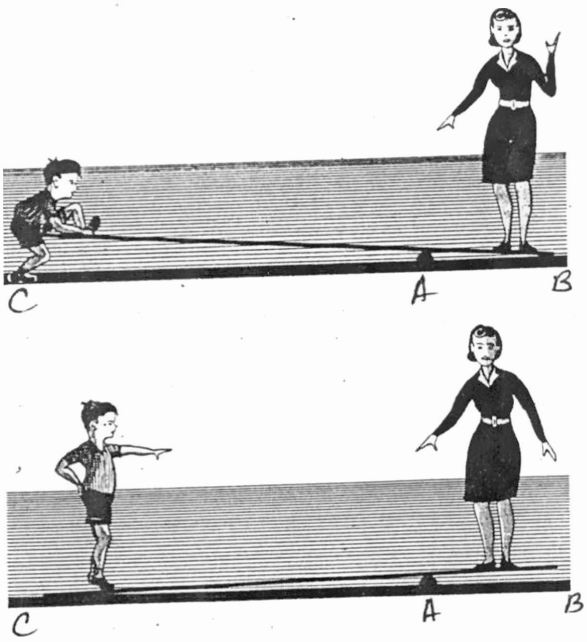


b) Mark the fulcrum in the picture.

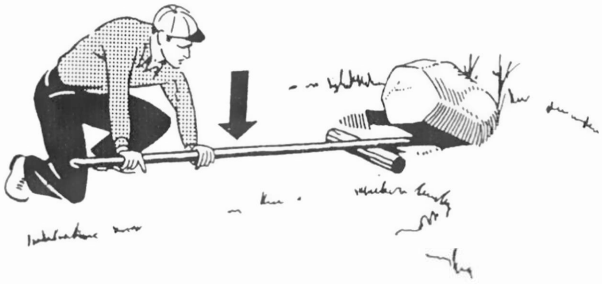
4. 1. What is the distance called

a) A to B :

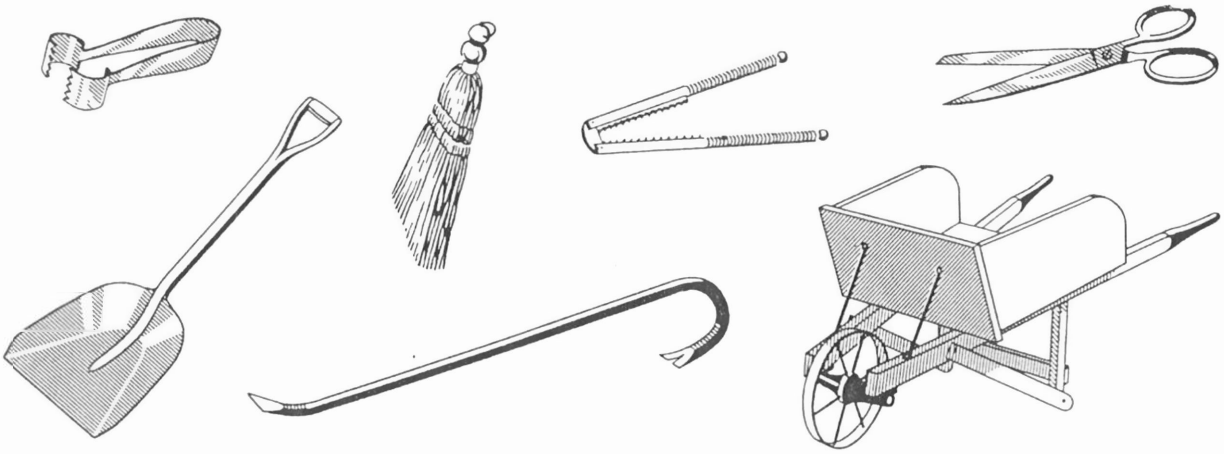
b) C to A :



5. Mark the following:
   a) load
   b) fulcrum
   c) effort



6. a) can you explain how each of these machines helps make the job easier ?

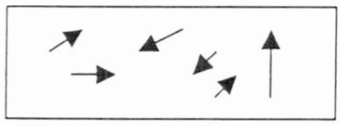


   b) In each of the above simple machines mark
      L for load
      E for effort and
      F for fulcrum

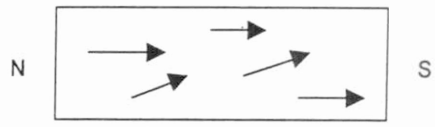
CHAPTER 10
MAGNETISM

Magnetism is caused by domains. A magnetic material is made up of tiny magnetic regions or domains. These regions are about 20 millionths of a metre in size.

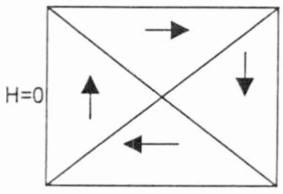
An electron spinning around the nucleus of an atom produces a tiny magnetic field. In the domain of the magnet, the spinning electrons are lined up in a way that lines up with their magnetic fields. This produces a tiny magnetic region in the material.



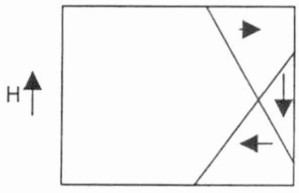
Non magnetic material



Magnetic material

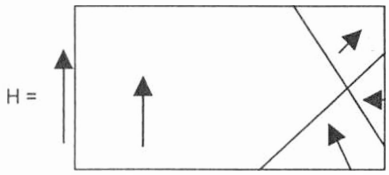


Domain Orientation in
the absence of magnetic field

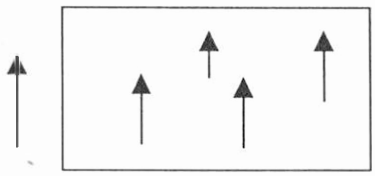


Domain enlargement due to
weak fields

If the material is unmagnetised, the domains point in a lot of different directions. The different field direction cancel each other so that there is no overall magnetic effect.



Domain rotation due to strong fields



Saturation due to very high fields

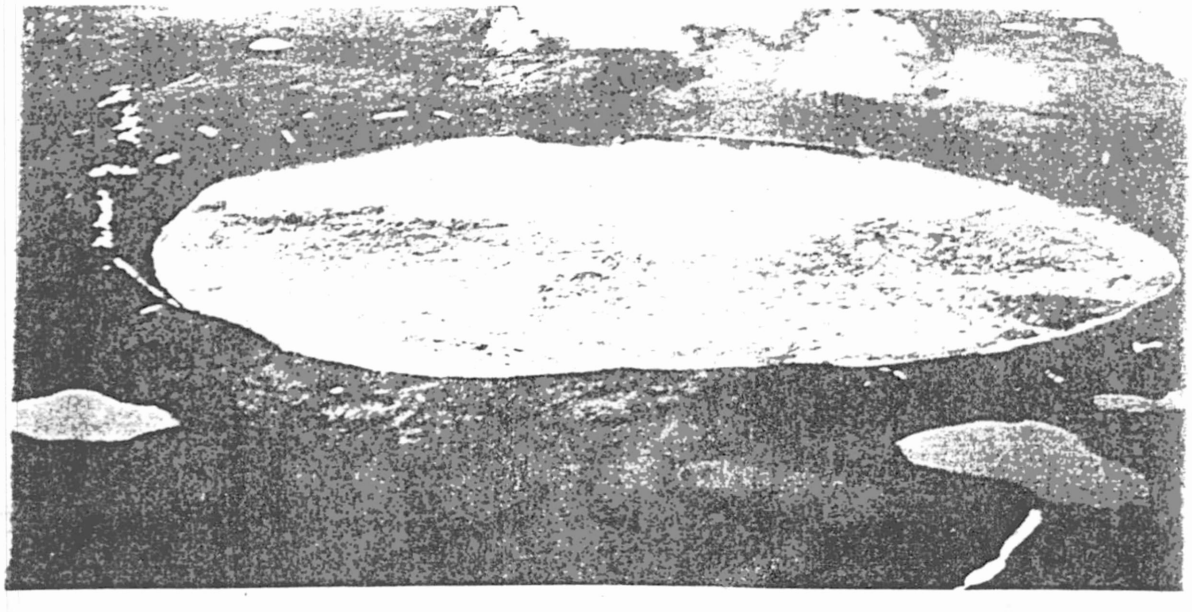
H = Hysteresis is sluggishness or the phase lag of the magnetic induction in ferro.magnetic material.

If the unmagnetised material is put into a magnetic field, the domains which are pointing in the same direction as the magnetic field grows bigger. They gradually 'take over' the piece of material, until all the domains have fields pointing in the same direction as the magnetic field. The material has now become a magnet.

Why meteors fall to the earth ?

Most of the meteors are "Visitors from outer space" They fly into the atmosphere of the earth. These streak across the sky causing people to exclaim 'look at the shooting star'. They are 'meteors'. There are fragments of material varying in size from a grain of sand to the size of a boulder of many tons. As meteors are heated by friction with the air, the glow brilliantly and burn. Those that do not burn and fall to the ground as a solid chunk are called Meteorites.

Meteorites are responsible for the famous meteor crater in Arizona – USA – which is a mile in diameter and 600 ft deep.



