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Preface

Renewal and amendment of syllabus and preparation of textbooks is a part of educational process. In this process SCERT Chhattisgarh, Raipur has amended the syllabus and prepared science textbook “Science and Technology” for class six in 2003-04. Text books for classes seven and eight were prepared in 2004-05 and 2005-06 repectively.

The objective of these books is not to load the students with scientific informations but to help them to understand the fundamental concepts of science around them. With the development of technology it is necessary to help students to acquire skills and knowledge which will help them to connect science and technology to society.

In the discussions on education, the over burdened school bag is a thought provoking matter. It is even the main point in the report of Yaspal Committee.

These books are written to obtain these objectives. By studying these books, the students would have an opportunity to understand and analyse the different new experiences in their daily life. Also they could have the opportunity to understand more clearly the principles by simple activities. They would also develop the ability to understand and analyse the environmental and health topics. This will help to develop such views in them which will motivate them in search and research.

Right to Education Act 2009 gives emphasis on imparting quality education to children.NCERT, New Delhi has developed class wise, subject wise learning outcomes and pedagogical processes for classes I to VIII which will help to achieve the objectives of all-round development of children.So, textbook for the session 2018-19 have been made contextual and significant which will provide more opportunities to achieve desired outcomes. We hope that textbooks will be helpful for students and teachers to achieve these goals.

In the development of this book, we have got the help and guidance of many teachers both from government and private institutions, professors of colleges and agriculture university, NGOs and learned citizens. We express our heartiest gratitude to all of them. Any suggestions for amendment of this book are invited to make it better and more useful for the children.

Director

State Council of Educational Research
and Training Chhattisgarh, Raipur

PRESTIGIOUS CONTRIBUTION BY INDIANS IN THE FIELD OF SCIENCE

You must have read about some eminent scientists in class 6 and 7, who have contributed to make science useful to the society, not only in India but throughout the world. In this series, this year also we are providing some short biographies of some scientists, whose contribution would always remain a debt to the scientific world.

1. VARAHMIHIR

He was born in 499 AD. He was a resident of a village named Kaphith, near Ujjain. He was so impressed by the great astrologer and mathematician Aryabhatt, that he made astrology and astronomy his aim of life. As Aryabhatt, he also believed that the Earth is round. In the field of science, he was the first to point out that there is some particular force which attract the things to the ground. Now this force of attraction is known as gravity.

He has also given important hints on environmental science, hydro, geology etc. According to him plants and termites indicate the presence of underground water. Now a days scientists are working on this. The books written by Varahmihir is a gemstone in the field of astrology.

2. BRAHMAGUPTA

He was born in 518 AD in Gujarat. He was an eminent mathematician. He was the first to give the methods for the use of 'zero' and linear equations. He was the founder of the department of statistical analysis. That is why, the great mathematician Bhasker has given him the title of 'Ganaak Chakra Chudamani'. It was Bhahmagupta who explained the differences of Maths and Algebra and also wrote a book on the use of Algebra in calculations of Astronomy.

3. T.R. SHESHADRI

Tiruvenkat Rajendra Sheshadri was born in 1900 in Kullilalai, in Tamilnadu. He is one of the pioneers of organic chemistry in India. By his experiments on plants, many chemical compounds present in them have been discovered. He was considered an expert in Chemistry of Algae. His research theories have great importance in

agriculture and medical science. He was awarded the Nobel Prize for his research work.

4. R.C. BOSE

Ramchandra Bose was born in 1901 in Hoshangabad, M.P. He was an expert in Mathematics and Statistics who discovered a new code for telecommunication. With this, code messages with least or no errors could be sent. For this he was awarded the Best Scientist in America.

5. PANCHANAN MAHESHWARI

He was born in 1904 in Jaipur, Rajasthan. He studied Botany, Specializing morphology and the anatomy of flowering plants and embryology. He classified the plants on the basis of their growth and development. He become famous as an 'Embryologist'. His books are studied in School, Colleges and Universities even today.

6. S. CHANDRASHEKHAR

Subramaniam Chandrashekhar was born in 1910 at Lahore. He received the Nobel Prize for Physics in 1983. Along with his studies on astronomy he has written two excellent books also. S. Chandrashekhar was a world famous physicist, astronomist and also a mathematician.

7. JAYANT VISHNU NARLIKAR

There are numerous stars, galaxies and heavenly bodies in this universe. How were they formed? Scientists has been researching on this for hundreds of years. Jayant Narlikar born in Kolhapur, Maharashtra in 1938 was the astronomist and physicist who worked on a new principle to answer this question. According to him matter is scattered through out the universe in form of stars, galaxies and other heavenly bodies. This principle is considered as important as Einstein's' theory of relativity. That is why he is called the Einstein of India.

CONTENTS

1 SKY VISION

The planet on which we live is called Earth. During daytime, we see the sun in the sky. Come; let us see if there is anything else other than the sun in the sky.

1.1 WHAT IS THERE IN THE SKY?

Look at the dark sky at night when there is no cloud. You will see a large number of stars. Some of which are very bright and some are less. Some are big and some are small. The interesting point is this, that these small stars are actually quite bigger than our earth and some of them are even many times bigger than the sun. Now the question is –why do these stars appear so small to us? Let us see.

ACTIVITY -1

Take two footballs of the same size. Go to the playground and place these balls at least 50—80 metres apart. Now move away to about 30 metres and look at the balls in such a way that the two balls and you are in a straight line. Now note the size of the balls. Are the size of the two balls same? When the things are far away from us, they appear smaller to us. Now you must have understood why the stars which are big in size appear so small to us.

If you observe minutely, you will see some objects other than the stars. They do not twinkle like the stars. These are the planets, which like our earth, revolve round the sun. Some times for a moment a line of bright light can be seen in the sky. Actually, they are burning meteors. In this way our earth and the other planets, the sun and the moon, meteors etc. together form the Milky Way. Let us know some more about them.

1.2 STARS AND THE STAR WORLD

The stars are the most attractive of all the objects in the sky. These are such objects, which emit light and energy continuously. Sun is the nearest star to earth. It

is because of the Sun's light, that the other stars are not visible in the sky. Most of the stars are so far away that it takes lakhs of years for their light to reach earth. Distance of stars are indicated in light years.

The distance travelled by light in a year at the speed of three lakh kilometres per second is known as one light year. Therefore, light year is a unit of distance. It equals 365 × 24 × 60 × 60 × 300000 kilometres that is 9460000000000 or 9.46 × 10^{12} kilometres.

The Sun is about 15, 00, 00,000 km (15 crores or 1.5x10^{8} km) away from the Earth. It takes about 8.3 minutes for the sunlight to reach earth so we can say that the Sun is 8.3 light minutes away. After Sun, the nearest star to the Earth is Alpha Centuari, which is about 4.3 light year away. The brightest star 'Sirius' is about 8.7 light year away. We can see countless stars in the sky. If you look carefully, you could see a band of stars from north to south. It is the Milky Way. There are many such constellations of stars or galaxies in the universe. Our Milky Way is one among the lakhs of galaxies present in the universe. Our solar system is situated in this Milky Way.

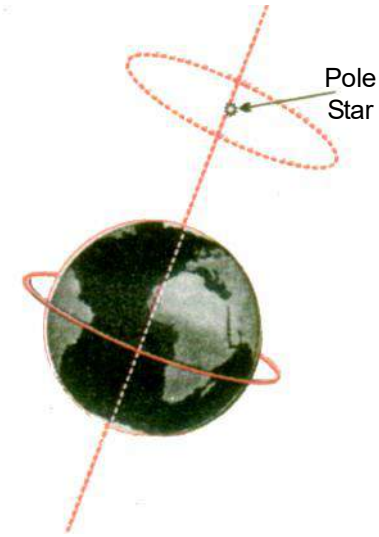


Fig 1.1 Position of Pole Star

Sun as well as all the stars are revolving with great speed around one or the other heavenly bodies. Because of the distance, we are not able to know the changes between these stars.

We know that our earth is rotating round its axis from west to east but we find the stars moving from east to west. One star, which is in the north, appears motionless. We know it by the name of Pole Star (Dhruvtara). The Pole Star has been used to know the direction for a long time. (fig 1.1)

If we observe, we can find some star groups forming some shapes. The group of stars is called constellations. All the stars of a constellation always remain together. So the shape of the constellation

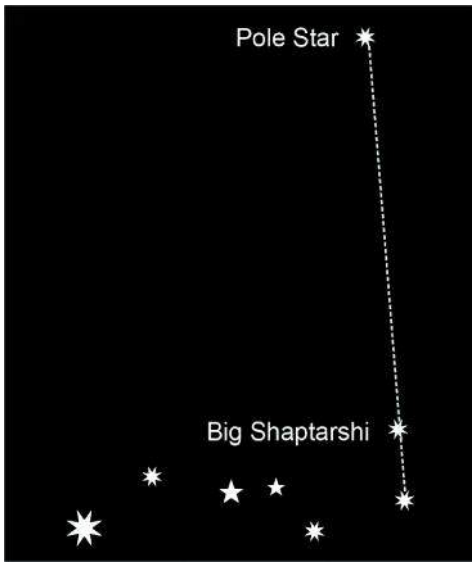


Fig 1.2 Big saptarishi

also remains the same. Our ancestors have named them according to the shapes they form, as-Big Saptarishi;Ursa Major (the great bear); Laghu Saptarishi or little bear; Ursa Minor and Orion.

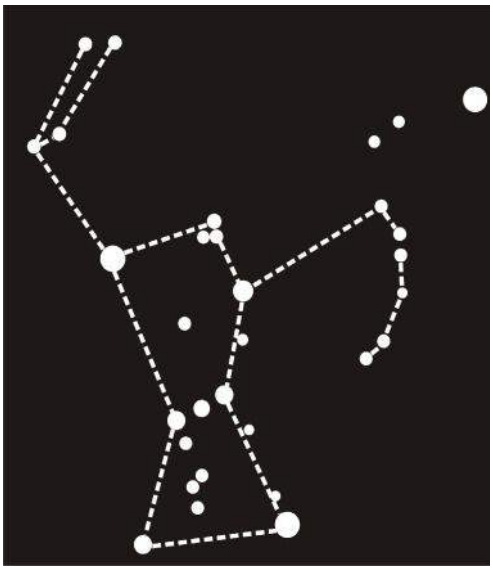


Fig 1.3 Orion/Hunter or Kalpurush

The constellation, which can be easily recognized, is the Big Saptarishi. It is also called the Big Dipper. This constellation has many stars, out of which seven brightest stars form the shape of a question mark or *saucepan.* (fig 1.2)

Out of the seven stars three are on the handle of the *saucepan* and the other four are in the *pan*. Two stars on the top of the *saucepan* are called the Indicating Stars. The line joining them, points to the Pole Star. In the Small Saptarishi all seven stars are brighter. The Pole Star is situated at the top of the handle here, therefore some times it is also called as "Dhruva Matsya".

Orion is also one of the main constellations seen in the sky, which has more bright shining stars than other constellations. The shape of this constellation is of a Hunter so it is also called the *Kal Purush.* (fig 1.3)

Try to recognize these constellations and try to find the position of the Pole Star.

NOW ANSWER THESE

1. Some stars which are bigger than the Sun, appear smaller to us .Why?
2. One star is 3.4 light years away from the Earth. What does this mean?
3. How would you find the star, which appears to be in the north?

1.3 THERE ARE ONLY EIGHT PLANETS NOT NINE

Planets are heavenly bodies that revolve round the Sun .Like a star they do not emit their own light. However, they reflect the sunlight, which falls on them and so they are as bright as a star.

Ancient astronomers already discovered Mercury, Venus, Earth, Mars, Jupiter and Saturn, as they were visible to the naked eyes. Uranus, Neptune, and Pluto were discovered after the discovery of the telescope. In this way, it was

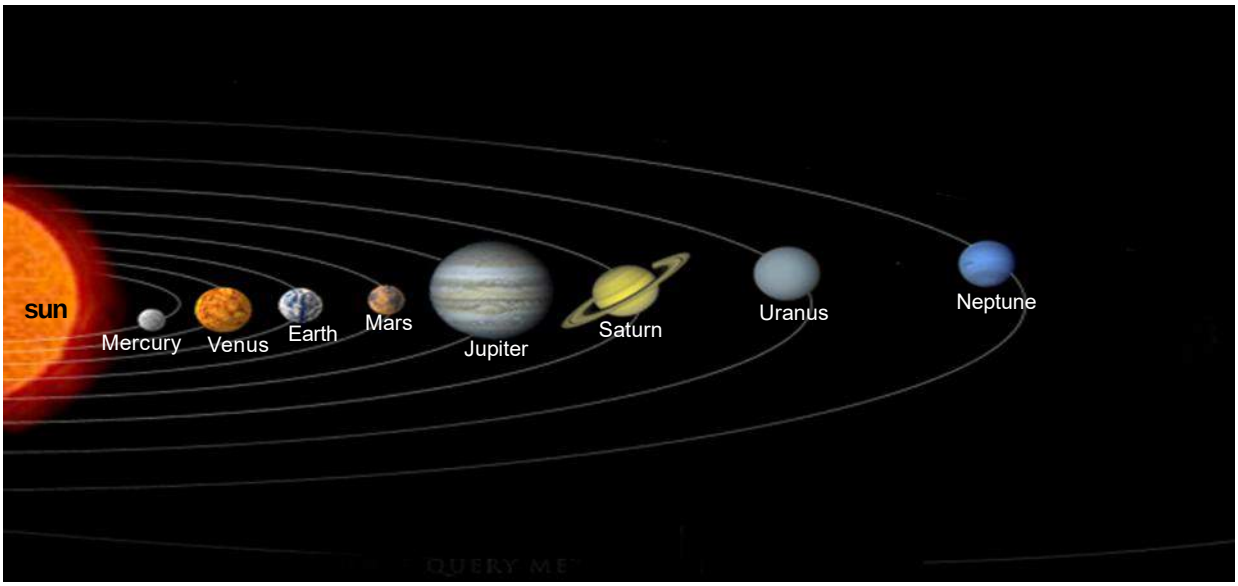


Fig 1.4 Solar System

believed that Sun has nine planets. Each planet revolved round the Sun in a fixed orbit (fig-1.4). Now after 76 years after its discovery, Pluto due to some controversies is not considered a planet. So now, there are only eight planets.

Some planets have satellites. Satellites are heavenly bodies, which move around some other heavenly body. Moon is the natural satellite of the Earth. Jupiter, Saturn are the planets which have more than one natural satellites. Come let us know more about the planets.

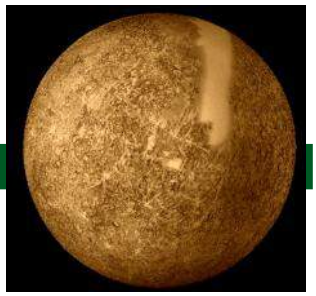


Fig 1.5 Mercury

1.3.1 MERCURY

It is the nearest planet to the Sun. Usually it cannot be seen due to the sunlight. It is the hottest planet as it is near to the Sun .Most of its properties resembles to that of the Moon, as its diametre and the mass. Like the Moon it also does not have any atmosphere and it is rocky and mountainous (fig-1.5). It does not have any known satellite.

Fig 1.6 Venus

1.3.2 VENUS

It is the second planet from the Sun in distance. It is the brightest of all the heavenly bodies seen by us. Its brightness is due to the thick clouds in its atmosphere, which reflects back about three fourths of the sunlight received by it. It can be seen as a bright star at the horizon just before sunrise and just after sunset. Even though it is not a star, due to its brightness it is called the 'Morning Star' or the 'Evening Star'. Its volume is about

4/5 of that of the Earth even when its diametre is nearly same. Venus does not have any satellite (fig. 1.6).

1.3.3 EARTH

Fig 1.7 Earth

As per the distance from the Sun the Earth is in third position(fig-1.7). No other planet is known to have life other than the Earth. The Earth revolves round the Sun in 365.26 days. It takes 24 hours to rotate round its axis. Days and nights are formed due to this rotation. Earth is inclined on its axis due to which there are changes in seasons. Earth has one natural satellite–the Moon. The Moon revolves round the Earth and along with the Earth, it revolves round the Sun also. It reflects the sunlight which falls on it, thus, we can see only that part of the Moon which faces us.

1.3.4 MARS

Fig 1.8 Mars

Mars is the next in position from the distance to Sun.It appears red in colour (fig-1.8). So it is also known as the red planet. It can be seen mostly every day through out the year from the Earth. Its radius is a little bigger than half the radius of Earth but its volume is 1/9 of the Earth's volume. There is no strong evidence of the presence of water and life on this planet. But astronomers are researching about it. Mars has two natural satellites.

1.3.5 JUPITER

Fig 1.9 Jupiter

Jupiter is the biggest of the planets (fig-1.9). Its volume is more than the total volume of all the other planets.Its distance from the Sun is more than the sum total of the distances of the earlier four planets.The amount of light and energy reaching this planet is less than the amount reaching Earth and Mars.But this planet is brighter than other planets except Venus and sometimes Mars. This is because of its dense atmosphere which reflects most of the light it receives. Jupiter has 28 known natural satellites.

Fig 1.10 Saturn

1.3.6 SATURN

This the sixth planet from the Sun. Its distance from the Sun is about twice the distance of Jupiter (fig-1.10).Its volume and nature is same as Jupiter but it is colder than Jupiter. Because of the three rings around it,it looks more beautiful than the other planets. These rings can be seen with the help of a telescope. Saturn has 30 known satellites.

1.3.7 URANUS

Fig 1.11 Uranus

This is the first planet discovered with the help of telescope(fig-1.11). Its distance from the Sun is twice the distance of the Saturn from the Sun.It has 21 known satellites.

1.3.8 NEPTUNE

Fig 1.12 Neptune

This is the eightth planet from the Sun. It has eight satellites. Because of being far away from the Sun, it is the coldest planet.

PLUTO: WHY IS IT NOT A PLANET?

Compared to the planets this object is farthest (about 39.5 times more than the distance of the earth from the Sun) and is the smallest in size. The light from the Sun reach here in 32 hours.For many years there had been discussions on Pluto being a planet.On 24th August 2006 at the meeting of the International Union of Astronomy (Czechoslovakiya)the definition of a planet was determined. And according to it, planet is that object :-

1. Which revolves round the Sun.
2. Which has that much volume that it takes a spherical shape due to gravity.
3. Which has a clear orbital.
4. There are no other heavenly bodies in the orbital.

Now the question arises,why Pluto is not a planet?

Pluto revolves round the Sun ,but being very small and having less volume, it is not perfectly round. Moving in an elliptical orbit , it cuts Neptune's orbital and enters inside it. Apart from this, all the other planets revolve round the Sun in the same plain, but Pluto makes an angle of 17°. Because of all these Pluto has been placed outside the group of planets. It is known as a psuedo planet.

NOW ANSWER THESE

Recognize the planet according to the information given:-

a) The biggest planet.

b) The planet which has life.

c) The brightest planet.

d) The red planet.

e) The first planet discovered with the telescope.

f) The planet with three rings.

g) The planet with eight satellites.

You know that there are some other heavenly bodies other than the Sun and the planets in the Solar System. Let's know about these bodies.

1.4 ASTEROIDS

These are small bodies which revolve round the Sun in an orbit between Mars and Jupiter. Asteroid is said to be that parts of matter which could not take the shape of a planet due to some reason.

1.5 COMETS (DHUMKETU)

Comets are small heavenly bodies which revolve round the Sun.We can see them only when they are very near to the Sun. Its characterstic feature is small bright head with a long tail. The tail of the comet always points away from the Sun. Usually the comet is seen after a fixed

Fig 1.13 Comet

interval of time . Hailey's Comet is one such comet which appears after 76 years. Last time it was seen in 1986 (fig- 1.13).

1.6 METEORS AND METEORITES

Sometimes during dark nights you may see bright lines of light in the sky. Some call these as 'shooting star' or 'falling star'. But they are not stars,they are meteors. Meteors are small heavenly bodies that revolve round the Sun. When these bodies enter the earth's atmosphere at very high speed ,they burn up due to friction and they appear as bright lights in the sky. Some meteors do not burn up completely in the atmosphere and some part of it falls on the earth without burning. These un-burned bodies are called meteorites.

As we know all the eight planets and satellites revolve on their own path without obstructing the others around the sun in a disciplined manner.

Do we also behave in the same manner ? Are we maintaining the peace and integrity in our society ?

Let us give a thought on how to maintain a harmonious relationship with our fellow being in the society.

NOW ANSWER THESE

1. Give short notes on:-
   a. Those heavenly bodies that could not take the shape of a planet.
   b. Those heavenly bodies which have a long shining tail.
2. Give the difference between meteors and meteorites.

WE HAVE LEARNT

- Stars are such heavenly bodies which emit light and energy of its own.
- The distance between the heavenly bodies are measured in light years.
- Constellations are the group of stars which tends to form a particular shape.
- Planets are those heavenly bodies which revolve round the Sun.

- Satellites are those heavenly bodies which revolve round any of the planets.
- Solar System is made up of Sun ,planets, its satellites, asteroids, comets, meteors and meteorites.
- The planets revolving round the Sun are Mercury, Venus,Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

QUESTIONS FOR PRACTICE

1. Fill in the blanks.

a) Group of stars forming a particular shape is called _____.

b) The heavenly body which revolve round any planet is called _____.

c) _____ is the coldest planet.

d) The _____ star seems to be fixed at the north direction.

e) The shape of the _____ constellation is like a hunter.

2. Choose the correct alternative.

1. The planet closest to the Sun is :-

   (a) Venus (b) Mercury (c) Jupiter (d) Earth

2. Asteroids are found in between these planets:-

   (a) Mars and Jupiter (b) Saturn and Jupiter

   (c) Venus and Jupiter (d) Earth and Mars

3. This planet doesnot have any natural satellite:-

   (a) Mars (b) Uranus (c) Mercury (d) Neptune

4. This is not a member of the solar system:-

   (a) asteroids (b) planets (c) satellites (d) constellations

5. This is not a constellation:-

   (a) Ursa Major (b) Ursa Minor (c) Orion (d) Hailey

3. Answer the following questions:-

1. Why do we find the Sun to be the biggest and the brightest star?
2. Why does the Pole Star appear to be stationary?
3. Draw diagrams of the positions of different stars in Ursa Major and Orion.
4. Venus is not the nearest planet to the Sun .Then why is it the brightest?
5. How will you recognise the Pole Star?
6. Write the names of the planets as per their increasing distance from the Sun.
7. Spell out differences between a planet and a star ?

TRY TO DO THESE ALSO

1. Observe the sky regularly and try to recognise these heavenly bodies.
   a. Venus (brightest)
   b. Mars (red)
   c. Jupiter (biggest and brightest)
   d. Saturn (yellow)
   e. Saptarishi and Pole Star
2. Collect interesting articles about heavenly bodies from newspapers and magazines and paste them in your scrap book.

2 SYNTHETIC FIBRES & PLASTICS

The clothes which we wear are made of fibres obtained from natural or artificial sources. Can you recall the names of some of the natural fibres?

Fibres are also used for making a large variety of house hold articles. Make a list of some common articles made from fibers. Try to classify them into those made from natural fibers and those made from synthetic fibres. Note them down in table 2.1.

Table 2.1: Natural and Synthetic fibres

S.No.	Name of article	Type of fibre (Natural /Synthetic)
1		
2		
3		
4		
5		

So, we find that some articles are made from natural fibres and some are made from synthetic fibres. Synthetic fibres are made by human beings that is why they are called synthetic or manmade fibres. Rayon, decron, terelene, darwan are synthetic fibres.

Clothes made from synthetic fibres are very durable. They do not wrinkle easily, dry quickly and do not need to be ironed.

On special occasions you might have seen people wearing clothes with 'zari work'. 'Zari' is actually thin wires of copper coated with gold or silver on it.

2.1 What are synthetic fibres?

Try to recall the uniform pattern found in a necklace of beads joined with the help of a thread (fig 2.1). Similarly a synthetic fibre is also a chain of small units joined together. Each small unit is actually a chemical substance. Many such small units combine to form a large single unit called polymer.

Fig 2.1 Bead joined to form long chain

Polymers occur in nature also e.g. cotton is a polymer called cellulose. Cellulose is made up of a large number of glucose units. Rubber, silk, wood etc are also polymers. Many household articles like plastic pipes, bottles, buckets manufactured by man in factories are all polymers.

2.2 Types of Synthetic Fibres

(a) Rayon-

You have already read that silk fibre is obtained from silk worm. Fabric obtained from silk fibre is very expensive but its beautiful texture fascinates everybody. Attempts were therefore made to make silk artificially. Towards the end of the nineteenth century, scientists were successful in obtaining a fibre having properties similar to that of silk. This fiber was called rayon or artificial silk. It is obtained by chemical treatment of wood pulp and is a man-made fibre. It is cheaper than silk and can be woven like silk fibres. Rayon is mixed with cotton to make bed sheets or mixed with wool to make carpets.

(B) Nylon-

Nylon is another man-made fibre. It was made without using any natural raw material (from plant or animal). It was the first fully synthetic fibre. Nylon fibre was strong, elastic and light. It was lustrous and easy to wash. So, it becomes very popular for making clothes. Because of its greater strength it is uses in making parachutes, ropes, socks, brushes etc. A nylon thread is actually stronger than steel wire.

(C) Polyester -

Polyester is another synthetic fibre. Fabric made from this fibre does not get wrinkled easily. Terylene is popular polyester. It can be drawn into very fine fibres that can be woven like any other yarn. PET is a very familiar form of polyester. It is used for making bottles, utensils, films, wires and many other useful products.

Polyester (poly + ester) is actually made up of the repeating units of a chemical called an ester. Polyester means the polymer of ester. Fabrics made of polyester are sold by names like polycot, polywool, tericot etc. Polycot is made by mixing polyester and cotton while polywool is a mixture of polyester and wool.

(D) Acrylic-

We wear sweaters and use shawls or blankets in the winter. Many of these are actually not made from natural wool, but are prepared from another type of

synthetic fibre called acrylic. Clothes made from acrylic are relatively cheaper and are more durable and affordable which make them more popular than natural fibre.

2.3 Characteristics of Synthetic Fibres: -

You have already performed an activity of burning natural and synthetic fibres. You must have observed that synthetic fibres melt on heating; this is actually a disadvantage of synthetic fibre. If the clothes catch fire, it can be a disaster. This fabric melts and shrinks therefore we should not wear synthetic clothes while working in the kitchen or in a laboratory.

Activity 1

Take two pieces of cloth of the same size and thickness. One of these should be made from natural fibre and the other one from a synthetic fibre. Soak the pieces in different mugs with the same amount of water. Take the pieces out of the containers after five minutes and spread them in the sun for a few minutes. Compare the volume of water remaining in each container.

- Which of the two pieces soak less water, natural or synthetic?
- Which of them takes less time to dry?
- On the basis of the above activity suggest two characteristics of synthetic fibres.

Find out from your parents about the durability, cost, strength and maintenance of synthetic fabric compared to natural fabric.

NOW ANSWER THESE

1. What are synthetic fibres?

2. Why should not we wear synthetic fabric while working in the kitchen?

3. Polymers are made up of smaller units called monomers. Explain with an example.

2.4. Plastics

Activity 2

You must be familiar with many plastic articles used every day (fig.2.2). Make a list of such item and their uses. Tabulate your list in table 2.2.

TABLE 2.2 - ARTICLES MADE OF PLASTIC AND THEIR USES.

S.No.	Name of Plastic articles	Uses
1.	Container	
2.	Comb	
3.		
4.		

Plastic is also a polymer like the synthetic fibres. All plastics do not have the same type of arrangement of units. In some it is linear, where as in others it is cross linked (fig 2.2a and b). Plastic article are available in all possible shapes and sizes this is due to the fact that plastic can be easily moulded i.e.can be shaped in any form (fig.2.3). Plastic can be recycled. By melting, rolling, colouring it can be reused.

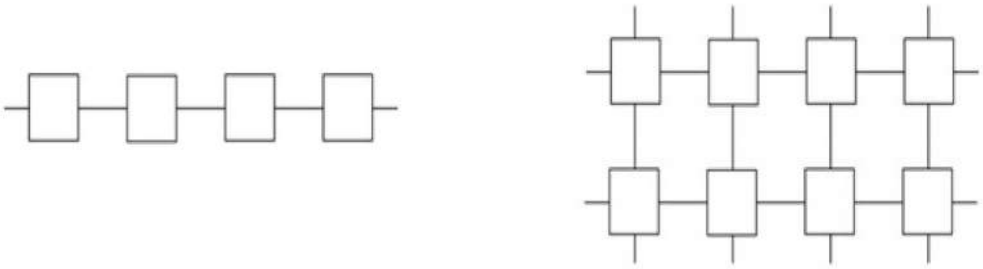


Fig 2.2 (a) Linear (b) Cross linked arrangements

Polythene (Polymer of ethene) is an example of plastic, which in commonly used for making polythene bags.

Activity 3

Collect some discarded plastic articles and perform the following activities one by one on them. Also note, your observations in table 2.3.

TABLE 2.2

S.No.	Plastic articles	On forcing	On heating
		Bends easily/ breaks / no effect	Deformed/melts/no effect
1			
2			

You will observe that some plastic articles gets deformed easily on heating and can be bent easily, such plastics are known as thermoplastics, polythene and PVC are some of the examples of thermoplastic.

On the other hand, there are some plastic which when, moulded once, cannot be softened by heating. These are called the thermosetting plastics e.g. melamine and bakelite. Bakelite is a poor conductor of heat and electricity. It is therefore used for making electrical switches, handles of various utensils etc. Melamine is a versatile material. It resists fire and can tolerate heat better than other plastics. It is used for making floor tiles, kitchenware and fabrics which resist fire.

Fig 2.3 Things made of plastics

Teflon is a special plastic on which oil and water do not stick. It is used for non- stick coating on kitchen utensils.

2.5 Characteristics of Plastics

Plastics find extensive use in our daily life. It is used in making slippers to furniture. We also use plastic containers to store food items. Just think, why is it so widely used?

Now let us discuss the characteristic properties of plastics.

(a) Plastic is non-reactive:- Plastics do not react with water and air. They are not corroded easily. That is why they are used to store various kinds of material, including many chemicals.

(b) Plastic is light, strong and durable- Articles made of plastic are light weight, strong, generally cheaper and are easy to use. They are even used in aircrafts and space ships as they are, lighter than metal.

(c) Plastics are poor conductors: - Plastics are poor conductors of heat and electricity that is why they are used in making handles of frying pans, cookers and plastic covering on electrical wires.

2.6 Plastics and the Environment: -

We make extensive use of plastic goods; polythene bags etc. in our daily life. That is one reason why plastic waste keeps getting accumulated in our homes. Ultimately plastic finds its way to the garbage bins, drains, beside the roads or in open grounds. So disposal of plastic has become a major problem.

You have read in class VI about biodegradable and non-biodegradable materials. Materials which get decomposed through natural processes such as action of bacteria are called biodegradable. Whereas materials which are not easily decomposed by natural processes are termed as non-biodegradable. Plastics take several years to decompose and hence, have become a major cause of environmental pollution. Just think, how can this problem be solved?

In some of the towns and villages the gram panchayat or local governing bodies have provided two different garbage bins to collect garbage. Usually one is blue and the other is green in colour. In the blue garbage bin the reusable substance are put as plastic, metals and glass. Those items which do not decompose are called non biodegradable substance.

Green garbage bin is to collect kitchen and other food left over or animal residue. You know that those substances which when buried in soil get completely decomposed and are known as biodegradables.

There could be some possible solutions. Avoid the use of plastics as far as possible. Make use of bags made of cotton or jute when you go for shopping. The biodegradable and non-biodegradable wastes should be collected separately and disposed off separately.

Plastic waste can be recycled. Remember the 4R principle-

Make less use of plastic	(Reduce)
Use repeatedly	(Reuse)
Melt & mould again	(Recycle)
Use again	(Recover)

Develop habits which are environment friendly.

NOW ANSWER THESE

1. Differentiate between thermoplastic and thermosetting plastics.

2. Why electrical switches are made from thermosetting plastics?

3. Plastics are a cause of environmental pollution. Explain by giving two examples.

WE HAVE LEARNT

1. Artificial fibres are synthesized by man using various chemical processes hence, are called, artificial or synthetic or man-made fibers.

2. Synthetic fibers are made up of very large units called polymer which in turn are made up of smaller units.

3. Cellulose, rubber, silk wood etc are natural polymers.
4. Rayon, nylon, polyester, acrylic etc are different types of synthetic fibers.
5. Artificial fibres melt on heating.
6. Artificial fibres soak less water and dry up faster.
7. Plastic can be recycled and reused.
8. Plastic takes several years to decompose, hence is a major cause of environ mental pollution.
9. Synthetic fibres and plastic should be wisely used without causing harm to environment.

QUESTIONS FOR PRACTICE

1. Choose the correct answer-

(i) Synthetics fibres are -

(a) Fibres obtained from plants. (b) Fibres obtained from animals.

(c) Fibres made from chemicals (d) All the above

(ii) The type of plastic used in making combs is -

(a) Thermosetting plastic (b) Thermoplastic

(c) (a) and (b) both (d) Neither (a) nor (b)

(iii) Clothes of firemen are made from -

(a) Teflon (b) Melamine

(c) Bakelite (d) Thermoplastic

(iv) Artificial silk is -

(a) Nylon (b) Polyester

(c) Rayon (d) Acrylic

(v) PET is

(a) Nylon (b) Polyester

(c) Rayon (d) Acrylic

2. Match the terms of column A correctly with the given in column B

A	B
1. Rayon	used in making parachutes and ropes
2. Nylon	fabrics do not wrinkle easily
3. Thermoplastic	made from wood pulp
4. Polyester	can't be moulded upon heating
5. Thermosetting plastic	can be moulded easily by heating

3. Name any three objects made from nylon that shows its strength.
4. Why PET containers are preferred to store food items?
5. Manufacturing of synthetic fibres has a beneficial role in conservation of forests. Explain.

TRY TO DO THIS ALSO

1. Complete the table below. Write the various kinds of clothes used in India in different seasons.

Season	Clothes used/Worn	Fibre obtained from (Plant/animal/artificial sources)
Rainy Winter Summer		

2. Take a cotton thread of about 60 cm length. Tie it to a clamp or nail on the wall so that it hangs freely. At the free end suspend a polythene bag so that weights or glass marbles can be placed in it. Add weight or marble one by one till the thread breaks down. Note the weight required to break the thread. This weight tells you about the strength of the thread. Repeat the same activity with threads of wool, polyester, silk, nylon etc. of same length and almost thickness and tabulate your findings

S.No.	Type of thread/fibre	Total weight required to break the thread
1	Cotton	
2	Wool	
3	Silk	
4	Kosa	
5	Nylon	
6		

Note-To find out the total weight, in case you use marbles first find out the weight of one marble.

3. To make plastic free environment of your house, school, village/city organize a campaign, conduct activities and make slogans to make community aware.

3 AIR

Air is present all around us. We cannot see it, but can feel it. It is necessary for living organisms. We cannot remain alive without breathing, even for a few minutes. Write in your notebook about activities which show the influence of air. Control of the temperature of the earth, falling of rain, dispersal of seeds are some activities, which cannot happen without air.Do try to make a list of such activities in your copy.

3.1 ATMOSPHERE

We have learnt that air is a mixture. Let us see what the main components of air are. Air has about 78% of nitrogen (N_2), 21% of oxygen (O_2), 0.9% of argon (Ar), 0.04 % of water vapour, 0.03 % of carbon dioxide and the rest is of sulphur dioxide and other gases and dust particles. Ozone layer is found above the earth surface at about 16 to 23 kilometre distance. Three atoms of oxygen combines to form one ozone molecule. This layer blocks the harmful ultra-violet rays. Thus the ozone layer helps in protecting us from skin cancer.

NOW ANSWER THESE

1. Air is a mixture of gases. What are they?
2. What is ozone layer? What is its importance?
3. Which are the gases, which have the maximum percentage in the air?

3.2 OXYGEN

We are all acquainted with the importance of oxygen in our life. It is a life-giving gas. Come; we will look at its preparation, properties and uses.

3.2.1 METHOD OF PREPARATION

Activity 1

Materials required- Stand, heating apparatus, thick-glassed test tube, rubber tube, trough, two test tubes, cork, cotton and potassium-per-manganate.

Take about two to three gram of potassium-per-manganate in the thick-glassed test tube. As per fig 3.1, arrange the apparatus. Now heat the test tube

and collect the gas formed, in a test tube which is filled with water and kept inverted. To prepare this fill the test tube full with water. Now close the mouth of the test tube with your finger (fig 3.1 a) and make it stand inverted in a trough filled with water (fig 3.1b). See to it that the water does not spill out when you remove your thumb. Now when the test tube is filled with gas, let the gas escape. Let the test tube remain like that. We did not do any experiment with this gas because it contained some air along with the gas. Now collect the liberated gas in the test tube and put a cork on it. This collected gas is oxygen.

$$2\,KMnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$$

Potassium-per-manganate ⟶ potassium magnate + manganese dioxide + oxygen

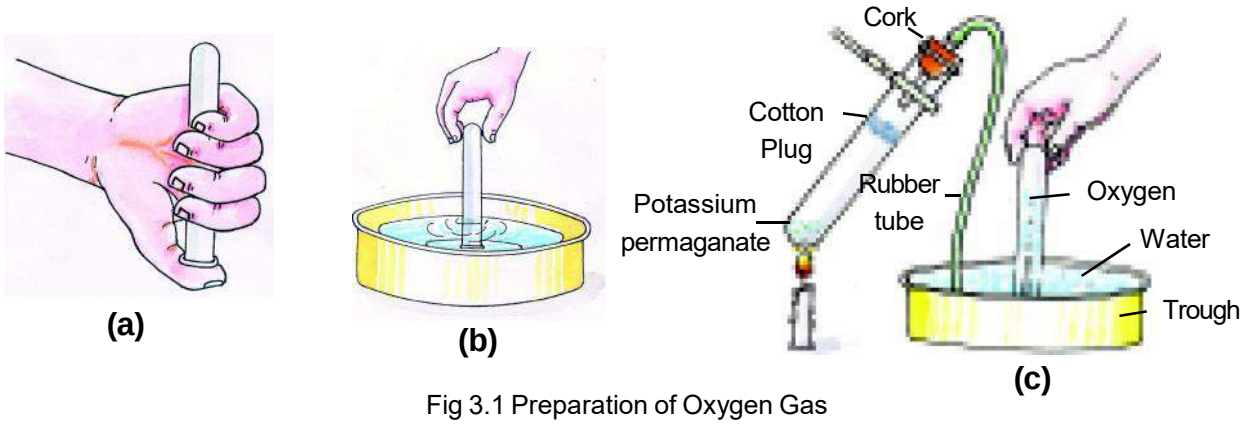


Fig 3.1 Preparation of Oxygen Gas

Precautions - While preparing oxygen from potassium-per-manganate, a plug of cotton must be put in the hard-glass test tube and the test tube should be continuously shaken otherwise potassium permanganate may spring up into the test tube in which oxygen is being collected.

3.2.2 PHYSICAL PROPERTIES OF OXYGEN

Draw the table 3.1 in your copy and write the observations about the following properties of the oxygen gas collected in the activity 1.

TABLE 3.1 PROPERTIES OF OXYGEN

S.N	Properties	Observations
1.	Physical state	.....
2.	Colour	.....
3.	Odour	.....
4.	Weight as compared to water	.....
5.	Solubility in water	less soluble

3.2.3 CHEMICAL PROPERTIES OF OXYGEN

Activity -2

Materials required - Test tube filled with oxygen, incense sticks, matchbox.

Take a test tube filled with oxygen. Light an incense stick with the matchstick. Take this incense stick near the mouth of the test tube filled with oxygen. (fig.3.2) and write the answers to the following questions in your copy.

1. Does oxygen burn by itself?
2. Does it help the incense stick to burn?

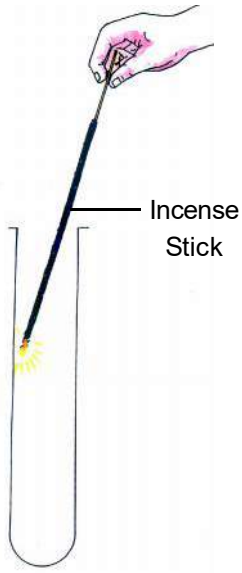


Fig 3.2 On bringing a lighted incense stick near oxygen gas

You see that when you bring the lighted incense stick near the test tube filled with oxygen, it starts burning vigorously. Therefore, we can say that oxygen does not burn itself but helps in burning.

Oxygen combines with metals and nonmetals to form oxides. You know that when magnesium wire is lighted in air, it burns with a bright light and gives a residue of white powder. This white powder is the oxide of magnesium.

$$2\,Mg + O_2 \longrightarrow 2MgO$$

Magnesium + Oxygen $\longrightarrow$ Magnesium oxide

Activity 3

Materials required- A piece of coal, small spoon, heating apparatus and test tube filled with oxygen, limewater.

Heat a piece of coal in a small spoon until red-hot. Take this near a test tube filled with oxygen. What coloured flame do you observe?

Pour some limewater into the test tube. Does the limewater turn milky?

$$C + O_2 \longrightarrow CO_2$$

Carbon + Oxygen $\longrightarrow$ Carbon dioxide

Do the same activity with melted sulphur. When sulphur burns, the following reaction occur.

$S + O_2 \longrightarrow SO_2$

Sulphur + Oxygen ⟶ Sulphur dioxide

3.2.4 USES OF OXYGEN

1. Respiration – The main use of oxygen is for respiration of plants and animals. Mountaineers, astronauts, scuba-divers carry these with them in suitable cylinders. In hospitals, asthma and heart patients and newborn babies having breathing difficulty are given oxygen masks.

2. Welding- Mixture of oxygen and some other gases are burned to get a flame used to join metal objects.

NOW ANSWER THESE

1. Explain the reaction, which takes place when potassium per magnate is heated?
2. What happens when red-hot coal is brought near a test tube filled with oxygen?
3. What are the uses of oxygen in our daily life?

3.3 USES OF NITROGEN

Have you ever thought, what would happen if there were only oxygen gas in the atmosphere? Would there be life? Presence of nitrogen in the atmosphere decreases the action of oxygen. Along with this, nitrogen is quite useful to us. Some of the uses of nitrogen are as follows:-

1. It is necessary for the growth of plants and animals.
2. A large amount of nitrogen reacts with hydrogen to form ammonia. Ammonia is used to make many fertilizers as urea.
3. Because of its inert nature, it is used in filling electric lamps to prevent oxidation of filament.
4. It is also used to keep stored food items fresh. Seal packed snacks as potato chips packets of uncooked and fried foods are filled with this gas. It does not allow the oxygen present in the air to come in contact.
5. Liquid Nitrogen is used as cooling agent in industry. Used for storing blood & organs for transplantation.

3.4 AIR POLLUTION

Air pollution means the presence of suspended particles and unwanted gases in such an amount that, their presence is harmful to man and other living

organisms. Lets us see how our day-to-day activities can affect the air in our environment. Come, we will try to understand this.

Activity -4

Materials required- White paper, oil or vaseline.

Apply oil or vaseline on one side of the paper. Now leave this paper in open air. Take care that the oil or vaseline applied side is facing upwards (fig 3.3). After ten minute, compare this paper with a plane paper. Do you find any difference? Now you must have come to know, how polluted your neighbourhood is. Different students at different places can do the same activity, write your findings in table 3.2, and then compare your notes. You can also choose places other than what is given in table 3.2. In this way, you can know which place of your village or town is the most polluted.

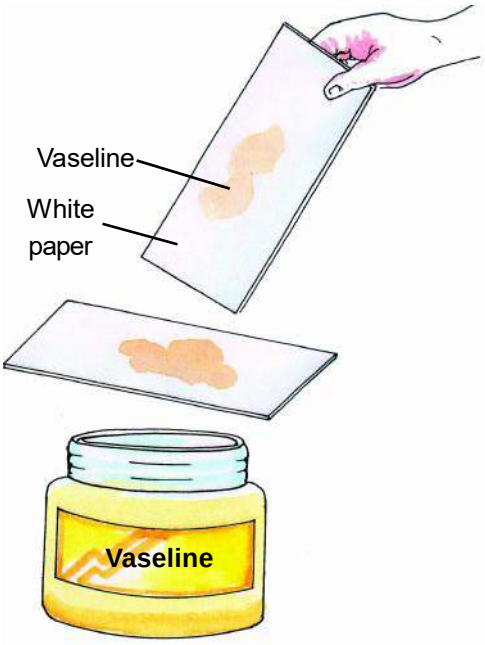


Fig 3.3 Testing of air pollution

TABLE 3.2

S.N.	PLACE/LOCATION	OBSERVATIONS
1.	Near fireplace	.....
2.	At crossroads	.....
3.	Near factories	.....
4.	Near the window of your house	.....

For getting information of pollution, there is another method also. For this, collect leaves from trees of different places as garden, road, school, industrial places, etc. Look at these leaves, see the dust on them and try to find the thickness of the dust on them. If you find any difference, try to find the cause.

Pollutants can be of any variety, they can be solids or gases. Solid particles are also called suspended particles. These particles are not only harmful to human health,

but also make the environment misty or dim. Some main causes of pollution are as follows-

1 . **Vehicles-** Use of vehicles has increased day by day. Cars, buses, trucks, auto-rickshaws run on petrol or diesel, which are fuels obtained from biological reactions. Because of the burning of these fuels or mostly due to the incomplete combustion of these fuels, large amount of carbon-monooxide, oxides of nitrogen, lead are liberated into the atmosphere. These gases seriously injure human health, vegetation and other objects. Along with the increased number of vehicles in the cities, other causes, such as the engine of the vehicle, the technology used in the vehicle being new or old are also conclusive to the increase or decrease of air pollution.

2. **Industrialization-** The polluted solid particles coming out of the steel industry, cement factory, fertilizer industry have harmful effects not only on human health but also on living beings, vegetation and buildings. With the increase of population and expanding industries, the need for more energy has increased. For this many big projects have been started. The increased use of coal in these energy stations has increased air pollution. Along with this, large amount of ash is also thrown out of these stations, which covers a large area of the ground. Discuss other factors of air pollution in your class and note them in your copy.

3.4.1 MEASURES TO CONTROL AIR POLLUTION

For decreasing the air pollution, we must adopt pollution-controlling methods as-

1. Change the methods of manufacture such that less quantity of polluting materials is liberated.
2. For energy production, less polluting methods as solar energy and wind energy must be used more.
3. Check the vehicles for air pollution measures.
4. Burning of dry leaves, twigs of trees, paper, and waste products must not be done in the open but disposed of in a safe manner.
5. Plant more trees, they are the lungs of nature.
6. Increase the height of the chimneys of the factories so that polluting gases may not accumulate at lower levels.
7. Adopt habits, which encourage in controlling pollution.
8. Avoid smoking and encourage habits to avoid smoking.
9. Avoid or at least decrease the use of scents, air-fresheners, cosmetic sprays and such sprays.
10 . Use petrol and diesel according to your need.

3.5 SMOG

Natural sources of air pollution are volcanic eruptions, forest fires etc. On the other hand smoke from the factories; thermal power stations; automobile exhausts and burning wood are the sources of pollutants produced due to human activities. Growing number of vehicles are continuously increasing the amount of pollutants like carbon-monoxide, carbon-dioxide, nitrogen oxide and smoke in the atmosphere.

During winters the oxides of nitrogen present in smoke mix with other air pollutants and fog to form a thick layer which is known as smog, which can cause respiratory diseases such as asthma, cough etc.

3.6 GREENHOUSE EFFECT

Usually earth absorbs the sunrays falling on it and acquires the needed heat energy. Out of this most of the light is reflected back. In this reflected rays, some infrared rays are also there. Some gases of the atmosphere absorb this infrared rays and stop them from going out of earth. Due to which the Earth surface remains hot.Carbon dioxide, carbon monooxide, methane, chloro-floro carbon, ozone are some gases which absorb infrared rays. These are known as green house gases. Stopping the infrared rays by these gases is what we call green house effect (fig.3.4). If these had not been there our earth would had been much colder as compared and may be, there would had been no life here also.

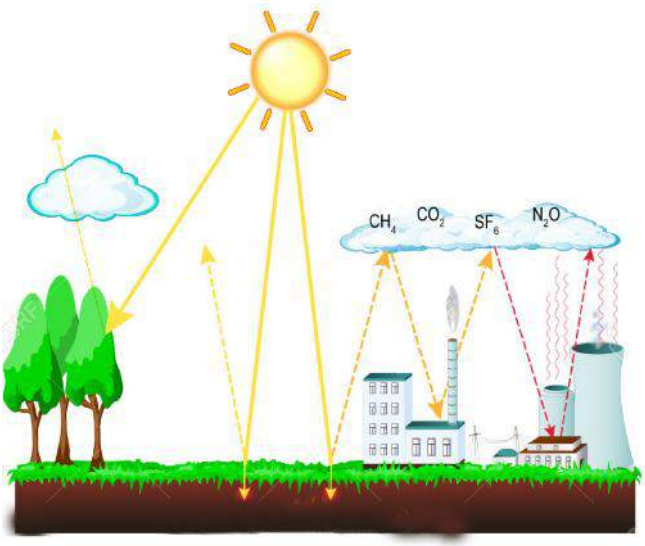


Fig.3.4 Greenhouse effect

Now can you say what the effect would be on temperature of earth if the amount of greenhouse gases were increased due to pollution.

Greenhouse

In colder regions, plants are kept in glasshouses to keep them alive. Through the glass walls, sunlight reaches the plants, but this glass walls stops the reflected infrared rays to go out, due to which the temperature inside remains high and the required heat for the plants to live is attained. Such room made of glass for the plants is called the greenhouse (fig.3.5).


Fig.3.5 Greenhouse

3.7 ACID RAIN

In the atmosphere due to different causes sulphur and nitrogen oxides are formed. In addition, when it rains these oxides mixes with the rainwater and makes it more acidic. This is called acid rain. Nitric acid and sulphuric acid are mainly present in it.

$$SO_2 + H_2O \longrightarrow H_2SO_3$$
(Sulphurous acid)

$$2SO_2 + 2H_2O + O_2 \longrightarrow 2H_2SO_4$$
(Sulphuric acid)

$$2NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$$
(Nitric acid) (Nitrous acid)

Effects of acid rain -

• Due to acid rain, plant leaves turn yellow and fall off.

• Acid rain harms soil, water resources, forests, and human health.

• Acid rain pollutes water sources in such a way that many species of fishes are now becoming extinct. It is also harmful for human health.

