

Science

Class VII



Rajasthan State Institute of Educational Research and Training, Udaipur



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Foreword

The Changes in scenario of the Society and the nation entail the changes in the system of education which determine and accelerate the process of development in them. Education, beside other factors, is an important factor, responsible for the development of the society and the nation. To make School education, effective, useful and interesting, the changes in the curriculum from time to time is an essential step. The national curriculum framework, 2005 and the Free and Compulsory Child Education Right Act, 2009 in the present time make it evident that a child occupies a pivotal place in all the teaching-learning activities, conducted in any educational institution. Keeping this view in mind, our process of causing learning amongst the students should be such that they construct knowledge on their own on the basis of the knowledge acquired through their experiences. A child should be allowed maximum freedom in the process of learning and for that – teacher should act as a guide and helper rather than a preacher. To make the curriculum easily accessible to children/students, a text book is an important means. That is why the government of Rajasthan has got the new text book written by making necessary changes in them in the light of the changes made the curriculum.

While writing a text book it has been kept in view that the text book should be easy and comprehensible, with the help of simple language and interesting and attractive with the inclusion of pictures and varied activities through which the learners may not only imbibe the knowledge and information, contained in them but also associate themselves with the social, neighborhood and local environment along with the development of and adherence to the knowledge about historical, cultural glory and constitutional values of the country so as to establish themselves as sincere, good and worthy citizens of our country, India.

I very humbly request the teachers that they should not only confine themselves to the completion of the teaching of the text book but also to present it in such a manner that a child gets ample opportunities of learning and accomplishing the objectives of teaching-learning on the basis of the curriculum and his/her experiences.

The state Institute of Educational Research and Training (SIERT), Udaipur acknowledges its thankfulness to all those government and private institutions viz. National Council of Educational Research and Training, New Delhi, State and National Census Departments, Ahad Museum, Udaipur. Directorate of Public Relations, Jaipur, Rajasthan, Rajasthan Text



Book Board, Jaipur, Vidya Bharati, All India Educational Institute, Jaipur, Vidya Bhawan Reference Library, Udaipur, different writers, newspapers and magazines, publishers and websites that have cooperated with us in choosing and making the required material available for writing and developing the text book.

Inspite of best efforts, if the name of any writer, publisher, institution, organization and website has not been included here, we apologize for that and extend our thankfulness to them. In this connection, their names will be incorporated in the next editions of this book in future. It (SIERT) also extends thanks to Mr. Damodar Lal Kabra, Retd. Principal, Chittorgarh for cooperation with us in the translation work of this book.

To enhance the quality of the text books, we have received timely guidance and precious suggestions from Shri Kunji Lal Meena Secretary, Elementary Education, Govt. of Rajasthan, Shri Naresh Pal Gangwar Secretary, Secondary Education Govt. of Rajasthan, and Commissioner National Secondary Education Council, Shri Suwa Lal Meena, Director Secondary Education, Govt. of Rajasthan, Shri Babulal Meena, Director Elementary Education, Govt. of Rajasthan and Shri B.L. Jatawat, Commissioner Elementary Education, Govt. of Rajasthan Jaipur, and as such the institute (SIERT) expresses its heartiest gratefulness to all of them.

This book has been prepared with the financial and the technical support of UNICEF. In this connection we are grateful to Mr. Samuel M, Chief, UNICEF Jaipur, Sulgana Roy, Education Specialist and all the related officers of UNICEF for their timely support and cooperation. Besides them the institute appreciates the efforts of all those officers and other members of the staff who have directly or indirectly cooperated with us in accomplishing the task of book writing and publishing it.

I am highly delighted to submit this book to you all with this belief in mind that it will not only prove beneficial to the teachers and the students but also serve as an effective link in the teaching-learning process and the personality development of the students.

To value thoughts and suggestions is a specific feature of a democracy; therefore the SIERT, Udaipur will always welcome your precious thoughts and suggestions for improving the quality of this book and thus make it better in every respect.

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SIERT, Udaipur



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For the Teachers

National Curriculum Frame Work, 2005 has thrown new light on the construction of knowledge according to which analysing of one's own experiences, developing of one's own understanding about something/somebody and explaining the meaning of something is called knowledge. Reaching knowledge means to establish one's own dialogue with other explanations and standard knowledge and information.

The great educationist and thinker Gijubhai has said, “Learning is an art and methods / techniques of learning are its tools. Those teachers who have good and proper knowledge of using these tools become expert in the art of teaching-learning, though their speed in this process may be a bit slow. But those teachers who have not had any preparation for using this art remain far away from the art of teaching-learning.

Just as a text book helps explain things to students and establish coordination between other explanations. Similarly a teacher's job is not confined only to serve as a resource of doling out knowledge but to understand the process of knowledge construction in the children, boost it and give it a concrete shape. The N.C.F. 2005 and the principles of guidelines to the Right to Education Act, 2009 have been the main-stay of the process involved in writing this text book (of science). While writing this text book, the important points, facts and subject matter contained in N.C.F., 2005, new Delhi and the curriculum and the text books of other states have been included in it with reference to Rajasthan after careful study of them (the books, curriculum of other states).

The main and important topics and their subject contents have been written in the form of dialogues, based on the experiments (practical work) and activity method. The subject matter of science has been written and presented through varied activities viz observing, inquiring, classifying, analysing, synthesizing, discriminating, concluding and propounding, etc. which have been incorporated through different steps at proper places in the lessons so that the students may construct knowledge by accomplishing these tasks on their own. The teachers are therefore requested to provide the learners ample chances to complete those tasks during the teaching learning process. And for that they (teachers) should encourage them (learners). The teachers

should play the role of guides and help the learners form concepts about the subject. Efforts have been made to incorporate the facts and figures and points related to Rajasthan, India and the world in the subject matter of the lessons in the text book so that the learners may get acquainted with their local, neighbourhood environment, culture and values along with those of their country and the world

By means of this book efforts have been to foster among the learners the feelings of tolerance, equality, consciousness towards the protection of environment, care for good health and healthy nutrition and the inculcation of scientific altitude along with the development of sensitivity towards cleanliness, sanitation and healthy habits. It is expected of the teachers that they will instil and develop the above stated feelings and emotions and values in the learners so that they may become the cultured, capable, suitable and disciplined citizens who may take part actively in the development of the society , the state and the nation. All this entails on the teachers to have not only full subject knowledge but also to have the sense of responsibility and dedication towards their profession. It is only then the will be able to prove himself as a model teacher for the students.

Again it is expected of the teachers that they will teach the subject matter, in the newly written books, in the light of the above stated objectives with zeal, fervor and dedication, using the above mentioned techniques so that the learners may be grounded in quality and value oriented education and thereby they may grow as responsible, dutiful and hardworking students of the country.



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Chapter 1

Components of food

Points to be studied:

- 1.1 Food
- 1.2 Components of food
 - Carbohydrate
 - Protein
 - Fat
 - Vitamin
 - Minerals (Salts)
 - Water
 - Roughage
- 1.3 Balanced diet

1.1 Food :

When we get hungry, we take food items from plants and animals as a food. Our body gets energy from food which increases the working capacity of our body. This food is responsible for growth and development of our body. Which part of plants and animals we eat mainly in the form of food?

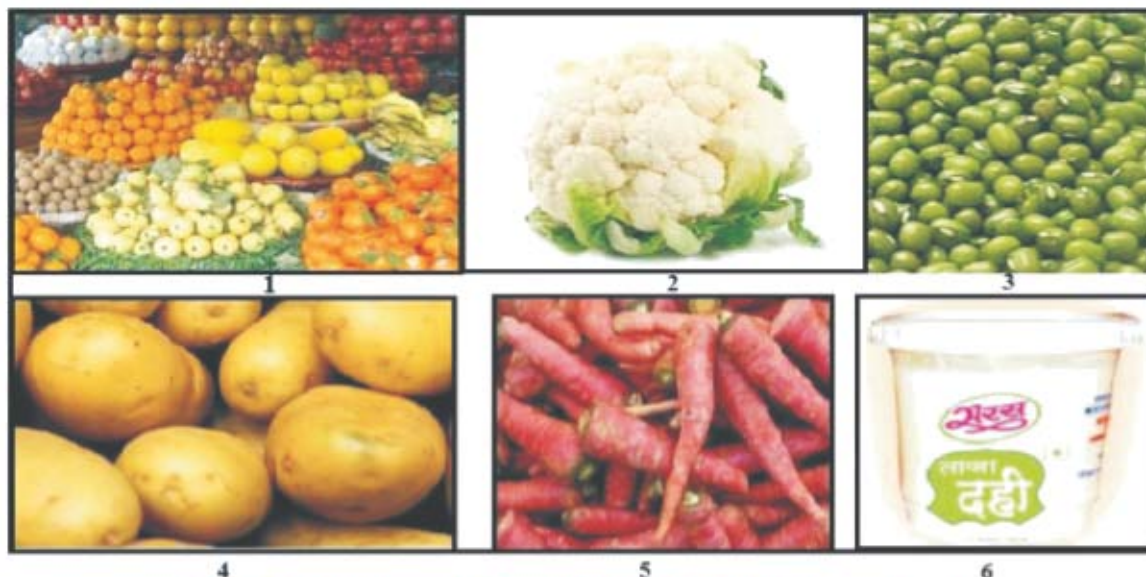


Fig 1.1: Main food material included in our food.



Food is beneficial to us in what ways?

Let us learn -

- Food Provides energy to do work.
- Food helps in growth, development and building of body.
- It also provides protection from diseases
- Nutrition Food develop physical as well as mental development sharp wit along with healthy body.
- Necessary for growth of body .
- Helpful in body building.

1.2 Components of food

The Ingredient of food which is beneficial for our body growth and development called as components of food.

What are those components of the food? Let's find out. The following are the main components of food:

- (I) Carbohydrate (II) Protein (III) Fat (IV) Vitamin
(V) Minerals (Salts) (VI) Water (VII) Roughage

Do all types of food component works alike?

Let's learn.

On the basis of works we can classify components of food as shown in Fig 1.2

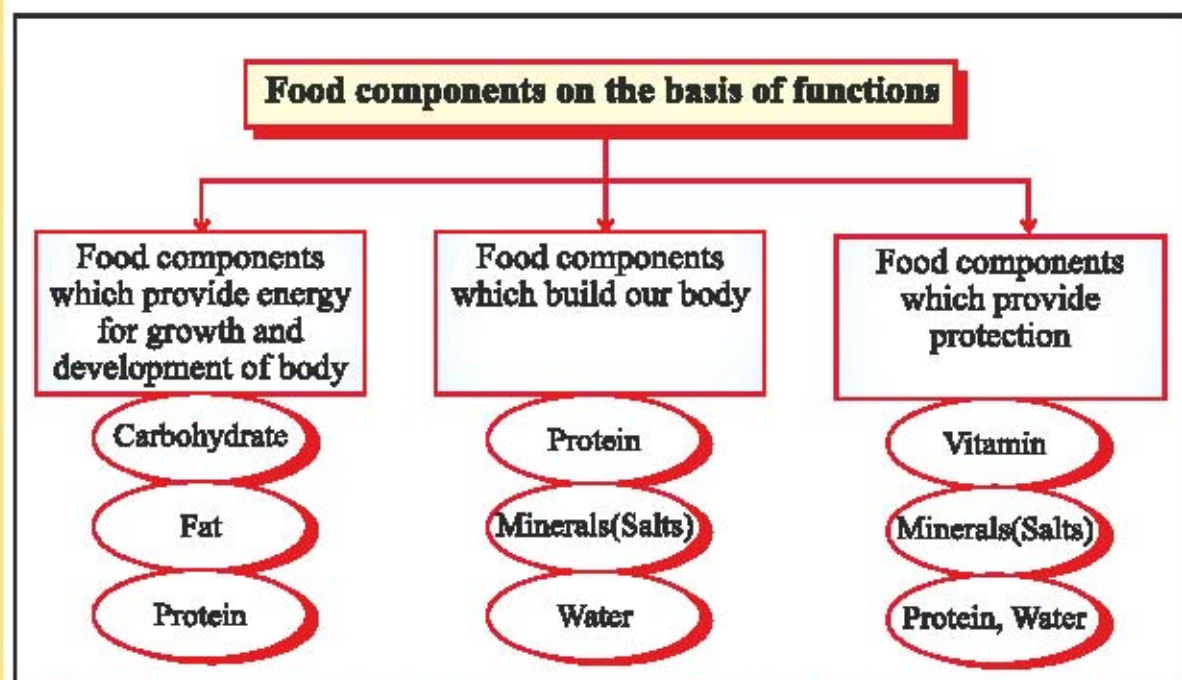


Fig. 1.2 Classification of components of food on the basis of functions

(I) Carbohydrate-

When we play, climb at an altitude, run or work hard, we get tired. Tell me why? Because when we do the hard work our bodies tend to spend the accumulated energy in more quantity. To get this energy instantly, we drink glucose solution. Glucose is a type of carbohydrate by which we get energy instantly.

Carbohydrates are the body's main source of energy and strength. It consists of carbon, hydrogen and oxygen elements. These elements are stored in body in the form of Glycogen. It decomposes by the process of respiration and release energy as needed. Carbohydrates are mainly of two types. Types of Carbohydrates and their sources are depicted in a figure 1.3.

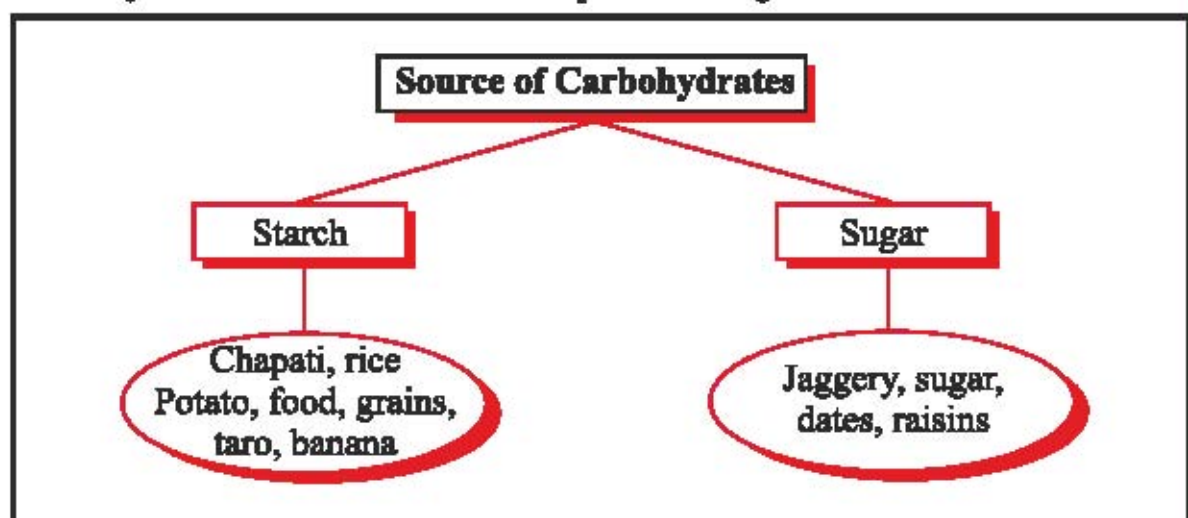


Fig 1.3 : carbohydrate - Type and sources



Fig.1.4 Source of carbohydrate in food

1gm of carbohydrate gives apporximatey 4 calory of energy

How much beneficial these Carbohydrate are for our body? Let's learn -

Functions of Carbohydrate -

- (i) Provide energy to body
- (ii) Control body temperature.
- (iii) Keep cells, Tissues & Body parts active.

Note : If carbohydrate is not included in our food we loose working capacity of our body.

Activity 1

Take two test tubes mark 1 and 2 on it. Take a boiled potato, prepare paste of it and put into a test tube No. 1. Add some water and shake the mixture. In test tube No. 2 add some plain water. Put down two drops of iodine solution in both the test tubes carefully, shake and observe. Tell me what is going to change? Test tube No. 1 potato mixed solution turns blue while test tube no. 2 containing plain water shows no change. Hence on the basis of this test we concluded that starch gives blue color by reacting with iodine solution. This is a starch test method.

(II) Protein-

Protein is necessary for biochemical reactions going on in cells and is essential for cell growth and repair. Body derives nitrogen from protein. They commonly consist of amino acids made by carbon, hydrogen and nitrogen elements. Sources of protein in our diet are as follows:

Source of protein in food -

Pulses, fish, egg, sprouted seeds, soybeans, leguminous vegetables, peas etc are the main sources of protein.

This protein is advantageous in which manner? Let's learn:



Eggs

Milk

Fig. 1.5 : Sources of animal protein



Soyabean

Pulses

Fig. 1.6 : Sources of Plant protein

Functions of protein -

- (i) Build the body.
- (ii) Growth and development of body.
- (iii) Provide mental strength.
- (iv) In construction of enzymes which help in food digestion.
- (v) Provide energy to body in the absence of fat and carbohydrates.
- (vi) They are helpful in cell division and repairing damage.
- (vii) Protein plays an important role as a enzymes in various biochemical reactions.

Special:

- (I) Our food contains ingredient of protein in proper amount than growth and development of body takes place properly.
- (II) Protein intake in childhood adolescence should do more.

Activity 2:

Let's do an experiment for the presence of protein in foods.

Take thick aqueous solution of gram flour in a clean test tube. Add two-three drops Copper Sulphate(CuSO_4) and ten to twelve drops of caustic soda shake well. After some time observe the test tube. What changes are visible on observation? We see that the color of the mixture turned purple.

Protein reacts with CuSO_4 & Caustic Soda than Converts into purple solution.

It proves that the protein component is present in flour.

(III) Fat-

The fats are organic compounds found in cells which are insoluble in water. These are esters of Glycerol. Fat is manufactured by Carbon, Oxygen and hydrogen elements. The energy is stored as fat in our body. Our body gets highest energy from fat. Fat as a solid called as 'Charbi' and as liquid, oily fats. It is smooth and called as body's energy Centers. Where fat comes from? Figure 1.7 helps us to know about the source and the type of fat: -

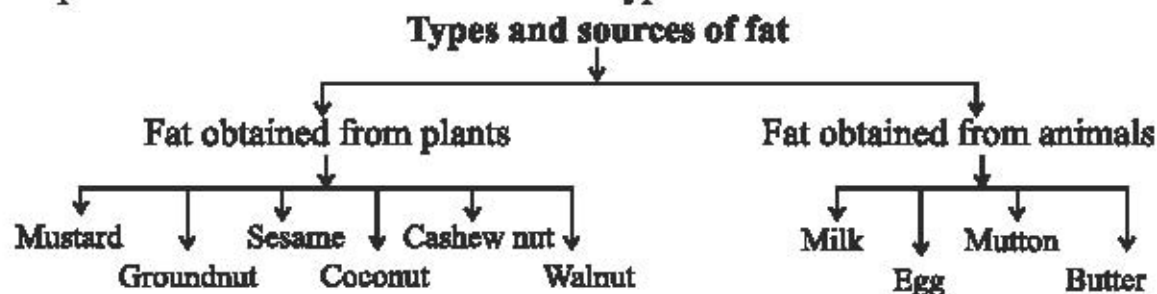


Fig 1.7 Types and sources of fat



So we can see that fats are obtained from both types of food, animals plants. How much beneficial these fats are for our body ? Let's learn -

Function of fat

- (i) Provide more energy to the body.
- (ii) Provide strength to Muscles.
- (iii) It makes a layer Under the skin
toned shape to body. Excess of fat
make the body unshaped
- (iv) Protect internal organs of the body
from external shocks.



Fig. 1.8 Major sources of fat in our food.

Special:-

- (1) Higher amounts of fat is accumulated in camel's hump, due to this the camel can live without food for many days.
- (2) Presently child uses junk food more. It increases obesity because it has high amount of fat.

Activity 3:

Take two white blank papers. Put small amount of butter on first paper and on another paper put 2-3 drops of water. Leave both the papers open for some time. Then observe it. What are visible? On the first paper oil spread more, and the paper has to be sleek as well became translucent when put across the sun. On the second paper water dried up and there are no change. This is a general method of test of fats. We concluded on the basis of that fat is smooth and oily.

(IV) Vitamin -

Such inorganic food material whose small amount is useful for growth and development of our body is called vitamins. It is not synthesized in animal body.

How vitamins are useful to our growth and development? Let's learn:

Function of vitamin:

- | | |
|---------------------------------|---|
| (i) For normal growth of body. | (ii) For normal appetite. |
| (iii) To keep the body healthy. | (iv) For maintaining digestion process. |
| (v) For enhancement of immunity | |

Special: 15 vitamins have been discovered till today in which 6 are major.



Fig 1.9 - Major Vitamins

Let us Come, get information with the help of following table 1.1

Table 1.1- Vitamins and their sources

S. No.	Name of Vitamin	Sources
1	Vitamin-A	Milk, green vegetables, carrot, papaya etc.
2	Vitamin-B	Milk, pulses, egg, soybean, fruits
3	Vitamin-C	Lemon, orange, gooseberry, tomato, guava
4	Vitamin-D	Milk, fish, egg, butter, sun rays
5	Vitamin-E	Milk, green vegetables, butter, Bran
6	Vitamin-K	Green vegetables, Jeera(Cumin), Soybean, Tomato

(V) Minerals

For proper growth, development and building of our body we must take certain amounts of minerals per day in a diet. The number of minerals that are found in our body is nearly 24 but main useful minerals are Calcium, Magnesium, Phosphorus, Iron, Copper, Potassium etc. Where do we get minerals? Let's get information: -

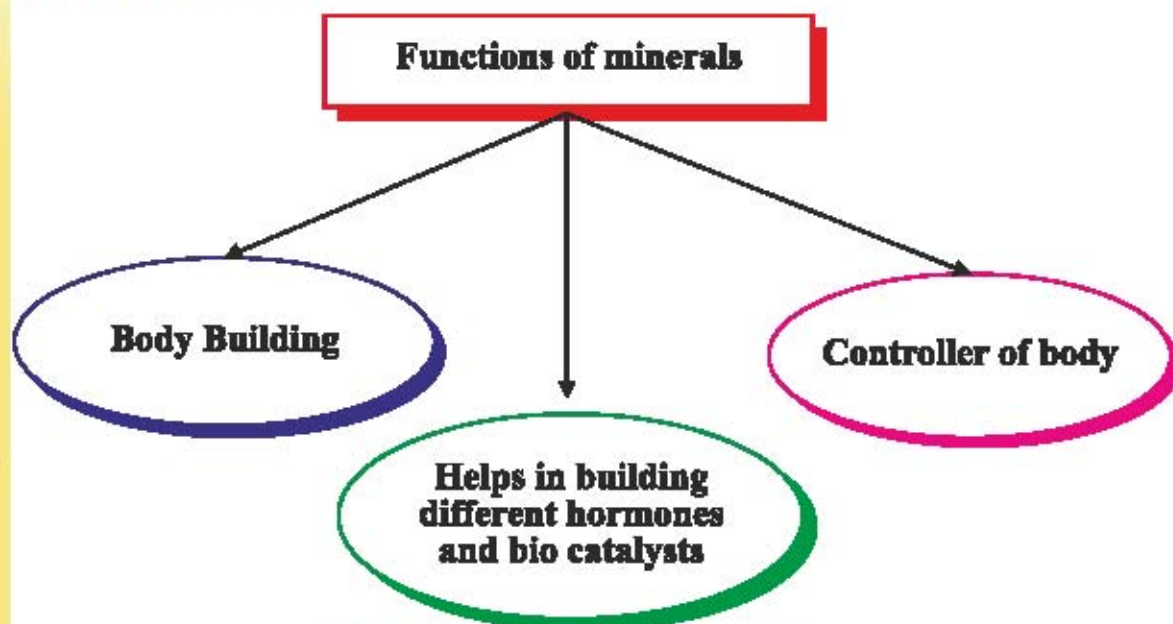
Source of minerals

Mineral salts are mainly received from milk, yogurt, green leafy vegetables, figs, fresh fruit, etc.



Fig 1.10 - Minerals in food



Functions of minerals**Fig 1.11 Functions of minerals****(VI) Water**

Water is very essential ingredient of our body. 70 percent of our body is water. Water acts as a solvent in the body and control the body temperature, may also protect us from many diseases.

Water helps to eliminates harmful substances present in our body. It consists of hydrogen (H_2) and Oxygen (O_2).

Do you know?

- The amount of water in various organs of the body also varies (for example in liver 69 % and in muscles 75%)
- The amount of water in our body is about 70 percent. We required 2-3 liters of water per day.
- In watermelon water is present up to 95%.

(VII) Roughage

A fibrous substance called cellulose is found in shelled corn, fruit, carrot, radish, spinach, okra, beans, cabbage, etc. which we consume in diet. These fibers are called as 'roughage'.

Roughage functions in our body as follows -

Function of Roughage :-

- (i) Roughage helps in the digestion of food.
- (ii) Food is not cling to intestine due to roughage.
- (iii) Roughage absorbs toxic substances and water produced during digestion.
- (iv) Roughage absorbs glucose from the body as a result of which blood sugar remains in controlled and there is a reduced risk of diabetes.

Fiber-rich foods enhance health

1. Fiber rich grains such as corn, beans, pulses etc must include in diet.
2. Eat fruits such as apple, pear and guava with peelings because they contain more fiber.
3. Radishes, cabbage, peas, cucumber, etc. have high amounts of fiber so we must take them.
4. Salads, oatmeal, nuts, peanuts are also good sources of fiber.
5. Please use flour instead of Maida(fine flour).
6. Eat brown rice and oats.

Activity 4 -

We are aware of the different types of food material that we receive as food. Information about the source of food materials and food components present in them is revised by filling Table No. 1.2 -

Table No. 1.2: The source of food materials and food components present in them

S.N.	Food name	Source of food		Component of food present
		Plants	Animal	
1	Rice	√	—	Carbohydrate
2				
3				
4				
5				
6				



This is evident from the table that in every food item, some food ingredient is present.

Disease caused by deficiency of nutritive elements -

Disease due to deficiency of nutritive elements or ingredients of food is called nutrition deficiency disease. Consumption of balanced diet can help in preventing these diseases.

Table 1.3: Various nutritional deficiency diseases and their symptoms

S.N.	Components of food	Deficiency caused disease	Symptoms of disease
1	Carbohydrate	Weakness	Decline in working capacity
2	Protein	Kwashiorkor	stunted growth, anemia, swollen legs
3	Fat	weakness in body	weakness, low energy
4	Vitamin A	Night blindness	poor vision
	Vitamin B	Beriberi	weakness
	Vitamin C	Scurvy	teeth and gum problems
	Vitamin D	rickets	Deformed and soft bones
	Vitamin E	low reproductive capability	low reproductive capability
	Vitamin K	delayed blood clotting	excessive bleeding
5	Minerals (Salts)		
	Calcium, Phosphorus	weakness in teeth and bones	weakness in bones
	Iron	deficiency of hemoglobin in blood	Weakness and feeling tired.
	Iodine	goiter	swelling of thyroid glands

1.3 Balanced diet

Normally food items we receive throughout the day, called as diet (food). For our body's regular growth, development and health, our diet must contain all components in a certain proportion and appropriate amount. This type of diet is called balanced diet.

Needed amounts of ingredients of balanced diet for children of 10-18 years are given in Table 1.4.

Table 1.4: Balanced diet (for age group of 10 to 18 years)

S.N.	Components of food	Quantity
1	Carbohydrate	130 to 150 gram
2	Protein	78 gram
3	Fat	22 gram

4	Vitamin	as per need
5	Minerals(Salts)	660 Mg
6	Water	2 to 3 liter as per need
7	Roughage	as per need

Our body's growth and development and to keep disease free, we should always take clean and balanced food.

What have you learnt:

1. Major components of food are as follows - Carbohydrate, Protein, Fat, Vitamins, Minerals (salts), Water and Roughage.
2. The lack of nutrients in food, our body is likely to be various diseases.
3. For our body's regular growth, development and health, our diet must contain all components in a certain proportion and appropriate amount. This type of diet is called balanced diet.
4. Deficiency of Vitamin A causes night blindness and Vitamin B deficiency causes beriberi disease.
5. For physical development, food nutrients as well as minerals are necessary.

□□□

Exercises

Choose the most appropriate option -

1. Which elements is found in protein -
 (a) Calcium (Ca) (b) Magnesium (Mg)
 (c) Boron (B) (d) Nitrogen (N) ()
2. Which vitamin's deficiency caused a night blindness disease -
 (a) Vitamin B (b) Vitamin C
 (c) Vitamin A (d) Vitamin K ()

Fill in the blanks -

1. Deficiency of vitamin C in diet causes..... disease.
2. Deficiency of causes beriberi disease.



3. Fat isin water.
4. Water acts as a in the body
5. Fibrous substance calledis found in food substances.

Short answer questions -

1. Define balanced diet.
2. Write two functions of protein ?
3. Write two vitamin's name and disease caused by deficiency of them.
4. What is roughage, give two examples?

Large answer questions -

1. Write down names of major sources of energy and describe any two sources.
2. Why is balanced diet necessary for our body?
3. Why are minerals necessary for our diet?
4. Prepare a chart of weekly menu of MDM provided by your school.

Activity:

1. Prepare a chart of food components, sources, impact, diseases caused by deficiency and excess of it and demonstrate in a classroom.
2. Do a role play on a disease caused by deficiency of food components with the help of teacher. "Come, keep the disease away" prepare an article on it and do act.



Chapter 2

Nutrition in Animals

Points to be studied:

- 2.1 Food Ingestion
- 2.2 Feeding and Digestion in amoeba
- 2.3 Digestion in grass-eating animals
- 2.4 Digestion in humans
- 2.5 Healthy eating habits.

2.1 Food Ingestion

We have studied in previous classes that the components of food such as carbohydrates, fats, vitamins and minerals are complex substances. These complex substances cannot be utilized as such. So they are broken down into simpler substances. The conversion or breakdown of complex components of food into simpler substances is called digestion.

All organisms require food. Plants can prepare their own food, but no one including humans, can't make their own food. Animals get their food from plants or animals that eat plants. Therefore, human and other beings directly or indirectly depend on plants for food.

Animals get Energy from food which conduct all activities of body. The mode of intake of needed food for growth, development and good health of the body is called nutrition. In this chapter we will study various modes of nutrition.

2.2: feeding and digestion in Amoeba -

Amoeba is a single-celled organism found in water bodies. Amoeba has a cell membrane, a rounded, dense nucleus and many small bubble-like vacuoles in its cytoplasm. Amoeba constantly changes its shape and position. It pushes out one, or more finger-like projections, called pseudopodia or false feet for movement and capture of food. Amoeba feeds on some microscopic organisms. When it senses food, it pushes out pseudopodia around the food particle and engulfs it. The food becomes trapped in a food vacuole. Digestive juices are secreted into the food vacuole. They act on the food and break it down into



simpler substances. Gradually the digested food is absorbed. The absorbed substances are used for growth, maintenance and multiplication. The undigested residue of the food is expelled outside by the vacuole. This method of nutrition found in amoeba is called Endocytosis.

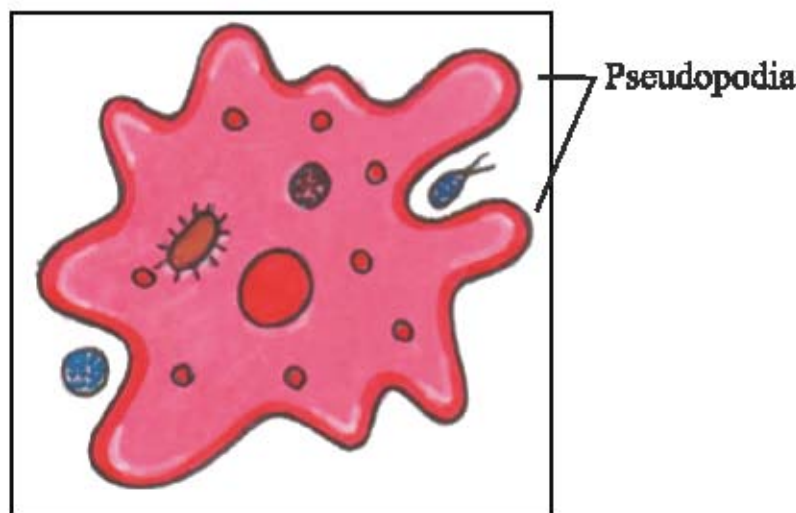


Fig.2.1: Digestion in Amoeba

2.3 Digestion in Herbivorous or Grass-eating Animals

Have you observed cows, buffaloes and other grass-eating animals chewing continuously even when they are not eating grass? Actually, they quickly swallow the grass and store it in a separate part of the stomach called **rumen** (first stomach). Here the food gets partially digested and is called **cud**. But later the cud returns to the mouth in small lumps and the animal chews it. This process is called **rumination** and these animals are called **ruminants**.

The grass is rich in cellulose, a type of carbohydrate. Many animals, including humans, cannot digest cellulose. Animals can digest cellulose as their intestine is big in size.

Ruminants have a large sac-like structure between the small intestine and large intestine, called **caecum**. The cellulose of the food is digested here by the action of certain bacteria which are not present in humans.

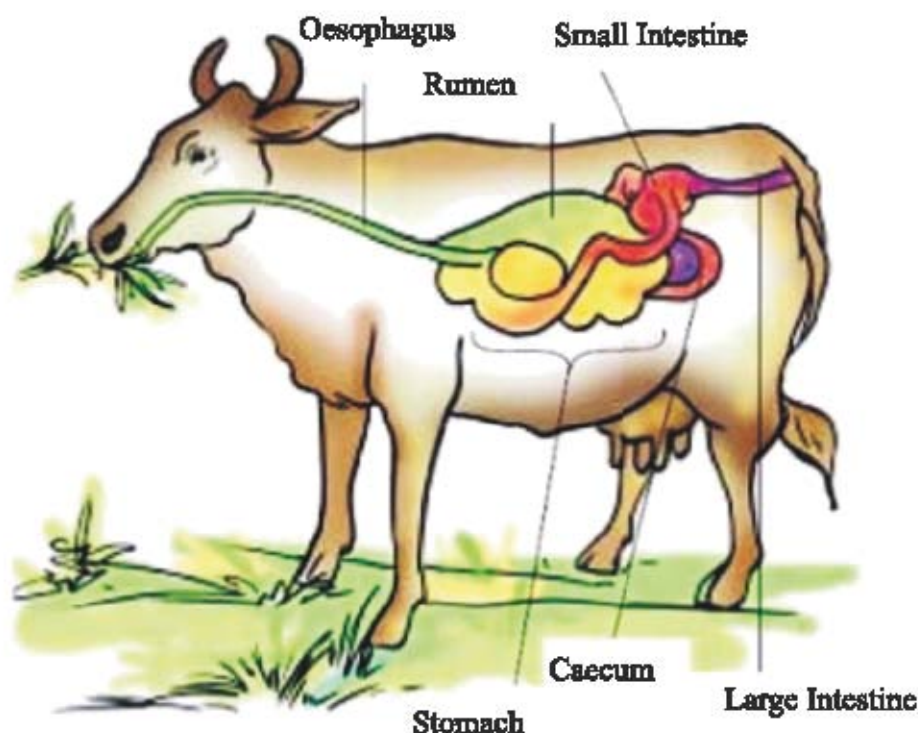


Fig 2.2: Digestive system in Cow

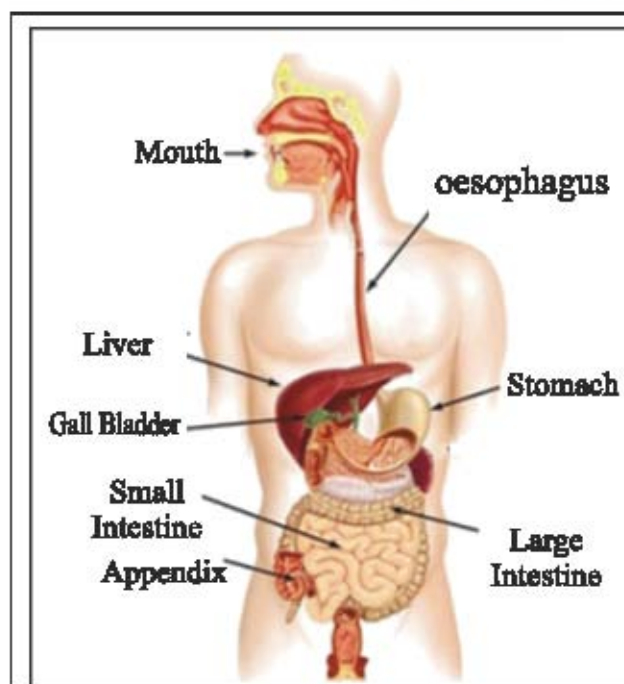


Fig 2.3 : Digestive System of human

2.4 Digestion in Humans

We take in food through the mouth, digest in alimentary canal and utilize it. The unused parts of the food are defecated. Have you ever wondered what happens to the food inside the body? The food passes through a continuous canal which begins at the buccal cavity and ends at the anus. This canal is called as alimentary canal.

Digestive System :

The alimentary canal of human can be divided into various compartments:
 (1) The buccal cavity (2) foodpipe or oesophagus, (3) stomach,
 (4) small intestine, (5) Large intestine ending in the rectum and (6) the anus.

These parts together form the alimentary canal (digestive tract). The food components gradually get digested as food travels through the various compartments. The inner walls of the stomach and the small intestine, and the various glands such as salivary glands, the liver and the pancreas secrete digestive juices. The digestive juices convert complex substances of food into simpler ones. The digestive tract and the associated glands together constitute the digestive system.

Now, let us know what happens to the food in different parts of the digestive tract.

The mouth and buccal cavity

Food is taken into the body through the mouth. The process of taking food into the body is called **ingestion**. Teeth are present in buccal cavity.

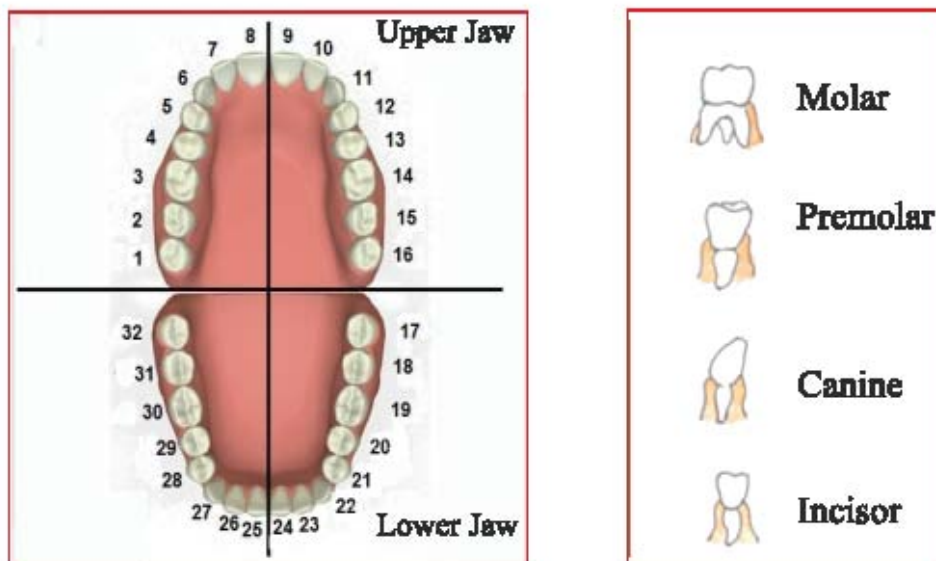


Fig 2.4 Teeth and (Teeth arrangement)

Are all teeth alike in appearance? What is the difference in the texture of the teeth? What is the difference in their functions?

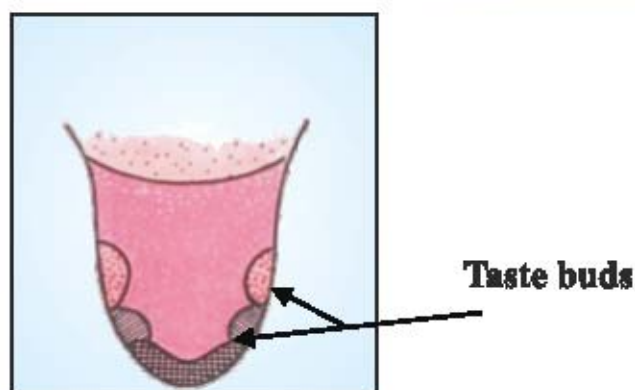
Now open your mouth and Look into the mirror. Identify the different types of teeth. Count their numbers. Use your finger to feel the teeth. Match your information with table.