The world's greatest known meteorite crater, discovered in 1950, is located in the northern section of Quebec, Canada. The crater, which is almost perfectly circular, is 2½ miles in diameter and contains a lake. The smaller lakes nearby were apparently formed by meteorite fragments that fell around the main crater.

The Chubb Crater in Canada.

CHAPTER 11

LIGHT

Concept:

- Light is a form of energy.
- The teacher explains that light from the sun falls on the earth at a speed of 3×10^8 m/s and reaches the earth eight and a half minutes later covering a distance of 150 million kilometers.
- Light excites the sense of sight and helps us see the world around us. Objects reflect the light that falls on it and make it possible to see that light is a form of energy and rules all life on earth.
- Light is the main source of energy for all living beings.
- There are many types of sources of light.
- Self luminous and non-luminous objects.
- Transparent, translucent and opaque object.

Objectives:

To enable the students to

- Recall that light travels through space with a velocity 3×10^8 m/s in the form of waves.
- Recognise that we see objects because of the light reflected from them.
- Understand opaque bodies do not reflect light. Shadows are formed whenever opaque bodies are placed in the path of light.
- Recognise that light emitting bodies are called luminous objects and those which do not emit light are called non-luminous bodies.
- To understand the needs of light.
- Recognise the sources of light.
- List out the objects which reflects the light.
- To recognize transparent, translucent and opaque objects.

Introduction : Page No. 96 on Training Package

Motivation : Scope in Daily life

Children observe many phenomena of light. They note reflections, rainbows, colours, shadows, sunsets, moonlights. They use cameras, magnifying glasses, mirrors. They play shadow games, mix colours. Even primary grade pupils may profit by simple experiences that make them more conscious of the phenomena of light and how it functions.

Some activities that may be useful for primary grades are :

- Observing shadows to see how they are made and how they may change.
- Looking through a prism at the colours.
- Using a magnifying glass to look at many different kinds of things and materials.
- Using a mirror to reflect light.
- Observing reflections on different surfaces.
- Mixing colours and observing the effects.
- Taking pictures to see how important light is in the process.

Teaching Learning Activity : Page No. 97 Activity 12.1.1 Training Package

Pupils' Activity : Observing how light behaves

Pupils may observe in their school to find examples of things 1. through which all or almost all the light striking it can pass (transparent), 2. through which part of the light travels (translucent), 3. through which no light travels (opaque), 4. from which much light is reflected. They may discuss how these various things are useful because of the way in which they transmit or do not transmit light.

Student responses

Pupils may examine mirrors to see what they can learn by looking at their own images. They may use mirrors to reflect beams of light. If they

experiment, they will soon see the relationship between the way the light beam strikes the mirror and the way in which it is reflected. Pupils may observe the uses of mirrors in store windows, in automobiles, in barber shops, and in dentists' offices and report on why the mirrors are shaped as they are and why they are placed as they are. They may also observe how light is reflected from various surfaces – light coloured walls, dark walls, etc.

Evaluation :

Exercise : Given in the V Std. Textbook.

Note to the teacher :

- All the planets and satellites reflect the sunlight that fall on them. Therefore, we are able to see them.
- Non-luminous objects – planets, satellites, spacecrafts and artificial satellites.
- Clear water, air and true solutions etc. are transparent objects.
- By varying the quality of plastics and glass they can be made into transparent, translucent and opaque objects.
- Water allows light to pass through it upto a certain distance. Then no light passes through it. Therefore, deep seas are totally dark.
- Page No. 101 on training package.

CHAPTER – 12

SHADOW AND ECLIPSES

Concepts

Shadow are formed when opaque objects are placed in the path of light waves.

Shadow is caused when opaque objects block the source of light.

Sharply marked shadows are formed when the source of light is relatively small.

Umbra and Penumbra Region

The dark part of the shadow from which all direct rays of light are cut off is called the umbra. The lighters or outerpart is called the penumbra. Some of the rays of light are cut off from this part of the shadow.

Umbra region is completely dark, whereas penumbra region is partially dark.

Eclipses

Rectilinear property of light is the cause for the occurrence of eclipses.

The earth casts a shadow into space, when the moon enters this cone shaped shadow, we have lunar eclipses. When the moon's smaller shadow sweeps across the earth, we have a solar eclipse.

Objectives

To enable the students to

- recognize the shadows are formed whenever opaque bodies are placed in the path of light waves.
- Understand the shadow is caused when opaque objects block the source of light.
- Reason out for the occurrence of solar and lunar eclipse.
- Recognize that image of the object is formed by regular reflection of light on a reflecting surface.

- Understand the light travels in straight light.
- Understand the umbra and penumbra region and identify the difference between umbra and penumbra regions.

Introduction

Children note reflections, rainbows, colours, shadows, sunsets, moonlight. They use cameras, magnifying glasses and mirrors. They play shadow games; they mix coloured paints. Problems come from observations and experiences such as these.

The following experiences illustrate how an alert teacher used an experience to help her pupils to observe, then guided them in making conclusions that they could apply to other situations.

Motivation : Activity 12.2 Page No. 97 (Training Package)

Observe shadows to see how they are made and how they may change.

Children like to watch shadows and play shadow games. A study lamp or other lamp with an opaque shade may be used to help pupils discover – what makes a shadow ? What makes shadows change length? What kinds of things make dark shadows ? Observing outdoor shadows at different times of the day helps pupils see how the sun behaves as the day passes.

Scope in daily life :

* Guessing the time with the help of shadow.
* Changes that take place in our shadow from morning till evening are observed.
* To develop scientific temper by eradicating myths about eclipses.
* To predict the next eclipse on the bonds of the motion of the earth and the moon.

Teaching Learning Activity

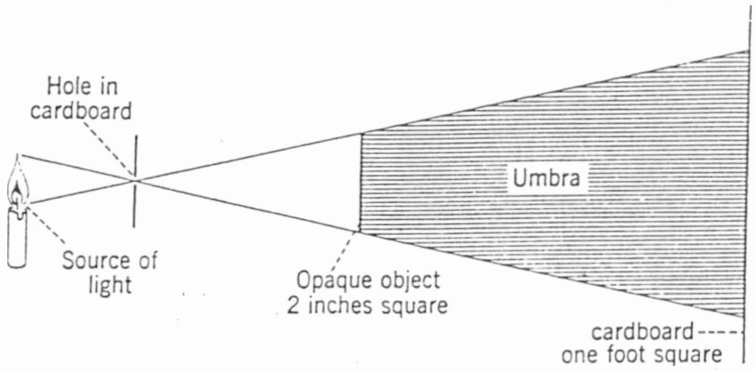
Activity : 12.3, 12.3.1 to 12.3.3 Page No. 99 and 100 (Training Package content and methodology).

Student Responses

Sharply marked shadows are formed when the source of light is relatively small.

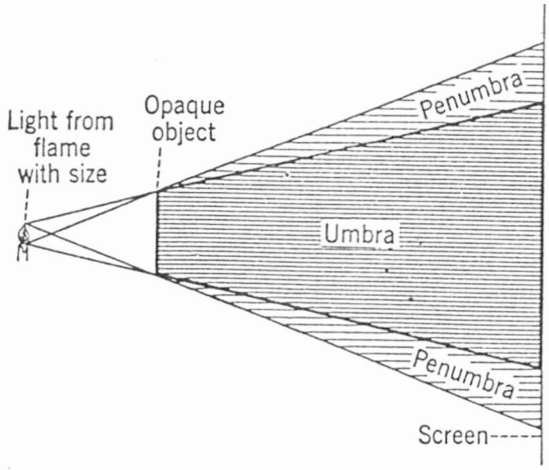
You have observed that your shadow is formed when you stand near a light, especially in a darkened room. Under what conditions are shadows formed? Have you observed that sometimes shadows are lighter on the edges than in the centre? How does this happen?

Sharply defined shadows are formed if the source of light is small.



Shadows with lighter edges are formed if the source of light has size.

Demonstration: First use a very small or a point source of light. Make a small hole in the piece of tin or heavy cardboard. Fold the tin or cardboard around a candle flame or electric light bulb. Darken the room as much as possible. Hold a cardboard about a foot square two or three feet from the source of light. Permit rays of light to pass through the opening and shine on the cardboard. Does the cardboard become bright ?



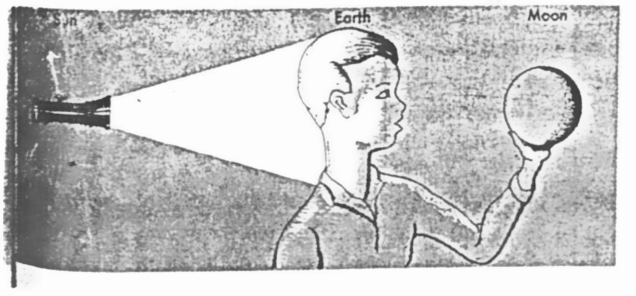
Now place a small cardboard about two inches square between the source of light and the large cardboard. Is a shadow formed? Now remove the covering from the candle and observe the shadow that is formed. (The source of light is now larger). What are the differences in the shadows formed? Study the diagrams to understand how the shadows are formed.