• Acid rain corrodes buildings, statues specially made of stone or marble. For example, Taj mahal at Agra is being corroded.

NOW ANSWER THESE

1. What are the main gases that pollute the air?
2. What difference do you notice on the layers of deposits on the leaves of a neem tree on the roadside and one planted away? What is the effect of these on the biological processes of the plant?
3. Name the gases responsible for greenhouse effect?
4. Which are the gases mostly present in acid rain? How do they affect our lives?

3.8 ATMOSPHERIC PRESSURE

You have seen the cycle tube when filled with air swells up. Why does it happen? Come let us do an activity to understand this.

Activity -5

Materials required- Cycle pump, cycle tube, balloons.

First with the help of the cycle pump, fill air in the cycle tube and the balloon. You will find that both tube and the balloon have swelled up. Why is it so? The small particles present in the air collide with the walls of the balloon and the tube asserts pressure on it. Due to the pressure on the inner walls, they swell up. In this way, more air enters and they also apply pressure.

In the same way, the pressure applied by the atmosphere around us is called atmospheric pressure. When we move high above, the density of the air changes and due to it the atmospheric pressure also changes. As we go up in the air, the density decreases and so does the atmospheric pressure.

3.8.1 SOME EFFECTS OF ATMOSPHERIC PRESSURE

Atmospheric pressure has much effect on our body. Have you ever wondered when the atmospheric pressure is high, why we have not shrunk due to the atmospheric pressure? We and all living organisms are made of cells, which have such fluids in them, which exerts pressure from inside. The pressure exerted by the cells equals the atmospheric pressure. Now you must have understood why we have not shrunk.

What would happen if the pressure exerted from inside the cell were greater than the atmospheric pressure? Come let us perform an activity to understand this.

Activity -6

Materials required- An empty bottle of glucose, cork, two curved glass tubes, balloon.

First make holes in the corks and insert the glass tubes as shown in the figure. Place a balloon on the lower end of one tube (fig 3.6a). Now tighten the cork to the bottle and through the second tube suck out the air from the bottle. On doing this see how it effects the balloon inside (fig3.6 b), you will find that the balloon slowly swells up. Sometimes it swells too much and bursts. This is because of the decreasing pressure inside the bottle. In the same way, when we go to a high altitude, the atmospheric pressure decreases, due to which our blood vessels swell up or sometimes burst.

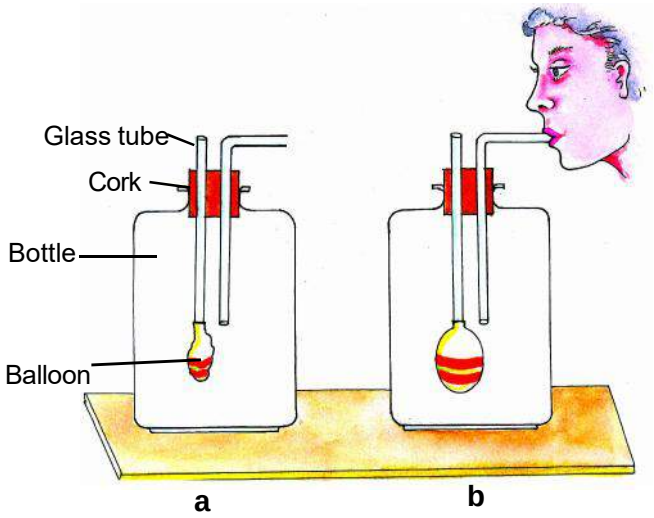


Fig 3.6 a, b

When the atmospheric pressure of an area of the earth falls down suddenly then there may be storms and strong winds. Sometimes low atmospheric pressure can cause rains also.

3.8.2 MEASUREMENT OF ATMOSPHERIC PRESSURE

To measure atmospheric pressure, Torricelli in 1643 made an instrument, which is called barometer. This is of two types. 1. Mercuric Barometer, 2. Aneroid Barometer. Generally, the measure of atmospheric pressure is equal to 1.013×10^5 Pascal or Newton/ Metre^2 or 76 cm of a column of mercury.

3.9 Do liquids exert equal pressure at same depth?

Activity -7

Materials required - An empty plastic bottle or a cylindrical container, water.

Make small holes at an equal height from the bottom of the bottle or container as shown in fig. 3.7 with the help of a nail. Now fill the bottle with water. Does the stream of water coming out from each of the holes fall at the same distance from the bottle? This activity shows that liquid exerts equal pressure on the walls of container at equal heights or depths.

Fig. 3.7 Liquid exerts equal pressure on the walls at equal depths.

NOW ANSWER THESE

1. What do you understand by atmospheric pressure?
2. What will happen to the human body if the air pressure of an area suddenly decreases ?

WE HAVE LEARNT

- Air is all around us.
- Mainly 78 %of nitrogen (N_2), 21 % of oxygen (O_2), 0.9 % of argon (Ar), 0.04% of water vapour, 0.03 % of carbon dioxide and sulphur dioxide and dust particles are present in air.
- Ozone layer absorbs the harmful ultraviolet rays.
- Oxygen is heavier than air and lighter than water.

- Oxygen does not burn itself but helps in burning.
- Metals and nonmetals burn to form oxides.
- Nitrogen is used in the synthesis of ammonia, which is necessary for the production of fertilizers.
- The causes of air pollution are some human activities, burning of fossil fuels and factories.
- Air pollution is due to the presence of carbon monooxide, sulphur dioxide and oxides of nitrogen and suspended particles. The gases responsible for greenhouse effect are carbon monooxide, carbon dioxide, methane, ozone and oxide of chloro-floro carbon.
- There is nitric acid and sulphuric acid in acid rain.
- The pressure exerted by the air around us is called atmospheric pressure.
- Air pressure is measured by Mercuric or Aneroid barometer.
- Barometer was invented by Torricelli.
- Usually the atmospheric pressure equals 1.013×10^5 Pascals or Newton/metre^2 or 76 cm of mercury column.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative-

1. Which gas has the highest percentage in air?
   a) Oxygen b) Nitrogen c) Helium d) Carbon dioxide
2. Nitrogen is used in the storage of food items because-
   a) it provides oxygen to the food items
   b) it provides carbon-dioxide to the food items
   c) it provides protein to the food items
   d) it keeps the food fresh.
3. Unit measure of atmospheric pressure is equal to the column of mercury pressure of -
   a) 76 cm b) 76 mm c) 1.013 mm d) 10.13 mm
4. Oxygen gas as compared to water is -
   a) heavier b) lighter c) equal d) none of these
5. The cause of heating up of our atmosphere is-
   a) Ozone layer b) greenhouse effect
   c) nitrogen d) oxygen

2. Fill in the blanks

1. .....gas helps in burning.
2. Of a nitrogen rich fertilizer .....is the main source.
3. The atmospheric pressure .....on going upwards from the earth surface.
4. Acid rain is due to .....and .....gases.
5. Oxygen is .....in water.

3. Find the correct sentences from these and rewrite the wrong sentences correctly.

1. The percentage of oxygen in air is 10 percent.
2. On heating potassium permanganate we get nitrogen gas.
3. Sulphur dioxide when mixed with air, pollutes it.
4. The air pressure in the balloon is due to the air filled in it, striking the walls of the balloon.
5. Because of the inertness of nitrogen gas, it is filled in the electric bulbs.

4. Match the following.

Green house effect	Respiration
Oxygen	Keeping food items fresh.
Nitrogen	Nitric acid and Sulphuric acid
Acid rain	Carbon dioxide

5. Answer the following questions.

1. What are the components of air?
2. Explain with a well-labelled diagram the preparation of oxygen.
3. What are the causes of air pollution? What measures would you adopt to stop it?
4. What are the main uses of nitrogen gas?
5. What is acid rain? How is it harmful for us?

TRY TO DO THIS ALSO

1. Find out how many planets in the solar system has atmosphere in it.
2. Collect articles about green house effect from newspapers and magazines.
3. Will you propagate celebrating 'no crackers Diwali? Give reason to support your answer.
4. Name the following :
   a. It is used as rocket fuel .
   b. An ecofriendly gas that does not omit pollution .
   c. The gas responsible for green house effect .
   d. The gas that forms protective shield around earth.
   e. Nitric acid & sulphuric acid with rain water.

4 CHEMICAL REACTIONS WHEN AND WHAT TYPE

4.1

We see many changes all around us, as melting of ice, rusting of iron, wearing of the cycle tube, spoiling of the food, breaking of the clay pitcher etc. You can add some more examples to this list. Let us find out about these changes.

Activity -1 (Demonstration by the teacher)

Materials required: Two beakers, concentrated sulphuric acid, quicklime, water and glass rod.

Take about 50mL of water in a beaker and 1-2 mL of concentrated sulphuric acid. Carefully stir with the help of the glass rod. Touch and feel the beaker. Is the prepared solution hot?

Now in another beaker take quicklime and add water. You will find that a sizzling sound is produced. Touch and feel this beaker. Does this also feel hot?

You will find that in both the cases due to the liberation of heat the beaker gets heated. So in this case, can we say that both the changes are same. To understand this better, let us do another activity.

Activity 2

Materials required: Test tube, test tube holder, red and blue litmus paper, heating apparatus, soda water and baking soda

Open the soda water bottle. What changes do you find? Place red and blue litmus paper, one by one near the gas coming out of the bottle. Also, put both of the litmus paper inside the solution of soda water and note the changes in the colour of litmus paper.

Take the baking soda in a spoon and test it with wet litmus paper (blue and red) for its acidic/basic nature.

Now heat baking soda in a boiling test tube. Bring the blue and red litmus paper near the gas liberated, and note the changes in the colour of litmus. Draw table no. 4.1 in your copy and note the nature acidic/basic according to the colour change in the litmus paper.

Table 4.1

S.No.	Substance/Compound	Test with litmus paper	Acidic/basic nature
1.	soda water	(a) Liberated gas	.....
		(b) In soda water	.....
2.	Baking soda	(a) In baking soda	.....
		(b) Liberated gas	.....

What differences did you see in both the cases? Can you say in which case a new substance was formed?

If you carefully note the results of the experiment -1, you will find that when we add sulphuric acid to water, it produces heat due to which the beaker gets hot. This is a physical change. However, when quicklime was added to water the heat produced was due to a chemical change. In both the cases heat was produced and on this basis we cannot define the type of change occurred.

Therefore, it is not necessary that the changes, which seems to be of the same type. To identify a chemical change we have to observe if any new compound is formed or not after the process.

In activity-2 the gas coming out from soda water, and the baking soda, both are of acidic nature. Whereas baking soda, which has an alkaline nature, and which when heated, liberates a gas of acidic nature. Based on the formation of the new substance and recognizing it we can say that a chemical reaction has taken place.

On opening the soda bottle, the carbon dioxide dissolved in it is liberated. Here no chemical reaction takes place. However, when we heat the baking soda the following reaction takes place.

$$2\,NaHCO_3 \xrightarrow{\text{On heating}} Na_2CO_3 + H_2O + CO_2$$

Sodium hydrogen carbonate → Sodium carbonate + Water + Carbon dioxide

In this reaction, on heating baking soda (sodium hydrogen carbonate) we get sodium carbonate, water and carbon dioxide, which is very different from initially

taken substance. Did you notice the water drops formed in the experiment? Such a process where a new compound is formed is called chemical reaction. The compounds, which take part in a reaction, are called reactants and the compounds formed in the reaction are called products. In this way in any chemical reaction, reactants are changed into products.

4.2 PROPERTIES OF A CHEMICAL REACTION

Come let us know about the properties of chemical reaction.

Activity 3

Materials required: Test tubes, calcium carbonate, dilute hydrochloric acid.

Take some Calcium carbonate in a test tube and add dilute hydrochloric acid in it. What changes take place on adding acid? Which gas is liberated during this reaction?

Here we find that calcium carbonate is an insoluble solid, which reacts with hydrochloric acid to give out carbon dioxide gas and calcium chloride. Calcium chloride is, formed which is soluble in water.

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

Calcium carbonate + Hydrochloric acid ⟶ Calcium chloride + Carbon dioxide + water

Liberation of gas and changes in the state of reactants are properties of a reaction.

We have seen that there was a reaction when two compounds combined with each other. Can you give some other such examples? Rusting, food spoiling etc are some examples of such reaction.

Activity 4

Materials required: Sugar, heating apparatus, test tube holder, boiling test tube.

Take a boiling test tube. Take some sugar in it and heat it. (fig 4.1). Observe the changes on heating. On heating at first sugar melts, then on further heating it turns black and we can see water droplets on the inside walls of the test tube.

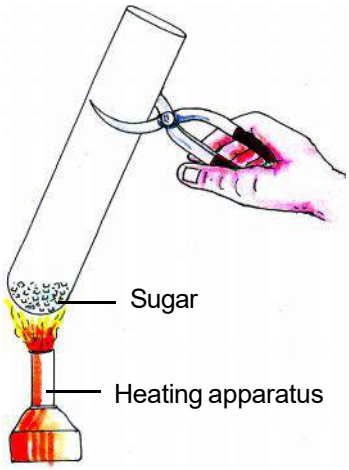


Fig 4.1 Charring of Sugar

This is called charring of sugar. Is the compound taken for the experiment same as that which is produced after the experiment?

Here we find that the production of the new compound is due to the heating. Therefore, we can say that chemical reaction happens when something is burned. Such reactions absorb heat. These reactions are called Endothermic reactions.

In the activity 1, you have seen that on adding water to quicklime heat was produced. Therefore, in some reactions heat is evolved. These reactions are called Exothermic reactions.

Activity 5

Materials required: Test tube, milk, lemon juice, heating apparatus.

Fill half the test tube with milk. Heat this and add some drops of lemon juice. Observe the changes happening due to the chemical changes.

Here you get some white residue. Formation of a residue is also a property of chemical reaction.

Activity 6 (Demostration by the teacher)

Materials required : Test tube, copper turnings, concentrated nitric acid.

Take about 1 g of copper turnings in a test tube and add 2-3 drops of concentrated nitric acid in it. You will find that a brown coloured gas is liberated during the chemical reaction. Changes in the colour of the reactants are also a property of a chemical reaction.

In this way, we have seen that a chemical reaction can be recognized by liberation of gas, colour change, residue formation, heat changes and changes in states of matter. Some reactions show more than one property.

NOW ANSWER THESE

1) What do you understand by chemical reaction?

2) Burning of candle is a chemical reaction. Give the properties connected with this.

3) What are reactants and products? Explain with examples.

4.3 TYPES OF CHEMICAL REACTION

After finding out the properties of the chemical reaction; come, we will see the different types of chemical reactions.

1. Combination reaction

Activity 7

Materials required:- Magnesium piece, forceps, heating apparatus.

Heat the magnesium piece, holding it with a forceps. During of burning, heat and light is produced and a white product is formed. What is this white product? On this basis, can you say that there is a chemical reaction going on between magnesium and oxygen?

In this reaction, magnesium and oxygen combine with each other to form a new white coloured product, which is magnesium oxide.

$$2Mg + O_2 \longrightarrow 2MgO$$

Magnesium + Oxygen Magnesium Oxide

Such chemical reaction in which two chemical substances combine to form a new substances is called a combination reaction.

You have read that iron and sulphur combine to form iron suphide. This is also an example of combination reaction. Ammonia (NH_3) combining with hydrochloric acid (HCl) is also an example of combination reaction.

$$NH_3 + HCl \longrightarrow NH_4Cl$$

Ammonia + Hydrochloric acid Ammonium Chloride

It is by successive combination reaction that many chemical substances are manufactured in large scale. As in the manufacture of suphuric acid, three successive combination reactions takes place. First of all sulphur is burned, in which it reacts with oxygen to form sulphur dioxide (SO_2).

$$S + O_2 \longrightarrow SO_2$$

Sulphur + Oxygen Sulphur dioxide

Sulphur dioxide combines with oxygen in special conditions to form sulphur tri oxide (SO_3).

$$2SO_2 + O_2 \longrightarrow 2SO_3$$

Sulphur dioxide + Oxygen ⟶ Sulphur trioxide

Sulphur tri oxide combines with water to form sulphuric acid.

$$SO_3 + H_2O \longrightarrow H_2SO_4$$

Sulphur trioxide + Water ⟶ Sulphuric acid

2. Decomposition reaction

In activity 2, we have seen that by the decomposition of baking soda, sodium carbonate, water and carbon dioxide is formed. In such reactions where one reactant breaks into two or more components or products are called decomposition reactions. When the decomposition is due to heat then it is called thermal decomposition.

$$2H_2O \xrightarrow{\text{Electric arc}} 2H_2 + O_2$$

Water ⟶ Hydrogen + Oxygen

The breaking of lime stone (calcium carbonate) into lime and carbon dioxide is also an example of decomposition reaction.

$$CaCO_3 \xrightarrow{\text{Heat}} CaO + CO_2$$

Calcium carbonate ⟶ Calcium oxide(lime) + Carbon dioxide

3. Displacement reaction

Activity 8

Materials required- Test tube, matches, zinc, dilute hydrochloric acid

Put some zinc pieces in the test tube. Now add the dilute hydrochloric acid into it. Is any gas liberated? Which gas is this? Bring a burning matchstick or candle near the mouth of the test tube (fig 4.2) Do you hear any type of sound?

In this reaction, zinc has displaced the hydrogen in the hydrochloric acid. Due to which zinc

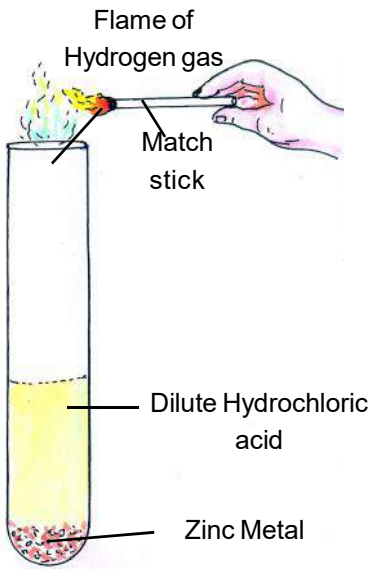


Fig 4.2 Displacement

chloride and hydrogen gas is formed. These reactions are called displacement reations.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$$

Zinc + Hydrochloric acid Zinc chloride + Hydrogen

4. Precipitation reaction

In activity 2, we have seen that in the decomposition of baking soda, the gas released when passed through limewater turns it milky. In this reaction, limewater, which is known as calcium hydroxide ($Ca(OH)_2$ in chemical terms, reacts with carbon dioxide to form calcium carbonate ($CaCO_3$) which is insoluble in water. Such chemical reactions where the products are insoluble are called precipitation reactions. The insoluble solids are called precipitates.

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

Calcium hydroxide + Carbon dioxide Calcium carbonate + Water

How to prepare limewater

***Materials.required**: Two glass bottles, funnel, filter paper, quicklime.*

Fill about two-third of a bottle with water. Add two teaspoons of quicklime in it and keep aside. Next day filter this into the other bottle. In this way, you can get transparent lime water.

NOW ANSWER THESE

1. Explain the following reactions with two examples each.
    1. Combination
    2. Decomposition
    3. Displacement
    4. Precipitation
2. If you prepare lime water and leave it open. What changes will taken place in this solution next day and why?

5. Neutralization reaction

Activity 9

Materials required: Test tube, sodium hydroxide, hydrochloric acid, phenolphthalein, dropper, blue and red litmus paper.

Take about twenty drops of sodium hydroxide in a test tube and add one or two drops of phenolphthalein in it. What is the colour change in the solution? By the change in the colour you can know whether the solution is acidic or alkaline.

Now in this alkaline solution add few drops of hydrochloric acid, drop by drop with a dropper. A time will come when the pink colour of the solution completely vanishes or fades away. Now dip the blue and red litmus paper one by one in it. Such reaction between an acid and an alkali producing a salt and water is known as neutralization reaction.

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

Alkali + Acid → Salt + Water

This reaction is to be done very carefully as after the stage of neutralization , even a drop of excess acid will make the solution acidic.

6. Oxidation Reduction reaction

In activity 6 when we burnt the magnesium wire, then magnesium oxide was formed. This is an example of oxidation reaction. Combination of oxygen with any compound is called oxidation. Do you know that it is reaction of iron with oxygen, which forms the rust? On the other hand, rusting is an example of oxidation. When we burn sulphur , we get sulphur dioxide, here also it is oxidation of sulphur.

$$S + O_2 \longrightarrow SO_2$$

Sulphur + Oxygen → Sulphur dioxide

Opposite to this, removal of oxygen from any compounds is called reduction.

When mercuric oxide is burned, mercury and oxygen is obtained.

$$2HgO \longrightarrow 2Hg + O_2$$

Mercuric oxide → Mercury + Oxygen

Here mercuric oxide is reduced because oxygen has been removed from it.

Oxidation and reduction can also be defined in terms of removal and addition of hydrogen respectively.

When ammonia is passed through red-hot glass tube then it is reduced to nitrogen and hydrogen.

$$2NH_3 \longrightarrow N_2 + 3H_2$$

Ammonia — Nitrogen + Hydrogen

Here hydrogen has been removed from ammonia, so ammonia has been oxidized.

Come, let us see the making of hydrochloric acid from hydrogen and chlorine.

$$H_2 + Cl_2 \longrightarrow 2HCl$$

Hydrogen + Chlorine — Hydrochloric acid

Here chlorine has combined with hydrogen so chlorine has been reduced.

Oxidation and reduction reaction goes on simultaneously. When one reactant is oxidized, the other is reduced. Such reactions are called Redox reactions.

Activity 10 (Performed by Teacher)

Materials required: A piece of coal, red lead, spirit lamp and blowpipe.

Take a piece of coal. Make a small hole in it. Put some red lead in this hole. With a blowpipe, direct the flame of the lamp towards the red lead. You will see that the colour changes from red to yellow. Continue blowing until you get a grey coloured liquid. It will solidify on cooling. This is lead. (fig 4.3)

$$Pb_3O_4 + 2C \longrightarrow 3\,Pb + 2CO_2$$

Lead oxide + Carbon — Lead + Carbon dioxide

In this reaction, oxygen was lost from lead oxide so we can say it was reduced and carbon combined with oxygen so carbon was oxidized. This is a redox reaction.

Bio chemical reactions

Some micro organisms also take part in some chemical reactions. Milk changing to curd, fermentation of batter for dosa, decaying of food, internal activities like digestion in man and other organisms are examples of bio chemical reactions.

Chemical reactions are an important part of our life. Many chemical reactions are continuously going on in our body and in other living organisms and plants. In factories, also it is by chemical reactions that many necessary things are manufactured as medicines, fertilizers, insecticides, paint, polish, soaps, cosmetics, etc.

NOW ANSWER THESE

1) What is neutralization reaction? Give one example.

2) What is precipitate? Write a reaction in which a precipitate is formed.

3) Explain oxidation, reduction and redox reactions.

WE HAVE LEARNT

- That reaction in which a new substance is formed is called chemical reactions. The substances taking part in a reaction are known as reactants and the substances formed in a chemical reaction are called products.
- Chemical reactions can be recognized by liberation of gas, colour changes, formation of precipitates, heat changes and state changes.
- There are different types of chemical reactions. They are categorized as combination, decomposition, displacement, precipitation, neutralization, oxidation-reduction reactions.
- Those reactions in which microorganisms also take part in the chemical reaction are called bio-chemical reactions.
- These reactions are used to obtain many chemicals.

QUESTIONS FOR PRACTICE

1. Choose the correct answer

1. $NaOH + HCl \longrightarrow NaCl + H_2O$ this is a:-

(a) Decomposition reaction (b) Combination reaction

(c) Neutralization reaction (d) Precipitation reaction

2. On ignition when a substance combines with oxygen, the process is called :-

(a) reduction (b) oxidation (c) decomposition (d) displacement

3. Which of these is not a characteristic of chemical reaction?

(a) production of heat (b) change in colour

(c) liberation of gas (d) formation of no new substance

4. $2KClO_3 \longrightarrow 2KCl + 3O_2$ is a reactions :-

(a) combination (b) decomposition

(c) displacement (d) neutralization

2. Write the type of chemical reaction

1. $NH_3 + HCl \longrightarrow NH_4Cl$
2. $NaOH + HCl \longrightarrow NaCl + H_2O$
3. $2NH_3 \longrightarrow N_2 + 3H_2$
4. $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$

3. Answer the following questions :-

1. When calcium carbonate is heated we get calcium oxide and carbon dioxide.

   $CaCO_3 \longrightarrow CaO + CO_2$

   What type of reaction is this? What are the reactants and products? Write it.
2. Give two examples for each of the following reactions in which -
   1. Precipitate is formed
   2. Heat is liberated
   3. Colour is changed.

4. Some reactions are given below. Identify the chemical reaction and write the reasons.

1. Melting of ice.
2. Dissolution of sugar in water.
3. Burning of wood.
4. Blackening of pieces of potatoes, brinjals and apples.
5. Melting of wax.
6. Blackening of silver ornaments.
7. Souring of Milk
8. Synthesis of food by green plants in presence of sunlight.

5. Point out the difference between-

1. Oxidation and reduction
2. Combination and decomposition

6. Write the characteristics of a chemical reaction.
7. Give an example of a reaction which shows more than one of these characteristics.
8. Enlist various chemical changes that you come across in your daily life and also classify or categorize them.
9. When Seema tasted glucose, she felt cold in tongue. Why did she feel so? What is this reaction called ?

5 METALS AND NON-METALS

5.1

You know that till now 118 elements have been discovered. Write names of any five elements which you use. Our list may have the elements as iron, copper, aluminium, gold, silver, oxygen, carbon, hydrogen etc. Do all these elements have the same properties. Let us find properties of some elements by doing some activities.

5.1.1

Activity 1

Materials required : Pencil lead (graphite) copper wire, iron piece, coal, sulphur, emery/sand paper, hammer.

Rub graphite, copper wire, iron piece, coal, sulphur on an emery paper. Now hit them with a hammer. What changes happen on beating or hammering?

On rubbing with an emery paper iron and copper piece shines and on hammering or hitting with a hammer, they flatten out to a sheet. This property is known as malleability. Graphite, coal and sulphur break up into pieces on hammering with a hammer because they are fragile or brittle. Hence this property is called fragility or brittleness.

Activity 2

Materials required : Copper wire, pencil lead (graphite), candles and matches.

Heat one end of both copper wire and pencil lead on the flames of different candles separately. After some time touch the other end of both. Is it hot? The other end of copper wire being hot shows that heat has transferred from one end to other end. Hence copper is a good conductor of heat, but graphite is an ordinary conductor of heat.

Activity 3

Materials required : Iron rod, sulphur, electric wire, bulb, drycells, graphite, glass slide, candles and match box .

Arrange the electric wire, bulb and dry cell according to fig.5.1. Open the two ends (A,B) of the wire in the circuit. Now connect the ends A,B to a iron rod as shown in the figure and see if the bulb lights up or not. Do the same experiment with the graphite rod in place of the iron rod. Does the bulb light up? Now take the sulphur powder on a glass slide and melt it over the flame of the candle and then cool it. You will get a layer of sulphur. Use this sulphur layer in place of graphite rod and repeat the experiment. Does the bulb light up ?

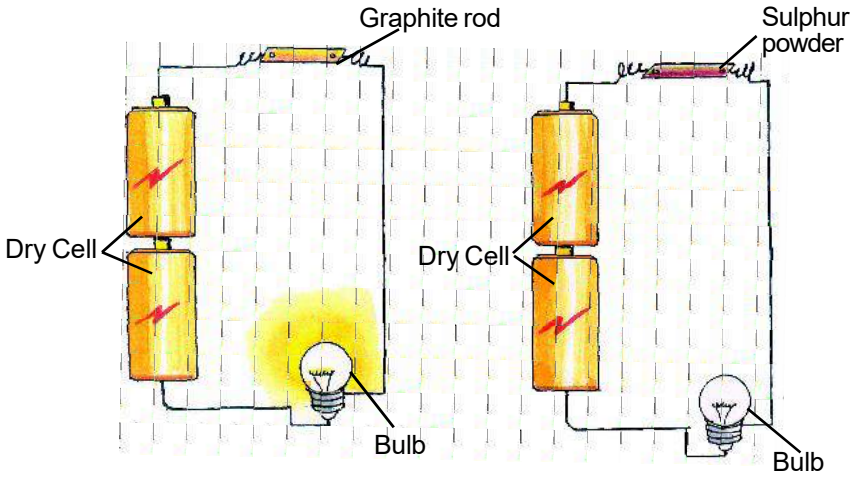


Fig 5.1 Conductivity of metals & nonmetals

Connecting the iron rod and graphite rod on the circuit makes the bulb light up. This shows that they are good conductors of electricity and sulphur is a bad conductor of electricity. That's why the bulb does not light up.

As per the above activity 1, 2, and 3 note the observations in table 5.1 in your notebook (copy) in the given space.

TABLE 5.1

S.No.	Element	Brightness or Lustre	Malleability	Fragility/ Brittleness	Heat conductivity	Electric conductivity
1.	Iron	----------	----------	----------	----------	----------
2.	Copper	----------	----------	----------	----------	----------
3.	Coal	----------	----------	----------	----------	----------
4.	Graphite	----------	----------	----------	----------	----------
5.	Sulphur	----------	----------	----------	----------	----------

We see that iron and copper have brightness are malleable and good conductors of heat and electricity. Whereas coal and sulphur are fragile or brittle and bad conductors of heat and electricity. So we can differentiate them according to their properties. Iron and copper like elements are called **metals**. Most of the elements in nature, are metals. Other examples of metals are gold, silver, aluminium, tin, lead, zinc etc.

In contrast to these the element carbon and sulphur like elements are called **non-metals**. In nature their number is less than metals. Other examples of non metals are chlorine, bromine, oxygen, helium, iodine, nitrogen, phosphorous etc. Graphite is also a non metal but it has the property of conduction of electric current.

NOW ANSWER THESE:

Fill in the blanks -

1. The number of metals is .....than non metal.
2. .....is a good conductor of heat and electricity.
3. .....is fragile or brittle.
4. .... and ..... are examples of metals.

5.1.2 Are all metals and non metals solids ?

Do you know any metal which has a different state other than solid at normal temperature? Mercury is a metal which exists in liquid form, and no metal exists in a gaseous state.

Usually all non metals are found in gaseous state. Five non metals are found in solid state (carbon, phosphorous, sulphur, selenium, iodine) and one in liquid state (bromine).

Gold and silver are the brightest metals. Silver is a very reflective metal. It reflects about 90 % of the light falling on it. It is used in the thin layer of metal coating for manufacturing of mirrors.

5.1.3 Are all metals and non metals hard.

Usually metals are hard. It is very difficult to cut them. Because of this hardness, they are very useful to us. Iron is a very hard metal, so it is used in the making of houses, bridge, rails, vehicles and machines. On the other hand sodium and potassium are also metals but soft. They can easily be cut by a knife.

Usually nonmetals are not hard. But diamond (a form of carbon) is the hardest substance (non-metal) in the nature.

5.1.4 Are metals and non-metals ductile

Usually which wire have you seen? Have you seen sulphur wires?

The property of metals to be drawn into wire, is known as **ductility**. In our

houses, in the bulbs thin wire of tungsten metal is used.

The property of ductility is not present in non metals. We cannot have wires of non metals. But now a days by new modern methods wires of carbon are being built.

- *The property of ductility is maximum in gold. Two kilometre wire can be drawn from 10 g of gold.*
- *Gold and silver are very malleable. Due to this property they can be beaten to very thin sheets. Sweets are decorated by silver foils.*
- *In the same way thin sheets of aluminium is used for keeping medicines and chocolates fresh and is also used as a cover for milk bottles.*

Let us see some other properties of metals and non metals.

Sonorous - Usually all metals are sonorous. You must have heard the school bell which is metallic. If metals are struck hard they produce sound. It is because of this, that copper, iron etc. are used to make bells. The strings of metals are also used in same musical instruments like Sitar, Guitar, Banjo etc.

Non metals do not produce sound on beating.

Melting Point- Usually the melting point of all metals are high. The melting point of iron is 1535° C and that of copper is 1083° C.

The melting point of nonmetals are very low. The melting point of sulphur is 119°C and that of iodine is 113° C.

NOW ANSWER THESE

Choose the correct alternative :

1. Metal are (harder/softer) than nonmetals.
2. Most of the metals are (bad/good) conductors of heat.
3. (Metals/Non metals) have Lustre.
4. The property of metals to be beaten into thin sheets is called (ductility/malleability).

Like physical properties, do metals and nonmetals differ in their chemical properties too ? Let us find out.

5.2 Chemical Properties of Metal and Non metals

1. Reaction with Oxygen

Activity 4

Materials required : Two test tubes, one glass slide and forceps, match box, blue/red litmus paper, magnesium wire, sulphur and water.

1. Burn the magnesium wire on the flame of the candle, holding it with the help of a forcep. When it catches fire and starts burning properly place a test tube upside down over it, so that the liberated gas is collected in it. When it is completely burnt, put the ash into the test tube. Immediately add little water in the test tube so that the ash and gas is dissolved in it. Test this solution with blue and red litmus paper.
2. Do the same experiment with sulphur also. Place sulphur on a glass slide and then heat it. Collect the liberated gas in a test tube and dissolve it in water. Test this solution also with blue and red litmus paper. Now draw table 5.2 in your copy and write the observations there.

TABLE 5.2

S.No.	Solution	Effect on red litmus	Effect on blue litmus	Acidic/Alkaline
1.	Solution of gas obtained on burning magnesium	----------	----------	----------
2.	Solution of gas obtained on burning sulphur	----------	----------	----------

Most of the metals react with the oxygen in air to form oxides, which reacts with water to form hydroxides having alkaline nature.

$$Mg + O_2 \longrightarrow 2MgO$$

Magnesium + Oxygen $\longrightarrow$ Magnesium Oxide

Magnesium Oxide + Water $\longrightarrow$ Magnesium Hydroxide (Alkali)

In contrast to this most of the non metals react with the oxygen in air to form oxides which reacts with water to form acids.

$$S + O_2 \longrightarrow SO_2$$

Sulphur + Oxygen Sulphur dioxide

$$SO_2 + H_2O \longrightarrow H_2SO_3$$

Sulphur dioxide + Water ⟶ Sulphurous Acid

2. Reaction with water

Activity 5 (Demonstration by teacher)

Materials required : Glass trough, water, sodium, filter paper, forceps.

Fill the glass trough with water. Take sodium which is kept dipped in kerosene and cut a small piece of it. Dry it on the filter paper. Now put it into the water in the trough. Immediately on putting, sodium starts moving around trough with a hissing sound and then it catches fire.

$$2Na + 2H_2O \longrightarrow 2NaOH + H_2$$

Sodium + Water ⟶ Sodium hydroxide + Hydrogen

Reaction between sodium and water produces hydrogen gas. This reaction produces a lot of heat

Take readily available metals around us like copper, magnesium, iron, zinc etc and put them into the water. Do they also react in a same way as sodium does?

Magnesium reacts mildly with cold water, but reacts vigorously with hot water or steam and forms Magnesium hydroxide and Hydrogen gas.

$$Mg + 2H_2O \longrightarrow Mg(OH)_2 + H_2$$

Magnesium + Water ⟶ Magnesium hydroxide + Hydrogen

Zinc and iron mildly react with steam. Copper, gold silver do not react with water or steam.

In this way we can say that reaction of metals with water differ. Non metals do not react with water. Phosphorous is kept under water to keep it safe from reacting with air. If it is kept open then it reacts with the oxygen in air and burns.

3. Reaction with Acids

Activity 6

Materials required : Magnesium, Zinc, Copper piece, Dilute Hydrochloric acid, test tubes, match box and heating apparatus.

Take the three metals in three different test tubes and add dilute hydrochloric acid to each. If there is no reaction, heat the test tubes slowly. Test the gas liberated in each test tube by bringing a burning match stick to the mouth of the test tube.

The gas from test tubes containing Magnesium and zinc burns with a "pop" sound which indicates that the gas liberated is hydrogen.

$$Mg + 2HCl \longrightarrow MgCl_2 + H_2$$

Magnesium + Hydrochloric acid ⟶ Magnesium chloride + Hydrogen

$$Zn + 2HCl \longrightarrow Zn Cl_2 + H_2$$

Zinc + Hydrochloric acid ⟶ Zinc chloride + Hydrogen

Copper pieces do not react with Hydrochloric acid. It reacts with Sulphuric acid and Nitric acid.

We use utensils made of metals in our day to day life. When food products (like pickles, curd, sour fruits) which have acid in them are kept in this utensils then the acid in these food items react with the metal and produce some poisonous substances. So it is recommended that such food items with acidic nature must not be kept in metallic utensils.

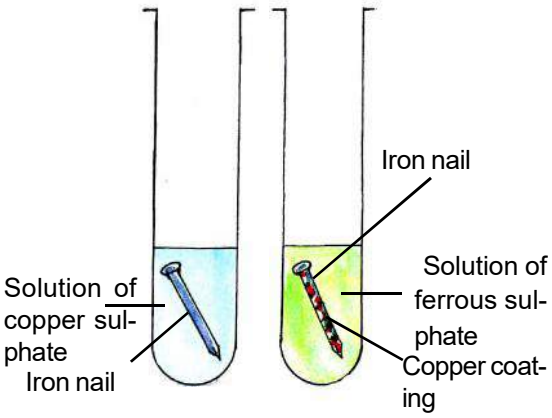
4. Displacement of metals with other metals

You know that metals react with acids and displace hydrogen gas. Let us see, can metals displace other metals from their solutions?

Activity 7

Materials required : Beaker, 5 test tubes, test tube stand, water, copper sulphate, iron pieces, zinc pieces, magnesium wire, aluminium (seal of the injection bottle) copper wire.

Take about 50 mL water in a 100 mL beaker. Add 5 g of copper sulphate in it and dissolve it . Pour a clear solution of it in equal amount into the five test tubes and keep them in the test tube stand. Now add, iron piece, zinc piece, magnesium wire, aluminium piece and copper wire into the different test tubes. Let the test tube stand with out any disturbance for some time. Draw the obsevation table 5.2 in your copy and note the observations.



Pic 5.2 Displacement of metals from a salt solution

TABLE 5.2

S.No.	Metals put into copper sulphate solution	Change in colour of copper sulphate solution	Layer of copper on metal deposited or not	Any other changes
1.	Iron	Colour fades	Layer of copper on iron deposited	----------
2.	Zinc	----------	----------	----------
3.	Magnesium	----------	----------	----------
4.	Aluminium	----------	----------	----------
5.	Copper	No change	No	----------

In this experiment you find that there is no change in the fifth test tube but in the other four test tubes the metal displaces the copper from the solution and takes the place of copper. On this basis we can say that iron, zinc, magnesium and aluminium are more reactive than copper. Do this experiment in groups in the class. Each group must prepare a different solutions as sodium chloride, ferrous sulphate, silver nitrate and observe the reaction with these elements.

To know if the reaction has taken place observe if there is any differences (gas bubbles) any change in colour of the solution, change in the colour of the metal or if heat is evolved or absorbed.

On the basis of all the experiments done by groups in the class, fill the table No. 5.4, and observe whether the metal has replaced the metal in the salt solution or not.

TABLE 5.4

S.No.	Solution	Iron	Zinc	Magnesium	Aluminium	Copper
1.	Sodium chloride	------	------	----------	----------	---------
2.	Copper sulphate	------	------	----------	----------	---------
3.	Ferrous sulphate	------	------	----------	----------	---------
4.	Silver nitrate	------	------	----------	----------	---------

From the above table we can know that which metal is more reactive and which is less. If zinc displaces iron from ferrous sulphate then we can say that zinc is more reactive than iron. If iron displaces copper from copper sulphate then iron is more

reactive than copper. As Zinc is more reactive than iron, it is also more reactive than copper.

Now you can make the reactivity series according to table 5.4. Does this series match with the one given here.

Li . K . Na . Ca . Mg . Al . Zn . Fe . Pb . H . Cu . Hg . Ag . Au

The more reactive the metal the more it will react with water and air. Sodium is so reactive that it has to be kept in kerosene to keep it safe from air and water. On the other hand gold which is almost inactive as it does not react with water and air, and not even react with acids.

NOW ANSWER THESE

1. What is the nature of the solution of magnesium oxide dissolved in water?
2. What happens when zinc pieces are put into copper sulphate solution?
3. Does copper displace iron from ferrous sulphate solution?
4. Why are pickles not kept in aluminium or iron vessels?
5. Which gas is produced normally when metals react with acids?

5.3 Nobel Metals

Do you know the ornaments are made from which metals? As per the reactivity series you can say which metals can be used for ornaments? One of the reason, for using gold in gold ornaments is due to its less reactivity. Silver, gold, platimum are the least reactive metals. These do not react with air, water, acids or alkaline compounds. Such metals are called noble metals. One property of nobel metals is that, due to its least reactivity its metallic lustre/brightness stays for a longer time.

Adding a bit of silver or copper with gold makes the gold more harder with which ornaments are made. Gold percentage is expressed in terms of carats. Pure gold (100 percent) is 24 carats. As the percentage of the mixed metal increases the carat of gold decreases. 22 carat gold means 22 parts gold and 2 parts of silver or copper.

5.4 Corrosion

You must have seen the iron nails, pipes etc. when left in open air for some time get rusted. In this way the formation of a compound on the metal surface is called **corrosion**.

Activity 8

Materials required: Three test tubes, iron nails or scraps, anhydrous calcium chloride and water.

Place three unrusted iron nails in each of the three test tubes. Put some water in the first test tube, in the second test tube add boiled water (oxygen free) and in the third test tube add anhydrous calcium chloride ($CaCl_2$) which absorbs the moisture in the test tube. Close all three test tube with rubber corks. After two or three days, observe and find out which test tube has rusted nails? After this observation can you say what are the factors necessary for rusting?

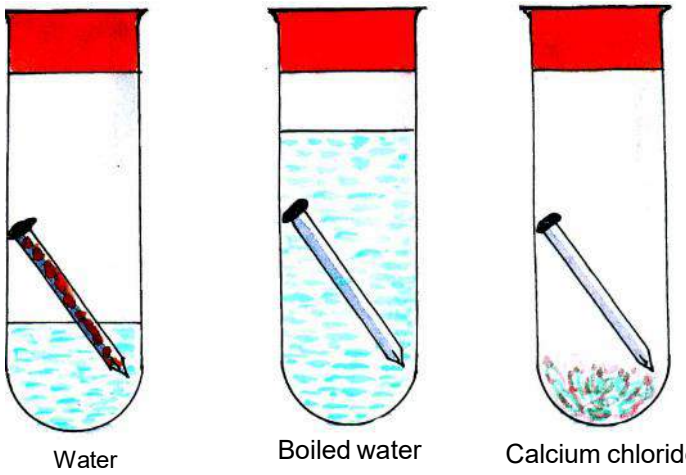


Fig. 5.3 Factors necessary for corrosion

This experiment shows that both oxygen and water are necessary for rusting. This indicates that to protect iron from rusting we must keep it away from moist air.

Prevention from Rusting :-

1. **By painting :** Most common method to stop corrosion is covering the metal with a layer of paint. We paint the objects made of iron in our houses to protect them from rusting.
2. **By applying grease :** By applying grease or oil, the contact of the metal with air and water is broken. To protect it from rusting, grease is applied to the bicycle chains.
3. **By metallic coating :** In this method objects made of iron is cleaned and then dipped in molten zinc. The objects get coated with a layer of zinc. To protect from corrosion, the iron sheets used to make the roof of our houses, buckets and tanks are coated with a layer of less reactive metal. This can also be done by electroplating. By electroplating, iron is protected with a layer of tin or chromium metal. Steel furnitures are made more durable and attractive by electroplating with chromium.
4. **Manufacture of Alloys :** You know that pure gold is not used to make ornaments. Iron rusts easily. So cooking utensils and materials used in

operations are not made of pure iron. In this way we have seen that pure metals are not useful always. To make these metals useful some other metal or nonmetal is added. This mixed metal is called an alloy. Alloys are more tough and resistent to corrosion. We can change the percentage of the metals and get the alloy with the desired properties.

In table 5.5 some important alloys, their constituents and their uses are given:

TABLE 5.5

S.No.	Alloy	Constituents	Uses
1.	Steel	Iron, Carbon	Ships, bridges, rails
2.	Stainless Steel	Iron, Carbon, Chromium Nickel	Utensils, Medical/surgical Instruments
3.	Bronze	Copper, Tin	Statues, Coins, medals
4.	Brass	Copper, Zinc	Utensils, Machines
5.	Duralumin or Dural	Aluminium, Copper, Manganese, Manganesium	Presure cooker, parts of aeroplane
6.	German silver	Copper, Zinc, Nickel	Utensils

5.5 Uses of metals and non metals.

You have come to know of some important metals and non metals. Try to fill this table as per your knowledge.

TABLE 5.6

S.No.	Metals/ Non Metals	Uses
1.	Iron	----------
2	Gold and Silver	----------
3	Copper and Aluminium	----------
4	Oxygen	----------
5	Zinc	----------
6	Carbon (Coal)	----------

Lead is used is making bearing balls of bicycle and motorcycles, soldering wires and water pipes. Titanium metal is used in making of different parts of machines, space - crafts and rockets.

A foil strip of aluminium or gold is used to make electroscope

Phosphorous is used in matches and chlorine is used as a disinfectant in purification of water. Iodine is used as tinture iodine, an antiseptic medicine. Sulphur is used in making many medicines, gun powder and crackers.

NOW ANSWER THESE

1. What are noble metals ?
2. What do you understand by corrosion? How can you protect metals from corrosion by electro plating?
3. Give the constituents of bronze and steel?
4. For what is chlorine and tincture iodine used?

Poisonous effect of lead and mercury

Lead and mercury are metals which are used in different industries. But these metal have poisonous effect in our bodies.

Lead is used in the manufacture of paint and batteries. Burning of products like petrol produce smoke having lead and its compounds.These compounds enter our body and can damage our red blood cells, brain and liver.

Compounds of mercury are used in making of paints, insecticides, fungicides. This compounds may enter our body through polluted water and food as fish and vegetables. They effect our kidneys and central nervous systems.

Metal Sculpture of Chhattisgarh

Man, from ancient times have known to obtain iron from iron ore. Adhariya tribes of Rajnandgaon district in Chhattisgarh have known the method to extract iron from iron ore. Now a days also the metal workers or sculptors make articles in traditional methods. The people of Lohar caste of Chhattisgarh make stoves, chisel, axes, pickaxe, spade angles spears and axles of vehicles of iron which is used in the daily village life.Nagarnar area of Bastar is famous for metal sculpture. People of this area make beautiful

Fig 5.4 Metal sculpture of Chhattisgarh

statues of birds and animals and very artistic lanterns lamps etc. Ghadwa tribes of Chhattisgarh is world famous for metal sculpture. The statues made by them are appreciated and are bought in our country and also in foreign countries.

In the same way the Jhara tribals of Raigarh area make statues which are famous as Jhara metal sculpture. Jhara sculptors usually make statues, utensils, lamps etc. of metals.

The statues made by Malar tribe of Surguja are known as Malar metal sculptures. These are usually utensils, chimneys, grain measuring cups.

They also make statues of birds animals, wild animals, Gods and Goddesses.

WE HAVE LEARNT

- Elements can be classified as metals and non metals.
- Metals have the properties of lustre, ductility, hardness, malleability, conductivity.
- Non metals are fragile brittle and bad conductors.
- Burning of metals produce basic oxides and that of non metals produce acidic axides.
- Aluminium, zinc metal reacts with acids.
- Usually non-metals does not react with acids.
- More reactive metal displaces the less reactive metal from the solution of its salt.
- Gold, silver and platinum are noble metals.
- Alloys are homogenous mixture, of metals with other metals and nonmetals.
- Metals like iron corrode. There are many methods to stop corrosion.
- There are many uses of the metals and non metals in our daily life.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative :-

1. This is not a property of metals

a) Fragility b) Conduction of electricity

c) High density d) Malleability and ductility

2. Out of the three pins of gold, silver and iron which pin can get a coat of copper when dipped in copper sulphate solution :-

   a) Iron b) Gold c) Silver d) None of these

3. Which halogen is used as an antiseptic?

   a) Fulorine b) Chlorine c) Bromine d) Iodine

4. Iron rusts :-

   a) Only in air b) Only in presence of carbon dioxide

   c) Only in water d) In presence of both air and water

5. An example of Noble metal is :-

   a) Iron b) Copper c) Gold d) Aluminium

6. Which of these is classified as metal or non-metal :-

   a) Element b) Compound c) Mixture d) All of these

2. Fill in the blanks

1. Noble metals are usually..... .
2. Breaking up of the non metals into pieces is known as..... .
3. On burning metals form..... oxides.
4. The main constituent of German silver is ..... .
5. .....alloy is used in manufacture of rails.

3. Match the following :-

1.	Duralumin	Disinfectant
2.	Stainless Steel	Ornaments
3.	Phosphorous	Medical Instrument used in surgery
4.	Chlorine	Parts of aeroplane
5.	Gold	Match box

4. Mark the statements true or false :-

1. All metals are solid at room temperature.
2. Sodium is more reactive than magnesium.
3. Stainless steel is an alloy of iron, nickel, carbon and chromium.
4. Non metals react with oxygen to form alkaline oxides (basic oxide).
5. Rusting is an example of corrosion of metals.

5. Answer the following questions :-

1. Differenciate metals and non metals on the basis of physical and chemical properties. Write three differences of each.
2. Why is gold and silver used for making ornaments?
3. What do you understand by reactivity series?
4. How much carat is pure gold? Why is pure gold not used for making ornaments?
5. What are alloys? Give names of any four alloys and write their constituents and uses.
6. What is metal corrosion? What are the ways to protect corrosion?
7. Why is graphite used as a electrode?
8. Iron is not used in making of railway tracks ? Why ?
9. Explain through an activity that Magnesium is more reactive than Iron ?
10. Rub any Copper vessel with sand paper and observe. Now explain with giving reasons.

TRY TO DO THIS ALSO :

1. Interview some blacksmith, goldsmiths and sculptors of your city/village and try to find out more about metals and its characteristics.
2. Take small scrap pieces of Aluminium foil, iron nail, 4-5 cm long copper wire. Let them be exposed to moisture and leave them in the open. Observe after every 2 days for 10-15 days and write your observation.
   What do you conclude from the experiment ? Discuss with your teacher.
3. Make your own Electroscope.
   Take an empty bottle having a wide mouth. Take a piece of cardboard slightly bigger in size than the mouth of the bottle. Pierce a hole in it, so that a metal clip can be inserted. Open out the paper clip. Cut two strips of aluminium foil about 4cm x 1cm each. Hang them on the paper clip. Insert the paper clip in the cardboard lid so that it is perpendicular to it. Charge a refill and touch it to the end of the paper clip. Now observe what happens.