Table 2.1 Types of teeth, Number of teeth and arrangement in mouth

S.N.	Type of teeth	Upper jaw	Lower jaw	Total and Characteristic	Function
1.	Incisor	4	4	8 sharp	Cutting food
2.	Canine	2	2	4 pointed	Piercing and tearing food
3.	Molar	4	4	8 rough	Chewing food
4.	Premolar	6	6	12 rough	Chewing food
	Total	16	16	32	

Sweets and tooth decay

Normally bacteria are present in our mouth but they are not harmful to us. However, if we do not clean our teeth and mouth after eating, many harmful bacteria also begin to live and grow in it. These bacteria break down the sugars present from the leftover food and release acids. The acids gradually damage the teeth. This is called tooth decay. If it is not treated in time, it causes severe toothache and in extreme cases results in tooth loss. Chocolates, sweets, cold drinks and other sugar products are the major culprits of tooth decay. Therefore, one should clean the teeth with a brush or dantum and dental floss (a special strong thread which is moved between two teeth to take out trapped food particles) at least twice a day and rinse the mouth after every meal. Also, one should not put dirty fingers or any unwashed object in the mouth.

**Fig 2.5 Tongue**

Our mouth has the salivary glands which secrete saliva. When we chew the food, saliva secreted from salivary gland and mixes with food. Food becomes moist and bolus by mixing saliva.

The partial digestion of food starts here. The tongue is a fleshy muscular organ attached at the back to the floor of the buccal cavity. It is free at the front and can be moved in all directions. Do you know the functions of the tongue? We use our tongue for talking. Besides, it mixes saliva with the food during chewing and helps in swallowing food. We also taste food with our tongue. It has taste buds that detect different tastes of food.

The foodpipe (oesophagus)

The swallowed food passes into the foodpipe or oesophagus. The foodpipe runs along the neck and the chest. Food is pushed down by movement of the wall of the foodpipe. Actually this movement takes place throughout the alimentary canal and pushes the food downwards. At times the food is not accepted by our stomach and is vomited out. Recall the instances when you vomited after eating and think the reason for it. Discuss with your parents and teacher.

The stomach : The stomach is a thick-walled bag. Its shape is like a flattened U and it is the widest part of the alimentary canal. It receives food from the food pipe at one end and opens into the small intestine at the other. The inner lining of the stomach secretes mucous, hydrochloric acid and digestive juices. The mucous protects the lining of the stomach. The acid kills many bacteria that enter along with the food and makes the medium in the Stomach acidic, which helps of digestive juices to react. The digestive juices break down the proteins into simpler substances

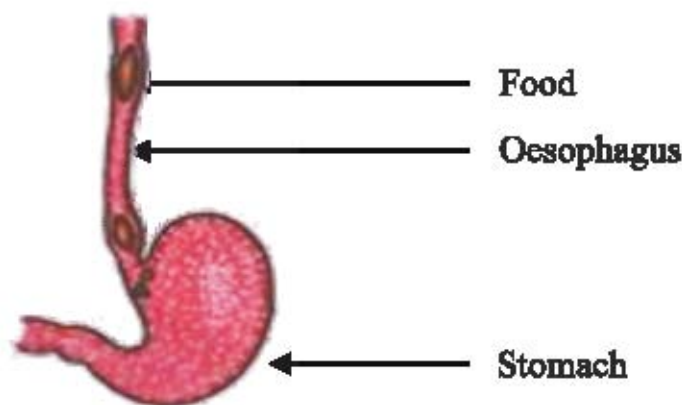


Fig 2.6: Stomach

The small intestine

The small intestine is highly coiled and is about 6-8 meters long. It receives secretions from the liver and the pancreas. Besides, its wall also secretes juices. The liver is a reddish brown gland situated in the upper part of the abdomen on the right side. It is the Largest gland of the body. It secretes bile juice that is stored in a sac called the gall bladder. The bile plays an important role in the digestion of fats. The pancreas is a large cream colored gland located just below the stomach. The pancreatic juice acts on carbohydrates and proteins and changes them into simpler forms. The partly digested food now reaches the lower part of the small intestine where the intestinal juice completes the digestion of all components of the food.

Absorption in the small intestine

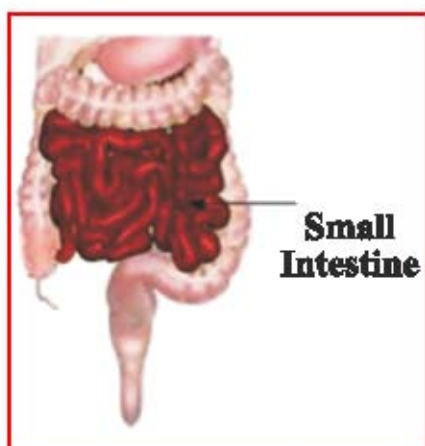


Fig 2.7 - Small Intestine The digested food can now pass into the blood vessels in the wall of the intestine. This process is called absorption. The inner walls of the small intestine have thousands of finger-like outgrowths. These are called villi. Can you guess what is the role of villi could be in the intestine? The villi increase the surface area for absorption of the digested food. Each villus has a network of thin and small blood vessels close to its surface. The surface of the villi absorbs the digested food materials. The absorbed substances are transported via the blood vessels to different organs of the body where they are used to build complex substances such as the proteins required by the body. This is called assimilation. In the cells, glucose breaks down with the help of oxygen into carbon dioxide and water, and energy is released. The food that remains undigested and unabsorbed then enters into the large intestine.

Large intestine

The large intestine is wider and shorter than small intestine. It is about 1.5 metres in length. Its function is to absorb water and some salts from the undigested food material. The remaining waste passes into the rectum and remains there as semi-solid faeces. The faecal matter is removed through the anus from time-to-time. This is called egestion.



Fig. 2.8 : Large Intestine

Diarrhoea

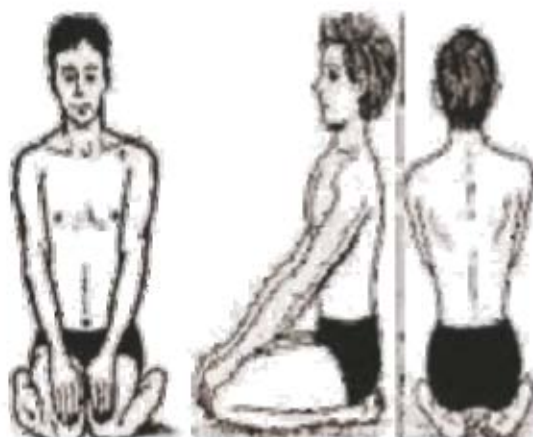
Sometime you may have experienced the need to pass watery stool frequently. This condition is known as **diarrhoea**. It may be caused by an infection, food poisoning or indigestion. It is very common in India, particularly among children. Under severe conditions it can be fatal. This is because of the excessive loss of water and salts from the body. Diarrhoea should not be neglected. Even before a doctor is consulted the patient should be given plenty of boiled and cooled water with a pinch of salt and sugar dissolved in it. This is called **Oral Rehydration Solution (ORS)** Which can get from government hospitals.

Now you understand that the digestive system is made up of different organs which help to digest food. We have daily meals. Our bodies remain healthy and free from disease, for the we should focus on the healthy eating habits.

2.5 Healthy eating habits.

By paying attention to these things we remain healthy:

1. Before Eating and after the meal wash your hand and mouth clean.
2. Take food on neat and clean place.
3. Always take fresh and covered meals.
4. Dine at certain times.
5. Eat with Healthy mind, stay relaxed and keep patience.
6. Take balanced diet.
7. Chew food thoroughly.
8. Take salad of fibrous and green vegetables in meal.
9. Do not eat more than necessary.
10. Take all types of food with interest.
11. Do not talk while eating.
12. Approximately one hour after a meal, drink water.
13. Do not waste food, because food grain is gift of God.

**Vajrasana:**

Today the problems related to digestion such as indigestion, acidity, constipation, gas, Obesity etc. is increasing rapidly in people. To deal with these problems a very simple and useful yoga is a Vajrasana:

Procedure :

1. After 5 minutes of meal , lay down a mat or blanket on a plane surface.
2. Sit down by spreading both legs ahead.
3. Thereafter, bend left knee such that paws of legs move back and upward.
4. Now bend the knee of right leg similarly.
5. Join together the toes of both the legs.
6. Keep body straight.
7. Keep your both hands on Knee.



What have you learnt

1. The process of taking food into the body is called ingestion.
2. Tongue has taste buds that detect different tastes of food.
3. The inner lining of the stomach secretes mucous, hydrochloric acid (HCL) and digestive juices.
4. The inner lining of the small intestine possess small finger like projections.
5. Cows, buffaloes and other grass eating animals are known as ruminants.
6. In Amoeba the digestion of food takes place in vacuole. This process is called as Endocytosis.
7. Incisor, Canine, Molar and Premolar are four types of teeth.
8. Buccal cavity, oesophagus, stomach, small intestine, large intestine, rectum are different parts of alimentary canal.

□□□

Exercises

Choose the most appropriate option -

1. Number of incisors in Buccal cavity of human being:

(a) 2	(b) 4	
(c) 6	(d) 8	()
2. Organ in which absorption of digested food takes place:

(a) Stomach	(b) small intestine	
(c) Large intestine	(d) mouth	()
3. A part of our body which has digestive juice:

(a) large intestine	(b) small intestine	
(c) Stomach	(d) oesophagus	()

Fill in the blanks with appropriate words:

- (i) Amoeba captures food with the help of.....
- (ii) In ruminantsis located between the small intestine and large intestine.
- (iii) Byon the tongue reveals taste.

Short answer questions -

- (i) What is a process of ingestion?
- (ii) If tongue doesn't has a taste bud than which process is affected?
- (iii) If ruminants doesn't have caecum what happened?
- (iv) Write name and functions of different types of teeth of human?

Long answer questions -

- (i) How do digestion of food takes place in stomach?
- (ii) Describe a method of feeding and digestion in Amoeba by a labeled diagram?
- (iii) Draw a labeled diagram of digestive system of humans?

Activity:

1. Draw a diagram of digestive system on chart, hard sheet, the model and color its different parts by different colors. There after cut the different parts. We can do different activities by pieces for example -
 - A student of class will speak organ name and another student pick it and tell the name
 - Make Digestive system by joining pieces.
 - Identification of various organs after bandaging on eyes.
 - Sit in Vajrasana for 5 Minutes after meal.
2. Prepare a chart of digestive system and fix in a class-room.



Points to be studied

- 3.1 Substances & Mixtures
- 3.2 Types of Mixtures
- 3.3 Need to separate the components of mixture
- 3.4 Methods of Separation

3.1 Substances and Mixtures

Take one teaspoon of sugar on your palm. You will see, it contains only one type of particles (i.e. sugar).

Now take a handful of sand and observe carefully, it contains different types of particles i.e. soil, gravels, weed etc.

Let us see the difference between the two. Sugar is a substance while Sand is a mixture. Examples of mixtures-Air, Soft drink, ice cream, milk, sea water, sand etc.

Write the components of mixture that are used in our daily life in the Table 3.1 given below.

Table 3.1 Components of mixture that are used in daily life.

S No.	Mixture	Components
1	Air	Oxygen, Nitrogen, Carbon dioxide, water vapour etc
2	Jaggery	Sugar and Other Extracts
3	Soft Drink	
4	Soda Water	
5	Brass	
6	Milk	
7	Blood	

3.2 Types of Mixture

Substances that are present in the mixture are called its components. In Some mixtures components are easily visible while in others it is difficult.

Activity-1

Take a glass half filled with water and add a teaspoon of salt in it and stir. Salt will completely dissolve in water .Salt and water cannot be seen separately in this mixture.

Those mixtures in which two or more components are present but can not be seen separately are called homogeneous mixtures. Eg. mixture of water & salt

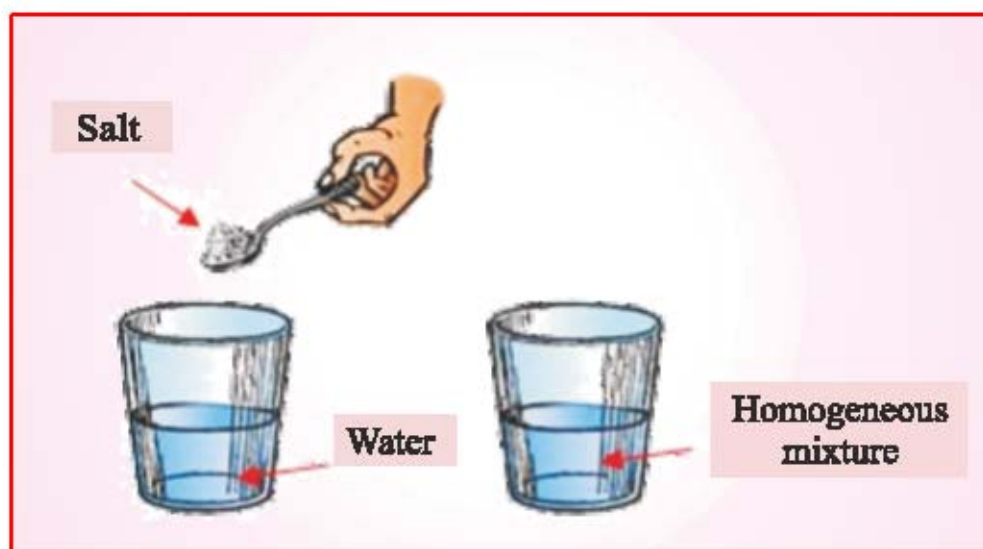


Fig. 3.1 Homogeneous mixture

Activity-2

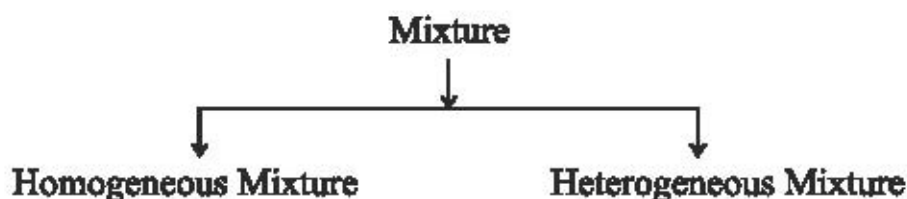
Take some water in a beaker. Add a teaspoon of groundnut oil or mustard oil in it and stir. What do you observe? You will observe two separate layers of water and oil in the beaker. Hence, those mixtures in which its components can be seen separately are called heterogeneous mixtures. E.g. Mixture of Water and Oil.



Fig. 3.2 Heterogenous mixture

So, the mixtures can be classified into two different types on the basis of nature of their substances.

Types of Mixture



Separation

You must have seen your mother picking wheat. Your mother separates out the tiny gravels or other impurities by picking with her hand. IF you are given a mix of wheat, barley and corn and asked to segregate the three then what will you do? You will separate the mixture of wheat, barley & corn on the basis of their identification by picking with your hands. This is called Separation.

3.3 Need to separate the components of mixture

We can improve the quality, purity, capability and utility of a mixture by removing the impurities from the mixture. It is also possible to find the ration of different components in a mixture. Like impurities in cement reduces its capability. Impurity in gold reduces its shine. Drinking impure water can make us sick. Hence we can say that separating mixture from its components is an important part of our lives. There are so many methods of seperation of components from mixture, Let's knows.

3.4 Methods of Separation

1. Hand Picking

In wheat, rice, Pulses, many impurities like gravels, soil, and other impurities are mixed. These impurities are present in less quantity. These are different in colour & shape from wheat, rice and pulses. These impurities are separated with the hands. This is called hand picking.



Fig. 3.3 Picking

2. Sieving



Fig. 3.4 Sieving



Fig. 3.5 Sieving

Your mother sieves flour before kneading it. Husk & other impurities remain in the sieve and we get pure flour. You must have witnessed at the construction site that gravels & pebbles are separated out from sand with the help of sieves. This process is called Sieving.

3. Filtration

Let us see how to remove insoluble impurities from dirty water?

Activity-3

Take a filter paper and fold it to make a cone as given in diagram-3.6 Place it inside a funnel. Pour the dirty water on filter paper slowly until $\frac{2}{3}$ rd part of funnel is filled. We will observe that filter paper will prevent soil granules & pebbles & allows only water to pass through it.

Filter paper can separate soil and water.

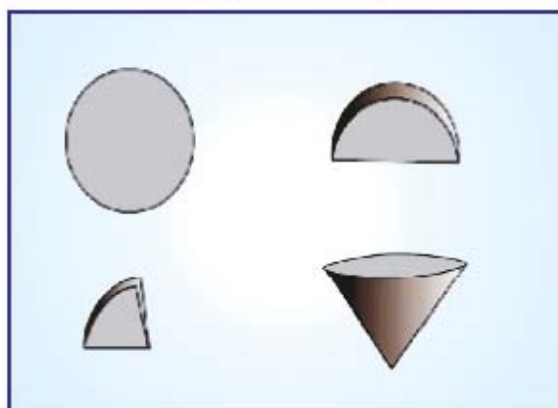


Fig. 3.6 Folding of filter paper



Fig. 3.7 Filtration

The process of separation of components from a solid or liquid mixture is called filtration.

4. Winnowing -

In your house you must have seen your mother cleaning wheat and rice by winnowing. Method of separating minor impurities from grains with the help of surp is called winnowing. Farmers make the grains fall from a certain height in the fields. Grains being heavier fall nearby while on the other hand impurities being lighter in weight fall away with the flow of wind. This Method of separating impurities from mixtures is called **Winnowing**.



Fig. 3.8 Winnowing

5. Centrifugation -

You must have seen separating of butter and butter milk from curd. How does this takes place? Let us learn-

Curd is rotated in circular direction with the help of churn due to which butter milk being heavier in weight goes downwards while butter being lighter in weight comes upwards. This process is called **Centrifugation**.

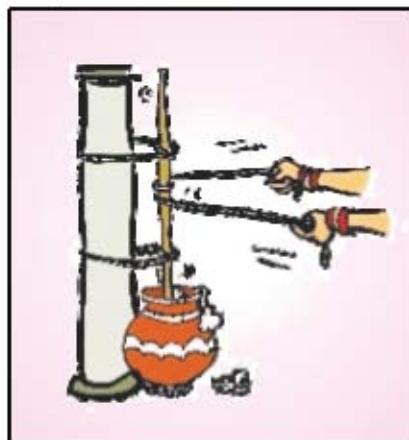


Fig. 3.9 Centrifugation

6. Threshing -

Plants of different pulses and grains are dried in the fields. Simultaneously to separate out the grains, dried plants are beaten on rocks or wooden planks. Separating out the food grains from dried plants is called threshing.

These days threshing machine is also used for this purpose.



Fig. 3.10 Threshing

7. Vaporisation -

How do we find Salt from sea water?

Activity-4

Take a ceramic dish, fill it half with water. Put a tea spoon of salt in it and stir. Now heat the water as per picture 3.11 After some time we observe that all the water converts into vapour & only salt remains in the ceramic dish. This method is used to find salt from sea. In which, water is made to accumulate in small lagoons. Water turns into water vapour with the heat of the sun and salt remains in the lagoons. Hence we can say that conversion of any liquid to its vapours is called Vaporisation.

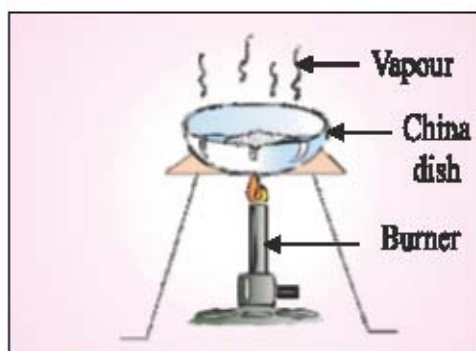


Fig. 3.11 Vaporisation

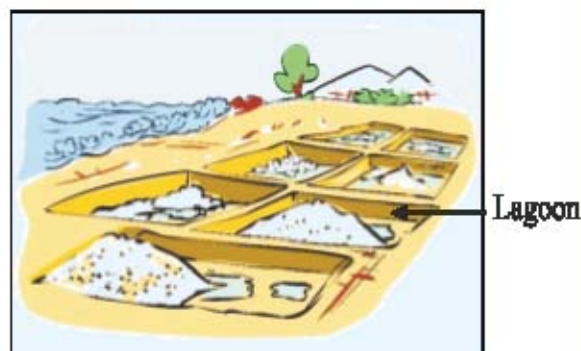


Fig. 3.12 Making Salt from sea water

8. Magnetic Separation Process

Activity 5

Take a mixture of sand and chips of iron on a piece of paper. Place a magnet near the mixture. Repeat this process again and again. We will see that chips of iron will get attracted to the magnet while sand will remain unaffected on paper. In this way magnetic substances are separated from non magnetic substances through magnetic separation.

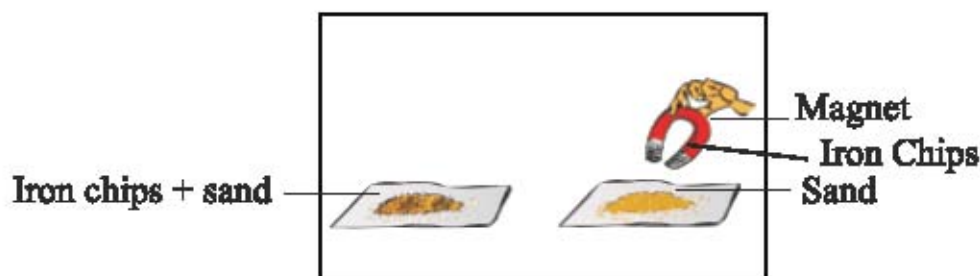


Fig. 3.12 Magnetic Separation

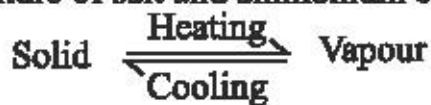
9. Sublimation -

In houses we often use white naphthalene balls for protecting woollen clothes. We see that after some time those naphthalene balls reduce in size or even diminish. Why does this happen? Let us know.

Some solids on heating directly get converted into vapours while turn directly into solids on cooling without getting converted into liquid. This process is called **Sublimation**.

We will separate mixture of salt and ammonium chloride through sublimation. Let us try.

Activity 6



Take mixture of ammonium chloride and salt in china dish. Place it on a tripod stand and place a funnel over the china dish so that it covers the china dish. Close the lid of the funnel with cotton. Heat the mixture till you see white smoke. Now stop heating the mixture, and let the funnel cool down for some time. We will see the white substance on the surface of the funnel. This is ammonium chloride and salt remains in the china dish.



Fig. 3.13 Sublimation

10. Sedimentation and Decantation

Activity 7

Take a glass beaker, fill it half with water. Put a teaspoon of sand in it and stir. What do you observe? You will see that sand will settle down at the base of the beaker. Settling down of heavier impurities present in the mixture is called **sedimentation**. Transferring of sedimentated mixture carefully without stirring into another beaker is called **decantation**.

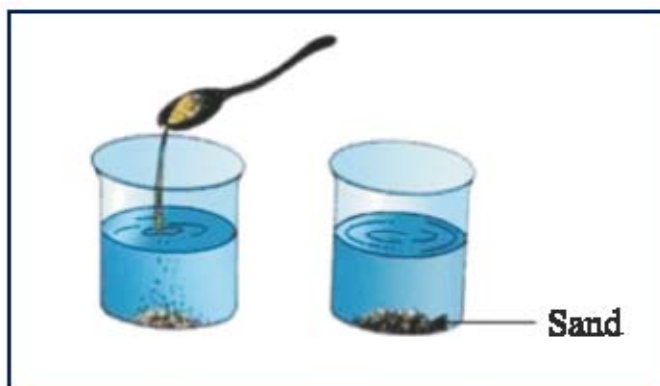


Fig. 3.15 Sedimentation

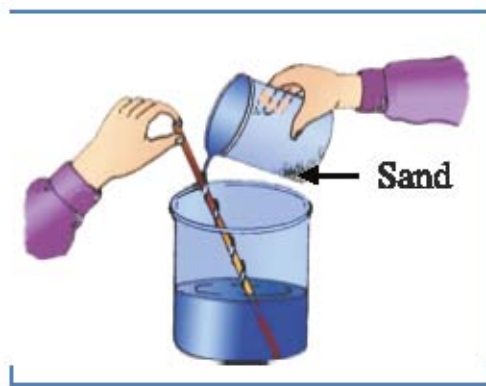


Fig. 3.16 Decantation

Why Potash alum is used in dirty water.

Activity 8

Take some dirty water in a glass beaker. Insert a piece of Potash alum hanging inside it with the help of a thread & stir it. After some time we will observe that sand particles being heavier settle down at the base of the beaker. Clean water can be separated out through decantation.

11. Distillation

Water in reservoirs & tap water contain impurities. Hence such water cannot be used in laboratories & in making medicines. Distill water is used in laboratories & in making medicines for injections.

How dissolved impurities in water do are separated out?

Activity 9

Take some water in a kettle & bring it to heat. Now take some ice on a metal plate. Keep the metal plate just above the valve of the kettle. All the water in the kettle gets converted into vapours. Conversion of liquid into vapour is called Vaporisation. Impurities of water remain in the kettle. When steam comes



in contact with the chilled plate then it gets converted into liquid. This liquid gets coagulate in the beaker drop by drop. Conversion of vapour into liquid is called **condensation**.

Method of separating out liquid with through vaporisation & condensation is called **Distillation**.

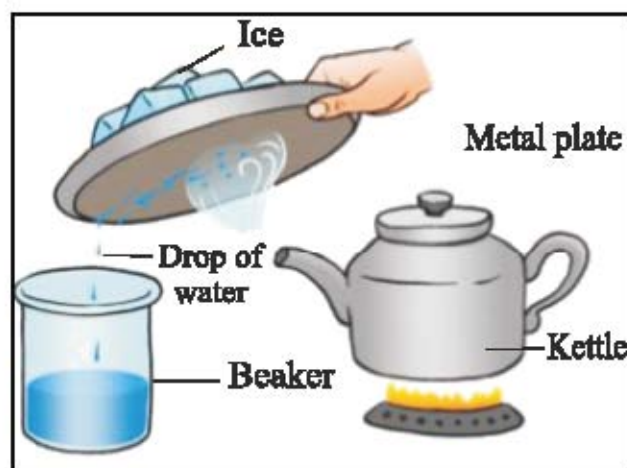
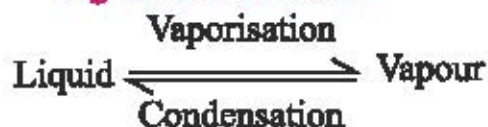


Fig. 3.17 Distillation



What have you Learnt?

- Mixing of 2 or more liquids in an indefinite amount makes a mixture.
- Mixtures are of two types-Homogeneous & Heterogeneous.
- Process of Separating out liquids from its components is called Separation.
- Some of the major processes of separation are-Vaporisation, magnetic separation, sublimation, sedimentation & decantation, distillation etc.
- Mixture of salt & ammonium chloride are separated out through Sublimation.
- Process of separating out clean liquid through vaporisation and condensation is called Distillation.

□□□

Exercise**Choose the correct option**

- Which process is used for separating out wheat from impurities.
(a) Winnowing (b) Magnetic separation
(c) Hand Picking (d) Threshing ()
- Which process is used for separating curd from butter?
(a) Distillation (b) Centrifugation
(c) Sieving (d) Vaporisation ()
- Type of Homogeneous mixture
(a) Mixture of milk and sugar (b) mixture of sand and iron
(c) Mixture of soil and water (d) Mixture of oil and water ()
- Process of converting vapour into liquid is called
(a) Vaporisation (b) Compaction
(c) Distillation (d) Threshing ()

Fill in the blanks

- Separating out Gram from mixture of Gram and wheat is called ____
- Conversion of liquid into vapours is called _____.
- Soft drink is an example of _____.
- _____ water is used in making medicines.

Match the following in Column A and Column B

Column A	Column B
(1) Sublimation	(a) Mixture of sand and iron.
(2) Sieving	(b) Mixture of salt and ammonium chloride
(3) Magnetic separation	(c) Separating out dirty water from sand.
(4) Vaporisation	(d) Salt from sea-water



Short answers type Questions

1. What is Lagoon?
2. Explain homogeneous mixtures with examples.
3. What do you mean by Filtration? Explain with diagram.
4. Explain the difference between hamogenous & hetrogenous mixture.
5. Explain the process of getting pure salt from impure salt with diagram.

Long Answer type Questions

1. Write the process of Separating out sand, salt, iron chips from mixture.
2. Explain with diagram any four techniques of Separation.
3. What is the importance of separation of substances? Explain.

Activity

Make the following mixtures & separate out the basic components from them.

- (a) Camphor + Salt
- (b) Water + Baking Soda
- (c) Salt + Sand
- (d) Soil + Iron Chips
- (e) Water + Mustard Oil



Chapter 4

Physical and Chemical Changes of Substances

Points to be studies

- 4.1 Physical Changes
- 4.2 Crystallisation
- 4.3 Chemical Changes
- 4.4 Corrosion of Iron

We observe different changes in our environment. Change means transformation. During rainy season water droplets present in clouds solidifies and convert into hails. These hails fall on earth and diminish after melting. During cooking at home water content of dal gets reduced due to evaporation. During winters water vapour present in the atmosphere cools down and gets converted into dew. Similarly water droplets in refrigerator cool down and convert into ice. All these processes come under "changes". In day to day life we observe many changes like lighting of candle, formation of curd from milk, formation of soft drink by dissolution of lime juice and sugar in water. Some interesting incidents also take place during these changes. During eating vegetable stains on clothes and at the time of cleaning the yellow stain of turmeric changes into red. Colour of peeled surface of potato and apple change when it is kept in open atmosphere. Green colour of mehendi converts into red. During rainy season, windows and doors made of iron get rusty. You must have seen magicians lighting fire in glass filled with water and white smoke when he transfers the solution of one glass to another. You must have been surprised by these changes and enjoyed them.

In this chapter we will perform some activities and try to understand the nature of changes. Are all of these changes stable or unstable or reversible?



Let's Do and observe

Activity 1

Take some wax in one bowl and heat it gently. What do you observe? Remove the bowl from the flame and let it cool down. After some time you will see that the wax present in the bowl solidifies again. Hence we can say that melting of wax is an unstable change. Conversion of solids into liquids is called change of state of matter. Change of state of matter is an unstable change.

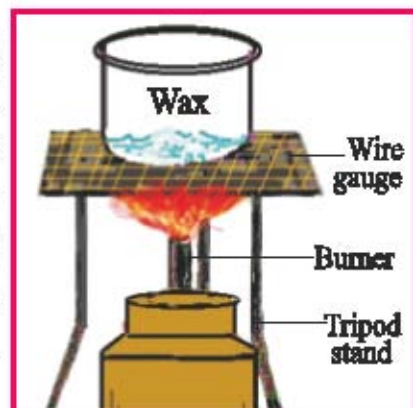
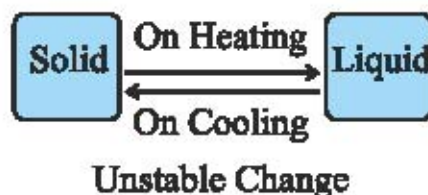


Fig. 4.1 Melting of Wax

Activity 2

Take some water in a glass test tube. Cover this test tube with a funnel and heat it. Close the funnel. Water will get converted into water vapour. Water vapour will again get converted into water on coming in contact with the wall of the funnel. We can see this in the form of drops of water on the internal surface of the funnel. So we can say that conversion of water into vapour is an unstable change. The changes can be written in the following way.

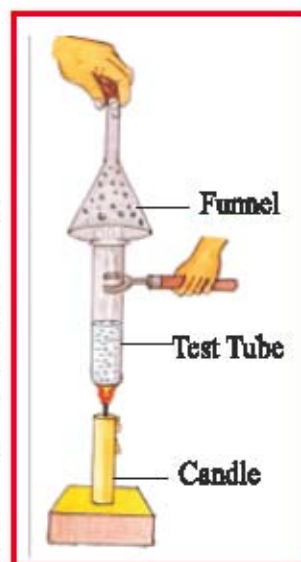
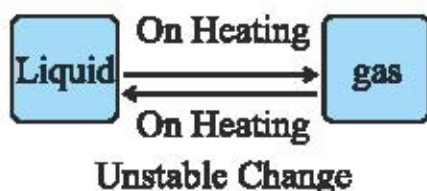


Fig. 4.2 The Change of State

Similarly can you solidify the water formed by melting of ice?

We can say that change of state of substance is an unstable change.

Activity 3

Take a square piece of paper. Fold it to make a boat, aeroplane or any other shape. Now unfold it. It regains its original state. This is also an unstable change. Take a rubber band and stretch it and release it. Does it regain its original shape? Regaining its original shape of a rubber band is an unstable change.



Fig. 4.3 The Change of State

Activity 4

Take a blade, hold it with the help of a fork and heat it till it gets red hot. Remove the blade from the flame and wait for a while. Its red colour disappears. Is this an unstable change?

Activity 5

In the following table 4.1 some changes are given. Fill in the table if these changes are stable or unstable.

Table 4.1 Incidents of Changes

S No	Incidents of Changes	Are these changes reversible?	Are these changes stable or unstable?
1.	Melting of ice	Yes	Unstable
2.	Formation of water vapour		
3.	Formation of curd from milk		
4.	Compressing of sponge		
5.	Glowing of bulb on switching ON		
6.	Corrosion of iron		
7.	Dry clothes getting wet		
8.	Burning of wood		
9.	Chilling of Milk		
10.	Mehandi getting red		

We see that by reversing the direction of a change some substances can be brought back to their original state while it is not possible with other. The changes that can undergo in reverse direction are known as **reversible changes**. Reversible changes are unstable.

In daily life experiences we have observed that formation of Milk into curd cannot be reversed in to formation of curd into milk. In this example curd is formed as a new product. This change is a stable change. So it is not a reversible change. Those changes which is not possible in both direction directions are called **irreversible changes**. Irreversible changes are stable in nature.

By above explanation the changes around us are basically classified in two types. First are those which are reversible and unstable and are called **physical changes** and the others which are irreversible and stable and are called **chemical changes**.

So, on the basis of nature of changes, they can be classified as follows:-

Physical changes and chemical changes.

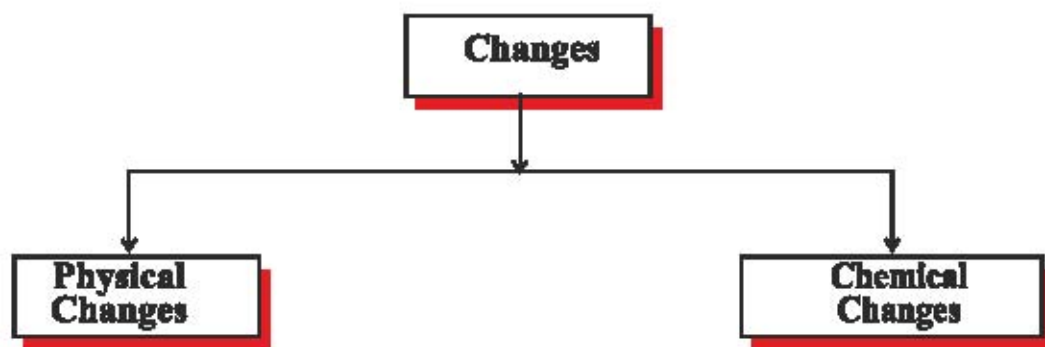


Fig. 4.4 Types of changes

4.1 Physical Changes:

Shape, size, state (solid, liquid, gas) temperature, pressure etc. of a substance are called physical properties. Changes in which physical properties of a substance are called are called **physical changes**. These are unstable and reversible. In these changes a new substance is not formed. Now you can easily identify melting of ice, dissolution of salt in water, glowing of bulb, heating blade on flame, formation of vapour from water, conversion of vapour into water etc. are physical changes.



Fig. 4.5
Lighting of Bulb
is a physical
changes

4.2 Crystallisation:-

Crystallisation- It is a physical change.

You have seen a white powder substance across the rivers and ponds. Women use this baking soda in making Dhoklas. Do you know how this baking soda is formed?

Activity 6

Take a beaker and fill it half with water. Add alum powder in it. Heat the above solution and add keep on adding alum powder till it gets dissolved completely in the solution. When dissolution stops, filter the solution with the help of filter paper. Let the solution cool down. Do not move the beaker at the time of cooling. Observe the solution after some time. Do you see the crystals of alum? If not then wait for some more time, you will see the crystals. The process of obtaining big and pure crystals from its solution is known as **crystallisation**. In this process new substance is not formed but crystals of same substance are formed, so crystallisation is the example of physical change.

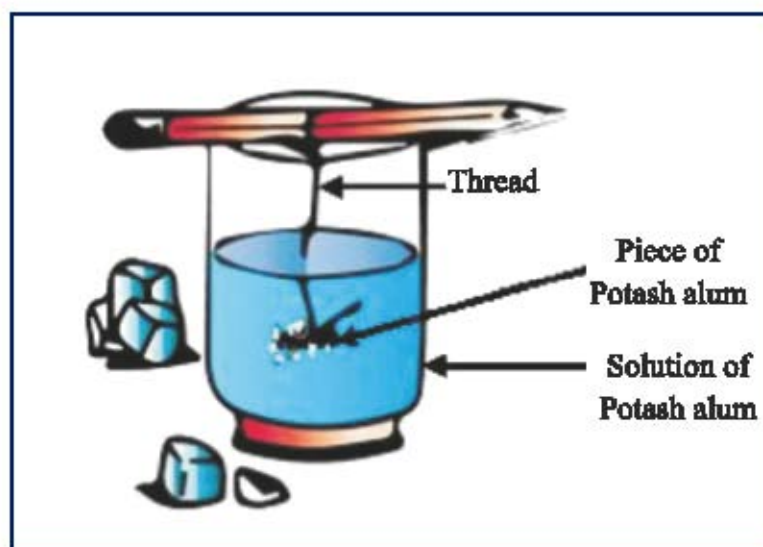


Fig. 4.6 Crystallisation

If you want crystals of bigger size, then tie a small crystal by a thread and hang it in a way that it will touch the solution. You will see many small size crystals stick around that small crystal and a big crystal is formed.



4.3 Chemical Changes

**What are the chemical changes,
Let us know-**

Activity 7

Light a candle and keep it on the table. Take a funnel and according to diagram 4.7 join its one end with a rubber tube and the second end of rubber tube with a glass tube. Dip the glass tube in a beaker filled with lime water. Cover the flame of candle with funnel so that the gas formed by burning candle can go to the beaker containing lime water. You will see that the lime water turns milky.

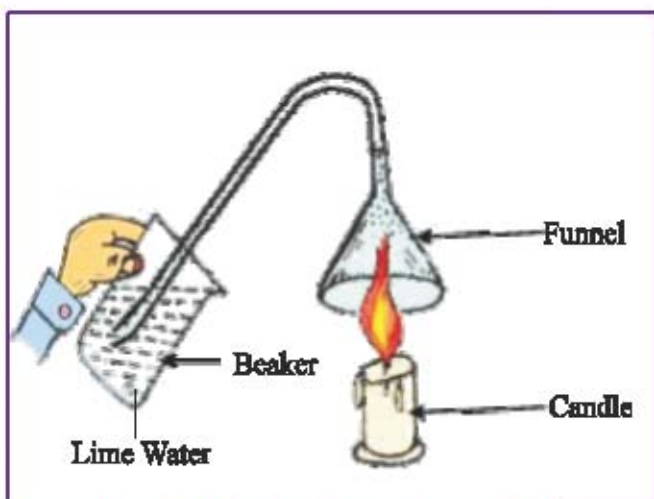


Fig. 4.7 Lime Water turns milky

Following reaction takes place in this experiment-



From above reactions it is clear that new substances carbondioxide and water vapour are formed by burning of wax. When carbondioxide is passed into lime water a new substance CaCO_3 is formed.