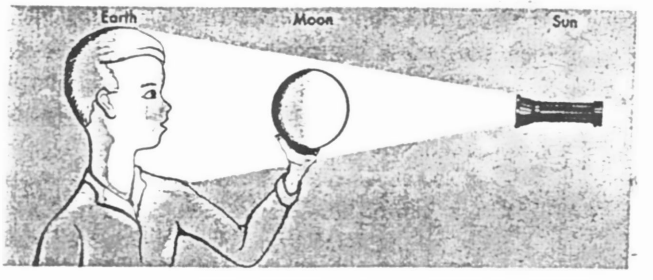
The dark part of the shadow from which all direct rays of light are cut off is called the umbra. The lighter or outer part is called the penumbra. Some of the rays of light are cut off from this part of the shadow.

Studying an Eclipse

An eclipse during a school year is reason enough to study astronomy, for nearly everyone is interested in such a phenomenon. Newspapers will carry pictures and accounts of the eclipse. Even if the eclipse is not visible locally, there may be considerable interest. The U.S. Naval Observatory supplies information about eclipses.

It is important to remember that while demonstrations such as this are indeed helpful in understanding the science principles, pupils need help in translating what they see there into an understanding of what actually happens.





The demonstration used to show moon phases may also be used to show eclipses. An electric lamp, placed at one side of a darkened room should be used as a source of light. The question may arise, "Why don't we have an eclipse every month as the moon travels around the earth?". It should be made clear that the earth, sun and moon are not often in line and in the same plane. As shown in the drawing here, children will see that when their head (the earth) is between the light (the sun) and the ball (moon) and all three are in line, the shadow of their head falls on the ball and eclipses it (an

eclipse of the moon). If the ball is now moved to a position between the head and the light they will see that the ball has cut off the light of the lamp (the sun). The shadow of the ball now falls on the child's face (an eclipse of the sun).

Ancient people regarded eclipses with great alarm. They gave all sorts of weird explanations and were superstitious about eclipses. Today most people realize that an eclipse is the result of natural causes and can be forecast to the exact minute. Pupils may be interested in discussing how the growth of knowledge of astronomy has been useful to us.

Evaluation

Draw a neat diagram of the lunar eclipse and label the following.

1. Sun
2. Moon
3. Earth
4. The umbra region

Draw a neat diagram of the solar eclipse and label the following.

1. Sun
2. Moon
3. Earth
4. The umbra region
5. The penumbra region

Precautions to be taken while observing an eclipse

- Never look at a solar eclipse with naked eyes.
  Caution: The rays coming from the sun are very intense. These strong rays will damage the eyes.
- Never look at its reflection in water.
- Use proper filters to observe solar eclipse.

Evaluation

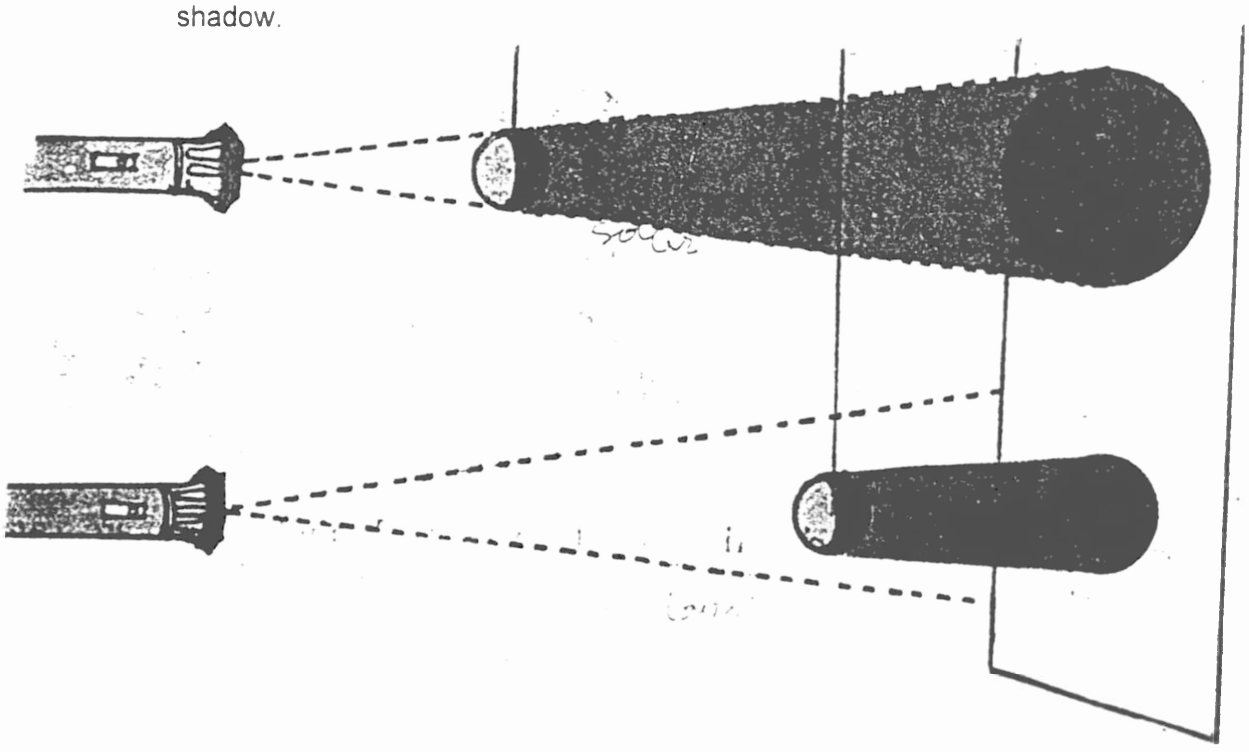
Activities from the book Exploring Environment – A Textbook for Class V – Book 3 Page Nos. 100-108.

Do this Activity

Perform this activity in a dark room. Take a torch light. Cover its glass with a thick black paper that has a small hole in its centre. This will make a small beam of light come out through the hole. Shine the beam of light at a white wall about 1 m away. Hang a ball from a string in the path of the light. Observe the shadow of the ball on the wall.

Now move about 2m away from the wall. Observe the shadow of the ball again. Do you observe any difference in the size of the two shadows?

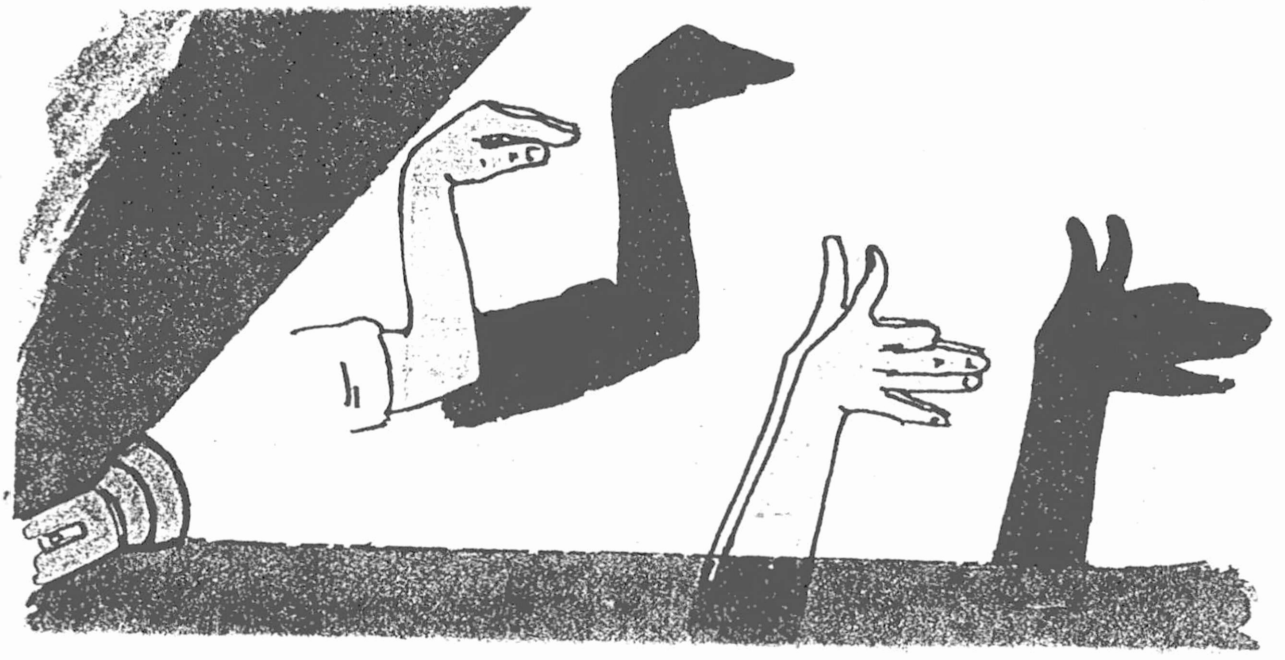
You will find that the size of the two shadows depends on the distance of the object from the source of light. The closer the object is to the light, the larger is the shadow. The farther the object is from the light, the smaller is the shadow.



Let us now find out what determines the shape of the shadow.