1) Is there any effect on the foil strips?
2) Do they repel each other or attract each other and why?
3) Can this apparatus be used to detect whether a body is charged or not?

6 CARBON

6.1

You must have seen the black substance produced after burning wood. Try to mark with this on paper and also put a mark on the paper with a lead pencil. Do you know which substance causes these black marks. Are the two marks the same? Let us see some other such substances.

Activity 1

Materials required: Earthen lamp, Metallic spoon or glass slide, cotton wick, mustard oil, match box.

Put some mustard oil in a earthen lamp. Dip the cotton wick in it so that it soaks the oil. Now burn this wick and collect the smoke on a glass slide (fig 6.1). Observe the product on the glass slide and try to answer the following questions in your copy.

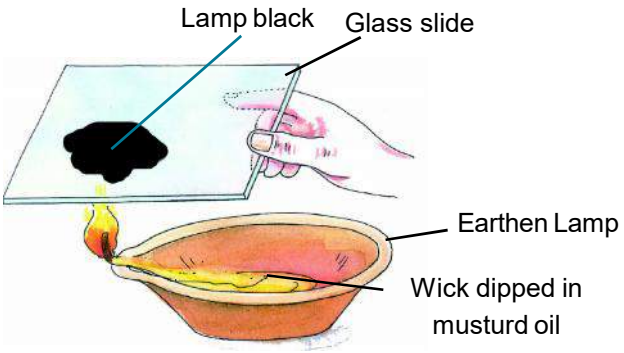


Fig 6.1 Making lamp black

1. What is the colour of the layer deposited on the glass?

2. What do you call this substance?

Activity 2

Materials required: Pencil shaving, heating apparatus, match box, boiling test tube made of hard glass and cork

Take the pencil shaving in a boiling test tube and close it with a cork. Heat the test tube on a candle or burner (fig 6.2) and observe what happens to the shaving in the test tube. Answer the following questions as per the observations.

1. What is the colour of the residue in the test tube?

2. What do you call this substance?

The black product formed in activity 1 and 2 are black coloured and are known as **lamp black** (Kajal) and **wood charcoal** respectively. Charcoal from sugar is called **sugar charcoal** and that from bones is known as **bone charcoal**. Charcoal,graphite, lamp black all are made of carbon. Beside these, coal and diamond are also made of carbon.

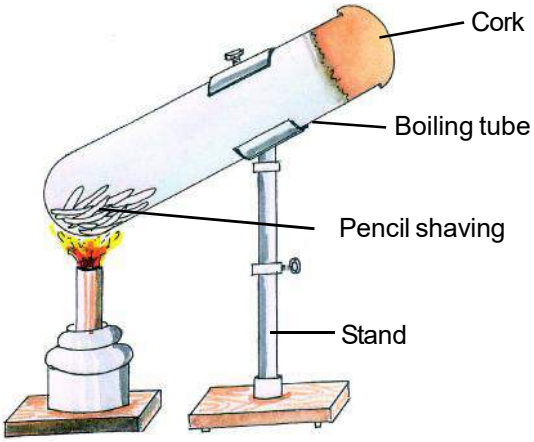


Fig 6.2 Making charcoal from wood shaving

Let us compare their properties :

Table 6.1

S.No.	Form of Carbon	Appearance	Hardness	Electric conductivity	Heat conductivity
1.	Diamond	Colourless, transparent, crystal, shines in light.	Hardest	Bad conductor	Very good conductor
2.	Graphite	Shining black, solid	Soft, smooth, slippery	Good conductor	Normal conductor
3.	Coal	Black, Flaky	Soft	Bad conductor	Bad conductor
4.	Lamp black	Black powder	Soft	Bad conductor	Bad conductor
5.	Wood charcoal	Black	Soft	Bad conductor	Bad conductor

The different forms of carbon have different physical properties. If they are burnt in sufficient air, then all will burn to form carbon dioxide.That means their chemical properties are same.

Different forms of an element having different physical properties but the same chemical properties are called **allotropes**. In this way the property of an element having different forms is called **allotropy**.

Carbon is not the only element, which shows allotropy, phosphorous, sulphur, tin: all show allotropy in their solid forms.

FULLERENE

In 1985 graphite was heated by chemists to a very high temperature and a new allotrope of carbon was made. The molecules of these are spherical and 60 carbon atoms

are joined together in it. This was named Fullerene after American architect Buckminster Fuller. In nature, it is found in the holes made by fallen meteors and ancient rocks. Now Fullerene having C-70, C-90 and C-120 carbon atoms are also discovered. In future Fullerene and its substance will be used in the manufacture of super conductors, semiconductors, lubricants, catalysts and electric wires. C-60 containing substances may also be used in the prevention and cure of AIDS (Fig. 6.3).

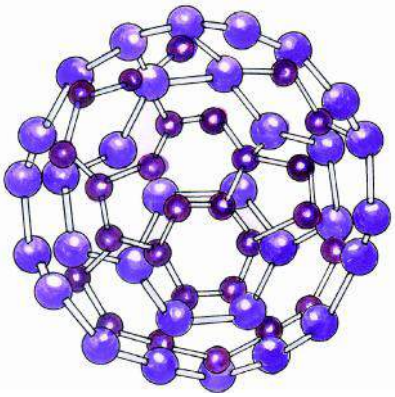


Fig 6.3 Fullerene

6.2 Uses of the allotropes of carbon

The substances given in table 6.1 has great importance in our daily life; Let us see where we use these :-

6.2.1 Diamond

(1) Diamond because of its lustre is a precious stone which is used in ornaments. The diamond is cut in such a way that each light ray which enters it has to reflect many times inside the diamond before it comes out. Because of this its surface appears shiny.

(2) Diamond is the hardest substance so it is used in the cutting of glass and in instruments used in drilling hard stones.

(3) Diamond is also used in some of the surgical instruments as knives, blades etc.

6.2.2 Graphite

(1) In making of pencil lead.

(2) As graphite has a very high melting point, it is used in making crucibles which can endure high temperature.

(3) As it is a conductor of electricity it is used as electrodes in dry cell.

(4) Graphite is used in the manufacture of black paint and printing ink.

(5) Graphite combines with plastic to form light weight, strong substance which is used in making fishing boats, cycle frames, parts of space shuttles, dish antenna and tennis rackets.

To make pencil lead, fine powder of graphite is mixed with fine soil and wax to form a paste. The paste is shaped into thin rods and dried. These dried up rods make the lead pencil.

6.2.3 Lamp black (Kajal)

(1) In making ink & black colour.

(2) As a supplement in tyres and plastic.

6.2.4 Coal

(1) As fuel

(2) In the extraction of some metals as iron.

6.2.5 Wood charcoal

(1) Being porous it is used as an absorbent of gas.

(2) To make sugar colourless and to remove coloured impurities from oils and fats.

NOW ANSWER THESE

(1) In which forms do we find carbon in our surroundings?

(2) What is allotropy?

(3) Write two uses of diamond?

(4) Write the methods of preparation of

(a) Wood charcoal (b) Lamp black (Kajal).

6.3 Presence of carbon

Carbon is an element, which is found in different allotropic forms in nature. Along with this, it is one of the main constituent of all living organisms (plants & animals).

Items which we daily use as paper, rubber, wood, tyre, pencil, cloth, oil, soap and fuel all contains carbon. Carbon in free state is present in diamond, graphite, coal etc. In combined form carbon is present in many substances as:

(1) Substance of carbon with oxygen and calcium is calcium carbonate. This is found in nature as limestone, chalk & marble.

(2) Main constituents of food as carbohydrates, fats, proteins, vitamins etc are all substances of carbon from which our body get energy.

(3) Carbon & Hydrogen in different proportions combine to form hydrocarbons as Methane, Ethane etc. In natural gas, cooking gas (LPG), petrol,

diesel, kerosene, paraffin wax, coal tar etc all have carbon in form of hydrocarbons.

Some allotropes & substances of carbon are used as fuel. Now you write names of some fuels, which are commonly used, in your house and note them in your copy.

6.4 Burning and Combustion

Some substances on burning evolves heat, light or even both the forms of energy. This burning process is called combustion. Come we will do an experiment to understand it.

Activity 3

Material required: Piece of Magnesium, Piece of Coal, chalk, small stone, match box, forceps and heating apparatus.

Hold each magnesium piece, coal piece, chalk and stone with the forceps over flame one by one and heat it. Observe carefully and answer the following questions.

(1) Which of these burn?

(2) Which of these do not burn?

Those substances which burn are called combustible substances as magnesium and coal. Stone, glass, cement etc do not burn, these are non-combustible substances.

Combustible substances combines with oxygen in the air to form oxides & liberate heat & light.

$2\,Mg + O_2 \longrightarrow 2MgO + heat + light$

Magnesium + Oxygen $\longrightarrow$ Magnesiun oxide + heat + light

$C + O_2 \longrightarrow CO_2 + heat + light$

Carbon + Oxygen $\longrightarrow$ Carbon dioxide + heat + light

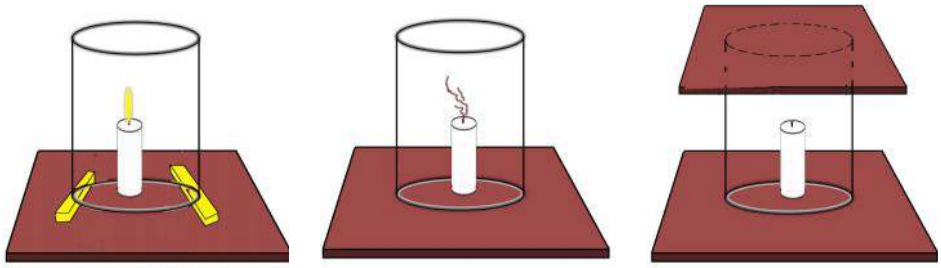
Therefore combustion is oxidation, which produces heat and light.

Come let's do an activity to understand if air is necessary for burning.

Activity 4

Materials required - Candles, matches, glass chimneys, two wooden blocks, glass plate.

Fix a burning candle carefully on a table. Put a glass chimney over the candle on the wooden blocks in such a way that air can enter the chimney (fig 6.4 a).Observe what happens to the flame. Now remove the blocks and let the chimney rest on the table (Fig. 6.4b). Now observe the flame again. Finally, put a glass plate over the chimney (fig. 6.4c). Watch the flame again. What happens in the three cases? Does the flame flicker off? Does it flicker and give out smoke? Does it burn unaffected? Can you infer anything at all about the role played by air in the process of burning?



a b c

Fig. 6.4 Air is essential for burning

We see that air is necessary for burning. In case (a) the candle burns unaffected. In case (b) the flame flickers and gives out smoke. In case (c) the flame is put off because air is not available for it to burn.

NOW ANSWER THESE.

(1) What is the name of the compound which is made of hydrogen and carbon?

(2) What is combustion?

(3) Write names of three combustible substances?

(4) Why are crackers and fuels not allowed to be carried in public vehicles?

Activity 5

Materials required: A piece of paper, a thick piece of wood, candles and matches.

Place the paper over the flame. What happens? Now place the block of wood over the flame. Does this also burn as quickly as paper?

The temperature at which a substance starts burning in presence of air is known as ignition temperature. The ignition temperature of paper is less than that of wood.

Petrol has lower ignition temperature than kerosene. As petrol vaporizes easily and catches fire quickly we do not use petrol in stoves.

You must have seen wood burning. At first it burns with a flame but later the flames are not seen. But camphor and wax burn with flame. When we put out the candle then you find white vapours evolving from it. Bring a lighted matchstick near this white vapour. The candles lights up.

Only those solids or liquid, which on heating produces vapours burn with a flame. So flame is that area where gaseous substances are combustible. So all combustible gaseous substances form flame.

Activity 6

Materials required: Candles, match box.

Burn the candle and observe its flame in semi darkness and draw a picture and note the different colours (fig. 6.5).

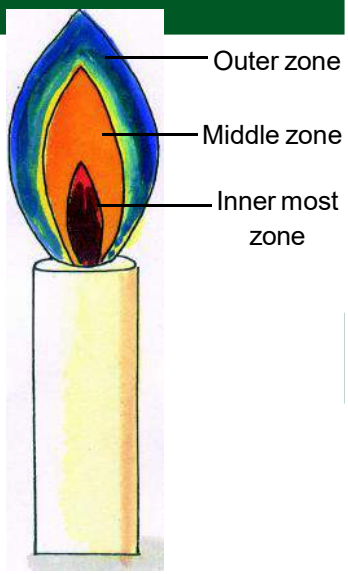


Fig 6.5 Flame of a candle

Activity 7

Materials required: Candles, match box, chips of wood.

Place a wooden chip on the upper part of the flame. Remove it and observe which part of it has blackened. Place the other chips on the middle & lower part of the flame and again observe the blackened portion and try to understand the difference (fig. 6.6).

From the experiment and observations we find that in a flame of candle there are three zone of different colours.

The inner most part is the darkest, it is the coldest part of the flame. In this zone there is the hot vapour of the combustible substance (wax). In this area there is no combustion because there is no oxygen.

The middle portion is the shining, bright zone. In this zone the fuel partly burns and forms carbon particles, which, shines when hot.

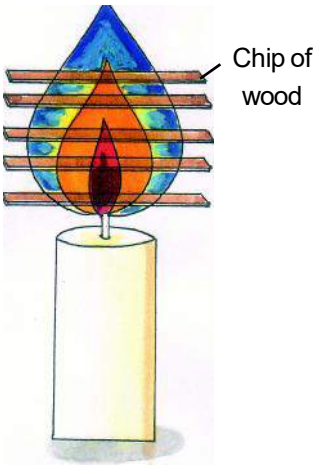


Fig 6.6 Experiment to find the different areas of the flame

The outer most part is slightly blue in colour. In this area the oxygen of the atmosphere mixes properly with the fuel and there is almost complete combustion. This is the hottest zone. Its maximum temperature it is about 1800°C.

Goldsmiths use flame of kerosene lamp to make ornaments in different forms out of gold and silver. With the help of a blowpipe they centralize the flame to a particular point. Air blown through blowpipes help the unburnt fuel to burn and makes the flame hotter.

NOW ANSWER THESE

(1) What are the favourable conditions for combustion?

(2) What is ignition temperature?

(3) From which substance does we get a flame?

(4) Which is the hottest zone of the flame?

(5) Draw a well labelled diagram of candle to depict various zones of flame.

6.5 Compounds of carbon

6.5.1 Carbon dioxide

Activity 8 (Demonstrated by the teacher)

Materials required: Test tubes, cork with a hole, bent glass tube, sodium carbonate (washing soda), lemon juice, fresh lime water, alkaline phenolphthalein.

Take some sodium carbonate in a test tube and arrange all the apparatus as shown in fig 6.7. Now put some lemon juice into the test tube. Perform the following tests on the gas evolved.

(1) Observe the colour of the gas. Do you find any colour? Does it have any odour?

(2) Bring a burning matchstick near the test tube with the collected gas. The matchstick is extinguished. What do you understand by this?

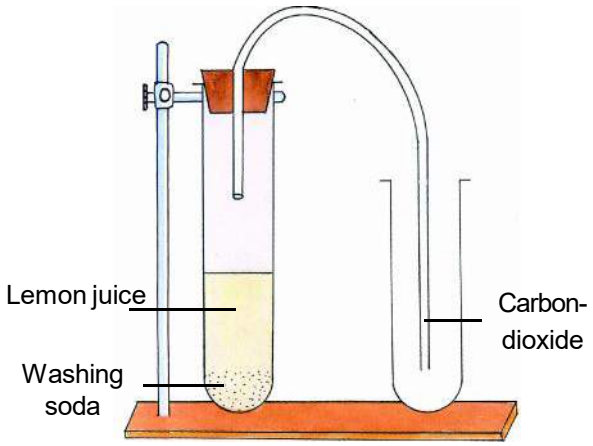


Fig 6.7 Preparation of carbon dioxide

(3) Take some fresh lime water in a test tube and pass the evolved gas into it. You will find that the limewater turns milky.

(4) In a different test tube take some alkaline phenolphthalein and pass the evolved gas. By the change in the colour of phenolphthalein can you say if the gas has a acidic or an alkaline nature?

In the experiment carbon dioxide gas is evolved, which is colourless and odourless gas. This gas neither burns nor does it support combustion. When carbon dioxide is passed into fresh lime water, insoluble calcium carbonate is formed, due to which the solution turns milky.

Alkaline phenolphthalein (pink) turns colourless when carbon dioxide is passed into it. It shows acidic nature. Due to its acidic nature it reacts with alkalies and forms salt and water.

$$CO_2 + 2NaOH \longrightarrow Na_2CO_3 + H_2O$$

Carbon dioxide + Sodium hydroxide $\longrightarrow$ Sodium carbonate + water

Uses of Carbon dioxide

(1) Carbon dioxide does not support combustion. This property is used in fire extinguisher to extinguish fire.

(2) The gas evolved on opening soft drink bottle is carbon dioxide. It gives a strong taste to the soft drink.

(3) On burning of the fuel and through respiration carbon dioxide is liberated into the atmosphere which is used by green plants in presence of sunlight to make food by the process of photosynthesis.

(4) Carbon dioxide is used in the manufacture of sodium carbonate and sodium hydrogen carbonate.

(5) When carbon dioxide is cooled it solidifies and this solid carbon dioxide is called dry ice. It is used as a coolant.

6.6 Catching Fire

You might have heard that when the clothes of a person catch fire, the person is covered with a blanket. Now you know that air is essential for burning. When the person is covered with a blanket, the burning clothes lose contact with air, due to which fire is extinguished. We burn crackers during our festivals. On burning crackers light, noise and many gases are produced. Sometimes this can also be a reason for burning. If you get burnt accidently, get first aid immediately and then consult the doctor.

Have you heard of forest fires? Due to extreme summer heat, dry grass catches fire at some places. From the grass it spreads to the trees and very soon the whole forest is on fire. It is very difficult to control such fires.

6.6.1 How do we control fire?

You must have seen or heard on TV and read in newspapers of fire breaking out in homes, shops and factories. Every town/city/village has a fire extinguishing service, which helps in controlling fire when it breaks out. Find out the telephone number of the fire extinguishing service of your area.

6.6.2 How does a fireman extinguish fire?

You know that to initiate fire three things are essential; they are fuel, air and heat. You can control fire by removing one or more of these things. Fire extinguishers usually control fires either by cutting off the air supply or by reducing the heat of the fuel or both. But in most cases, removing the fuel or reducing its heat is not possible.

Do you know about fire extinguishers? What are the various fire extinguishing systems used at the public places in your neighbourhood? Find out and write about them.

NOW ANSWER THESE

(1) Why does limewater turn milky on passing carbon dioxide through it?

(2) What is dry ice? What is its use?

(3) Which gas is produced after chemical reaction in a fire extinguisher? Why is this gas used to extinguish fire?

WE HAVE LEARNT

- Carbon is a non-metallic element.
- Carbon shows allotropy. Its different allotropic forms are diamond, graphite, charcoal, lampblack and coal.
- Different forms of the same element having different physical properties but same chemical properties are called allotropic forms. In this way the property of having different forms of an element is called allotropy.
- Fullerene is a newly discovered allotropic form of carbon.

- In free state, carbon is found in the form of diamond, graphite, coal etc and in substance form as calcium carbonate, carbohydrates, fats, proteins, vitamins etc.
- Substances which burn are called combustible substances and which do not burn are known as non-combustible substances.
- Carbon combines with hydrogen in different proportions to form hydrocarbons.
- Combustion is a process of oxidation and it liberates heat and light .
- Flame is that area where there is combustion of gaseous substances.
- In the flame on a candle there are three distinctive zones.

  (a) Inner dark zone.

  (b) Middle shining bright zone.

  (c) Outer light-bluish zone.
- In the reaction with sodium carbonate and lemon juice we get carbon dioxide gas. This gas does not help in burning and is acidic in nature.
- Carbon dioxide is used in soft drinks, as coolants, fire extinguisher and dry ice.

QUESTION FOR PRACTICE

1. Choose the correct answer :-

1. Graphite is not used :-

   (a) As lubricant (b) In electrodes

   (c) In pencil lead (d) In cutting instrument.

2. Carbon dioxide converts blue litmus into red, thus it is an :-

   (a) Acidic oxide (b) Alkaline/basic oxide

   (c) neutral oxide (d) none of these.

3. Carbon allotrope with 60 atom is :-

   (a) Fullerene (b) Graphite

   (c) Diamond (d) Charcoal

4. Dry ice is :-

   (a) Solid CO_2 (b) liquid CO_2

   (c) Gaseous CO_2 (d) Solid CO

5. The hardest substance in nature is :-

   (a) Graphite (b) Stone

   (c) Diamond (d) Charcoal

6. Which zone of the flame has the highest temperature?

(a) Inner dark zone (b) Shining and bright middle zone

(c) Light blue zone (d) Unlighted zone

7. Allotropy is a characteristic of : -

(a) Element (b) Compound

(c) Mixture (d) All of the se

2. Fill in the blanks :-

1. Combination of _____ produces flame.
2. Because of its softness _____ is used in pencil lead.
3. _____ is the hardest allotropic form of carbon.
4. Carbon dioxide is a _____ , _____ gas.

3. Say whether the following statements are correct or wrong. Correct the wrong statements.

1. Both graphite and diamond have the same element, carbon in it.
2. Diamond is a good conductor of electricity.
3. The light blue zone in flame is in the middle of the flame.
4. Combustion doesn't take place in the outer zone of the flame.
5. Carbon dioxide is of alkaline nature.

4. Match the following :-

Lamp black and charcoal	-	Solid carbon dioxide
Made of 60 carbon atoms	-	Oxidation
Hardest substance	-	Carbon allotrope
Dry ice	-	Fullerene
Combustion	-	Diamond

5. Answer the following questions :-

(1) What do you understand by allotropy? What are the different allotropes of carbon? Write two uses of each?

(2) How will you differentiate between graphite and diamond?

(3) What is Fullerene? What are its main uses?

(4) Draw a labelled diagram showing the preparation of carbon dioxide.

(5) What is dry ice? What are its important uses?

(6) What are the main parts of candle flame? Explain with a diagram.

(7) Give the reason :-

(a) Diamond is used in ornaments.

(b) Diamond is used in cutting instruments.

(c) Graphite is used as lubricant.

(d) Graphite is used in electrodes.

(e) Petrol is not used in cooking stoves.

(8) The colour of flame in Fatima's gas stove is blue and Rajesh's is yellow. Who will cook faster and why ?

(9) Why doesn't charcoal burn with flames?

(10) Can blue flame be formed inside in the candle. Justify.

TRY TO DO THIS ALSO :

Fire extinguisher -

Place a short candle and a slightly taller candle in a small bowl filled with baking soda. Place the bowl at the bottom of a larger bowl as shown in fig. 6.8. Light both the candles. Then pour vinegar into the smaller bowl containing baking soda. Take care not to pour vinegar on the candles. Observe the reaction that takes place and answer the following -

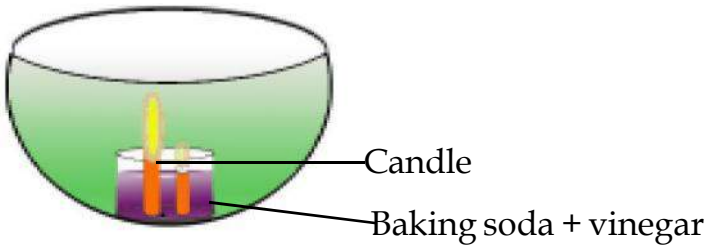


Fig. 6.8 Fire extinguisher

1. What happens to the candles?
2. Why does it happen?
3. In what order does it happen?

7 STRUCTURAL AND FUNCTIONAL UNIT OF OUR BODY - THE CELL

7.1

In the seventeenth century in the year 1665 an English scientist named Robert Hooke invented a simple microscope. Hooke observed a thin slice of cork under microscope invented by him. He found sections like a beehive. He gave these sections the name 'cell' (fig 7.1) From time to time scientists have attempted to study the structure of a cell and after many studies have declared that as a house is made up of small units (the bricks), in the same way our body is also made up of small units. These units are called cells.

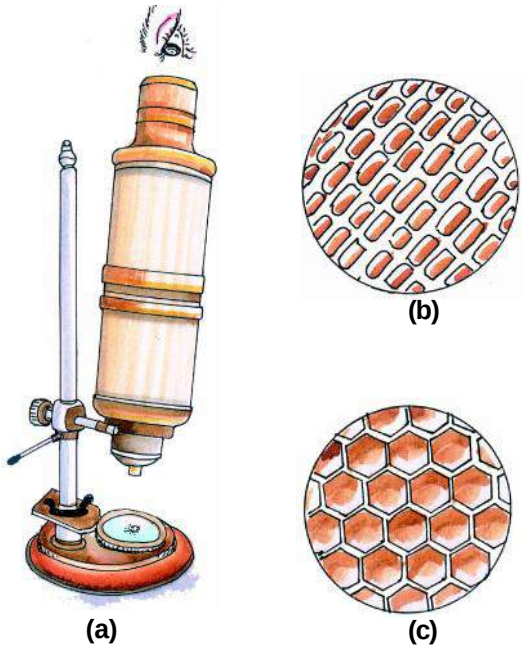


Fig 7.1 (a) Robert Hooke's microscope,
(b) Microscopic picture of cork,
(c) Picture of a honey beehive

Cells are of different shapes and sizes. You may know that some organisms are made of only one cell, as amoeba and paramecium. In these organisms nutrition, respiration, excretion, reproduction and such living functions are performed in a single cell. But in multicelled organisms to perform different function, cells are divided in different groups to perform them. In this way cell is the basic structural and functional unit of life of our body Amoeba is a unicellular organism which can live independently. But if a cell of the cheeks or a cell of onion is removed then they cannot live independently.

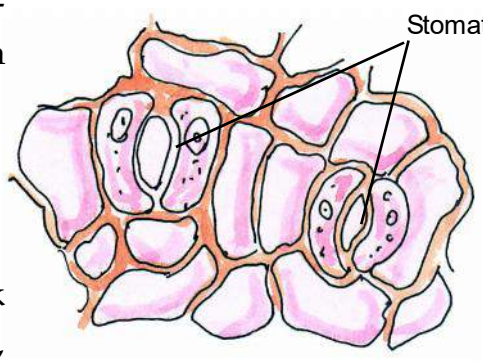


Fig 7.2 Cells of Rhoeo leaf

Activity 1

Materials required : A leaf of Rhoeo (thick greenish violet leaves), slides, coverslip, permanent slide of human blood cells, microscope.

Take a thin slice from the lower side of the leaf. Keep it on the glass slide, add a drop of water and cover it with a cover slip. Now observe it under a simple microscope (fig. 7.2).

Also observe the permanent slide of human blood cells. (fig 7.3).

Are the cells of the leaf and the cells of the human blood same in shape and size ? Now look at fig 7.4. You can see cells of different size and shapes. This proves that there are variations in the shape and size of the cells.

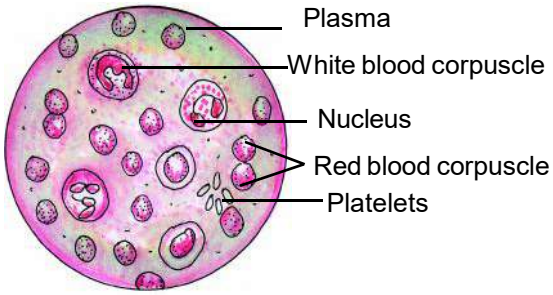


Fig 7.3 Human blood cell

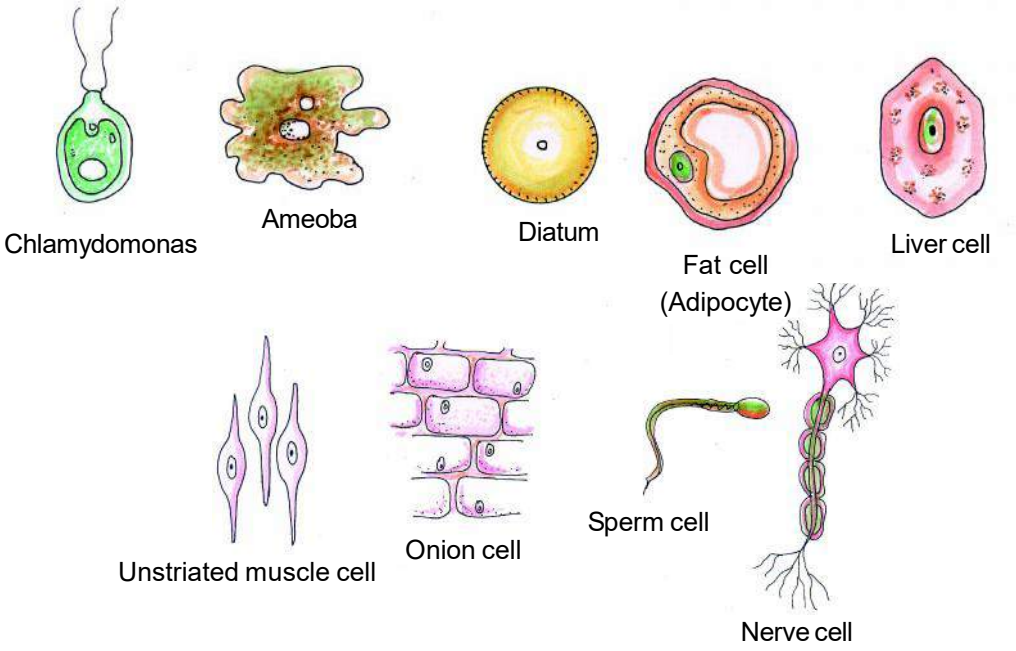


Fig 7.4 Different type of cells

Usually we cannot see a cell without any instrument or microscope but there are some cells which are so big in size that we can see them without a microscope, for example, Yolk of hen's egg.

7.2 STRUCTURE OF A CELL

You have seen that cells are of different shapes and sizes. Even when having such differences, each cell has a definite structure. Come, let us study the structure of a common cell. In your earlier class, you have studied the cell of onion skin. Now prepare again a slide of the onion cell observe it under the microscope and answer the following questions.

1. What is the shape of the cell; rectangular, oval or round?

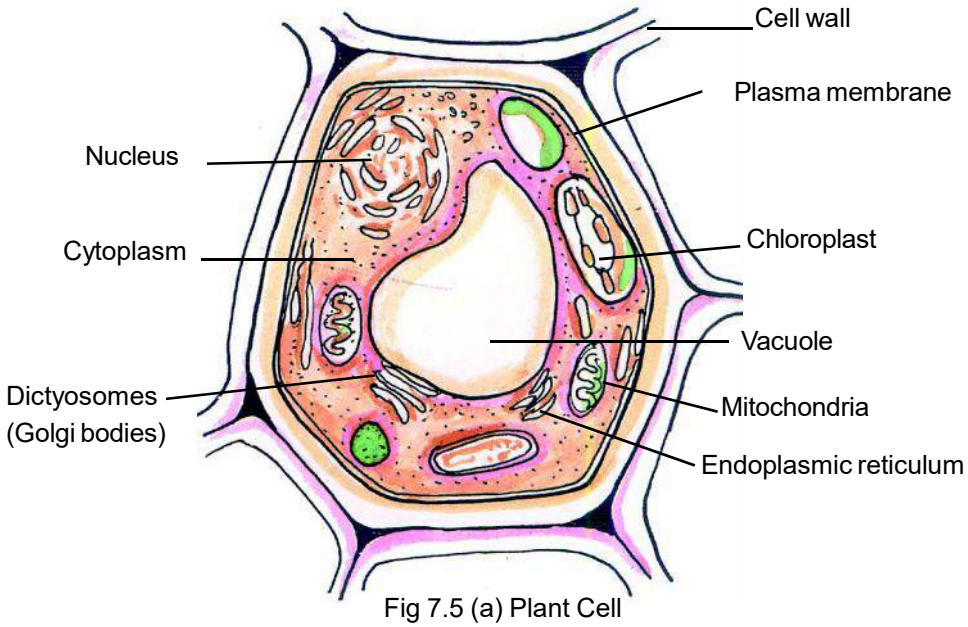


Fig 7.5 (a) Plant Cell

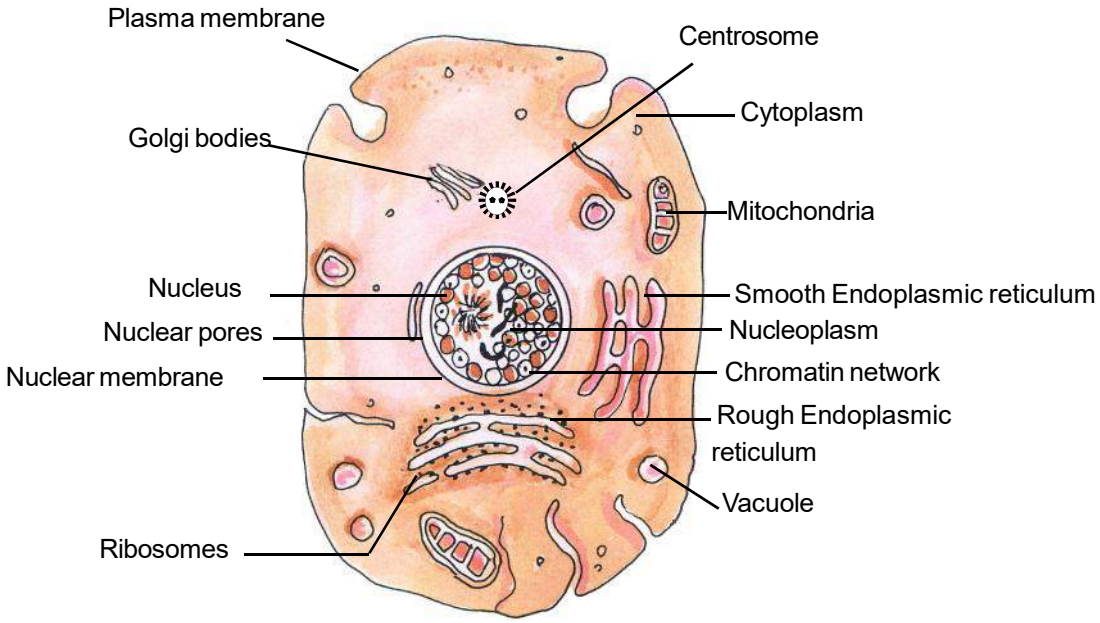


Fig 7.5 (b) Animal Cell

2. Does a cell have a definite margin?

3. Is there any substance filled in the cell?

4. Is there any round structure inside the cell?

Every cell has the following parts -

(1) Outer cell membrane

(2) Protoplasm

7.2.1 OUTER CELL PLASMA MEMBRANE

Every plant and animal cell has around the life substance a thin, elastic membrane which is called **plasma membrane**. This membrane is living and semi - permeable, made of protein and fats. The following are its functions -

(1) It helps in maintaining the shape of the cell.

(2) It controls the flow of different molecules to and fro in the cell.

(3) It protects and supports the cell.

In plant cells there is another cover to the outside of the plasma membrane. This is called **cell wall**. This is made of cellulose and is non-living and determines the outer border of the cell and provides a definite shape to the cell.

7.2.2 PROTOPLASM

In every cell, inside the plasma membrane, there is a sticky fluid substance which is called protoplasm. All the cell organells of the cell which perform the life processes are found in this matter. That is why Huxley, a scientist has called the protoplasm substance as the physical basis of life.

Protoplasm can be divided into two -

(a) Cytoplasm (b) Nucleus

(a) Cytoplasm

The part of protoplasm which lies in between the cell membrane and the nucleus is called the cytoplasm. This has minerals, salts, water, carbohydrates, proteins and fats in it.

Observe fig 7.5 a and b. List the various cell organells (cell bodies) present in the cytoplasm. Come, let us find out about these cell organells -

(1) Mitochondria - See fig 7.5 You will find a double layered round or rod shaped structure with its inner membrane having finger like projections. This is the mitochondria. This is the respiratory centre because here energy is produced by the oxidation of food products. So this cell body is also called the **power house** of the cell.

(2) Endoplasmic reticulum - In fig 7.5 (a) and (b) you must have seen branched, irregular channels forming a network. It is called endoplasmic reticulum. These channels are filled will fluid and help in the transport of materials and it also provides mechanical support to the body.

(3) Ribsomes :- Some bodies are scattered in the cytoplasm near the endoplasmic reticulum they are called ribosomes. The work of these bodies is to produce proteins so they are also called 'protein factories'.

(4) Golgi bodies/Golgi apparatus :- In the animal cell you can see disc shaped bodies arranged in a pile. These are called golgi apparatus. Their function is to secrete various chemical products.

(5) Centrosome :- Now you look at the star shaped body near and over the nucleus in the animal cell. These are the centrosomes. Two small bodies can also be seen in the middle of the centrosome. These are the centrioles. Centrosomes helps in the cell division of animal cell. Centrosomes are also formed in the plant cell during cell division.

Activity 2

Materials required: Algae formed near a pond, lake or any other water source, slides, microscope and water.

Collect the silken green, thread like growth near the ponds or lakes. Place two or three drops of water on the slide and place one or two green threads on it and observe these under the microscope. Draw the diagram of what you have seen in your copy.

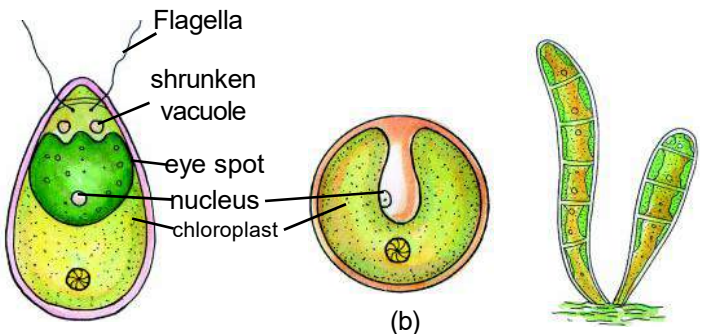


Fig 7.6 Algae found in lakes or ponds

What type of cells do you see here ? Do you find something green in it. The green bodies found in these are the chloroplasts, which help in the preparation of food through photosynthesis in plants. Do you find these in animal cell ? Look again at fig 7.5

(6) Plastids :- Solid bodies found scattered in the plant cells which are ribbon like, oval or round in shape are called plastids. These are of three types -

Leucoplasts :- These are colourless and store food.

Chromoplast :- These are coloured and it is because of these, that flowers & fruits have red, yellow, violet colours. They also help in pollination.

Chloroplast - These are green coloured and help in photosynthesis.

Draw the table 7.1 in your copy and fill in the blanks with the plastids found in the food items.

TABLE 7.1

S.No.	Examples of eatbles	Colour	Type of Plastids
1.	Radish (Muli)	White	Leucoplast
2.	Green Chillies	.....	.....
3.	Ripe Papaya	.....	.....
4.	White Tomato	.....	.....
5.	Green Tomato	.....	.....
6.	Red Tomato	.....	.....
7.	Others	.....	.....

7. Vacuoles - In the plant cell there is one or sometimes two big round or oval shaped bodies. These are the vacuoles. They have a membrane covering with a jelly like substance inside. In animal cells vacuoles are small in size.

NOW ANSWER THESE -

1. What is the outer layer of plant cell called?
2. What are the functions of golgi bodies?
3. Which plastid is found in red apple?
4. Which is known as 'protein factory'?
5. Which is the 'Power house' of the cell and why is it called so?

7.2.3 NUCLEUS

The big round or oval body in the cells shown in fig 7.5 a & b is the nucleus. Different types of cells have different shapes and sizes of nucleus. This is the most important part of the cell. It is from here that all the life processes are controlled. So this is also called the 'control room' of the cell. Come, let us see what the structure of a nucleus is like. (fig 7.7)

Nucleus is covered by a thin membrane.This membrane is called nuclear membrane. This membrane is thin, elastic and semi permeable. This have very small pores

through which there is exchange of materials between nucleus and cytoplasm. Inside the nuclear membrane thick semifluid is filled, which is called nucleoplasm.

The nucleus of the cell was discovered in 1831 by Robert Brown. In 1939, J. Parkinjey named the living substance protoplasm in 1940 after the discovery of electron microscope, the cell organells were identified and studied.

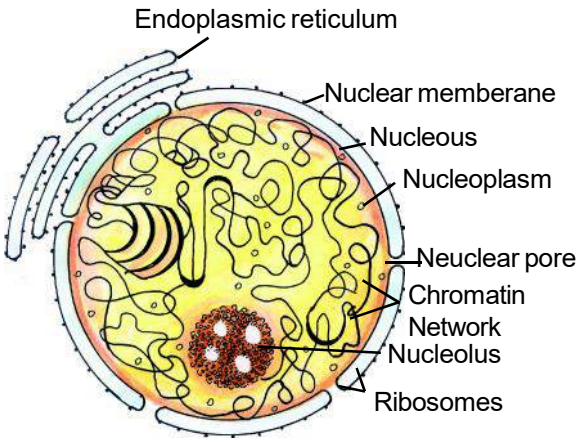


Fig 7.7 Structure of a Nucleus

In the nucleoplasm see the minute thread like network. This is called the chromatin network. During cell division these threads of the chromatin network shrink to form small fat bodies called chromosomes. Chromosomes are made of proteins and DNA (Deoxyribonucleic acid). These transfer heridatary materials from one generation to the other.

In the nucleoplasm, a round or oval shaped body is there which is the nucleolus. This helps in cell division. Draw the given table 7.2 in your copy and fill it -

TABLE 7.2

S.No.	Cell Bodies	Plant cell	Animal cell
1.	Cell wall	Present	Absent
2.	Centrosome	.....	.....
3.	Vacuoles	.....	.....
4.	Chloroplasts	.....	.....
5.	Golgi bodies	.....	.....

NOW ANSWER THESE

1. Which is called the control room of the cell and why is it called so?
2. What are chromosomes made of?
3. What is the function of nucleus?

We have seen that a common cell has mitochondria, golgibodies, centrosome, nucleus etc. Such a cell is called Eukaryotic cell. Most of the living organisms as

amoeba earthworm, frog, cow, rose, humans etc. have this kind of eukaryotic cells. But there are some microorganisms which cannot be seen through naked eyes. In these microorganisms a clear cut nucleus is not seen. This is because they do not have clear nuclear membrane and well defined nucleus. The heriditary material DNA (Deoxyribonucleic acid) lie scattered in the cytoplasm. In these cells some main bodies as mitorchondria, golgibodies, centrosomes, endoplasmic reticulum are also absent. These are called prokaryotic cells. Examples are bacteria, cynobacteria (blue-green algae) etc.

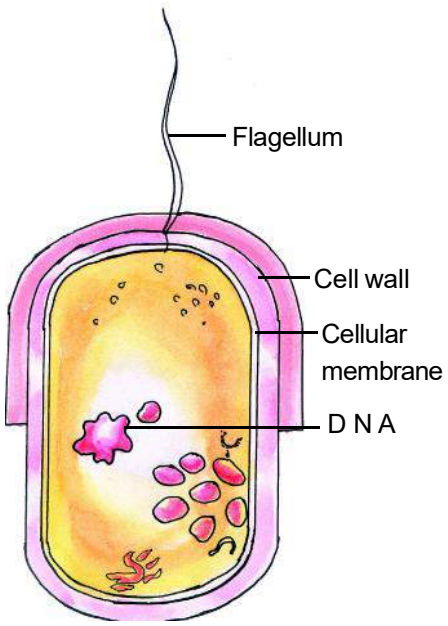


Fig 7.8 Prokaryotic cell of bacteria

Differentiate eukaryotic and prokaryotic cell and write it in your copy.

WE HAVE LEARNT.

- Cell was discovered by Robert Hooke in 1665.
- Cell is the structural and functional unit of all living organisms.
- Plasma membrane is the outer covering of all cells. In plant cell an additional cell wall made of cellulose is found.
- Life substance or protoplasm is the physical basis of life.
- In the life substance or protoplasm the jelly like substance found in between nucleus and cell membrane is called the cytoplasm.
- There are many minute organelles in the cytoplasm which are called cell bodies.
- Mitochondria is the 'power house' of the cell.
- Centrosomes are found in animal cells. They help in cell division.
- In the plant cell, plastids like chloroplast, chromoplast and leucoplast are found.
- The thick, round organelle in the cytoplasm is the nucleus. It is the ' control room' of the cell.
- The DNA present in the chromosomes are the carrier of heriditary features.

- Bacteria and blue green algae are prokaryotic cells. They do not have nuclear membrane and a well defined nucleus.
- Eukaryotic cells have a well developed nucleus and all cell organells.

QUESTION FOR PRACTICE

1. Choose the correct alternative :-

(1) Cell wall of plant cell is made of :-

(a) Protein (b) Fats

(c) Cellulose (d) Protein and fat.

(2) The power house of the cell is :-

(a) Centrosome (b) Ribosome

(c) Nucleus (d) Mitochondria

(3) Protein synthesis in the cell is done by :-

(a) Ribosome (b) Plastids

(c) Vaculoes (d) Nucleus

(4) Example of Prokaryotic cells is :-

(a) Euglena (b) Amoeba

(c) Paramoecium (d) Blue green algae

(5) Nuclear membrane is not present in :-

(a) Onion cells (b) Bacterial cells

(c) Inner cheek cells (d) Hydra cells

2. Fill in the blanks.

(a) The control room of the cell is .....

(b) The cell was discovered by .....

(c) ..... shrinks to form chromosomes.

(d) In a prokaryotic cell DNA is scattered in the .....

(e) Green colour of plants is due to.....

3. Match the following.

Centrosome	-	carrier of genetic material
Protoplasm	-	helps in cell division
Endoplasmic reticulum	-	Plasma membrane
Semi permeable membrane	-	transport of materials in the cell
Chromosomes	-	physical basis of life.

4. Answer the following questions :-

1. Why is cell called the functional unit of life?
2. What is the function of plasma membrane?
3. Which structure is there outside the cell membrane in the plant cell and what is it made of?
4. Write three differences between plant cell and animal cell.
5. What is the function of chloroplast?
6. Draw diagram of plant cell and animal cell and write the name of all the parts of the cell.
7. Why the cells are of different shapes and size ? Give reasons.

TRY TO DO THIS ALSO

1. Make the model of any one cell of the following by using the different materials found around your surrounding.

   (1) Plant cell (2) Animal cell (3) Bacterial cell

2. Divide the class in groups of six. Each group will select a part of the cell and write its functions on drawing sheets.

8 MICRO - ORGANISMS : A WONDERFUL WORLD

8.1

If a small amount of curd is added to the milk, the whole milk turns into curd slowly. In the same way fruits and vegetables kept for a long time start decaying. Sometimes, we suddenly fall ill. Come let us try to know why does this happen and what are the root causes for it?

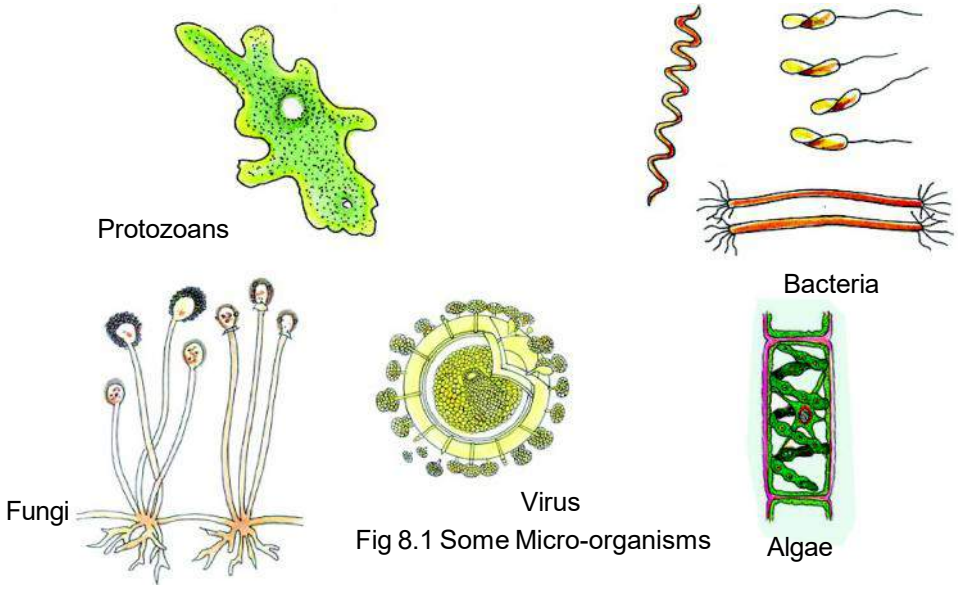


Fig 8.1 Some Micro-organisms

You know that in our earth there are different types of living organisms like trees, plants, elephants, human beings, birds, fish, ant, etc. All these can be seen with our naked eyes. These are called macro-organisms. But these are not the only ones in the living world. There is another world of organisms which cannot be seen with our naked eyes, but their presence is felt. Such organisms can be seen only through a microscope so we call them micro organisms. It is these micro organisms which turn milk to curd, decay the materials and are the cause of some diseases (fig 8.1).

8.2 Come on let us see how small they are

As we see, in the animal kingdom there is a vast difference in size and shape, (an enormous elephant and a tiny ant). In the same way there is great variety among the micro organisms also. An amoeba is three times bigger than any common bacteria. Some micro organnisms can be seen through a simple microscope. For example : amoeba, paramoecium etc. Apart from these, some micro-organisms as algae, fungi

etc. can be seen if they are in groups but to see any individual one we have to use the microscope. Some micro-organisms cannot be seen even through a simple microscope also. They can only be seen by a more powerful electron microscope as bacteria virus etc.

Micro-organisms are very small in size. So, to measure their length and width, micro units are used because centimetre, milimetre are too big for their measurement.

Come, let us try to understand this -

Draw a line of 1 mm length with a scale you use for measuring. Now if you can divide this 1 mm line into 1000 parts then each divided part will be of one micrometres. We cannot see things which are smaller than 100 micrometres. Paramoecium is about 100 micrometre. Some organisms are even smaller than paramoecium. They are measured in nanometres.

If one micro metre is divided into 1000 equal parts, then each divided part is equal to 1 nanometre. The Polio virus coccus is of 28 nanometre in diameter. Now you must have understood how small micro-organisms are.

8.3 Where do we find micro-organisms

You may be surprised to know that micro-organisms are found everywhere in the earth. This means that they are present in air, water, soil, on the body and inside the body of all living organisms. In the hottest regions and in the coldest regions of the earth also these micro-organisms are found and they can live in all type of conditions.