We will study some more changes in which new substances are formed.

Activity 8

Cut a potato. Add few drops of iodine solution on the open surface of potato. The colour of surface becomes purple blue.

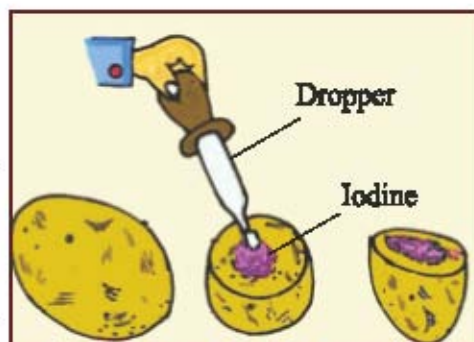


Fig. 4.8 The Colour of Potato becomes purple blue



You can see a new substance is formed in this reaction.

Activity 9

Take a magnesium ribbon. Ignite its one end in candle flame . Magnesium ribbon burns with brilliant light and ash (magnesium oxide) is formed. A new substance is formed in this process:-

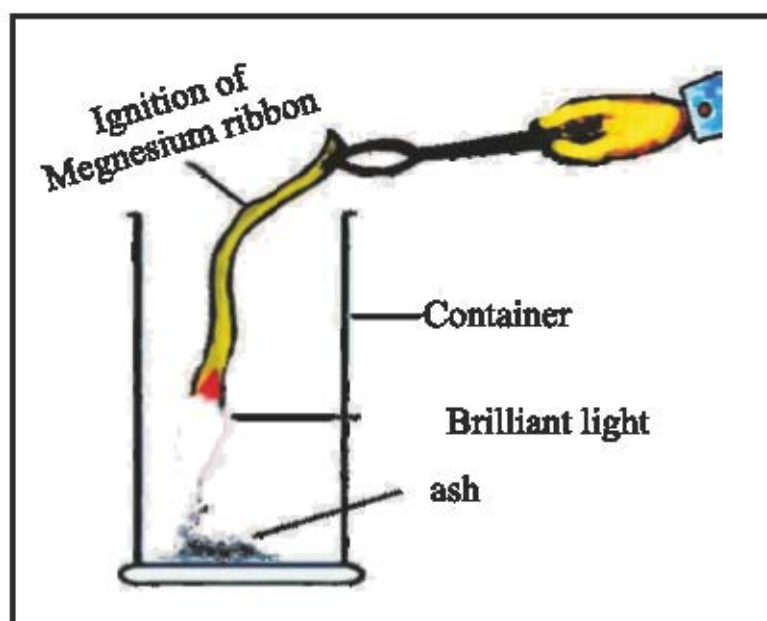


Fig. 4.9 Ignition of Magnesium ribbon



We can say that-

Those changes in which two or more chemical substances react to produce a new substance with a different set of properties of their internal composition also changes are called as **Chemical changes**. After chemical change, product could not change again into their original reactants. That's why these changes are permanent and can be also termed as **Ir-reversible changes**.

Example:- Burning of candle, formation of curd, burning of tyres, digestion of food, rusting of iron, bursting of crackers on festivals, burning of magnesium ribbon etc.

4.4 Rusting of Iron

You are well acquainted with the process of rusting. you must have seen in the kitchen that wet 'Tava' is rusted when left in open air. In the same manner



spade, axe also got rusted in moist air. If we put an iron piece in open air its surface gets converted into a brownish layer known as Rust. This is a chemical process called as Rusting. Rust is not iron metal, in this process iron metal transformed into a new substance called Rust (Iron oxide Fe_2O_3) but it is formed due to a chemical process of iron with moist air termed as Iron oxide (Fe_2O_3).

Process of Rusting

The process of rusting can be shown as –



Oxygen and water are two essential components for rusting of Iron.

Rusting destroys iron slowly. As iron is used to make the body of vehicles like ships, trucks, cycles etc. How can you protect this? To prevent iron from rusting, iron must be protected from the contact of water and oxygen (O_2).



Fig. 4.10
Iron Tower
of Mehroli

Do You Know?

Charismatic Ancient iron tower

In Delhi near Qutub Minar in Mehroli, there is an ancient iron tower situated which was built about 400 B.C. by Indian blacksmiths. Its height is 8 meter and weight is 6 ton (6000 kg). So many centuries have been passed but this iron pillar is still intact and not rusted at all. This is an evidence of advanced knowledge of our ancestors. Even at that time they had developed the technique of keeping Iron rust free. It is known by researches the Mehroli Towers surface is coated with a thin layer of iron oxide (Fe_3O_4). So we can guess that to keep the tower rust free, so many steps must have been taken by them. At the time of synthesizing it, phosphorus must have been mixed in it. It must have been painted with a mixture of various chemicals and it must have been heated up at a high temperature. Sun Temple (Kanark, Odissa), Mookambika Temple (Kolor, Karnataka) Dharmadhy Pradesh etc. also have the wonderful iron towers and display the excellent ancient story of Indian metallurgy.

Greasing and coating of paint are easy way to protect the iron from rusting. Coating of chromium and zinc can also protect iron from rusting. **Galvanization** is a process in which iron objects are coated with zinc to protect them from rusting. Mixing of carbon, manganese, nickel and chromium in iron metal gives us an hard and rust proof alloy 'Steel' (stainless steel).

Let's know about some chemical changes:-

1. **Change in colour of apple when left "Cut" in air.** Apple contains Iron (Fe), due to this when it come in contact with air iron reacts with oxygen producing iron oxide (Fe_2O_3) which is reddish brown in colour.

2. **How does Henna dyes.** Henna contains chemical compounds such as Quinone. Naphthoquinone and Lawsone. Lawsone is colourless but when it come in contact with air or sunlight it forms a red coloured compound.

3. **Truth of magicians** earlier in this chapter we talked about how a magician lit fire over a glass full of water and produces white fumes mixing two liquids in glass.

1. **Lit fire over a glass full of water** in this trick the magician uses a sodium metal which he tricks into the glass of water.

Sodium metal reacts rapidly with water to form a colourless solution of sodium hydroxide (NaOH) and hydrogen gas (H_2). The reaction is exothermic. During the reaction, the sodium metal may well become so hot that it catches fire and burns.



2. **Production of white fumes** in the trick the magician has one glass ammonium hydroxide solution and in other hydrochloric acid solution. when he mixes the 2 solution. The reaction between Ammonium hydroxide and Hydro chloric acid. Produces ammonium chloride and water. Ammonium chloride produced as white fumes.



What have you Learnt?

1. Some changes are permanent but some changes are temporary and reversible.
2. According to nature of changes, there are two types of changes – Physical change and chemical change.
3. Physical changes are temporary and reversible while chemical changes are permanent and ir-reversible.
4. In physical changes only physical properties of substances changes and no new product are formed in it. While new substances are formed in chemical change.
5. In the presence of Oxygen (O_2) and water rusting of iron occurs.
6. To protect from rusting oiling, greasing and coating of metal on iron objects.
7. The process by which pure and big sized crystals of a compound can be obtained from its solution is known as crystallization.

Exercise

□□□

Choose the correct option

1. Example of physical change is –
 - a. Rusting
 - b. melting of ice
 - c. Formation of curd
 - d. Browning of apple after cutting()
2. Example of chemical changes is –
 - a. Lightening of bulb
 - b. Milky change of lime water
 - c. Water changes into water vapour
 - d. Melting of Ghee.()
3. Why are doors painted in our house
 - a. To protect from sun rays
 - b. To make it dust proof
 - c. To prevent from rusting
 - d. To protect from birds.()

Points to be studied

- 5.1 Acids and Bases
- 5.2 Indicators
 - Natural Indicators and Artificial (Man made) Indicators.
- 5.3 Salts
- 5.4 Use of Acids, Bases and Salts in our daily life.
- 5.5 Examples of neutralisation in daily life.

5.1 Acids and Bases

You must have used food materials like lemon, tamarind, oranges, apples, sapodilla (chiku), sugar and salts etc. Do they have same taste? Let us compile the taste of food products in table 5.1

Table 5.1 Food products according to their taste.

S No.	Food Products	Taste (Sour/Sweet/Bitter/Any other)
1	Lemon Juice	Sour
2	Orange Juice	Sour
3	Amla	Sour
4	Tamarind	-----
5	Neem	-----
6	Sugar	-----
7	Salt	-----
8	Banana	-----
9	Butter	-----

On tasting these food products we get to know that some items are sour, some are sweet, some are bitter and some are salty in taste.

Acids

You will see that lime and orange juice, tamarind etc are sour in taste. Why these are sour in taste? The reason is acid that is present in these food products. What are acids? Let us know.

Acid word comes from a latin word 'Acidus', which means Sour. So we can say that the substances that are sour in taste are acids.

Natural Sources of Acids

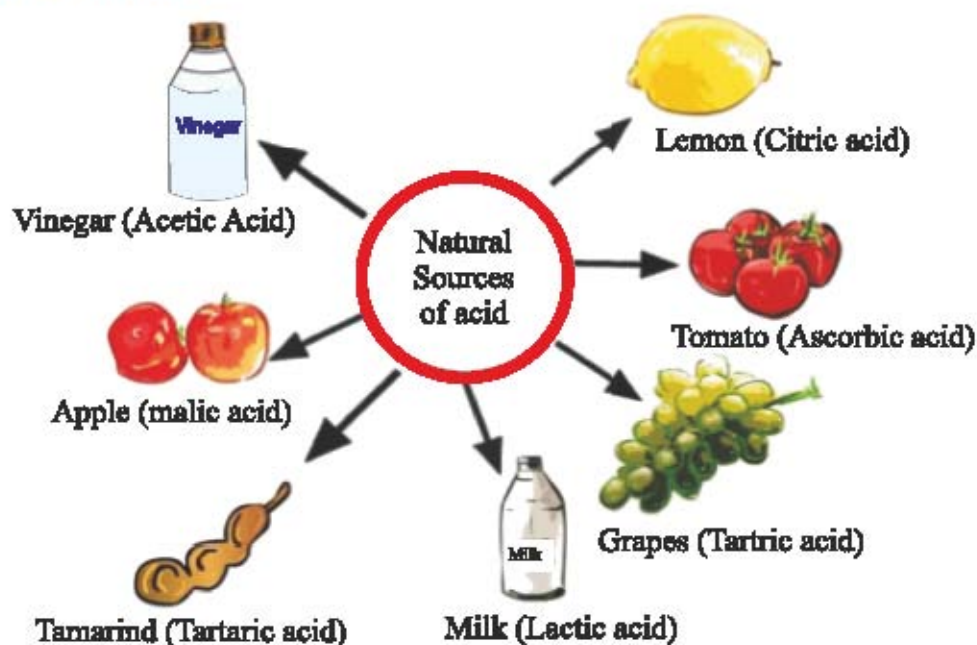


Fig. 5.1 Natural Sources of Acids

Acids are sour in taste.

Activity 2

Let us know about some other properties of acid by some experiments.

Take some baking soda in a glass. Add few drops of lime juice in it. What do you see? You will observe some bubbles in the glass.. A gas releases in this reaction which blows out on bringing a matchstick near the gas. Why matchstick blows out? Acid on reaction with baking soda (Sodium bicarbonate), forms CO_2 gas which blows out the matchstick.

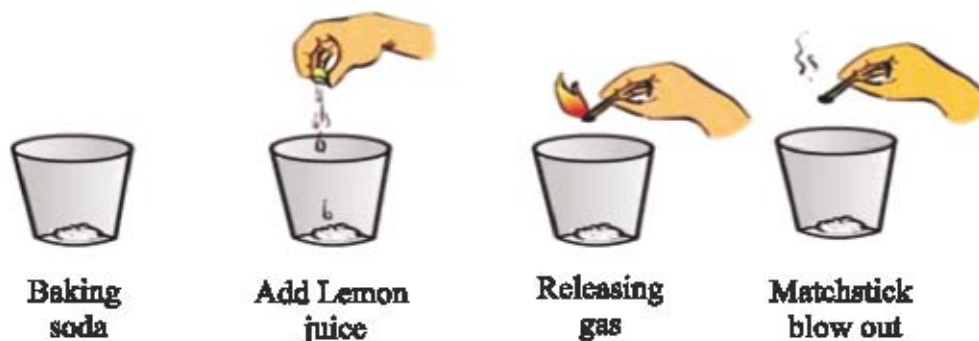


Fig. 5.2 Acid react with Sodium Bicarbonate

Acids react with Sodium bicarbonate and forms CO_2

Activity 3

Add a few drops of concentrated Sulphuric acid in a test tube and add Zinc granules in it. You will observe bubbles in the test tube. On bringing the matchstick flame near the mouth of the test tube, the flame burns with blue flame. So from above experiment we can say that acids evolve H_2 gas on reacting with metals.

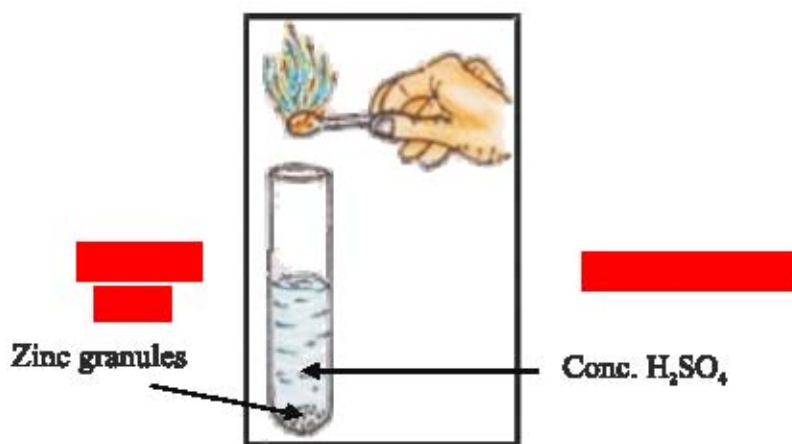


Fig. 5.3 Reaction of Acid with Metal

Acid forms Hydrogen (H_2) gas on reacting with metals.

Also know about it - In houses we do not use metal containers pickles, lemon juice, mango chutney because of the reason that acids are present in these food products which form poisonous substance on reacting with metals.

Activity 4

Take petals of blue colour flower and put them in a test tube filled with a small amount of acid. What do you observe? You will see that blue colour petals turn to red. So we can say that acids turn blue into red.

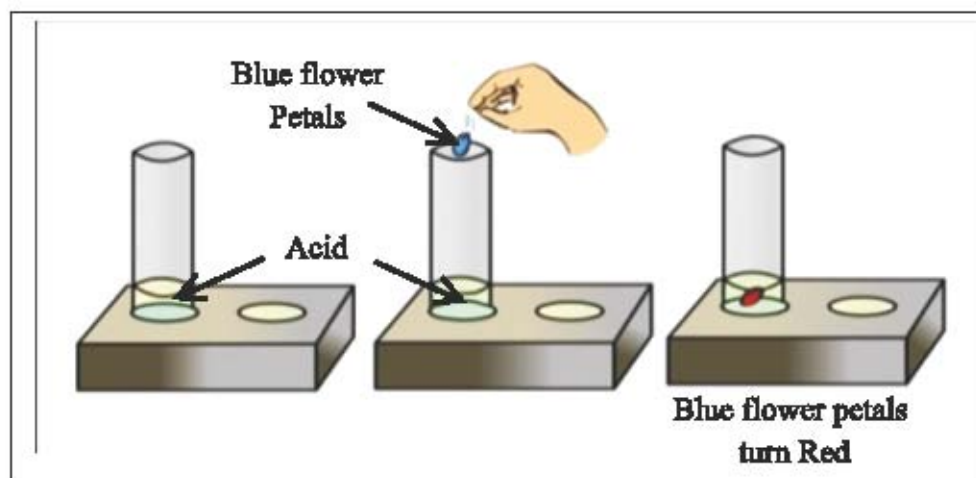


Fig. 5.4 Testing of Acid by vegetable dyes

Acids turn blue vegetable dyes to red.

Bases

You must have seen formation of khaman, dosa, biscuits, at your home. Baking Soda is used in this procedure. How does it taste (baking powder)? It is bitter in taste. Rub the solution of baking powder on your fingers. What do you feel? You will feel a soapy solution. So we can say that the substances that are bitter in taste and feel like soap on touching are bases.

Bases are bitter in taste and feel like soap on touching.

Table 5.2 Food products according to their taste.

S No.	Name of Substance	Name of Bases Present	Chemical Formula
1	Lime Water	Calcium hydroxide	Ca(OH)_2
2	Soap	Sodium hydroxide	NaOH
3	Milky Magnesium	Magnesium hydroxide	Mg(OH)_2

Let's know five other characteristics of bases by experiments.

Activity 5

Take petals of red colour flower in a test tube filled with base (lime water). You will see that red colour of petal turn to blue, so we can say that bases turn the red colour of vegetable dyes into blue.

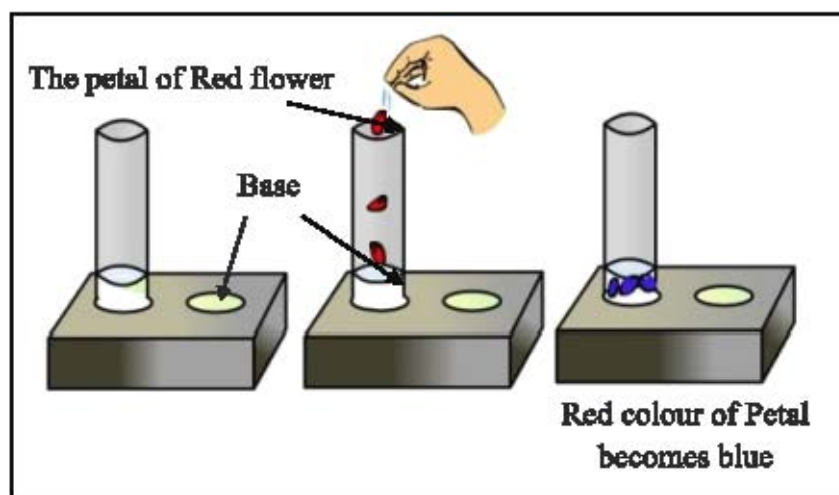


Fig. 5.5 Testing of Bases by vegetable dyes to blue
Bases Turn Red vegetative dies into blue

Substances that are bitter in taste and feel like soap on touching and turn red litmus to blue are called bases.

Neutral

substances that do not affect colour of blue or red litmus are called neutral. These substances are neither acidic nor basic e.g. Salt, NH_4Cl , Calcium Chloride, Sodium Carbonate, Sodium bicarbonate etc.

Do not touch or taste acids , bases and other chemicals present in laboratories as they can be poisonous and dangerous.

5.2 Indicators

Is it possible to identify the nature of substances by their taste? The answer is no, because it can be dangerous to touch or taste the unknown substances. To identify the nature of substance whether it is acidic or basic without touching or tasting, we use some special substances that are called indicators so indicators tell the nature of substances by changing its colour. i.e. turmeric, litmus, petals of china

rose etc. are natural indicators and phenolphthaleine and methyl orange are man made indicators.

Natural Indicators

Litmus: This is the most common natural indicator which is used to identify acids and bases. Litmus is obtained from lichen (algae). It is present in forms of solution and paper strips. These paper sheets are known as litmus papers.

Litmus are of two types: - Red and Blue.

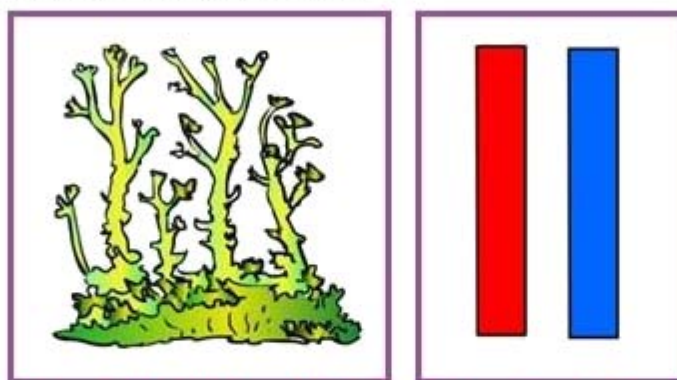


Fig. 5.6 (a) Lichen (b) Red and Blue litmus Paper

Activity 6

Turmeric: - Take turmeric powder in a tea-spoon. Make a paste by adding few drops of water. Now spread this paste on a thick white sheet. Cut this sheet into small pieces on drying. Now add few drops of lime water on this turmeric paper. What do you observe? The yellow colour turns into red.

Test the following solution given in table and note the observation in table 5.3 and conclude the results.

Table 5.3 Test of Solution from Turmeric Paper

S.No.	Test Solution	Effect of turmeric paper on solution	Conclusion (Solution is Acidic or Basic)
1	Amla Juice	.....	.....
2	Lemon Juice	.....	.....
3	Lime Water	.....	.....
4	Curd	.....	.....
5	Milky Magnesium	.....	.....

China rose petals

Activity 7

Take petals of China rose in a beaker and add a small quantity of hot water in it. Keep it for few minutes until the colour of solution turns to light pink. This is china rose flowers indicator. Indicator of China rose flower makes acidic solution dark pink and basic solutions green.

Man Made Indicators

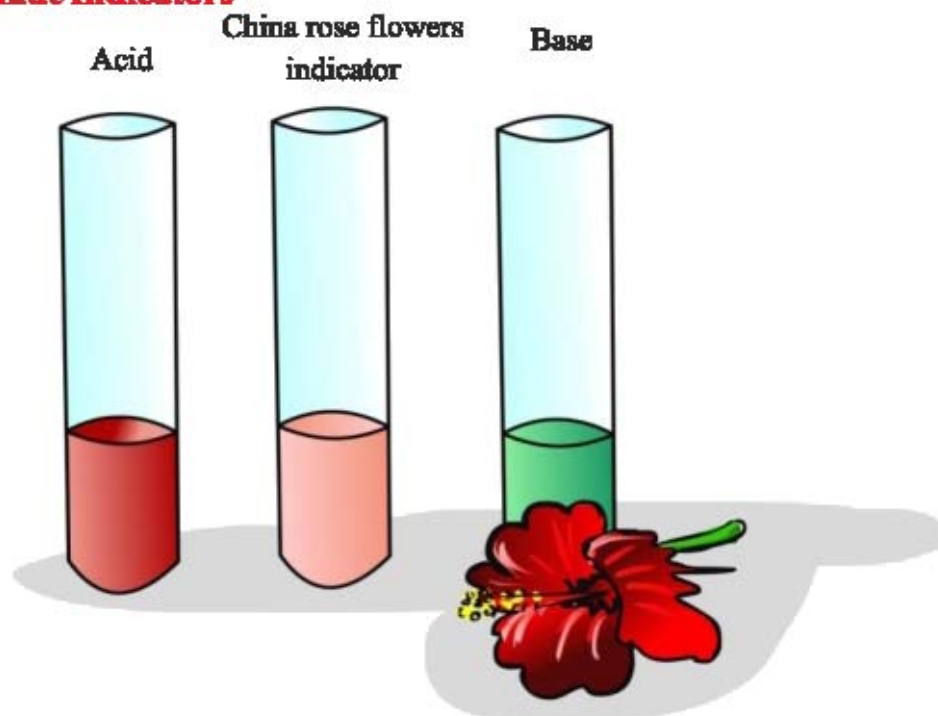


Fig. 5.7 China rose flower and prepared indicator

Some substances other than natural indicators act like indicators phenolphthalein methyl orange are examples of man made indicators.

Activity 8

Take two test tubes and label them as A and B. Now add NaOH in test tube A and HCL in test tube B. Add phenolphthalein in test tube A and Methyl orange in test tube B. Solution of test tube A turns to pink and of test tube B turns to red. So we can say that phenolphthalein and methyl orange act like artificial (man made) indicators.

Now add phenolphthalein into concentrated HCL solution and methyl orange into NaOH solution and observe the change of colour.

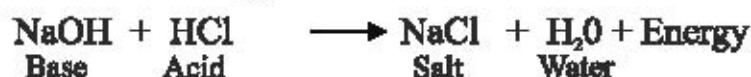
5.3 Salts

What are Salts? Let us know-

Activity 9

Make solution of caustic soda(NaOH) in test tube. On addition of 2-3 drops of phenolphthalein indicator the solution turns to pink. Now add HCl with the help of dropper. We observe that an appropriate amount of acid make solution colourless. Why this happens. Sodium hydroxide reacts with HCl and forms Sodium chloride and water as product. In this reaction heat is released. This is called **neutralisation**.

Those reactions in which addition of appropriate amount and volume forms salt and water and energy releases are called neutralisation.



Reaction of acid and base make a new product other than water, That is known as salt e.g.:- Sodium chloride , Sodium carbonate , Sodium bicarbonate etc. Test these solutions with litmus paper. You will see that these solutions do not affect litmus paper so these are neutral in nature.

Properties of Salts:-

- (i) Salts are solid in nature.
- (ii) Generally salts are neutral in nature.
- (iii) Solutions of salts are good conductors of electricity.

5.4 Uses of Acids, Bases and salts in our daily life

(A) Uses of Acids

- (i) **Sulphuric Acid:** - The chemical formula of sulphuric acid is H_2SO_4 . It is used in industries for formation of fertilisers like formation of ammonium sulphate and in batteries, dyes, clothes and paper industries.
- (ii) **Nitric Acid:** - Its chemical formula is HNO_3 . It is used in industries for making fertilisers like ammonium nitrate, in purification of gold and silver and in making of crackers and other explosives like TNT, dynamite etc.



(iii) **Hydrochloric Acid:** -It is also called *namak ka amle*. Its chemical formula is HCl . It is used in toilet cleaners and purification of salt at industrial level.

(iv) **Acetic Acid** - It is also called *vinegar*. Its chemical formula is CH_3COOH . It is used in making pickles in houses, in making medicines and in making cellulose acetate (photo film) in industries and in making white lead.

(B) Use of Bases

(i) **Sodium Hydroxide** - It is often called *caustic soda*. Its chemical formula is NaOH . It is used in houses for cleaning of utensils and for making soaps in industries.

(ii) **Calcium Oxide**- It is often called *Bina Booja Choona*. Its chemical formula is CaO . It is used in houses for white washing and treating wounds and for making ammonia and extraction of iron in industries.

(C) Uses of Salts

(i) **Sodium Chloride**- It is also called *table salt*. Its chemical formula is NaCl . It is used in houses in food and for making chlorine in industries.

(ii) **Sodium Carbonate** - It is often called *washing soda*. Its chemical formula is Na_2CO_3 . It is used in houses for washing clothes and for softening of water in industries.

(iii) **Sodium bicarbonate** - It is often called *baking soda*. Its chemical formula NaHCO_3 . It is used in houses for making baking powder, in making beverages, breads, cake etc. And for making sodium carbonate and for making digestive substances in industries.

5.5 Examples of Neutralisation in daily life.

Treatment of Acidity- Hydrochloric acid found in our stomach is helpful for digestion but presence of acid in more than the required amount causes indigestion. This is called acidity. To get rid of it we use milky magnesium (magnesium hydroxide). This neutralises effect of excess acid.

Soil Treatment - Excess Use of chemical fertilisers in fields turns the soil acidic. Which is harmful for growth of plants? Soil being more acidic or basic

reduces the fertility of soil hence when soil is more acidic Quick lime is mixed which is basic in nature and reduces acidity of soil. When the soil is basic then fertilisers are mixed in soil which reduces the basicity of soil.

Waste of Industries- Acidic materials are present in waste of industries. If this waste is directly released to water reservoirs then it is dangerous for fishes, marine plants and water bodies. Hence this waste is first neutralised with bases and then released to the water reservoirs so that water bodies are protected from being destroyed.

What have you learnt

- Salts are sour in taste and turn blue litmus red.
- Bases are bitter in taste and turn red litmus blue.
- Acids react with metals to form hydrogen.
- Appropriate amount of Acids and bases undergo continuous reaction and form salt and water with the release of heat . This reaction is called neutralisation
- Salts are solid in state and show neutral properties.
- Acidic, basic and neutral properties of substances can be known with the help of Indicators.
- Turmeric, litmus petals of China rose etc. are some of natural indicators and phenolphthaleine and methyle orange are man made indicators.

Exercise

Choose the correct option:-

1. Acid present in tamarind -
 (a) Lactic Acid (b) Citric Acid
 (c) Tartaric Acid (d) Acetic acid ()
2. Choose base from the following compounds -
 (a) Salt (b) Acid of salt
 (c) Washing soda (d) Malic acid ()
3. Gas formed by the reaction of acid and Zn.
 (a) Hydrogen (b) Nitrogen
 (c) CO_2 (d) Oxygen ()



4. Which of the following is Nitric acid -?

- (a) HNO_3 (b) H_2SO_4
(c) HCl (d) CH_3COOH

Fill in the blanks -

- (1) Bases turn Red litmus to _____.
(2) Reaction of acid with base forms _____.
(3) Acid reacts Sodium bicarbonate and evolves _____ gas.
(4) $\text{HCl} + \text{NaOH} \longrightarrow$ _____ + _____.

Match Column A and Column B.

Column A	Column B
(1) Sodium Chloride	(a) H_2SO_4
(2) Acid of Sulphur	(b) NaHCO_3
(3) Baking Soda	(c) NaCl
(4) Vinegar	(d) CaO
(5) Quick Lime	(e) CH_3COOH

Short answer type questions:-

- (1) Write the names of any two natural indicators.
(2) In which reaction do acids and bases react to form salt and water?
(3) Write three properties of bases.
(4) A blue litmus is dipped in a solution. It becomes red. Write the nature of the solution. Explain it.
(5) What is acidity? Write its treatment.
(6) What happens if waste material of industries is drained off without treatment?
(7) Why do we not use metal container to keep lemon juice?

Long type Questions

- (1) What are indicators? Name any two indicators. Explain the effect of these indicators on acids and bases?
(2) Write three differences between acids and bases.
(3) Write uses of the following
(a) Washing Soda (b) Sodium Chloride (c) Sulphuric acid
(d) Calcium Oxide (e) Acetic acid.



Chapter 6

Endocrine Glands

Point to be study:

- 6.1 What is adolescence?
- 6.2 Endocrine Glands and Hormone
 - Thyroid gland
 - Pancreas gland
 - Parathyroid gland
 - Pituitary Gland
 - Adrenal Gland
 - Pineal Gland
 - Thymus gland
- 6.3 Good Health in adolescence

6.1 What is adolescence?

In our life span we pass through the stages of childhood, adolescence, youth, maturity and old age. Begins around the age of 11 and lasts up to 18 or 19 years of age, our body undergoes many changes, is called Adolescence. In this age moustaches, beard grows on face, pimples on the face and rapid growth in length etc.

Why are these changes?

These physical changes occur in the body by certain chemical substances called hormones. These hormones are secreted by endocrine glands into the blood. In this chapter we will study endocrine glands, hormones secreted by them and their effects on the body.

It is a strange period of life when you are neither a child nor an adult. This is the period between childhood and adulthood.



6.2 Endocrine glands and hormones :

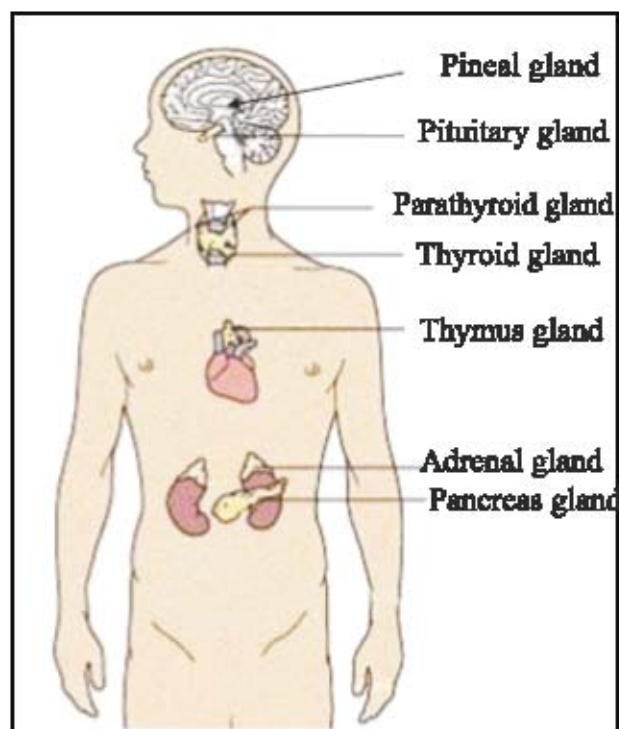


Fig 6.1: Location of Endocrine glands in human

Pituitary gland

Sometimes we come in contact with such persons, which is very small (dwarf) or too tall. His stature has remained longer or too short, why?

It is caused by a growth hormone secreted by the pituitary gland. This hormone regulates the body's growth. If there is a lack of this hormone in childhood, person remains dwarf. Excessive Secretion of this hormone, some individuals got more than eight feet height.

Thyroid gland :

Khushi went to market with her father to buy household goods. When shopkeeper gave him a bag of salt, by returning a bag of salt, father said that they needed iodized salt. Khushi was wondered, why father bought iodized salt. When asked to her father, he said



**Fig 6.2: Goiter disease
Throats is bulging**

that in our throat thyroid gland is located. This gland secretes a hormone called as thyroxin hormone. Gland requires iodine for the formation of this hormone. Lack of iodine in our diet, we may suffer from a disease called goiter. In this disease throats is bulging (Figure 6.2).

Pancreas gland :

On 15th August sweets were distributed in school. Khushi was also support this work. Hindi teacher did not eat sweets. The doctor advised him to eat less sweet. On the second day Khushi asked to her science teacher why the doctor gave her the advice to eat less sugar. He said that madam is suffering from diabetes disease. This disease is caused by a deficiency of insulin hormone in blood. Its formation has been taken place in pancreas gland of the body. If this hormone is not secreted in proper amount, increases the amount of glucose in the blood that is harmful to our body.

Adrenal glands :

You will often see that when you get angry, or before result declaration or when your mind is anxious, your heart beats faster. Blood pressure of body increases. Adrenalin hormone prepares our body to face crisis situations. This hormone is secreted by the adrenal gland.

Parathyroid gland :

Four small glands are located in our throat. They secrete a parathyroid hormone. It regulates calcium level in our blood.

Thymus gland :

The thymus gland is found in the breast. The size of the gland is large in children. It is also secrete a hormone called thymosin. In childhood the secretion of this gland is helpful in growth of genitals. Our body's ability to fight with germs is also due to secretion of this gland.

Pineal Glands :

We often feel sleepy at night time. Get up at a certain time in the morning. Why does this happen. There is a very small gland in the center of our brain. This gland secretes a hormone called Melatonin. Our sleep-wake cycle is regulated by Melatonin hormones. In addition to that this gland also regulates reproductive hormone.



In addition to the above there are some other endocrine glands found in our body, you will study about them in further classes.

6.3 Health and adolescence:

In adolescence rapid growth in body takes place. For Balanced growth it is necessary for us to be in good health. The following things is necessary for good health in adolescence

Nutrition:

Adolescence is a stage of rapid growth and development. Therefore adolescent's diet must include proteins, carbohydrates, fats, vitamins and minerals in requisite proportions. Our Indian meal of roti, rice, dal (pulses) and vegetables is a balanced meal. Milk is a balanced food in itself. Fruits also provide nourishment. Iron makes blood. Leafy vegetables, jiggery, meat, citrus, amla are iron-rich food. They must include in diet.

Personal Hygiene

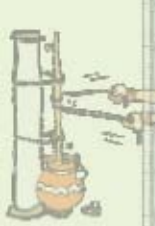
Everyone should have a bath at least once every day. It is more necessary for teenagers because the increased activity of sweat glands sometimes makes the body smelly. All parts of the body should be washed and cleaned every day. If cleanliness is not maintained there are chances of catching bacterial infection.

Physical exercise

Walking and playing in fresh air keeps the body fit and healthy. All teenagers should take walk, exercise and play outdoor games.

Say "NO" to Drugs

If anybody suggests that you will get relief if you take some drugs, just say 'No' unless prescribed by the doctor. Drugs are addictive. If you take them once, you feel like taking them again and again. They ruin health and happiness. You must have heard about AIDS which is caused by a dangerous virus, HIV. This virus can pass on to a healthy person from an infected person by sharing the syringes used for injecting drugs.



What have you learnt:

- Begins around the age of 11 and lasts up to 18 or 19 years of age our body undergoes many changes, is called Adolescence.
- Hormones are secreted by endocrine glands
- Iodine deficiency in diet cause of disease called goiter.
- Diabetes disease is caused by a deficiency of insulin in blood.
- The growth hormone secreted by pituitary gland regulates growth of body.
- Pineal gland secretes a melatonin hormone.
- Adrenalin hormone prepares our body to face crisis situations.
- In adolescence for good health balanced diet, personal hygiene, physical exercise, to stay away from drug abuse is necessary.
- Thyroid, pancreas, parathyroid, pituitary, adrenal, pineal, thymus etc. glands are found in our body.

Exercises

Choose the most appropriate option -

1. Name of Endocrine gland secretes insulin -
 (a) Pituitary Gland (b) Thyroid
 (c) Pancreas (d) Adrenal ()
2. Which element deficiency in our diet causes goiter?
 (a) Calcium (b) Iron
 (c) Iodine (d) not any ()



3. What is necessary for good health in adolescence?
- (a) Balanced diet (b) Personal Hygiene
(c) Physical exercise (d) all of the above ()

Fill in the blanks -

1. Endocrine gland secretes hormone in.....
2.disease is caused by deficiency of the insulin hormone in the blood.
3.hormone prepares our body to face crises.
4. The size of thegland is large in children.

Short answer type questions -

1. Define adolescence.
2. If a person has a very big and bulging throat what is the likelihood of disease?
3. Which hormone deficiency causes diabetes? What is the function of this hormone?
4. If a person has diabetes, what advise will you give him?

Long answer type questions -

1. What are the things essential for good health, in adolescence write an article?
2. Which endocrine glands have our body? Describe the.

Activity -

1. Prepare a list of endocrine glands and fix it in a classroom.
2. Prepare a chart of location of endocrine glands in a body and fix it in a classroom.
3. Identify patients with hormone deficiency or excess in your local area, prepare a list and as possible as examine them by physician.
4. Prepare a table on chart to demonstrate endocrine glands, their hormones, function of hormones and excess and deficiency of hormones secretion.



Point to be studied:

- 7.1 Origin of life
- 7.2 Organic evolution
- 7.3 Evidences of organic evolution
- 7.4 Theories of organic evolution

Innumerable species of plants and animals exist on the Earth. At present also, discovery of new species is going on. Man from primitive dimension strives to unravel the mystery of the origins of organism. Let's know.

- When and how did life begin?
- What were all the creatures from beginning same as they are today?

7.1 Origin of Life -

The origin of life on Earth as a result of a very slow process occurred. Initially, nitrogen and water vapour was in the Earth's atmosphere. From the reaction of extreme hot vapour and carbon build-up a hydrocarbons. By the action of nitrogen and metals, nitrite was formed. Reaction between newly formed nitrite and hot vapour produced ammonia gas. Chemical combination between hydrocarbons and ammonia, Sugars and organic acids were formed. As a result of chemical reactions between amino acids and organic acids, build proteins. Three billion years ago a virus like organism developed from these early proteins. The first creatures were extremely small and like a blue-green algae. Thereafter, single-celled organism protozoan were originated. Generally, this gradual change move towards the complex organisms from simpler one.

Origin and evolution of respective complex organisms from simpler ones by changes is called organic evolution.