Do this Activity

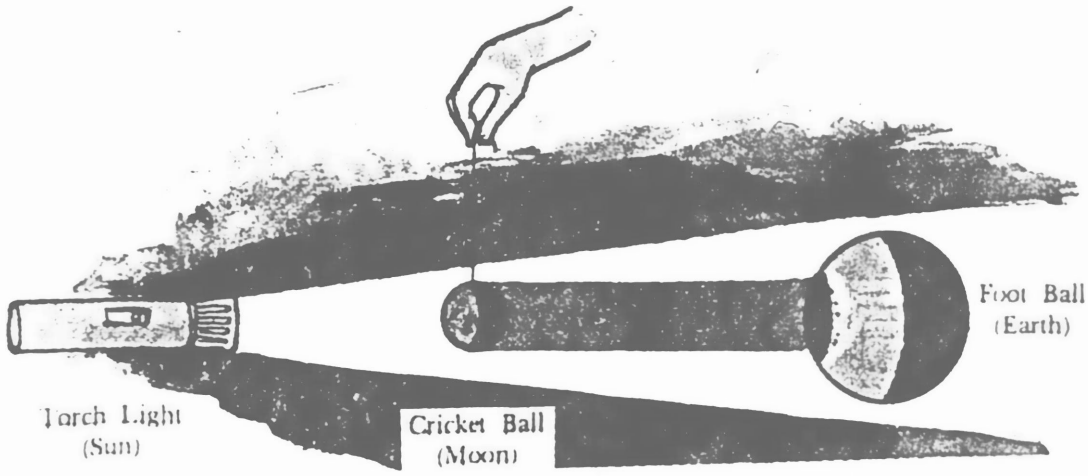
Use the same torch light. Shine its light on a wall about one metre away. Bring a pencil in the path of light. Observe its shadow. Does it resemble the pencil? Now put a metal or plastic tumbler in its path. What is the shape of the shadow? Bring different objects one by one in the path of light and observe the shapes of their shadows. What do these shapes look like? The shape of the shadow is similar to the shape of the object. Also note that the shadows are right side up.



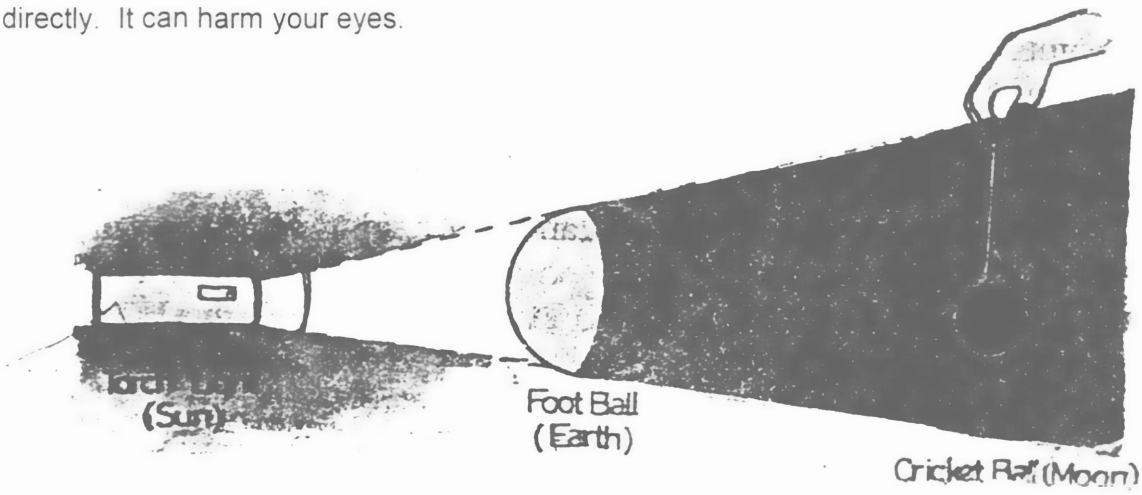
Let us now study the phenomenon of shadows in relation to heavenly bodies. You must have heard of and seen eclipses of the sun and the moon. Let us find out how the eclipses are caused.

You know that the moon revolves around the earth. The earth, along with the moon revolves around the sun. Normally, these bodies are not in a straight line at any time. However, when the moon passes directly between the earth and the sun on the new moon (Amavasya) day, it casts a huge shadow on part of the surface of the earth. When this happens, the people living on that part of the earth where the shadow falls are not able to see the sun. From them the sun is said to have eclipsed. Put simply the moon blocks in the view of the sun. This is called solar eclipse. The part of earth where no light falls from the sun, the eclipse is said to be total. At the edges of the

shadow some light can reach the earth. There the solar eclipse is said to be partial. Note that the solar eclipse does not occur on every new moon day.



Hold the cricket ball at the height of the football. The torch represents the sun, the cricket ball, the moon and the football, the earth. Shine the torch light on the cricket ball and observe its shadow on the football. People living in the dark portion of the shadow cannot see the sun. For them eclipse is total. The people living in the semidark (dim) region can see the sun partially. For them, the solar eclipse is only partial. Never look at a solar eclipse directly. It can harm your eyes.



CHAPTER 13

STATIC ELECTRICITY

Pupils may do many experiments with static electricity. They may demonstrate activities such as combing the hair (as shown in their texts) rubbing a rubber comb on a woolen sleeve or rubbing silk on a sheet of glass.

Some experiences of static electricity are more effective if they take place in the dark so that they can see sparks. Static electricity experiments work better on dry days than a humid days.

Concepts:

* Electricity stems from the electron and proton make up of atoms.
* The contact and separation of two surfaces may permit electrons to be torn away from one and deposited on the other. Both acquire charge of static electricity.

* The object that loses election acquires a positive charge; the one that gains electrons, a negative charge.

* like charges repel ; unlike charges attract.
* Lightning is an abrupt discharge of electricity through air.

Instructional objectives : (are dealt with in the manual)

* To enable the students to
* define static electricity

Static Electricity

Electricity that accumulates and stays on a substance is normally called Static electricity. But we notice static electricity more when it is not static when it jumps.

- Have you heard of the crackling sound when you take off your terylene shirt at the end of a dry day ?

- Have you observed flashes of lightning in a thunderstorm ?

In all these phenomena two things have happened

- Electricity accumulated
- Electricity jumped

What happens when a comb is rubbed on your dry hair (or silk cloth) ?

The contact of these two materials causes some electrons to be torn away from the hair (or silk cloth) and adhere to the comb.

More about Static electricity

Atoms contains electrons and protons. If these are separated a charge results. This charge can be positive or negative. Some materials can be given an electric charge – Extra electrons produce negative charge, too few electrons produce a positive charge.

Unlike charges attract

Like charges repel

The atom is uncharged if the number of protons equal the number of electrons.

If you rub two materials together, it is possible that electrons might be rubbed off one and on to an other. The electrons and protons in each material are no longer balanced. One material has extra electrons and the other is missing some electrons. The materials become charged.

The Greeks discovered this in the 6th century BC when a piece of Amber is rubbed it becomes charged. It attracts small pieces of paper. The Greek word amber is electron. Now we call the charge **Static** (Stationary) **electricity.**

If a polythene or amber rod is rubbed with a piece of cloth, electrons are transferred from the cloth to the rod. The rod now has extra electrons. Electrons have negative charge. The cloth now has too few electrons and too many protons. Protons have a positive charge. So the cloth has an overall positive charge.

Rubbing the rod has not produced the charge. The energy produced in rubbing has only separated the positive and negative charges already in the atoms.

Lightning is a violent discharge of static electricity. Some buildings have a pointed lightning conductor on the top which is connected to the ground by a thick copper strip. The charged cloud attracts an opposite charge to the point. Charge is transferred at the point. This helps to reduce the chance of a strike. If lightning does strike, it passes down the strip and not through the building.

In a lightning g a static charge builds up in the thunder clouds. It is discharged to the ground often through a large building or a tree. A lightning flash usually consists of several static charges discharges one after the other. The temperature inside a flash can be 30,000° C.

Discover for yourself

1. Find out how tall buildings in your Community are protected against lightning.

2. Find examples of static electricity in your environment. Keep a list of places where you observed the phenomena and explain the conditions that caused the discharge to be generated.

CHAPTER 14

ENERGY AND ENERGY SOURCES

Concepts :

1. Energy is the ability to do work.
2. Work and energy are like two faces of the same coin.
3. Heat, light and sound are three forms of energy.
4. Muscular energy, solar energy, wind energy, hydroelectric energy, thermal energy, chemical energy, electric energy and nuclear energy are some other forms of energy.

Objectives :

1. To recognize that energy is needed to do work.
2. To recognize that food is the main source of energy for animals and humans.
3. To recognize the form of energy associated with a work.
4. To recall the sources of energy.

Introduction :

Teacher asks the following questions.

1. If you don't get food for two days, what will happen ?
2. Will you be able to do the work then?
3. Will the bulb glow when there is no electric current ?
4. If a plate is covered on boiling water in a vessel, what happens?
5. List out the forms of energy known to you.
6. Which animal is used to transport heavy loads ?
7. To get hot water for bathing which fuel do you use at home?
8. Name any two waterfalls you have heard or seen.
9. Have you played with kites? What is the principle used?
10. What is the source of energy for a flour mill ?
11. Give examples for conversion of one form of energy into another.

Scope in Daily Life :

The various forms of energy needed to perform various works can be recalled. Also, these energy sources may be identified. The conversion of one form of energy into another is accounted for. The need for increasing use of non conventional (renewable) sources of energy is stressed.