Activity -1

Materials required : Plastic/Glass bottle, microscope, glass slide, dropper.

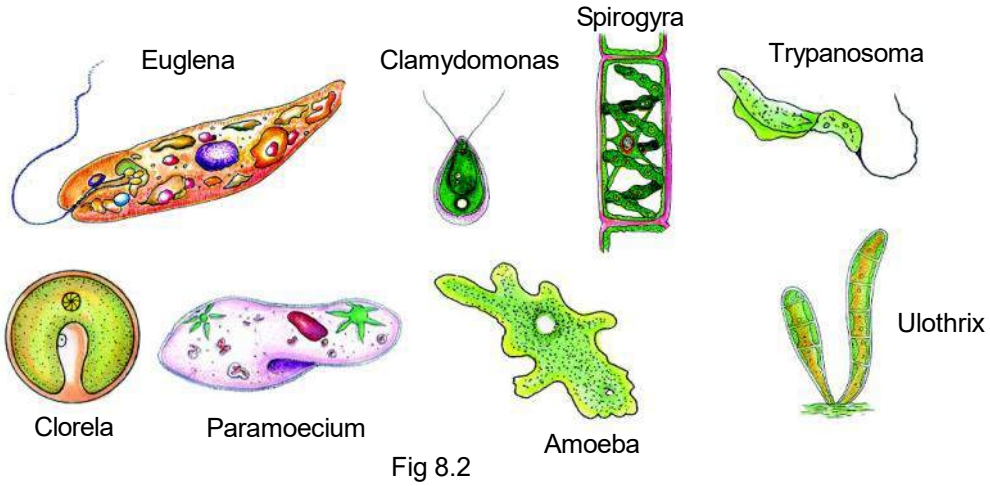


Fig 8.2

Collect a bottle of water from a pond or tank where water has accumulated for some time. Place a drop of this water on a glass slide and observe it under a microscope and compare it with the picture at 8.2. Try if you can draw the diagram of the microorganisms you have seen.

8.4 TYPES OF MICRO-ORGANISMS

You have seen that a drop of water has many different micro-organisms out of which some are unicellular and some multicellular. These are usually of five types -

(1) algae (2) fungi (3) protozoa (4) bacteria (5) virus.

8.4.1 Algae

Algae are usually found in water or moist places. You must have observed that in wet, moist places, ponds or in accumulated water of rivers, there are some green or grey layers. These are algae, which are also called slimy mould. Algae are usually green red or brown (fig 8.3) Their colour is due to the presence of a particular pigment. Write the name of the pigment present in green algae and also the name of the process by which they prepare food.

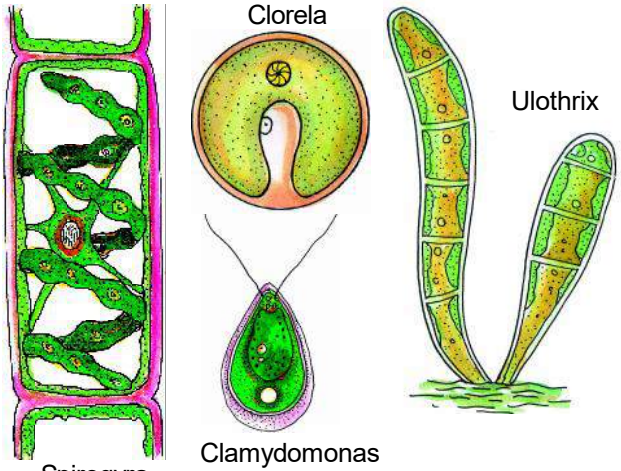


Fig 8.3 Some Algae

Activity 2 (Demonstrated by teacher)

Materials required : Small glass bottles, microscope and algae.

Collect algae of water from different sources like accumulated water of tanks, rivers, ponds, lakes. Observe each sample collected to find the difference in their colour, shape and compare them to the fig 8.4. Now answer these questions in your copy.

1. Is the structure of all algae the same?
2. Draw diagrams of the algae you see through the microscope and compare them to the ones given in your book. Point out the features for recognizing them.
3. Write the similarities and dissimilarities among the different algae you have seen.

In this way you have seen that mostly all algae are green in colour and have different shapes. Algae are the main food of water animals. Also it is used by human beings as food and also in factories as medicine, cosmetics, paints, printing, iodine and other products.

Giving cattle food to animals

To get more milk from milk producing animals, special cattle food is given to them. For example Sani is a mixture of chaff, oilcake, jaggery etc. which is soaked in water overnight. The micro organism react with food materials in the cattle food and increases the nutritive value of the food.

8.4.2 Fungi

You must have seen moulds which appear on pickles, jams, fruits, vegetables wet clothes, old shoes, walls, wood etc. in the form of yellow, black, grey-spots. Actually they are different types of fungi (fig 8.4).

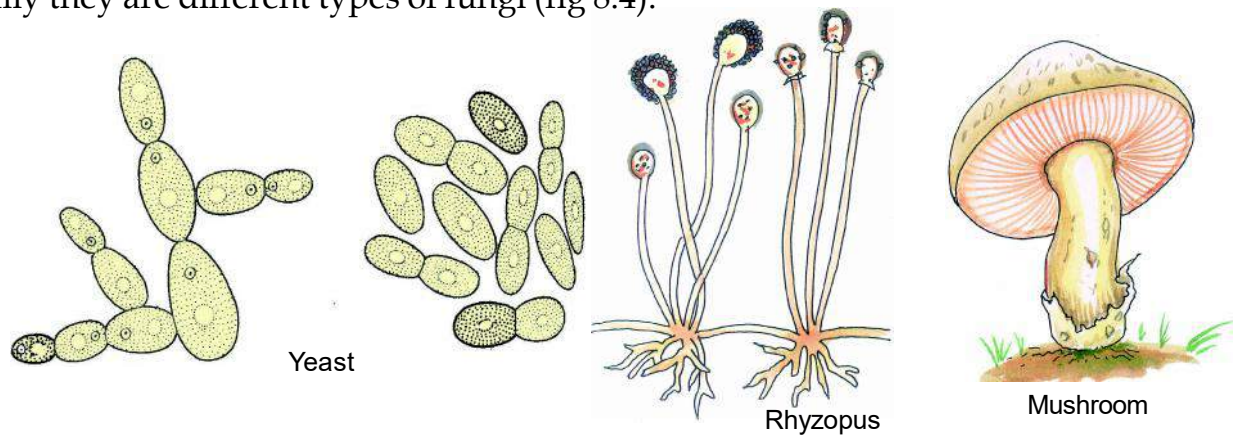


Fig 8.4

Come, let us grow fungi and then observe them minutely.

Activity 3

Materials required : A piece of bread, microscope, slide, cover slip.

Wet a loaf of bread with a little water and keep it covered in the less lighted area. After three or four days observe it minutely. Write the difference you find in the bread in your copy.

Now scratch the grey coloured stain (mould) formed on bread and place

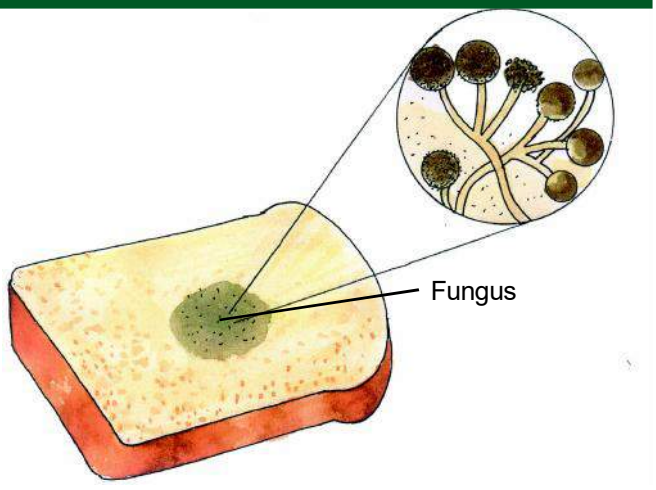


Fig 8.5 Fungus on bread

it on the glass slide after mixing it with a few drops of water and observe the slide under the microscope. Compare it to fig - 8.5.

On seeing through the microscope you see the fibres of fungi and round shaped spores floating in the water. Most of the fungi are thread shaped structures. You must have seen mushrooms growing in the ground or wet wood during rainy season. These are also a type of fungus of bigger size.

Come, let us see in what condition fungi can multiply.

Activity 4

You can do this in groups of 5-6 students.

Materials required : Ten small polythene bags, candles, match box, bread.

Break a bread slice into ten pieces. Put each into a polythene bag and keep each in conditions according to the given table. See to it that dry bread means that the bread is completely dried. Those bags which are to be closed must be sealed by heating its end on a candle fire. Let the bags be kept as such for 5-7 days and then observe them.

Now draw the table given below in your copy and write your observations.

TABLE 8.1

S.No.	Particular Conditions	Growth in fungus much/less/nil
1.	Dry piece of bread-open and kept in light	.....
2.	Dry piece of bread-open and kept in dark	.....
3.	Dry piece of bread-closed and kept in light	.....
4.	Dry piece of bread-closed and kept in dark	.....
5.	Wet piece of bread-open and kept in light	.....
6.	Wet piece of bread-open and kept in dark	.....
7.	Wet piece of bread-closed and kept in light	.....
8.	Wet piece of bread-closed and kept in dark	.....
9.	Piece of bread with fungus on it in an open bag	.....
10.	Piece of bread with fungus on it in a closed bag.	.....

As per the observations, write in your copy the favourable conditions for the growth of fungi.

You must have heard and seen that in idli or dosa or jalebi preparation, and in the preparation of bread a particular thing is added to the batter. This is called 'Yeast' or 'Khameer'. Yeast is a saprophyte, fungi which is present in soil and air. This can be kept in dry form for years as powder or small pills. This is easily available in market. Sometimes even without adding yeast in idli and dosa, the batter rises. Now write the answers to these in your copy.

All fungi are parasites or saprophytes. Think why it is so, discuss it with your teacher and write the answer in your copy.

1. *Why is it necessary to add yeast in the batter of idli, dosa and bread?*
2. *Why does the batter rise even when yeast is not added?*

When you eat chapattis, puris, parathas and bread, you find that bread is the most spongy and softest. Come on, let us see, why it is so ?

Activity - 5

Material required: One bowl of wheat flour, yeast, two test tubes, luke warm water, two bowls or plates, half teaspoon sugar, cotton.

Clean and dry your hands properly. Divide the wheat flour into the two bowls. Add 1 teaspoon of yeast in both bowls. Name them as 'A' and 'B'. Now add ½ tsp sugar in bowl 'A'. Add water to 'B' bowl flour and make soft ball of it. Now make ball of 'A' bowl flour also. Now put these balls into two diffrenet test tube and mark them. Label each testtube accordingly as 'A' and 'B'. Observe every 10 minutes and mark the rising of the balls on the test tube.

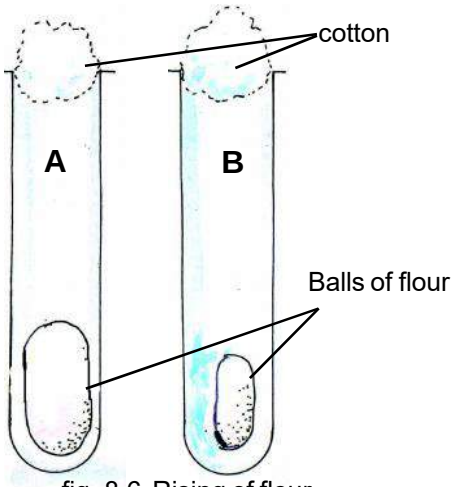


fig- 8.6 Rising of flour

Now answer these questions in your copy -

1. In which test tube has the flour risen more? What may be the cause?
2. How has adding sugar to the flour affected the rising of the flour?
3. Is any special food item needed for yeast to multiply?
4. From where did the air come to inflate flour ball?

Yeast is a living organism. So it also needs food, water and energy. It breaks down the sugar for energy and liberates carbon dioxide. This process is called **fermentation**. By this process the batter for idli, dosa, jalebi and bread is prepared. The carbon-di-oxide formed in the process is trapped in the batter and when the batter is heated or baked, it escapes, making the food item soft and spongy. Now you know why bread is soft and spongy.

Come, let us see which gas is there in the balls of hour -

Activity 6

Materials required: Six test tubes, test tube stand, three balloons, yeast, sugar, jaggery, alkaline phenolphthalein solution, water.

Label the three test tubes as 'A', 'B' and 'C'. Take a little water in each. Add two teaspoons of sugar in test tube 'A' and 'B'. Add a small piece of jaggery also in test tube 'B'. Now add yeast in test tube 'A' (fig 8.7). Close the three test tubes with balloons. Expand and dilate the ballons before using them on the test tubes. Place the test tube on the stand and keep the stand in some warm dark place. Observe these for three to four days. When you find any balloon expanded then you can do the next experiment and also answer these questions.

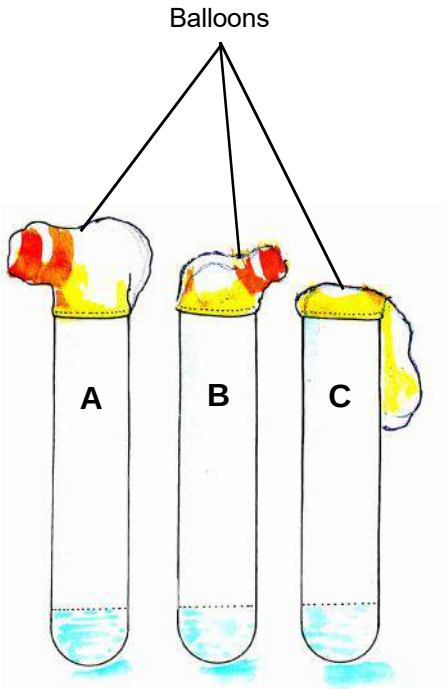


Fig 8.7

1. Balloon of which test tube expanded the most? What may be the reason?
2. Balloon of which test tube has expanded the least ? What is the reason?
3. Balloon of which test tube has not expanded at all and why is it so?
4. What is the name of this process? (You have learnt this in your earlier classes also.)

Now we have to see which gas is filled in the balloons. Take three more test tube. Fill each about one fourth part with alkaline phenolphthalein solution. Remove the balloons from the test tube carefully such that the gas does not escape. Now tie these balloons to the phenolphthalein solution test tubes and shake the test tubes. Note which test tube's phenolphthalein solution has a change in colour.

You know that by fermentation process, wine, beer and vinegar is prepared. There are other uses of fungi also. The mushroom which is called Kukurmutta, Khumbi and Futu is also fungus. They have much minerals and proteins in them so they are very nutritious food. Many medicines as penicillin etc. are made from other fungi.

Some fungi are harmful, which occur on different materials and food items in moist weather and spoil them. Some fungi cause diseases in plants and animals. The skin disease of ringworms is also caused due to fungus.

Fungus and Potato

Fungus can also destroy crops and plants. You may be surprised to know that in the nineteenth century the potato crop of Ireland was completly destroyed by a parasitic fungus and there was famine because potatoes are the staple food of Irish. Due to this famine many lost their lives of hunger.

Now answer these -

1. If the water of the tank is not cleaned for a month, tell what all micro - organisms may be present in it?
2. Why cannot we see the Amoeba and Paramaecium with our naked eyes?
3. Why do the leather shoes get moulds in rainy season?
4. Why is it necessary to dry coriander, cumin seeds and pulses before storing them?
5. Usually algae are not parasites. Explain the reasons.

8.4.3 PROTOZOA

You must have read about amoeba, paramecium, euglena (fig. 8.8). These are all easily avaliable unicellular protozoans. As all other micro-organisms, these are also found in water, plants, animal body and soil. In some protozoa there are one or more fibre shaped structures, with the help of which they move about in water.

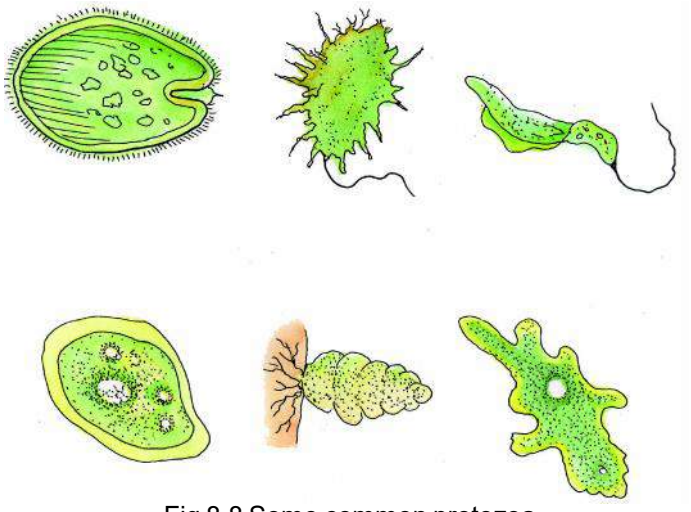
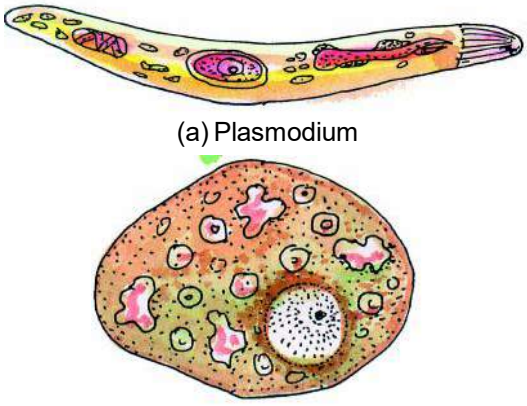


Fig 8.8 Some common protozoa

You know the malaria disease is caused due to the bite of female anopheles mosquito. You may be surprised to know that this mosquito is a carrier of malarial germ, a protozoa named Plasmodium (fig 8.9 a). The mosquito carries these from a diseased person to a healthy person.

Some other protozoa like Entamoeba (fig 8.9 b) and Giardia also are the cause of some diseases in man and animals. They cause common diseases like dysentry.



(a) Plasmodium

(b) Entamoeba

Fig 8.9 Some general protozoa

8.4.4 BACTERIA

These are found all around us. They were first of all discovered in 1675 by Antonio-Leewanhawk who observed it through a microscope which he had himself prepared. Bacteria are usually round, rod shaped or spiral in shape. (fig 8.10)

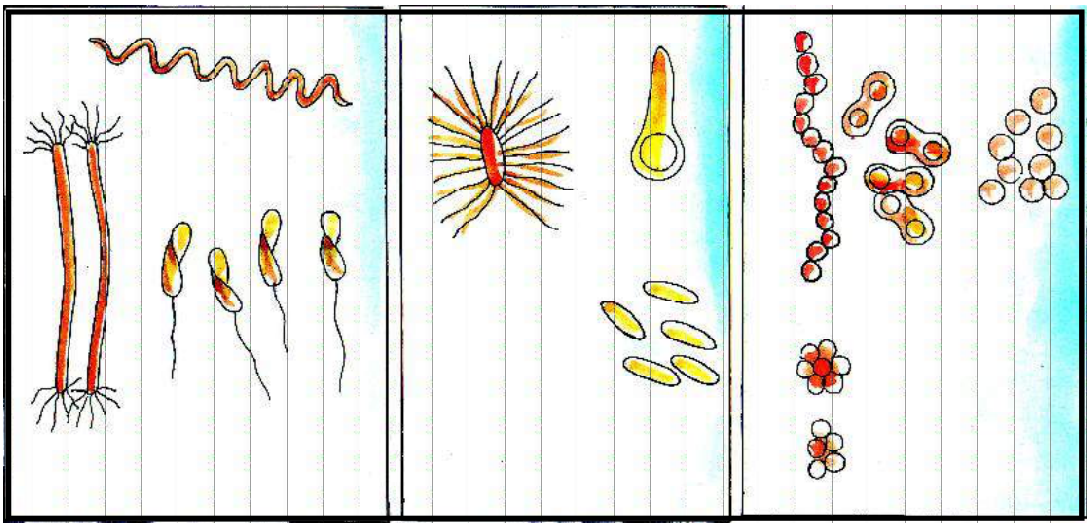


Fig 8.10 Different shaped bacteria

Come, let us find out something about bacteria.

Activity 7

Go to some farm, garden where some leguminous plants as pea, bengalgram fenugreek etc are grown. Observe the root of any of these plants. Observe any other plant which is not a legume and draw its diagram. Now compare the two.

In which root do you find node like structure?

In the roots of plants of pulses as bengalgram, pea, there are nodes in which there is a bacteria known as Rhizobium. This is a symbiotic bacteria. This bacteria coverts nitrogen present in the atmosphere to nitrogenous substances; which makes the soil nutritious. So this bacteria is considered by the farmer as a friend (fig 8.11)

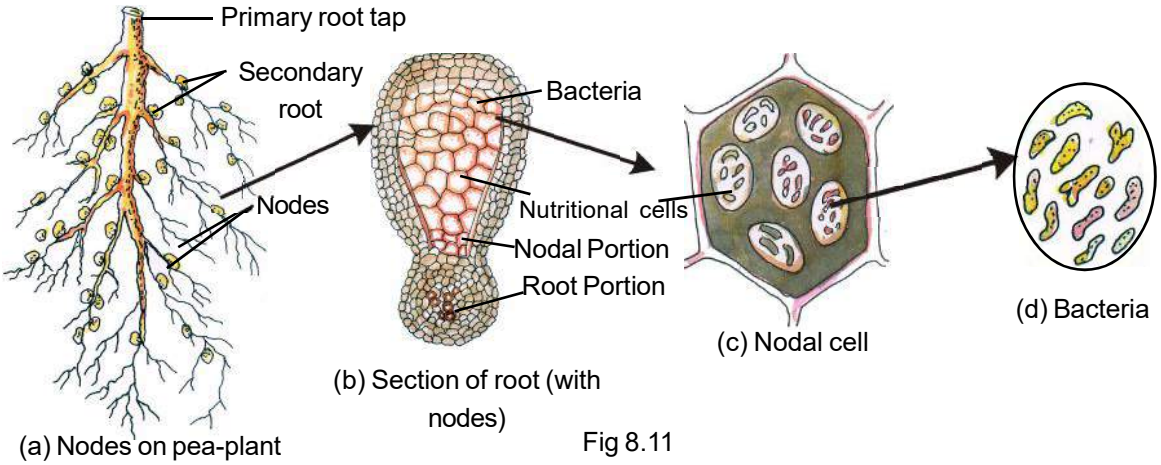


Fig 8.11

Activity -8

Materials required : Two bowls, milk, curd, spoon, heating apparatus.

Take lukewarm milk in both the bowls. Put a quarter spoon of curd in the first bowl and let the second milk bowl remain as it is. Cover both the bowls. Observe them, after 4-5 hours and write the answers to the following questions in your copy.

1. In which bowl was the curd formed?
2. Why was curd formed?

The bacteria named Lactobacillus present in milk turns glucose to acidic product. Due to this milk thickens to form curd. These bacteria multiply and grow fast in luke warm milk (about 37°C) so as to form curd. We keep the milk in a warm place and after the curd is formed we keep it in a cool place or fridge. So that the growth of the bacteria is slowed down and curd does not turn sour.

Some bacteria are present inside the bodies of animals as cow and deer. In herbivorous animals bacteria present in their alimentary canal help in the digestion of cellulose.

Some bacteria help in tanning of leather, turning fruit juices or glucose to vinegar and many such industries.

Sometimes some old things in our houses give out a foul smell. It is because microorganisms act on food and other biotic products as leather, wood, dead animals etc. and decay them. This process is called fermentation. This process can be benefial and also harmful. Continuous fermentation make the environment, pollution free and manures are made by this process.

Talk with your family members and write in your copy how food items can be saved from being spoiled.

Bacterias are helpful to us but they can be harmful also. They cause diseases in living organisms. In human being many diseases as cholera, tuberculosis (TB) tetanus, pneumonia, diphtheria, leprosy are caused by bacteria. You will read more about these diseases in the chapter "Common diseases".

NOW ANSWER THESE

1. Herbivorous animals can easily digest grass but humans cannot. Why? Give reasons.
2. Fruits, milk, vegetables, egg, meat kept in the fridge do not get spoilt for a long time. Why?
3. If we add a little curd to fresh milk, will it turn to curd?
4. Why do we boil milk before using it?
5. Due to which organism is malaria caused? Write about it.
6. How does leguminous plants make the soil more fertile?

8.4.5 VIRUS

These are very minute. Compared to other micro-organisms these are so small that they can only be seen under an electron microscope. They can multiply only on other living organisms. Their presence can be felt by their effect on the organism. Such virus which are present on plants are called plant virus, those present in animals are called animal virus and those present on bacteria are called bacteriophage. Bacteriophage virus is present in Ganga water. It is not certain if they are liv-

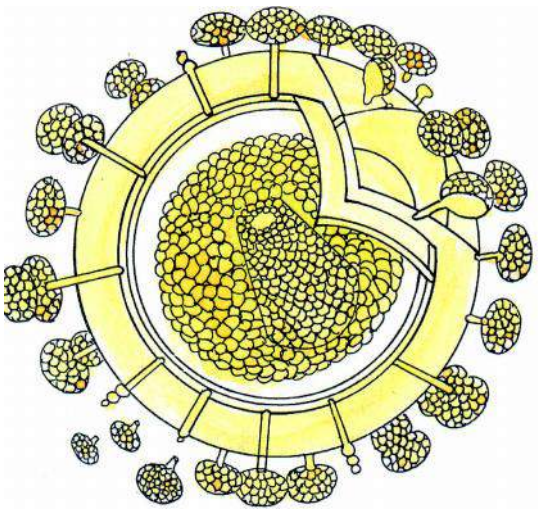


Fig 8.12 AIDS virus

ing or non living because outside a living organisms they are as inactive as a nonliving things. So some scientist believe them to be the link between living and nonliving (fig 8.12)

Some diseases as cold,fever, flu, eye disease (conjuctivities) are diseases which spread very fast. Apart from these rabies, polio, measles, AIDS are some more viral diseases found in man. Virus causes diseases in other animals and plants also. You must have known from news-papers, radio, television about HIV and AIDS. There is no known cure for this disease but with proper precautions we can be safe from this disease. That is why media is propogading about this. Collect knowledge about AIDS and answer these questions in your copy.

1. Why is virus known as bridge between living and non-living ?
2. What is the full form of AIDS and HIV?

8.5 Attack of micro-organisms and our fight against them

We have seen that around us in our water, soil and food products there are many disease causing microorganisms which through contaminated water, food, air, diseased blood and through carrier medium enter our body. But we donot always fall ill. It is because of our body's resistance power to fight against these germs. First of all the mucus of our skin, nose, throat, tears and hair of our nose etc. tries to stop these microorganisms. Some germs are expelled out through urine and sweat and some even when present in our body do not harm us. You have read that our blood has white blood corpuscles which acts as an army for inner security and attacks all germs which enter our body and destroy them.

When we have some disease then our body prepares a resistance power against it and our body becomes ready to fight the disease.In some diseases as polio, measles, small-pox, tuberculosis etc. by vaccination the resistance power of the body is developed.

When the resistance power is decreased, the number of germs increases fast. The disease spreads and causes fever and the other symptoms of the disease is seen. In such a case the doctor must be consulted and proper medication must be taken.

NOW ANSWER THESE

1. Your friend has cold and fever. On being together, you also get infected with cold. Why ? Give reasons.
2. You are suffering from cold and even though being together with you, some of your friends donot get infected and some do get infected, Why is it so?
3. Name a disease which has no cure but by taking precautions the disease can be avoided.
4. Why are virus called strange compared to other living organisms?

WE HAVE LEARNT

- There are many types of living-organisms in our earth. Those which can be seen by our naked eyes is called macro organisms and those that cannot be seen is called micro-organisms.
- Micro-organisms are found in air, water, soil, inside and on living organisms. That is they can survive in any condition and are found in all places.
- The different kinds of micro-organisms are algae, fungi, protozoa, bacteria, virus.
- Micro-organisms are both beneficial as well as harmful.
- Beneficial micro-organisms are used in many industries and in preparation of many food items as curd, bread, idli, dosa etc.
- Harmful micro-organisms produce different diseases in different living organisms. Decay of things and food spoilage is due to harmful microorganisms.
- Our body has resistance power against disease causing germs. The resistence which helps us to fight infections. This is called disease resistance power.
- If the resistance power is less in our body then the number of disease germs increase and the disease spreads.
- To protect us from diseases caused by microorganisms we must adopt clean and healthy habits.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative :-

(1) Thing which cannot be seen by naked eyes are of the size -

(a) Smaller than 1 micron (b) Smaller than 10 micron

(c) Smaller than 100 micron (d) Smaller than 1000 micron

(2) The first person to see micro organisms by observing bacteria through the self made microscope was -

(a) Robert Hooke (b) Antonia Leewan Hawk

(c) Edward Jenner (d) Louis Pasteur.

(3) The germs causing malaria is -

(a) Bacteria (b) Virus

(c) Protozoa (d) Fungi

(4) The micro-organisms present in the roots of bengal gram is -
(a) Bacteria (b) Virus
(c) Protozoa (d) Fungi

(5) Mushroom is a .....
(a) Protozoa (b) Algae
(c) Flower (d) Fungi

(6) HIV/AIDS is caused due to -
(a) Bacteria (b) Virus
(c) Protozoa (d) Fungi

2. Answer the following question in short :-

(1) How does boot polish protect leather shoes?
(2) Why does curd sometimes turn bitter?
(3) Why must the milk be lukewarm when curd is to be made from it?
(4) How does the leguminous plants increase the fertility of the soil?
(5) Why must we safe guard food items from micro organisms?
(6) What are the medium through which micro organisms enter our body?
(7) Must we use the handkerchief used by a person suffering from cold and fever or not? Explain with reasons.
(8) What happens, when our body looses its resistance power?
(9) Why is cleanliness necessary for being healthy?
(10) What will hapen if a small amount of curd is added to milk to prepare curd and then heated.
(11) Why do the doctors advice us to drink boiled water ?

3. Write difference between -

(a) Bacteria and virus
(b) Algae and fungi
(c) Micro organisms and Macro organisms.

TRY TO DO THIS ALSO

(1) With the help of your teachers relatives, newspapers and magazines try to make a list of beneficial and harmful processes caused by micro-organisms.
(2) Collect articles about micro-organisms from newspaper, maganizes and other media.

9 REFRACTION OF LIGHT

You know that any plane mirror will form a single reflected image. In your previous class you have made kaleidoscope. Take two plane mirrors, set them at right angles to each other with their edges touching. Place an object like a candle between them. Guess, how many images would be seen? Do this activity yourself or with your friends.

Now place the mirrors at different angles as 45^o, 60^o, 120^o, 180^o and place a candle or any object between the mirrors. Note the number of images formed in each situation. Finally, place the mirrors parallel to each other. Now see how many images are formed. Placing the mirrors at different angles makes the formation of many images (multiple image formation) which is used to make different patterns. This is used in textile industry in making designs.

You know that when the rays of light fall on any shiny surface, they are reflected. According to the laws of reflection, the angle of incidence is always equal to the angle of reflection and the ray of incidence, the ray of reflection and the normal at the point of incidence all lie in the same plane. Can you tell what happens when light rays pass through water?

9.1

We can see through transparent materials as air, water, glass etc. because light rays can easily pass through them. Such transparent material are called optical media. These media can be as dense as glass and water and thin or rare as air.

Let us see what happens when a light ray passes from one optical medium to another optical medium.

Activity 1

Materials required: One cardboard, glass, water, pin and a spoon of milk, torch.

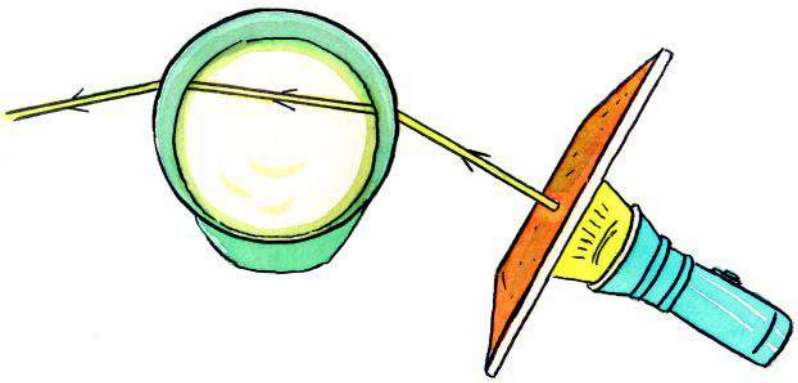


Fig 9.1 Bending of light rays in change of medium

Fill the glass half with water and mix milk in it. Water becomes milky. With the help of a pin pierce a hole in the cardboard. Now place the cardboard over a lighting apparatus (torch) such that the light passes through the hole and touches the water in the glass. On seeing from above the glass, you will find that the light is passing through the milky water in the glass. Observe clearly the line of light ray which passes through the glass. Do you find any change in the rays (fig 9.1)?

When light passes from one optical medium (air) to another optical medium (milky water) we find the ray bend at the contact point of the two media. Bending of light rays due to change of media is called refraction of light.

Activity - 2

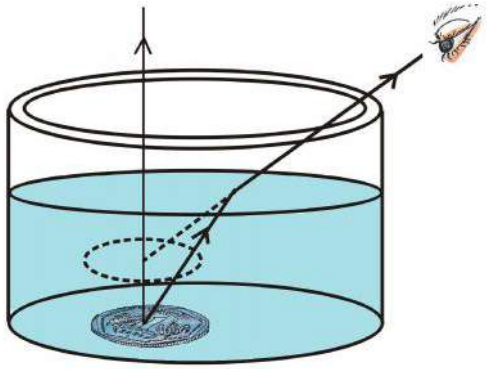


Fig 9.2 Coin appears to be raised from the bottom

Materials required: A bowl, a coin, a glass of water.

Place the coin in a bowl. Stand a little away from the bowl and try to observe the coin with one eye. Now adjust yourself such that the coin disappears.That is the light rays coming from the coin is stopped by the walls of the bowl and doesnot reach you (fig 9.2).

Now stay in the same position and ask your friend to fill the bowl with water slowly so that the coin is not disturbed. You must also not move and keep your neck and eyes as it is.

Do you now see the coin? Till now the light rays from the coin was stopped by the walls of the bowl. Now what happens is that when the bowl is filled with water you could see the coin. How?

Of course, it is due to refraction. On filling the bowl with water the light rays from the coin, on reaching the surface of the water get refracted (bend) and could reach your eyes and you could see the coin. The assumed path of light rays are shown in fig 9.2.

9.1.1 Refraction of light through a glass slab

Activity - 3

Materials required: Glass slab, a plain mirror, black sheet of paper, a white paper, blade or scissors, scale, protractor, rubber band.

Cover the mirror with black paper and make a small hole on it. Now place the white paper on a table or flat surface in such a way that the sun rays reflected by the mirror passes through the hole in the black paper & falls on it. If you shade the white paper you could see the ray more clearly.

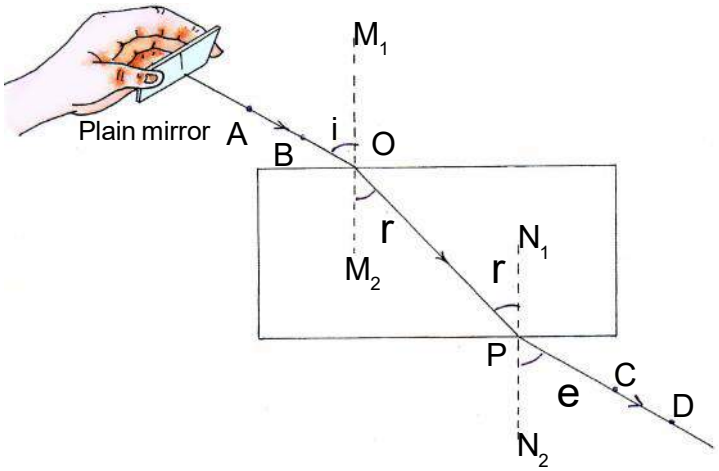


Fig 9.3 Refraction through a glass slab.

Now place the glass slab on the white sheet in such a way that the light rays fall on its length. Draw the outline of the glass slab on the paper and mark the point of the incidence. According to fig 9.3 mark the incident ray as AB and the point of incidence as O and draw a perpendicualr normal M_1, M_2 at O to the glass slab.

Now place the glass slab back at its place and with the help of plain mirror point the rays at O through line AB. On placing the plane mirror at the correct place, you will find the ray of light passes through the glass slab in a straight line to the point P and from there it gets refracted to air again and forms the path CD. Keeping the incident ray stable, ask your friend to mark point P and the outgoing rays at C and D. Now remove the slab and join point O and P. Join P and C also. Also draw a perpendicular N_1N_2 at P point to the glass slab. Your figure will be similar to fig 9.3.

This figure tells us that the incident ray AB when it enters the glass from air at O bends towards the perpendicualr normal M_1M_2 and goes further as the refracted ray OP. This ray OP goes into the air medium again or comes out as CD from the glass slab. Second time at point P the line OP becomes incident ray and CD the outcoming refracted ray which moves away from the perpendicualr normal N_1N_2. So by this activity we see the light rays refrects twice from air to glass and from glass to air. And it also shows the effect and direction change. In this condition air is a rarer medium and glass is a denser medium.

Observe the figure of the experiment and answer these

1. When light travels from a rarer medium (air) to a denser medium (glass) the refracted ray bends in which direction - towards the perpendicular normal or away from it?
2. When light travels from a denser medium glass to a rarer medium (air) the ray bends towards the perpendicular normal or away from it?

In fig 9.3 the angle $\angle AOM_1$ formed between ray AB and the perpendicular M_1M_2 is called the angle of incidence and is denoted by $\angle i$. In the same way the refracted ray OP and the perpendicular M_1M_2 makes the angle $\angle M_2OP$ is the angle of refraction and is denoted by $\angle r$.

From figure 9.3 you can understand that both perpendiculars M_1M_2 and N_1N_2 are parallel and so $\angle M_2OP$ and $\angle N_2PO$ is similar. You can confirm it by measuring the angles in the figure.

So at point P on second refraction the angle $\angle N_1PO$ will be the angle of incidence and is equal to $\angle r$ and the outgoing ray PCD form the angle $\angle N_2PD$ at point P is the refracted angle which we will denote by $\angle e$. This angle formed on the second refraction is also angle of refraction. With the help of the protractor measure $\angle i$, $\angle r$ and $\angle e$ and note them in your copy and check the conclusions given above in 1 and 2.

In this activity you can change the angle of incidence $\angle i$ and find out if the same conclusions are true or not.

Activity - 4

You can do activity 3 in such a way that the incident ray is in the same direction with M_1OM_2. Does the incident ray deviate from its line after refraction?

From activity 3 and 4 you can form the definition in your own words. With the help of your teacher and your friends you can make the definition of refraction.

9.1.2 Refractive Index

Moving from one medium to another medium, the deviation of the incidence ray is how much and to which direction is calculated by refractive index. Refractive index is a unit to express the optical density of a medium.

$$\text{Refractive Index of any medium} = \frac{\text{Velocity of light in vacuum/air}}{\text{Velocity of light in the particular medium}}$$

Let us see a method to know refractive index.

Activity - 5

Take the figure of activity 3. In it make a circle with point O as the centre and which cuts the incident ray at A and the refracted ray at F.

Now we have to find the distance of point A and F from the perpendicular M_1M_2 . For this draw a line from A & F to M_1M_2 and name them AX and FY. You have learnt this method in mathematics in class 6. Your figure will be similar to figure 9.4.

Measure AX and FY with the help of a scale and find its ratio as AX/FY. The number got by you is the refractive index. This number is denoted by the greek word μ and is pronounced as 'miu' so ratio is μ = AX/FY (refractive index of air to glass).

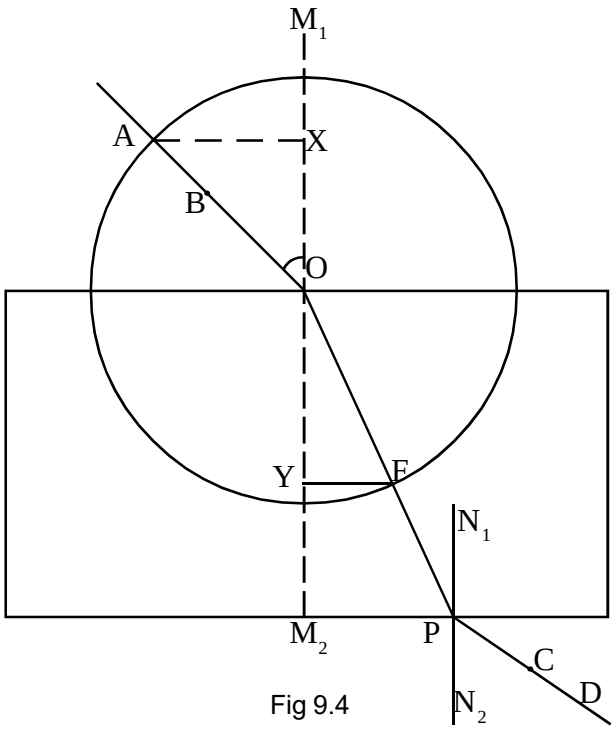


Fig 9.4

This depends on the type of glass. The refractive index is about 1.5 when light passes from air to glass. What ratio did you get from your experiment with the glass slab? Now, calculate refraction using different angle of ∠i by the same method.

You will find that refraction will be same for both the values of ∠i from air to glass i.e. refraction does not depend on ∠i (angle of incidence) but depends on the nature of both the mediums.

Using the same method you can measure the ratio of refractive index at point P and taking PD as a radius of circle. Is the number you got less or more?

On comparing the refractive indices of air to glass and glass to air you can conclude that if the refractive index is more than 1, then the light ray is moving from rarer medium to a denser medium ,it shifts towards the normal. And if the refractive index is less than 1 and the light ray is moving from a denser to rarer medium, it deviates away from normal.

NOW ANSWER THESE

1. What changes happen to the path of light ray when it moves from denser to rarer medium?
2. If the light ray deviate towards the normal when passing from medium 1 to medium 2. What can you say about the medium being denser or rarer?
3. A light falling perpendicular to a optical medium moves in which direction?
4. Glass is denser than water. So will the refractive index of air to glass and air to water be more or less?

9.2 Refraction through lens

Optical medium with two surfaces with one side circular or rounded and the other side rounded or plane is called lens. These are two types of lens :-

(1) Convex lens (2) Concave lens.

The Concave and Convex lens can be classified as follows (fig 9.5).

Convex lens	Concave lens
1. These lenses are thick at centre and tapers to the ends.	1. These lenses are thin at the centre and thickens at the ends.
2. These lenses converge the light rays so they are also called converging lens.	2. These lenses diverge the light rays. So they are called diverging lens.

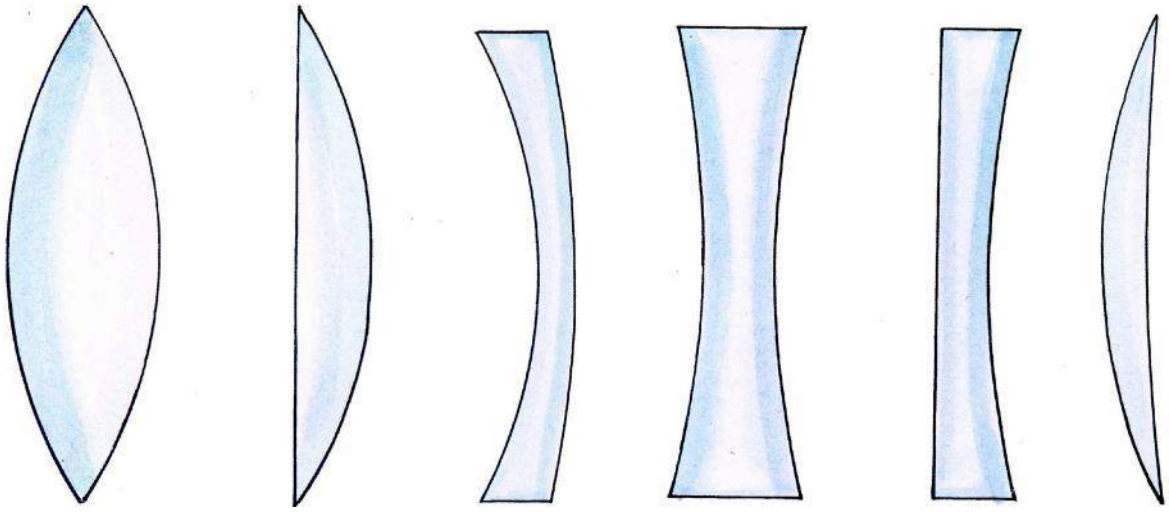


Fig 9.5 Some common shapes of lens

9.4.1 Some definitions used in lens

1. **Principal axis -** The line joining the centre of curvature of both the surfaces is called principal axis. (C_1C_2 in figure 9.6)

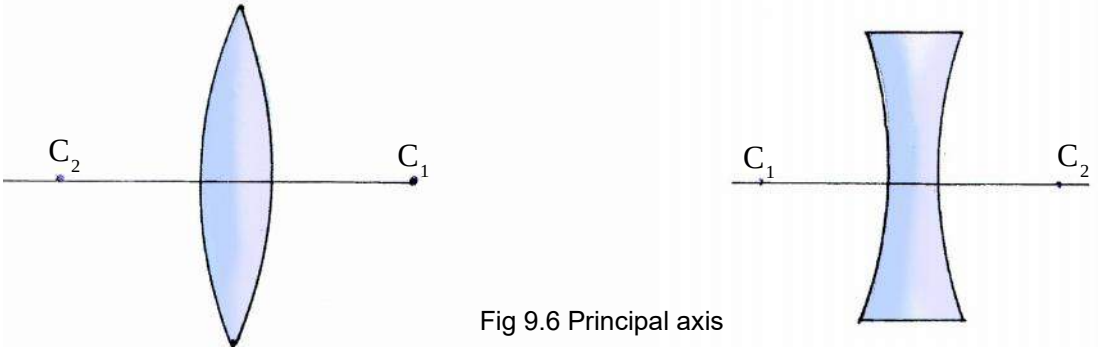


Fig 9.6 Principal axis

2. **Optical centre -** This is the centre of the lens from where rays pass (fig 9.7) without bending

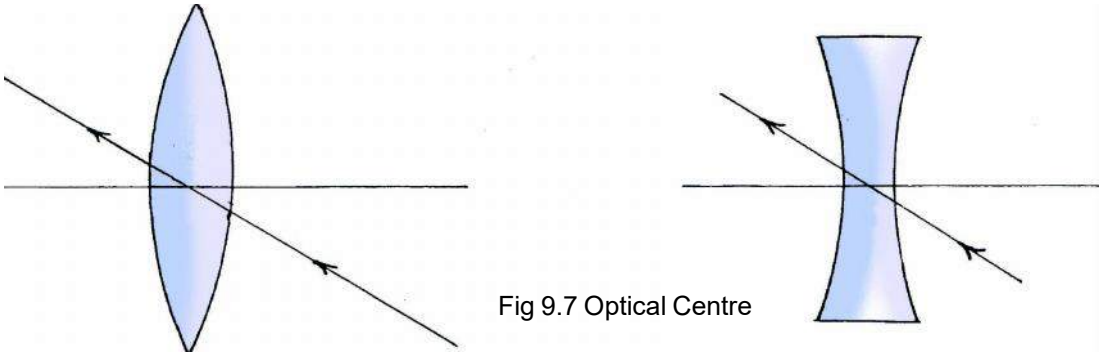


Fig 9.7 Optical Centre

3. **Principal focus -** The point at which the light rays parallel to the principal axis after passing through a lens converge (in convex lens) and appear to diverge (in concave lens) is the principal focus (fig.9.9)
4. **Focal length (f)** -It is the length between principal focus and optical centre.

9.2.2 Rules of formation of images by lens

1. The rays which pass through optical centre, pass without any deviation (fig 9.8).

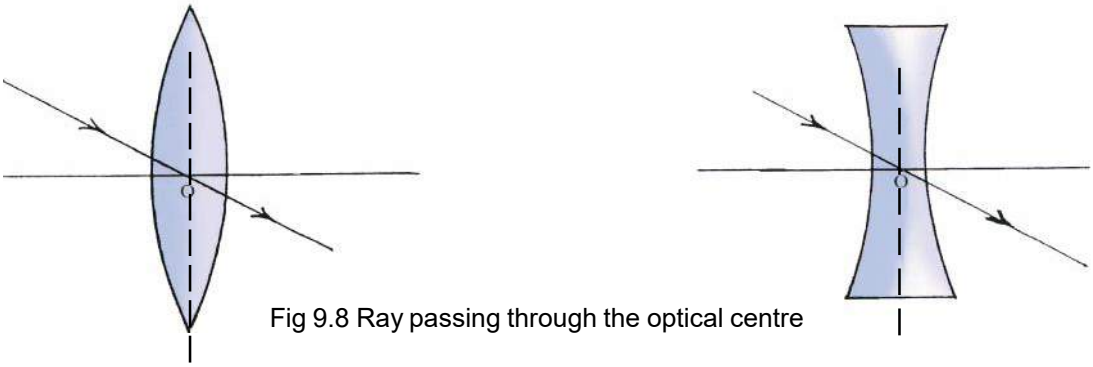


Fig 9.8 Ray passing through the optical centre

2. The rays which run parallel to the principal axis after refraction pass through the focus in convex lens and appear to pass through the focus in concave lens. (fig. 9.9)

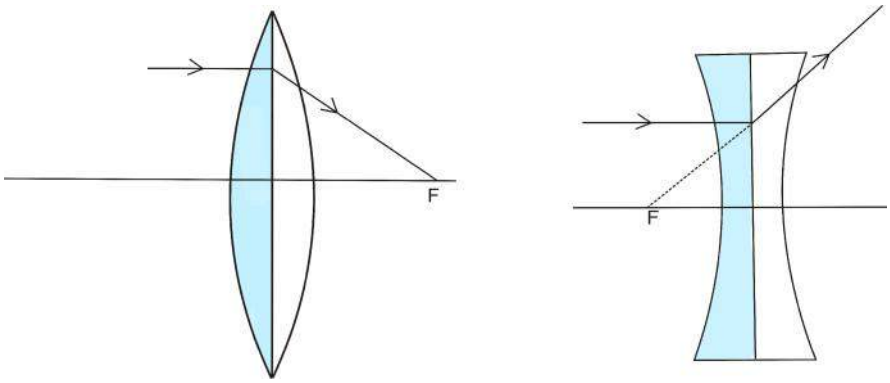


Fig 9.9 Ray coming parallel to principal axis

3. The rays which pass through the focus in convex lens or appear to come from the direction of the focus in concave lens after refraction runs parallel to the principal axis (fig 9.10).