7.2 Organic Evolution -

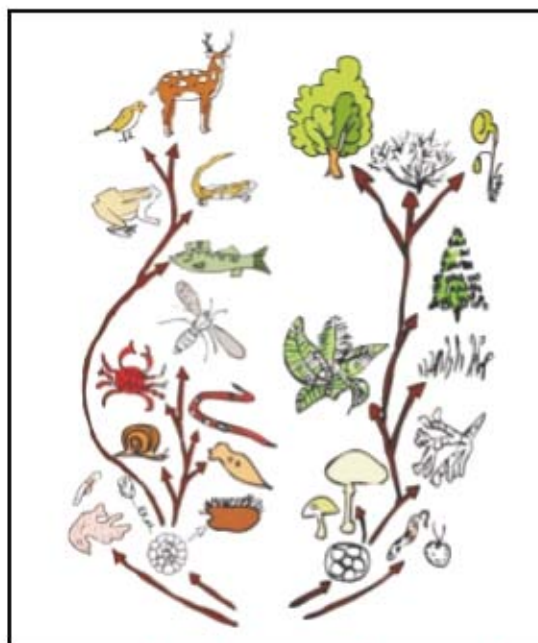


Fig 7.1: Organic Evolution

Evolution of organisms is shown in Fig 7.1. Firstly single-celled organisms were formed. Then multi cellular organisms were originated from them. Earlier, these were simple, but in gradual development became complicated. All animals were initially without a backbone. Fishes grew from them, by which amphibians were developed. From these evolved reptiles who ruled on the earth millions of years. Thereafter, some reptiles developed into birds and other in mammals. Animals from one class to another takes thousands of years to develop. Similarly, the evolution in plants also take place.



Fig 7.2: Dinosaur (Extinct animal)

7.3 Evidences of organic evolution -

Evidences from Classification: Classification of animals, from protozoa to Echinodermata is the gradual evolution of all animals. Similarly, Pisces, Amphibia, Reptilia, Aves and Mammalia of chordata have many similarities. Such as in these vertebral column are hollow. Animals of class Pisces developed by non-chordates. The evolution takes place from simple to complex. It is proven that all organisms evolved from a common ancestor like many branches originated from the main stem of a tree.

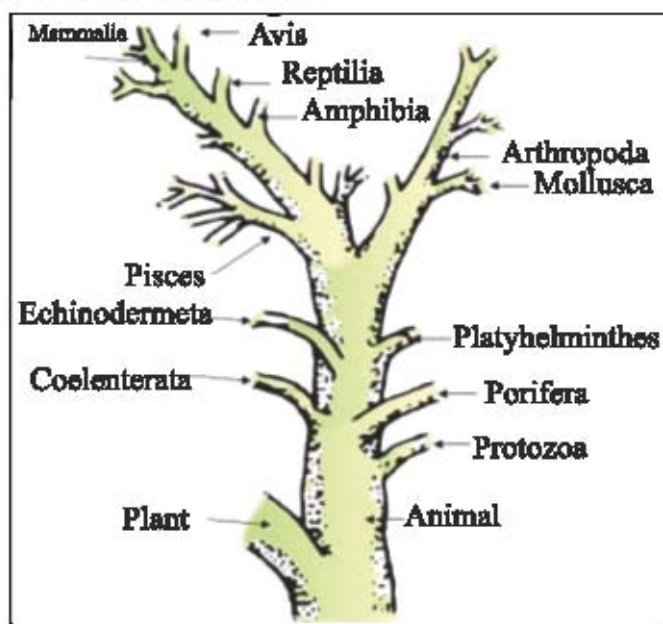


Fig 7.3: Evidences of classification

Structural Evidences:

I. Homologous Structures or Organs

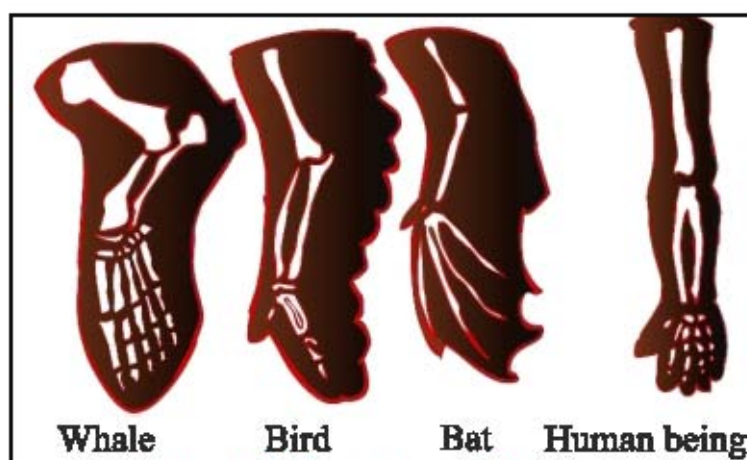


Fig 7.4 Homologous Organs



In the picture a 7.4 bird, bat, whales and humans forelimbs have been shown. There is a difference between the external structure of forelimbs of all of these due to different type of habitat and functions performed by them.

Table 7.1

Modifications and functions of forelimbs of animals

S.N.	Animal	Function	Modification of forelimb
1	Whale	Swimming	Into flipper
2	bird	Flying	Into wing
3	bat	Flying	Into wing
4	human	Grasping	Into arm

Difference between functions and external structure of forelimbs of these animals, basic structure of the skeleton and the origin of these animals is the same. Such organs are called **homologous organs**. Same origin of organs proves that ancestors of all of them were same and development gradually took place as time passed.

II. Analogous Organs :

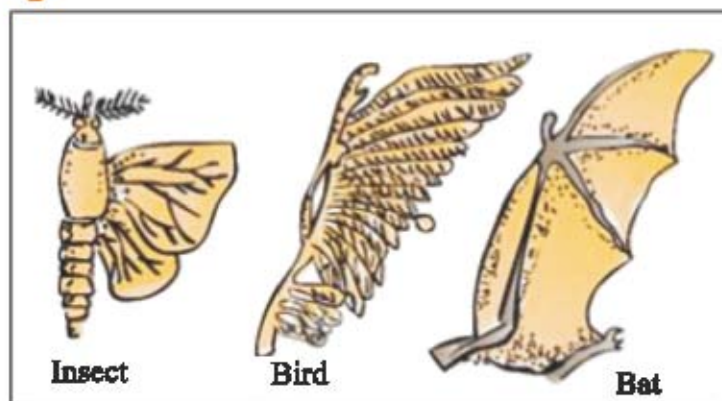


Fig 7.5: Analogous Organs

In the picture wing of insect, bird, bat are shown which help them in flying. There are differences in the structure and origin of their wings. The origin of insect wings protrudes from the walls of the body while the origin of bird and bat's wing is the modification of the forelimb. They have bones. Though the functions are similar, the origin and structure are different, such organs are called **analogous organ**. Animals with analogous organs developed in different classes in a different way.

Palaentological Evidences

Remains of dead animals and plants or their impressions found in rocks are called fossils. Fossils are found in sedimentary rocks. Some times whole body's size of an organism is found. It is a most concrete evidence of evolution.

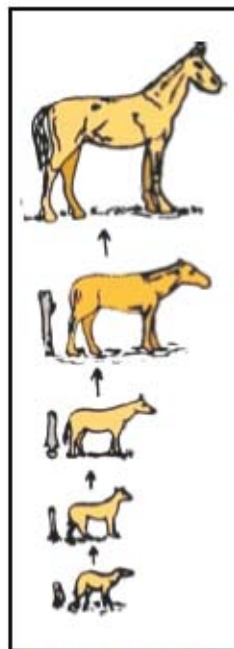


Fig 7.6 Evolution in horse

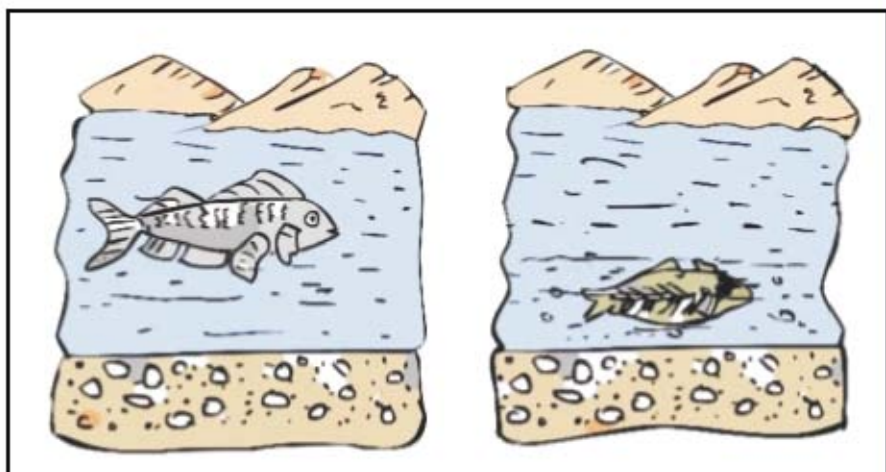


Fig 7.7 Fossils evidences

Evidences From Vestigial Organs

Some organs are found in animals, today which are present in the form of remains. But they were highly developed and functional in their ancestors. Examples are as follows -

Table 7.2 (vestigial organs of animals)

S.N.	Animal name	Vestigial organs
1	Human	muscles of ear, nictating membrane, caudal vertebrae, vermiform appendix
2	Marine bottom fish	less developed eyes
3	pythons (snake)	Vestiges of the hind limbs
4	Kiwi and Ostrich	Wings

These vestigial organs certify that in their ancestors, these organs were functional and well developed. But over time, as their utility decreases, they remained as a vestigial.

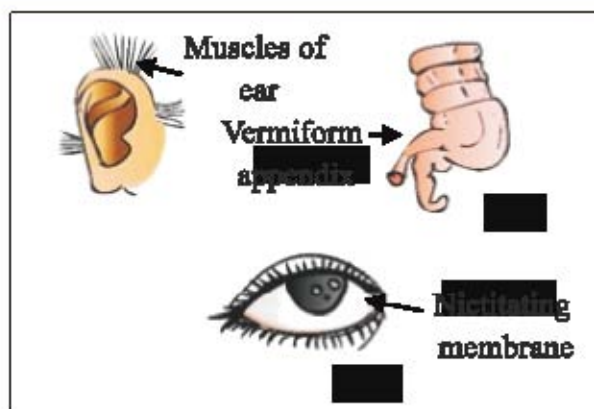


Fig 7.8 Vestigial organs in human being

Evidences From Physiology

I. Similarities in digestive system

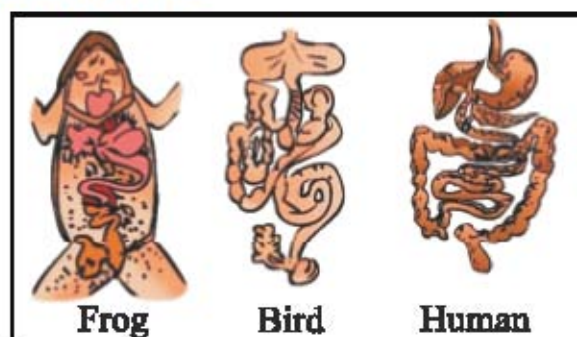


Fig 7.9: Digestive systems of different animals

In the picture 7.9 we see that digestive tract of these animals have a pharynx, stomach, small intestine. It includes liver, pancreatic, digestive glands etc. Secretion of digestive juices and their function is also same. So this proves that these animals have evolved in a certain order.

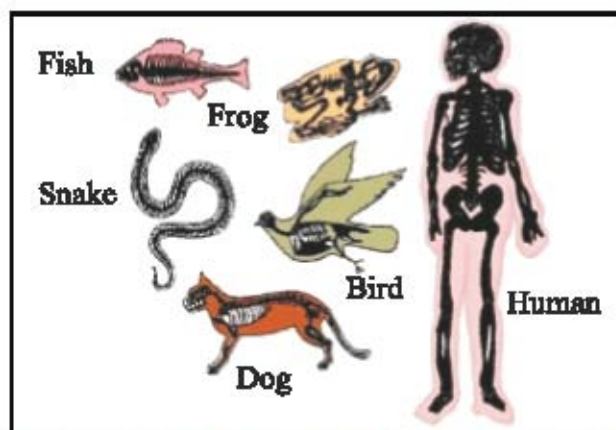


Fig 7.10: Skeleton of different animals

Generally a skeleton is found in notochord animals. They have back bone which is made up of small bones called vertebrae. The similarity in their bones of hands and leg and skeletal systems, shows that their ancestors would have been similar. Over the time some differences appear due to change in conditions.

Evidence of the complexity of the heart:

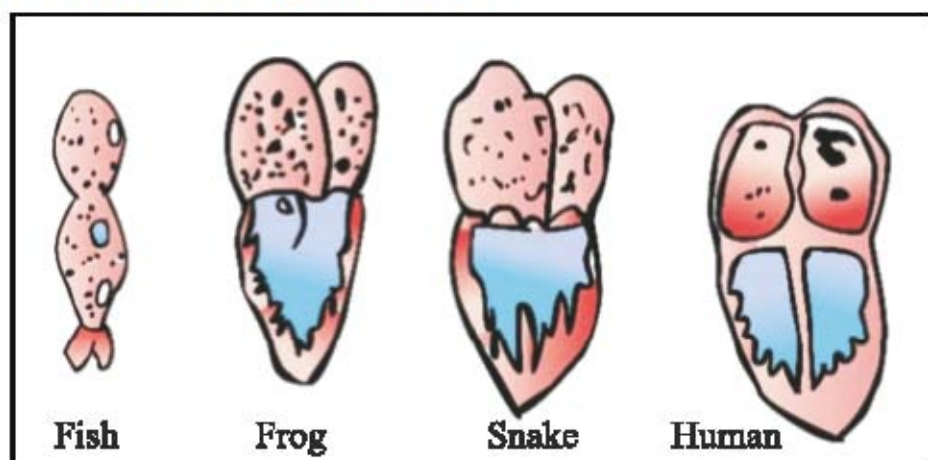


Fig 7.11: Structure of hearts

We see that heart structure of fish is the most simple but complex in man who shows an order of certain evolution.

Table 7.3- Structure of heart of animals

S.N.	Animal name	Structure of heart
1	fish	two chambers(One auricle and one ventricle)
2	frog	three chambers(two auricles and one ventricle)
3	snake	two auricles and two incomplete ventricles
4	human	four chambers(two auricles and two ventricles)

II. Similarities in blood protein

Animals of different classes such as man, gorilla, monkey, fish, frogs etc have similarities in blood proteins.

Evidences from Embryology:

In multicellular animals, a unicellular zygote is formed by sexual reproduction which creates embryo by the division.

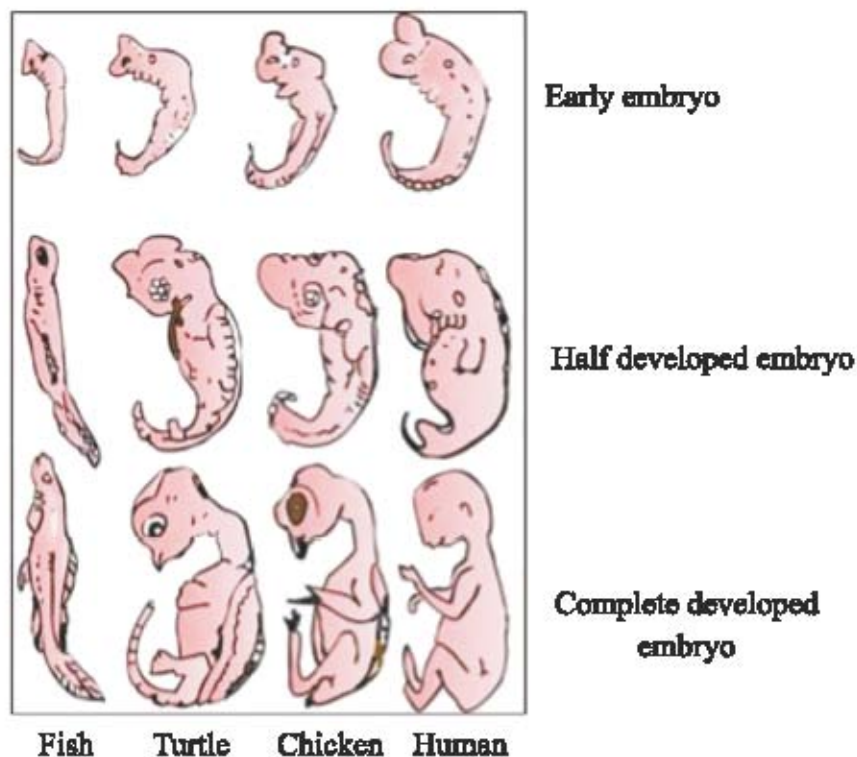


Fig 7.12: Developmental stages of different animals

When we see fish, turtle, chicken, human's embryos, early stages of them appears almost identical. This proves that the ancestor of all vertebrates resemble with fish and their development is certainly in order.

Every organism, in its development, repeats its organic history called as Theory of Recapitulation. This theory was proposed by Jarman Scientist Haeckel.

Evidences From Connecting Link

In the classification of organisms, organisms with related properties have been placed in the same class. There are some animals which have properties of the two classes.

1. Archaeopteryx :-

This serves as connecting link between reptiles and birds. This animal had some features beak, wings, structure of legs etc were similar to aves (bird) and some characteristics beak, tail, scales on body etc were similar to reptiles.



Fig 7.13 Archaeopteryx

Similarly Platypus and echidna serves as connecting link between Reptilia and Mammalia classes.

Evidences from Geographical Distribution: Now a day variations are found in the geographical distribution of plants and animals. For example - Platypus, Kangaroo and eucalyptus plant is found in Australia only. Similarly Giraff is found only in Africa. According to scientists at a time the continents were connected to each other. Later on they were separated by the sea. That's why animals and plants found in one continent could not reach to another continent. Due to different circumstances structures of them are changed according to different places. The geographic distribution is therefore also certifies organic evolution.

7.4 Theories of organic evolution:

Due to the development in the living world, new species are discovered and is going on till today. To explain the order of organic evolution scientists gave different theories. Following are the theory of organic evolution -

1. Lamarck's Theory
2. Darwin's Theory
3. Mutation Theory
1. **Lamarck's Theory:** This theory was given by Jean-Baptiste Lamarck in 1809. His theory is known as theory of acquired characters.

According to Lamarck due to changes in environment, more frequently used organ strengthened and organ that was less frequently used, disappeared.



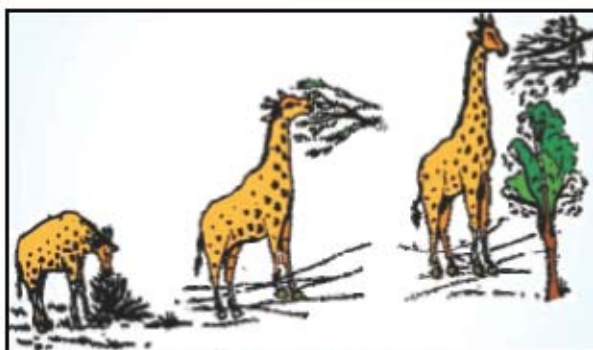


Fig 7.14 Elongation of Legs and neck of Giraffe

Giraffes are found in Africa. It has long legs and neck. It lives by eating the leaves of tall trees. According to Lamarck giraffe was not as long as their ancestor. They could easily eat weeds. Gradually due to change in environment, deserts extended and grassland perished. To get the leaves of the trees which were at height, legs and neck had to be used more that's why his legs and neck became too long. These traits are inherited from generation to generation.

Snakes live in holes. Due to inconvenience legs were used less and gradually disappeared.

Some scientists denied the theory of Lamarck. They said, "if the tail of a mouse is cut generation to generation, there is no chance of birth of a mouse without tail. In the same manner girls do not take birth with a prick in the earlobe, even after girls are having it from generations.

Darwin's Theory: Charles Robert Darwin's gave a theory of natural selection for organic evolution. Different phases of Darwin's theory are as under:

- 1. Production of offspring in living organisms:** Each organism does production of offsprings to maintain their race. Example elephant produces 8 offsprings in her life span. It is a slow breeder. A pair of elephants began to breed regularly and engender that all offsprings are regularly breeding, in the 750 years a pair will generate approximately 1.9 million elephants and numbers of elephants will be very high. But this does not happen.
- 2. The struggle for survival:** Due to over production of offsprings, the struggle for space and food for the growing number of offsprings takes place. It is the struggle of survival. This struggle occurs in between animals of own species and with other species also. Which is capable of the same shall live. Destruction due to struggle, the number of organisms will remain balanced and consistence in nature.
- 3. Natural selection:** In struggle of survival only those animals live who adapt them according to nature. If they are not able to do it, then they are destroyed.

4. **Origin of the new species:** Inheritance of useful traits will continue from generation to generation and harmful traits gradually become extinct or remain as a vestigial organ. Sometimes variations increase so that after hundreds of millions of times new generation is more different from older generation and the development of a new race goes. For example, at the beginning dog, jackals and wolves, three were members of the same race but due to change in atmosphere to adapt themselves accordingly changes in their size and physical characteristics. After thousands of years dog, fox and wolf three new species was developed.
5. **Neo-Darwism** Darwin added new approaches to his old doctrine and gave a new doctrine of neo-Darwinism. According to this, the new species are originated due to gene variation into the members of the particular species. Only genetic variations are inherited and environmental characteristics ends with animal die.
6. **Mutation theory:** Hugo deries gave the theory of the mutation. When he tested some plant, found that some of the plants produced are quite different from thier species. These traits are in herited from generatio to generation. These sudden variations in inherited characters are called **mutation**. Mutations in animals can be caused by the following-
 1. Change in number of genes
 2. Change in gene arrangement
 3. Change in gene structure.

Means of mutation: Mustard gas, Nitrous acid, Phenol, X-rays, Beta rays etc.



Birbal Sahni

Palaeobotanist who enchanted the world with interesting tidbits, Birbal Sahni was born on November 14, 1891 at Bhera village; in the Shahpur District. He is the founder of palaeobotanical research in India.

Amongst a large number of fossil plants described by him from Rajmahal Hills of Bihar, was his most remarkable discovery of a new group of fossil gymnosperms, to which he gave the name "Pentoxylae". Sahni was greatly interested in archaeology and he published a number of papers in this field. His work on the "Technique of casting coins in ancient India" set a new standard in archaeological research in India. He founded

the Institute of Palaeobotany at Lucknow, which was later renamed as Birbal Sahni Institute of Palaeobotany after his death.

What Have You Learnt

1. There are constant gradual changes in living things.
2. The origin of life on earth is from the simple substances.
3. The very first single-celled organism was evolved. Thereafter, multicellular organisms evolved from unicellular organisms.
4. Organic evolution is a slow process.
5. Organic evolution has solid evidences which prove occurrence of organic evolution. Classification evidence, physical structure evidence, fossil evidence, vestigial evidence, physiology evidence, embryonal evidence, connecting link evidence, geographical distribution evidence etc. are evidence of organic evolution.
6. According to Lamarck organic evolution is more or less based on the usefulness of organs.
7. Darwin's theory of natural selection is assumed as the basis of the organic evolution.
8. According to mutation theory, evolution is a sudden change in the chromosomes.

□□□

Exercises

Choose the correct option -

1. Heart of fish has -
 (a) One auricle one ventricle (b) one auricle two ventricles
 (c) Two auricles two ventricles (d) two auricle two ventricles ()
2. Archaeopteryx is a connecting link between
 (a) Pisces and amphibian' (b) Reptiles and Aves
 (c) Aves and mammals (d) Amphibians and Reptiles ()
3. Which Scientist gave a theory of mutation -
 (a) Lamarck (b) Darwin
 (c) Hugo de Vries (d) Mendel ()

4. Fore limb of whale is called as -

- (a) Flipper (b) arm
(c) wing (d) leg ()

Fill in the blanks -

1. Wings of bird and bats are.....organ.
2. Vertebral Column is consists of small.....
3. Every organism, in its development, repeats it's history.
4. Organic evolution is aandprocess.
5. Darwin gives Theory of.....

Short answer type questions -

1. Write differences between homologous and analogous organs.
2. Write a process of fossils formation.
3. Draw a structure of hearts of different animals to show sequence of organic evolution.
4. Define Lamarck's Theory of evolution with examples.
5. What is mutation?

Long answer type questions -

1. Explain enohition on the the basis of edivendences of embryology.
2. Clarify different steps of Darwin's Theory.
2. Explain a process of formation of fossils?

Activity -

1. Make a chart of organic evolution and fix in a class room.
2. Make a collage of vestigial organs.



Chapter 8

Adaptations in Animal

Points to be studied

8.1 Adaptation

8.2 Habitat and animals

Adaptations in animals of aquatic habitat

Adaptations in animals of terrestrial habitat

- Adaptations in animals of terrestrial habitat
- Adaptations in animals of desert habitat
- Adaptations in animals of polar region habitat
- Adaptations in animals of desert habitat

8.1 Adaptation:

Our Earth has a various geographical atmospheric conditions such as excessive heat (desert) extremely cold regions (Polar and Tundra) and regions of normal atmospheric conditions, sweet and brackish water areas etc. You will have read, heard and seen about the organisms living in various environmental regions. What these diverse environmental conditions, physical structures and behavior of living organisms will be the same?

Let's find out:

The physical structures and behavior of organisms living in these diverse environmental conditions are not uniform. Fish out of water after sometime dies. Have you ever thought why this happens?

Fish is an aquatic organism. Its external and internal structure of the body is made for living in aquatic environment only.

The physical characteristic of living organism, which enables them to survive in particular environmental conditions, is called adaptation.

8.2. Habitat and animals:

The following table 8.1 provides the names of some habitat. Write the names of animals living around in front of them.

Table 8.1: Animals living in different habitat

S.N.	Habitat name	Animals name
1	Normal terrestrial	
2	Desert	
3	Terrestrial Aerial	
4	Aquatic	
5	Polar	

Animals that are mentioned in the table, their physical characteristics enable them in living in the respective habitat.

Let us learn about adaptations found in aquatic animals -

Adaptations of animals of aquatic habitat:

For respiration aquatic animals get necessary oxygen from the water. These animals depend on aquatic plants and animals for food. Example - fish (fig. 8.1), pila, snails. They have following characteristic in their physical and internal structures. These characteristics are called as adaptations. Such as -

1. Aquatic animals have gills for respiration.
2. They possess scales or shell on their body.
3. Aquatic animals have air sac in the body which helps in living and swimming in water.
4. Eyes have a nictating membrane to protect it from the water.
5. They have fins for movement or swimming.

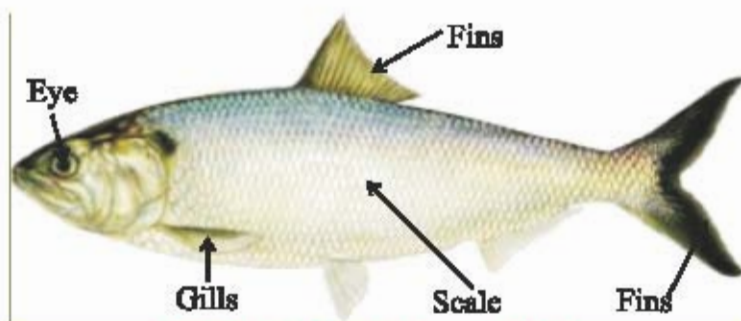


Fig 8.1: Adaptations in fish



Adaptations of Terrestrial Animals:

Various types of Terrestrial areas are found on the earth such as very high hills, plains and plateaus. In addition to these, area of excessive heat and extreme cold also exists on the earth. Animals found in a these variety of areas are also differing in physical and internal structures. Animals found on terrestrial habitats of earth are classified into the following categories -

1. Normal terrestrial habitat
2. Desert habitat
3. Hilly habitat
4. Polar habitat
5. Habitat of animals flying in air

Adaptations in animals of normal Terrestrial habitat:

Habitat of normal environmental conditions on the earth is called normal terrestrial habitat. The following are the characteristic of the animals found in this type of habitat :

- 1- They have legs for movement such as horse, deer, cows etc. But many animals do not have legs, but their body is muscular, which allows them to creep on the ground such as snakes.
- 2- A long tail found in monkeys is helpful in climbing on the trees, maintaining balance and provide grip on branches.
- 3- Giant animals such as elephants due to their heavy body and short neck cannot easily bend, therefore, it could not hold food by fore limbs hence it uses its long proboscis for breaking leaves and branches, pick up the food from the land and protect it from enemies.
- 4- Giraffe's neck is adapted to get its food from tall trees.
- 5- Carnivorous animals such as Lion, cat, leopard etc. have more developed canine teeth in mouth to tear prey.
- 6- Deer, hare, nilgai, horse etc. have well developed incisors to chew food.



Fig 8.2 Elephant and Horse

Adaptations in Desert animals:

The desert atmosphere includes dried areas of high temperature. Numbers of species of animals found in it is also less. In this habitat only those animals can survive which bear extreme temperatures and scarcity of water. Most animals living in this habitat make burrows in the land such as lizards, snakes; wild rats etc.



Fig 8.3 Desert Animal (Mouse)

Desert dwelling creatures have the following physical characteristics.

1. Their skin is light brown in color.
2. Their skin is thick, smooth and is dry.
3. Most animal are nocturnal which save them from the heat of the day.

Camel is an important example of this type of habitat. Broad, flat, pads at the bottom of their hooves. For this reason it can move freely in sand. It is also called the "ship of the desert". After taking water it remains without water for many days. The urine of it is thick. Its stool is also hard. Camel's skin is thick so it excretes less sweat. Other examples of animals of this habitat are fox, rabbit, wolf, monitor lizard etc.

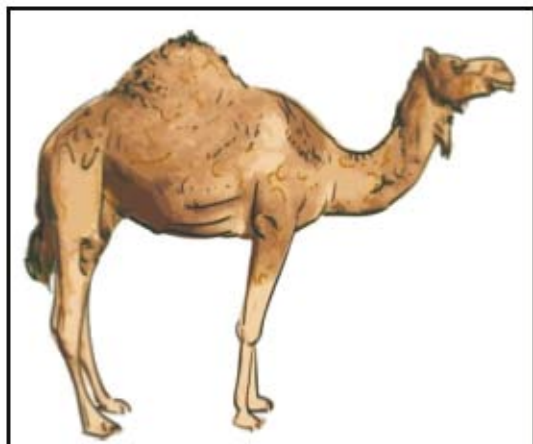


Fig 8.4 Desert animal (Camel)



Adaptations in Polar or cold habitat-

In polar region most of the time the ground is covered with snow. These regions have extremely low temperatures and the weather is dry. This type of habitat found in Polar Regions, on high mountains and plateaus. This is also called cold desert.

Low vegetation is found in Polar Regions. Hence less number of animals is found there. The animals found in these areas are rabbits, bear, Musk ox, reindeer, mountain goat etc. These animals have thick fur on the body and a thick layer of fat under the skin, which prevents them from cold.

Animals in these region is very less so it is a safe area. That's why penguin makes their home in these areas during their breeding season.



Fig 8.5 Reindeer



Fig 8.6 polar bear

Adaptations in animals flying in air:

This category includes those animals which can fly in the air as well as live on the land.

You have seen a wide variety of birds flying in the sky. Have you ever thought how the birds fly in the sky? What are the physical characteristics by which they can fly in the sky and we can't?

Let's know about physical adaptations of these flying birds -

1. Their forelimbs are modified into wings.
2. Their body is lighter and the boat shape so they can fly in the air easily.
3. Birds have no teeth in the mouth, but their beak is rigid and strong, they eat insects by comfortably holding it.

4. Their bones are hollow and the air is filled in hollow cavity of bone, which makes their body lighter.
5. Its body is covered with feathers.
6. Bird's heart is very powerful. It provides blood, nutrition and oxygen to wings during flight.

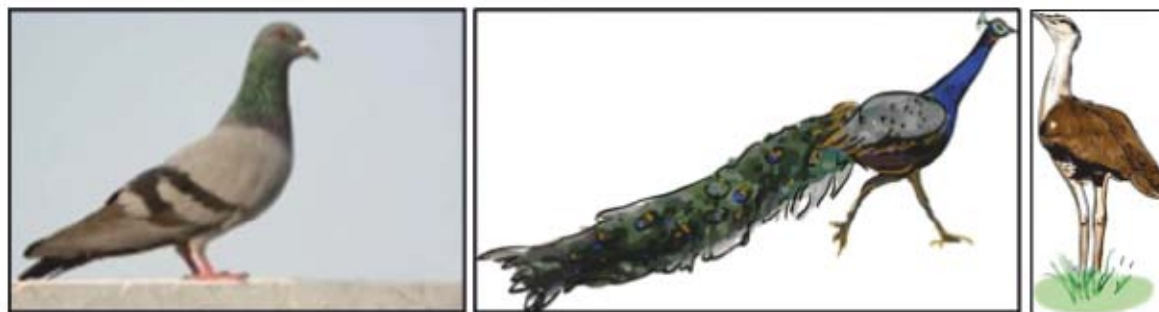


Fig. 8.7 Pigeon, Peacock and Godavan

What have you learnt

- The physical characteristic of living organism, which enables them to survive in particular environmental conditions, is called adaptation.
- Respiration in aquatic animals takes place through gills.
- In Aquatic animals a nictating membrane is found on eyes.
- Many normal terrestrial animals do not have legs, but they have muscular body which allows them to creep on ground such as snakes, earthworm etc
- The skin of desert animals is thick, smooth and dry.
- Polar animals have thick hair and a thick layer of fat under the skin, which regulates their body temperature.
- Their bones are hollow and the air is filled in hollow cavity of bones, which makes their body lighter.

□□□

Exercises

Choose the correct option -

- Aquatic animals have adaptations -
 (a) Gills (b) Scales
 (c) Lay eggs (d) all the above ()
- State bird of Rajasthan -
 (a) Peacock (b) Pigeon
 (c) Great Indian bustard (d) Parrot ()
- Which habitat has a characteristic of fat under skin and a layer of fur?
 (a) Aquatic (b) desert
 (c) Polar region (d) all the above ()

Fill in the blanks -

- The physical characteristic of living organism, which enables them to survive in particular environmental conditions, is called.....
- Bones of birds are.....and body is covered by.....
- Aquatic animals have.....on eyes.

Short answer type questions -

- What features are found in bird's body, which make them suitable for flying?
- What would happen if there was no cushioning in the camel's foot?
- If a thick layer of fat is not found under the skin of the polar bear then what will be the effect of it?

Long answer type questions -

- What is a difference between terrestrial and aquatic organisms?
- What characteristics are found in camel which adapts it for desert habitat?

Activity:

- Observe your nearby animals. Prepare a table of adaptations found in them on a chart and fix it in your class room.
- Observe aquatic and terrestrial plants and animals and discuss their characteristics.
- Observe different type of insect's shape, colour etc found on trees.
- Prepare a chart of beaks of birds found around.
- Prepare a scrap book of pictures of adaptation (animals and plants).



Chapter 9

Respiration and Excretion in Animals

Points to be studied:

- 9.1 Respiration
- 9.2 Human Respiratory System
- 9.3 Respiration in insects
- 9.4 Respiration in aquatic animals
- 9.5 Excretion
- 9.6 Human excretory System

We perform various activities like playing, cycling, reading and drawing water from hand pump etc. in our daily life. We need energy for doing all these activities. We get this energy from food. This energy stored in food is released by the process of respiration. What is respiration? Let's learn.

9.1 Respiration:

Our body is made up of uncounted tiny cells. When we breathe in air which is rich in oxygen enters into the body through nostrils. This process is called as inhalation. Ultimately this oxygen reaches to cells. In the cells, oxygen helps in the breakdown of stored food and energy, carbon dioxide and water is formed. This carbon dioxide is released out through breathe known as exhalation.

The process of respiration is same in all the organisms. But different categories of animals have different organs for respiration so there is a difference in the mechanism of respiration. Let's learn.

9.2 Respiration in humans:

Normally we take in air through our nostrils. When we inhale air, it passes through our nostrils into the nasal cavity. From the nasal cavity, the air reaches to our lungs through the windpipe. Two lungs are present in the chest cavity of our body. This cavity is surrounded by ribs on the sides. A large, muscular sheet

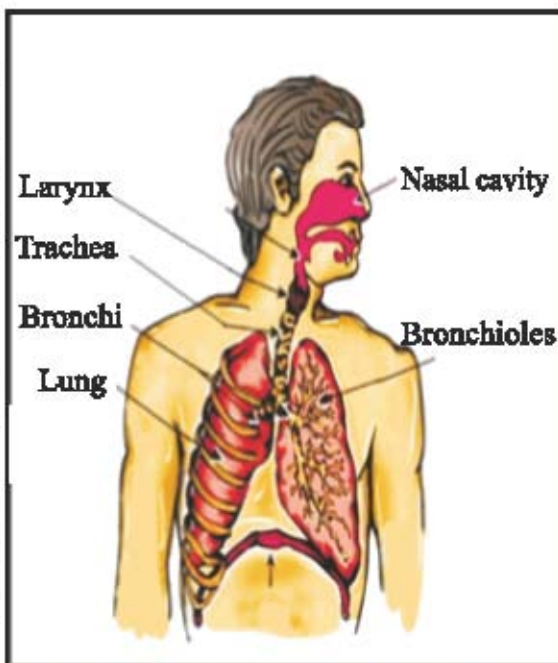


Fig 9.1: Human respiratory system

called diaphragm forms the floor of the chest cavity. During inhalation, ribs move outwards and diaphragm moves down. This movement increases space in our chest cavity and air rushes into the lungs. The lungs get filled with air. During exhalation, ribs move inwards, while diaphragm moves up to its initial position. This reduces the size of the chest cavity and air is pushed out of the lungs.

Lets do an experiment to understand the mechanism of breathing.

Activity 1

Take a wide plastic bottle. Remove its bottom. Get a Y-shaped glass or plastic tube. Make a hole in the lid so that the tube may pass through it. To the forked end of the tube fix one balloon each. To the open base of the bottle tie a thin rubber or plastic sheet using a large rubber band. Pull the rubber sheet from the base downwards. Did you see any changes in the balloons? Now push the rubber/plastic sheet up and observe the balloons.

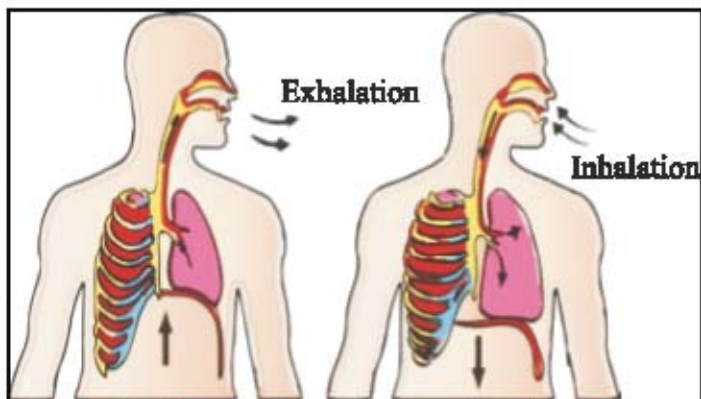


Fig 9.2: Respiration mechanism in humans

Pushing the rubber sheet downwards balloons become swelled and pulling the rubber sheet upwards, deflate balloons.

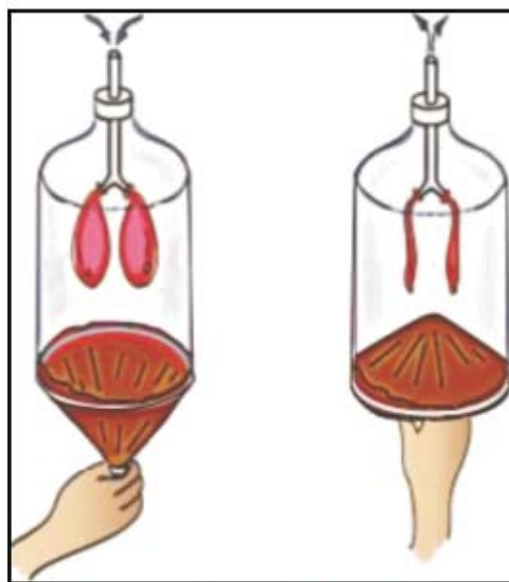


Fig 9.3 : Model to show mechanism of respiratory system in human

Animals such as cows, goats, snakes, birds, lion's have lungs like the human beings.

Do all living organisms have lungs?