Teaching Learning Activities :

In addition to the textbook activities, the following can be added.

1. Pressure cooker whistle blowing
2. Rotation of paper wheel
3. Lifting of weights by hands
4. Solar water heater picture demonstrated.
5. Picture of hydro-electric station.
6. To discuss the working principle of automobile fuels.
7. Radio, toys, etc. that work on batteries.

In the above examples, the conversion of energy from one form to another can be recognized.

The following activities may help the students to understand the conversion of one form of energy into another.

1. Lighting of an electric lamp
2. Playing in a tape recorder
3. Movement of automobiles
4. Working of boiler, pressure cooker, etc.

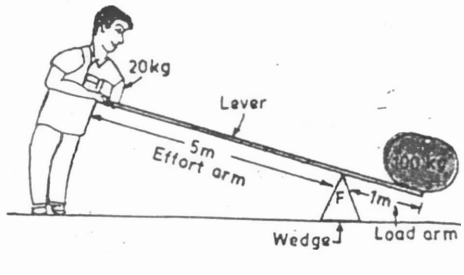
Evaluation :

1. Give four instances which prove that heat is a form of energy.
2. Write four examples to show that energy can be converted from one form to another.
3. Identify the place/s in Karnataka having atomic power stations.

For Teachers :

1. Everyone has a hidden energy in him/her.
2. Earlier people were using muscular energy for doing most of the work. See the picture.

Man soon found that the energy of his muscles alone was not sufficient to do all the work. In order to increase his capacity to do work, he started using domesticated animals like ox, camels and horse to do the harder jobs. The energy obtained from the muscles of an animal is much more than that of a man. So with the help of animals, man could do much more heavy work than done alone.



Man soon found that doing hard physical work like lifting heavy load was not an easy job for the muscles. By lifting heavy loads frequently, his muscles started aching and he started disliking hard physical work. And in an effort to decrease the burden of hard work, man discovered the use of simple machines. So, slowly man started using many machines. In fact, the present day can be called Machine Age.

3. **Information regarding Solar Energy**

Sun is the primary source of energy for life on earth. Solar energy is enormous, perennial and no-cost. Wind, tides, coal, petroleum and gas also indirectly get the help of sun. Man depends on plants for food. So even man depends upon sun. Solar energy is used in the following :

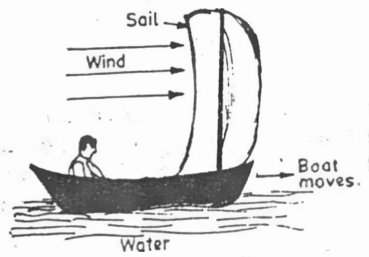
Solar cooker, solar lamps, solar calculators, etc.

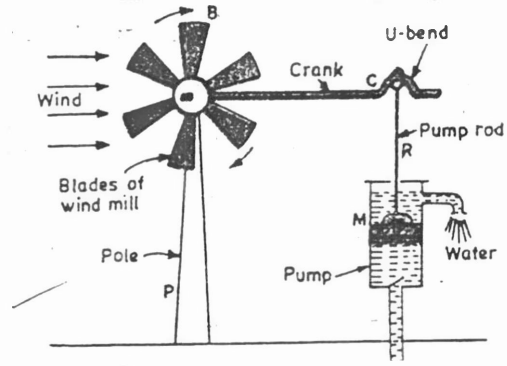
Wind Energy :

A sail boat is just a simple machine to use the energy of wind for moving.

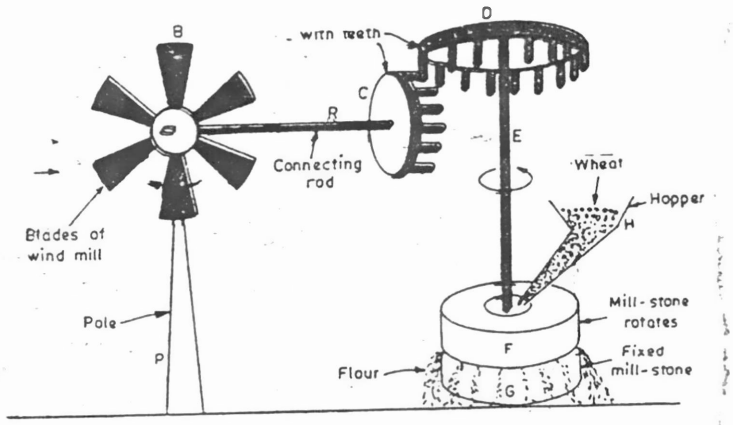
Uses of Wind Energy :

1. The energy of wind is used to propel the sail-boats in rivers and sea to transport men and materials from one place to another.
2. The energy of wind is used through windmills to run pumps to draw water from the ground.
3. The energy of wind is used to run flour-mills to grind the grains like wheat and corn into flour.





4. These days, wind energy is being used to generate electricity. This is done as follows. The wind rotates the wind-mill blades. When the blades rotate, they turn the coil of an electric generator to produce electricity.



Energy stored in matter is chemical energy. Coal, gasoline and all other fuels have energy stored in them. When fuel is burnt, this energy is released during the chemical change. Chemical energy stored in the dry cell can be changed to electrical energy. For all the life processes, living beings get their energy from the food they eat.

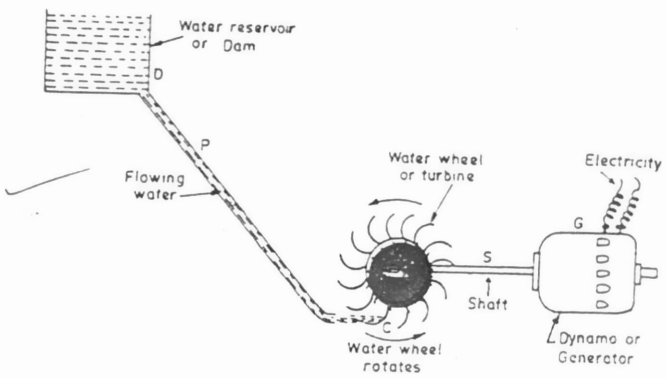
Chemical energy may be converted into heat, light and sound energy.

For example,

1. lighting of crackers
2. when quick lime is put in water, it produces heat.

Electricity

Electricity is generated from water, coal and atomic energy. Following is the hydroelectric project.

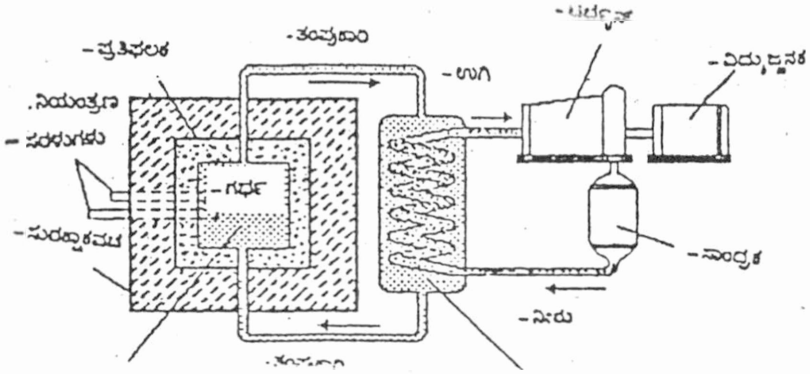


Production of Electricity from Thermal Power

Now, Thermal Power projects are more than hydroelectric projects. We have one at Raichur in Karnataka. They produce steam by burning coal. This steam is then used to turn the turbines and generate electricity.

Atomic Energy

As a result of some nuclear reactions, enormous energy is released. This energy is used in boiling water and finally produces electricity.



We have atomic power plants at Tarapur (near Mumbai, Kota (in Rajasthan), Kalpakkam (Tamil Nadu) and Karawar (Karnataka).

To meet the ever increasing demand for fuels, atomic energy is coming up as an alternate sources of energy. Putting atomic energy for peaceful purposes was one of the most significant contributions of science to humanity.

Uranium is an (mineral) element found in the earth. When Uranium (^{235}U) is bombarded with fast moving neutrons, enormous energy is released in fraction of seconds.

$$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{142}_{56}Ba + ^{91}_{36}Kr + 3\,^{1}_{0}n + energy$$

Uranium Neutron Barium Krypton

Uranium comes chiefly from Jaduguda in Bihar. It is processed in Nuclear fuels complex at Hyderabad.

Fuels

Concepts:

1. Fuels are sources of energy.
2. Fuels can be solids, liquids or gases.
3. Fuels have to be used but not wasted.

4. A good fuel is one which can give maximum heat without giving ash and smoke.

Objectives:

1. To recognize the organic compounds present in living beings.
2. To recognize the fuels used in daily life.
3. To cite examples for fuels in three states of matter.
4. To classify fuels into renewable and non-renewables.
5. To recognize the need to save fuels.

Introduction/Motivation:

1. Teacher asks the students to list down the various fuels used at home for cooking and boiling water.
2. To list out the various fuels used in various automotives.
3. What is the source of these fuels?
4. Classify fuels into solid, liquid and gases fuels.
5. Teacher should encourage the se of gas (cooking) in preference to firewood. Burning of plastic, rubber and paper to be discouraged.