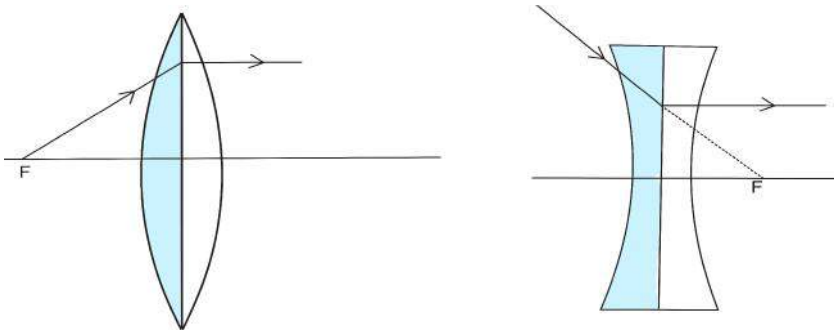


Fig 9.10 Ray coming from the focus

After knowing about lens, come let us do some activity associated with this.

Activity - 6 (Demonstrated by teacher)

Material required : Convex lens, paper.

Take a convex lens and hold it perpendicular to the sun rays. With your other hand hold a paper on the other side of the lens. Adjust the position of the lens such that the rays fall as a shining dot on the paper. (fig. 9.11) If you hold the paper and lens in the same position for one or two minutes. You will find that the paper starts burning. If you use carbon paper it will burn in comparatively lesser time.

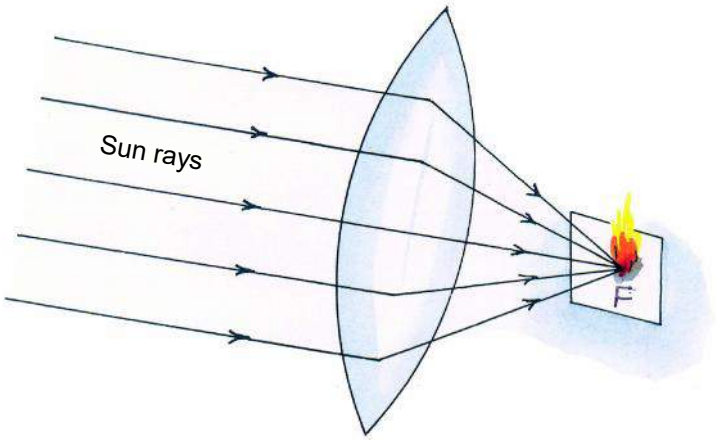


Fig 9.11

The paper placed at the focus of the convex lens burns because the sun rays are converged to that point.

9.2.3 Formation of images by convex lens

Activity 7

Materials required: Convex lens, candle (object) Screen (Paste a white paper on a slate), three blocks of wood, match box, pins/nails.

Make a furrow on the block of wood and place the lens on it (fig 9.12) On the second block place the candle and on the third block fix the screen with pins. Arrange them according to the picture. Now adjust the screen in such a way that the candle image is brightest and most clear. You will find that changing the distance of the object as compared to the lens changes the shape, size and distance of the images.

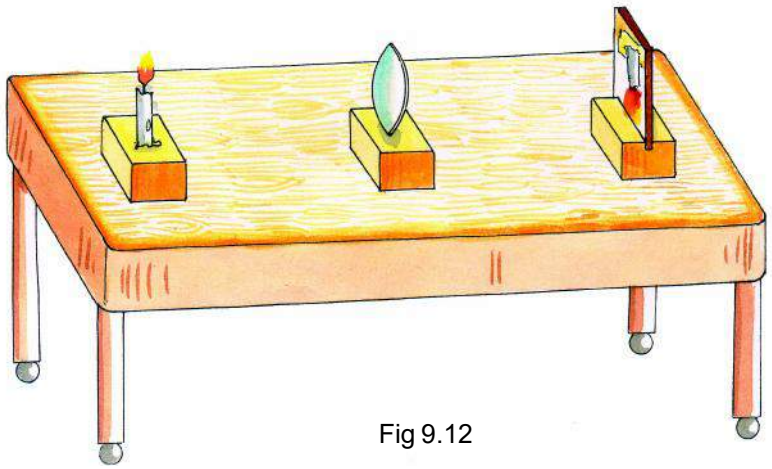
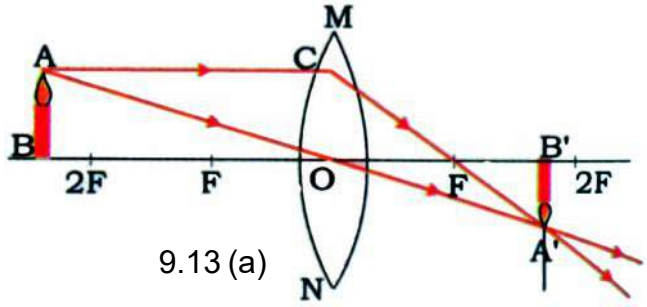
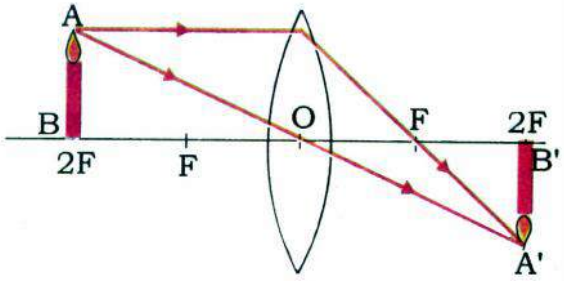


Fig 9.12

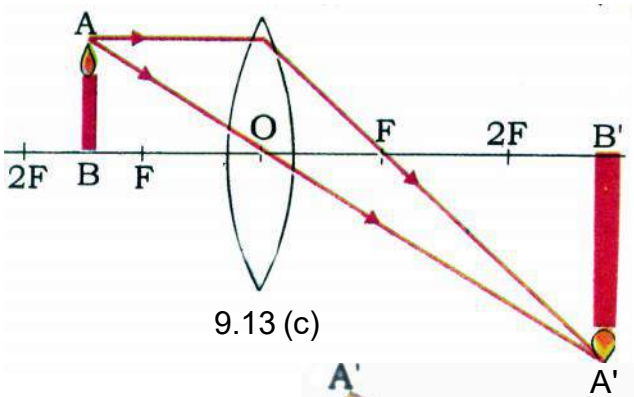
Write the different positions shape and manner of images formed at different positions in table 9.1. And compare them to the figures (9.13 a, b, c, d, e).



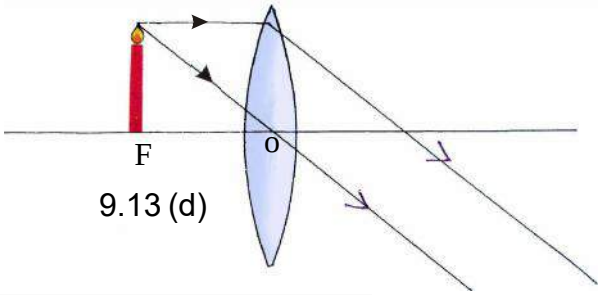
9.13 (a)



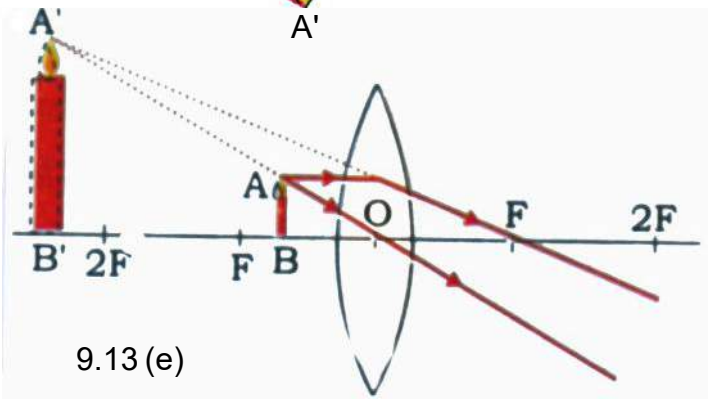
9.13 (b)



9.13 (c)



9.13 (d)



9.13 (e)

Fig 9.13 Images formed by a convex lens

TABLE 9.1

S.No.	Position of object	Position of image	Type of image	Size of image
1.	Beyond 2F	.....	.....	.....
2.	At 2F	.....	.....	.....
3.	Between F & 2F	.....	.....	.....
4.	At F (focus)	at infinity	real	magnified ..... (bigger than the object)
5.	Between F and optical centre O	.....	.....	.....

From this experiment we can obtain the following conclusions :-

1. All the real images (which forms on the screen) are inverted.
2. As the object is brought nearer to the lens, the image moves further away.
3. As the object is brought nearer to the lens the image becomes bigger.
4. When the object is too near the lens, no real image is formed.

9.2.4 Images formed by concave lens

In table 9.1 you have seen and learnt the different types of images formed by a convex lens. In class 7th you have learnt about the images formed by a concave mirror. You must note that mirror reflects the light rays, on the other hand, lens refracts the light rays.

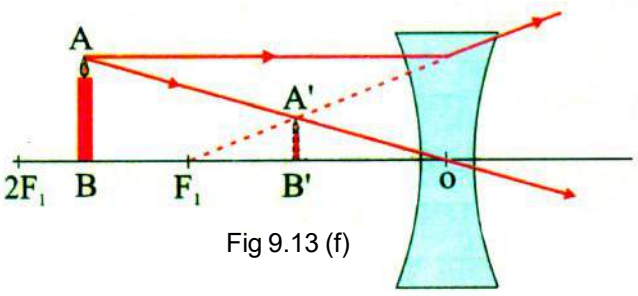


Fig 9.13 (f)

Object placed at any place/distance in front of a double concave lens makes a smaller and imaginary virtual image (fig. 9.13f)

NOW ANSWER THESE

(1) What is a lens ? How many types of lens are there?

(2) Define - (a) Principal axis (b) Optical centre (c) Focus

(3) Write the rules about the formation of image by lens.

(4) The picture formed on the screen at the theatre hall is real or virtual?

Activity - 8

Material required: Cardboard block, water, nail

With the help of a nail make a small hole on the cardboard block. Place a drop of water on this hole. If you place the cardboard in this position about 2 cm above your book and look through the hole with the water drop on it you will see the letters bigger in size.

9.2.3 Application of Lens

(1) **Magnifying glass -** Actually it is a convex lens. For proper handling, the lens is fixed on a frame with a handle. This is used to make small objects bigger and to get direct images. This is also called simple microscope. The eye lens used by watch repairers are also magnifying lens.

(2) Water-lens microscope :-

Activity - 9

Materials required: Sole of old rubber slipper, saw, bolt of 2 inches, 10 cm of G.I. wire, mirror or shining plastic, fused torch bulb, candle, matches, metal pipe or metallic cap of a pen and divider of geometry box.

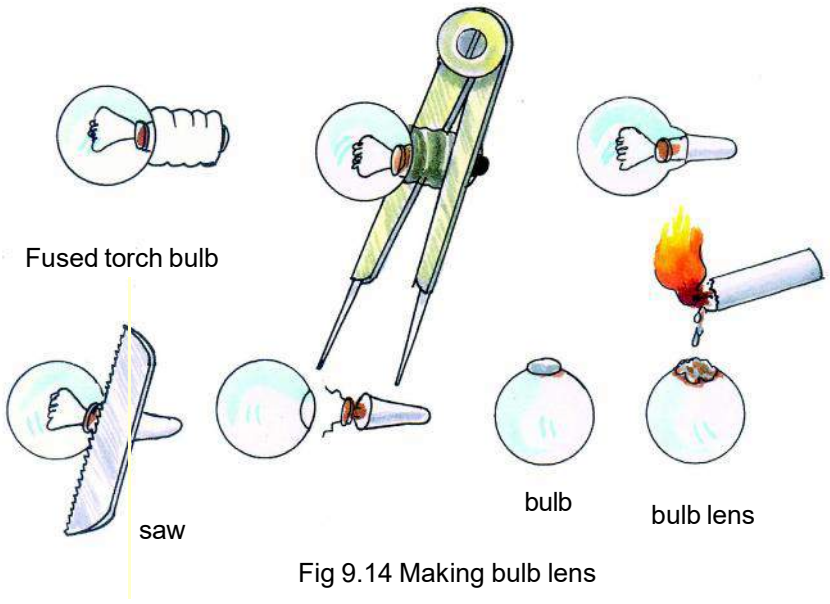


Fig 9.14 Making bulb lens

As shown in fig 9.14 remove the metallic part of the fused bulb with the help of a divider. To remove the filament cut the end of the bulb with a saw. Fill the bulb with water and seal the mouth with wax from a burning candle. See a bulb lens is ready (fig 9.14).

Now take a thick rubber sole cut a piece of 10 cm length 8-7 cm width (fig 9.15). With the help of a metallic pipe pierce 5 holes (A, B, C, D, E) As shown in the figure place the bulb lens (wax on side), mirror and bolt on the holes. Make a clip of the wire and fix as per figure 9.15. Place a millimetre graph paper or any minute thing on the stand with the clip. Now adjust the lens with the help of the bolt and enjoy observing small things in a bigger size.

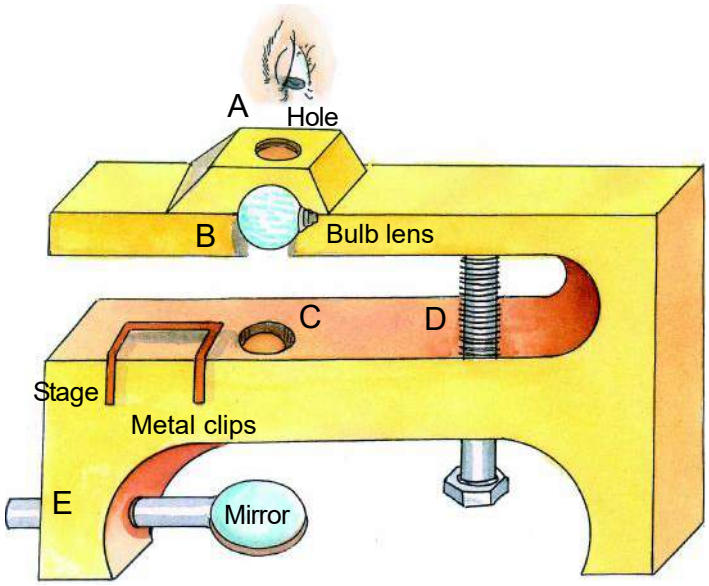


Fig 9.15 Water lens microscope

3. Water-lens telescope

Activity - 10

Materials required: Two square or cylindrical pipes or empty boxes of incense sticks, fused torch bulb, saw, candle, matches, convex lens (about 15 cm focal length), scissors, pieces of cardsheet, pins, and divider of geometry box.

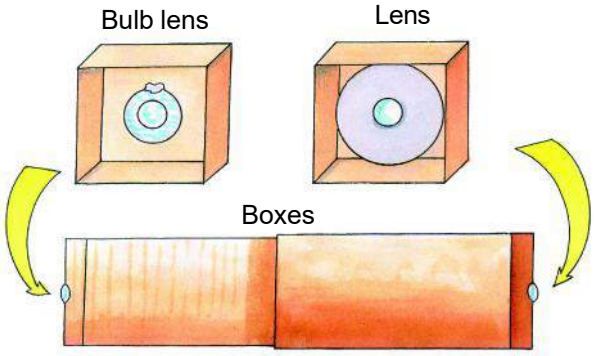


Fig 9.16 Water lens telescope

Prepare bulb lens as given in activity 9. Now take two boxes of different size or diameters. So that the smaller one can slide easily inside the bigger one (fig 9.16). Make a cardboard lid for the smaller box. Make a small hole on this lid and fix the bulb lens on it. See that the wax part is away. Now place the convex lens (about 15 cm focal length) on one side of the bigger box. Keeping 1 cm open. Paste paper on the lens and fix it on the box.

Now fix the boxes in such a way that both the lens (bulb lens and lens) are at the two ends. Keeping the bulb lens near your eyes try to observe things far away by adjusting the boxes by sliding them. The image will be inverted.

Don't forget to look at the moon through this at night and try to think of making a stand for this.

9.3 Human eye - A living lens

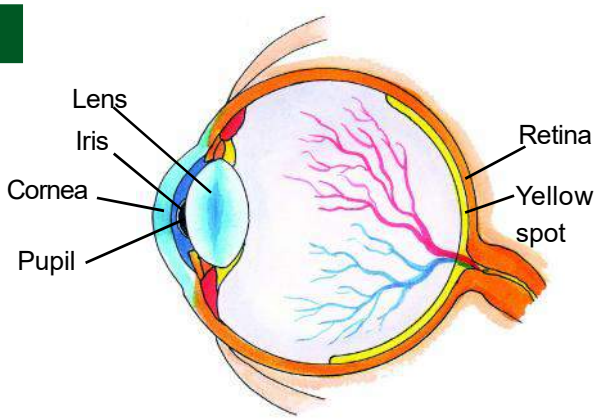


Fig 9.17 Human Eye

Human eye is spherical and the front portion is a bit bulging which is called the **cornea** (fig 9.17). Behind the cornea there is an opaque screen which is called **iris**. There is a small adjustable hole in the centre of iris, which is called the **pupil**. With the help of muscles automatically, the diameter of the pupil decreases with much light and increases when we stand in darkness. Behind this there is convex lens which is made of soft, transparent material. This is called the **lens of the eye**. In human eye the innermost part there is a transparent membrane which is called the **retina**. The real image of the object in front of person is made by the eye lens on the retina. There is spot near about in the middle of the retina which is called the yellow spot. The image formed on yellow spot is very clear.

The light rays coming from any object passes through the cornea and is refracted by the lens. After refraction the image formed on the retina is real inverted image. To get a clear image the object must be kept at minimum 25 cm distance.

9.4 Eye defects

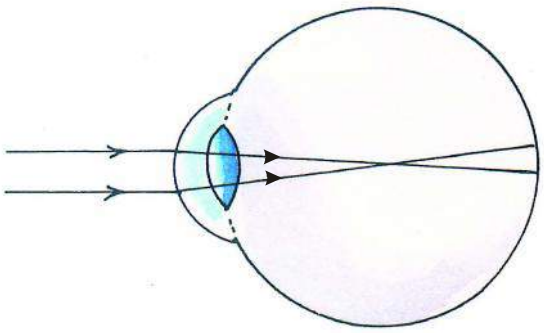


Fig 9.18 Eye with shortsightedness

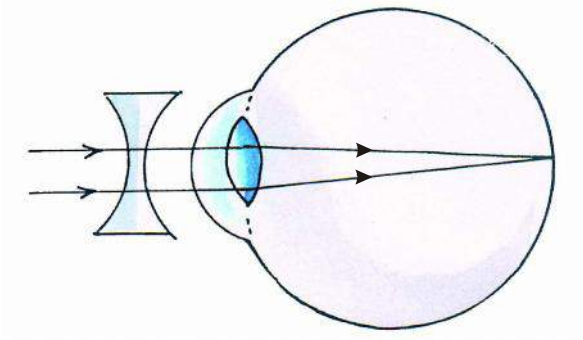


Fig 9.19 Rectification

Some persons whose eye lens are not proper cannot see things at a distance. In this the image of a far away object is not formed on the retina but at a point in front of it. This defect of eye is called **short sightedness or myopia**, (fig 9.18). This defect can be rectified by using eye lens with double concave lens . These lenses diverge the rays so that the image is formed on the retina (fig. 9.19).

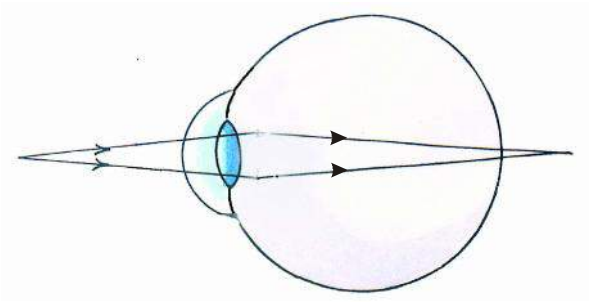


Fig 9.20 Eye with longisightedness

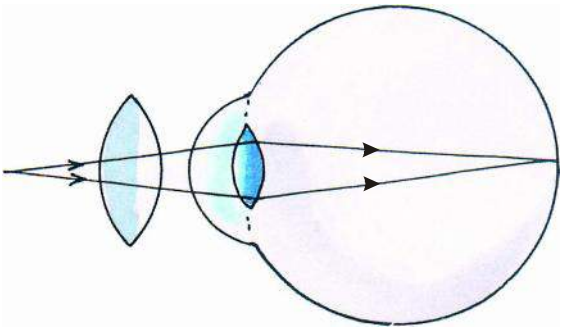


Fig 9.21 Rectification

Some person on the contrary have the opposite defect. That is, they cannot see things which are near by, because due to tension in the eye lens the focal length increases. Due to this the image of the nearby object is formed beyond the retina. This defect is known as **long sightedness or hypermetropia** (fig 9.20). This defect can be rectified by using an eye glasses with convex lens. The lens turn the rays in such a way that the rays focus properly on the retina (fig 9.21).

NOW ANSWER THESE

1. What is the minimum distance at which a clear image can be visualized?
2. Where is the image formed in a human eye?
3. What is shortsightedness ? How can it be rectified?
4. What do you understand by longsightedness ? How can this be rectified?

WE HAVE LEARNT

- Transparent things are called optical mediums.
- When light passes from one optical medium to another, it bends at the line of contact of the two mediums. Such bending of light rays is called refraction.
- The refraction by any medium is measured by its deviation in terms of refractive index.
- The refractive index of a medium can be more or less than 1.
- When a ray passes from a rarer medium to a denser medium it bends towards the perpendicular or normal while when moving from denser to rare medium it bends away from the normal.
- A transparent medium with two surfaces out of which one surface is spherical and the other being plain or spherical is called lens.

- Convex lens are thick at centre and thinner at the ends, where as in a concave lens it is thinner at the centre and thick at the ends.
- The line joining the centres of curvature is called principal axis.
- Optical centre - It is the centre of the lens from which the rays pass undeviated.
- The distance between optical centre and the principal focus is called the focal length.
- The rays which pass through the optical centre pass without any deviation.
- That rays which pass parallel to the principal axis after refraction pass through the focus in convex lens and appear to pass through the focus in concave lens.
- The rays which pass through the focus in convex lens or appears to comes from the direction of the focus in concave lens after refraction runs parallel to the principal axis.
- Convex lens is used in magnifying glasses, microscopes and telescopes.
- The focal length of the human eye changes automatically and the image formed by the human eye is real and inverted. To observe any object clearly the object must be at a minimum of 25 cm away.
- Short sighted person cannot see things at a distance properly. It can be rectified by using concave lens.
- A longsighted person may not be able to see nearby objects clearly. This can be rectified by using convex lens.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative :-

(1) The refractive index of glass is

(a) 1.5 (b) 1.3 (c) 2.4 (d) 1.0

(2) The point from which a light ray passes without any deviation is the-

(a) Focus (b) Optical centre

(c) Focal length (d) Centre of curvature.

(3) When light passes from one medium to another, it deviates from its path. This is called :-

(a) Reflection of light (b) Irregular reflection of light

(c) Refraction of light (d) None of these

(4) When the object is placed at 2F. The image formed by a convex lens will be at :-

(a) 2F (b) F

(c) Between F and 2F (d) Between F and optical centre.

2. Match the following :-

Object placed at		**Image formed at**	
1.	At F	1.	Between F and 2F
2.	Between F and 2F	2.	On the side of the object
3.	Beyond 2F	3.	at infinity
4.	Between F and Optical centre	4.	Beyond 2F

3. Answer the following questions -

(1) What do you understand by refraction?

(2) When the light ray enters water medium through glass medium, where will it deflect - towards normal or away from the normal?

(3) What do you understand by refractive index of a medium?

(4) Draw a ray diagram when the object is placed between optical centre and principal focus of a convex lens.

(5) What is longsightedness ? How can it be rectified ? Explain with diagrams.

(6) Explain with the help of an activity that the incident ray the normal at the point of incidence and the reflected ray all lie in the same plane

TRY TO DO THIS ALSO

1. Cut and remove the filament part of any fused bulb. Now fill the bulb with water. Now say what type of lens would this be. Try to find its focal length by using sunrays. Now fill this bulb with kerosene, coconut oil and glycerine in place of water. Try to find their focal length and compare all.
2. With the help of your school community organize an eye testing camp.

10 SOUND

10.1

We hear different type of sounds around us, for example the school bell, chirping birds, thundering clouds and sound of vehicles etc. We also hear the loud sound of an empty metal utensil falling. We are familiar with the melodious sound of the harmonium. We don't like when everyone in the class start speaking simultaneously. It is clear from the above examples that some sounds are low and some are loud. Some sounds are pleasant to the ears and some are not. Let us try to find how sound is produced and how we hear it.

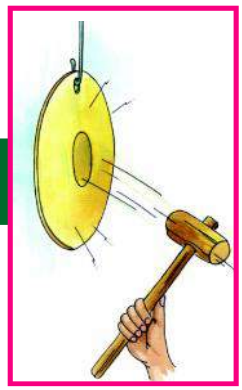


Fig. 10.1

Activity 1

Materials required :- School bell, hammer.

Ring the school bell with the hammer(fig.10.1). When you hear the sound touch the bell gently with your hand. You would certainly feel the vibration. Did the vibrations stop on your touching the bell? Can you still hear the sound?

Activity 2

Materials required :- Tuning fork, rubber pad.

Hit one arm of a tuning fork (fig. 10.2) on the pad of hard rubber. Bring it near your ear and hear the sound. Watch its prongs carefully. Can you see them vibrating? Now touch the tuning fork. You would observe that on touching the fork the vibrations stop and we cannot hear the sound. When we are speaking, we can feel the vibrations on touching our throat.

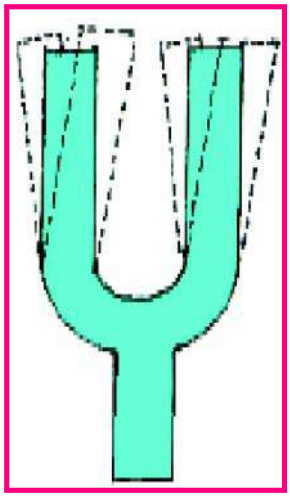


Fig. 10.2

From the above activities it can be seen that vibrating objects produce sound. When we touch vibrating objects they stop vibrating and the sound is also not heard. In some situations these vibrations can also be easily seen but in most cases they are too minute for us to see.

10.2 Amplitude, frequency and the time period of vibration

In the previous class we learnt about oscillatory motion. We know that the to and fro motion of an object about a mean position is called oscillatory motion.

Activity 3

Materials required : - Scale or spoke of a bicycle.

Put one end of a scale or of the spoke of a bicycle at the corner of a table and press it hard on the table. Let the other end be outside the table and not resting on anything. Press this end downwards and release. It starts vibrating (fig.10.3) and produces sound. Now repeat this experiment with different lengths of the free end of the scale or spoke. Here, the motion of scale or spoke is oscillatory. Spoke moves up and down and vice versa and keeps oscillating for sometime.

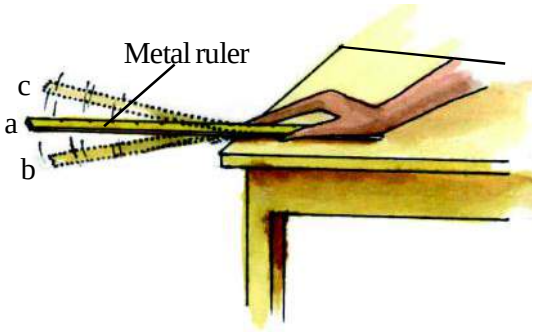


Fig. 10.3

Amplitude -

When scale or spoke goes to the position 'b' from its mean position 'a' and returns back to mean position 'a' via position 'c', then we call it one vibration or one oscillation. The maximum displacement of the spoke or the scale upto 'b' or 'c' from the mean position 'a' is called the amplitude of the vibration. The distance from 'a' to 'b' and from 'a' to 'c' is equal. By applying a small or a large force we can increase or decrease the amplitude.

Frequency -

The number of oscillations in one second is the frequency of oscillation. Frequency is measured in oscillation per second or in hertz. The unit hertz has been named after scientist Heinrich Rudolph Hertz as a mark of respect. If an object oscillates ten times in one second, then its frequency will be ten oscillations per second or ten hertz.

Time period -

The time taken by a vibrating object to complete one oscillation is called the time period. It is measured in seconds.

The relation between frequency and time period is the following :

$$\text{Frequency} = \frac{1}{\text{Time period}}$$

NOW ANSWER THESE

1. What makes an object produce sound?
2. When we ring a cycle bell with one hand while holding it with the other, then its sound is not heard clearly. Why?
3. The frequency of an vibrating object is 20 hertz. What do you understand by this statement?
4. An object completes 20 oscillations in ten second; find its frequency and time period.

10.3 Sound and medium

Sound is produced by an object when it is vibrating. These vibrations make the surrounding air vibrate. When the vibrating air reaches our ears, it makes the ear-drum vibrate and we hear the sound. For the vibrations of the vibrating object to reach our ears a medium must be present between them.

Activity 4

Keep your ear close to one end of the table (Fig. 10.4). Ask your friend to knock softly on the other end. Do you hear a sound? Through which medium did the sound reach you? Now try to hear the sound again after raising your ear from the table. Through which medium would the sound reach you in this situation? What is the reason for the difference between these two sounds?

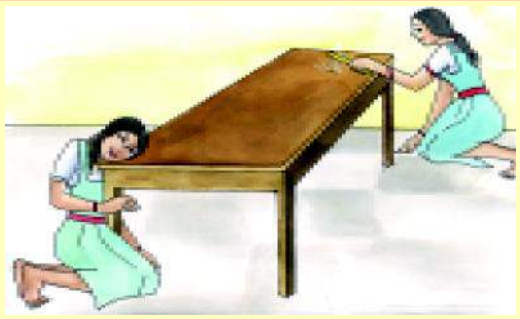


Fig. 10.4

Activity 5

Materials required :- Two match boxes, 10m long thread, two pins.

Take the inner part of two match boxes. Using them make a toy like in Fig. 10.5 by piercing a hole in each of them and put a thread and pins through the holes. Let the length of thread be about 10m. More away from your friend so that the thread is stretched. Now ask your friend to say something into one of the boxes, keeping it close to the mouth like a phone. Keep the other box on your ear and try to listen to the voice. Is the voice heard clearly? Remove the box from the ear. Can you hear the voice clearly even now? If not then why? It is clear from the above activity that sounds can travel through the thread.

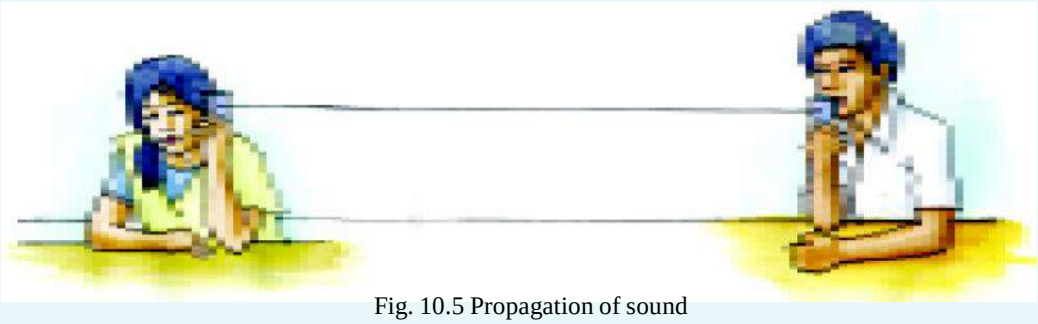


Fig. 10.5 Propagation of sound

Activity 6

Materials required : - Plastic funnel, balloon, rubber tube, bucket full of water and a rubber band, some pebbles.

Cut the top of the balloon and tie it to the wider end of the funnel with the help of a rubber band. Attach the rubber tube to the other end of the funnel. Immerse the wider end of the funnel into the water filled in a bucket. Attach the free end of the rubber tube to your ear. Drop some pebbles into the bucket one by one and listen to the sound produced by the stone hitting the bottom of the bucket. This instrument is called hydrophone. This activity shows that sound can travel even in liquids.

In the above activities we saw that a medium (solid, liquid or gas) is needed for the propagation of sound. Can sound travel through vacuum? A medium is required for the propagation of sound. When we placed an electric bell connected to a battery in an air tight bell jar. On ringing the bell, sound

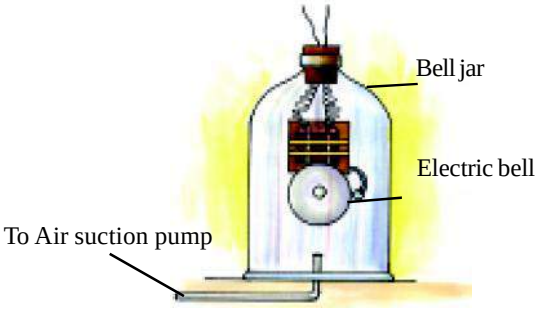


Fig.10.6

could be heard as the jar was filled with air. Then the air in the jar was evacuated with the help of an air suction pump. Now, no sound could be heard when the bell. (fig. 10.6). From this we came to the conclusion that sound cannot propagate through vacuum. As compared to air sound travels 16 times faster in some metals and 4 times faster in water.

Have you ever wondered how astronauts can communicate with each other on the moon where there is almost no atmosphere? Astronauts use radio waves for communication. Radio waves do not require a medium for their propagation.

NOW ANSWER THESE

1. On the surface of the moon why can the voice of an astronaut not be heard by the other astronaut standing nearby?
2. Who was the first to suggest that a medium is needed for the propagation of sound?

10.4 How do we hear sound?

Sound reaches our ears through a medium. From the ears it reaches our brain as signals and then we hear the sound. Human ear consists of three main parts – outer ear, middle ear and inner ear. The sound coming from outside gets transmitted from the outer ear to the middle ear. The vibrations of the diaphragm present in the middle ear are propagated to the inner ear. The audio nerves present in the ear send these vibrations to the brain in the form of signals (fig. 10.7). Ear is a very sensitive organ. We should take proper care of our ears. We should not insert anything, that can damage the diaphragm in our ear. The damage to the diaphragm may even make a human being deaf.

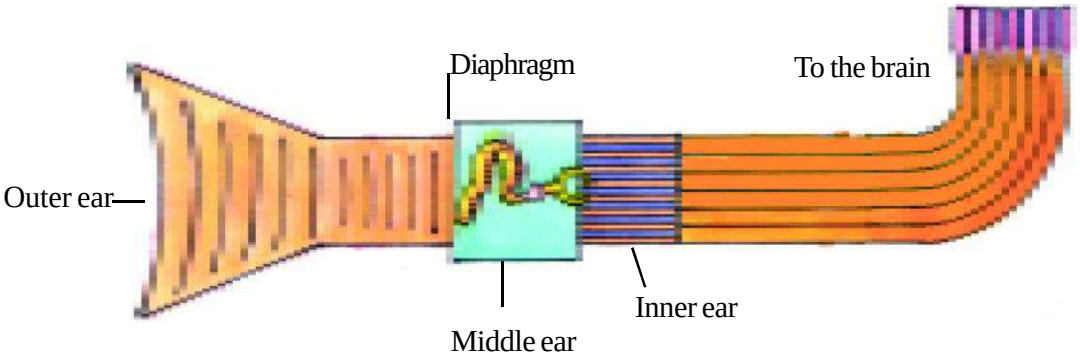


Fig. 10.7 Transferring sound from the ear to the brain.

10.5 Audible and in-audible sounds

We know that in order to produce sound, it is necessary for the object to vibrate. Do all objects that vibrate produce sound? Can we hear all sounds? Let us see.

Activity 7

Move your hands up and down as fast as you can. Do you hear any sound? You cannot move your hands more than five or six times in a second. The sound produced by this movement can not be heard by you.

We can hear only those sounds that have frequencies in the range 20 vibrations per second (Hertz) to 20000 vibrations per second (Hertz). The sounds which can be heard by our ears are called audible frequencies. The sound having a frequency less than 20 vibrations per second is called infrasonic sound while the sound having a frequency greater than 20000 vibrations per second is called ultrasonic sound. Some animals can hear sounds with frequencies even more than 20000 vibrations per second.

Dogs can hear frequencies up to 40000 vibrations per second while bats can hear frequencies up to 70000 vibrations per second and can also produce it.

Uses of ultrasonic sound -

1. For searching cracks inside metals.
2. For destroying bacteria.
3. For cleaning parts of watches.
4. For locating tumors inside the brain.
5. For curing gout pain.
6. For treatment of cataract.
7. For removing stones from the kidneys.

NOW ANSWER THESE

1. Write the difference between audible and ultrasonic sounds.
2. Write two uses of ultrasonic sound.
3. Write the audible range of normal human beings.

10.6 Reflection of sound and Echo–

When we speak loudly in to a deep well or shout facing a hill then after some time we may hear same sound as if somebody is repeating it from the well or from the hill. This return of sound from a surface is called the reflection of sound and the reflected sound is called the echo.

Activity 8

Materials required :- Two tubes of length one meter and diameter of five centimeter each, a watch and a board with plane surface.

Place the plane board vertically on a table. In front of this surface keep a tube parallel to the dotted line PQ on the table. Keep the watch with a tick-tick sound on the other end of the tube. Now move the other tube around QR and keep it in a position such that the sound of the watch can be heard clearly after reflection (fig. 10.8). A thick board (N) must be placed between the two tubes before doing the experiment so that the sound from point P can not reach the point R directly. When the sound of the watch is the clearest then you will see that $\angle PQN = \angle RQN$ or angle of incidence = angle of reflection.

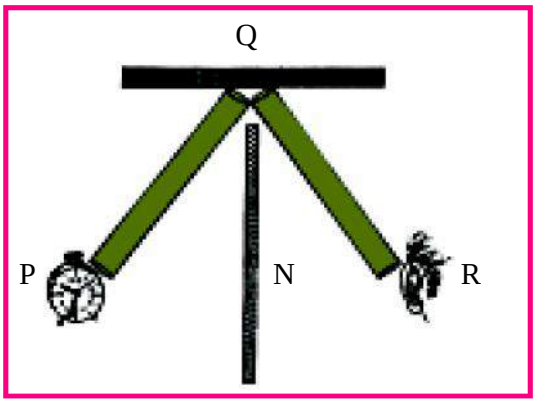


Fig. 10.8 Reflection of sound

If the reflecting surface is at a distance of 17 metre or more from the source of sound then the reflected sound can be heard as distinctly seperate from the original sound. Different materials do not reflect sound equally. Metal sheets and plywood are good reflectors of sound. Clothes, corks, thermocole etc. are not good reflectors of sound. Good absorbers of sound are used on the ceilings, floors and walls of cinema halls. They stop the reflection of sound and echo is not heard.

Human ear can hear two sounds separately and distinctively only when the sounds have a time gap of atleast 1 / 10 second. The speed of sound in air at 20^0C is approximately 340 metre per second.

The distance covered by the sound in 1 / 10 second = speed $\times$ time

= 340 $\times$ 1 / 10

= 34 meter

Therefore, it is possible to hear both original sound and reflected sound distinctively only when we are at a distance of 17 metre or more from the reflecting surface.

The reflection of sound is used to measure the depth of the sea. For this a sound signal is send in to the sea. The depth of the sea is calculated by the time taken by the sound signal in going to the bottom and coming back.

NOW ANSWER THESE

1. Under what condition will you hear your echo?
2. From the sounds falling on wood, steel, asbestos, paper and thermocole for which-
   (a) You will hear a clear echo?
   (b) Echo will not be heard?

10.7 Speed of sound

You must have heard the thundering of clouds and must have seen the lightening on rainy days. The thunder and the lightening are generated almost at the same time but we see the lightening first and hear the thunder later. Why?

The reason for this is that the speed of light is much more than the speed of sound. The speed of light 30,00,00,000 metre per second and the speed of sound at 0^0C is 332 metre per second and at 20^0C is 340 metre per second.

10.8 Properties of sound –

1. **Intense and soft sound –** The intensity of sound depends on the amplitude of vibrations. Vibrations of large amplitude produce sounds of high intensity. Vibrations of small amplitude produce soft sounds. When we hit an object hard then the object starts vibrating with a large amplitude and intense sound is produced.

2. **Low and high pitched sound –** You all know that Indian music has seven notes Sa, Re, Ga, Ma, Pa, Dha, Ni. These notes are ordered according to increasing frequencies. Sounds starting from Sa keep on becoming sharper and shaper. This means the pitch of the sounds increasing.

   The sounds of high pitch have higher frequency. For example the voice of women, the voice of cuckoos, the sound of mosquitoes and any shrill sound. The sounds of low pitch have low frequency and it sounds heavier. The voice of men, roaring of lion and sound produced by drum are heavy due to the low pitch.

3. **Melodious sounds and noise –** The sound which is pleasent to our ears is called a melodious sound and the sound which is not pleasent to our ears is called a noise.

Non-harmonious vibrations produce noise. Harmonious vibrations that have a fixed relationship with each other produce melodious sounds. The vibrations of different musical instruments are examples of melodious sounds while the sound of a fired bullet is a noise.

10.9 The sound produced by different musical instruments -

We are familiar with different kinds of musical instruments. Musical instruments are mainly of three types: musical instruments having strings, Reed musical instruments and membrane musical instruments. In instruments having strings, the strings are made to vibrate by rubbing or stretching. Sitar, veena, violin etc. are some examples of musical instruments with string.

In Reed musical instruments an air column vibrates. Air is blown in to the Reed and flows through the Reed like in a flute. There is a vibrating membrane in the membrane musical instruments like drum, dhlolak and mridang.

Fig. 19.9 Musical instruments

You would have seen musical instruments like manjeera (Jhangh, kartaal), ghattam and noot (Clay pots). These musical instruments are played in many parts of our country. Sound is produced by hitting or tapping them. Jal tarang, bells etc. are examples of such musical instruments.

10.10 The sound produced by human

The throat is the most important source of sound in human beings. A narrow slit is found between the two vocal chords in the throat for passing air. When the air from the lungs passes through the slit with a force then the chords starts vibrating, this produces a sound. The muscles attached to the chords can increase or decrease the pull on them.

Activity 9

Take two rubber strips of the same size. Place them on each other and stretch them tightly. Blow air through the space between them. When air is blown between the stretched strips then a sound is produced. Our vocal chords also produce sound in the same manner. Sounds of high frequency are produced when the chords are tightly stretched and sound of low frequency is produced while they are lax. You can even use a thick rubber band in place of rubber strips. The vibrations can be felt by putting your hand on the throat while talking.

The length of the chord of an adult man is 20 mm. The length of the chord in women, is approximately 5 mm smaller than men. The vocal chords of children are very small, that is why their voice is quite sharp.

10.11 The sound produced by animals

Many animals like dogs, cows, goats etc. produce sounds with the help of vocal chords. But all animals do not have vocal chords. The birds produce sounds with the help of the special vocal instrument present in its breathing tube. Flies produce sound by vibrating their wings fast. Frog produces the croaking. (Terr-Terr) sound with the help of its vocal chords. Some fish generate sound by pushing air out of their airbladder. Snakes do not have vocal chords but produce sound by pushing air out of their mouths.

NOW ANSWER THESE

1. Give the two examples each for sounds with a high pitch and with a low pitch.
2. Which kind of sound is produced when vocal chords are thin and stretched?
3. How do birds, fishes and flies produce sound?

WE HAVE LEARNT

- Sound is produced by the vibrations of objects.
- The maximum displacement of the vibrating object from its mean position is called the amplitude.
- The time taken to complete one oscillation is called the time period.
- The number of vibrations per second is the frequency of oscillations.
- The frequency is measured in vibrations per second or in Hertz (Hz).
- Frequency = 1 / time period.
- The range of audible frequencies for human ear is between 20 Hz to 20,000 Hz.
- A medium is required for the propagation of sound. Sound does not propagate in vacuum.
- Sound can be reflected after striking an obstacle. Echo is produced by the reflection of sound.
- The voice of human beings is due to the vibrations of their vocal chords.
- The speed of sound at 0^0C and 20^0C respectively is 332 metre / second and 340 metre / second.

QUESTIONS FOR PRACTICE

1. Choose the correct answer out of the choices given–

1. The range of audible frequencies for human beings is –

(a) 0 – 20 Hertz (b) 20 – 2000 Hertz
(c) 0 – 20,000 Hertz (d) 20 – 20,000 Hertz

2. On increasing the frequency of a sound, what else increases –

(a) Its pitch (b) Its intensity
(c) Its time period (d) Its amplitude

3. To hear the echo clearly, the minimum distance of the reflecting surface should be –

(a) 11 metre (b) 34 metre (c) 17 metre (d) 50 metre

4. Sound propagation is not possible –

(a) In metals (b) In water (c) In vacuum (d) In air

2. Write the definitions of amplitude and frequency.
3. How would you show through an experiment that sound can propagate in gases?
4. Differentiate between a noise and a melodious sound.
5. Sound is heard clearly in a big room with curtains on its walls rather than in a room without curtains. Why?

TRY TO DO THESE

1. Use the hydrophone given in Activity 6 as a stethoscope and listen to the heartbeats of your friend.
2. Take some pieces of paper having dimensions 2×5 centimeter. Press these between your two fingers (fig. 10.10). Now blow air from mouth forcefully from one side. Were you able to produce a sound? Where did this sound come from? Try this experiment with thin, thick and long pieces of paper as well. Repeat the same experiment with increased or decrease a pressure exerted by the fingers. Did you notice any change in the sound?

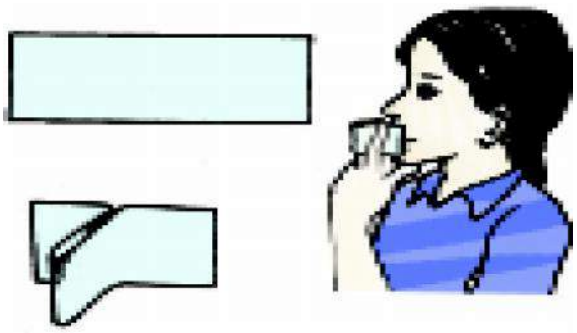


Fig. 10.10

3. Where and why may be the speed of sound high in Antartica or in your city. discuss it in your class room ?
4. Ektara

Materials required - Coconut shell/ tin box, thin bamboo stick, two nails, rubber band, thread.

Method - Take a hollow coconut shell or a tin box Make two holes as shown in fig 10.11. Take a thin bamboo stick which can get through these holes. Nail the two nails each on either side of the stick. Attach the rubber band to the nail tightly. Cover the coconut shell with a sheet of paper and secure it with the thread, now play this musical instrument and identify the part which shows vibration. Make a list of different stringed musical instruments you see in your area. Collect information about them.

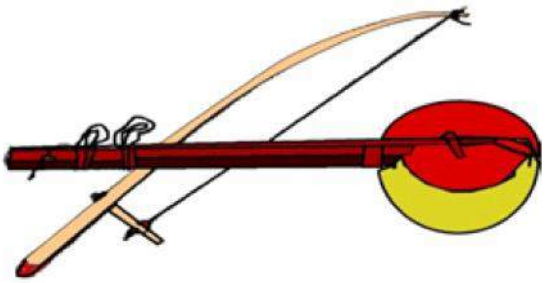


Fig 10.11 Ektara

11 CHEMICAL EFFECTS OF ELECTRIC CURRENT

11.1

Our elders might have cautioned us against touching an electrical appliance with wet hands. But do you know why it is dangerous to touch an electrical appliance with wet hands?

We know that some solid materials allow electric current to pass through them like copper aluminum, silver etc. On the other hand some solid materials do not allow electric current to pass through them easily like rubber, plastic, wood etc. These materials which allow electric current to pass through them are good conductors of electricity. On the other hand, materials, which do not allow electric current to pass through them easily, are poor conductors of electricity.

You all have seen at your home that conduction of electric current in solid materials is checked by tester, do liquids also allow electric current to pass through them? Let us do an activity to know this -

Activity 1

Materials required - Plastic or rubber cap or a beaker, vinegar or lemon juice, 2 testers, battery, bulb, two electric wires.

Take a small plastic or rubber cap of discarded bottle and pour one teaspoon of lemon juice or vinegar in it. Connect one tester to the battery and another tester to the bulb with the help of connecting wire as shown in figure 11.1. Now join the other terminal of the battery to the wire connected to the bulb. Bring the ends of the two testers and dip it in lemon juice or vinegar solution. Take care that the ends are not more than 1 cm apart but at the same time do not touch each other.

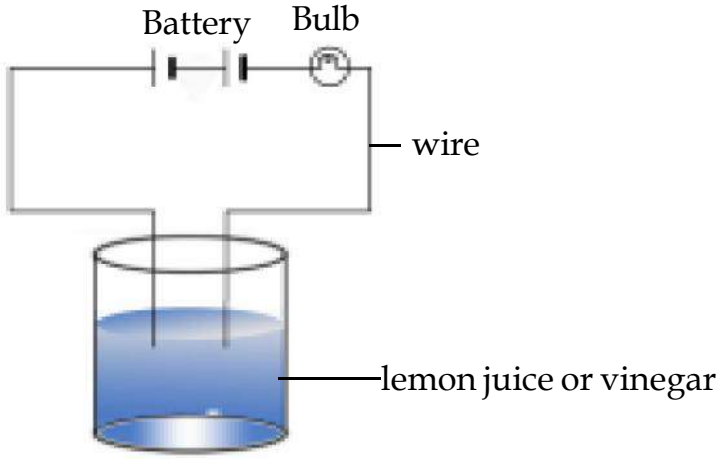


Fig 11.1 Testing of conduction of electricity in lemon juice or vinegar.

Does the bulb of the tester glow? Does lemon juice or vinegar conduct electricity? How would you classify lemon juice or vinegar- a good conductor or a poor conductor? Before doing the activity check whether tester and cell are working properly or not?

Repeat the same activity with other liquids like pure water, milk etc and check whether they are good conductors or poor conductors.

Thus we saw that when the liquid between the two ends of the tester allows the electric current to pass, the circuit of the tester becomes complete. The current flows in the circuit and the bulb glows. And when the liquid like pure water does not allow the electric current to pass, the circuit of the tester is not complete and the bulb does not glow.