Different groups of organisms have special type of organs for the respiration in place of lungs. Let's study about these special type of organs.-

9.3 Respiration in insects:

Spiracles:

A cockroach and insects have small openings on the sides of its body. These openings are called spiracles. Insects have a network of air tubes called tracheae for gas exchange. Oxygen rich air rushes through spiracles into the tracheal tubes, finally reaches to cells. Similarly, carbon dioxide from the cells goes into the tracheal tubes and from there moves out through spiracles.

9.4 Breathing under water:

Clome or Gills

Aquatic animals like fish have gills or clome. Gills are found out of the skin. Clome absorbs oxygen dissolved in water. Gills are well supplied with blood vessels. Exchange of gases takes place in these blood vessels.



Fig 9.4 : Respiration in fish by gills

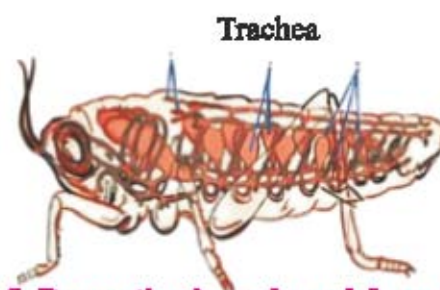


Fig 9.5: Respiration in cockroach by spiracles

Earthworms, leeches etc. respire through their moist and slimy skin.

Respiration in plants:

You have already learn tin previous class that the leaves of the plants have tiny pores called stomata. In plants the exchange of gases takes place through stomata.

Do roots of plants also respire? Let's know -

Activity 1:

Carefully remove an unwanted plant with roots grown in the field and observe its roots. There are so many soil particles sticking with root hairs. Roots



take up oxygen from the air spaces present between the soil particles. In this way respiration process takes place in the root of plants.

9.5 Excretion

We know, we sweat after playing or hard work. This sweat comes out through tiny pores of skin. The excretion of additional water and salts takes place through skin in the form of sweat.

In this chapter you also know that carbon dioxide is removed as waste from the body through the lungs during exhalation. The undigested food is removed as stool and toxic products (Urea and Uric acid) are removed from the body by urine. Carbon dioxide, sweat & stool, urine are excretory products of our body. When our body cells perform various types of bio chemical processes, certain waste, products are released. These waste products are toxic and hence need to be removed from the body. The process of removal of wastes produced in the cells of the living organism is called **excretion**. The organs involved in excretion forms the excretory system.

9.6 Human Excretory System:

In human two kidneys, ureters, bladder and urethra form the excretory system. The removal of waste substances present in the blood takes place in two kidneys. The wastes dissolved in water are removed as urine goes into the urinary bladder through tube-like ureters. A muscular tube is attached with ureters. It is called urethra. Urethra opens outside the body through a pore which is called urinary opening. From the urinary bladder urine is passes through urethra removed out by urinary opening.

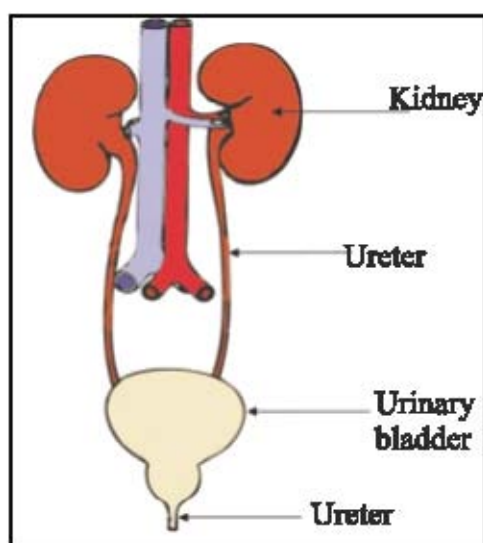


Fig. 9.6: Human Excretory System

YOGA

In today's environment, we can make our lives healthier and happier by yoga. In today's polluted environment Yoga is a mode, which has no adverse effects (side effects). Many yoga postures and the KAPAL BHATI, ANULOM-VILOM and BHRAMARI PRANAYAM make us free from many diseases. Yoga and Pranayam make mind calm, SHAWASAN makes our high blood pressure normal, VAJRASAN helps us in tackle digestive disorders. In today's era of computers, whole day work on computer causes back and neck pain. TADASAN and SHALABHASAN give us freedom from pain relief medication. Adopting many postures of yoga in life, can stay away us from diseases and can fit our health. Yoga gives the body strength to fight with diseases. It increases resistance power in body.

Yoga is profitable of our physical, mental and spiritual health. It makes our life stress free. Gift of Rishi tradition, Yoga is accepted by all over the world. As a result of which the proposal made by our honorable Prime Minister in UN of celebrating International Day of Yoga on June 21 was passed by the 177 countries within a very limited time. On 21 June, 2015 the first International Yoga Day was celebrated all over the world.

It is written in the Gita, 'Yoga itself is a journey through self-reach themselves'.

Let us make a success of life by joining the trip.

What have you learnt

1. The intake of air rich in oxygen into the body is called inhalation and giving out of air rich in carbon dioxide is known as exhalation.
2. The respiration is a process in which breakdown of food with the release of energy takes place.
3. Cockroach and other insects respire through their spiracles.
4. Earthworms, leeches etc respire through their moist and slimy skin.
5. In human two kidneys, ureters, bladder and urethra form the excretory system.
6. The process of removal of wastes products from the body is called excretion.



□□□

Exercises

Choose the correct option -

- (i) Which organ is helpful in utilisation of oxygen dissolved in water -
 (a) Clome (b) stomata
 (c) Mouth (d) nostrils ()
- (ii) Respiratory organ in insect is -
 (a) Skin (b) Clome
 (c) Lungs (d) nostrils ()
- (iii) Which organism respire through skin -
 (a) Human (b) fish
 (c) cockroach (d) earthworm ()

Fill in the blanks -

- (i) The process of removal of wastes produced from the body is called.....
- (ii) During inhalation ribs moves towards-----and diaphragm moves toward.....
- (iii) Insects have a network of air tubes called.....

Short answer type questions -

- (i) How fishes respire in water?
- (ii) How respiration in insects takes place?
- (iii) What happened if our kidneys stop working?

Long answer type questions -

- (i) Describe a respiratory system with a well labeled diagram?
- (ii) Draw a well labeled diagram of excretory system.
- (iii) Explain the mechanism of diaphragm by an activity?

Activities:

- (i) Prepare a model of respiratory system with the help of thermocol?
- (ii) Take a measurement of chest of your friends after inhalation and exhalation, note down in the table given below.

S.NO.	Name of Friend	Measurement of Chest	
		After Inhalation	After Exhalation
1			
2			
3			
4			
5			

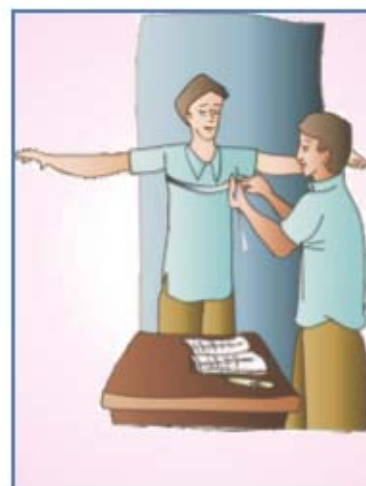


Fig 9.7: Measurement of chest

- (iii) Prepare a model of mechanism of human respiratory system with the help of waste material.
- (iv) Prepare a model of human excretory system with the help of waste material and plaster of paris.
- (v) Count respiration process doing in one minute in students of class.
- (vi) Act role play on "Danger of smoking".



Chapter 10

Skeleton and Joints

Points to be studied:

- 10.1 Human skeleton system
- 10.2 Major parts of human skeleton system
 - Axial skeleton
 - Thoracic skeleton
 - Appendicular skeleton
- 10.3 Major joints of our body
- 10.4 Muscles
- 10.5 Movement in certain animals

You must have seen colourfully kites in the sky and must have flown kites also have you ever thought that if kite's thin wooden spikes will be removed, what will happen? The size and shape of the kite may be contorted and that would not have flown. These twigs prepare the framework of kite. Similarly, our body is also needed a framework to provide a certain shape and size of our body. In the absence of it, our body will neither walk nor can act. How this structure is made up? Let's know-

10.1 Human Skeleton System:

Observe Fig 10.1 carefully and answer the following questions:

- What is illustrating in this picture?
- What are visible in this picture?

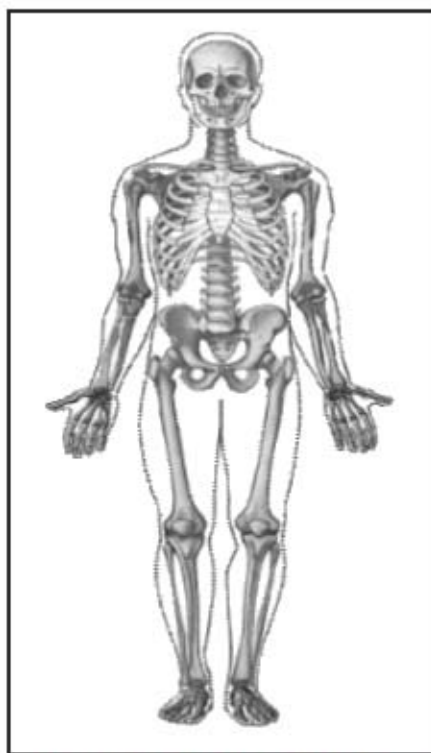


Fig. 10.1 Skeleton System

It is our body's skeletal system. It has bones, Cartilage, joints etc. It makes frame work of our body. This skeletal system of the body performs the following important functions.

Functions of skeleton system:

- (i) It provides framework and support to the body.
- (ii) Provides protection to body's internal organs against external shocks.
- (iii) The skeleton system provides movement of body or parts of the body with the help of muscles.
- (iv) It strengthens the body.

What is the skeletal system?

What are the main bones of the skeleton?

A frame work composed of Bones and cartilage is called skeleton system.

10.2 Major parts of skeleton system

We can categorize human skeleton system into three major parts:

- (i) Axial skeleton
- (ii) Thoracic skeleton
- (iii) Appendicular skeleton
- (i) **Axial skeleton:** Its shape is like a question mark ?. It mainly includes bones of the skull, upper and lower jaw bones with teeth and ring shaped 33 vertebrae from which vertebral column is formed.

Vertebral column:

Move your hand on the back of your friend. What is experience? You feel a hard bone in the middle of back from neck to below the waist.

Bone from the neck to below the waist is called back bone. It consists of 33 small bones called vertebrae. All these vertebrae connected to each other and form a vertebral column which also called as back bone.

- (ii) **Thoracic skeleton:** It is a basket like structure of 12 pair of hockey sticks like bones which is called ribs. The body's vital organs such as the heart, lungs, etc. are protected in it.



Fig 10.2
Vertebral Column





Fig. 10.3: Ribs

- (iii) **Appendicular Skeleton:** It mainly involves the bones of hand and legs, pectoral and pelvic girdle.

(A) Bones of hand

(B) Bones of leg

- (A) **Bones of hand :** the following are the major bones of the hand &

(i) Humerus

(ii) Radius and Ulna

(iii) Wrist bones

(iv) Bones of Palm, digits and thumb

- (i) **Humerus :** You press the middle portion between your elbow and shoulder. What is experience? A rigid and strong bone is felt. Bone between our elbow and shoulder is humerus. Its longest middle section called the shaft.

Tell by looking at the picture, to whom lower and upper end of this bone attached?

- (ii) **Radius-ulna :** Press the bones between your wrist to the elbow and feel. How many are these in numbers. Two bones are located here. The first one towards the outside of arm and second one towards the inside the arm are respectively called radius and ulna. The end towards the elbow of this bone is attached to humerus and its lower end to wrist bones.

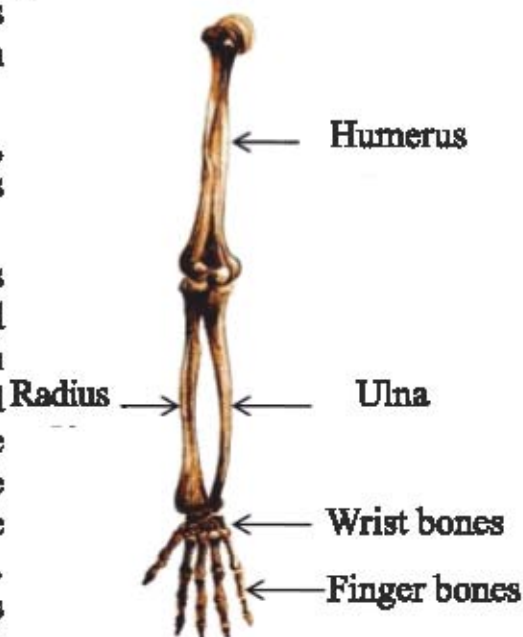


Fig. 10.4 : Bones of hand

- (iii) **Wrist bones:** Stretch palm of your hand on the table upperside down. The place where radius ulna bone is attached to palm is called wrist. Wrist consists of eight small bones called metacarpals.
- (iv) **Palm, digits, thumbs bones:** There are five bones in palm. Our fingers and thumb also have bones which is called carpals and thumb bone respectively. Each finger has three bones and thumb has two.

Let's understand hand's bones numerically, by following table:

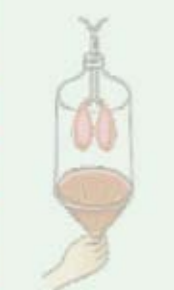
Table 10.2: Parts of hand and name and number of bones find in them

S.N.	Name of parts of hand	Name of bone	Number of bones
1	from elbow to shoulder bone (above the Elbow)	Humerus	01
2	From elbow to wrist (from elbow downward)	Radius (outside the body) ulna(body inwards)	02
3	wrist bones	Carpals	08
4	Palm bones	Meta carpals	05
5	Finger bones	Carpals	$03 \times 4 = 12$
6	Thumb(hand) Bones	Thumb bone	02

(B) Bones of the leg:

Bones of the leg are as follows -

- (i) Femur
 - (ii) Tibia-fibula
 - (iii) Ankle bones
 - (iv) Foot, fingers and bones of thumb
- (i) **Femur:** Moving hand along the knee to hips and experience its length. As well as find out its position that where is articulated its upper and lower end. Based on experience to fill the table -



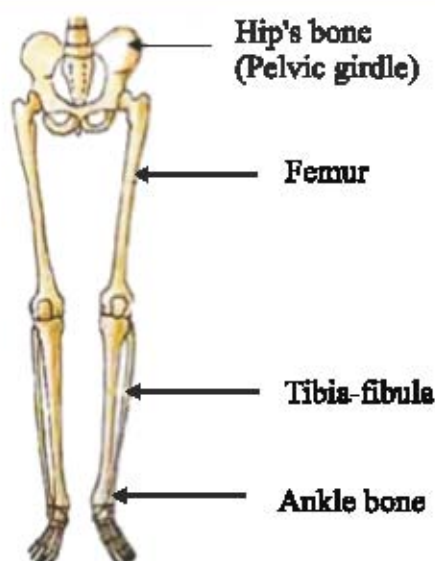


Fig 10.5: bones of the leg

Table 10.3

S.N.	Questions related to touch experience	Probable answer
1-	Position	In between knee and hip
2-	Length	
3-	articulation of upper end	
4-	articulation of lower end	

It is an upper bone of leg called as femur. It is the longest and strong bone of body. Its lower end is articulated with Tibia fibula and upper with hip bone.

- (ii) **Tibia-fibula** : Experience by touching the middle portion along the knee to ankle. and with the help of figure 10.5 fill the following table 10.4 -

Table: 10.4

S.No.	Questions related to touch experience	Probable answer
1-	How many bones in this portion?	02
2-	Where the upper end of these bones is articulated?	
3-	Where the lower end of these bones is articulated?	

- (i) **Movable joints:** joints which provide help in movement of bones, called Movable joints such as joints of knee, ankle, elbow, neck etc.
- (ii) **Unmovable joints:** These joints are not movable. Their main task is to protect the body's delicate organs such as skull and chest.

Major movable joints of body:

Following are the major movable joints of our body -

- (i) Ball and socket joint
- (ii) Hinge joint
- (iii) Pivot joint
- (i) **Ball and socket joint:** Twist your hands near shoulder. In this type of joint one end of bone is cavity like and other remains rounded. The cavities called as socket and the rounded end as ball. Due to this particular structure of this joint it is called as ball and socket joint.

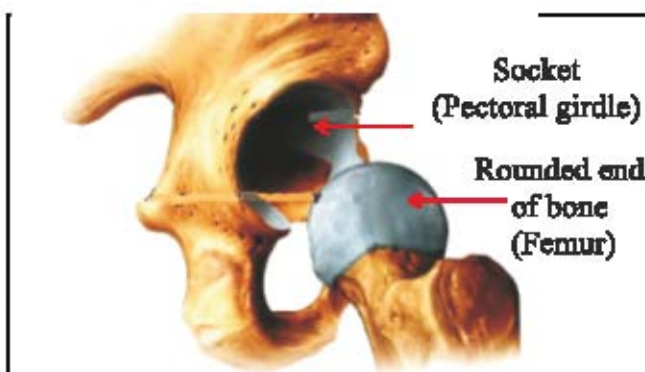


Fig 10.6 : Ball and socket joint

In this joint round headed bone could easily turn around in all directions.

Example- (i) Pectoral girdle and humerus.

(ii) Pelvic girdle and femur.

- (ii) **Hinge joint:** Turn around your elbow and knee. Can they move circular? No, they can move in a single direction. You can also compare it with the doors of your home.

In this type of joint rounded end of a bone is implicated in the bone cavity of another. Example - the joint between elbow and knee.

- (iii) **Pivot joint:** Turn around your head, what do you experience? It can move left-right, top-bottom up to a certain direction. The joint by which our head is articulate with upper end of the spine is called pivot joint. Due to this joint the lower end of the skull turn around easily right-left, up-down on stable bone of vertebral column.

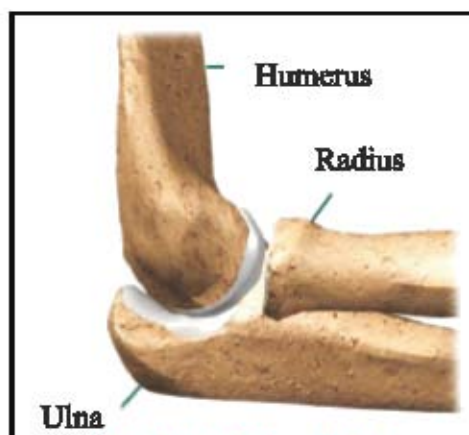


Fig 10.7 : Hinge joint

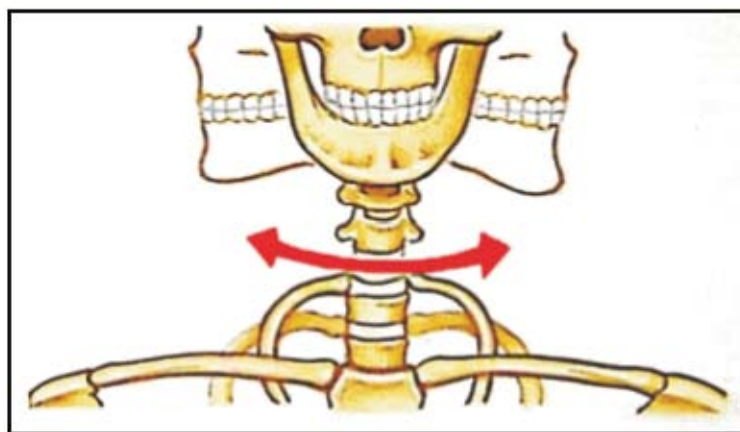


Fig 10.8 : pivot joint

Muscles have an important role in movement of these bones. What are muscles? let us know about it-

10.4 Muscles

It is made up of contractile muscle fibre which has the ability to expand and contract.

Let's do -

Stretch your hand in front of your body. Now close your palm and stretch straight and bring closed palm near your shoulder. Look, middle portion of your

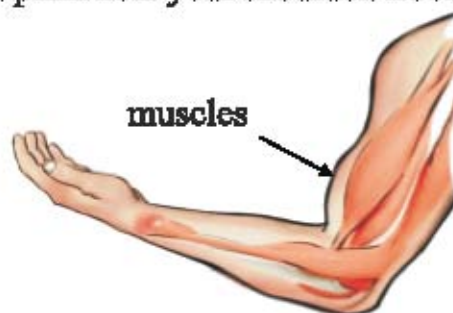


Fig 10.9: Contraction of muscles







elbow and the shoulder, bulging out and remain stretched.

For movement of any bone, two muscles work together. When a muscle contracts, bone is stretched in that direction and other muscle comes in a resting stage. For the movement of bone in opposite direction previous shriveled muscles get loose and relaxed muscles shrinks. Both the type of muscles works simultaneously for body movement.

Movement in bones is caused due to relaxation and contraction of muscles.



10.5 Movements of some other animals

S.N.	Animal name	Type of movement	Helpful in movement	Diagram
1	Earthworm	creep	Earthworm moves by expansion and contraction of muscles of the body.	
2	Snail	creep	snail creep and moves with muscular foot	
3	Cockroach	Walk/fly	In cockroaches the body and legs are covered with hard cover. The thoracic muscles are attached to the three pairs of legs and two pairs of wings who helps cockroaches in flying and walking by which he moves from one place to another.	
4	Bird	Fly/walk	In birds muscles are firm and bones are hollow due to which they are lighter. Both of them (muscles and bones) together help birds in flying.	
5	Fish	swim	Fish is a linear in shape. Annuluses are formed on both the side of its body due to movement of muscles. As a result fish moves by swimming in the water.	
6	Snake	creep	Snakes creep on the ground by making rings in alternate order on both the side of its body. Several bones and its associated muscles push the body forwards that the snake is in motion	

Jaipur Foot

Jaipur Foot is also known as Jaipur leg. It is worn down the knee. It is prepared by the high-quality rubber. Dr. P.K.Sethi of Sawai Man Singh Hospital, Jaipur (India) perceived problems of the disabled, suggest to ShriRam Chandra Sharma for making the Jaipur Foot.

Bhagwan Mahaveer Viklang Sahayata Samiti established by Devendra Raj Mehta help the disabled by fitting Jaipur foot free of charge to needy persons.

Jaipur foot related other information:

- Jaipur foot works like a normal limb.
- It looks like a normal limb.
- No adverse effect of water and moisture on it.
- This shoe can be worn with or without shoes.
- Generally a Jaipur Foot serves for three years.
- It is very light in weight.



What Have You Learnt

1. Animals move from one place to another by different ways.
2. Human skeleton system is made up of bones and cartilages.
3. There are many bones in the human skeleton - bones of hands, leg's bones backbone etc.
4. Human skeleton system have two types of joints for example - movable and fixed joints
5. Joints- (i) Ball-socket joint (ii) hinge joint (iii) pivot joint
6. Insects, birds, animals, aquatic organisms move differently.

□□□



Exercises

Choose correct option -

1. What's the longest middle section of Humerus is called?
 (a) Shaft (b) girdle
 (c) joint (d) carpal ()
2. Number of bones in thumb of hand.
 (a) 1 (b) 2
 (c) 3 (d) 4 ()

Fill in the blanks -

- (i) There are..... bones in our palm.
- (ii) Shoulder bone is called as.....
- (iii) Each finger of hand and leg has ----- bones.
- (iv) Muscles have a capacity ofandwhich help in movement.

Short answer type question

- (i) Tell about Radius-ulna bone.
- (ii) From which bones the front and back end of femur is articulated with ?
- (iii) Tell about pelvic and pectoral girdles.
- (iv) How many vertebrae are found in vertebral column?

Long answer type question

- (i) What is a skeleton system? Draw a labeled diagram and describe functions of skeleton system?
- (ii) What is a Joint? Describe any two joints by a labeled diagram?
- (iii) What is a muscle? How they help in movement? Describe by a labeled diagram?

Activity:

1. Prepare a list of bones of skeleton system on chart and demonstrate in a classroom.
2. Prepare charts of diagrams of hand and leg's bones.
3. Demonstrate the mechanism of joints in a classroom.



Points to be studied:

- 11.1 Concept of Time
- 11.2 Simple pendulum and its time-period
- 11.3 Unit of Time
- 11.4 Concept of speed
- 11.5 Speed and time graph

Whatever we do time passes on continuously. So, it becomes extremely important for us to have knowledge about time. If you do not have a watch then how will you decide what is the time right now? Are you not eager to know that how our ancestors could tell the approximate time of the day by just looking at shadow? At capital city Jaipur of Rajasthan, we have a "Large Samrat clock" sun clock at Jantar - Manter which measures even 2 secs with accuracy. It was built in 1735 AD by Maharaja Swai Jai Singh. In the same manner, sand clock and water clock, were used to measure time during ancient times.

**Fig. 11.1 Jantar Mantar****11.1 Concept of Time****Fig. 11.2 Sand clock**

Our ancestors saw that many periodic events occurred in nature which happens repeatedly after specific time intervals by which we come to know about time and time intervals. These are -

1. **Solar Day** : Sun rises in morning every day. Time interval between one sun rise and the next sun rise is known as one "Solar-day"
2. **Moon Month** : Period between new moon to next new moon is called as one "Moon-Month".
3. **Year** : The time at which earth completes one revolution around the sun has been fixed as one year time period.

If mean solar day is assumed as standard time and it is divided into 24 equal parts then 1 day = 24 hours.



Similarly, if one hour is divided into 60 equal minutes and one minute is divided into 60 equal seconds, then

$$1 \text{ hour} = 60 \text{ minutes}$$

$$1 \text{ minute} = 60 \text{ seconds}$$

Similarly, you will find that 1 hour has 3600 seconds and 1 day has 86400 seconds.

Now find out how many hours and seconds are there in 1 year?

Now, you may have come to know that how we measure the time-interval for one day or one month or one year. Our ancestors had made periodic motion as base for measuring time. To measure time, a normal device is clock. The working principle of clock is very complicated. However, all watches work on the basis of periodic motion. The well known example for periodic motion is simple pendulum.

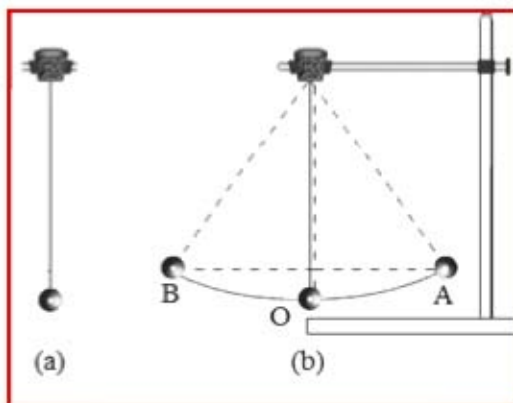


Figure 11.3 Simple Pendulum

11.2 Simple pendulum and its predict time :

The oscillation that is produced by a small metallic ball or a piece of stone suspended from rigid support by a thread is called a simple pendulum (figure 11.3). The small metal sphere is known as ball for simple pendulum.

In Figure 11.3(a), a simple pendulum is shown at rest position. It is the mean position of pendulum. When the bob of pendulum is to either side from rest position and released slowly, it begins to move to-and-fro. This motion is called Oscillatory motion. As shown in fig 11.3 (b), as the pendulum, starting from its mean position O, moves to A, from A to B and back from B to A is said to have completed one oscillation. Similarly, a ball starts to move from extreme position A to another extreme position B and again from B to A, it is also known to complete one oscillation.

Time taken by the pendulum to complete one oscillation is called periodic time of simple pendulum.

Activity 1

Calculation of periodic time:

Take more than one meter long thread or rope and make a simple pendulum as shown in figure 11.3 by hanging the thread on a nail or a stand and ensuring that length of simple pendulum is one meter (100 cm.). Switch off any

fans nearby. Wait till the bob of pendulum comes at rest. Mark the mean position of bob on wall behind it or on the floor below it. To measure time-period of pendulum, we need a stop-watch. If stop-watch is not available then table-watch or wrist watch can be used.

To set the pendulum in motion, gently hold the bob and move it slightly on one side and make sure that the string attached to the bob is taut as you displace it. Now release the bob from displaced position, making sure that there is no jerk on bob during release. Note down the time from a clock when bob passes through the mean position. You can also note the time when the bob is in either extreme position. Measure the time taken by a pendulum for 20 oscillations. Table 1.1 has sample observations. Your observation may be different from it. Repeat the activity for three to four times and note it down in the table. Now, to get periodic time for one oscillation, divide the time taken in 20 oscillations by 20 i.e. Calculate the periodic time for pendulum.

Table 11.1 The periodic time for simple pendulum (rope length = 100 cm.).

Sr. No.	Number of Oscillations (N)	Time taken for Oscillations (t)	Time-period = t/N
1	20	40 second	$40/20 = 2.0$ second
2	20	.....second	.....
3	20	.....second	.....
4	20	.....second	.....
5	20	.....second	.....

Is the periodic time for the pendulum approximately equal each time?

Note that slight variation in initial displacement does not affect the periodic time of a pendulum.

11.3 Unit of time:

International unit of time is seconds. It is a small unit of time. The time interval of one second is how much short or long? The pronunciation of two or three words loudly like "Jai Rajasthan" takes approximately one second by us. At rest, the pulse rate of a normal healthy man 72 times in one minute. i.e., 12 times in 10 second. In children, it can be slightly increased.

What are the other big units of time? Show by writing in Table 11.2, what is the relation between different units of time like minute, hour, day, year, etc. with



smaller time units?

Table 11.2 Time units and their relations

Sr. No.	Unit name	Relation with small unit
1	Minute	1 Minute =Second
2	Hour	1 Hour = Minute =Second
3	Day	1 Day =hours =Minutes
4	Year	1 Year =Day =Hours

According to necessity, the different units of time can be used. For example, age of person is easy to express in unit of years compared to days or hours. Similarly, it is not wise to express the time taken to travel from home to school in one year.

Now a days, most of clocks have electronic circuits of one or two cells. These clocks are called quartz clocks. The time measured by these watches is more accurate as compared to earlier watches. In addition, today the electronics or digital clocks are also available in which time is expressed in digits.

Today specific clocks are available for use in scientific research. Among them few are able to measure ten millionth fraction of one second (micro second) and also one trillionth part of a second (nano second).



Fig. 11.4 Digital watch

India's National Physical Laboratory, New Delhi provides time maintenance service. The clocks are available here can measure of ten millionth of one second with accuracy.

11.4. Concept of speed.

We know that any change in the position of an object with respect to time is said as motion of the object. In our surroundings, we see many objects in motion. Among them few objects move fast and few objects move slowly.

Let us assume that a bullock cart and motorcycle both are moving simultaneously along a straight line path, tell which moves fast or slow?

Similarly, take the objects which move on straight line motion and pair them and then classify their speed as slow or fast in table 11.3 in two separate columns.

Table 11.3 Slow and fast motion.

Sr. No.	Pair of objects	Slow motion	Fast motion
1	Car and Motorcycle		
2			
3			
4			
5			
6			
7			
8			

How have you ensured which object is moving slowly and which is moving fast?

“In a fixed time if an object 'A' travels more distance as compared to other object 'B', then we say that Object 'A' is moving faster than object 'B'.”

When the object moves fast, then we say that the speed of the object is more and when object moves slowly then we say that the speed is less.

To know, which object is moving faster among two or more objects, the simplest method is to calculate the distance covered by an object in unit time. Let us assume that two cars are moving. First car travels 50 km in an hour and second car travels 65 km in an hour. It is clear that the second car is moving fast.

Distance covered by an object in a unit time is called speed.

Similarly, if we know the distance travelled by two objects in an hour then we may say which has more speed and which has less speed. When a car or bus starts to move, initial speed is slow then it raises its speed. Its speed doesn't remain constant during the motion, sometimes its speed is more and sometimes it is less due to turn or any other obstruction that comes across on the road. So, no vehicle moves with a constant speed (constant speed) in an hour. If the speed of an object along a straight line path keeps on changing



then it is called non-uniform speed of that object. When we say that a car has speed of 50 km per hour, usually we only consider the distance travelled by a car in one hour. We do not bother about the speed of car as uniform or non-uniform in one hour. In reality, the calculated speed is the average speed of a car. In this chapter, the word speed has been used for average speed.

When an object moves along on straight line path with constant speed then it is known constant speed or uniform speed. In the condition of uniform speed, the average speed is equal to its actual speed.

The calculation of speed is done by dividing the total distance covered by the object by total time taken.

$$\text{Speed} = \frac{\text{Total distance covered}}{\text{time taken in covered distance}}$$

So, if we measure the total distance covered by an object and time taken to cover it then we can calculate the speed of an object.

If we know the speed of an object, you can calculate the distance covered by in it given time. For that you have to multiply the speed of the object with time.

$$\text{Distance travelled} = \text{Speed} \times \text{Total time taken}$$

$$\text{Time taken} = \frac{\text{Total distance covered}}{\text{Speed}}$$

You can also calculate how much distance can be covered by an object in given time for a given speed.

Activity 2

Measurement the speed of an object

Draw a straight line on the floor and tell your friend to stand about 2 meters away from this line. Ask your friend to roll a ball slowly perpendicular to the straight line along the floor. Now, take a stop-watch and start it when the ball crosses the straight line and stop the watch the moment the ball becomes still. In this way you can find out how much time the ball takes to come to rest. Measure the distance between straight line and stop point of the ball by a tape or a scale. Write down the time and distance measurements in table 11.4 and also repeat the activity 4-5 times. Calculate the speed of ball from these measurements.

Table 11.4 Measurement of speed

Sr. No.	Distance travelled by the ball (S) in meter	Time taken (t) in seconds	Speed = $\frac{\text{total distance travelled}}{\text{time taken}}$ (meter per second)
1			
2			
3			
4			
5			

Unit of speed

In above activity, you have calculated the speed in units of Meter per second. The international unit (SI) of speed is meter per second. The other units of speed are centimetre per second (cm/s), kilometre per second (km/s), kilometre per hour (km/h), etc. You must remember that all the symbols of units are written in singular person. For example, for distance we write 50 km, but not 50kms or 8cm but not 8cms.



Fig. 11.5 Speedometer and odometer

You may have seen a meter in motorcycle, car, bus, or other vehicle as shown in figure 11.5. Observe the meter of any vehicle. Km/h is written on the meter. It is known as "Speedometer". By this, speed can be measured directly in km/h. There is another meter in vehicles which measures the distance travelled by a vehicle. It is called Odometer.

Activity 3

Distance - time graph

Take a graph paper. Draw two perpendicular straight lines on it as shown in figure 11.6. Mark X'OX on the horizontal line. It is called X-axis. Similarly, mark Y'OY' on the vertical line. It is called Y-axis. The intersection of X-axis and Y-axis is referred to as origin point 'O'. A graph is plotted between two quantities mentioned across these two axes. We assign positive values along OX-axis.



Similarly, we assign positive values along OY-axis. In this chapter we will consider only positive values of quantities.

Table 11.5

Sr. No.	Time	Distance
1	0 minute	0
2	10 minute	5 km
3	20 minute	10 km
4	30 minute	15 km
5	40 minute	20 km
6	50 minute	25 km

The distance and time values for a vehicle have been shown in table 11.5.

Steps for making a graph -

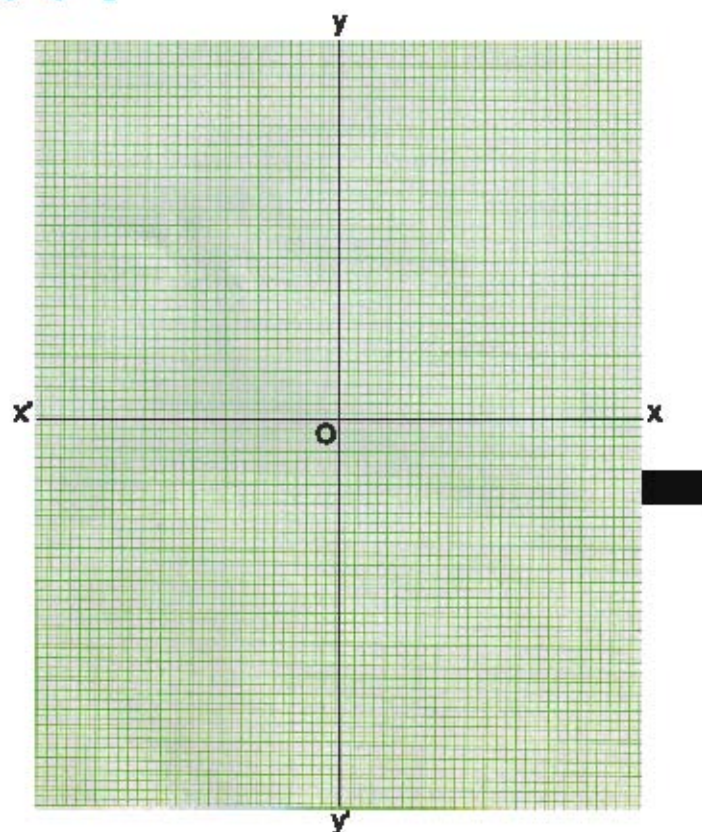


Figure 11.6: Graph paper

- To represent two axes, draw two perpendicular lines and mark OX and OY on it as shown in figure 11.6.
- First ascertain which quantity is to be represented along X-axis and which quantity is to be represented along Y-axis. Represent time on X-axis and distance on Y-axis.
- Choose an appropriate scale to represent the distance along Y-axis, Similarly choose another scale to represent time on X-axis. For vehicle speed, the scales can be as follows -
 On X-axis Time 10 min. = 1 cm.
 On Y-axis Speed 5 km = 1 cm.
- As per scale selection, mark values for time and distance on X-axis and Y-axis respectively. For car speed, represent time on X-axis by mark time as 10 min., 20 min., 30 min., 40 min., 50 min. on X-axis from origin point 'O'. Similarly, represent distance on Y-axis from origin point 'O' by marking 5km, 10km, 15km, 20km and 25km.
- In table 11.5, in the first observation the distance travelled for time 0 min is zero. This set of value is positioned at origin point 'O'. After 10 min, the car travels 5 km. To represent, this set of value (10, 5), draw a parallel line to the Y-axis through 10min on X-axis and similarly draw a parallel line to the X-axis through 5km on Y-axis. Identify the point at which both the lines intersect each other, it represents the set (10, 5). By adopting the above method, mark other points of different sets values on the graph paper.
- All the different sets of time and distance covered by the car have been marked in figure 11.7.
- Join all these points on the graph. You will find a straight-line after joining the points. This is the time-distance graph for speed of car.

If the distance-time graph is a straight-line, it indicates that

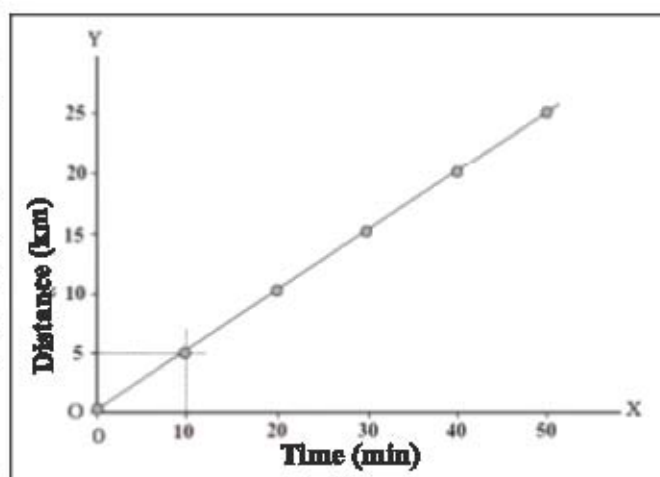


Figure 11.7 Distance -time graph.



the object is moving with a constant speed. If speed of an object keeps on changing, the nature of graph will be different.

Activity-4

We may easily know how much distance an object has covered in a given time from the points on distance-time graph. A vehicle starts to move at 1:00 clock from some location. The distance travelled and time values are given in table 11.6 whose graph has been shown in figure 11.8. From the graph, find out how much distance has been travelled by a vehicle at 2.15 pm?