Student responses:

1. To know the two sources of energy/fuels.
2. To be able to discriminate between the use and misuse of fuels.

Evaluation:

1. Why rubber, plastic and paper burning is not desirable ?
2. How do you show that wood contains carbon ?
3. What is the contribution of Cow/buffalo to the fuels ?
4. Which fuel is used to cook fast ?

   What are the different ways in which you can conserve electricity ?

Scope in daily life:

The importance of fuels in our daily life to be highlighted. The need for conservation of fuels and prevention of wastage to be stressed. Fuels which may be harmful to the environment have to be discontinued or minimized.

Teaching learning activities:

1. To show the formation of lampblack by holding a plate to a candle flame.
2. To familiarize electrical goods.
3. To test out various steps that can be taken to reduce current bill.
4. To list out the fuels which will not cause environmental pollution.

Energy Sources:

They are of two types (1) renewable and (2) non-renewable.

Renewable sources are those which get replenished by nature as and when they are used up. Ex. Solar, geothermal energies.

Non renewable sources include fossil fuel, like coal, petroleum etc which are not replaced easily as and when they are used up. This is because it takes hundreds and thousands of years for fossils to form. They are formed from the remains of plants, and animals buried deeply in the earth's crust. These fossils consist of hydrocarbons which can produce large amount of energy combustion.

Coal: Coal mines are storehouses of energy. It is formed by the decay of plants deep inside the earth fork millions of years. Coal mine are mainly found in Bihar, Madhya Pradesh, Orissa and West Bengal. Coal chiefly consists of Hydrogen, oxygen, carbon and sulphur.

Petroleum: Petroleum is formed by the decay of sea organisms. Deep under the sea, due to high pressure and temperature these dead organisms are converted into hydrocarbons. The mixture of hydrocarbon in the liquid form rises up through the pores till it is obstructed by rocks, and gets trapped there. Petroleum is then mined out from these places.

Petrol and diesel are the fractions obtained from fractional distillation of petroleum.

Natural Gas:

This is also called marble gas since it is found in marbly places. It mainly consists of Methane, hydrogen and to small extent Ethane, propane and butane gases. Natural gas is obtained as a by-product of petroleum mining. Exclusive natural gas wells are also there. In Tripura, Jaisalmer, Mumbai sea coast and Krishna Godavari belt natural gas have been identified.

Rocket fuels:

The fuel contains a combustible substances and supporter pf combustion. A fuel may be in solid or liquid state but capable of becoming vapour readily.

CHAPTER-15

NATURAL RESOURCES

1. Concept:

1 The essential things that are commonly available in nature are called natural resources.

2. Natural resources are clarified in to three groups based on their locations.

   a) Resources in the earth
   b) Resources in ocean
   c) Resources on the earth

3 There are two types of natural resources

   - Renewable resources and
   - Non Renewable resources

4 In the Eco system every life is dependent on some or the other life forms, for their survival. There is an inter relationship among all the resources.

II Objectives:

To enable the student:-

- To make them understand & appreciate that natural resources are the gift of nature.
- Make them understand about the natural interaction among the resources.
- Know about importance of renewable and non-renewable resources.
- Create awareness about the availability of the resources.
- Use the natural resources with discretion.

III **Introduction :**

(a) ***Motivation:***

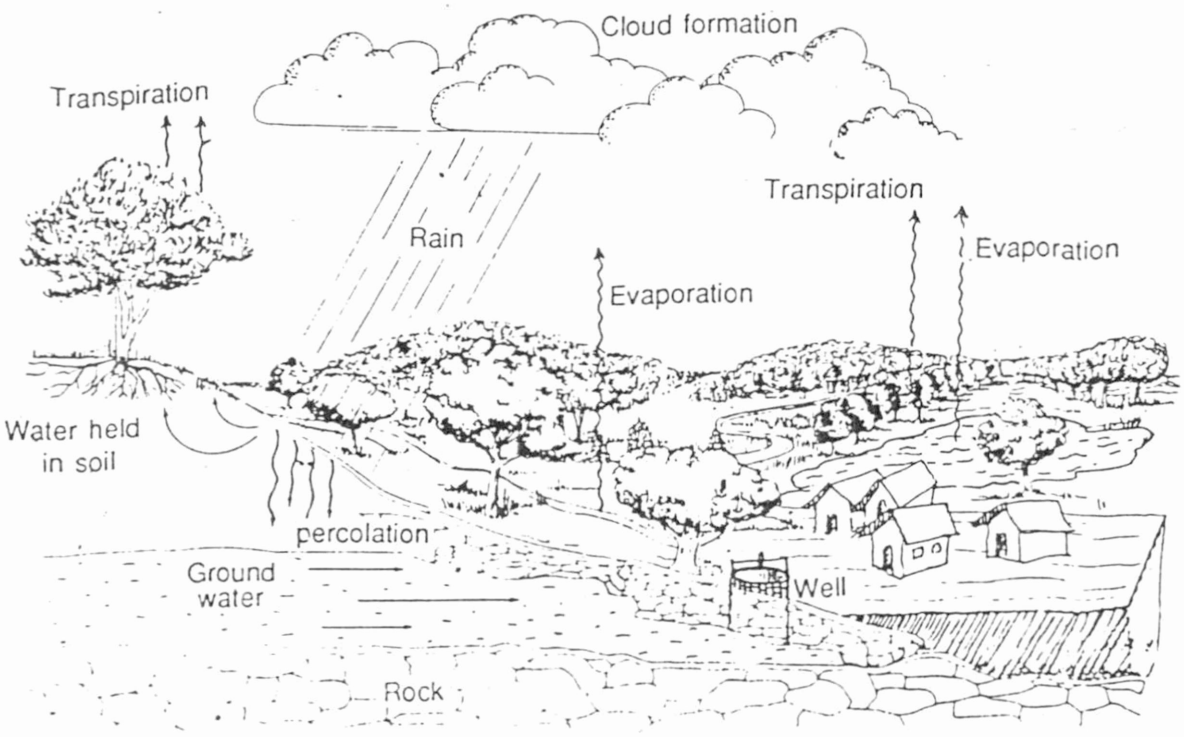
- List the natural resources around your school.
- Visit a near by lake or an our agricultural farm and list the natural resources there.
- Classify them as man made resources and natural resources.

(b) ***Scope in daily life***

- The child understands the importance of natural resources in his daily life.
- The child learns to conserve natural resources.
- Create awareness about the loss due to improper use of natural resources.
- The child will learn the proper use of water and electricity.
- The child learn to recycle the things. Ex: Use plant waste to produce manure.
- He learns to use resources like water, gas, Electricity judiciously.

Teaching Learning Activities

- Explain about water cycle in nature
- Taking students to a near by pond, farm or forest and ask them to list down the things they see there.
- Giving an assignment on natural resources.
- Discussing about the importance of natural resources.
- Teacher explains with diagram about the working of water cycle.
- Explain about the importance of the photo synthesis.



Photosynthesis is process of preparing food by the green plants in presence of the sunlight using water, carbon dioxide, chlorophyll and Mineral salts as raw materials and releasing oxygen as a by-product:"

Activity:

Food chain:

Grass → Producers

↓

Grass hopper → consumer I level

↓

Frog → - do- II level

↓

Snake → -do- III level

↓

Eagle → -do- IV level

Grass —— Producer

↓

deer —— Consumer I

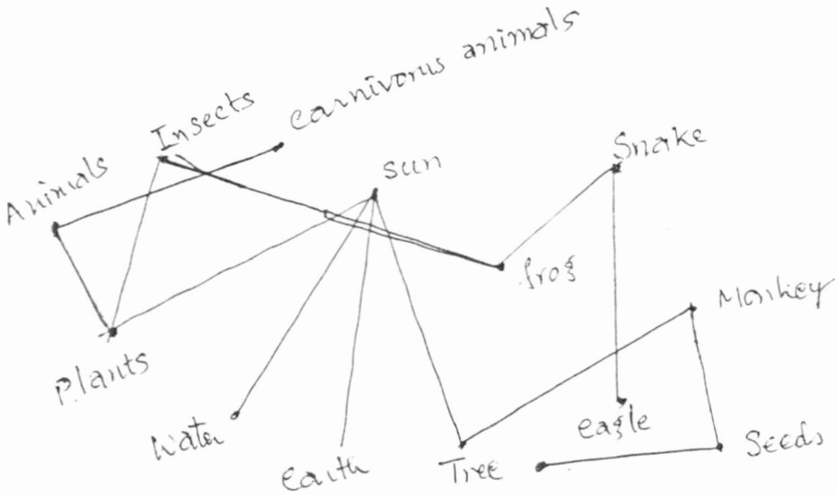
↓

tiger —— Consumer – II

- Teacher explains about the inter-dependence resource in nature creates balance.
- All resources in nature are interdependent any variation in one resource brings changes in others.

Activity: Play a role of interdependence of natural resource by children and make a web life.

- Distribution of sunlight among natural resources
- Water dependant of natural resources
- Illustrating about the imbalance



Group Activity

Distribute different word cards/flash cards to the children.(about 15 to 20 children), named with natural resources. Connect each other in the form of web using woolen thread. Ask any one of the student in the web to drop the thread. Now we can observe that the balance of life web is disturbed. It creates an imbalance condition. This activity shows how all the resources in the nature are inter dependant.