In some situations even though the liquid is conducting, the bulb may not glow, what can be the reason? You know that, on passing electricity through the bulb, due to the heating effect of the current, the filament of the bulb gets heated to a high temperature and it starts glowing. However, if the current through the circuit is too weak, the filament does not get heated sufficiently and it does not glow. Let's make another tester which can detect a weak current.

Activity 2

Materials required- Discarded matchbox, small magnetic compass, connecting wire, battery.

Take the tray from inside a discarded matchbox. Place a small magnetic compass, inside it. Now according to the fig. 11.2 wrap an electric wire, a few times around the tray. Now connect one free end of the wire to the terminal of a battery. Leave the other end free. Take another piece of wire and connect it to the other terminal of the battery. Join the free ends of two wires momentarily. Should the compass needle show any deflection?

Due to passing electricity in the circuit path, compass needle shows deflection. Now dip the free ends of the testers in lemon juice, do you find any deflection? Why does this happen? Lemon juice being good conductor passes electricity through itself. Repeat the activity with other liquids like distilled water, vegetable oil etc instead of lemon juice. In each case observe whether the magnetic compass needle shows deflection or not. Record your observations in table 11.1

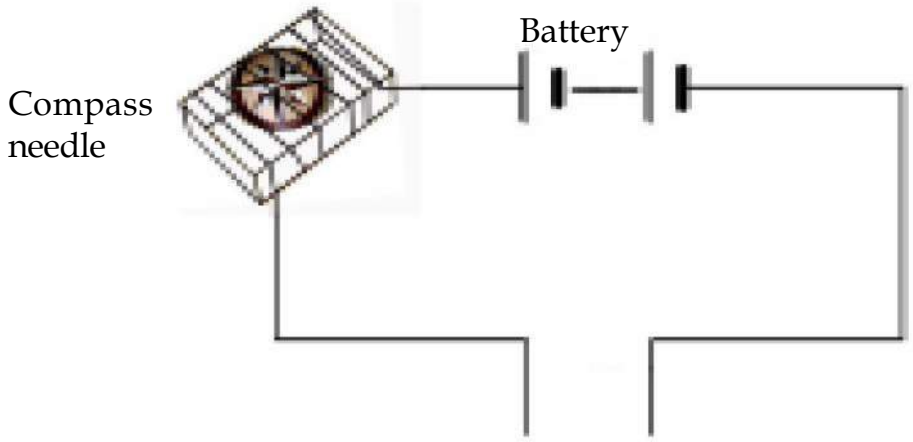


Fig 11.2 Testing of conduction of electricity through the circuit

TABLE 11.1 Good/Poor conducting liquids

S.No.	Material	Compass needle shows deflection yes/no	Good conductor/ Poor conductor
1.	Lemon Juice	Yes	Good conductor
2.	Distilled Water	.....	.....
3.	Tap water	.....	.....
4.	Vegetable oil	.....	.....
5.	Salt water	.....	.....
6.	Honey	.....	.....
7.	.....	.....	.....
8.	.....	.....	.....

Actually, under certain conditions most materials can conduct electricity. That is why it is preferable to classify materials as good conductors and poor conductors instead of classifying as conductors and insulators.

In the above activity we have seen that distilled water does not passes electricity through it but the water that we get from sources such as taps, hand pumps, wells and ponds is not pure. It may contain several salts dissolved in it. Small amount of mineral salts are naturally present in it. This water is thus a good conductor of electricity. On the other hand, distilled water is free of salts and is a poor conductor.

Now you understand that why you are cautioned against touching an electrical appliance with wet hands.

Activity 3

Materials required -Three clean plastic or rubber caps of bottles or beaker, distilled water, vinegar or lemon juice, caustic soda, sugar, 2 testers, connecting wires for the electric circuit path.

Take three clean plastic or rubber caps of bottles. Pour about two teaspoon full of distilled water in each of them. Add a few drops of lemon juice or dilute hydrochloric acid to distilled water in one cap. Now in the second cap containing distilled water, add a few drops of a base such as caustic soda or potassium hydroxide. Add a little sugar to the distilled water in the third cap and dissolve it. Now arrange electric circuit path for the above three caps and test which solutions conduct electricity and which do not. Most liquids that conduct electricity are solutions of acids, bases and salts.

NOW ANSWER THESE

1. What do you mean by good and poor conductor of electricity?
2. Why distilled water is poor conductor while tap water is good conductor of electricity?

11.2 Chemical Effects of Electric Current

Electric current produces some kind of effect when it flows through a conducting solution. What is this effect called? Let's understand this.

Two metal rods are dipped in a conducting solution kept in a beaker, one end of metal rod is connected to the positive terminal of the battery and other rod is connected to the negative terminal. Electric current begins to flow. In this condition the conducting solution dissociates into ions. This effect is called chemical effect of electric current. The passage of an electric current through a conducting solution causes chemical reactions. As a result, bubbles of a gas may be formed on the electrodes. Deposition of metal may be seen at electrodes, Also changes of colour of solution may occur. All these may be seen one at a time or simultaneously. The apparatus mentioned above is called voltameter. The terminal of the voltameter which is connected to the positive terminal of the battery is called anode and the terminal which is connected to the negative terminal of the battery is called cathode. In the external circuit of the voltameter, current flows from anode to cathode but inside the conducting solution current flows from cathode to anode, this process is called electrolysis.

If current is passed through a container of acidic water (water and few drops of sulphuric acid), electrolysis of water takes place and it dissociates into ions (fig 11.3) Bubbles were seen below the two electrodes. Similarly, on passing electricity through salt water, electrolysis takes place with dissociation of sodium and chloride ions. Thus the changes that takes place in the conducting solution is called its chemical effect.

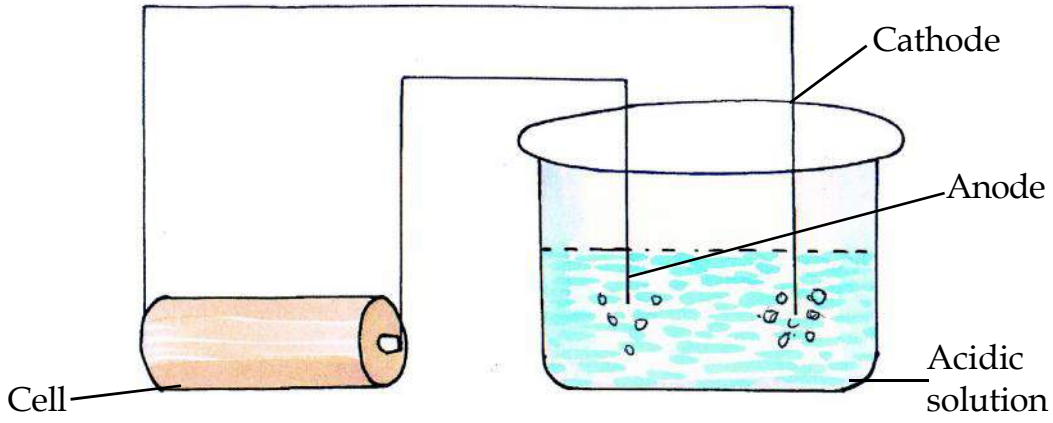


Fig. 11.3 Passing current through water

11.3 Electric Conduction through Fruits and Vegetables

Activity 4

Materials required -Potato, sugar, connecting wire for the electric circuit path.

Cut potato into two equal parts and make an electric circuit path according to the fig.11.4 by inserting the copper wires of a tester into it. After few times, you will notice greenish blue spot on the potato around one wire whereas there is no such spot around the other wire, Repeat the activity for 2 to 3 times, you will find that it was always the wire connected to the positive terminal which had a greenish blue spot around it. This shows that electric current passes through the potato and produces chemical effect.

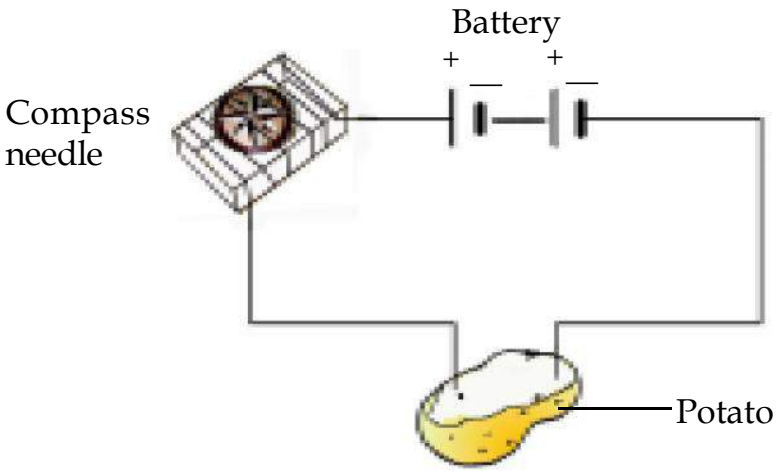


Fig. 11.4 Testing the conduction of a potato

11.4 Electroplating

We have to consider few examples to understand electroplating. You know that a brand new bicycle has shiny handle bar and wheel rims. However, if these are accidently scratched, the shiny coating comes off revealing a not so shiny surface beneath. You might have also seen women using ornaments which appear to be made of gold. However, with repeated use, the gold coating wears off, revealing silver or some other metal beneath. Let's try to learn in both the situations, how one metal is coated over another metal.

Activity5

Materials required - Beaker, distilled water, copper sulphate, dilute sulphuric acid, battery, two copper plates,

Take 200 mL of distilled water in a clean and dry beaker, Dissolve two teaspoon full of copper sulphate in it and make a solution. Add a few drops of dilute sulphuric acid to copper sulphate solution to make it more conducting. Clean, copper plates of size 10 cm x 01cm with sand paper. Now rinse them with water and dry them. Connect the copper plates to the terminals of a battery and immerse them in copper sulphate solution. Allow the current to pass for about 15 minutes. Now remove the electrodes from the solution and look at them carefully. Do you find a coating over it? What colour is the coating? Note down the terminal of the battery with which this electrode is connected (fig 11.5)

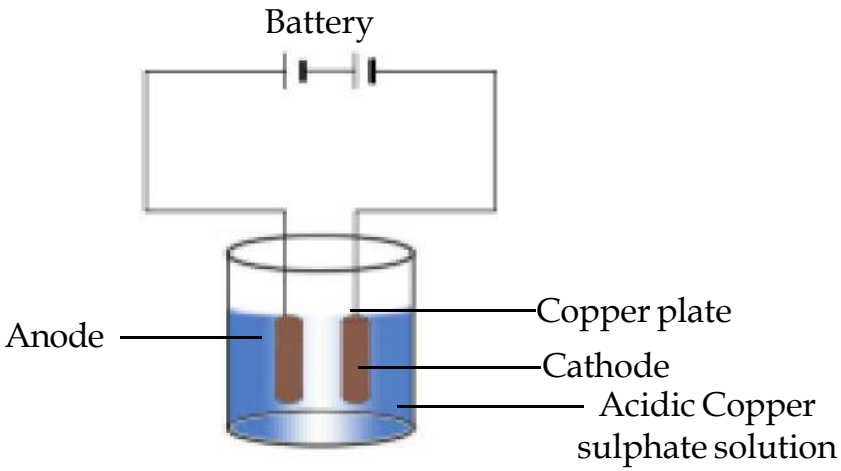


Fig 11.5 A simple circuit showing electroplating

After doing the electroplating activity interchange the electrodes and repeat the activity, what do you observe this time?

When electric current is passed through the copper sulphate solution, copper sulphate dissociates into copper and sulphate. The free copper gets drawn to the electrode connected to the negative terminal of the battery and gets deposited on it. There is a loss of copper from the solution. From the other electrode of copper plate, an equal amount of copper gets dissolved in the solution. Thus the loss of copper from the solution is restored and the process continues. This process continues until electric current passes through the circuit path. On interchanging the electrodes, copper gets deposited on the other plate.

Thus in the process of electroplating, copper gets transferred from one electrode to the other. In the solution, on passing current, when copper plate is connected with positive terminal of battery and carbon rod is connected with negative terminal of the battery, we get success in obtaining a coating of copper on carbon rod. The process of depositing a layer of any desired metal on another material by means of electricity is called electroplating.

11.4.1 Uses of Electroplating

1. Chromium has a shiny appearance. It does not corrode. It resists scratches. However chromium is expensive and it may not be economical to make the whole object out of chromium. So the object is made from a cheaper metal and only a coating of chromium over it is deposited. Thus chromium plating is done on many objects like car parts, bath taps, kitchen gas burners, bicycle handlebars, wheel rims and many others.

2. Jewelers electroplate silver and gold on less expensive metals. These ornaments have the appearance of silver or gold but are much less expensive.

3. Electroplating is used to obtain pure metals from their ores.
4. Electrolysis method is used to get pure metals from their impurities.
5. Tin cans, used for storing food, are made by electroplating tin on to iron. Tin is less reactive than iron. Thus, food does not come into contact with iron and is protected from getting spoilt.
6. Iron is used in bridges and automobiles to provide strength. However, Iron tends to corrode and rust. So, a coating of zinc is deposited on iron to protect it from corrosion and formation of rust.

NOW ANSWER THESE

1. What do you mean by chemical effect of electric Current?
2. What are the main reasons of doing electroplating?
3. Name some electroplated objects available in your surrounding by mak ing a list.

11.5 Electric Cell

We use cell or battery in our daily life to obtain electric current. Some cells are given below.

11.5.1 Voltaic cell

At first in 1796 a scientist named Alexandro Voltas of Italy successfully tried to get continuous flow of current. He found that if two plates made of different metals are placed in an acidic solution kept in a glass jar then the electric current flows through the circuit between the two plates (fig 11.6).

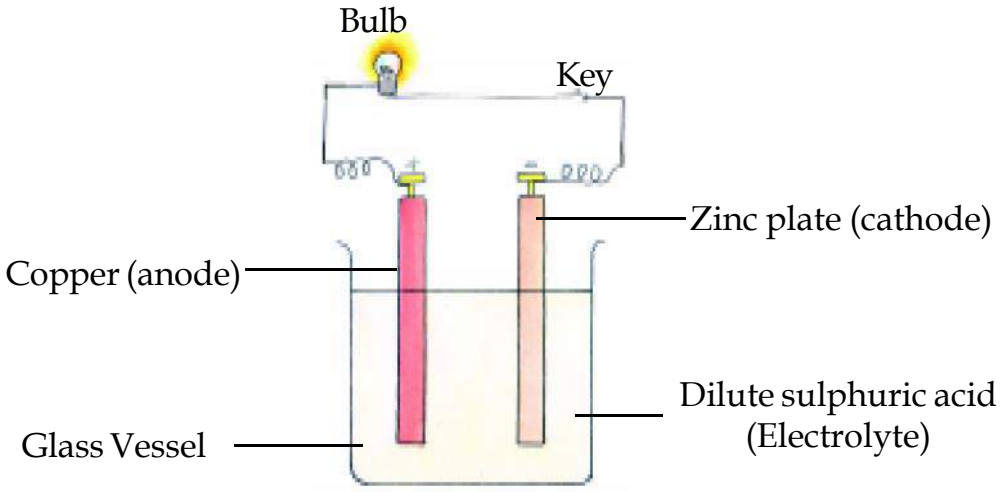


Fig 11.6 Voltaic cell

This source of electric current is called voltaic cell named after its discoverer. In the cell the solution is called electrolyte and the metal plates are called electrodes. The anode and cathode of Voltaic cell are made up of which metals?

11.5.2 Dry cell

The cell, used in torch, transistor, radio and many toys is the dry cell. Do you know how it is formed? To know this, take a used or useless cell and remove its outer cardboard or tin cover and try to look inside. You will find that there is a hollow cylindrical plate of zinc which acts as negative electrode.

This is filled with mixture of ammonium chloride (electrolyte), zinc chloride and plaster of paris paste. In the centre, there is a muslin cloth bag filled with mixture of manganese dioxide, ammonium chloride, and zinc chloride and carbon powder with a carbon rod in the centre. The upper part of the carbon rod comes out and is covered by a cap of brass. This carbon rod acts as the positive electrode. The mouth of this cylinder is closed with sealing wax or pitch. A small hole is there in this to allow the gas formed inside to escape (fig 11.7). To get more electric current we attach two or more cells to each other in series. The positive end of one cell is placed on the negative end of the next cell. The series of such cells is called a battery. When the chemical inside the cell is completely exhausted, the passage of electric current stops. Such a cell is called a dead cell. Cut open a longitudinal section of a dry cell and draw its labeled diagram.

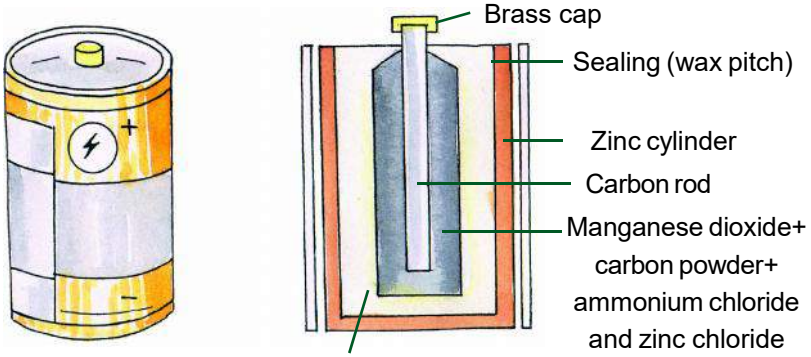


Fig 11.7 Dry cell

11.5.3 Button cell

Button cell is a button shaped small dry cell in which there is a zinc or aluminum anode (positive pole), silver oxide or mercury oxide, cathode (negative pole) and the electrolyte is sodium or potassium oxide.

Because button cell is small sized, cheap, long lived and more powerful, it is used in many electronic instruments as calculators, watches hearing aids etc.

11.5.4 Solar cell

Solar cell transforms the solar energy falling on it to electrical energy. An ordinary solar cell is made of two layers of silicon. In the lower layer, a very small

quantity of arsenic is mixed. This forms the positive layer. In the upper layer, a small quantity of atoms of boron is mixed. This forms the negative layer. When sunlight falls on this arrangement and electric circuit is connected between the two layers then very weak current flows. To increase the quantity of the current, many solar cells are attached in a series.

Uses

1. They are used in watches, calculators, transistors and artificial satellites.
2. It is used for cooking, water heating and for illuminating the street.

NOW ANSWER THESE

1. Which electrode and electrolyte is used in a simple voltaic cell?
2. What is a solar cell made of?

WE HAVE LEARNT

- Some liquids are good conductor where as others are poor conductor of electricity.
- Most liquids that conduct/ pass electricity are solutions of acids, bases and salts
- Electricity does not pass through distilled water.
- The passage of an electric current through a conducting liquid causes chemical reaction, the resulting effects is called chemical effect of current.
- The process of depositing a layer of any desired metal on another metal is, called electroplating.

QUESTION FOR PRACTICE

1. Tick the correct answer -

(i) Which of the following is not a good conductor of electricity -

(a) Distilled Water (b) lemon Juice

(c) Salty Water (d) Tap Water

(ii) The electrolyte used in a simple voltaic cell is -

(a) Dilute sulphuric acid (b) Dilute hydrochloric acid

(c) Copper sulphate solution (d) Potassium hydroxide solution.

(iii) The process of depositing a layer of any desired metal on another material by means of electricity is known as -

(a) Electrolysis (b) Electroplating

(c) Chemical reaction (d) Electro refining

(iv) The apparatus used for electrolysis is -

(a) Electric cell (b) Voltameter

(c) Ammeter (d) Magnetic needle

2. Fill in the blanks -

(i) Solution of ..... electrolyte is used in simple voltaic cell.

(ii) On passing current through any solution, produces..... effect.

(iii) In solar cell ..... energy is converted into ..... energy.

(iv) Process of coating of expensive metals over cheap metals by voltaic cell is called.....

(v) ..... cells are used in watches, calculator, transistors and artificial satellites.

3. Answer the following questions -

1. Does distilled water conduct electricity? If not what can we do to make it a conductor?
2. In case of fire, before the fireman uses the water they shut off the main electrical supply for the area. Explain why they do this?
3. Why zinc is coated with iron?
4. Explain the process of electrolysis?
5. Name the electrolyte, positive terminal and negative terminal of button cell.
6. Write 3 uses of electroplating.

12 SOURCES OF ENERGY

12.1

We need energy to perform physical activities as walking, running, picking up things, removing things etc.

In our earlier classes we have learnt about different type of energies as chemical, electrical, sound, light and heat energies. We know that one type of energy can be transformed to another type.

Write a list of the uses of the given energies in your daily life.

We find that most of the energy used by us is electrical energy. Have you ever wondered from where we get this electrical energy? How this electrical energy is produced and distributed from the distributing centres to far off places.

Come we will do an experiment to find from where we get electrical energy.

12.2 Hydroelectrical Energy

Activity 1

Materials required - Empty matchbox, four small plastic spoons, one empty refil.

Make cuts on four sides in the horizontal part of the match box. Fix the four spoon on this cuts as shown in figure 12.1 (a). Make a small hole in the centre of the match box and insert the empty refil in it. Place this apparatus under water falling from a tap as shown in 12.1 (b).

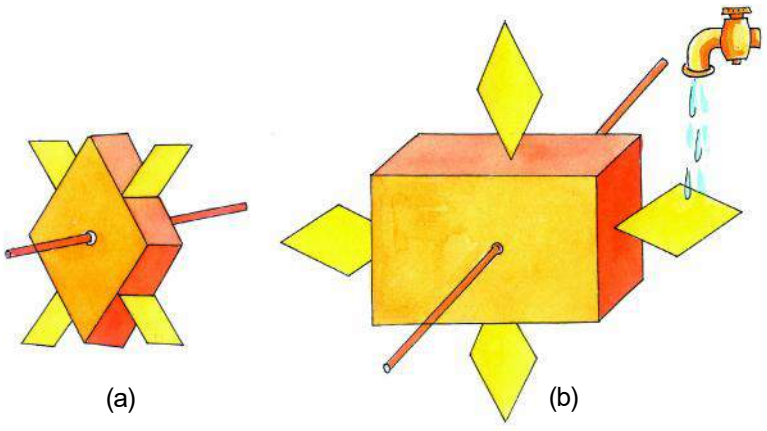


Fig 12.1 Movement of turbine with falling water

What happen when water falls on the spoons?

Some what similar arrangement is there in

dams, where the accumulated water is made to flow with a force such that the turbines on its way turn or rotate.This turbine is connected by a shaft to generators which produce electricity (fig 12.2).

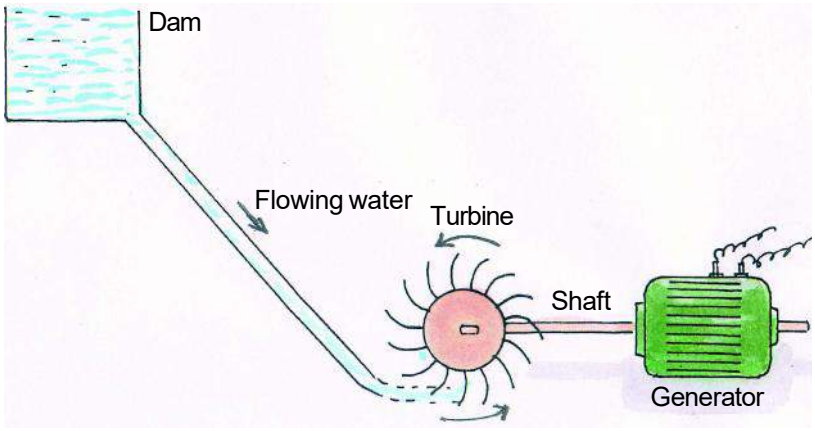


Fig 12.2 Production of hydroelectricity

In Chhattisgarh hydroelectricity is produced at Hasdev Bango and Gangrel dam projects.

12.3 Tidal Energy

Another example of the use of the energy in flowing water is the use of the high and low tides of the sea to produce electrical energy.

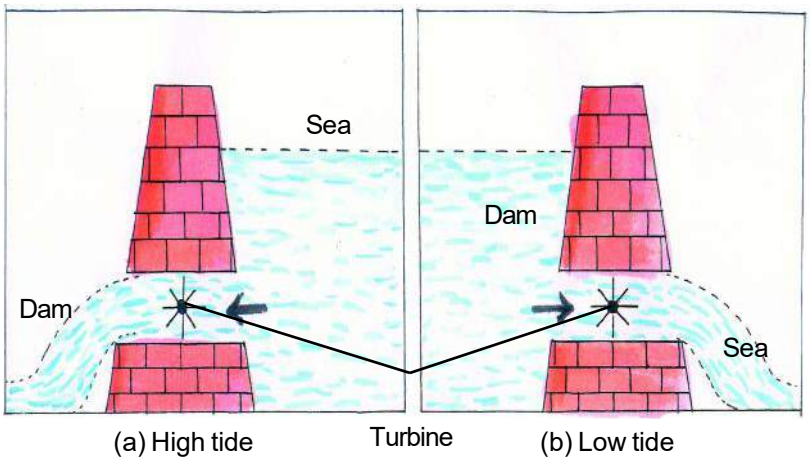


Fig 12.3 Tidal energy

For this dams are made at the mouth of sea bays. At high tide the level of the water increases and water flows into the dam which makes the turbines placed on the way, rotate(fig 12.3 a). In the same way at low tide water flows froms the dam to the sea, which again makes the turbine rotate (fig 12.3 b)

The turbines are connected to the generator and they produce electrical energy. The source of electrical energy here is tidal energy.

In India places for tidal energy has been discovered. These are at Bay of Kutch in Gujarat and the Eastern border near West Bengal.

12.4 Wind Energy

You must have seen bits of paper, leaves flying in strong wind. Can you get energy from strong flowing wind ? Let us know this by an activity.

Activity 2

Materials required - Paper, pin, straw or stick.

Take a square shaped paper and fold it diagonally. You will find the mark of the folds as shown in figure 12.4.

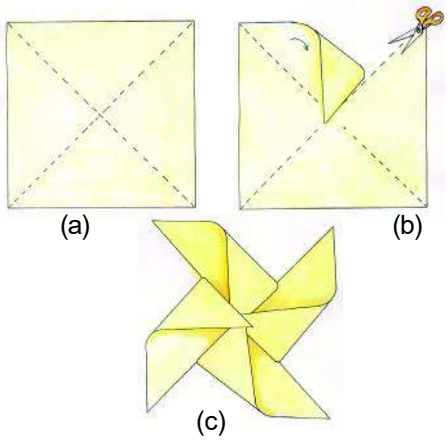


Fig 12.4 Making paper fans

Now cut the paper at the marks to half of the length (fig 12.4 b). Take one end of each cut and paste it at the centre to form a structure (fan) as shown in fig 12.4 c. At the centre make a hole with a pin and attach it to a straw or stick. Hold this 'fan' in your hand and run, or place this fan on the way of the wind coming through a window. What do you see ?


Fig 12.5 Wind farm

Flowing wind is also a source of energy which is called **wind energy**. The direction and speed of wind varies from place to place and from time to time but at some places the direction and speed remains constant.

At these places big fans (wind mills) called **turbines** are built and electricity is produced by the generator attached to the wind mill. The places where these wind mills are constructed are called '**wind farms**' (fig 12.5).

In India, places like Gujarat, Rajasthan, Western Madhya Pradesh, sea shore areas, Southern Tamilnadu, Islands of Bay of Bengal and Arabian sea and some places of Karnatak are found suitable for 'Wind Farms'.

Why are these places only suitable for the installation of wind farms? Discuss.

12.5 Steam Energy

Have you heard about trains being run by steam engines? You must have seen steam coming out while cooking and boiling water.

Can steam be a source of energy ? Let us perform an activity.

Activity 3

Materials required - Fan made in Activity 1, tea kettle, stove to boil water.

Fill the tea kettle with water and heat it. Put the lid on. After some time steam will come out of the nose of the kettle. Place the fan as shown in fig 12.6 on the way of the steam. What do you find?

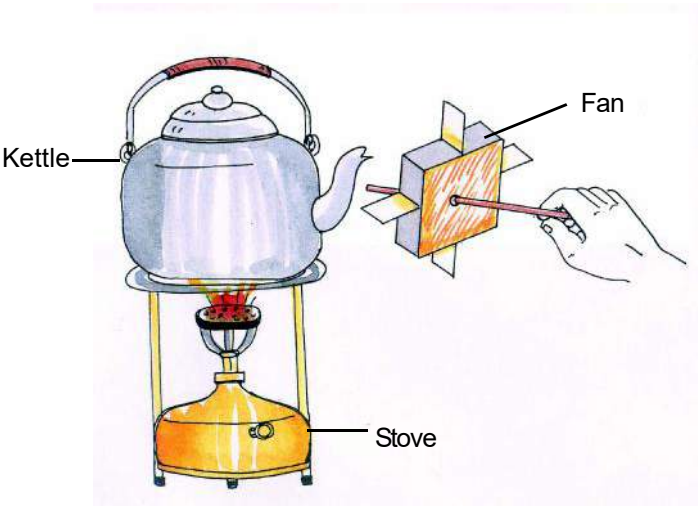


Fig 12.6 Turning of the turbine by steam

In the same way in special plants which are called **boilers**, water is heated by burning coal and then steam is produced. The power of the steam


Fig 12.7 Thermo-electric plant

turns the turbine and electricity is produced by the generator attached to it (fig - 12.7). This is called **Thermoelectric plant**. In our state Chhattisgarh Thermoelectric plant is in Korba district.

12.6 Nuclear Energy

One more source to obtain energy has been developed. We know that the mass of an atom is centred in its nucleus and most of the energy is in the nucleus. When some heavy atom as uranium is broken into smaller sized atom, a large amount of energy is liberated. This process is called fission and the energy produced is called **nuclear energy.**

This nuclear energy is produced in special plants called nuclear reactors. Here nuclear energy is converted into electrical energy. In our country nuclear reactors are working at Tarapur, Kalpakam, Kota and Narora. About 100 km away from Mumbai, the nuclear energy plant at Tarapur is India's completely native nuclear reactor.

NOW ANSWERS THESE

1. How is electrical energy produced in dams?
2. What do you understand by Tidal energy?
3. What is Nuclear energy?
4. What material is used in a Thermoelectric plant to produce electricity?

12.7 Fossil Fuels

In our daily life, to run our vehicles and to make our food which things are used for obtaining energy?

Coal, wood, cooking gas, petrol, diseal, kerosene are called fuels. From where do we get these? Come, let us find out.

Due to the changes long ago in the earth, plants and trees got buried and slowly layers of soil were formed on them. Due to high pressure and temperature these remains of plants

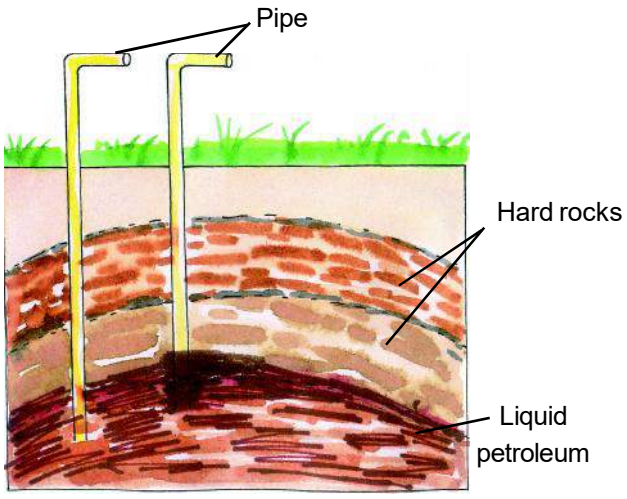


Fig 12.8 Petroleum well

and animals got converted to coal. Formation of the coal in this way takes thousands of years.

In the same way the buried remains of dead animals changed to petroleum due to high pressure and temperature .That is why we call them fossil fuels.

Fossil - Word is used for those remains of dead animals and trees that are preserved in nature for thousands of years.

Petroleum is found deep below in the earth pressed between the rocks. This is obtained by digging wells and pumping it out through pipes (fig 12.8).

The petroleum pumped out from the earth cannot be used directly to get energy. So this pertroleum is sent to the refinery where it is changed and purified to get useful products as petrol, diesel, kerosene, and petroleum gas.

From the wells where we get petroleum, natural gas is also obtained. Natural gas is mainly methane gas which can burn easily to provide heat. This gas can be compressed and used for driving the vehicle. This is called CNG (Compressed Natural Gas). In some of our main cites vehicles run on CNG. Vehicles which are run on CNG produce very less pollutants as compared to other vehicles.

We all know about the cooking gas used by us in our homes. Actually this is the liquid form of petroleum gas which mainly contains butane. Other than butane it has two more gases -Propane and ethane.These are liquidified and filled in cylinders. It is called LPG - Liquified Petroleum Gas.

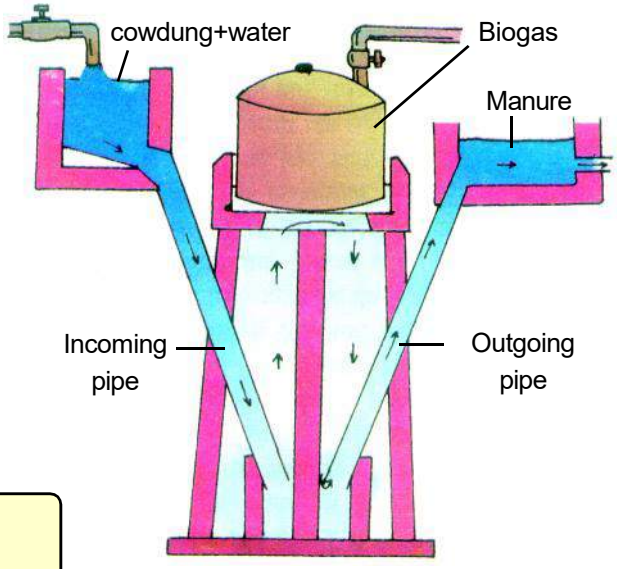


Fig 12.9 Bio-gas plant

LPG is a highly inflammable odourless gas. So for safety purposes a very strong smelling gas is added to this, so that if there is any leakage, it can be identified.

In villages cowdung cakes are used as fuels. Can cowdung be used in any other form to get energy from it?

In many areas cowdung is used to get energy, in form of a gas. For this cowdung is dissolved in water and put in specially prepared covered pits. In this pits this

mixture, in the absence of air is reduced to form methane, carbondioxide and some other gases. This mixture of gases is known as Bio-gas.

The produced gas is collected in the dome covering the pit and taken out through the pipes attached to the dome (fig 12.9)

The following are the uses of Biogas -

1. Like LPG, it is also used as a cooking gas.
2. To produce light.
3. It's use lessens, the use of wood.
4. After the removal of gas the left off material is used as manure.
5. There is no environmental pollution by its use.

NOW ANSWER THESE -

1. What are the main products of petroleum?
2. What is the other name for cooking gas ? What are its constituents ?
3. Bio-gas is a mixture of which gases?

Copy the following table 12.1 in your copy and fill it accurately.

TABLE 12.1

S.No.	Solid fuel	Liquid fuel	Gaseous fuel
1.	.....	.....	.....
2.	.....	.....	.....
3.	.....	.....	.....
4.	.....	.....	.....
5.	.....	.....	.....

Will the store of coal be always there?

Will the source of wind energy end?

These are sources of energy from which we can continuously get energy and they will not get extinct also. But on the other hand there are sources which are rapidly getting finished.

Make table 12.2 on your copy and list the different sources of energy -

TABLE 12.2

S.No.	Sources which are becoming extinct	Sources which will not become extinct
1.	..... Coal	..... Wind .....
2.	.....	.....
3.	.....	.....
4.	.....	.....

Energy sources as wood, coal, petrolum can be said to be non renewable sources and energy sources as wind, water are renewable sources.

Renewable sources are present in plenty and their use doesnot harm the environment. But we can not depend on the nonrenewable sources of energy in distant future to obtain energy. Moreover their uses are harmful to the environment also. Therefore we must find other sources of energy, before these sources are completely exhausted.

12.8 Solar Energy

Can sun be a source of energy? Can the energy received from the sun be used for cooking? Let us do an experiment.

Activity 4 (Demonstration by teacher)

Materials required - Convex lens, some dry leaves and paper.

With the help of the lens, focus the sunlight on the dry leaves. What happens if you hold it so, for some time? In the same way focus on the paper also. You find that the energy obtained from the sun has the power to provide heat to any material. The energy from the sun in form of light and heat is called solar energy.

Let us do one more experiment.

Activity 5

Material required - Two test tubes, black rough paper, water and glue.

Stick the black paper on the outside of one test tube with glue. The paper must be tightly fixed on the test-tube and must not move. Let the other test-tube remain as it is.

Now fill both the test tubes with water and place both the test tubes in sun. See that the light doesnot fall directly on the water. After 30 minutes pour the water of each test tube seperatly on your hands.

What difference do you find in the temperature of the water in both test tubes?

What is the cause? Black surface is a good absorber of heat. This principle can be used in the following apparatus which use solar energy.

1. Solar Cooker

It is big box made of metal. The inside wall of this box is painted black and a mirror is placed on the lid, which can be adjusted to focus the sun rays to the inside of the box.

The inner walls of the box absorbs heat and gets heated. To stop the heat to escape from the box another cover of glass is placed on the lower part of the box. Inside the box there are small metal boxes painted black on the outside. The food items can be placed in these small boxes. (fig 12.10)

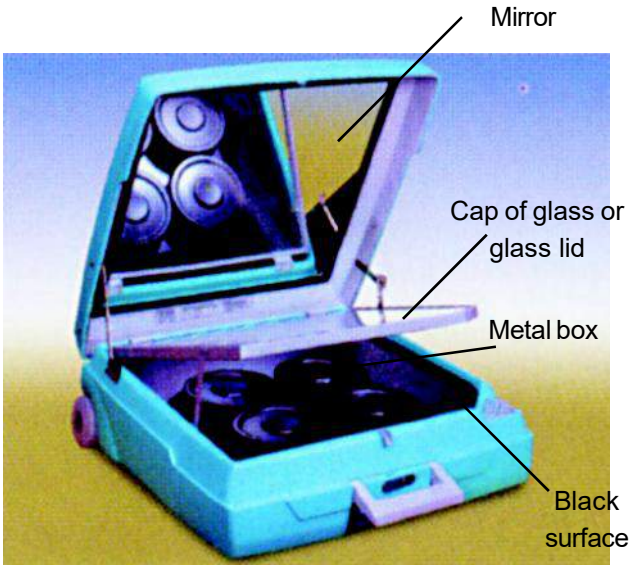


Fig 12.10 Solar Cooker

2. Solar water heater

Water is heated by this apparatus, so it is called solar water heaters. This is a box of insulated material with a long pipe of copper which is painted black.

Water passing through the pipe get heated and it is collected at the other end in tanks (fig 12.11)

Fig 12.11 Solar water heater

Visit places where these apparatus are used and observe its function.

Presently the new form of solar energy apparatus - 'Solar cell' is used. In this solar energy is converted to electrical energy. These cells are made of silicon materials.

Solar batteries are also a type of stored solar energy which is used to run vehicles and machines. Discuss about other uses of solar energy and apparatus using solar energy in your class.

NOW ANSWER THESE -

1. Why is the solar cooker box painted black?
2. In the solar water heater, energy is transformed into which form?
3. What is the solar cell made of?
4. Why are the pipes of solar water heater made up of copper ?

BIO DIESEL

You must have heard of bio-diesel. This is the recent source of energy which is being used widely. It is an oil obtained from the seeds of a plant named 'Ratanjoth'. It can be used along with petrol and diesel. Chhattisgarh government is using the waste lands to grow Ratanjoth. Chhattisgarh biofuel authority has been established for this purpose. Chhattisgarh is the pioneer to the use of biodiesel.

12.9 Which is the primary source of energy?

We has learnt about many different sources of energy. Is there any primary source of energy for all these?

Think :-

1. How do plants prepare their food?
2. From where does water come in the rivers?
3. Why does the wind blow? Give reason.

We know that plants make their food through photosynthesis in presence of sunlight. That is energy is stored in plants with the help of sun. The biodiesel from Ratanjoth is also obtained by the same process. In the same way water on earth evaporates due to the heat of sun and forms clouds. Rains fall from the clouds and the rivers are filled with water, which will be collected by making dams. This collected water in the dams is used in hydroelectric plants.

Let us see how wind energy is connected to the sun.

The solar energy heats up the land and water on earth to different temperatures. Due to this difference in temperatures flowing currents are formed in the air which flow between the hot & cold regions. These flow very fast and are called winds. In this way sun is the source for wind energy also.

Petroleum and coal are the remains of plants and animals which are a modified form of energy from the sun.

In this way most of the energies are formed due to the sun or we can say, 'solar energy is the principal source of energy'.

In the newspaper, T.V. etc. we find appeals to take some precautions as.

- Save oil its every drop is precious.
- Check your vehicles regularly.
- Save electricity.
- Cover the utensils while cooking.
- Use pressure cookers
- Check the pressure of air in tyres.

Why do you think such precautions are necessary?

The articles used in our homes as bulbs, tubelights, fridge ,cooler etc. consumes much energy. The consumption of different forms of energy is continuously increasing in arrangements of light on roads, in transport, agriculture and factories.

The energy received from different sources are also not sufficient to fulfill our increasing necessities of energy. So we must control and balance the use of the available energy sources.

NOW ANSWER THESE

1. What can you do to conserve or save electrical energy in your homes?
2. Biodiesel is obtained from which plant?
3. In future, from which other sources can we obtain energy?

WE HAVE LEARNT

- The electricity produced from water is called hydro electric energy.

- Windmills run due to strong winds from which electricity is produced. This energy is called wind energy.
- It takes thousands of years to form coal and petroleum. They are called fossil fuels.
- Petroleum is obtained from the earth through pipes. Many products are obtained from them as petrol, diesel, kerosene etc.
- Cooking gas has 'butane' and natural gas has 'methane' in it.
- Energy can also be obtained from the sun. It is called solar energy.
- Black surface is a good absorber of heat. This principle is used in solar cookers and solar water heaters.
- Cowdung mixed with water is used to make a gaseous fuel, which is called Bio Gas.
- Fuels can be solids, liquids or gases.
- Wood, Coal and Petroleum are non renewable sources of energy and solar energy, wind energy, hydro energy are renewable sources of energy.
- Biodiesel is good source of Bio-energy.
- Demand for energy is increasing continuously so we must use it carefully in a balanced manner.

QUESTION FOR PRACTICE

1. Choose the correct alternative :-

(1) Out of these, this is a non renewable source of energy -

(a) Wind energy (b) Petroleum

(c) Tidal energy (d) Solar energy

(2) The fuel used in heavy vehicles as buses & trucks are -

(a) Tarpene (b) Biogas

(c) Diesel (d) Kerosene

(3) The energy converters in a solar cell is made of -

(a) Aluminium (b) Carbon

(c) Plastic (d) Silicon

(4) The energy received from the battery is :-

(a) Chemical energy (b) Heat energy

(c) Electrical energy (d) Mechanical energy

(5) It is not a product of petroleum :-

(a) Petrol (b) Bio diesel

(c) Kerosene (d) Diesel

2. Fill in the blanks :-

1. ..... energy is mostly used in our homes.
2. Solar cooker is based on ..... energy.
3. Coal is a source of ..... energy.
4. Mixture of cowdung and water treated in special plant produce ..... gas.
5. The liquid fuel in our homes is .....

3. Match the following :-

1.	CNG	Electrical Energy
2.	Sea	Solar energy
3.	Solar cooker	Wind energy
4.	Wind Farm	Natural gas
5.	Dams	Tidal energy

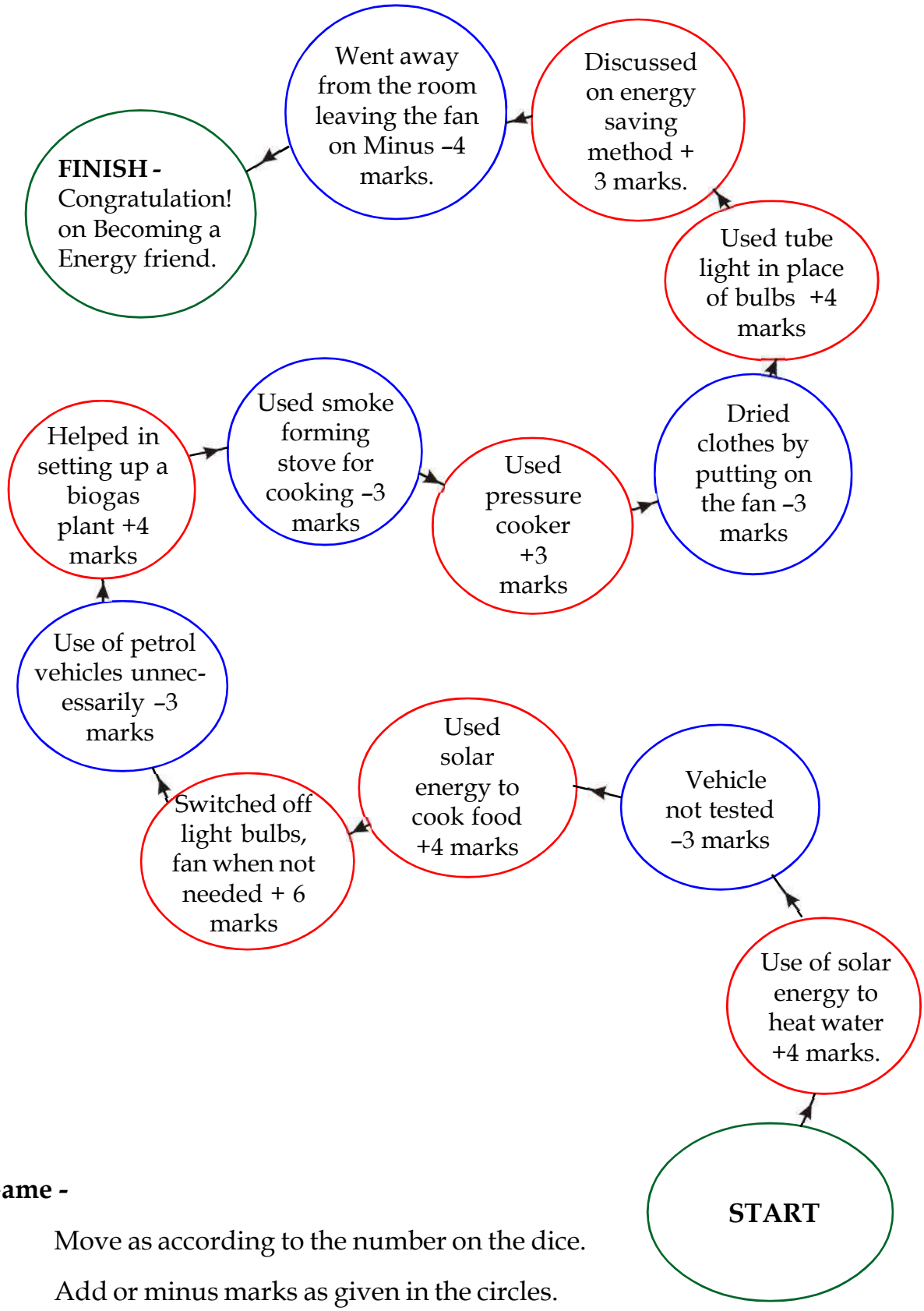
4. Answer the following questions :-

1. Write names of four sources of energy.
2. What are the benefits of solar energy? Give two examples of its use in daily life.
3. How is hydroelectricity produced? In Chhattisgarh where are the projects for hydroelectricty situated?
4. Write the names of the different products of petroleum.
5. What is Biogas ? How is it produced?
6. List down the various sources of energy used in your surrounding and categorize them as renewable and non-renewable sources of energy ?
7. What are the main gases present in LPG?
8. According to the available resources what kind of power station would you like to install in your area. Explain.

TRY TO DO THIS ALSO

1. Discuss with your friends and teachers about the misuse of energy.
2. Collect articles from newspaper about the different types of energies, their uses, preservation and precautions in their use.
3. Play the given game with four friends and discuss about the things given in it.

ENERGY GAME



Game -

1. Move as according to the number on the dice.
2. Add or minus marks as given in the circles.
3. The players who reaches the end with maximum marks is the winner.

13 FOOD PRODUCTION AND MANAGEMENT

13.1 AGRICULTURE

You know that food is one of the basic requirements of all living organisms. Man along with most animals obtain their food directly or indirectly from plants. From ancient times man has farmed the lands for obtaining food. Plants of a common variety grown in a particular area for a particular purpose is called crop. Growing different types of crops and their yields is called agriculture.

In present situation occupations and activities connected to agriculture as animal husbandry, poultry, fisheries, apiculture and mushroom production are also included under agriculture. We can define agriculture science as :- Technical knowledge about the management & mass production of different crops and animals useful for man is known as 'Agricultural science'.

13.2 TYPES OF CROPS

Do all type of crops grow in the same season? Different crops are grown and their yield are collected in different seasons. Growth of the crops and their production depends on the factors- soil, rainfall, light and temperature factors. According to the seasons we can differentiate the crops into three kinds-

1. KHARIF/AUTUMN CROPS

These crops need much water and heat (temperature). These are grown in the rainy season. These crops are sown during monsoon that is June-July and are reaped in October-November. Main kharif/autumn crops of our country are paddy (rice), maize, green gram (moong) blackgram (Urad), jawar, millets, sugarcane and cotton.

2. RABI/SPRING CROP

These crops needs moisture and less temperature. These are grown during winter season. They are sown in October-November and reaped in March-April. Main rabi/spring crops are wheat, bengalgram, mustard, barley, lentils, pigeon pea (Arhar), kusum, linseed etc.

3. JAYAD CROP

Some crops yield more in dry weather. These are usually sown in December to February and by March to May these crops are ready to reap. Some main crops are Water melon, Musk melon, Cucumber, Sunflower, Ground nut etc.

13.3 METHOD OF AGRICULTURE

Every farmer's main aim is to get maximum yield from the available land. For this he makes many preparations and follow different procedures. All these jointly is called the agricultural methods. During the production of crop these methods are in a systematic sequence which starts from the preparation for sowing of the crop to the ripening of the crop. Then the yield is reaped and stored. Come, now we will see the agriculture methods.

13.3.1 SELECTION OF THE LAND

For maximum yield farmer selects an appropriate land where the seed may germinate and grow easily and also where it can get the required amount of nutrients, water and air.