Table 11.6

Sr. No.	Time	Distance
1	1:00 PM	0
2	1:30 PM	30 km
3	2:00 PM	60 km
4	2:30 PM	90 km
5	3:00 PM	120 km
6	3:30 PM	150 km

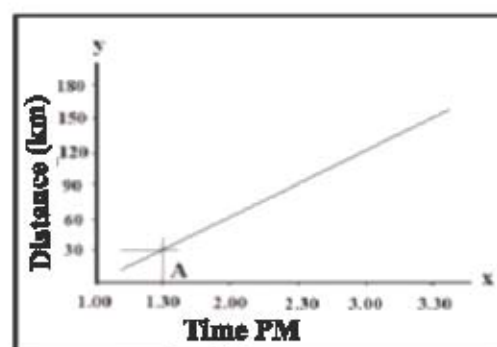


Figure 11.8 Distance-time graph

What have you learnt

- Periodic events are used to measure time.
- Time taken to complete one oscillation is called periodic time of a simple pendulum.
- The fundamental unit of time is second. Minute, hour, day, years, etc are other units of time.
- By motion of objects one can compare their low and high speeds.
- The distance covered by an object in unit time is called its speed.
- The speed of an object is the distance travelled divided by the time taken to cover that distance. Its fundamental unit of motion is meter per second (m/s). The other units of speed are centimetre per second (cm/s), kilometer per second (km/s), kilometer per hour (km/h), etc.
- Distance-time graph of an object which travels with a uniform speed is a straight-line.

Exercises

Choose the correct answer

- If Bharti's brother is 10 days old then his age in hours will be:
 (A) 120 hours (B) 100 hours
 (C) 240 hours (D) 80 hours ()
- The working principle of watches is based on which type of motion:
 (A) Linear motion (B) Periodic motion
 (C) Curvilinear motion (D) Rotational motion ()
- Meter per second is International units of:
 (A) Time (B) Weight
 (C) Speed (D) Distance ()

Fill in the blanks with suitable words.

- The international unit of time is.....
- The distance travelled in unit time by an object is called it's.....
- An object is moving with uniform speed along a straight-line. The speed of an object is called.....

In the following statements, tick T against those which are true, and F against those which are false:

- Each object is moves in straight-line. (T/F)
- The motion of a bus is represented in meter. (T/F)
- The distance between two cities is measured in kilometer. (T/F)
- The time period for a given pendulum is not constant. (T/F)
- An object, moving with a uniform speed, has straight-line on distance - time graph. (T/F)

Short answer type questions

- A simple pendulum takes 80 second to complete 40 oscillations. What is the time period of the pendulum?
- The distance between two stations is 100 km. A bus takes 2 hours to cover this distance. Calculate the speed of the bus.
- A motorcycle rider moves with a speed of 40 km/h for 1.5 hour and reaches the destination. What is the total distance covered by him?
- Define a solar day?



Long answer type questions:

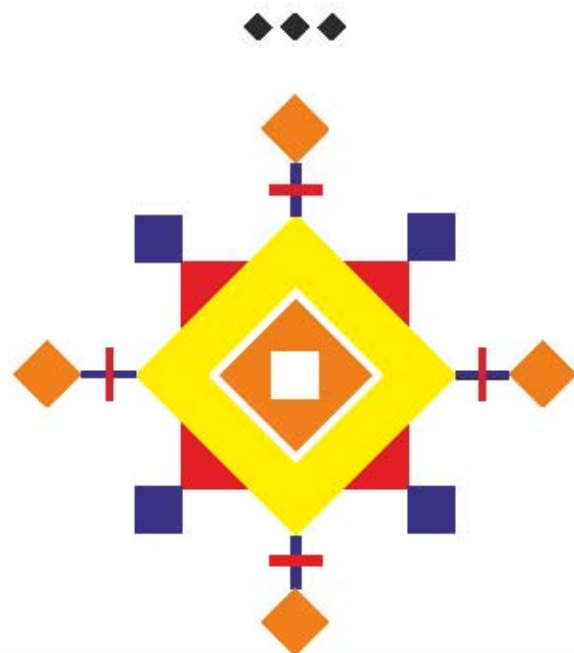
1. For speed of any vehicle the distance travelled by it and the time taken is given in the table below. Draw the time-distance graph.

S. No.	Time	Distance
1	2 seconds	10 m
2	4 seconds	20 m
3	6 seconds	30 m
4	8 seconds	40 m
5	10 seconds	50 m

2. What do you mean by simple pendulum? Explain its time-period.

Activity based work:

- Observe the speed of your nearby objects- on earth, in air, and water. By observing the distance travelled and time taken, find out the speed of these objects.
- Take two plastic bottles. Fill sand in one bottle, cap the bottle and make a hole into the cap. Fit another plastic bottle on it without cap and make a model of sand watch.



Time calculation in ancient times

In India, there has been a tradition to measure smallest time unit (time) since ancient times. It is evidenced in many books which explain in detail about time calculation. There is no evidence for this time calculation in any other civilization of the world. As described in "Sun-Theory" book time has two forms.

Abstract Time - "It is time which can neither be seen nor calculated by the simple methods. This type of time cannot be perceived by ordinary sense organs."

Real Time - "This time can be calculated and can be visualized and felt."

Truti : Fundamental unit of time calculation is Truti which is equal to 0.32400000 second i.e. an error is equal to three croth part of a second. Time from Truti to 'Pran' is abstract and after that real.

Time table of Sun-Theory

fundamental unit is Truti.

60 Truti = 1 Renu

60 Renu = 1 Love

60 Lav = 1 Leshak

60 Leshak = 1 Pran

60 Pran = 1 Vinadi

60 Vinadi = 1 Nadi

60 Nadi = 1 Ahoratra (Day-Night)

7 Ahoratra + 1 Week

2 Weeks = 1 Paksh

2 Paksh = 1 month

2 months = 1 season

6 months = 1 Ayan

12 months = 1 Year

432,000 years = Kali Yuga

864,000 years = Dwapara Yuga

1296,000 years = Treta Yuga

1728,000 years = Satya yuga

4320,000 years = Chatur Yuga

71 Chatur Yuga = Manvantar (Block Pralay) (32258,000 years)

14 Manvantar = 1 Brahm day (432,00,00,000)

864,00,00,000 year = 1 ahrotra of Brahma = 1 Sristi cycle.



Points to be studied :

- 12.1 Pressure dependence on force
- 12.2 Pressure dependence on area
- 12.3 Air-pressure
- 12.4 Liquid pressure and its effects
- 12.5 Buoyant force

Camel can walk easily on sand but a person feels difficulty in walking on sand. The wall of a dam is built narrower at top and wider towards the bottom. As we walk towards higher altitude, we feel difficulty in breathing. The tin-sheds or 'khaps' of weak houses fly away during a storm. The water tank is built at a very great height for water distribution. To know the cause of all these, the knowledge about the pressure is essential. What is Pressure? Let's know about it.

12.1 Dependence of Pressure on Force**Activity 1**

Place two books on your palm. What do you feel ? Now, remove one book. What difference do you feel now than in the previous position? Why do you feel more comfortable in second situation than previous one? We feel more pressure due to more weight (force) in the first situation.

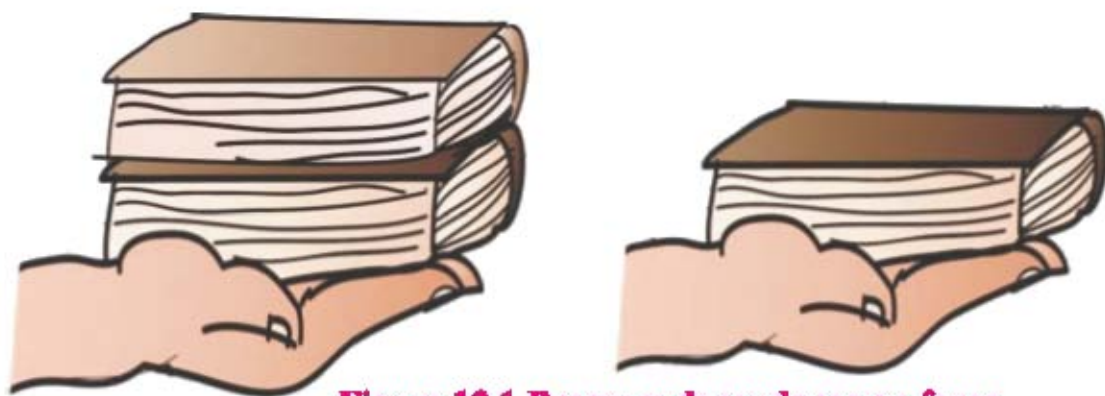


Figure 12.1 Pressure dependence on force.

Activity 2

Place the sharp head of a nail towards a wooden block and strike it lightly by hammer. Nail does not pierce the wooden block by light blow of the hammer. Using same hammer, now strike hard. Why does the nail penetrate into wooden block this time? Due to the hard strike by the hammer, more force is applied due to which more pressure is applied on the object.

It is clear from both the above activities that magnitude of pressure depends on applied force. When the applied force is different on the same area then the pressure is also different on the object.

Pressure applied on any thing depends on applied force

12.2 Pressure dependence on area

How is pressure dependent on area? Let's know by an activity-

Activity-3

Take two balloons filled with air. Puncture one balloon through flat head of pin as shown in Figure 12.2 (A) and puncture the second balloon through sharp head of the same pin as shown in Figure 12.2 (B).

In which situation was the balloon punctured easily?

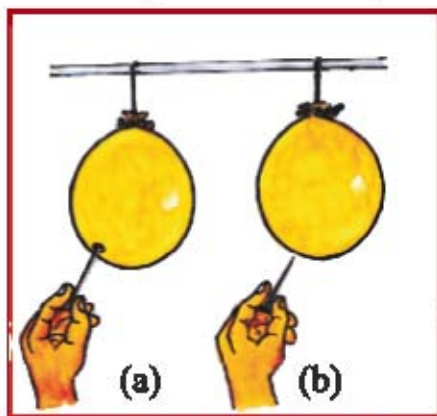


Fig. 12.2 Pressure dependence on area.

Activity-4

Put a brick on sponge as shown in figure 12.3 (A). Now, put the brick vertical on sponge. The applied force is equal on sponge in both situations. However, we see that sponge squeezes more in vertical position of brick. In which situation, the contact area between sponge and brick is less?

If the area is reduced and value of force is kept constant then pressure



Fig. 12.3 Pressure dependence on area.



increases. This is the reason why the balloon is punctured by sharp pin head and sponge squeezes more in vertical position of brick.

We may say that the value of pressure depends on the contact area of object. When contact area is reduced pressure increases.

It is clear from above activities that-

It can be represented by the formula given below

The applied pressure on any object depends on the applied force and contact area.

On the basis of above formulae we can say that-

$$\text{Pressure (P)} = \frac{\text{Force (F)}}{\text{Contact Area (A)}}$$

The perpendicular force applied per unit area on any object is called Pressure.

Unit of Pressure:

In above formula, if force (F) is in Newton and area (A) is in meter square then unit of pressure will be Newton per meter square. Newton per square meter is also called Pascal.

$$\text{Pascal} = \frac{\text{Newton}}{(\text{meter square})}$$

12.3 Air-pressure

Does air apply pressure on an object? Let's know this by performing an experiment.

Activity 5

Take water in pot and heat till it boils. Pour this boiled water into a plastic bottle. After sometime, drain water from the plastic bottle and tightly cap the bottle. Now, the cold water pours on bottle. What do you see? Why does the bottle collapse?

After draining the hot water from bottle, water vapours are trapped inside the bottle. When cold water is poured on the bottle then water vapours cool into liquid so the amount of water vapour inside the bottle reduces, thus the resultant pressure also reduces and bottle collapses due to external air-pressure. Thus we can say that air has pressure.

Air applies similar pressure in all directions at each spot.
Pressure applied by air on per meter square area is called air pressure.

Pressure exerted on us by surrounding atmosphere is called atmospheric pressure. At sea level, the average value of atmospheric pressure is 101325 Pascal.

Air flows from high pressure area to low pressure area. So, we can say that air blows due to the difference in air-pressure. When air blows with speed, the air-pressure is reduced on the roof but air-pressure increases inside the rooms. Due to this tin-sheds or 'khaps' are blown away from weak homes.

Does liquid apply pressure like air? Let's know about it.

12.4 Liquid pressure and its effects

Activity 6

Liquid applies pressure on the walls of a pot. To understand it, let us perform an activity. Take a balloon and fill with water gradually. The balloon expands slowly. The expansion of balloon in all directions with increased amount of water shows that -

Liquids also apply pressure as does air.



Figure 12. Liquid exerts pressure.

Activity 7

Tie a rubber sheet of balloon on one side of a glass tube as shown in figure 12.5. Fill the tube with water partially. Due to pressure exerted on balloon, balloon expands a little. As we increase water level in the tube, we see that balloon expands more. So we can say that



Liquid pressure increases with the increase in the height of the liquid column.

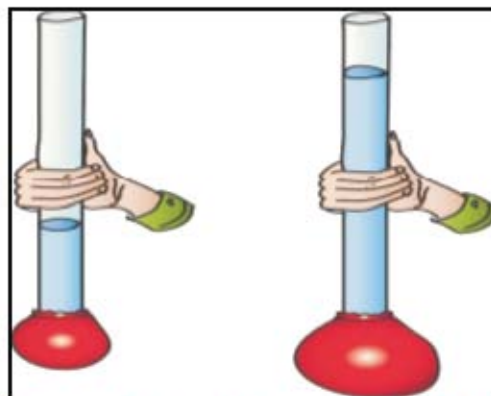


Figure 12.5 Pressure dependence on liquid column height.

Activity 8

Fill a plastic bottle with water. According to the Fig. 12.6 make holes A, B, C at equal height on it using a needle. Now, close these holes using a tape. Now, remove the tape from hole A for one minute and collect water into measuring glass and measure the amount of withdrawn water. Repeat the same process with hole B and C. We see that amount of withdrawn water from three holes is equal in quantity. So, it is

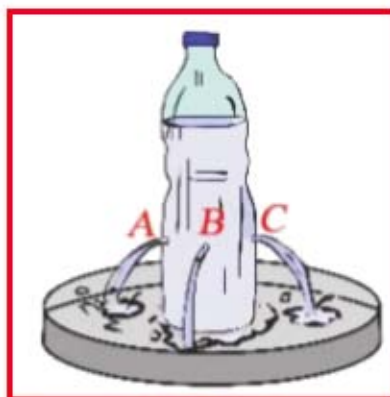


Figure 12.6 Equal pressure at equal height.

Clear that -

The value of water pressure is equal at points in horizontal plane at equal height.

What are the values of water pressure at different depths? Let's know by performing an activity.

Activity 9

Take a plastic bottle and make three same sized holes A, B, C at different heights and close them with a tape as in figure 12.7. Fill the plastic bottle with water put it on a stool. Now, open all the three holes simultaneously and observe the water coming out of the holes. From which hole water drops at a greater distance? The height of the water column above hole A is low i.e., the depth from surface is low whereas the height of the water column above hole C is more. Due

The value of liquid pressure increases with depth

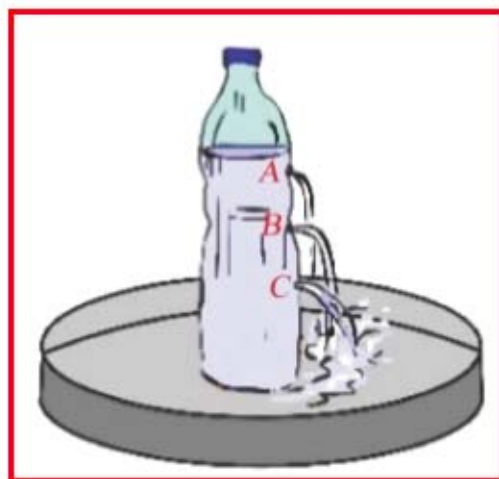


Figure 12.7 Liquid pressure dependence on depth.

to low pressure at hole A, water drops at a shorter distance and due to high pressure at hole C, water drops a greater distance. Thus

12.5 Buoyant force

Do objects have equal weight in air or water? Let's know about it.

Activity 10

Take a stone. Hold it and then dip it into water. Now, gradually take it out from water. What do you feel? You will find that the weight of the held stone is less until it remains inside water but weight increases as it comes out of water.



Figure 12.8 Reduction in weight inside water.



By this we know that an upward force acts on an object when it is inside water. Similarly, your body appears light when you swim in water.

So, we can say that -

An upward force acts on objects submerged in liquid which is known as **Buoyant force**. This property of liquids is called **Buoyancy**.

Activity 11

Take a stone. Clamp it with thread on balance as shown in figure 12.9 and measure its weight (W), from the markings of the balance. Now, put it into a pot filled of water and measure its weight, W' , from the balance. Deduct the weight of the object in air from W' in water and calculate the weight loss.

Now, shown in Fig. 12.9 collect the displaced water into a measuring cylinder and take the weight of displaced water. You will find that weight of displaced

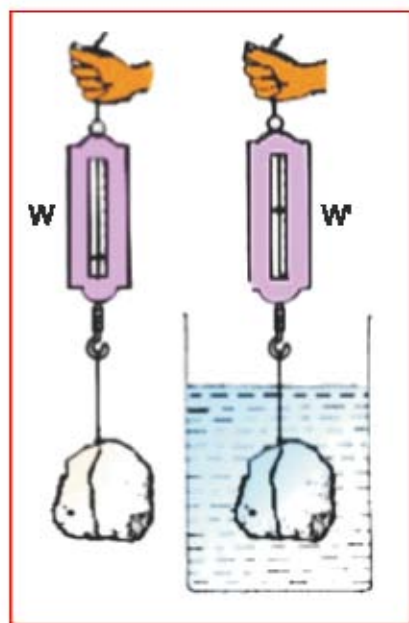


Figure 12.9 (A) Weight loss in Liquid.

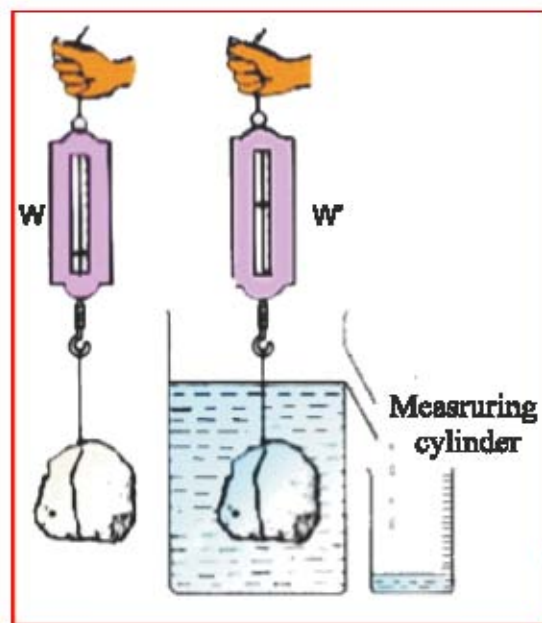


Figure 12.9 (B) Weight loss is equal to weight of the displaced liquid by the object.

Buoyant force = weight of displaced liquid by an object

water by the object is equal to its weight loss ($W - W'$). This value is equal to buoyant force exerted on the object.

Also know about it -

On the basis of detailed discussion about pressure in this chapter, you can understand that -

1. School bag strips that hang on shoulder are made broad so that low pressure is exerted on the shoulders.
2. Camel can walk easily on sand but a person feels difficulty in walking on sand. This is due to large surface area of camel's legs which reduce pressure and its legs do not sink into the sand.
3. Liquid has more pressure at greater depth. To bear this increase in pressure, the walls of dams are constructed wider at the bottom and narrower towards the above part.
4. As we go at increasing heights the air-pressure is reduced. Due to this we feel difficulty in breathing.
5. For water distribution, the water tank is built at a greater height so that water can be easily distributed at greater heights.
6. Approximately fifteen thousand kilogram force is applied on human body by atmospheric pressure. Even then our body does not shrink, because pressure inside the body balances the atmospheric pressure.

What have you learnt?

- Force per unit area is called pressure. The unit of pressure is newton per square meter. It is called Pascal.
- By applying equal force, more pressure is exerted on less area.
- By applying more force on equal surface area more pressure is exerted.
- Air also exerts pressure on all objects.
- Air-pressure gets reduced with height.
- Fluid has weight, so it also exerts pressure. With increasing depth, the pressure of the liquid also increases.
- The objects placed at similar location in fluid experience equal pressure.
- The buoyant force on object immersed in liquid is equal to weight of the displaced liquid.



□□□



Exercises

Choose the correct answer

- The unit of pressure is.
 (A) Newton (B) meter/sec
 (C) Newton/meter² (D) Joule
- As the height of Liquid in a column increases, the amount of pressure will be-
 (A) less (B) more
 (C) No change (D) Non of the above
- The spring balance is used to measure-
 (A) Work (B) Weight
 (C) Speed (D) Length

Fill in the blanks with suitable words.

- As we move from the earth's surface to a higher altitude, air pressure will be.....
- The force acting upon objects immersed in a liquid is called
- Pascal is unit of.....

Short answer type questions

- Define pressure.
- Why is the knife used for cutting vegetables sharper?
- What will be effect on pressure as area increases?

Long answer type questions

- Explain the importance of atmospheric pressure in daily life.
- What do you mean by buoyant force? The buoyant force is equal to the weight of the displaced liquid, prove it by an experiment.
- Liquids also exert pressure as does air. Explain it.

Know and tell

You may have seen a woman carrying a pot filled with water on her head for household use. She always keeps a cloth between water-pot and head. Explain why they do so?

Activity

Take a empty refill of a ball pen and remove its metal part. Now draw water in it with mouth, then close the tip of the refill with your finger. Why does water not fell down? Why does this happen? Think.

What is the importance of pressure in a kerosene pump, injection syringe, hand pump, water gun? Discuss with your friends.



Chapter 13

Computer

Points to be Studied

- 13.1 What is a computer
- 13.2 Main parts of computer
- 13.3 Input devices
- 13.4 Output devices
- 13.5 Properties of computer

In today's computer era the use of computer is increasing continuously in every field of our life.

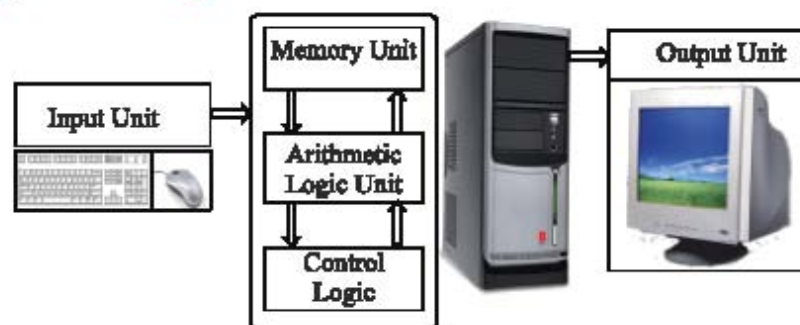
13.1 What is a Computer?

Computer is a device which converts data into meaningful information. Now you may be thinking what is data?

Names of students studying in a class, age, sex, father's name, height, weight, marks obtained in different subjects, etc, can be called as **Data**. All examination results and separate mark sheets of each student may be drafted in computer with use of these data as meaningful information. In view of the working of computer it is defined as follows -.

Computer receives data as input, store it, works as per our desire i.e. processes it and provides desired results in the form of a print.

13.2 Main parts of computer



Central Processing Unit (CPU)

Fig. 13.1 Main parts of computer

Computer has been divided into three main parts -

1. Input device
2. Central processing unit
3. Output device

(1) **Input device** - main function of input unit is to put data in the computer.

(2) **Central processing unit** - This is the main part of a computer. It stores data, performs different types of calculations and controls all the actions of computers. It has three parts -

- (1) Memory
- (2) A.L.U (Arithmetic logic unit)
- (3) control unit

1. **Memory** - Memory is that part of computer which stores different types of data and instructions.

2. **A.L.U (Arithmetic logic unit)** - Its main function to perform logical and comparative calculation- addition, subtraction, multiplication, division, etc.

3. **Control device** - It controls all the processes of computer.

(3) **Output unit:** It is used to collect meaningful information from input data in computer.

13.3 Input devices

Input devices are used to insert data into the computer. The examples of few input devices are as follows -

Main Input device

(i) **Key-board** : It is an easy and widespread usable input device, as most data and instruction are inserted into computer through it. All key-board keys are divided into three parts:-



Fig. 13.2 Key-board

(A) **Alpha-numeric keys** - It includes alphabets (A-Z), Numeric (0-9) and other characters like space bar, <, >, ', *, ` , #, @, \$, %, ^, &, (,), /, ?, [], {, }, and special keys- shift, enter, backspace, Tab, Ctrl, Esc, & Alt.

(B) Numeric keys: It includes 0-9 numerical characters and other keys like - Num Lock, /, *, -, home, page up, page down, insert and enter.

(C) Function keys: There are 12 function keys in the upper part of key board with markings as F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, F11, F12, F13. The function of all keys is differently.

- (ii) **Mouse :** It is one of the most popularly used input device. Movement of the ball on the under surface of mouse moves the cursor on the screen. When cursor reaches the desired position then by click of the mouse button on cursor we can choose the instruction that is to be processed. At present , optical mouse that lack a ball are more commonly used.



Fig. 13.3 ; Mouse.

- (iii) **Magnetic ink character recognition (MICR) :** MICR technology is used mainly in banking sector where cheques are checked in abundance. In this technique, script is made to emerge by the use of special characters that come out of a special typewriter that uses ink that has magnetic material mixed in it. It is used to check the factuality of records.



Fig. 13.4 Magnetic ink character.

- (iv) **Optical character recognition(OCR):** it is used for very high speed reading (appx. 300 page per hour) of printed, typed or handwritten letters with optical or LASER scanner. This technique is mostly used in those institutions where large number of bills are made.



Fig. 13.5 Optical character recognition.

- (v) **Optical Mark Reading(OMR):** OMR is a device which is used to check the presence or absence of pen or pencil mark on a paper. In this, light is thrown on the marked paper and reflected light is checked. This technique checks only boxes at specific places and boxes filled with pencil on printed cards or forms. OMR is highly essential device to check the answer books of an exam.



Fig. 13.6 Optical mark reader.

- (vi) **Scanner:** It is used to store documents or pictures available on any paper into the digital memory of computer. Its working principle is almost similar to xerox machine. It can provide duplicate copy of any document.



Fig. 13.7 Scanner

- (vii) **Touch screen:** It is alternate of key board. The monitor screen is used to give instructions to computer by touching the exact position on screen



Fig. 13.8 Touch screen

- (viii) **Microphone:** Microphone is an input device to feed voice as input.

- (ix) **Web Camera:** The activity of a person we are conversing with, who is in another city or abroad can be viewed on computer screen by web camera.



Fig. 13.9 Microphone

13.4 Output devices:

The instruments or devices are instruments that represent or print meaningful information present in computer. The commonly used output devices are

- (i) Monitor
- (ii) Printer
- (iii) Plotter
- (iv) Speaker

1. **Monitor :** Monitor or V.D.U.(visual display unit) is the main out-put device. Technically it is of three types.

- (i) CRT Monitor
- (ii) LCD Monitor
- (iii) LED Monitor

- (i) **CRT:** This monitor contains a cathode ray tube. These monitors are big in size and occupy more space on the table, heavy and consumes more electricity. So now a days they are rarely used.



Fig. 13.10
CRT Monitor

- (iii) **LCD:** A liquid crystal display is set into LCD monitor. Due to its contour it is light weight, occupies less space and also has low electrical consumption.



Fig. 13.11
LCD Monitor

- (v) **LED :** In view of its good picture quality and low electrical consumption this monitor is most preferred choice. Light emitting diode is placed in this monitor



Fig. 13.12
LED Monitor

2. **Printer:** It is that out-put device by which a hardcopy is taken in printed form. The commonly used printers are -

- (i) LASER Printer
- (ii) Ink-jet printer
- (iii) Dot matrix printer
- (iv) Line printer

- (i) **LASER Printer:** High quality printing work is done by LASER printer. It prints paper with speed. Speed of printing is measured in DPI (dots per inch).

- (ii) **Ink-jet printer:** It prints images by spraying the ink on paper. However, the quality of image is low as compared to that of LASER printer. Its printing speed is also lower than LASER printer.



Fig. 13.13 Ink-jet printer.

- (iii) **Dot matrix printer:** It prints image or words in the form of dots form thus known as dot matrix printer. Its printing speed is measured in CPS (characters per second). It is economical, with low sound, low speed of printing and also low quality of printing



Fig. 13.14 Dot matrix printer

- (iv) **Plotter:** Like printer plotter is another type of output device . It is used for printing the huge maps or images on paper.



Fig. 13.15 Plotter

- (v) **Speaker:** It is also a type of output device. It is used to hear music, talks, etc.



Fig. 13.16 Speaker

13.5 Properties of computer

Computer has the following properties-

- (i) **Storage capacity:** Computer has extraordinary capacity to store data. It is measured in bytes. It can store any type of data.
- (ii) **Accuracy:** Computer never makes any error because it works on the principle that as the input so will be the output i.e. if input is wrong then output will also be wrong.
- (iii) **Speed:** Computer can do complicated calculations in a very short time.
- (iv) **Automation:** Computer is an automatic machine which when once started, works accordingly to directions as per the given programme.
- (v) **Diligence:** Computer is an electronic device which can do restless work for long time without any exhaustion.
- (vi) **Wide utility:** The use of computer is increasing day by day. Its utility is increasing in every aspect of life like banking, in education, transportation, printing, etc.

Shakuntala Devi

Shakuntala devi was born in a traditional kannad family at metropolitan city Bangluru the capital of Karnataka on 4th November 1929 . At the age of 6 years she represented her calculation dexterity in a conference at Mysore University. She had the capability to tell the date of any day of past century within fraction of seconds. In 1982 her name was included in "Guinness Book ". Due to these specialities , the people were forced to call her "Human Computer". She could solve very complicated and difficult calculation very easily. Books written like ' Sun With Numbers', 'Astrology for You', ' Puzzles to Puzzle You', 'Mathability'are universally famous. She had broken the myth that girls are weak in mathematics. In her honour, Google dedicated Google doodle on 4th November 1913. Renowned with the title of "human computer", this famous scientist passed away on 21 April, 2013 in Bangluru.

What have you learnt

- Computer takes data as input, store it. Process and prints the data as per our desire.
- Computer has been divided mainly into three units -
 - (i) Input unit
 - (ii) Central processing unit
 - (iii) Output unit.
- The three parts of central processing unit are-Memory, A. L. U. and Control unit.
- Key-board, mouse, magnetic ink character recognition, optical character recognition, optical mark reading, scanner, touch screen, microphone etc. are input devices.
- Monitor, printer, plotter and speaker etc. are output devices.
- Capacity storage, accuracy, speed, automation, diligence and wide usability are the different properties of computer.

□□□



Exercises

Choose the correct answer

- Which device is not an output device.
 (A) Monitor (B) Printer
 (C) Key-board (D) Plotter ()
- The part of central processing unit is-
 (A) Memory (B) A.L.U.
 (C) Control Unit (D) All the above ()
- Input device is -
 (A) Key-board (B) Mouse
 (C) Scanner (D) all the above ()

Fill in the blanks with suitable words

- All the actions of computer are controlled by.....unit.
- To check the examination answer books, device is used.
- Monitor, Printer, Speaker and plotter aredevices.
- printer speed is measured in CPS.

Short answer type questions

- Write names of input devices.
- What is the difference between CRT and LCD monitor?
- If you want to purchase a printer, which one will be your choice? and why?
- Define computer on the basis of their functions.

Long answer type questions

- What are the characteristics of a computer? Explain it?
- In how many parts key-board keys can be divided? Describe them.



Points to be Studied

- 14.1 Reflection of light
- 14.2 Laws of Reflection
- 14.3 Regular and diffused reflection
- 14.4 Reflection from a plane mirror
- 14.5 Spherical mirror
- 14.6 Concave mirror and the images formed by it
- 14.7 Convex mirror and the images formed by it

We have studied in earlier classes that light travels in a straight line. If an opaque object is placed in the path of light then it cannot penetrate through it but what happens, when a bright object like plane mirror is placed in its path? Let us know about it.

14.1 Reflection of light**Activity-1**

Take a plane mirror and stand in front of a building in open space during the day. Let the sunlight falls on the mirror. Now rotate the mirror in such a way that a spot of light falls on the wall of the building with no sunlight. Why is the spot of light formed on the wall? When incident light of sun falls on a plane mirror then mirror changes the direction of the incident light that falls on it.

You can perform similar activity in a dark room. Take cardboard and make a hole in it using a nail. Stand in the middle of room and cover the glass of torch by this card board. Ask your friend to stand in the corner of the room with plane mirror in his hand. Switch on the torch and place it such that the light falls on the plane mirror. Adjust the direction of the torch in such a way that a spot of light

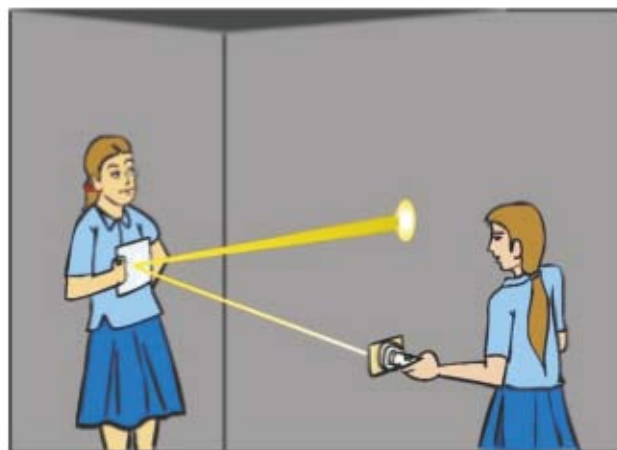


Fig. 14.1 To change the direction of light using a plane mirror.



falls on the wall of the room. It can be concluded that plane mirror changes direction of light that falls on it. In this activity light travels in air, strikes the plane mirror and returns back in the same medium.

Place a bucket full of water near the wall of a room and focus light on the water surface. You will see that water surface acts like a mirror and can turn the path of incident light. Take a shining steel plate or spoon and watch the reflection of light caused by it.

So, we can say that-

The phenomenon of reflection of light-rays after colliding with a mirror or any other object back into the same medium is called reflection of light.

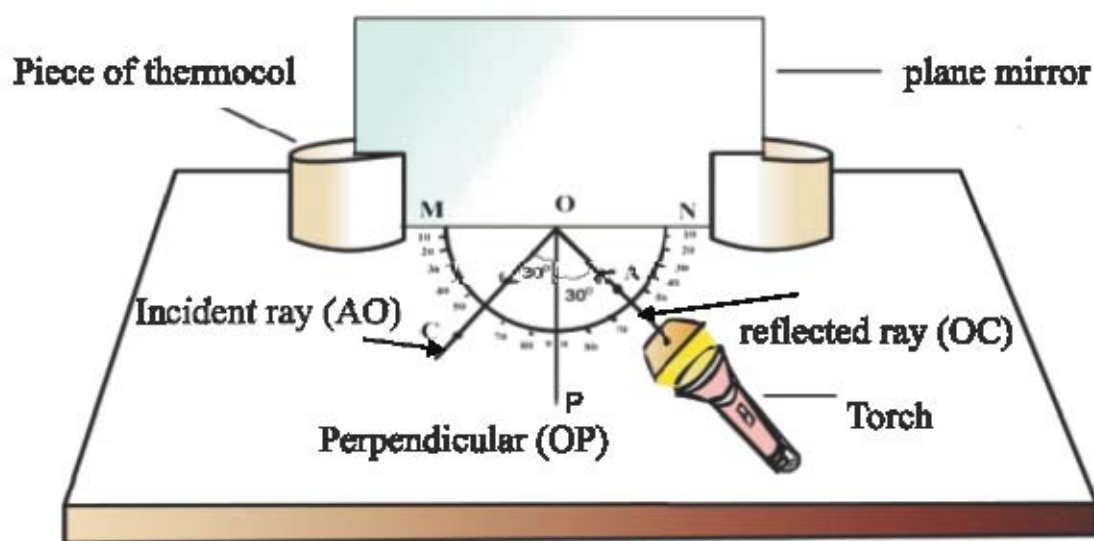


Fig 14.2 Reflection of Light.

14.2 Laws of Reflection

Activity 2

Take a drawing board and fix a white paper with the help of drawing-pins. Draw a straight line MN on it by a pencil. Mark a point O at the centre of MN. Draw a perpendicular line OP on MN from point O. Mark the angle like 90° , 80° , 70° , 10° , 0° on both side of point O as shown in figure 14.2. Place plane mirror parallel to straight line MN with help of thermocol. Cover the glass of a torch with black coloured drawing sheet which has a slit in it as shown in figure. Switch on the torch and focus the light passing through slit on the mirror in such a way that it appears as a straight line on the paper. Adjust the position of torch in such a way that its light strikes on the plane mirror with an angle of 25° from the

normal OP. The light ray reflected back from mirror will also appear on white paper. Put a mark A with pencil on incident light ray. Light ray AO that comes from torch and strikes the plane mirror is called **Incident light ray**. Similarly mark a point C on the reflected light ray. This ray of light (reflected ray) that comes back after striking the mirror is called **Reflected ray (OC)**.

Join the points A and O and point O and C.

The angle AOP formed between Incident ray AO and normal OP is called the **Incident angle i**.

The angle POC formed between reflected ray OC and normal OP is called the **Reflected angle r**.

Measure both the angles. Are these equal?

Similarly, repeat the above process by making different angles with normal and note down the values of incident and reflected angles in table 14.1.

Table 14.1

Sr. No.	Incident angle (i)	Reflected angle (r)
1	25°	
2	30°	
3	35°	
4	40°	
5	45°	

From the above observation you will conclude that -

The values of incident angle and reflected angle are always equal.

$$\text{Incident angle } i = \text{Reflected angle } r$$

This is first Law of Reflection.

You also see here that incident ray AO, reflected ray OC and normal OP all are present on the plane of paper.

Therefore, we can say that incident ray AO, reflected ray OC and perpendicular OP all exist in same plane.

This is the second Law of Reflection.



14.3 Regular and Diffused Reflection

When parallel rays of light are incident on plane mirror then reflected rays are parallel to each other in any specific direction. This type of reflection is called **Regular Reflection**. Regular reflection occurs by plane mirrors or other smooth and bright surfaces.

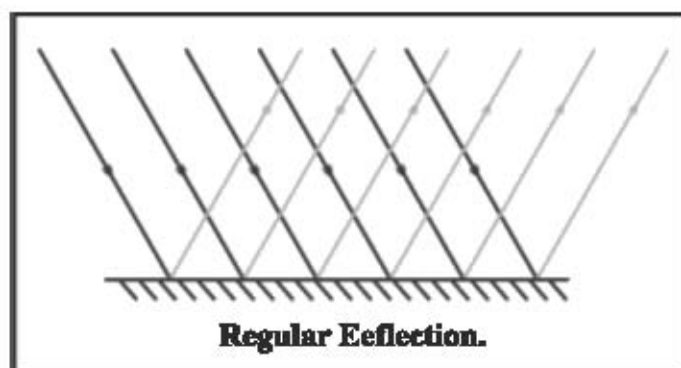


Fig. 14.3(a) Regular Reflection.

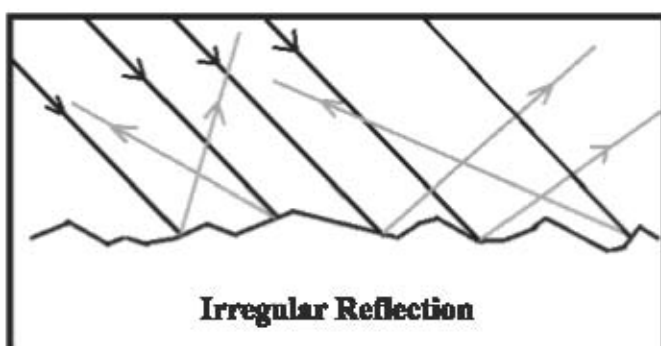


Fig. 14.3(b) Irregular Reflection

reflection occurs on the irregular surfaces such as- books, surface of table, etc. The presence of light under a tree and inside the room is because of diffused reflection.