Student Response:

- Identify the natural resources around them.
- Classify the types of resources and recognize the limitations of renewable resource and non renewable resources.
- Appreciate the contribution of nature in man's life.
- To understand the concept of interdependence among the resource
- He learns not to waste our natural resources but to protect and preserve

Evaluation:

1 Classify the following in to natural resources and man made resources. Mountain, telephone, River, car, boat, scooter, tree, cow. However fish, birds train.

2 Classify the following in to renewable and non renewable resources. Water, forests, soil, solar energy, wind energy, Petrol, diesel, kerosene, coal

3 Pick the odd one out:
Light, water, petrol, air.
Deer, elephant, rabbit, tiger
Fish, tortoise, crocodile, elephant.

4 Distinguish between
   a) Herbivores animals and carnivorous animals .
   b) Renewable resources and non renewable resources
   c) Natural resources and man made resources.

EXTRA INFORMATION

Food Chain and Food webs

All food chains and food webs start with solar energy being captured by green plants. The plants are called producers since they create useable food for the other life forms.

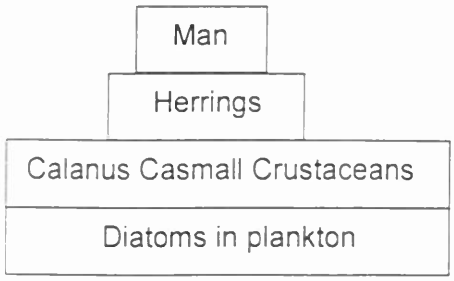
All animals obtain their food by taking in complex materials and breaking them down by the process of digestion in to simpler substances that can be absorbed by the body some animals, herbivore? Such as rabbits or elephants do this by eatings plants, and others carnivores like lions, seals or wolves, by eating other animals, the diet of some species like badgers or man includes both plants and animals. All animals however derive their food either directly or indirectly from plants , carnivorous animals feed on other animals, which themselves may feed on smaller animals, but sooner or later in such a series we always come to an animal which feeds on vegetation. For example, pike eats perch, perch eats stickleback which feeds on water fleas; the water fleas feed on microscopic plants in the pond. This kind of relationship is called a food chain. The basic of food chains on land is vegetation in general, but particularly grass and other leaves. In water the basic is the phytoplankton, the millions of microscopic plants living on the surface of the sea, ponds and lakes. These need only the water around them, carbon dioxide, salts dissolved in it and sunlight to make all the constituents of their cells.

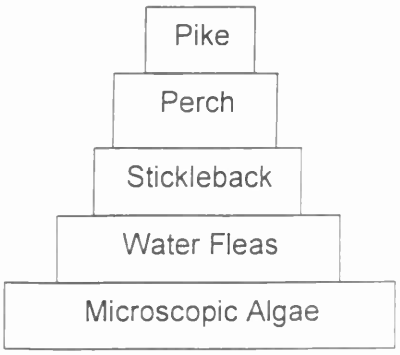
Feeding on these microscopic plants are tiny animals zooplankton such as water fleas and other crustacea and the larvae of many kinds of animals. The small animals of the zooplankton are eaten by surface feeding fish such as herring the herring in turn forms part of the diet of man.

In reality, food " chains " are less straight forward than they might appear. Since an animal especially if it is a predator, does not live exclusively on one type of food. A weasel, for example, eats rats, rabbits, birds and other

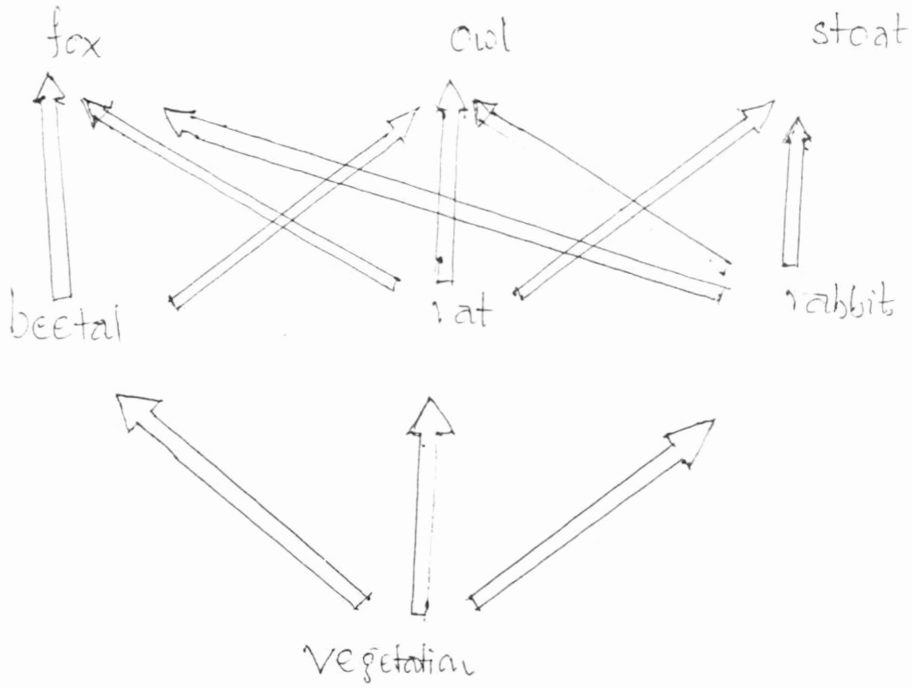
creatures, according to the availability of food at any one time. Similarly and particular species may be preyed on by several different kinds of predator.

Example of food chains





A food Web



This more complex relationship can be shown as " food web" on such is shown in a food web. But even this presents a very over simplified and generalized picture. It is important to realize also that the links in a food chain do not all involve similar numbers of individuals. The crustaceans which feed on the phytoplankton although also microscopic are much larger than the diatoms and each of these small animals eats a great number of diatoms during its lifetime. The herring which eat the zooplankton are larger still, and far less numerous finally large numbers of herring are needed to feed one man.

These numerical relationship are a consequence of the loses involved in the transfer of energy and matter at each stage of a food chain. Most of the food eaten by an animal is either used for its own energy needs or is lost to the body because it has not been wholly digested and absorbed in general only about 10% by weight of its food is covered in to new living material that can be eaten by another animal.

This is why a large mass of living organisms at the beginning of a food chain will support only a small number of carnivorous animals at the end.

CHAPTER 16

RESOURCE MANAGEMENT AND UTILISATION

I. Concept

1. Animals living in forest are called wild animals.
2. A protected reserve forest where wild animals and birds can move freely in a sanctuary.
3. Every act of man in the name of development leads to destruction of wild life.
4. Use of alternate source of energy is a must to minimize the use of limited resource.
5. Solar energy, wind energy and tidal energy are some alternate sources of energy.
6. Wastage of water can be reduced by reuse.
7. Waste material can be recycled.
8. Nature pollution causes money problems.

II. Objectives

To enable the student –

- to understand about the natural resources and types of natural resources.
- to know that it is our responsibility to protect wild life.
- To know about the steps taken by the Govt. to protect wildlife.
- To understand the role of Government and people in conserving our resources.
- To list the main bird sanctuaries in our State.
- Create awareness about the imbalance condition caused due to improper usage or natural resources.
- To understand harms caused by deforestation.
- To know about the different types of pollutions and how we can protect from pollution.

- To make them understand about the importance of recycle of waste materials.

III. Introduction

- Visit a nearby lake, garden, field to make list of things they see there.
- Ask them to note down all the new things and natural resources that they see around them.
- Let them read out the things that are seen around.
- Teacher asks children to bring electricity bills. Let them observe and discuss about how can we reduce electric bill (by using sunlight, natural air) by proper use of electricity.
- Asks how much of water they consume everyday and discuss the steps taken to control washing water.

Scope in Daily Life :

- Students will realize that they should not waste water, electricity unnecessarily.
- He develops the skill of planting trees and come to know the importance of planting tree.
- Help in situations to dispose and recycle of waste materials.
- Reason out the need to conserve drinking water resources.
- He should switch off the light, fans and other appliances when he does not need them.

IV. Teaching-learning Activities:

- Prepare a plan to go to places like forest, river, garden or zoo. The teacher must have essential knowledge of the places which students will have to visit.
- Prepare a list of what information they should collect and brief them about what they should do, when they visit the new place.
- Ask them to note down all the new things that they see around (insects, birds, worms, stones, sand, mica, etc.)

- Teacher describes about the forest, forest products and wildlife.
  - Forests are very important and useful to us. They give us timber, fuel, pulp, resin, gum, cane, herbs and many other useful things.
  - Forests protect the soil from being eroded, keep the air clean, attract rain and provide shelter to the wildlife.
- Teacher explains to conserve and protect our wildlife and Chipko movement and arrange a visit to a forest or wildlife sanctuary/bird sanctuary.
- Arrange *Vanamanothsava* in school every year. At least one plant should be planted by one student in a year.
- Explains about the importance of alternate sources of energy. For example, we can run a flour mill using electricity, petrol or diesel. To conserve these forms of energy, we can run the same flour mill using water or energy.
- Teacher tells about the production and uses of wind energy.
- The morning air has energy and this energy can be used for rotating the blade or windmill. It is used for running a wheat grinding machine, pumping out water and generating electricity.
- Teacher takes the children to nearby pond, tank or river and ask them to observe the causes of pollution by humans, cattles, industries, etc.
- Asks to think how to protect water pollution and also create awareness.
- Asks them to list out the reasons for air pollution.
- Safety measures are taken to preserve natural resources. Air, water and soil are the most precious resources. Caution and care need to be taken to preserve and utilize them so that the next generation of human being live in clean and safe environment.
- Describe about recycle waste material.