13.3.2 PREPARATION OF SOIL OR LAND

In the first stage of land preparation, the farmland is ploughed. For this the simple traditional plough or the soil over turning plough is used. The traditional plough only cleaves through the land but the soil turning plough not only cleaves but also turns the mud out (fig 13.1 a & b).

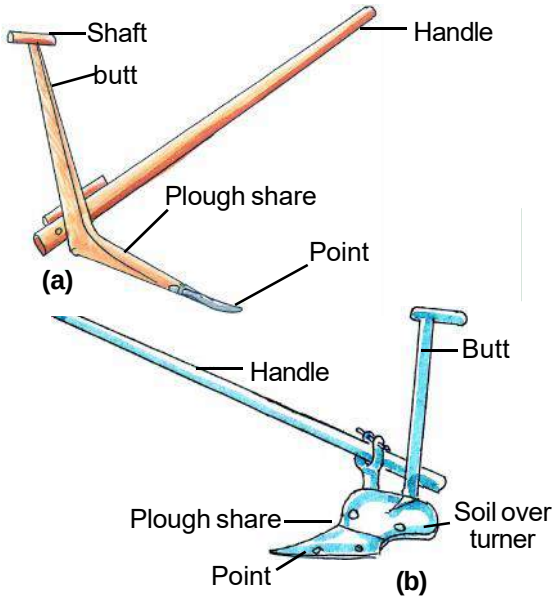


Fig 13.1 (a) Traditional plough, (b) Soil overturning plough

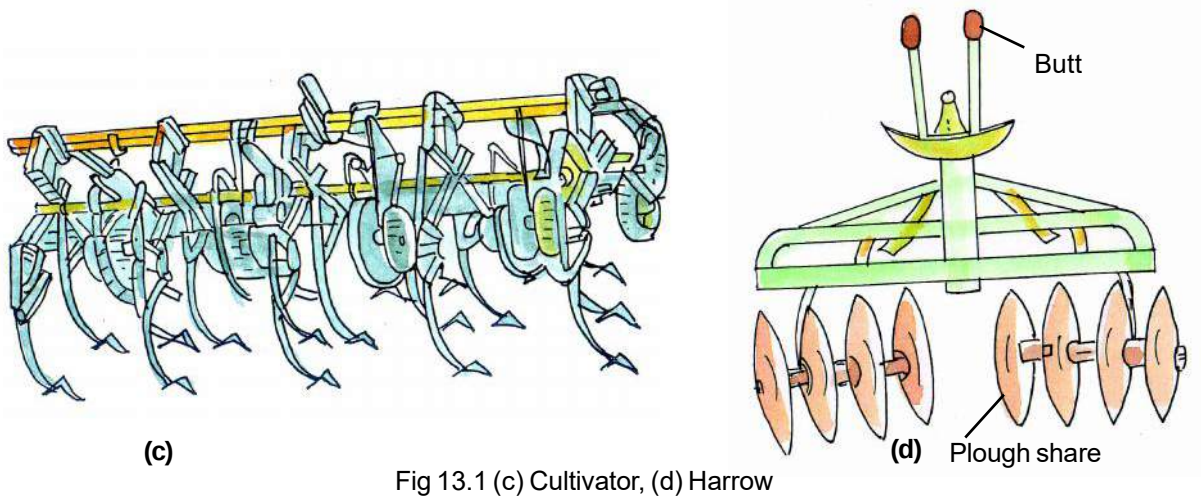


Fig 13.1 (c) Cultivator, (d) Harrow

After the paddy crop the lands becomes much hard for the rabi crop. To prepare this land traditional plough is not sufficient. For this tractor or power run cultivator, Rotawer or Harrow is used (Fig 13.1 (c) (d)).

ADVANTAGES OF PLOUGHING

1. Soil becomes loose such that its capacity to retain water and air increases. Due to which roots develop faster.
2. The left out part of earlier crop and grass etc. mixes with soil and becomes manure for the soil.
3. Disease creating insects, worms and their eggs are exposed and are inactivated in the sunlight.
4. Crop friends as earthworm millipeds bacterias and fungi get the facility to develop further and thus they increase the fertility of the soil.
5. The fertilizers and manures mixed with the soil before ploughing gets evenly distributed.

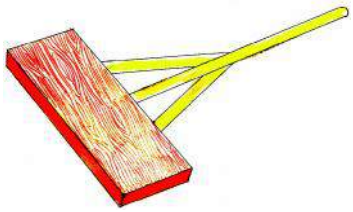


Fig 13.1 (e) Wooden block or harrow plank

After ploughing, the soil in the field may have big lumps. So before seed sowing and irrigation, these lumps are to be leveled. For this wooden block is used(fig.13.1 e).

NOW ANSWER THESE

1. Can you say that Ipomea or some weeds grown in some place is said to be a crop? Give reasons.
2. Write the different crops according to seasons.
3. What are the traditional and modern equipments used in ploughing?

13.3.3 SELECTION OF SEEDS & SEED TREATMENT

Which ever crop is chosen, the seeds of it must be completely healthy, having good germinating capacity and resistance to diseases. For a good yield improved and hybrid seeds must be used. Selection of good seeds can be done by the following methods.

Come let us do an experiment -

Activity 1

Material required - A big beaker or bowl, about 50 g of old wheat or bengal gram (whole) and water.

Soak the wheat or bengal gram in the water in the bowl and observe it after two to three hours. What do you find ? Those seeds which float are lighter. They are hollow because of being eaten by worms. Such seeds do not swell and do not germinate hence are useless. Those seeds which are at the bottom are healthy and useful seeds.

Seeds may have fungus or other disease germs and their eggs on them, which may affect their germination. Therefore, the seeds must be treated with fungicides or insecticides solution. Outer skins of some seed are very hard such that their germination takes much time. Such seeds must be soaked in hot water for three to four hours, so that their skins may become soft and may easily germinate. The process of preparation of seeds by treating them against infections and for easy germination, before sowing is known as treatment of seeds.

Hybrid Seeds

Seeds with different characteristics are selected and artificially breeded to get new improved and better seeds. These type of seeds are called Hybrid seed. Hybrid seeds are of better quality.

13.3.4 SOWING OF SEEDS

Planting the seeds in the soil for germination is known as sowing of seeds. For sowing of seed it is necessary to see if there is sufficient moisture, air and light needed for germination. And also if there is enough space between the seeds. The following are the different ways of sowing of seeds.

(1) Scattering method

In this method the seeds are scattered through out the field by hand. And then the field is ploughed (fig 3.2) due to which the seeds get embedded in the soil. By this method a large area can be covered in less time. Mostly all grain crops are sowed by this method. Try to find out if bengal gram, peas, tomato and vegetables are sowed by this method or not.

Fig 13.2 Sowing by scattering method

(2) Ploughing-Seeding method

To sow by this method a machine is used. In any simple ploughing-seeding machine there is a long tube with a funnel on one end. This is tied to the plough. The

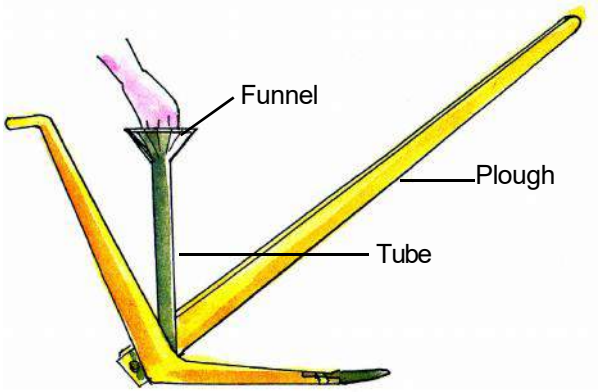


Fig 13.3 (a) Simple ploughing-seeding machine

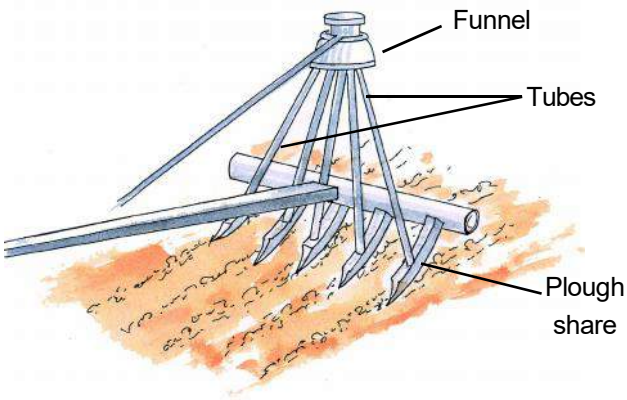


Fig 13.3 (b) Improved ploughing-seeding

Fig 13.3 Ploughing-seeding machine

seeds are filled in the funnel. The seeds pass through the pipe or tube into the furrows made by the plough (fig 13.3a) In this way seeds are sown in a line and at similar depths. In a improved machine a funnel is attached to five to six tubes (fig 13.3b) By this five to six furrows can be sown at a time. This machine can also be used with a tractor.

Activity 2

Materials required : Four equal sized beakers, wheat grains, soil and water.

Label each beaker and name them A, B, C, D. Put ten healthy grains of wheat in each beaker. Now fill beaker A, B & C with soil upto 3 cm and fill beaker D to 6 cm height. Now Fill beaker A full of water and keep it that way. Keep the beaker B dry. Add only that much water to beaker C and D that the soil remain moist.

Observe the beakers for some days and answer the following questions.

1. Which beaker shows maximum germination?
2. Did beakers A, B & D germinate? If they didn't then why?
3. Write the favourable conditions for germination.

3. METHOD OF PLANTING

Some crops as onion, chillies, tomatoes, cabbages, brinjals etc. are not grown directly, that is their seeds are not sown directly into the field but

they are sown in small nursery farms or boxes and when small saplings appear, the healthy saplings are selected and planted in he fields at regular intervals. This is known as planting method.

Fig 13.4 Planting method

In our country where there sufficient water supply and irrigation facility sowing of paddy (rice) is done by **planting method.**

13.3.5 MANURES AND FERTILIZERS

For Proper growth of the plants, different minerals are needed. These are called plant nutrients. Plants usually get them from the soil. But continuous farming deprives the land off nutrients due to which the fertility of the soil diminishes. So to keep the soil fertile the farmer adds fertilizers and manures.

Manures are usually prepared from remains of plants and animals as their wastes, garbage and decaying things. These are called biotic manure. The different types of biotic manures are -

(1) Dung manure (Gobar Khad)

The cattle excreta is made to decompose in a pit. This makes a very good manure.

(2) Compost manure

This is prepared by decomposing organic matter derived from vegetable waste, garbage, animal refuse placed in large pits or specially designed tanks. In this, dung and animal refuse is in less quantity, but this also have much nutrients as dung manure.

(3) Green manure

Different legume crops as sun hemp, horse gram, cowpeas, beans, lentils and branched plants are ploughed back into the soil and they decompose to form green manure. This manure is good for paddy, corn and wheat crops.

Come, we will make compost

In your school compound or any open place, select a place which is not much visited or is not used for some work. Prepare a 1 metre deep pit with the help of your environment club students or your friends. Fill the pit to 30 cm with garbage as paper pieces, broken twigs, dry leaves, vegetable, fruit skins, cattle dung. Now spray a mixture of dung, soil and water over this. Again make a layer of garbage and soak it again with dung-soil mixture. Continue this layering till about only about 50-60 cm is left. Now fill the rest with wet soil and cover it tight with dung mixture and leave it like that. After 3-4 months you will find the pit has shrunken and the matter in the pit has turned to black crisp substance. This is compost you can use it as manure for your garden and also keep your school premises clean.

Vermi composting

For quicker composting of organic matter, earthworms are used. Earthworms eat the decomposing organic matter and their worm casting are rich in nutrients. This is known as vermicompost. This has nitrogen, phosphorous and potassium etc. nutrients in sufficient quantity. Earthworm remove garbage from the environment and helps to keep the environment clean. It also provide manure. In this way earthworms are useful to man in being 'environment friendly' and a 'farmer's friend'.

4. Fertilizers

Some nutrients as nitrogen, phosphorous and potassium in the soil is enriched by the farmers by adding chemicals. These are called **fertilizers**.

(1) Nitrogenous fertilizers

These provide nitrogen to the plants. Main nitrogenous fertilizers are Urea, Ammonium sulphate, Ammonium nitrate etc. These are necessary for leafy vegetable crops as cabbage, spinach etc. and by their use plants grow fast.

(2) Phosphatic fertilizers.

These provide phosphorous to the plants. By their use the roots and stems of the plants are strengthened. They are necessary for legume crops. Calcium super phosphate is a phosphatic fertilizer.

(3) Potassium fertilizer

These provide potassium to the plants. These are beneficial to root crops. Potassium sulphate, potassium chloride are the main potassium fertilizers.

For the crops different methods are adapted to add the manures and fertilizers in the field, as spraying over the fields putting them around each plant in furrows, dissolving the fertilizer in water and spraying them with sprayers or placing them on the mouth of irrigating pipes so that they may mix with the water and reach the plants.

Fig 13.5 Spraying of fertilizers

Proper use of fertilizers increases the yield but excessive use of it, may make the chemical flow over by rain and irrigating channels to the near by rivers and ponds and pollute them, and disturb the ecological balance.

Observe the ponds and lakes nearby where fish are breeded and kept. Here for feeding the fish, some fertilizers and manure are added to the water. Due to their effect the number of algae and other water plants is increased so much that the whole water of the pond looks green. After sometime there is a foul smell also. Discuss with your teacher why it is so.

Changes due to an increased number of algae can decrease the amount of dissolved oxygen in the water. So the other organisms in the water do not get sufficient oxygen, due to which they die. This state is called ***eutrophication****.*

You must be knowing of the micro organisms which can fix the atmospheric nitrogen, such that it increases the fertility of the soil. Can you tell the name and place where these are found?

In a paddy field when the farmers fill it with water then large amount of green coloured microorganisms are formed in the water. These are blue green algae. These also help in the fixation of atmospheric nitrogen and increase the amount of nitrogen present in the land. Farmers use micro organisms and blue green algae as bio-fertilizers to increase the yield of the crops.

Crop rotation

When the same type of crop is grown again and again, then the fertility of the soil decreases. To maintain the fertility of the soil, different type of crops must be sown one after other. Usually a legume crop is sowed after a grain crop, which helps in retaining the nitrogen in the soil.

Mixed cropping:- When two or more different crops are grown together in the same field, it is called mixed cropping. When two or more different crops are grown in definite rows it is called inter-cropping.

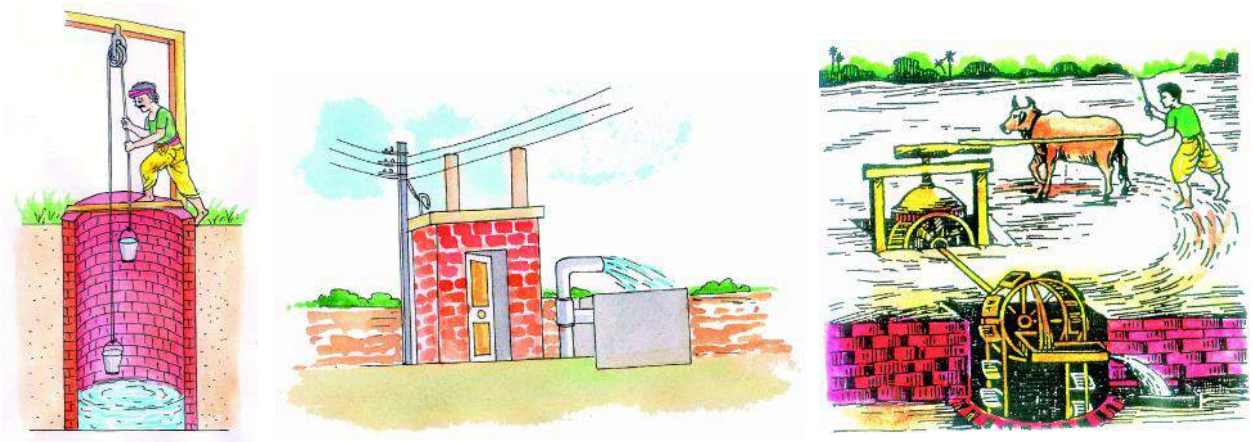
Example:- (1) wheat ↕ gram ↕ mustard (2) groundnut ↕ sunflower

13.3.6 Irrigation

Watering of crops is necessary at regular intervals. The process of providing water to the plants artificially is known as irrigation. With the water from irrigation the plants perform the activities of absorbtion of minerals, photosynthesis and other biological functions. The amount of irrigation depends upon the type of soil and the requirement of water by the grown crops. The summer season crops (kharif) need more water. You must have seen the paddy fields filled with water, right from the plantation of seedlings to harvesting of the crop. Where as the winter season crops (rabi) do not need much water.

Sources of irrigation

Can you tell which is the main source of water? A field cannot get water from rains at all times. Farmers use water from dams, rivers, ponds and underground



A. Irrigation by pulley B. Irrigation by water pumps C. Irrigation by water wheel

Fig 13.6 Different source of irrigation

sources to irrigate their fields. On large scale irrigation is done through canals from the dams built on the rivers. On small scale irrigation is done from ponds, wells and pipelines. From the wells, water is pulled up with the help of a pulley or a seesaw-lift (Dhekuli) or a water-wheel and water is transported to the fields through canals. (fig 13.6) For irrigation, machines as motor pumps and submersible pumps are also used to pump up water from the water sources.

It is beneficial to irrigate the crops in the right time and in right quantity. What would happen if the crops are irrigated irregularly and unnecessarily? In both the cases the crops would fail. If there is more irrigation than needed, then it would harm the soil- aeration. When water accumulates in the field for a long period, there is a shortage of transfer of air in the soil, due to which the roots of the plants do not get sufficient oxygen and starts decaying. This is called flood.

New techniques of irrigation

With the new techniques of irrigation water wastage can be lessened. These measures are:-

Sprinkler or fountain method irrigation

In this method standing crops are artificially showered with water. Water is passed at high pressure through pipes and it comes out through outlets of small pores, fitted on wheel shafts, in form of showers. (fig 13.6a) This method of irrigation is perfect in uneven lands where no other method is effective.

Drip irrigation

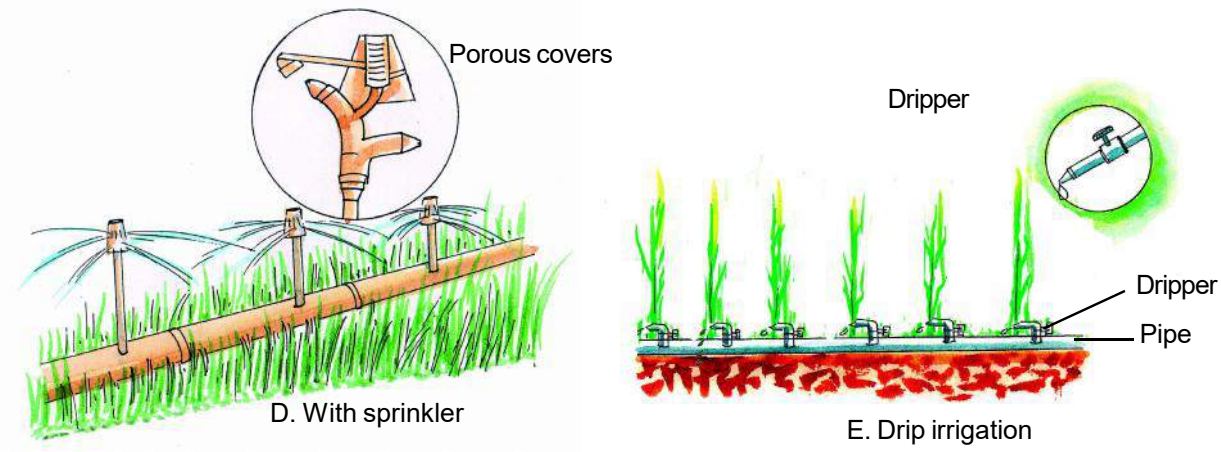


Fig. 13.6

In this method water is send directly to each plant from a compressor. Water flows through closed pipes and falls in drops through small minute pores. (fig 13.6b) By this method fertilizers and other chemicals are also given to the plants.

Which crops are watered through drip irrigation ?

NOW ANSWER THESE

1. What is seed treatment?

2. Why is it necessary to plant seeds at reasonable depths?

3. How is compost made?

4. Why is the earthworm called the 'farmer's friend'?

5. What are fertilizers?

6 Why is irrigation necessary for crops?

7. What are the new irrigation techniques?

8. Can we plant or grow grains and gourds in the same field? Explain giving reasons ?

13.3.7 Weeding or weed control

The unwanted plants which grow along with the crops are called **weeds**.

Can you tell why is it necessary to remove the weeds from the crops? These weeds compete with the crops for nutrients, water, space and sunlight, which can hinder proper growth of the crop plants. Due to which the quality and production gets affected. Some weeds hinder the harvesting of crops and some are poisonous to animals and human beings.

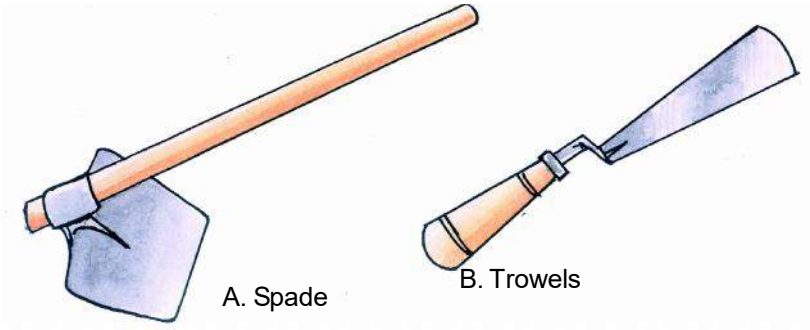


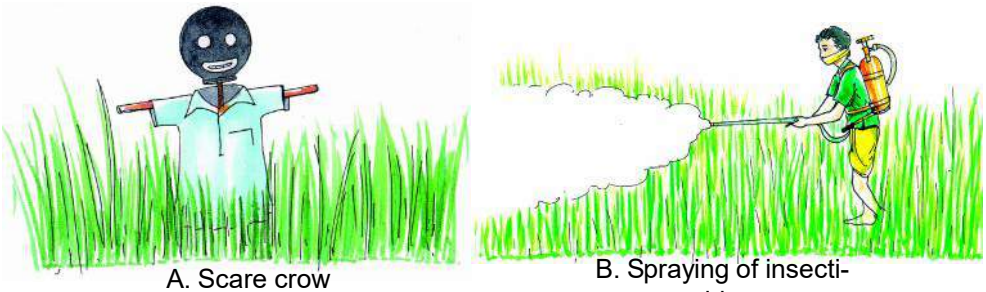
Fig 13.7 Tools to control weeds

The process of removing the weeds from the crops is called **weeding** or **weed control**. The weeds which grow with the summer season crops (kharif) and the winter season crops (rabi) are different. Some of them are as follows -

Summer season crop weeds :- rot(dhubi), sauwa, kausi, nut grass (Motha), amarantus (chowlai), trianthema(Satthi), sarkanda etc

Winter season crops weeds :- Chenapodium (bathuwa), wild oats (jungali jaii), convolvulus (hirankhuri), bhungari, red rot (lal dudhi).

Usually weeding or removal of weeds are done by hands or by simple tools as spades,trowels, hoes and harrow cultivator.(fig 13.7). Weeds are also destroyed with some chemicals which are called weedicides. In nature there are living organisms which selectively destroy the weeds. For example, an insect is used to control the growth of cactus and some fishes as grass carp is used to control water weeds. Weed control by living organisms is called biological weed control.



A. Scare crow

B. Spraying of insecti-cides

Fig 13.8

13.3.8 Crop protection

Crops are affected by many external factors. Can you tell what can affect or harm crops? The organisms which harm the crops, as animals, birds, insects, disease causing micro organisms- bacteria, virus and algae are jointly called pests.

Come lets find some measures to control them.

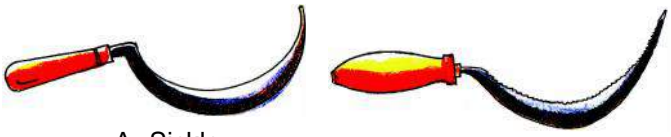
1. Fields can be protected against grazing by stray and wild animals, by making boundaries on fields and fencing them with thorny wires.
2. Scarecrows can be placed in the fields to drive away the birds. Even sound of the beating drums can keep them away. (fig 13.8a)
3. Protection against pests as bacteria, fungus, insects, rats and squirrels can be done by spraying pesticides, fungicides and insecticides.(fig 13.8b)
4. Protection from pests can also be done with the help of some parasites predictors, bacteria, and fungus. This is called biological method of pest control. Trichogerma is a parasite which grows on sugarcanes, grams, groundnut and feeds on the disease causing insects and their larvae. Predator insect cocsinella destroys *mahu*. Predator birds as cranes, ducks and swans play an important role in biological pest control. They feed on the insects on the crops and destroy them.
5. Before sowing, the land must be tilled properly, such that the buried eggs and larvae of the harmful insects may be exposed to the Sun and be destroyed.
6. Mixed cropping is a very effective way of pest control from insects. Even selection of adequate crop rotation cycle also helps in pest control.

An advice

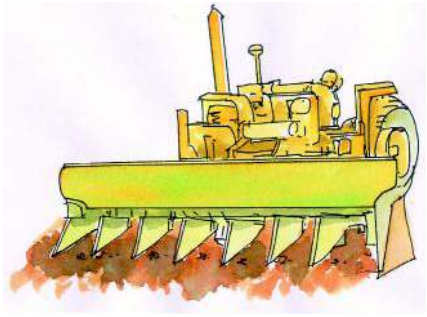
Pesticides directly affect our health. These chemicals flow into the soil and are absorbed by the plants. These may also form a layer on the leaves and fruits. That is why we must always wash the fruits and vegetables thoroughly before use.

13.3.9 Crop harvesting and thresing

After maturation of the crops, reaping the crops is called **harvesting**. Reaping is done by hands or by using tools as sickle, scythe or reaping hook. Rice and wheat is reaped by machines called harvester(fig 13.9) Fruits and vegetables are picked with hands. Tractors or power-triller are also used for reaping. After reaping the harvest the grains have to be separated. This



A. Sickle B. Scythe (Daranti)



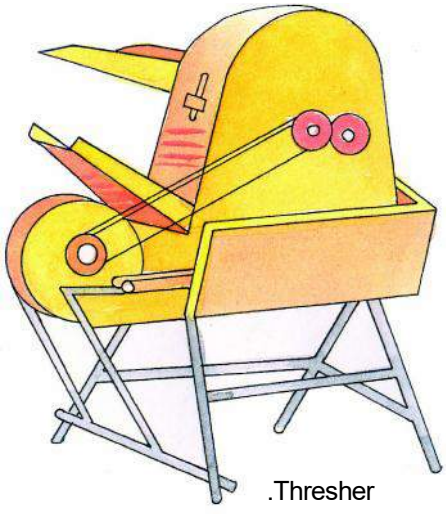
C. Harvester

Fig. 13.9

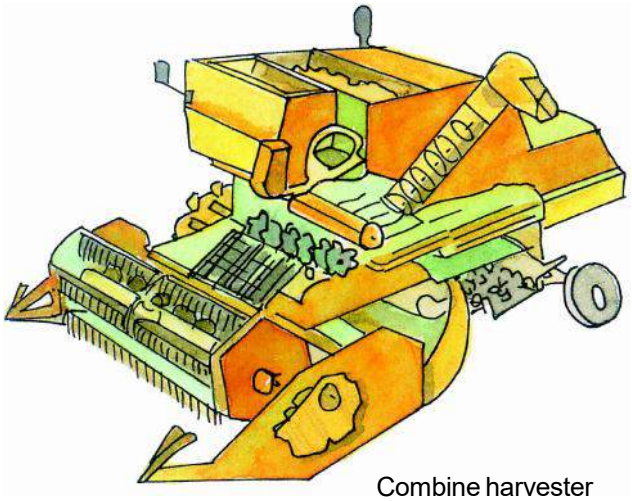
Rollers

Suppression

Fig. 13.10 A. Traditional methods of threshing



.Thresher



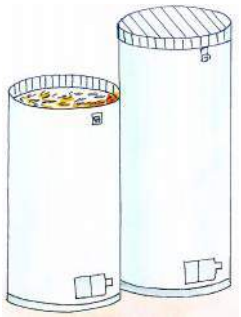
Combine harvester

Fig13.10 B. New machines used for threshing

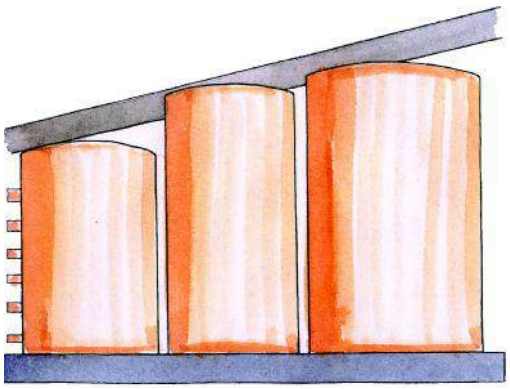
process of seperation is called threshing. Traditionally threshing was done by the roller and suppression method. Tractors are also used for this purpose. Some farmers use threshers for this purpose. Combine harvester is a type of agricultural machine, by which, both reaping and threshing is done. After threshing, removing the husk from the grain is called **winnowing**.

13.3.10 Storage

a- Godowns (Godam)



b- Bins



c- Cylos

Fig 13.11 Different types of storage

After reaping and threshing grains and other products in large quantities are to be stored safely. This is called storage. From harvesting to the use of the grain about 10 % is lost due to many factors as transport, godown, warehouse process, accumulation and storage process. Due to improper storage about 30% is lost to insects, rodents, rats ,moisture and diseases. Farmers and traders store grains in big godowns, bins and cylos . In national level storage of grains at centre and state is done by Food Corporation of India –FCI in warehouses.

Activity 3

To know about the type of storage in your town or village by farmer and trader, in godowns and warehouses, by food corporation. Go for a survey with your teacher's help. Write your observations on the following points.

1. Type of storage;- room/ godown/ warehouse/cylo
2. Walls have been whitewashed and sprayed with insecticides.; yes/no
3. Name of the sprayed insecticides_____.
4. Is there proper moisture in the grains.(break the grains with your teeth and check if there is a 'cut'sound, then it is suitable for storage.) yes/no

5. Where is the grain stored; -filled in the sacks/ spread on the floor.
6. Are the sacks treated with insecticides or is the floor plastered with cowdung: _____
7. The sacks are kept away from the walls/ are the sacks kept on wooden planks.
8. Proper sunlight and ventilation is there in the room/godown. Yes/no
9. Are there spider webs or insects on the roof or the walls of the room. Yes/ no
10. Are vapours of chemical insecticides used on the grains for protection. Yes/no
11. Name the insecticide used. _____
12. Any other remarks_____.

Cold storage

Fruits, vegetables and also potatoes, onions, garlic, ginger, and other perishable crop products are kept in cold storage or warehouses maintained at low temperatures. In the cold storage the low temperature stops or retards further ripening of the products and also growth of micro organisms and thus stops the products spoilage.

NOW ANSWER THESE

1. Why do fruits and vegetables spoil faster in summer and remain fresh for more time in winter?
2. What are weeds ? Why is weed control necessary?
3. How can you protect your crops from pests?
4. For which work is the combine harvester used ?
5. How are crop products stored?

Mushroom cultivation and mushroom culture-

In rainy seasons you must have seen small white or brown umbrella shaped growths on the fields, wood, straw etc. These are mushrooms. In different places they are known by different names as phutoe, khumbi, dhigari etc. Mushroom is a fungus which has proteins, vitamin B complex, vitaminC, minerals and fibre in large quantity. That is why it has a special category in the edible items of the world .

Mushroom is purely a vegetarian food as they are grown on wheat husk, straw, and other mediums which are prepared by mixing mushroom spores. Professionally two type of mushroom farming is done in our country; - Dhingri mushroom and white button shaped oyster mushrooms.

Medium of wheat husk or straw is soaked in water for 14 – 20 hours and then it is boiled for two hours or is processed with fungicides or antibiotics. Now water is drained away and the spores of the mushroom are mixed in it. This is now placed in polythene bags which have holes in it. This is then kept in a room with a temperature of about 20°– 25° centigrade. In about two or three weeks the whole medium changes into a ball of white colour.

Now the polythene is removed and this ball is hanged by a string for two or three days, when this is covered with small pebble like structure. These develop into umbrella shape in five to seven days. These are the mushrooms.

Many species of mushrooms are poisonous, so you must use them only after consulting your teacher or a knowledgeable person.

13.4 Crop improvement

By adapting proper irrigation, fertilizers, manures and improved agricultural methods, the production of food grains can be increased. Another method for a better yield is improvement of crop variety. This process is called crop variety improvement or crop improvement.

13.5 Food products obtained from animals

For obtaining the necessities of food, man not only depends on crop products but also on animals and other living organisms. For proper development of our body, we need proteins which is obtained, apart from pulses, from milk, eggs and flesh also. We tame all that animals which can fulfill our needs connected with food. The proper care and rearing of these animals scientifically is called animal husbandry.

Come let us know about some of these animals and the food products we get from them.

13.5.1 Milk Production

In our country the number of cows and buffaloes is maximum. These are called the milk producing 'milch' or dairy animals. They are reared in large numbers in large farms. Milk production is the second largest production after rice production in agriculture. Although buffaloes are the better producers of milk but cows are the main source of milk production.

For proper rearing of dairy animals, they need proper nutrition, care, shelter, health, and breeding. For their diet grass, dried fodder (straw or wheat husk), green fodder is needed. To make their diet more nutritious, mustard and cottonseed oilcakes are also added. For proper health along with a nutritious diet, proper sanitation and medical treatment and care is also necessary. Availability of drinking water and clean, ventilated shelter is also needed.

By hybridization improved breeds of cows and buffaloes are developed. High yielding breeds of cows are Freisian Sahiwal, Halstein- Freisian, and for buffaloes the breed is Murrah.

13.5.2 Poultry farming

Rearing of hens, ducks and other birds for eggs and their meat is known as poultry farming. Hens are reared at homes and also at farms. Hens sit on eggs for 21 days to hatch them. This is the hatching period. In big poultry farms, eggs are hatched in special rooms or boxes called incubators. In these, the eggs get the required moisture and heat, which help in the growth of the chicks inside the eggs and later helps in their hatching.

Hen breeders sometimes place paddy grass on the floor to provide adequate heat. Hens which sit on the eggs for them to hatch is called the brooding hen. On the seventh and ninth days the eggs are examined and the underdeveloped eggs are removed. During winter season, as the days are shorter and the presence of moisture in the air and in case of insufficient food, the production of eggs decreases.

The eggshell is made of Calcium carbonate. The middle part of the egg is called yolk which is covered by the transparent albumin. There is much protein in the albumin.

The food given to the poultry contain small worms, insects, vegetation and also small pebbles. These pebbles help in crushing the food. These are mixed with lime stone, which help in the formation of the eggshell.

In poultry farms the shelter of the birds have proper ventilation and light arrangement. The droppings of the birds are used as manure. For higher yield in eggs and meat (broiler) improved varieties are obtained by hybridization. White leghorn, Rhode Island Red, ILS-82, B-77 are some main varieties.

13.5.3 Fish production

Fish is one of the main foods of people living near the banks of rivers and the sea. This animal is a good source of protein. The oil of cod and sharks are the main source of vitamin D. Fish is also taken as dried food and processed tinned food. Fish

is also used as food for poultry and cattle. Some parts of the fish like tails, fins,and bones are used as fertilizers.

Large scale production of fish is known as fish production. Fish producing farms and ponds are called fisheries. In these fish are hatched and small fishes are produced. These are placed in big ponds for nourishment and growth, where there is proper arrangement of food, oxygen and light. At times fish are caught from these farms also.

As per the source of water, where they are found, the fish are grouped as non-salty water fish eg. katla, lobia, rohu. And those in seas and oceans as salty fish eg. tuna and cod. By reproduction and hybridization new varieties which grow faster and in less time are developed.

13.5.4 Bee keeping or Apiculture

Bee is an insect from which we can obtain honey. Honey has water, sugar, minerals and enzymes in it. Honey is easily digestible. Though honey is not used as a food regularly, it is used as a medicine. It is used in many common diseases as cold etc. For obtaining more honey bees are kept in special boxes. Artificial rearing of bees is called bee keeping or apiculture.

Bees are usually found in forests. They make their homes on tall trees and high building. These are called beehives. The special boxes prepared for bee rearing takes the place of their hives. All their life activities takes place in this boxes. Laying of eggs by the queen bee, larvae hatching out of eggs, formation of pupae, care of them by the worker bees, collecting pollen grains from the flowers and converting it to honey, all takes place in the boxes. Honey is removed from this by hand or by machines. The collected honey is then kept in air tight bottles. Wax is also obtained along with the honey from apiculture.

WE HAVE LEARNT

- Technical knowledge of production and management for higher yield of man needed crops and amimals products is called agriculture.
- According to the yield in different seasons the crops are of three types – kharif, rabi and jayad.
- Necessary planning and farming activities for farming of crops is called crop methods or farming practices. The following are the steps

- selection of land
- preparation of land
- selection of seeds and seed treatment
- sowing of seeds
- Adding fertilizers
- Irrigation
- Weeding and weed control
- Crop protection
- Harvesting and threshing
- Storage
- Artificially developing new improved varieties of the same species plants by crossing plants with different qualities is called hybridization.
- Organic fertilizers and manures are added to the soil to provide the required nutrients to the plants.
- Unwanted plants which grow along with the crop are called weeds.
- Living organisms which harm the crops are called pests.
- Growing different crops one after another is called crop rotation.
- Storing the crop yield at large scale is called storage.
- Cows and buffaloes are reared for milk.
- For eggs and meat, hens and fishes are reared.
- For obtaining honey, bees reared artificially is called bee keeping or apiculture.

QUESTIONS FOR PRACTICE

1. Choose the correct alternative-

1. Incubators are used in -

a. In dairy products b. In fisheries

c. In poultry d. In apiculture

2. Hybridization is a technique of -

   a. protecting crops from pests.

   b. artificial crossing and producing seeds with required qualities

   c. new technique of irrigation

   d. production of more eggs

3. The carbonic product obtained from the wastes of animals and the decomposed plants is called

   a. fertilizers b. manure c. green manure d. bio fertilizers

4. Which is not a method to maintain the fertility of the soil?

   a. crop rotation b. mixed cropping

   c. weeding d. leaving the land uncultivated for some time

5. Which machine is used for both reaping and threshing?

   a. thresher b. tractor

   c. combine d. harrow

2. Fill in the blanks -

1. Artificially prepared manure is called _____.
2. Leveling the land is done by_____ machine.
3. Removing the husk from the grains is called _____.
4. To make the fodder of dairy animals more nutritive _____ and _____ are mixed with the oil cakes.
5. To produce honey _____are reased.

3. Find the statements which are correct and rewrite the wrong statements correctly.

1. Kharif crops require more water than rabi crops.
2. Pesticides and weedicides are not harmful to human beings.
3. Earthworms are harmful for crops.
4. Wheat is the main kharif crop of our country.
5. There is much carbohydrate and fat in mushroom.

4. Write short notes on :-

1. milk production 2. pisciculture 3. apiculture

4. poultry farming 5. earthworm manure

6. mushroom culture 7. cold storage

5. Draw sketches of the following farming tools-

1. traditional plough 2. simple seed dropper

3. harrow

6. Answer the following questions -

1. What are farming methods? Write the different steps involved.
2. You want to produce a legume crop in your school garden. What different farming steps would you follow? Write the steps in a sequence.
3. Which method of sowing seeds do you prefer the spraying method or the puncture method?
4. Why is hybrid seeds considered better than normal seeds?
5. Write the names of the crops which are sowed by the planting method.
6. Write short notes on any two new techniques of irrigation.
7. Due to what reasons are mushrooms considered as a food product?
8. What do you understand by crop improvement?
9. How can the fertility of the soil be maintained by crop rotation?

TRY TO DO THIS

1. Visit a farm with your friends and discuss about the different farming steps involved with the farmer.
2. How are plants which reproduce by vegetative propagation as sugarcane, potato, sweet potato, turmeric, ginger and garlic planted? Survey the nearby fields, vegetable gardens, farms and collect information about their plantation and write it in your copy.
3. Which river flows near your town or village? Is its water used for irrigation? If yes write the methods and sources used to bring water from the river to the fields.

14 FRICTION

You might have seen a driver of a car, truck slowing down the vehicle at a traffic signal. You, too slow down your bicycle whenever needed by applying brakes. Have you ever thought why a vehicle slows down when brakes are applied? Not only vehicles, any object, moving over the surface of another object slows down when no external force is applied on it. Finally it stops. Similarly a moving ball stops on the ground slopping after some time. Why is it difficult to walk on a smooth and wet floor? Why do we slip when we step on a banana peel?

Let us find out the reason behind all these incidents?

14.1 Force of Friction

Activity 1

Materials required -A table, a book.

Gently push a book on a table. You observe that it stops after moving for some distance(fig 14.1a). Now push the book from the opposite direction (fig 14.1b). Does the book stop this time, too? Is there any force acting on the book opposing its motion? The force which opposes the motion of an object is called the force of friction.

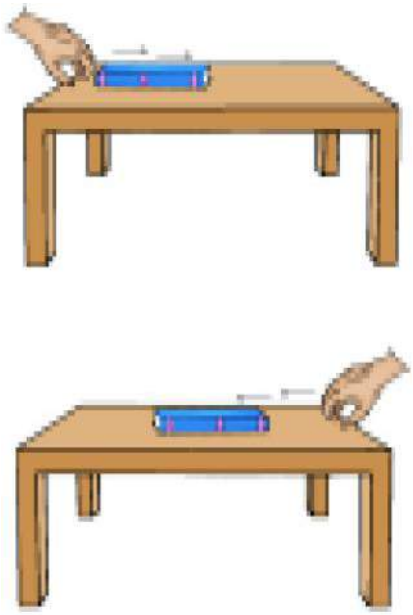


Fig 14.1(a andb): Friction opposes relative motion between the surfaces of the book and the table.

Thus, we saw that if we apply the force along the left, friction acts along the right and if we apply the force along the right the friction acts along the left direction. In both cases the force opposes the motion of the book. The force of friction always opposes the applied force. In the above activity, the force of friction acts between the surface of the book and the surface of the table.

Think, is the force of friction the same for smooth and rough surfaces or does it differ?

14.1.1 Is Frictional Force a Contact Force?

In activity 1, when we push a book we use the force of muscles, this force is called muscular force. Muscular force is only applicable when our muscles are in contact with any object. So, it is also called contact force. Similarly the frictional force exists in between the surfaces of book and table is contact force.

Some forces are non-contact forces e.g. magnetic force exerted by magnet on the pieces of iron, electrostatic force exerted by a charged body on another charged or uncharged body and the gravitational force exerted by the earth on the bodies lying on it. All these forces are non-contact forces because here the force is exerted between bodies without being in contact.

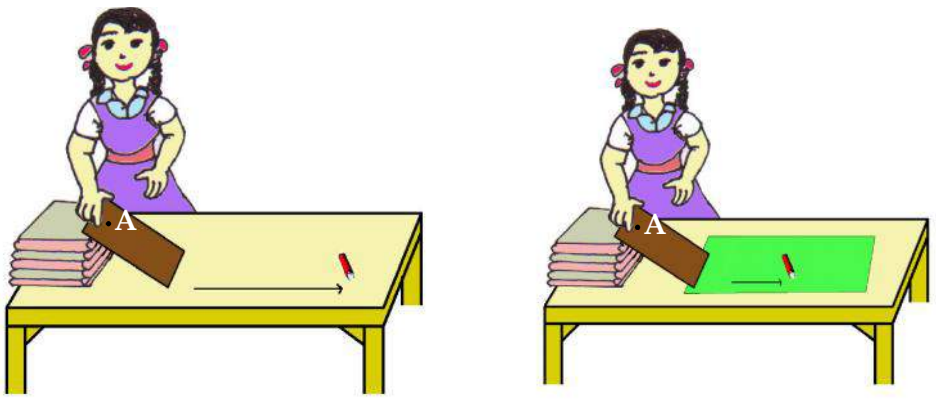
14.2 Factors Affecting Friction

Let us do an activity to understand what are the factors affecting friction.

Activity 2

Materials required - Wooden board, brick, pencil cell, cloth, sand etc.

Make an inclined plane on a smooth floor or on a table. You may use a wooden board supported by bricks or books. Put a mark with a pen at any point A on the inclined plane. Now, let a pencil cell move down from this point. How far does it move on the table before coming to rest (fig 14.2 a)? Note down the distance. Now spread a piece of cloth over the table. Make sure that there are no wrinkles in the cloth. Again let the pencil cell move from the point A (fig. 14.2 b).



a b

Fig 14.2 (a) and (b) the pencil cell covers different distances on different surface

Now, repeat this activity by spreading a thin layer of sand over the table. Maintain the same slope throughout the activity.

Is the distance covered by the pencil cell in each case the same? In which case the distance covered by pencil cell is least? Why the distance covered by the pencil cell different in every case?

The distance covered by pencil cell, depends on the nature of the surface on which the cell moves. The smoothness of the surface of the pencil cell also affects the distance travelled by it. For this you shall try the activity by wrapping a piece of sand paper around the pencil cell.

Friction is caused by the irregularities on the two surfaces in contact. Irregularities on the two surfaces lock into one another. When we attempt to move any surface, we have to apply a force to overcome interlocking. There are minute irregularities in both the smooth and rough surfaces. Even those surfaces which appear very smooth have a large number of minute irregularities on them (fig.14.3) but on rough surfaces the irregularities are more. Now you understand that why the pencil cell covers a short distance on sand and longest distance on smooth surface of table.

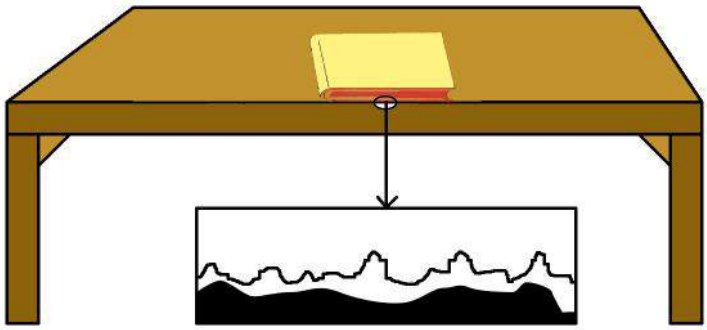


Fig 14.3 Surface Irregularities

We understand that the friction is caused by the interlocking of irregularities in the two surfaces. The force of friction will increase if the two surfaces are pressed harder. This can be experienced by dragging a mat when nobody is sitting on it, and when a person is sitting on it.

Think what is easier, to move the heavy box from rest or to move it, when it is already in motion?

The force required to overcome friction at the instant when an object starts moving from rest is a measure of static friction. On the other hand, the force required to keep the object moving with the same speed is a measure of sliding friction.

When the box starts sliding, the contact points on its surface do not get enough time to lock into the contact points on the floor. So, the sliding friction is slightly smaller than the static friction. So it is easier to move the heavy box already in motion than to get it started.

NOW ANSWER THESE

1. Why we slip down on stepping over the banana peel?
2. Explain why sportsmen wear shoes with spikes?
3. Abdul has to push a lighter box and Rama has to push a heavier box on the same surface. Who will experience more frictional force and why?
4. Explain contact and non-contact force with examples.

14.3 Friction a Necessary Evil

Recall your experience; is it easier to hold a kulhar (earthen pot) or a glass tumbler? It is clear that the surface of a glass tumbler is smooth while kulhar is rough, that's why glass tumbler slips but a kulhar does not. So, holding a glass tumbler is difficult than to hold a kulhar. Suppose the outer surface of the tumbler is greasy, or has a film of cooking oil on it, would it become easier or more difficult to hold it?

Imagine, what would happen if there were be no friction at all? Could vehicles move on the road? If there had been no friction between the tyres of the automobiles and the road, they could not be started or stopped or turned to change the direction of motion.

You could not write with pen or pencil if there was no friction. It is due to only friction that we can write with chalk on blackboard. When something is written with chalk on the blackboard, its rough surface rubs off some chalk particles which stick to the blackboard. If an object started moving, it would never stop if there were no friction. We could not fix a nail on the wall, tie a knot or construct a building without friction.

On the other hand, friction is an evil, too. It wears out the materials whether they are screws, ball bearings or soles of shoes.

Can friction also produce heat? To understand this, vigorously rub your palms together for a few minutes. Do they become warm? Now you learn that friction produces heat. When you strike a matchstick against the rough surface, it catches fire due to generation of heat by friction.

There are so many other examples in which friction generates heat. In fact, when we operate a machine the generated heat causes much wastage of energy.

14.4 Methods of Increasing and Reducing friction

Have you ever thought why the sole of your shoe is grooved? Due to these grooves, shoes provide better grip on the floor, so that we can move safely. Similarly, the treaded tyres of cars, trucks and bulldozers provide better grip with the ground.

We deliberately increase friction by using brake pads in the brake system of bicycles and automobiles. When we are riding a bicycle, the brake pads do not touch the wheels. But when we press the brake lever, these pads arrest the motion of the rim due to friction.

You might have seen that kabaddi players rub their hands with soil for a better grip of their opponents. Gymnasts for better griping apply some coarse substances on their hands to increase friction.

Is friction necessary in every situation? In some situations, however, friction is undesirable; so that in this situation we minimize it e.g. we sprinkle fine powder on the carrom board to reduce friction. You might have noticed that when a few drops of oil are poured on the hinges of a door, the door moves smoothly. A bicycle and a motor mechanic use grease between the moving parts of these machines. In the above cases, we want to reduce friction in order to increase efficiency. When oil, grease or graphite is applied between the moving parts of a machine a thin layer is formed there and moving surfaces do not directly rub against each other. Interlocking of irregularities is avoided to a great extent so that movement becomes smooth. The substances which reduce friction are called lubricants. In some machines, it may not be advisable to use oil as lubricant. An air cushion between the moving parts is used to reduce friction.

Friction can never be entirely eliminated because no surface is perfectly smooth. Some irregularities are always there.

14.5 Wheels Reduce Friction

You must have known that attaches and other pieces of luggage fitted with wheels or rollers. On pulling attaches, rollers roll over, here the motion of the roller is called rolling motion. When one body rolls over the surface of another body, the resistance to its motion is called rolling friction. Rolling reduces friction. It is always easier to roll than to slide a body over another. That is the reason it is convenient to pull attaches fitted with rollers in comparison to the attaches without rollers.