When the incident rays fall on a rough surface they are parallel to each other but after reflection they are no longer parallel but are reflected in different directions. This type irregular reflection is called diffused reflection. Diffused reflection is caused by irregular surface of the reflector.

Good and Moderator Reflectors

Those surfaces which reflect most of incident light rays that fall on it are called good reflectors e.g. smooth and polished surface of an object, mirror etc.

Those surfaces which reflect only a small amount of incident light-rays are called moderate reflectors.

14.4 Reflection from a plane mirror?

Activity-3

Place a vertical plane mirror in between a thermocol as shown in fig.14.4. Place a pencil in vertical position (or pen or any object) at a little distance in front of the mirror. See its image in the mirror. Now place the pencil at different positions in front of the mirror and in each see the position of image. How is the image seen? Erect or inverted? When compared to the



Fig. 14.4 Image from plane mirror?

object of the image (pencil) is small or big?

Image formed by a plane mirror is upright and is equal in size to the object.

Activity -4

Draw a straight line on a plane white paper. Now starting from it, draw 3 cm sided squares one by one as shown in fig. 14.5. Place a plane mirror vertically clamped into a thermocol perpendicular to the straight line. Place a pen or pencil in vertical position in the centre of any square in front of the mirror. Observe the image and find out how far is it from the mirror?

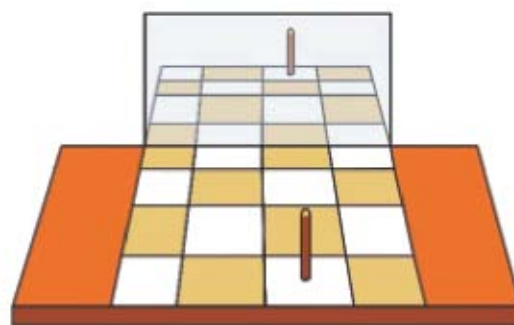


Fig. 14.5

You will see that **image formed behind the mirror is at a distance equal to the distance of object from the mirror.**

Place a white paper sheet at the back of the mirror at a distance from mirror equal to the distance you see an image. Does the image of an object appear on screen? You will find that the point at which you see the image without screen will not be seen if you put a screen at the same place. Thus this image is virtual.

The image which cannot be obtained on screen is called **Virtual image**. These images seem to form at a point but practically no image is formed at that point. Conversely, image formed at any point which can be taken on screen is called **Real image**.

Lateral Transformation - Standing in front of plane mirror observe your image when you extend your right hand. You find that the left hand of your image is extended.



Fig. 14.6(a) Lateral Transformation in Plane Mirror



Fig. 14.6(b) Ambulance

In plane mirror, the left part appears as right in the image and right part appears as left in the image. This event is called lateral transformation. Due to lateral transformation, words are written in a specific manner at the front side of ambulance so that image formed in side glass of the vehicle ahead of the ambulance is accurate and the driver of the vehicle views it as AMBULANCE and will easily give side to the ambulance to overtake it. How is image formed by a plane mirror?

Let us find out.

Activity 5

A point of light source 'O' is placed in front of plane mirror MN. Moving from point O, two rays, OA and OC are incident on the mirror as shown in fig. 14.7. Draw perpendicular points A and C on the surface of mirror MN. Draw reflected rays at point A and C and mark them as AB and CD respectively. Extend them further. They do not meet on extension in the forward direction. Now extend them backwards. They meet at a point, mark this point as I. Point A is Virtual image of object O. For our eyes placed at point E, these reflected rays appear to come from the point I. Since, the reflected rays do not meet at A but only appear to do so, we can say that the image is virtual. Virtual image cannot be obtained on screen.

It is due to reflection we are able to view the objects.

When light strikes at different points on an object and reflected rays reach our eyes then image of each point of the object is formed in our eye due to which we are able to see the object.

Multiple images

As you have seen a single image of an object is formed by a plane mirror, but how many images are formed when an object is placed in between two parallel mirrors? You might have gone to a saloon to get a haircut. You sit in front of plane mirror and another plane mirror is placed at your backside. These two mirrors are parallel to each other. Due to mirror placed at your

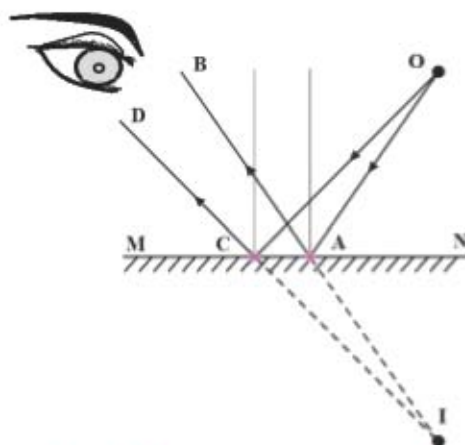


Fig. 14.7 Image Formation by Plane Mirror



Fig. 14.8 Multiple Images

back you see multiple images of yourself. Thus, infinite number of images is formed of an object placed between two parallel mirrors.

If the mirrors are positioned at any angle to each other and an object is placed in between them, then how many images of an object will be formed?

Let us experiment.

Activity-6

Make a semi circle on drawing-board with help of a compass as shown in fig.14.9. Mark angles from 0° to 90° on it. Place two plane mirrors along the lines A, B and C,D in such a way that these mirrors are at right angles to each other. Now place a pen in between the two mirrors and tell how many images of pen are formed? You will find that three images are formed for an object placed in between mirrors at right angles. Now find out the number of images formed by the two mirrors at different angles to each other as given in table 14.2. Divide 360° by angle θ and one from it. Is this value equal to number of images formed?

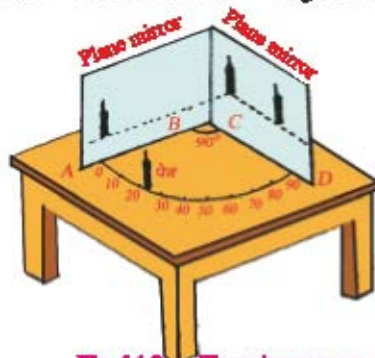


Fig. 14.9 Three images are formed from object placed in between two plane mirror

Table 14.2

S. No.	Angle between mirrors θ	Number of images formed	$360 / \theta$	$360 / \theta - 1$
1	90	3	4	3
2	60			
3	45			
4	30			
5	0			

On the basis of above study we can say that the formula (N) for number of images formed for an object placed between two parallel mirrors at a certain angle is-

$$\text{Number of Images (N)} = \left(\frac{360}{\text{angle between the mirrors}} \right) - 1$$



After dividing 360° with an angle, if an integer is not obtained then to find out the image numbers next integer is taken for e.g. if the value of the angle is 50° then $(360/50)-1 = 6.2$ which is not an integer which has seven as the next integer. So the number of images formed will be seven for two mirrors an angle of 50° . If the angle in between two mirrors is zero i.e. both are parallel to each other then number of images formed will be infinite(∞).

Till now you have learnt that-

- Image formed by a plane mirror is always virtual and erect.
- Size of the image is equal to the size of the object.
- Image formed behind the mirror is at a distance equal to the distance of the object from the mirror.
- In addition to it, image is laterally transformed.

If the reflecting surface is not plane but is curved then what kind of image formation takes place?

Let us perform.

14.5 Spherical Mirror

Activity 7

Take a table spoon and try to see your face on its surface. Can you see the image? Is it small or big? Gradually take away the spoon from your face and observe the image. How is it transformed? Now, revert the spoon and repeat the process to view your face on the outward surface. How is the image seen now? Compare the properties of the image obtained on both surfaces.

Curved surface of a bright spoon is assumed as a curved mirror. The most commonly used form of curved mirror is spherical mirror. The reflector surfaces of these mirrors may be assumed as a part of a sphere. Mirrors having spherical reflecting surfaces are called spherical mirrors.

Spherical mirrors are two types -

1. Concave mirror (divergent mirror) and
2. Convex mirror (convergent mirror)

What is their shape?

Let us find out.

Activity 8

Take the spherical hollow ball and cut a spherical part AOB along the circumference perpendicular to XY axis as shown 14.10 (A). Observe the AOB part. One of its parts is depressed inwards whereas the opposite part is bulged outward. Both the inwards and outwards parts are curved. What are these parts called?

Any outwardly bulging curved surface is **Convex** and inwardly depressed curved surface is **Concave**. If the same process is performed for a transparent spherical hollow glass then get a transparent curved part of the glass which has two opposite planes, one convex and another concave.

A spherical mirror in which the outwardly curved part works as reflector is called **Convex mirror**.

The bulged inward part i.e., the centre of the of spherical mirror works as reflector is called **Concave mirror**.

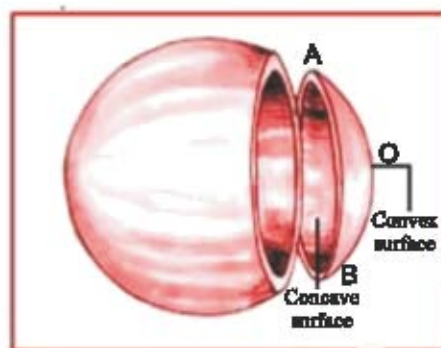


Fig. 14.10 (a) Parts obtained after cutting a rubber ball

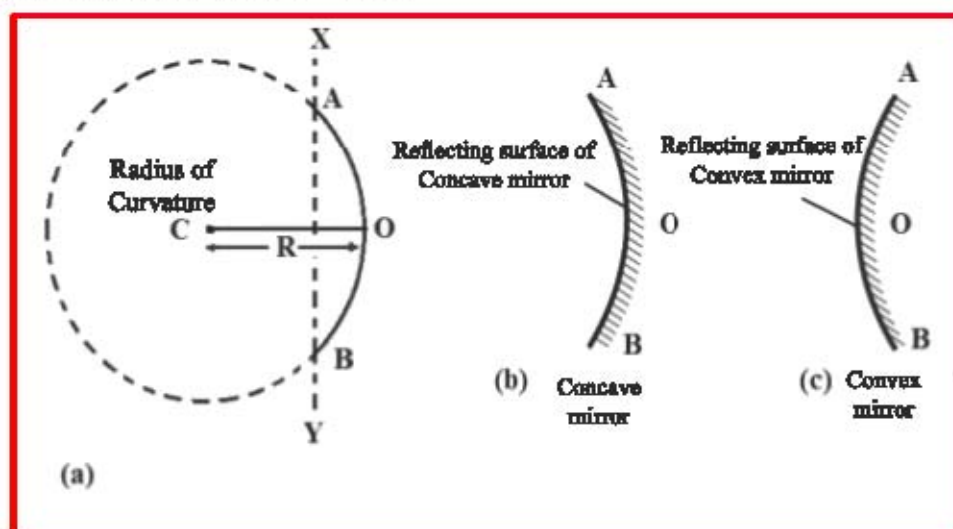


Fig. 14.10 (b) Graphical Representation of Spherical Mirrors

Thus, we can say that the inward or outward reflecting surfaces for a spherical mirror can be curved towards inside or outside. The graphical representation of these mirrors is shown in figure 14.10(b). In these figures,

backside of mirrors is shadowed. Now you may have understood that inwardly curved surface of the spoon behaves almost as a concave mirror and outwardly bulged curved surface as a convex mirror.

Reflecting surface of a spherical mirror is a part of sphere. Its centre C is called **Radius of curvature**. The centre O of reflecting surface of spherical mirror is called pole. The reflecting surface of spherical mirror which is a portion of sphere has Radius R which is called the **Radius curvature** of mirror. It is shown by OC in Fig. 14.10 (B). The line joining the pole O and centre of curvature C of the mirror is called **Principle axis**.

A concave mirror is convergent

Why is a concave mirror called convergent mirror?

Let us learn by doing.

Activity - 9

Hold a concave mirror in your hand and face the reflecting surface of the mirror towards the sun. Focus the light reflected by the mirror on a black paper sheet placed near the mirror. Gradually move the paper sheet backward and forward till you get a bright sharp spot of light on the sheet. Hold the mirror and the sheet for few minutes in the same position. What do you observe?

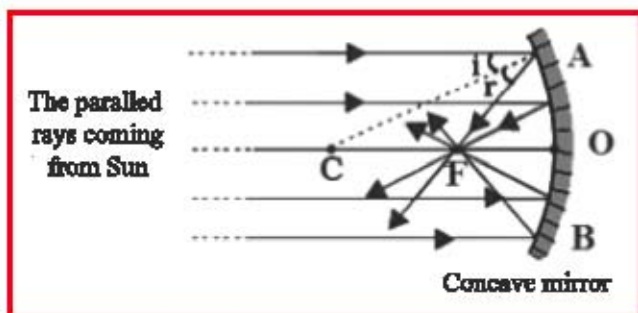


Fig.14. 11 Concave mirror and its image formation

First smoke appears from the paper and at the end it catches fire. Why does it burn?

Warning - Do not look directly towards the sun or towards sunlight reflected from a mirror. It may damage your eyes.

The parallel rays coming from sun are converged as a bright sharp spot by a concave mirror. So, it is also called as Convergent mirror. Actually, bright spot of light on paper sheet is the image of the sun. It is the focus point of concave mirror.

After reflection, incident rays parallel to principal axis are concentrated on a point on the principle axis. This point is called as Focus F the concave mirror. The distance between focus and pole is called Focal length of a concave mirror. It is half of the radius of curvature i.e., $f = R/2$.

Heat is generated by focussing sun light at a point due to which the paper starts to burn. The distance of image (bright sharp point) from mirror's position is approximately equal to focal length of mirror. By measuring it with a ruler, calculate the approximate focal distance of mirror.

Convex mirror is divergent.

Why a convex mirror is called divergent mirror?

Let us learn by doing.

Activity 10

Hold a convex mirror in your hand and face its reflecting surface of the mirror towards the sun. Focus the light reflected from the mirror on a black paper sheet placed near the mirror. Gradually move the paper sheet backward and forward. Are you able to get a bright sharp spot of light on the paper? The parallel rays coming from sun are not converged at spot by the convex mirror but are spread (diverged). That is why, the convex mirror is called a **Divergent mirror**.

Incident rays from a convex mirror parallel to principal axis seem to come from a point on principle axis after reflection. This point is called **Focus of convex mirror**. How is the image formed by a concave mirror? Let's learn by doing.

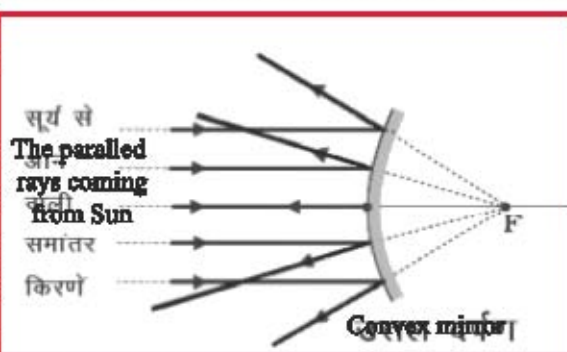


Fig14.12 Diverging Property of a Convex Mirror

Image Formation by a Concave Mirror

Activity 11

Take a concave mirror. Focus sunlight on a paper after reflection by mirror to get a bright sharp spot. Actually, bright spot of light on the paper is the image of the sun. It is very small, real, and inverted. By measuring the distance of image (bright sharp spot) from position of mirror, calculate the approximate focal length of mirror.

Draw a point O with help of chalk on a table. Place a concave mirror on a stand at point O. Now adjust the concave mirror on line in such a way that pole of mirror is located at point O. Now mark a point F equal to the focal length in front of the stand and a point C at a distance double to it. Keep a burning the candle at a little distance from it. Paste a white paper on a hard board approximately 15 cm long and 10 cm wide. This will work as a screen. Gradually move the mirror



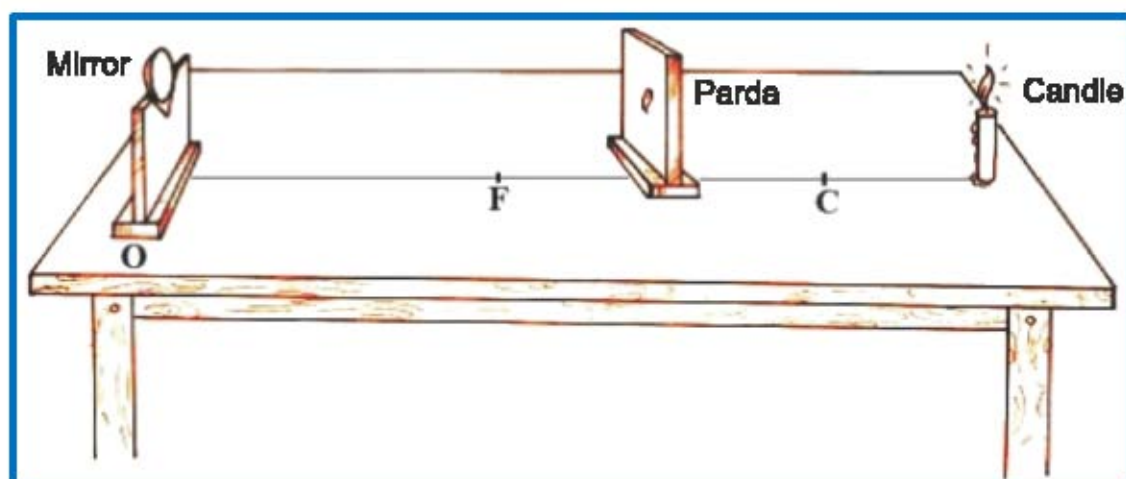


Fig. 14.13 Concave Mirror and its Image Formation

backwards and forwards till you get a bright sharp spot of candle flame on it. Look carefully at the image. It is inverted and small and formed in between the focus F and the centre of radius of curvature C .

Repeat this activity for several different positions of the candle and write down the observations in table 14.3.

In the situation when the position of candle is in between F and mirror, you will not be able to get image. Find out the position of image in this situation. Then view the virtual image directly in the mirror.

Table 14.3

Sr. No	Position of object	Position of image	Image size	Nature of image
1	A little distance from C			
2	At C			
3	In between F and C			
4	At F			
5	In between F and mirror			

Now, repeat the same activity by taking a convex mirror in place of a concave mirror. You will find that no image formation occurs on screen by using a convex mirror. The image is always obtained at the backside of the mirror, which is erect, virtual and small and can be viewed in a mirror.

Uses of Concave mirrors

1. Generally concave mirrors are used in torch, search lights and headlights of vehicles to obtain a powerful beam of parallel light.
2. Concave mirrors are used to obtain large and clear image for shaving??
3. Large sized concave mirrors are used to focus sun rays in solar cookers and solar heaters.
4. Concave mirrors are used by dentists to view an enlarged image of patient's teeth.

Uses of Convex mirrors

Convex mirrors are mostly used as side glass of vehicles. These mirrors are clamped at the side of vehicles and driver can view the vehicle at its rear side so that he can drive safely. The primary importance of convex mirrors is due to its ability to form an erect image though the size of the image is small. Thus viewing area is much more because they are curved towards the outer side. Therefore as compared to plane mirror, convex mirrors provide a larger rear view to the driver.

What have you learnt

- The reflection of light-rays after striking a bright surface or a mirror back in same medium is called reflection of light.
- The angle of incidence is equal to the angle of reflection. This is the first law of reflection.
- Incident ray, reflected ray and perpendicular the normal drawn at the point of incidence to the reflecting surface, lie in same plane. This is the second law of reflection.
- When parallel rays of light are incident on a plane mirror then the reflected rays of light are also parallel to each other. It is called regular reflection.
- The parallel light-rays incident on an irregular surface after being reflected are not parallel to each other but are reflected in different directions. It is called irregular/diffused reflection.
- Virtual image cannot be obtained on screen.



- Image formed by plane mirror is always erect, virtual and equal to size of an object. In plane mirrors, left part of the object is seen as right in image and right part is seen as left in image. This phenomenon is called lateral transformation.
- Spherical mirrors are of two types - concave mirror (divergent mirror) and convex mirror (convergent mirror).
- Convex mirror is that spherical mirror in which the outer curved surface works as reflector.
- Concave mirror is that spherical mirror in which inner curved surface works as reflector.
- Image formed by a convex mirror is always small, erect and virtual.
- Concave mirrors are used in torch, search lights and headlights of vehicles, for making shave, in solar cookers and heaters and by dentists.



Exercises

Choose the correct answer

- Image formed by concave mirror for a object placed away from centre curvature is -
 (A) At centre of curvature
 (B) at focal point
 (C) At infinity
 (D) in between focal point and centre of radius curvature ()
- To see the rear view of vehicles the following is used-
 (A) Convex mirror (B) Concave mirror
 (C) Plane mirror (D) all the above ()
- Image formed for an object placed in front of a plane mirror is-
 (A) At distance equal to distance between object and the plane mirror.
 (B) At twice the distance
 (C) At half the distance
 (D) At four times the distance ()

Fill in the blanks with suitable words

1. Image formed by convex mirror is erect, small,
2. Infinite number of images are formed by two plane mirrors having..... angle in between them.
3. We usemirror to see our image.

Short answer questions

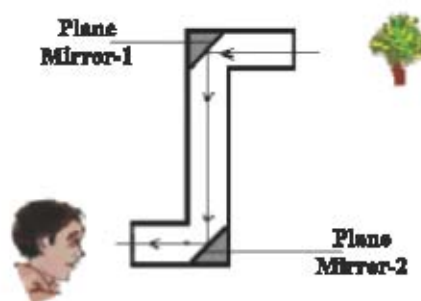
1. Define reflection.
2. A concave mirror has focal length of 20 cm. Calculate its radius of curvature.
3. Write down the laws of reflection.
4. What will you call the right part of an object's image as left part by plane mirror?
5. What is the difference between concave and convex mirror on the basis of constitution and images formation?

Long answer questions

1. Explain the process of image formation with a diagram for an object placed in front of a plane mirror.
2. Differentiate between virtual and real images.
3. Explain the regular and diffused reflection with the help of a diagram.

Activity based work

As shown in figure, make a simple periscope with two mirrors arranged in Z shaped box. Put its upper part towards the scene and view through the bottom. By this method, you can easily see the scenes of upper parts while remaining at bottom position.



Points to be Studied

- 15.1 Meaning of temperature
- 15.2 Measurement of temperature
- 15.3 Meaning of heat
- 15.4 Heat circulation methods
 - Conduction
 - Convection
 - Radiation

Every day we come across a numbers of objects. Some of them are hot and some cold. List the names of some objects in next table 15.1. Mark these as hot or cold.

Table 15.1

Sr. No.	Object's Name	Hot or Cold
1	Ice	Cold
2		
3		
4		
5		

Generally how do you decide that the object is hot or cold? We often do it by touching the objects. But is our sense of touch reliable to know about the hot or cold objects? Let us find out.

15.1 Meaning of temperature

Activity 1

Take three big containers like a bucket, a stainless steel pot. Put ice mixed cold water in first pot A, normal water in second pot B and warm water in third pot C. Now dip your left hand in pot A and the right hand in pot C. Now take out both the hands and put them immediately in pot B (see fig 15.1).

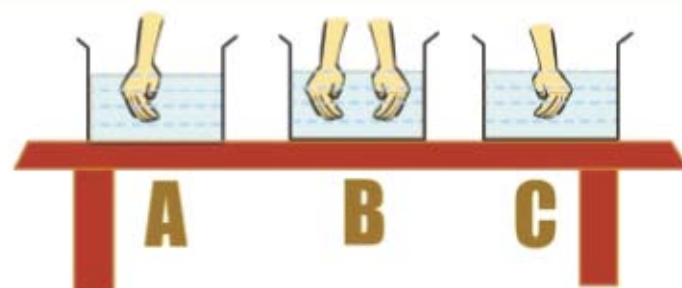


Figure 15.1 Touch is not a reliable method to find out about the hotness or coldness of objects.

What do you feel? Whether water in pot B is hot or cold? Your left hand feels hot water and the right hand feels cold water. You are unable to decide whether water in pot B is cold or hot. This experiment proves that our sense of touch is not reliable to know about the hotness or coldness of objects.

Then, how do we find out how hot an object really is? The hotness or coldness of an object can be known by a characteristic called the temperature of an object. Temperature of an object is measured by a device called thermometer.

We do not use the words cold or hot for an object. But we say that the object has high temperature or low temperature. The hotness or coldness of an object displays a comparative state of temperature. For example - temperature of ice is low as compared to that of lukewarm water but the temperature of boiling water is more as compared to both ice and lukewarm water.

15.2 Temperature measurement

Temperature of an object is measured by a device which is called thermometer. There are many types of thermometers e.g., laboratory thermometer, gas thermometer, alcohol thermometer, digital thermometer, etc. In this chapter we will study about laboratory thermometer and clinical thermometer.

(A) Laboratory thermometer

Activity -2

Observe carefully the thermometer available in your school. It is a long glass tube with a thin internal glass tube of equal diameter filled with mercury. One end of the tube is joined with bulb and other end is closed. Thermometer has printed scale on which is generally a Celsius scale. In Celsius scale, temperature is expressed in $^{\circ}\text{C}$ (degree Celsius). Observe the thermometer carefully, and find out the highest and lowest scale value on it.

In the laboratory thermometer, normally -10°C to 110°C markings are seen. It is called the range of thermometer. How is temperature measured by a thermometer?





Figure 15.2 Laboratory thermometer

Let us do and observe

As in earlier activity, dip the bulb of thermometer in pots A, B and C filled with water one by one and wait till mercury surface level becomes stable. Note the readings on the thermometer.

Be careful that bulb of thermometer does not touch the bottom and sides of pot. Also keep in mind to place the thermometer in erect/ vertical position, not in inclined position and note the reading by keeping the eye parallel to the mercury level

(B) Clinical thermometer

The thermometer which is used to know the temperature of our body is called **Clinical thermometer**. It has two scales marked, one Celsius and another Fahrenheit. Its glass tube is also filled with mercury. Observe the clinical thermometer carefully. Outside the bulb, a fine and shining line along the tube is seen. If you are not able to see the line, then rotate the thermometer slightly and then see the fine line.

The clinical thermometer is designed to measure the temperature of human body only which is between 35°C to 42°C . Thus the temperature range of clinical thermometer is between 35°C to 42°C . This range in Fahrenheit scale is between $94-108^{\circ}\text{F}$. The normal temperature of human body is 37°C or 98.6°F . In fever the temperature of the body increases.



Fig 15.3 Clinical thermometer

How do we find the body temperature from clinical thermometer?

Let us see by doing

Activity-3

Take a clinical thermometer and put the bulb of thermometer under the tongue inside mouth and hold it there for some time and then take it out. Now, see the mercury level and note the reading in your notebook.

Wash the thermometer, with an antiseptic solution and measure the body temperature of another student. Repeat the procedure for other students in your class and note down the readings in table 15.2. The mercury level neither rises nor drops in clinical thermometer after taking it out from mouth. It is due to the presence of a kink near the bulb which does not let the mercury level to drop or rise by itself. So, each time before taking the temperature it is held firmly in hand and a few jerks are given so that the level of mercury goes down.

Table 15.2

Sr. No.	Student's Name	Temperature
1		
2		

It is not necessary that body temperature of each student is 37°C . It could be slightly higher or slightly lower. Actually, the normal temperature of a healthy body is the average body temperature of a large number of people. This average temperature is 37°C .

Precautions:

The bulb of thermometer should not be put directly on a flame or near a flame or in sunlight for longer period of time as it may break.

Also know it.

Figure 15.4
Maximum-
minimum
thermometer.



Figure 15.5
Digital
thermometer.



Maximum - minimum thermometer

The different thermometers are used for different applications. It is used to provide the maximum and minimum temperature in weather reports.

Digital thermometer

Mercury is a toxic material and if a thermometer breaks and its mercury litters, it may be harmful to the body if any kind of intake occurs. So, nowadays, digital thermometer is in common use.

15.3 Meaning of Heat

Heat is a form of energy which can be transferred from one object to another. Due to heat transfer the objects either become hot or cold i.e., their temperature either increases or decreases. Why does this happen?

Let us see by doing.

Activity-4

Take 1.5 - 2 litre water in a stainless steel pot or other container and warm it till boiling. Now, remove the pot from the flame. Take water with normal temperature in a glass or test tube and measure its temperature. Now, put the test tube or glass into the hot water pot for some time and again measure the temperature. What is the difference in both temperatures?

You will find that the temperature cold water rise and temperature of hot water decreases a little. Thus

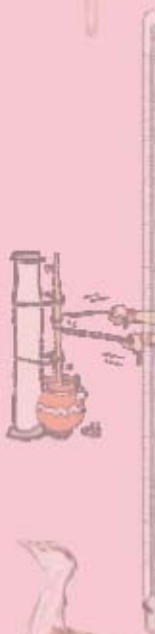
"Heat flows from the object with high temperature towards object with low temperature."

"The temperature of the object which releases heat becomes low whereas the temperature of the object which receives heat becomes more."

Find out the temperature of both water containers after one hour. You will find that temperature in both the water containers is the same.

"The hot or cold objects exchange heat till the temperature of both becomes the same."

You have seen that heat is transferred from one object to another. What are the methods for heat transfer? Let us discover.



15.4 Methods of Heat transfer

(A) Heat Transfer through conduction

Activity-5

Take a broken cycle spoke or thin straight iron wire and paste a few pieces of wax at equal distance on it. Put one end of wire on a table, put a brick or stone on it under the brick or stone as shown in fig 15.6. Heat the other end of wire with candle see what happens? Which piece of wax falls down first?

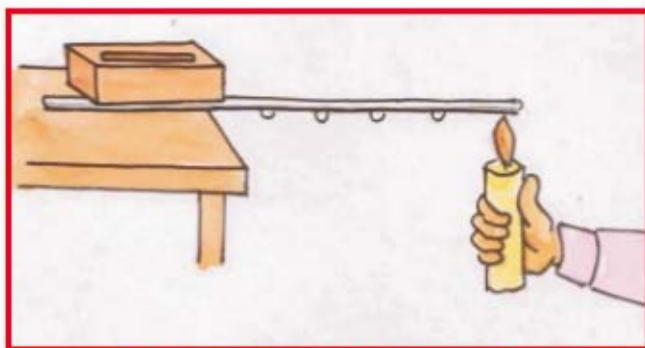


Fig 15.6 Conduction of Heat

By heating one end of the wire, heat is transferred towards the cold end. This method of heat transfer is called **conduction**. The transfer of heat in solid objects occurs by conduction.

Also do this

Wrap the thin paper tape tightly on iron or copper rod. Try to burn it over a candle flame by continuously rotating the rod. You will find that paper does not burn and the other end of rod becomes hot. It is due to the fact that heat given to the paper is absorbed by the rod which moves promptly ahead in rod. Due to this temperature of paper does not rise.

Does heat conduction happen easily in all objects?

Let us learn by doing

Heat conducting and insulating materials

Activity-6

Heat water in a beaker till boiling and dip a plastic scale, pencil, steel spoon, iron nail or wire, aluminium wire as shown in fig 15.7. Wait for some time, then touch the upper end of the objects. The upper end of which of the objects have become hot? Heat flows easily in metals - aluminium, iron, steel, etc. That is why the upper end of all these materials are hot. Now, you may have



Fig 15.7 Difference between Heat conducting & insulating objects

understood why wood, plastic, etc. are less hot?

The materials which allow heat to pass through them easily are called **heat conductors**. In opposition, the materials which do not allow heat to pass through them easily are called **bad Conductors** of heat or heat insulators. For example metals like aluminium, iron and copper, etc., are conductors of heat whereas plastic, wood, ebonite, woollen cloths, etc., are Insulators of heat.

Find out

1. Why are the utensils of cooking food made of metals and their handles made of wood or ebonite?
2. Stainless steel pot usually has a copper base, why?
3. During summers, why is it less troublesome to walk bare foot on a mat or carpet as a covering of heated floor?

Have you ever thought that how woollen clothes protect us from cold in winters? Air is a bad conductor of heat. Air is trapped in tiny pores of woollen clothes. Wool and air being bad conductors of heat do not allow body heat to go out and we are protected from cold. Similarly, during winters, when the body is covered with two blankets simultaneously a large layer of air is formed between the two blankets and gets trapped and we are protected from cold.

If hollow bricks are used during the building construction, then there is less effect of heat or cold on rooms in summer or winter. Why does this happen?

Air and water are bad conductors of heat, then how does heat conduction takes place in these?

Let us learn by doing.

(b) Heat transfer by convection:

Activity 7

Take water in a pot. Place few crystals of potassium permanganate or 4-5 beads of tea leaves in it and heat. Observe water in a pot carefully. You may find that water rises above from the centre and lowered from here and there (as in fig 15.8). Colourful currents are set in water. Why does this happen?

When the bottom of the pot is heated the water molecules absorb heat and move upwards whereas the

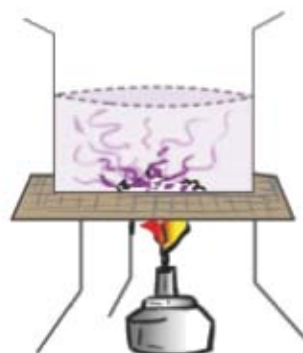


Fig 15.8 Convection of Heat in liquid

upper molecules are cool and move towards the bottom of pot.

By this mechanism, the liquid molecules itself move from one place to another to transfer heat. This method of heat transfer is called **convection** of heat.

Air also convects heat. Air molecules also become lighter after absorption of heat (with low density) and move bottom to the top. The upper cold molecules of air move downward to gain heat.

What are the uses of heat convection in our daily life? Let us discuss about it.

Uses of Convection

1. **Ventilation:** Keeping hand in front of your mouth breath out forcefully. Is the air hot? Generally the air we exhale is hot and of low density compared to normal air. It rises up towards the roof and exits from ventilator near the ceiling and fresh air enters from doors and windows.
2. **Chimney:** Smoke and gases which are come out from houses and factories being hot move upwards and exits through the chimney.
3. **Oceanic currents:** Sun rays fall directly all around the equatorial line as compared to poles. That is why the water in oceans is more hot water near the equatorial circle as compared to poles. This water being remains on the surface and as such flows towards the polar region. The hot water that flows in such a way is called **hot water current**.

Just opposite of it, the water around the poles is heavy due to its coldness. It flows from poles to equatorial circle. These types of currents are called **cold water currents**.

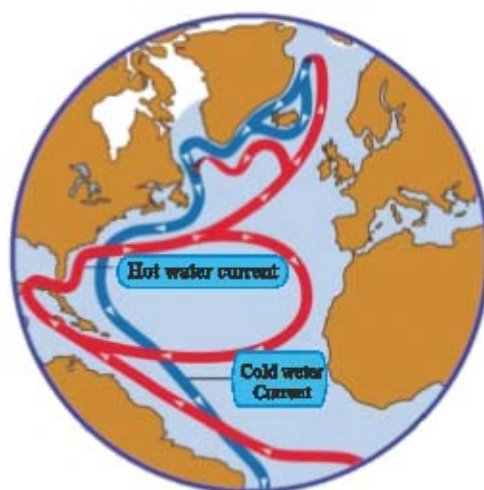


Fig. 15.9 Oceanic current

4. **Air flow:** Air flows from high air pressure to low air pressure area. When a place has high temperature then its air becomes hot, rises up (vertical height) and expands. Because of this air pressure at that place is reduced.



Then, air starts to flow from cool place to hot place.

During the day, the land gets heated up more than the sea water. The cooler air from the sea blows towards the land. It is called **sea breeze**. But at night the land gets cooler fast. The cool air from land blows towards the sea side. This is called the **land breeze**. In summer, during monsoon air flows from the ocean for the same reason and rainfall occurs.

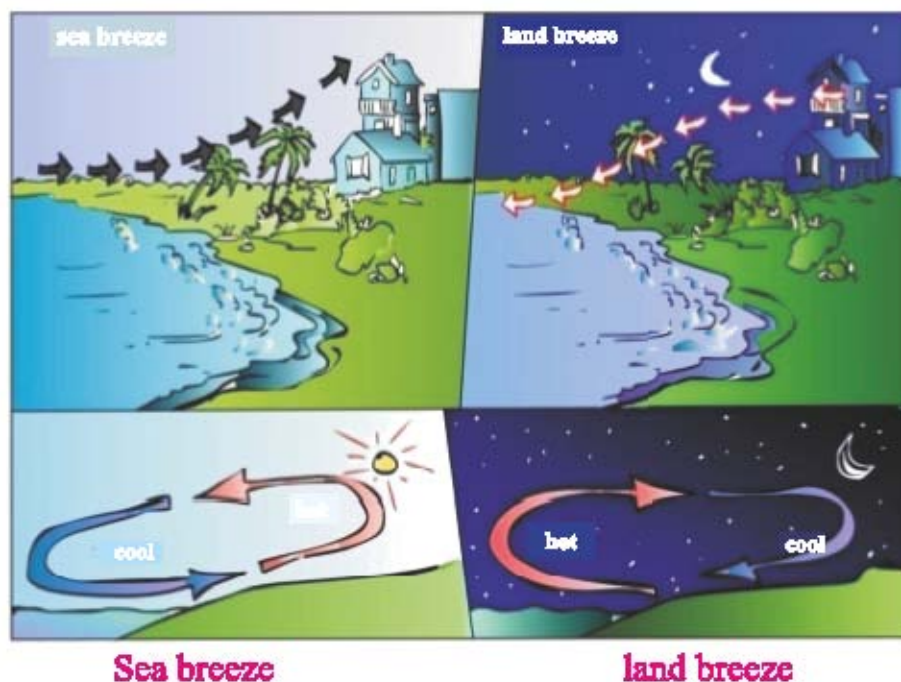


Fig.15.10 Air flow

Is it possible to transfer heat without any medium (vacuum)?

(C) Heat transfer by radiation:

There is no medium in the space between earth and sun. We call it vacuum. It is a place where there is no air. This means, that there is total absence of molecules of any substance in vacuum. The heat radiated from sun reaches the earth as light through vacuum. The method in which heat transfer takes place without any medium (in vacuum) is called **Radiation**. There is no requirement of any medium like solid, liquid or gas in the transfer of heat by radiation. Radiation like light is electromagnetic wave which can move with the speed of light in vacuum.

When we sit in front of a heater or stove, we receive heat by radiation. When a hot utensil is moved away from the flame it cools down by transferring its heat to the environment by radiation. In the same way our body also gives up heat to the environment and receives heat from it by radiation.

When heat radiation falls on some object the following activities occur -

1. **Reflection:** Part of incident radiation energy falling on object is reflected back by an object. The lustrous objects are better reflectors e.g. metals.
2. **Absorption:** A part of incident radiation energy falling on object is absorbed by the object. Thus, object becomes hot and its temperature rises. When we go out at noon we feel hot. Due to this reason we use an umbrella or find shade to protect ourselves from the heat. White or light coloured objects absorb less heat as compared to black or dark coloured objects. Now, can you tell why we feel more heat by wearing dark coloured clothes during summers?
3. **Transmission:** When radiation falls on a transparent object then part of it is reflected, part is absorbed and some part is also transmitted.

Also know it

Heat reaches from sun to earth by radiation. Besides the sun, the heat is also radiated by stove, hearth, candle, light bulb etc. Objects with normal temperature like hot tea, living organisms, water, earth and its objects and even ice emit radiations. This type of radiation occurs as waves and is called infrared rays. Most part of this infrared rays emitted from earth goes into space and earth's temperature cools down at night due to this reason.

What have you learnt

- The hotness of an object is called temperature.
- Temperature of an object is measured by a thermometer.
- The laboratory thermometer has a range from -10°C to 110°C whereas clinical thermometer has a range from 35°C to 42°C .
- Normal temperature of human body is 37°C .
- Heat is a form of Energy. Which flows from the object with high temperature towards object with low temperature.
- There are three methods of heat transfer: conduction, convection and radiation.
- Normally heat transfer in solids takes place by conduction method. When one end of a solid is heated, then heat transfer occurs towards the cold end. It is called conduction.
- The objects in which heat transfer occurs easily are called conductors of heat.



- In convection, the heat transfer takes place through the movement of molecules themselves. The Heat transfer in liquids and gases takes place by convection.
- Radiation is that method of heat transfer which does not require solid, liquid or gaseous medium to transfer heat. It can travel in vacuum also.
- The lustrous objects are better reflectors of heat radiation.
- Black or dark coloured objects are good absorbers of radiation. e.g., due to this reason one should wear light colour in summer and dark coloured in winter.
- Air and woollen clothes are bad conductors of heat. For this reason woollen clothes protect us during winters from cold.