  Teacher asks student to collect waste materials like fruit, vegetables, spoilt food, vegetable skin, fruit skin, ash (these things can be used to prepare compost manure in the farms).
- Asks them to use all these things and prepare compost manure. Use it in their farm.

Evaluation

1. What do we get from forest ?
2. How can we protect our wildlife?
3. Name six useful things which we get from forest ?
4. Name three trees which grow in forest.
5. Study the map and find the names of national parks and sanctuaries in India.
6. How is water useful in our daily life ?

For Teachers

Wildlife : The Sunderbans in West Bengal are the home of the famous Bengal tiger. The Gir Forests in Gujarat are famous for Asiatic lion. The rich wildlife of India needs protection, to preserve the wildlife. Our Government has developed a number of zoos, national parks and wildlife sanctuaries in the sanctuaries and national parks. Nobody is allowed to cut down any tree or kill any animal. Some of the well known national parks and wildlife sanctuaries are the Corbett National Park in Uttaranchal, the Kaziranga National Park in Assam, Gir Sanctuaries in Gujarat and Periyar in Kerala.

Water Resource : Water is one of the most precious resource and is also our commonest and cheapest resource. Water conservation involves the protection and extension of watershed areas. Construction of dams and reservoirs, improved industrial practices in relation to water usage and elimination of waste (Recently the de-salting of sea water has been studied as a possible solution of the fresh water problem).

Alternate Sources of Energy

The energy given by the sun in one hour is equal to the energy used on the earth during one year. The question arises : Why are we using coal and petroleum? Even though a large amount of the sun's energy is falling on the earth. It is very much diffused. In order to use sun's energy, we have to collect and concentrate it. The plants collect and store sun's energy for millions of years.

CHAPTER 17

SOIL EROSION AND CONSERVATION

I. Concepts :

1. All living things depend on soil. It is valuable natural resource.
2. Heavy rain, running water and wind leads to soil erosion.
3. Proper agriculture practices, less of urbanisation and afforestation increase soil conservation.
4. The measures undertaken to prevent soil erosion are called soil conservation.
5. Improper agriculture practices, urbanisation and deforestation leads to soil erosion.

II. Objectives:

To enable the student

- to understand that soil is a valuable natural resource.
- To understand different measures taken to conserve soil.
- To encourage them to appreciate the importance of soil.
- To reason out the causes for soil erosion.
- To differentiate between various types of soil.

III. Introduction:

Motivation

1. Take the children outside and ask them to collect different types of soil.
2. Ask them to separate different varieties and name them.

Scope in daily life

- Students recognize the importance of soil and appreciate the gift of nature.
- Population explosion causes deforestation and deforestation causes soil erosion.

IV. Teaching-learning Activities

Through different activities, teacher explains about soil erosion and conservation.

Activity 1 : Go out into the garden or the play ground. Using soil, make a model of hills and a river valley. Pour water over the model from a watering can. Imagine it is raining over the model. What happens to the hill slopes of the model? When it rains, the top soil from hills washes down to the rivers and plains. The running water carries the rich soil and deposits it in the river bed. This results in the massing of this rich soil in the river bed. This is called silting. During heavy rains, the rivers also get flooded and the running water carries the top soil from one place to another. This soil is very rich in humus and therefore, is good for plants.

Activity 2: Place a piece of paper on the floor. Place some sand on the paper. Blow air over the sand. Observe what happens. It is deposited elsewhere as a heap. Now blow air from other directions. The sand heaps shift. In the same way, strong winds blow the top soil from one place to another, especially when the sand is not covered with grass, other plants and trees i.e. vegetation. This removal of top soil by water and wind is called erosion.

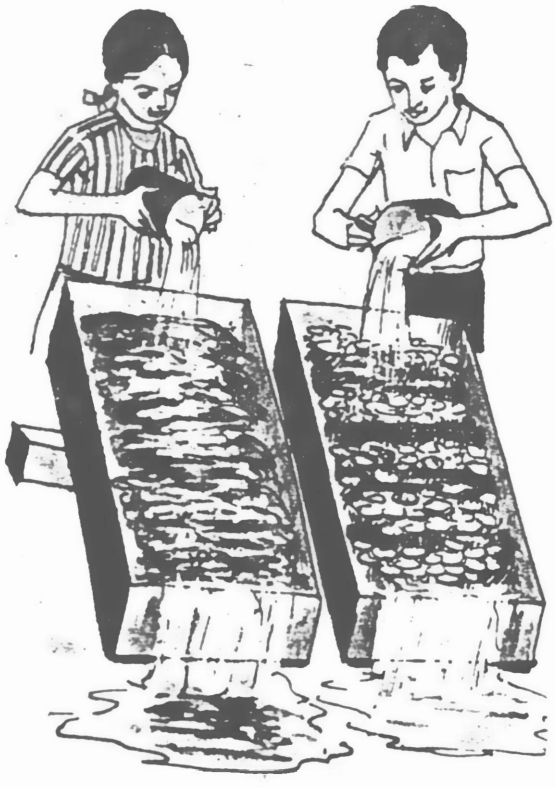
Activity 3 :

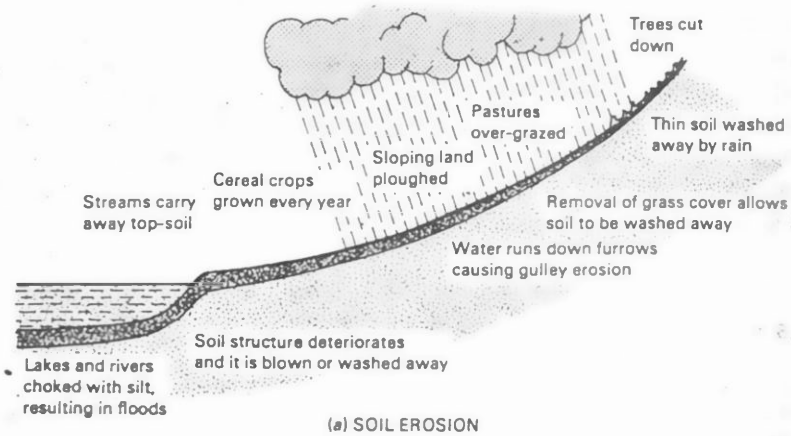
How can we stop the erosion of soil? Fill two boxes with soil. Take some grass plants from a field. It is best to dig them up along with some soil. Plant them as they are in one box. Tilt the boxes, water both the boxes as shown. Observe what happens?

Grass, shrubs, other plants and trees protect the top soil from the rains, running water and wind. When trees are cut down, the top soil is exposed. It gets easily washed away by water. It is also blown away by winds. Therefore, we should stop indiscriminate cutting of trees and thus help protect our forests.

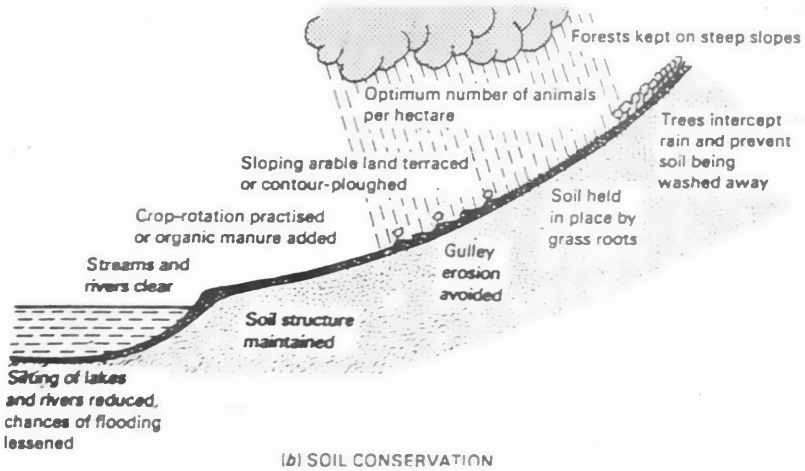
Activity 4 :

Fill two boxes with soil. Tilt them as shown. Collect some small stones. In one of the boxes use these stones to make steps as shown here (terraces). Pour water gently on the soil or both boxes. Observe what happens to the soil in each box.





(a) SOIL EROSION



(b) SOIL CONSERVATION

V. Evaluation

1. Observe in your locality the areas where there is soil erosion. Suggest ways in which it can be prevented.
2. Display the chart, containing different types of soil and ask the students to identify.
3. Silt from the tanks should be removed from time to time. Give reason.

For Teachers

Soil conservation :

Grazing animals such as cattle, sheep, goat, etc. eat grass. When these animals graze on the same piece of land year after year. The grass cover gets destroyed. To avoid this, such animals should not be allowed to graze in the same field continuously for a long time.

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