Exercises

Choose the correct answer

1. Which material is used in laboratory thermometer?
(A) Sodium (B) Mercury
(C) Melted aluminium (D) Shining water.
2. In a heat transfer method when molecules themselves move from one place to another to transfer heat, it is called
(A) Conduction (B) Convection
(C) Radiation (D) Conduction and radiation both

Fill in the blanks with suitable words

1. Degree of hotness or coldness of an object is called.....
2. A metal spoon is dipped into ice-cream pan for few moments then it will become.....
3. A layer of copper is adhered at bottom of steel pan because copper is good.....of heat.
4. The heat flows fromtemperature object totemperature object.
5. Air and water areof heat.

In the following statements, tick T against those which are true, and F against those which are false:

1. If we add 1 litre of 35°C water into 1 litre of 55°C water then the mixture will have a temperature of less than 30°C . (T/F)
2. Utensils for cooking food are made up of metals because metals are good conductors of heat. (T/F)
3. The houses, which have outer walls painted with white colour, are less hot in summer days (T/F)

Long answer questions:

1. Explain the difference between heat conductor and insulator with examples.
2. What are the different methods for heat transfer? Explain the difference in each.
3. When we put objects in sun light, why do black objects get more heated up as compared to lustrous objects although having same size and shape?
4. Give the reason for formation of hot currents in sea?
5. Why is the handle of cooking utensils made with ebonite or wood? Give reasons.
6. With the help of a diagram, explain the heat conduction procedure.
7. How are we protected in winter by wearing woollen clothes? State the reason.

Activity based work:

1. Take same sized pots and fill it with same amount of water, oil, sand, salt etc for similar time period in sun. Measure the temperature of each and tell which one becomes rapidly hot and why?
2. Make a chart of thermometers having Fahrenheit and Celsius scales and display it.
3. With the help of a thermometer find out the melting point of ice and boiling point of milk.
4. Measure the temperature of normal water and sugar containing water and compare them.



Chapter 16

Forest and Wildlife

Points to be studied

- 16.1 Forests
- 16.2 Advantages of forests
- 16.3 Causes of Deforestation
- 16.4 Disadvantages of deforestation
- 16.5 Measures to conservation Forests
- 16.6 National Parks and Sanctuaries
- 16.7 Some of the major wildlife found in Rajasthan
- 16.8 State animal, bird, tree and flower of Rajasthan

During rainy season we visit gardens, fields, etc. with our family or friends. Lush green surroundings make us happy there. This greenery and beautiful environment is only because of trees and wildlife.

Write down the names of plants and animals in your surrounding in Table 16.1:

Table 16.1: Names of plants and animals found around us

S.N.	Name of plants	Name of animals
1		
2		
3		
4		
5		
6		
7		
8		

Have you ever seen or heard about a nearby area where trees and wildlife are found in over abundance. This green environment is due to trees and wildlife. You know this terrain by which name?

These terrains are called forests or jungles. Let us know about forests.

16.1 Forest

Plants and animals are important components of the environment. A large land area with abundance of trees and wild animals is called a Forest.




Fig. 16.1 Forest

How are these forests important for us? What are the advantages we get from them? Let us know.




16.2 Advantages of forests


1. Wood obtained from forests is used for various domestic, commercial and industrial purposes. We obtain drugs in the form of herbs and many important commercial products like rubber, wax, bamboo, grass, catechu, resins etc. from the forest.



- 
2. Forests reduce air pollution and other types of pollution.
 3. Forests are the best habitat for wildlife.
 4. They enhance the natural beauty.
 5. They help in the maintenance of humidity of air.
 6. They enhance the fertility of the land.
 7. They help to increase ground water level and level of water in the soil.
 8. They prevent soil and land erosion.
 9. Forests provide oxygen in the form of air that keeps our environment clean.
 10. They help in bringing rainfall.

Let us get a detailed knowledge about some of the above given important benefits provided by forests.

- 
- 
- 
- **Maintain humidity of air-** Climate is controlled by the forests. Forests reduce the temperature. Forest is the excellent natural source of pleasantness. There are several small pores called stomata found in leaves of plants. The water leaves the stomata in the form of water vapour which enhances the moisture content of the air known as humidity. Due to high density of trees in forests there is more humidity and we feel pleasant. Due to this, the temperature of the forests is lower as compared to other places.
 - **Improve the fertility of land -** Worn out leaves, twigs, etc. fall down from trees which are decomposed by micro-organisms present in the soil as a result of which a layer of organic material is formed on the top soil, known as **Humus**. Humus increases the fertility of the soil and causes the rain water to seep slowly into the soil so that there is enough moisture in the land and the quantity of water the trees receive is adequate.
 - **Improve ground water level -** Forests reduce the strong water currents as a result of which water trickles down in the earth thus raising the ground water level.
 - **Prevent soil and land erosion -** All of you have gained knowledge about the benefits we receive from forests. There is a field with plants and another field without plants, from which field soil will wash or flow over more during rains or a storm?



There is a change in the pattern of land by various events that occur in nature. The removal of top soil by rain and wind (washed or blown to another location) is called **Soil erosion**. The forests play an important role in preventing soil erosion. Roots of plant binds the soil particles as a result of which fertile soil is not washed or blown away by storm, flood etc.

16.3 Causes of Deforestation

- (1) Fast growing population, urbanization and industrialization need additional land for housing, shelter, agriculture and factories. To fulfill this demand there is an indiscriminate cutting of forests. This is called deforestation.
- (2) Trees in the forests are being cut down for the construction, of dams & roads, mining, river valley projects etc.
- (3) Indiscriminate cutting of trees in forests to fulfill industrial, commercial and domestic needs is the main cause of deforestation.

16.4 Disadvantages of Deforestation

The major side effects of over-exploitation of forest resources are as follows-

1. Environmental imbalance.
2. Decrease in precipitation.
3. Increase in soil erosion.
4. Increase in atmospheric temperature.
5. Lowering of ground water level.
6. A decrease in biodiversity due to decrease in the number and species of wildlife.
7. A decrease in forest productivity.
8. An increase in floods, drought and natural disasters and also an increase in desertification.

At present there is a continuous decline in the number of plants, hence their protection is necessary. How and in what way can we protect them? Let us think about it. What effort will you make to save the forests? Discuss in groups on this subject, list down the suggestions given by students.


We are well aware of the importance of forests. Decrease in forest area and its destruction due to continuous exploitation and eradication is a matter of concern. Forests are important contributors in maintaining the ecological balance. Therefore, at present, there is a dire need of replantation and conservation of forest.

16.5 Measures for the Conservation of Forests

To conserve forests we should strive to make the following efforts-

- (1) Plantation.
- (2) Adequate safety of forest from fire.
- (3) Prevention of diseases in trees.
- (4) Plantation by an awareness program.
- (5) Strong action to be taken against individuals for illegal deforestation.



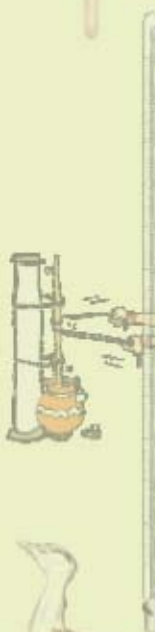


- 
- (6) Ensure our participation in protection and conservation of forest and environment.
- (7) Abidance of the rules constituted by legal institutes, government and courts.
- (8) Celebrating wildlife and forest conservation weeks enthusiastically.

Wildlife

You might have visited farms, mountains and other natural places. Make a list of animals and plants you might have seen there.

Table 16.2 List of animals and plants

S.N.	Location	Name of animals	Name of plants
1			
2			
3			
4			
5			
6			
7			
8			
9			

All the living species that are found in their natural habitat (flora and fauna) are called wildlife.

16.6 National Parks and Sanctuaries

Wildlife is found in all the ecosystems of the world. Wildlife stays away from human habitat.

National parks and sanctuaries were established for conservation, promotion and management of wildlife. Some of the major national parks and sanctuaries of Rajasthan are as follows -

- 1. Ranthambore National Park** - This Park spreads over an area of several square kilometers around Ranthambore, the historic fort near Sawai Madhopur. Tigers project was undertaken to stop the depletion in the numbers of tigers. Here tiger, wolves, leopards, nilgays, deer, wild boars, sambhars, etc. Are found in abundance. It is an aspiring project of Government of India for the conservation of tigers.



2. **Keoladeo National Park** - It is located in Bharatpur. Particularly, migratory birds come here in specific seasons and many Indian species of birds are also found here.
3. **Sanctuaries of Rajasthan** - Some major wildlife sanctuaries of Rajasthan are- Ramgarh Vishdhari Wildlife Sanctuary, Bundi, Nahargarh Wildlife Sanctuary, Jaipur, Sita Mata Wildlife Sanctuary, Pratapgarh, Tal Chhaper Wildlife Sanctuary, Churu.
4. **Sita Mata Sanctuary** - It covers several square kilometers area in Pratapgarh district. Teak trees are found here in abundance. Nilgai, Sambar, Chital, Wild cats, foxes, etc. are also found.
5. **Mount Abu Sanctuary** - It covers several square kilometers of dense vegetation rich area in Sirohi district. It is a protected forest area for the conservation of leopard, nilgai, chinkara, wild boar etc.

16.1 Some Major Wild Animals Found in Rajasthan

Tiger - Usually tiger is ten feet in length and three and a half feet in height. Its body is golden yellow, with long black strips from top to bottom with bulging eyes. Tiger's sense of smell is highly developed.



Fig 16.2 Tiger

Leopard: Its body is buff or light brown in color which has certain whiteness. The breast is white. Rounded black spots cover the entire body.

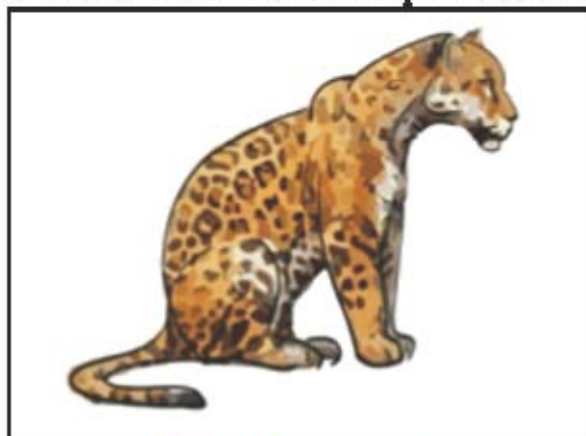


Fig 16.3 Leopard

Hyena - Also known as lakkadbagha in common language. It appears like a dog. Abundant hair is present on its back, neck and tail. Its color is gray or ashy which have vertical and horizontal black strips. Hyena's sense of smell is very intense, due to which it can find out hidden remains of animals. It is very timid animal. Its voice is horrible and graceless. Hyena in animals, and vultures in birds get their food from decaying dead organisms. This is an automated system in forests to keep the natural habitats clean.



Fig 16.4 Hyena



Fig 16.5 Wolf

Wolf - The wolf is here! The Wolf is here! Is a proverb. Its color is like ash. It has light brown colored hair mixed with black hair. It is renowned for its cleverness. It is adept in treachery and thievery. It deceives its prey, makes it run and hunts it in packs. It has immense power to run, It chases its prey so that the prey gets exhausted and then it kills the prey.

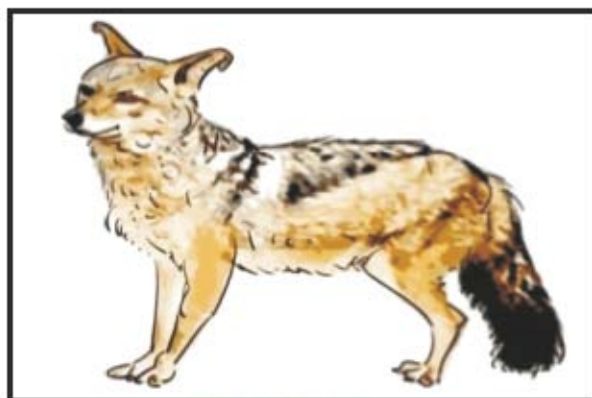


Fig 16.6 Fox

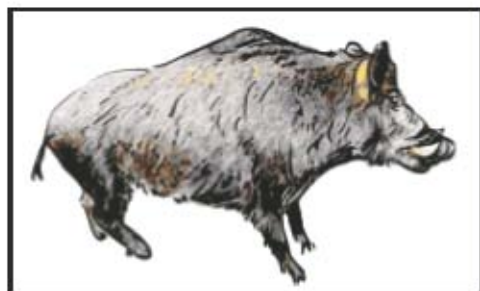
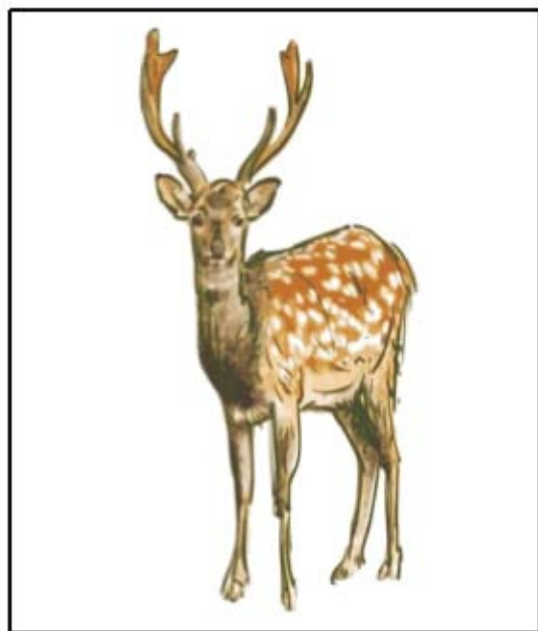
Fox - The story "Grapes are sour" is prevalent for the fox. It is considered one of the most cunning among animals of the wild life. Fox is a small, very agile and clever animal.

Jackal: Hua.....Huavoice of jackal at night is heard and recognized by villagers. Jackal is also known as siyar.

**Fig 16.7 Jackal**

Wild boar: It is bigger and quite different in appearance than pigs found in cities, but has totally different attitude. It is very strongly built to hit the target with high speed directly.

Deer and Antelope - Deer species mainly found in Rajasthan are Chinkara, Blackbuck Antelope, Black Buck and Nilgai. The two main species found in Rajasthan are Sambhar and Chital.

**Fig 16.8 Wild Boar****Fig 16.9 Chinkara****Fig 16.10 deer**

Black buck - It is very beautiful and picturesque wild animal found in Tal Chhapar wild Life sanctuary in Churu district.

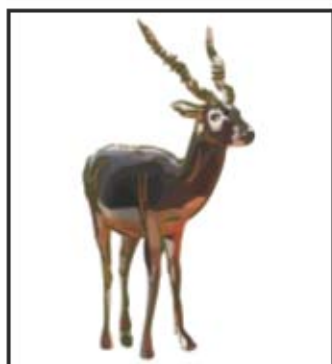


Fig 16.11 Black Buck

Blue bull (Nilgai) - The Nilgai is also known as 'Rojda or Rojh'. It is heavy as a horse, strong, gray to blue in color. It explores grounds and fields along with forests and destroys the crop in the fields completely.



Fig 16.12 Nilgai

Chital - It is a beautiful and alluring wild animal. It is spotted deer. It is an embodiment of playfulness, innocence and beauty.



Fig 16.13 Chital

Sambhar - Sambhar is a huge wild animal of deer species, also known as Barahsinga by many people.



Fig 16.14 Sambhar

Indian Hare - Beautiful and simple natured animal that has the capacity to run fast. Due to hunting and deforestation its number is decreasing continuously.



Fig 16.15 Indian Hare

Porcupine - Porcupine is also known as Shaveli in villages. It has long spines of black and white color all over its body. It uses them as a weapon against its enemies.



Fig 16.16 Porcupine



Some Species of Birds (The World of Birds) -

It is an amazing coincidence that the international bird, White Stork (Siberian Crane), the national bird, Peacock and the state bird, the Great Indian Bustard reside in Rajasthan. Besides these, cuckoo, sparrow, Indian roller, Indian crane etc are also found here.

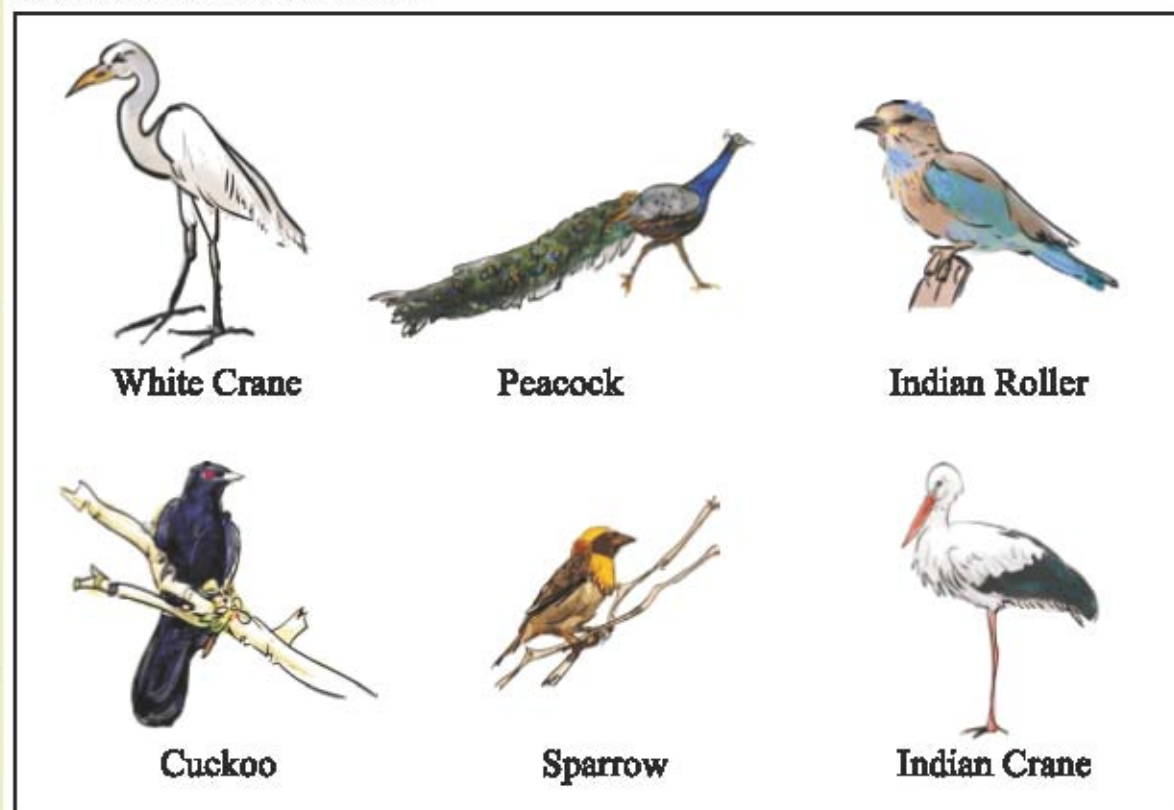


Fig 16.17 The World of Bird

Lets learn about state bird, animal, tree, flower of Rajasthan.

1. State bird - Great Indian Bustard



Fig 16.18 State bird - Great Indian Bustard

2. State animal - Chinkara and Camel

The Government of Rajasthan declared Camel as a state animal in 2014. Now along with Chinkara, Camel is also our state animal. Chinkara is a state animal in wildlife category. Camel gets a status of state animal in the category of livestock.



Fig 16.19 Camel

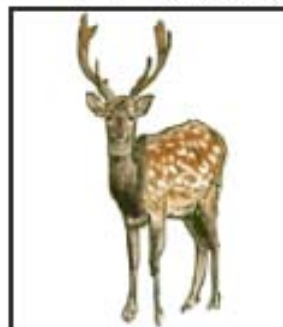


Fig 16.20 Chinkara



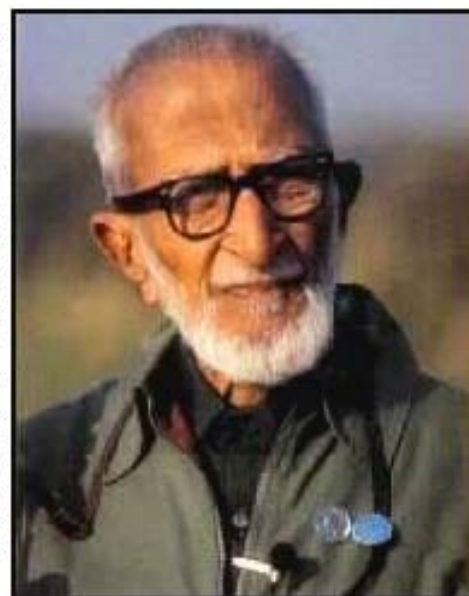
**Fig 16.21 State tree
Prosopis Cineraria
(Khejri)**



**Fig 16.22 State Flower
Tecomella undulate
(Rokida)**

Salim Ali

Salim Ali was born on 12th November, 1896 in Bombay (Now Mumbai). He was an Indian ornithologist and naturalist. Salim Ali is known as the "Birdman of India". Salim Ali was the first Indian to conduct systematic bird surveys across India and has written several books on birds that have helped popularize ornithology in India. He spent 65 years surveying birds hence was called as 'Parindo ka Chalta Phirta Vishvakosh'. Among the books written by him on birds 'The Book of Indian birds', 'Handbook of the Birds of India and Pakistan' and 'The Fall of a Sparrow' gained enormous popularity. Owing to his great contribution towards Natural Science and birds he was awarded Padma Vibhushan and many such awards by Government of India.



What have you learnt

- A large area of land covered by trees and inhabited by wild animals, is called forest.
- We get wood, drugs, gum and oxygen from forest.
- For forest conservation there should be dense plantation and proper care of plants.
- State bird is the great Indian bustard and state animal is camel and chinkara.
- State tree is Khejri (*Prosopis cineraria*) and state flower is Rohida (*Tecomella undulata*).
- Prominent national parks of Rajasthan are
 - ☐ Ranthambore National Park
 - ☐ Keoladeo National Park

□□□

Exercises

Choose the most appropriate option

1. What are the advantages of forests to us -

(a) Improves ground water level	(b) Control environmental temperature
(c) Improve fertility of land	(d) all the above ()
2. Disadvantage of deforestation is -

(a) Increase in soil erosion	(b) decrease in soil erosion
(c) Increase in number of wildlife	(d) increase in rain ()
3. State flower and tree of Rajasthan -

(a) Roheda and Khejri	(b) Jaal and Roheda
(c) Roheda and Neem	(d) Lotus and Banyan ()
4. State bird of Rajasthan is -

(a) Pigeon	(b) peacock
(c) Great Indian bustard	(d) parrot ()

Match columns 1 and 2

- | | |
|-------------------------------|------------------------------|
| (a) Ranthambore National Park | (i) Pratapgarh district |
| (b) Keoladeo National park | (ii) Sirohi district |
| (c) Sitamata Sanctuary | (iii) Bharatpur district |
| (d) Mount Abu Sanctuary | (vi) Sawai Madhopur district |

Fill in the blanks

- (i) Large area of land covered by trees, inhabited by wildlife is called.....
- (ii) Forests prevent..... erosion.
- (iii) A Forest is a habitat for.....
- (iv) For wildlife conservation, National parks and..... were established.

Short answer type questions

1. Write down the causes of deforestation.
2. Write down the disadvantages of deforestation.
3. Write down the advantages we receive from forests.
4. Write down the names of some major wild life species of Rajasthan.

Long answer type questions -

1. Write down the suggestions for forest conservation.
2. Write about Keoladeo and Ranthambore National Parks.
3. Draw a figure of a wild animal of your choice.
4. What would be the impact if forests were nonexistent? Explain in detail.

Activity

1. Find out some specific medicinal plants of local forest area by surveying and interviewing the local Ayurvedic practitioner (Vaidhya, Hakim, Guni) and document their effects and scientifically test the local traditional knowledge. By contacting Central Drug Laboratory Discover the science behind local traditional knowledge.
2. Study the impact of local pesticides or pest control methods such as neem leaves, havan of benzoin (Guggal), akada (Calotropis) etc. on mosquitoes or other insects on the basis of community dialogue and survey and compare them with modern insecticides.
3. Prepare a tabular chart to exhibit wildlife sanctuaries located in Rajasthan, their districts and the names of wild animals which fall under conservation.



Points to be studied

- 17.1 Garbage (Waste material)
- 17.2 Types of garbage
 - Biodegradable waste
 - Non-biodegradable waste
- 17.3 Methods of disposal of garbage
 - Composting
 - Vermicomposting
 - Land filling
- 17.4 Reuse and Recycle

17.1 Garbage (Waste material)

From your home to school, market, park, on way to the farm and its surroundings you must have seen various types of garbage lying around. Look at the figure 17.1 given below. From where is this garbage received? Let's learn.

Polythene bag, pebbles, disposal bottles and plant leaves, rotten food items cause garbage. Garbage is the result of natural and social activities of humans.



Fig. 17.1: Garbage (unusable things)

Activity - 1

You might have observed garbage outside the houses, schools and in market. Look at it carefully and make a list, write it down in the following table:

Table 17.1: Garbage and types of garbage

S.N.	Domestic garbage	Community garbage
1	Vegetable peels	plastic bag
2	Paper	paper bag
3	Leftover food	.....
4	.....	.....

We throw away unnecessary and useless material as a consequence of our daily routine. This useless(unnecessary) material is called Garbage.

Activity - 2

You must have noticed different types of garbage like polythene, fruits and vegetable peels, leftover food, pieces of glass, wrecked plastic and metal containers, scrap paper, dirty water, human excreta, empty drug bottles, plastic bags, syringes, gloves, bandages, expired medicines, old newspapers, damaged goods, leaves of plants, disposable cups, plates, glasses etc. Write down this kind of useless material in following table 17.2:

Table 17.2 Garbage found on various places

S.N.	Kitchen Garbage	Hospital Garbage	Garbage at public places
1			
2			
3			

On the basis of above table we can find out the garbage of different places.

17.2 Types of Garbage (Waste) materials:

You must have observed various types of garbage materials. There are some materials that can be re-used while others cannot be re-used. On this basis we can divide the waste materials into two parts:

- (1) Biodegradable waste Material
- (2) Non-biodegradable waste Material



- (1) **Biodegradable waste Materials:** The waste material which is decomposed by the bacteria. The substances such as leaves of plants, fruit and vegetable peelings, meat, waste paper, cloth, excreta, cow dung etc. decompose fast and get mixed with soil and are known as **Biodegradable waste Materials**.
- (2) **Non-biodegradable waste Materials:** The waste material which is not decomposed by micro-organisms & thus not mix with soil, pollute the surroundings such as paint, glass, pieces of metal, plastic goods etc, are called **Non-biodegradable waste materials**.



Fig. 17.2: Biodegradable waste



Fig. 17.3: Non biodegradable waste

The time of decomposition of each material is different. Some material decomposes within 10 days, some within 4-5 months and some take 500 years to decompose. Different types of plastic take millions of years to decompose.

On the basis of states different waste materials can be subdivided into solid, liquid and gas as follows:

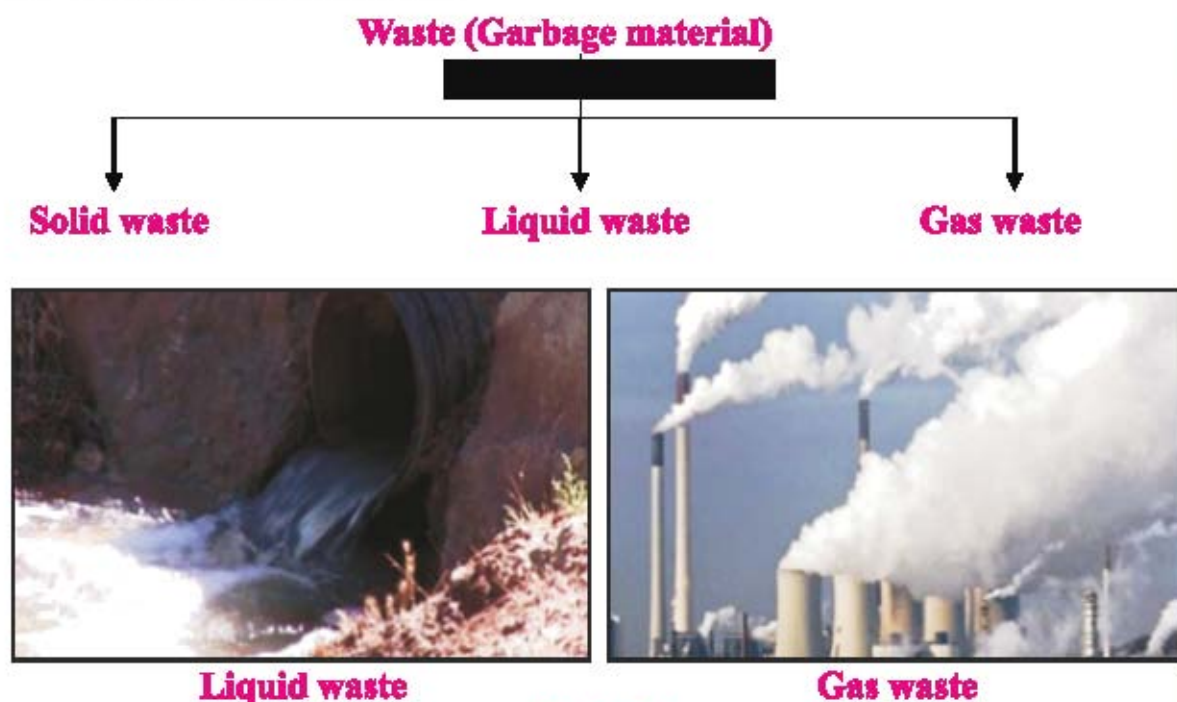


Fig. 17.4

Activity 3

Look at the open drain near your home, street, school, road side. Look at the flowing (unwanted) water and other materials in it.

You'll see the solid waste as plastic, glass pieces, fruit and vegetable peels etc, fluid (liquid) waste like as polluted water, oil, paint, sewage etc. in it. Similarly smoke from vehicles, chimney of industrial plants and factories are gaseous wastes.

who is responsible for various types of waste increasing on the earth? Definitely we are responsible for it. At present, our love and attachment towards the environment has diminished. Instead of using naturally available products we have started excessive use of man-made things which is destroying the natural beauty of the environment, as well as polluting it. We observe garbage and polythene scattered everywhere which has given rise to many grave problems. One of the reasons of untimely death of cattle is due to eating polythene bags along with garbage. Polythene traps the outlets of drains and blocks them and water tends to spread all over these places in the city. During



rainy season, due to this blockage of drains putrid materials spread over the public places causing obnoxious stink. This is harmful for our health because such a place becomes the dwelling of mosquitoes and harmful micro-organisms.

Let's know about the methods of disposal of waste and reuse.

17.3 Methods of disposal of Waste (garbage) material:

What happens when plants wither?

Where does the sewage of your home go?

What happens to the plastic waste throw away?

Dustbins are placed by Municipal council, Zila Parishad at various places.

Where is this waste carried and what is done of this waste?

The disposal of this waste (garbage) is done by various methods, some of which are as follows-

(1) Compost:

Waste is collected and **Biodegradable** and **Non-Biodegradable** waste is separated. From Biodegradable waste materials like fruits and vegetables peels, excreta-dung, plant leaves, grass, rotten material etc., manure is prepared. This type of material is put into a pit. Pits are made in a shade. Then these pits are covered by soil such that it remains moist and airy. After few months this material is decomposed by bacteria and converted into compost which can be used in fields. It is called as **Compost**. The Cow and buffalo dung used in **Gobar gas** plant gets converted into compost after some time fuel gases are derived from it.



Fig. 17.5 Gobar gas plant



Fig. 17.6 Vermicomposting

(2) Vermicomposting:

Red earthworm is specifically added to the waste. These earthworms feed on organic matter. The excreta of earthworm is high quality compost and is called vermicompost and the process is called vermicomposting.

(3) Disposal of solid waste substances:

Solid waste substances are collected in a pit outside the city or town and then covered with a layer of soil. Solid waste degrades after some time. This process is called land filling.

Activity -4

What do you do to stored useless things in your home? You may have noticed that we sell them to ragman. Go to the junk shop and observe those things. What he does with unusable things?

Ragman separates different types of things from unusable things.

He separates Iron, copper, aluminum, newspaper, cardboard, note book, book, Electric wire, plastic materials.

Where or to whom does junk dealer sell these things?

You'll see that junk dealer separates different types of unusable materials from the and sends them to related factories for recycling. Because of recycling we get these material back as different usable products. In this way the conversion of unusable things into usable things is called recycling. The disposal of solid waste occurs by this method.

17.4 Disposal of non biodegradable waste:

Pieces of plastic, glass pieces, disposable cup, iron, aluminum and copper utensils are included in non-biodegradable waste. The decomposition of these substances is very slow in nature.

Three methods- 3 R(reduce, reuse, recycle) are used to dispose these unnecessary waste materials. These are-

- (1) **Reduce** : Reducing the quantity of unusable substances, such as broken tin box, plastic bottle, broken pot etc can be utilized in domestic purposes like growing flowers and vegetables into them. By separating such material from garbage we can reduce the quantity of unusable material.
- (2) **Reuse** : Separate such things from unusable things that can be reused. Unusable products like as batteries, metal utensils, iron scrape, broken tins, glass bottles, jute contents etc can be used for other domestic purposes.



- (3) **Recycle:** Plastic and glass waste material is separated from unusable material and send to factories for recycling and usable materials are synthesized from them. During recycling coloring agents are added to these. Specifically such material is used to make bags, packing rags, containers to preserve food stuff.

Waste Management:

The process of systematical disposal of waste is called waste management.

You manage household waste keeping three separate containers. Collect biodegradable waste like leaves, fruits and vegetables, fruits and vegetable peels, waste food material etc. in a green container. Collect non-biodegradable waste material such as plastic materials, pieces of glass and ceramic pots in second blue bin and collect toxic drugs, wastage drugs, battery, cell, useless medicines, paint, oil-syringe, cosmetics in third black container. Have you managed waste like this? What benefits do you have from it? Discuss this with your family and share these benefits of waste management to other students.

You might have noticed in village / town / city /slums, that there is no provision of clean and safe toilets. People defecate in open. Sewage is scattered here and there or flows around the settlements.

Now a days, under the Swachh Bharat Abhiyan hygienic toilets are being laid down in schools, villages and public places like markets and along the side of roads.

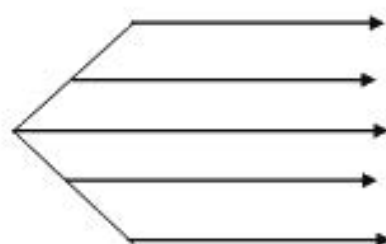
- Have you ever thought why is this being done? Why are they needed?
- What is the harm of open defecation?
- You might have seen people defecating in open near railway stations, bus stands around in slums and fields. Open defecation causes dirt and foul smell to spread which pollutes the environment with swarms of flies and mosquitoes.
- What is the impact on health of individuals who reside there? Students discuss with the teacher.

17.5 Effect of Garbage (waste) on health

If we deal with garbage disposal systematically than we can keep our home, street, neighborhood, schools and public places clean. As a result we would be safe from being infected by diseases like asthma, dengue, viral fever,

diarrhoea, malaria, jaundice, etc. "Healthy body, harbours healthy mind". By doing so, we may contribute to make India clean, healthy and beautiful country and also efficiently discharge our duty. We should try to reuse unusable materials. Always collect garbage in dustbins and stop people who throw garbage all around and persuade them to throw garbage in dustbins.

Multiple
problem
through
polythene



Environmental Pollution
Cause of death of Cattle
Danger to fertility of soil
Hurdle in drainage system
Prevention of rain water
from absorbing the soil



Fig 17.7 : Dust bin

Keep your village and city clean.



What Have You Learnt

- Humans throw unusable things during their daily routine. Such material is called garbage. i.e., the substance is called waste.
- Waste (waste) is of two types - Biodegradable and non biodegradable waste.
- Waste (garbage) can be divided into solid, liquid and gas.
- Disposal of waste can be done by various methods like composting vermicomposting, land filling, biogas.
- Due to Garbage and sewage, magnificence of the environment is being destroyed as well as the problem of pollution is being created.
- Many diseases thrive wherever there is non -systematic disposal of Garbage (waste).
- Toilets should be built under Clean India Campaign and Swachh Bharat Abhiyan.

□□□

Exercises

Choose the most appropriate option -

- Which of the following has long disposal period?
 (a) Banana peelings (b) piece of wood
 (c) Plastic bag (d) paper bag ()
- What happens when Wastes (garbage) is thrown in open
 (a) Soil pollution (b) water pollution
 (c) Air pollution (d) all above ()

Fill in the blanks -

- Biodegradable waste with the help of bacteria are in less time.
- During our daily routine we throw unusable material. These unused materials are
- Waste materials can be divided into solid and
- Unnecessary products made up of plastic do not for a longer periods.

Short answer type questions -

1. How can waste paper be made reusable?
2. Enumerate the harm caused to environment by plastic/polythene.
3. How does garbage affect our health?
4. What are benefits of collecting domestic garbage in separate bins?
5. Which types of waste materials can be disposed off by recycle method?

Long answer type questions -

1. How will you manage household waste? Explain in detail.
2. What is the difference between biodegradable and non biodegradable waste material? Explain by examples?
3. What are the methods of disposal of the non- biodegradable waste? Explain.
4. What are the methods of disposal of biodegradable waste? Explain.

Activity:

Prepare a research project on the impact of plastic bags on animal health.

Prepare a research project on the impact of plastic bags on water absorbing capacity of soil



Road Safety

Different Signs along the sides of highways:

You must have seen the different road signs beside the road when you might have travelled by car or bus. Different signs are displayed at various locations. Have you ever tried to find out the meaning of these signs? Let us know about these signs.

At the time of travelling by road, it is of utmost importance to follow these signs. Signs displayed beside the roads are of three types:

1. **Mandatory Signs:-** These signs are displayed inside a circle. These signs are mainly displayed on main roads or road junctions. Some of the important signs are :-

No Entry



No way both directions



U-turn prohibited



Heavy vehicles prohibited



Speed limit for that place



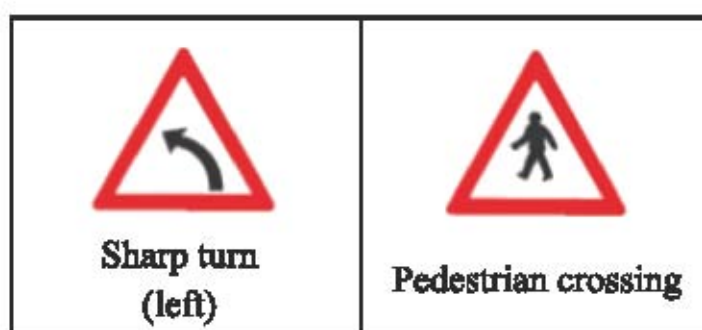
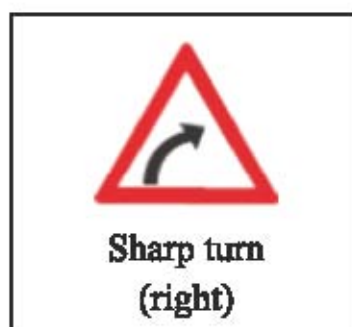
Horns Prohibited



One way



2. **Cautionary Signs:** - These signs are enclosed inside a triangle which represents further road conditions. Some of the important signs are:-



3. **Informatory Signs:** These signs are enclosed inside a square / rectangle. These represent further divisions / diversions on the road and the distance and direction of different cities / places from that information board and some signs display different facilities available on the highway. Some of the major signs are as follows:

This sign means that Jaipur is 426 kms ahead , Delhi is 673 kms ahead and Nathdwara is 50 kms ahead from that place.

Example -

Jaipur	426 Kms
Nathdwara	50 Kms
Delhi	673 Kms



Public telephone



Hospital



Service station