Since the rolling friction is smaller than the sliding friction, so sliding is replaced in most machines by the use of ball bearings. Common examples are the use of ball bearings between hubs and the axis of ceiling fans and bicycles.

14.6 Fluid friction

You know that in science, the common name of gases and liquids is fluids. Air, Water and other liquids exert force of friction when objects move through them. The frictional force exerted by fluids is also called drag. The frictional force on an object

in a fluid depends on its speed with respect to the fluid. The frictional force also depends on the shape of the object and the nature of the fluid.

When objects move through fluids, they have to overcome friction acting on them. In this process they lose energy. Efforts are, therefore, made to minimize friction. So, objects are given special shapes. In fact, all vehicles are designed to have shapes which reduce fluid friction like the shapes of ships and boats.

14.7 Earthquake: A Natural Phenomenon

You know that there are certain natural phenomena occurring on earth, to which it is very difficult to protect ourselves from them, so they are called natural disaster. Some natural phenomena are flood or drought, lightning or thunderstorm earthquake, getting fire, wind or cyclone etc. These natural phenomena can cause large scale destruction of human life and property. Due to protective steps taken by Science and Technology , these phenomena can be predicted to some extent.

Let's learn about the major steps to be taken for our protection by reducing the loss due to the natural phenomenon earthquake.

Earthquakes occur all the time all over the earth. They are not even noticed. Major earthquakes are much less frequent. They can cause immense damage to buildings bridges, dams and people. They can also cause floods landslides and tsunamis.

An earthquake is a sudden shaking or trembling of the earth which is caused by a disturbance deep inside the earth's crust. We know that the outer most layer of the earth is not in one piece. It is fragmented. Each fragment is called a plate. These plates are in continuous motion. When they brush past one another or a plate goes under another due to collision, they cause disturbance in the earth's crust which is shown up as an earthquake on the surface of the earth (fig 14.4)

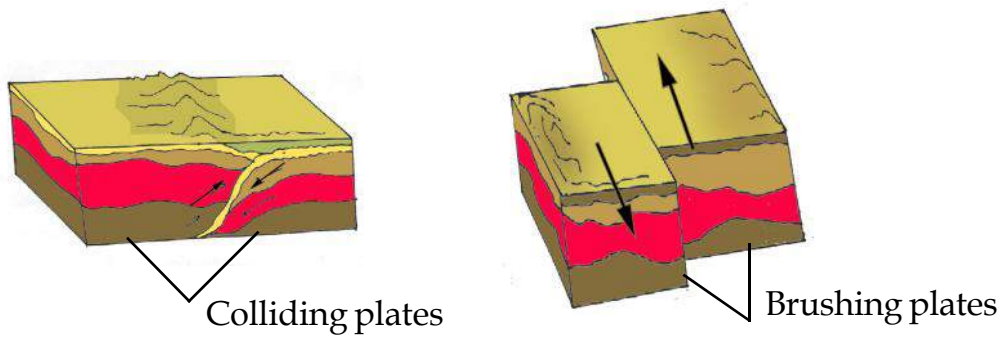


Fig. 14.4 Movements of Earth's plates

Tremors on the earth can also be caused when a volcano erupts, or a meteor hits the earth or an underground nuclear explosion is carried out. However, most earthquakes are caused by the movement of earth's plates.

The power of an earthquake is expressed in terms of a magnitude on a scale called the Richter scale. Destructive earthquakes have magnitudes higher, than 7 on the Richter scale. It is advisable to make the structure of building simple and 'Quake safe'.

Protection against earthquakes

- If you are at home, take shelter under a table and stay there till the shaking stops.
- Stay away from tall and heavy objects that may fall on you.
- If you are in bed, do not get up; protect your head with a pillow.
- If you are outdoors, find a clear spot, away from buildings, trees and overhead power lines; drop to the ground.
- If you are in a car or a bus, do not come out. Ask the driver to drive slowly to a clear spot.

NOW ANSWER THESE

1. Explain how the shape of an aeroplane reduces friction.
2. By continuous movement, why does a machine get heated up?
3. Can friction be less or become nil by using lubricants?

WE HAVE LEARNT

- Friction opposes the relative motion between two surfaces in contact; it acts on both the surfaces.
- Friction is caused by the irregularities on the two surfaces in contact.
- For a given pair of surfaces, friction depends on the nature of surface and the state of smoothness.
- Friction also depends on how hard the two surfaces press together.
- Sliding friction comes into play when an object is sliding over another.
- Friction can be increased by making a surface rough.
- Friction can be reduced by using lubricants (oil, grease or graphite).
- When one body rolls over another body, rolling friction comes into play. Rolling friction is smaller than sliding friction.

- In many machines, friction is reduced by using ball bearings.
- An earthquake is a sudden shaking or trembling of the earth which is caused by a disturbance deep inside the earth's crust.

QUESTION FOR PRACTICE

1. **Fill in the blanks -**
   (a) Friction opposes the_____ between the surfaces in contact with each other.
   (b) Friction depends on the _____ of surfaces.
   (c) Friction produces _____.
   (d) Sprinkling of powder on the carrom board _____ friction.
   (e) Sliding friction is _____ than the static friction.
2. Aabida runs her toy car on dry marble floor, wet marble floor, newspaper and towel spread on the floor. The force of friction acting on the car on different surfaces, in increasing order will be -
   (a) Wet marble floor, dry marble floor, newspaper and towel.
   (b) Newspaper, towel, dry marble floor, wet marble floor.
   (c) Towel, newspaper, dry marble floor, wet marble floor.
   (d) Wet marble floor, dry marble floor, towel, newspaper.
3. Suppose your writing desk is tilted a little. A book kept on it starts sliding down. Show the direction of frictional force acting on it.
4. Would it be easier or more difficult for you to walk on the floor of soapy water? Give reason in support of your answer.
5. Give example to show that friction is both a friend and a foe.
6. Explain why the objects moving in fluids must have special shapes.
7. Suppose you are outside your home and an earthquake strikes. What precautions would you take to protect yourself?

TRY TO DO THIS ALSO

1. Ask your parents about the huge damage to life and property caused by these earthquakes; collect a few pictures showing the damage caused by the earthquakes from newspapers and magazines. Prepare a short report on the suffering of the people during and after the earthquakes.

15 HOW MUCH FOOD, WHAT TYPE OF FOOD

It is believed that if a person regularly takes sufficient food, then the need of nutrients to his body is fulfilled. But this is not correct. If you take only one type of food always then all the nutrients are not available to the body. Only if food has all the main ingredients like proteins, fatty products along with vitamins and minerals, then only it is called a balanced diet. Therefore, our food must be a mixed one which has all the nutrients of food.

Those foods which have nutrients named as carbohydrates, fats; proteins, vitamins and minerals in the required quantity in it are called **balanced food**. Let us see which foods we have to eat from which we can get all these nutrients.

15.1 Different type of food items

In our food one or two items are the main food items as rice, wheat, maize, bajra, jawar, millets etc. In some countries, potato, banana or sweet potatoes are the main food items. What are the main items of your food?

In all these food items, the main nutrient is carbohydrate. But you have read earlier that a balanced diet must have many things other than carbohydrates. So if a man eats stomach full of only rice, or wheat, potato, then he will become weak and he may have many diseases.

For the growth of our body and proper development of our mind, it is necessary that our food must have proteins. To say so proteins are present usually in all food items, but it is present in abundance in the following food items given below.

All types of pulses, soyabeans, groundnuts, peas, milk, curd, egg, fish and mutton. So it is necessary that our food must have any one of these items.

Butter, ghee and all type of oil have fats. We get energy from these. Other than these we get energy from jaggery, sugar and honey also.

Now you will read about one group of nutrients which keep us healthy and free from diseases. These are the vitamins and minerals. Given below are names of some items which have sufficient amount of vitamins and minerals

All green leafy vegetables (spinach, mint) drumsticks, papaya, goose berry (amla) mango, orange, lemon, guava, carrots, cucumber, pumpkin, tamarind, beetroot, jaggery, mutton, egg etc.

Come let us see what we get from which items.

TABLE 15.1

Carbohydrates	Fats	Proteins	Vitamins & Minerals
Rice, wheat, corn, maize, bajra, jawar, potato	Butter, Ghee, Oil	Pulses, Mutton, Fish, Egg, Soyabean	Carrot, Pumpkin, Papaya, goose-berry, green leafy vegetables, milk, egg, orange, tomato, mango, lemon

Carbohydrates, proteins and fats are to be taken in large quantities but vitamins and minerals are needed only in minute quantities. But if this minute quantity is not received then diseases may happen.

The proper names of vitamins are different but they are known as A, B, C, D etc. Given below are some names of vitamins, along with it the diseases caused due to the deficiency of these vitamins are given.

1. Vitamin A : This is present in milk, egg, yolk, liver, green vegetables, tomato and carrots. !f there is a deficiency of this vitamin in the body then it may cause night blindness in which one cannot see at night.

2. Vitamin B : This is a group of vitamins which are present in grains, mutton, milk, curd, butter, egg. etc. Deficiency of this may cause anemia (shortage of blood) deformed vertebral column, beri-beri (weakened nervous system) etc. diseases in the body.

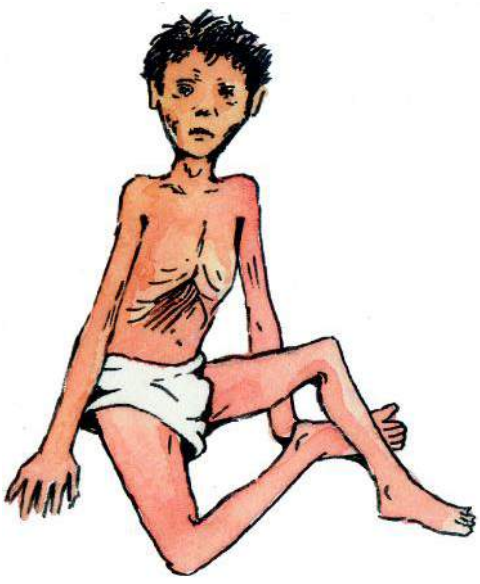


Fig 15.1 Rickets

3. Vitamin C : This is present in gooseberry, orange, lemon and such fruits. Its deficiency can cause a disease called scurvy.

4. Vitamin D : This vitamin is present in milk, curd, butter, butter milk etc. Vitamin D is also produced in the body in presence of sunlight. Our bones need calcium and vitamin D. Vitamin D help calcium to reach the bones. Therefore if there is a deficiency of calcium or vitamin D the bones of the body becomes weak and becomes curved. This is called rickets (fig. 15.1). Along with these , there are vitamin "E" and Vitamin "K" which are also necessary for the body.

Our body needs many types of minerals. Iodine, iron, phosphrous and calcium are the most important ones. In our country, in many places food lacks iodine in it. Therefore iodine is added to the salt we buy from the market. Deficiency of iodine can lead to the disease called goitre.

Fig 15.2 Anaemia

If sufficient iron is not there in our food then sufficient amount of blood is not made. This disease is called anaemia. When anaemia occurs, the diseased person's skin becomes pale and looks white, tongue becomes shiny and smooth, the inner part of eyes, nails and gums become colourless (Fig 15.2). The diseased becomes weak and gets very tired on doing even little labour.

Green leafy vegetables, jaggery, tamarind, beetroot, bajra, mutton, egg and fish have a large amount of iron in them.

If we eat these we can be safe from anaemia and to some extent can be its treatment.

15.2 Water

You must have experienced that if you do not take water for a long time, then you feel very thirsty. We feel very uneasy. We need water for all the functions of our body. A healthy man must drink atleast 2 to 3 litres of water per day. One glass can have about 200 mL of water. Calculate how many glasses of water must a healthy man drink per day.

Is it necessary to purify water before it is used for drinking? Water which appears clean may still have disease causing microorganisms and dissolved impurities. So it is essential to purify water before drinking. Water which is suitable for drinking is called potable water.

Municipal bodies treat the water before supplying it to households. Come, let us see how we can make water safe for drinking.

• Candle type filter, which filters and removes impurities are used in our household. This is the most popular physical method.

• Many households use boiling as a method for obtaining safe drinking water. Boiling kills the bacteria present in the water.

• Chlorination is a commonly used chemical method for purifying water. It is done by adding chlorine tablet or bleaching powder to the water. We must be cautious that we do not use more chlorine tablets than specified.

When we eat fruits, fresh vegetables, green vegetables etc. a part of them is excreted from our intestine without being digested. This part is called roughage. Roughage is very important for our body, because it helps in keeping our digestive organs clean so that the digestive process goes on smoothly. Raw cucumber, carrots, turnips, beetroots have much roughage in them.

If a person does not get sufficient food to eat or gets food without all the required nutrients then the person's body will become weak. When body does not receive the required nutrients in the required quantity, then it is called malnutrition. Children get malnourished quite easily.

Children who are malnourished become weak. Due to this weakness they get infected by diseases easily and when they become ill they get malnourished even more. Which means a trend of malnutrition and illness starts. To help such children their malnutrition is to be treated.

Balanced and full diet is the only treatment to malnutrition. If a malnourished child given the diet given here, then it is possible to recover soon. Mix equal amount of groundnut, wheat and bengal gram and powder it into flour. Fry this flour in oil, add jaggery and feed the malnourished child daily. He will recover fast. It can be given even after he has recovered.

15.3 Testing Food Items

Given below are some methods by which you can yourself know, which food items contain which nutrients (carbohydrates, proteins, fats). But for this some preparation is needed. So, come first of all we will prepare some of the chemicals needed for the test.

Iodine Solution

When someone gets hurt we apply tincture iodine. This medicine is available at the chemists or the hospital easily. Take a small clean bottle or a test tube and add 10 drops of tincture iodine. Add water till it becomes a light yellow solution. Keep a clean dropper to use to pour drops of the solution.

Solution of Blue Vitriol

Take about 2 g of blue vitriol in a small clean bottle or test tube and add 100 ml of water. Stir it till the blue vitriol is completely dissolved. For this solution also keep aside one separate dropper.

Solution of Caustic Soda

Take 10 gm of caustic soda in a bigger bottle and add 100 ml of water and mix well. Keep a separate dropper for this solution also.

Now, collect the food items given in table No. 15.2. Take small quantity of each item in a large plate and place them separately such that they do not mix with each other. You can take oil instead of ghee. Milk and ghee can not be put on the plate. So take them in a small bottle or test tube. Now start the experiment or test.

Activity 1

Materials Required : Food item of table 15.2 and piece of paper, test tubes, water, 2 percent solution of blue vitriol, 10 percent solution of caustic soda, iodine solution. With these you can test each item to know if it has any nutrient or not. If the nutrient is present then put a (✓) mark against it in table 15.2 and if absent put a (×) mark against it.

Fat Test

Take a small quantity of the item to be tested on a piece of paper and lightly rub it on the paper. If the paper becomes slippery and semitransparent then that item contain fats. If you rub kerosene oil, diesel or wax then also the paper becomes transparent, but they are not food items. The don't have fats in them.

Protein Test

Take about 10 drops of the item to be tested in a test tube. If the item is solid, powder a portion of it and take it in the test tube and add 10 drops of water on it.

Add 2 drops of 2% blue vitriol solution and 10 drops of 10 percent caustic soda solution and mix well. If it shows violet colour then the presence of protein is indicated.

Carbohydrate Test

In our food there are two types of carbohydrates. One is sugar or sucrose which we take. As sugar there is a sweet item called glucose. This is also a type of sugar. The other type of carbohydrate, which is known as starch is present in rice, wheat, potato etc.

Its test is very simple, so we will test starch type of carbohydrate.

Drop about two to four drops of dilute iodine solution on the food item to be tested. If the colour changes to dark blue or black then that item contains starch or carbohydrate.

TABLE 15.2

S. No.	Name of food-items	Presence of Fat Yes / No	Presence of Protein Yes / No	Presence of Starch Yes / No
1.	Boiled rice			
2.	Rice			
3.	Wheat			
4.	Potato piece			
5.	Ground nut			
6.	Full gram/ Tuvar			
7.	Cotyledons of Tuvar (Tuvar Dal)			
8.	Oil or ghee			
9.	Milk			
10.	Piece of some vegetable			
11.	Piece of some fruit			

Now write the answers to the following questions in your copy

1. Is carbohydrate, protein and fat present in all food items?
2. Is it correct to say that each food item can have more than one nutrients in it?

Now, you must have know that usually every food items have more than one nutrients present in it. In the staple foods along with carbohydrates, fat and vitamins are also present. There is fat, protein, vitamins and minerals in eggs. But this is not correct for all food items. Sugar has only carbohydrate and oil or ghee has only fat in it.

15.4 Why is balanced diet necessary ?

It is necessary to take balanced diet to keep our body healthy. Taking balanced diet provides our body the following benefits.

1. Many functions takes place inside our body, for which we need energy. This we can get from the balanced diet.
2. Food helps to develop new parts. The bodies of children, who are continuously growing, if they do not get a balanced diet their bodies will not develop properly.
3. There is the process of wear and tear continuously going on in our body for the replacement of these wear and tear, balanced diet is necessary.
4. Vitamins and minerals are a part of balanced diet. These protect us from many diseases.

Things to remember-

1. Avoid taking too much of sweets, too spicy or too oily fried foods. Also avoid taking too much of tea or coffee because these many damage our digestive system.
2. It is not necessary that costly food items have more nutrients in them. Green leafy vegetables, carrots, pumpkin and such yellow coloured vegetables have more nutrients compared to cauliflower, cabbage and capsicums. In the same way gooseberry (amla), guava and such fruits are rich in vitamins.
3. Before eating and cooking meals, one should clean one's hands properly so that germs in our hands may not enter our body through our food.
4. Children, pregnant women and lactating mothers need more amount of balanced diet.

15.5 STOPPING WASTE OF FOOD ITEMS

In our country many food items go to waste because either people waste them or they become unsuitable to eat because of weevils, rats, fungus etc. There are many micro organisms present in the air which can infect and destroy the food. It is necessary tat we protect our food items from these.

15.5.1 – Food Preservation

Keeping the food items properly and safe is called food preservation some methods of food preservation are as given below:

Pickling

You must have seen how pickles are made in your house. You also know that pickle remain as such for many days. The oil and salt put in the pickle protect them from fungus. But sometimes pickle are spoiled due to fungus. That is when the quantity of oil and salt is not sufficient then fungus and other micro organisms enter it and spoil it.

Drying

Another type of food preservation is drying ie drying of food materials. You must have seen green vegetables, onions, chilies etc. are dried and kept. Drying means removing water content from that food. When water is removed, the food does not spoil and can be kept for quite a long time.

Use of Salt

Some food items are cut into pieces, salted and dried. This keeps the food unspoiled for long and can be used even after a long time.

Making Jams/ Murabbas

Fruits are generally preserved by this method. Presence of large amount of sugar stops fungi and this preserves the food.

Freezing the food items

A very easy method of preserving food for a long time is freezing. It is because of this that we keep out food in the refrigerator (fridge). The food products remain more safe or fresh if the temperature is less (more freezing).

Protection against Insects

Many food items as green vegetables grains etc. are destroyed by insects. To protect these food items many methods are used. You may be knowing that ripe crops in the field are sprayed with insecticides. Usually these drugs are DOT or BHC.

Find out which drugs are used by the farmers of your area.

The drugs used to kill insects are called insecticides. All the insecticides are poisionous chemicals and are harmful to human beings.

Now a days people are trying to avoid using dangerous chemical insecticides and are trying to use age old traditional methods like spraying of juices prepared from tobacco or neem leaves.

Protection against rats

You will be surprised to know that about one fifth of the total production of grains in our country is eaten away by rats. So it is necessary that food items should be kept in such a way that rats may not reach them.

Protection against Contamination

If we don't keep our food properly covered then houseflies, cockroach etc. may sit on them.

These insects have many micro organions on their legs which can infect human being and cause many diseases, that means food gets contaminated. In the same way when dogs, cats and such tamed animals lick the food items, it may get micro organisms into the food and the food gets contaminated.

Preventing Wastage of Food

Many people take much more than needed in their plates and then throw away the leftovers. In the same way cooking more than needed and having no proper way of preserving it also means wastage of food.

WE HAVE LEARNT

- Food which have carbohydrates, protein, fats, vitamins and minerals in sufficient quantity is called a balanced diet.
- Carbohydrates and fats provide energy, protein is necessary for the growth of the body and for the development of our brain.
- Vitamins and minerals keeps us healthy and safeguard us from diseases. Fibres, keep our digestive system clean.
- Water is necessary for the functions of our body.
- Children, pregnant women and lactating mothers need balanced diet more than others.
- Keeping the food items safe and protecting them is called food preservation.
- Method of food preservation are, Pickling, Drying, Use of salt, Sugaring (Murabba) and Freezing.
- It is necessary to protect food items from insects, rats and stop contamination of food and wastage of food.

QUESTIONS FOR PRACTICE

1. When you bring some fried food items as sev, bhajiya or samosa wrapped in a paper, you find the paper has become transparent. Why does it happen?
2. What will happen if a person does not get a balanced diet ?
3. Which food items have vitamin A, B & C in them? And what are the diseases caused due to their deficiency?
4. Correct the wrong statements and write it in your own words?
   a) Fibres are harmful for humans because it hinders the digestive process.
   b) Costly food items are more nutritious than others.
   c) Children, pregnant women and lactating mothers doesnot need balanced diet much.
   d) Potatoes have much proteins in them.
   e) Each food item has only one nutrient in them
   f) A balanced diet must have only one nutrient in them.

g) Our body needs vitamins and minerals in large quantities and carbohydrates proteins and fat only in small quantities.

5. Green vegetables, onions and chillies are preserved by drying. Make a list of other food items which are preserved by drying.
6. Make a list of food items which are preserved in salt in your and your neighbour's houses.
7. Which insecticide is used on grains and vegetables safeguard against insects in your area? In the same way what is added to the grain in your house to preserve it.
8. It is observed that many people do not take balanced diet. What could be the possible reasons for it? What will you advice them to do ?
9. Clean, clear water is always safe for drinking. Write your comments.
10. What are the various methods adopted to make water potable?

TRY TO DO THIS

1. Collect labels from jam, jelly and pickle bottles and list the name of the ingredients present in each of them. Also try to find which preservative is used.
2. Try to make your own filters. Take a plastic bottle and cut it into two halves at the centre. Use the upper half as a funnel by putting it upside down into the lower half. Make layers in it with paper napkin or a fine cloth followed by cotton, sand and then gravel. Now pour dirty water through this filter and observe the filtered water. Discuss with your friend and teacher on the following questions-

1. Why is it necessary to purify water?
2. What will happen if we drink contaminated water?
3. What are the methods used in households to purify water?
4. What steps can be taken to create awareness about potable water?

16 SOME COMMON DISEASES

16.1

It is believed that "there is a healthy mind in a healthy body". You may have experienced that sometimes you don't feel like reading, writing, playing or even taking any food. Why does this happen? Usually in a healthy person all physical,mental and chemical actions goes on smoothly. Any irregularity in these can be the cause of any disease in man. Some diseases are such that when a healthy person comes in contact with an ill person, the healthy person also becomes ill.Such diseases are called **communicable** or **contagious disease**. But all diseases are not contagious. That disease which does not transmit from a sick person to a healthy person are called **non-communicable** or **non-contagious diseases**. Diseases due to deficiency in nutrients come under this category. Let us know about some common diseases found in human beings.

16.2 How a disease spreads?

Our environment plays a vital role in the spread and cause of communicable disease. It is because disease-spreading micro organisms as bacteria, protozoan, virus & worms flourish in an insanitary environment. So it is necessary to know about

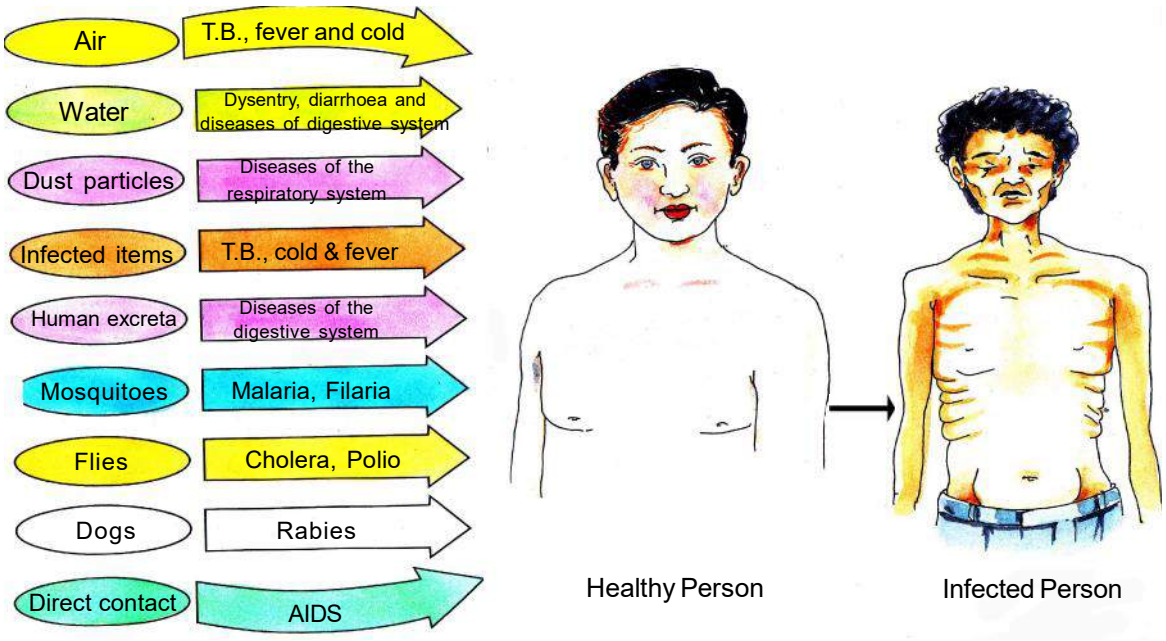


Fig 16.1 Transmission of diseases

these diseases and how they spread. By knowing about the diseases, their prevention and cure becomes easy (fig. 16.1).

In fig 16.1, you have seen that wind , dust particles, infected food, water, infected items of the sick person, as excreta, flies, mosquitoes, dogs and other animals play an important role in the transmission of diseases.

16.3 Communicable Diseases

(1) Cholera

This is caused by a bacterium named Vibrio cholera. It spreads to an epidemic. Cholera affects the digestive organs.

Symptoms of cholera

(a) Sick person passes frequent white stools.

(b) Spasms & cramps of the stomach muscle.

(c) The sick persons have sunken eyes, hollow cheeks, low blood pressure and fatigue.

(d) Dehydration is lack of sufficient water in human body due to prolonged passing of stools frequently. It may lead to sometimes death also.

Prevention from cholera

(a) Always eat fresh, clean food. Avoid contaminated food.

(b) This disease is caused due to contaminated water and insanitary conditions. So proper drainage facilities must be adopted.

(c) One should drink boiled & cooled water.

(d) Vomit & faecus of the patient must be covered with hot ash or limestone and must be thrown far away or buried in a hole.

(e) Patient must be given life saving solution of ORS regularly.

(f) Cholera antivaccine must be taken for its prevention. Its effect remains for six months.

You can make Life Saving Solutions

1 For making life saving solutions or Oral Rehydration Solution (O.R.S.), take about (200 ml) that is, about 1 cup of water in a bowl and boil it for 5 minutes.

2 Let it cool down at room temperature. Add a pinch of salt (sodium chloride) and one teaspoon of sugar. Stir it properly. If available add half a

piece of lemon juice and stir well. Life saving solution is ready. Tell about this method to others also.

2 T.B. or Tuberculosis

Have you seen some persons in your neighborhood who does continuously cough and spit thick phlegm with the cough? That person may be having a communicable disease called Tuberculosis, which is caused, due to bacteria. The bacteria of this disease spread through air and enter a healthy person and infects his lungs and also his brain, eyes, intestine etc.

Fig 16.2 Person infected with tuberculosis

Symptoms of tuberculosis :-

(1) If cough with phlegm persists for more than two weeks, then it may be tuberculosis. If the infection is severe then blood may also be seen with the phlegm.

(2) There is pain in chest, weight loss and the suffering person has no appetite and feels tired.

Prevention from tuberculosis :-

(1) Keep the sick person away from other family members in a clean, comfortable room.

(2) Do not use the articles used by a sick person.

(3) Ask the sick person to cover his mouth while coughing with his hand or a cloth.

(4) Avoid being in highly populated, dark, dust polluted environment and avoid being under nourished.

(5) The sick persons spit must be covered with ash or soil and be thrown far away or buried in a hole.

(6) BCG - (Bacillus Calmette Guerin) is a very effective vaccine.

(7) A long treatment with anti tuberculosis drug also controls this disease.

Every year 24th March is dedicated as T.B. Day and 1st December as World AIDS Day.

3. Typhoid

It is a contagious disease caused by Salmonella typhi bacteria. Every year many fall prey to this disease.

The spit, vomit, faeces, urine of the suffering person may have bacteria which is spread through flies and may reach our food and water sources and contaminate them. Through the contaminated food and water these bacteria may reach a healthy persons' intestine and may damage the walls of the intestine. Along with the intestine this disease may harm the pancreas and gall bladder also.

Symptoms of typhoid

(1) The sick person has continuous headache and fever. The body temperature increases day by day in the first week, persistent high fever is there in the 2^{nd} week and then gradually decreases during the 3^{rd} & 4^{th} week. The fever increases & decreases at a specific interwal of time.

(2) Rose coloured rashes appear on the upper abdomen. The sick person feels nervous and his pulse rate goes down.

(3) Only after 10-15 days the disease symptoms are seen. The sick person feels uneasy, has pain in head, body and stomach and has loose motions and there is danger of blood cuts occurring in the veins which leads to haemorrhage.

(4) Due to the infection spreading to the bone marrows, pancreas and gall bladders, typhoid may reoccur after 2-3 weeks.

Prevention from Typhoid :-

(1) Give the sick person enough rest, proper food, boiled water.

(2) Save the food from flies and insure proper disposal of human faeces of the sick person.

(3) Use the articles used by the sick person after cleaning them in dettol and drying them in sunlight.

(4) Spit, vomit etc of the sick person must be covered with ash or limestone and buried far away.

(5) Give the sick person T.A.B. - Vaccine that provides immunity for 3 years.

(6) Use of antibiotics can help in the control of disease.

Now answer these:

(1) Write the main symptoms of cholera?

(2) How does typhoid spread to others?

(3) On which part of the body does typhoid affect?

(4) If a person has dehydrated (lost much water from the body), what treatment can you give him at home?

4. Malaria

You must have seen people sleeping inside mosquito nets. They do so to avoid mosquito bites because a species of mosquito named anophelese (female) bite can cause malaria. Female anopheles mosquito has the protozoa named plasmodium in its salivary glands. When female anopheles mosquito bites any healthy person this

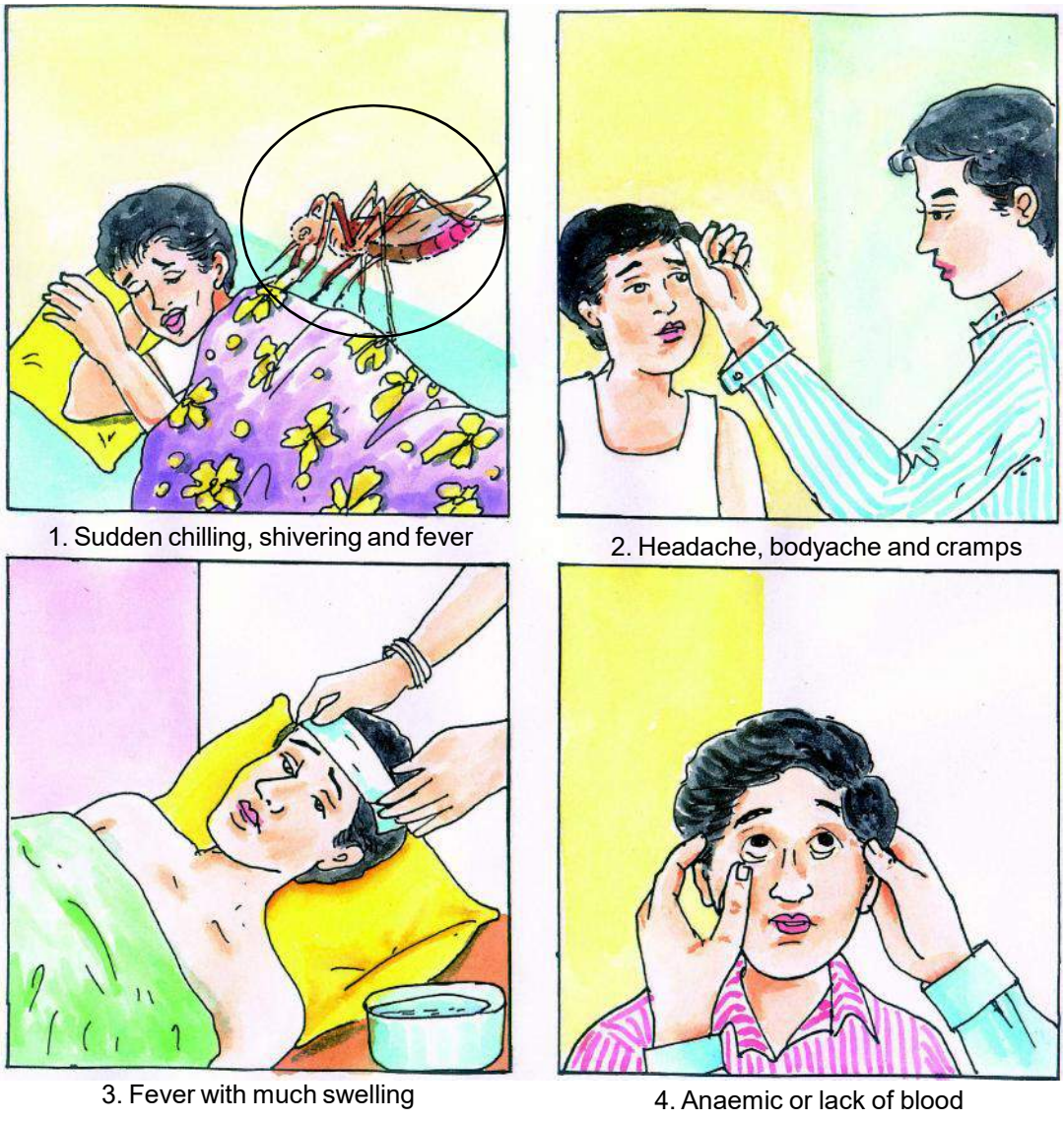
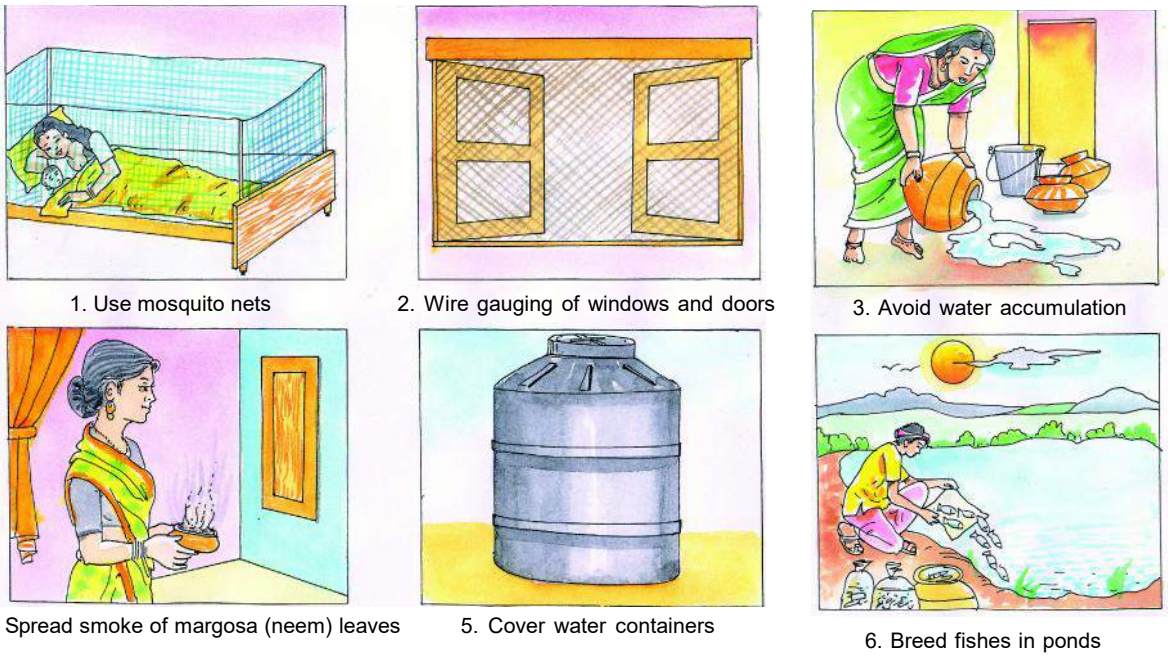


Fig 16.3 Symptoms of malaria

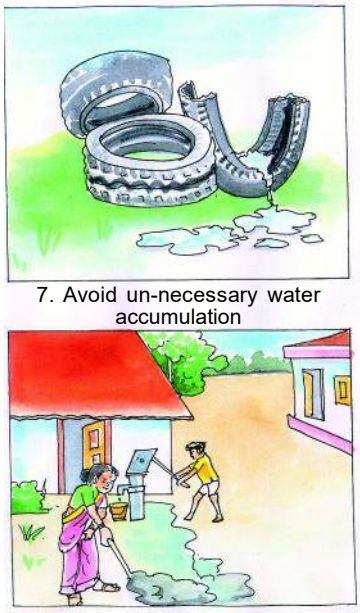
plasmodium enter the person's body and destroys the red blood cells and liver. Because of the destruction of many blood cells a poisonous substance known as haemozoin is produced in the blood. Due to which shivering occurs and the person has high temperature .

Symptoms of Malaria :-

(1) Sudden chilling, shivering and high fever.



1. Use mosquito nets
2. Wire gauging of windows and doors
3. Avoid water accumulation
4. Spread smoke of margosa (neem) leaves
5. Cover water containers
6. Breed fishes in ponds



7. Avoid un-necessary water accumulation
8. Spray oil or burnt engine oil over water accumulated ditches and ponds.

Fig 16.4 Protection from malaria

(2) Head ache, body ache and cramps.

(3) Lowering of temperature with sweating.

(4) Anaemic, lack of blood in the body.

(5) Malaria fever occurs daily, on third day or on alternative days.

(6) The sick person feels very thirsty and his face turns red.

(7) The sick persons' liver and spleen is enlarged due to swelling.

Prevention from Malaria :-

The following measures can help prevent malaria.

(1) Use mosquito nets.

(2) Wire gauging of doors, windows.

(3) Avoid water to accumulate in vessels etc.

(4) Spread smoke of margosa (neem) leaves in the room.

(5) Cover water containers etc.

(6) Breed fishes, which eat mosquito larva in small ponds.

(7) Don't let water to collect anywhere.

(8) Kerosene oil or burnt engine oil be sprayed on stagnant water or ditches, ponds etc.

With WHO (World Health Organization) help malaria eradication programme is held. In which each all sick persons blood is tested and on being infected he is given 600 mg Chloroqunine tablets on the first day and afterwards 15 mg tablet is to be taken every day for four days. Medicines must be taken under doctor's direction.

5. Amoebiosis (Dysentry)

Sudden cramps and pain in the stomach is a symptom of amoebiosis. This disease is common in summer and rainy seasons. It is spread by contaminated food and water.

This disease is caused by a micro organisma protozoa (Entamoeba Histolitica). This is a parasite of human's large intestine, which uses the living cells and tissue as its food and produces a toxic and harmful material, which destroys the tissues. They enter the inner walls of the intestine and forms incurable ulcers due to which dysentry or amoebiosis disease occurs. As cholera, flies transmit this disease also.

Symptoms of Amoebiosis :-

You can recognize amoebiosis by the following symptoms.

(1) Cramps and spasms in the abdomen with frequent bowels. Continuous bowel discharge, which may later have blood and mucus.

(2) Slight fever may be there.

(3) This disease does not clear out soon. Sometimes it may take years to recover from it. The protozoa may even hurt the heart and spleen by passing through the walls of the intestine.

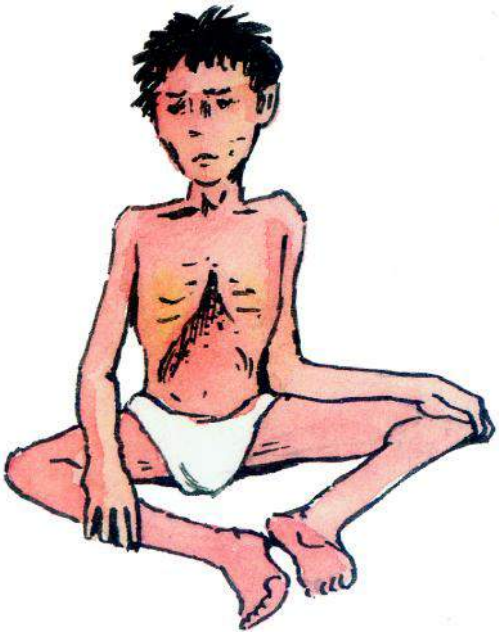


Fig 16.5 Diarrhoea

Fig 16.6 Prevention from diarrhoea & dysentry

(4) Usually this disease occurs for 2 - 3 or 4 - 5 days. But once one is infected with this disease, it may occur again and again and later its power may increase.

6. Diarrhoea

In this disease a person passes watery or semi watery stools more than 3 times a day. This disease is caused by Escherichia coli Salmonella or Entamoeba Histotytica. This is caused by contaminated food and water causing damage to the intestines.

Symptoms of Diarrhoea :-

(1) Spasms and cramps in the abdomen and frequent watery stools.

(2) Vomiting, dry mouth, thirst and irritability.

(3) Sudden weight loss, slow pulse rate, deep breathing.

(4) Sunken eyes, shrunken nose, dry tongue and dry inner cheeks.

(5) Less urine passing and sometimes urine passing is completely stopped or dark yellow urine is passed.

(6) Excessive loss of water leading to dehydration which may even cause death.

Prevention from Diarrhoea :-

Following measures can help prevent Diarrhoea -

Home remedy for Diarrhoea :-

Coconut water, salty buttermilk, lemon juice, rice starch water, light tea, water boiled pulses (dal water) whatever is present in the house must be given to stop him from dehydrating.

Water loss due to vomiting and frequent bowels can be contradicted by ORS (Life saving solution).

NOW ANSWER THESE

(1) What are the diseases caused by the protozoan parasite?

(2) What is the main cause for the spread of Malaria?

(3) What is the first aid you will provide to a person having frequent bowels and diarrhoea?

(4) What is the name of malarial parasite and its carrier?

(5) Write any two differences between dysentry and diarrhoea?

7. Filaria or Filariasis

You must have perhaps seen some persons with one leg or even both the legs fatter than normal? Have you ever thought how it has got swollen so? This is because of a worm-infected disease called Filaria.

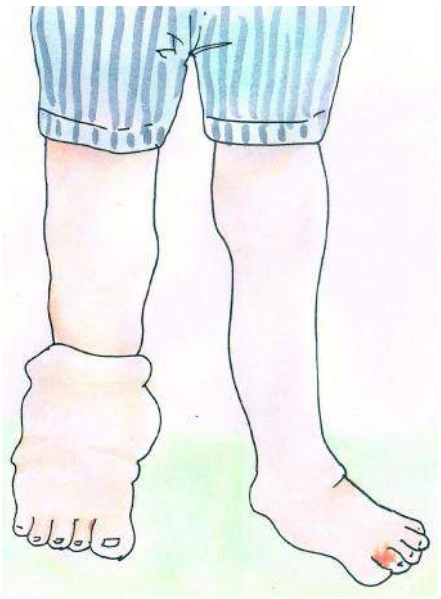


Fig 16.7 Legs of a Filaria patient

This disease is spread by Culex mosquitoes bite.

This disease worm (Wucheria bancrofti) living or dead can cause this disease. In living condition these worms enter the lymph nodes and canals and produce a harmful metabolic product due to which the lymph cells divide in the lymph canals and close it. This causes itching. Slowly the leg gets swollen and so this disease is also called elephant leg (Elephantasis).

Symptoms of Filaria :-

(1) The sick person has fever and itching.

(2) Liver, pancreas, scrotum, legs gets swollen and form glandular swelling.

(3) Legs become swollen more than normal so it is also called elephantiasis.

Prevention from Filaria :-

To prevent filaria following measures must be adopted.

(1) Use of mosquito nets as a protection against mosquito bites.

(2) Mosquito breeding places must be sprayed with kerosene oil or engine oil, so that eggs, larvae and the mosquitoes may be destroyed.

(3) DEC (Diethyle Carbomazine) drug must be taken but the following should avoid taking it, those -

- children below 2 years of age.
- pregnant women.
- persons who are seriously ill.
- persons who are admitted in the hospital.

8. Cold & Fever

Sometimes we sneeze and our nose flows. This is caused by a virus and can happen to one and all. Cold is caused by virus named rhinovirus. It is a common disease. In this disease the upper respiratory tract membrane (mainly nose & throat) is affected by the virus. Some times due to other viral attacks there may be body pain and fever. This fever is also known as flue. The diseased persons spit or spit droplets formed due to sneezing or coughing can infect a healthy person. Articles used by the sick person as handkerchief, towels etc can also spread this disease.

Symptoms of Cold

(1) Frequent sneeze

(2) Profuse watery discharge from nose or nose flows.

(3) Nose becomes red, swollen & has a burning sensation.

(4) Nose blocked.

(5) Mild fever, head aches & body aches.

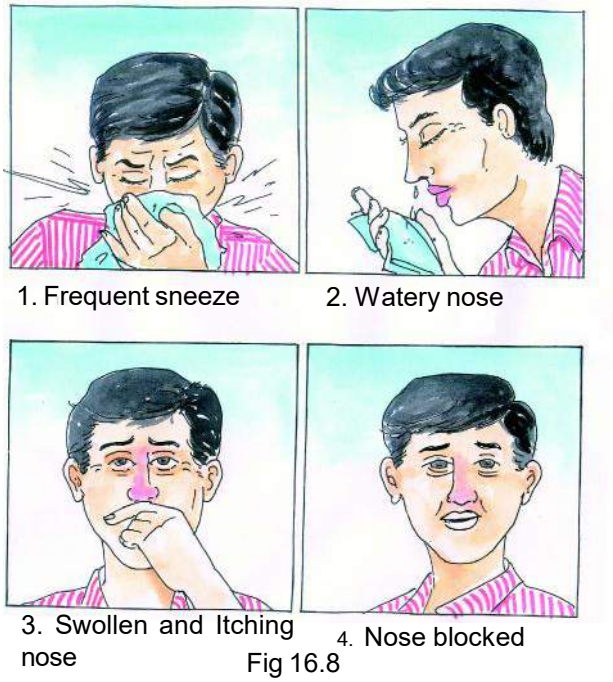


Fig 16.8

(6) Cough with itching sensation in nose and throat.

Prevention from Cold :-

To prevent cold following measures must be adopted.

(1) Avoid close contact with the sick person and do not use handkerchief, towels, cloths etc of the sick person.

(2) The articles of the sick person as handkerchief, towels, and cloths must be cleaned in dettol and dried in sun.

(3) The sick person must cover his mouth, nose while sneezing or coughing with handkerchief, clean cloth or hand.

9. Chicken pox

Chicken Pox is also a disease caused by virus, which usually affects small children. This is caused by varicella zoster virus and it affects children under 10 years mostly.

Symptoms of Chicken pox :-

(1) The diseased has slight or medium fever.

(2) Uneasiness, back pain and joint pain.

(3) The most prominent time for spreading of this disease is 2 days before and 14 days after the formation of rashes.

(4) The potency of this disease is as per the rashes formed on the body. In high potency the rashes appear on all over the body. It starts with rashes on neck then it appear on the face and then it spreads to the lower part and legs. After 4 to 7 days the rashes form scales.

Prevention from Chicken pox :-

(1) Avoid contact with the diseased.

(2) Immunation vaccine is given,

(3) Keep the sick person's bed & cloths clean. Keep him away from other children.

10. Polio [Poliomyelities]

Have you seen any child who is having a weak leg or is using a crutch or support cane for walking? This is due to a viral disease called polio.

Polio is caused by one of the smallest virus or poliovirus. This virus after entering the body multiply in the intestine walls and pass through blood vessels and

then the central nervous system and attack the nerve controlling the leg muscles. In the absence of nerve stimuli the leg muscles stop working properly. So the legs become infected for life and remain polio affected and lame. Sometimes death can also occur due to this disease.

Fig. 16.9 Polio affected child

Symptoms of Polio :-

(1) Cold and cough with fever and vomiting.

(2) Neck muscle cramp due to fever.

(3) Muscle fibers shrink and stops working and there is pain.

(4) After sometime the sick person's leg muscles become weak and the person is unable to stand properly (Fig. 16.9).

Prevention from Polio :-

(1) The child must be given OPV (Oral Pulse Vaccine) just after birth.

(2) The sick person's stools, urine must properly be disposed.

(3) The affected leg must be treated immediately.

Pulse Polio

You must have heard that during the last few years oral polio vaccine, which prevents polio, is given to all children from birth to 5 years. To free children of our country from polio. Indian government with the help of World Health Organization has started this "Pulse Polio" programme to eradicate polio.

NOW ANSWER THESE

(1) Write the symptoms of chicken pox?

(2) Where does the poliovirus attack in our body?

(3) What is OPV?

(4) How is Polio spread ?

11. RABIES (HYDROPHOBIA)

Rabies (hydrophobia) is a very dangerous which occurs in human due to animal bite. Usually when a rabies virus infected animal as dog , cat, ,squirrel, bat

, fox, jackal , wolf bites any healthy person then the virus present in its saliva enters the body through the bite wound . This disease becomes known only after 1 to 3 months. This virus reaches the central nervous system and brings the person to a high stimulating stage.

Symptoms of rabies :-

1. Fear of water is its main symptoms that is why this disease is called hydrophobia.
2. High fever, headache and uneasiness.
3. Blockage in the throat, so the sound produced is low or suppressed.
4. Due to the bursting of nerve, there may be paralysis.

Prevention against rabies :-

1. Animals must be given anti rabies injection. Earlier there was fourteen injection of anti rabies. Then it was reduced to five injections. Now only one anti rabies vaccine is given.
2. If you come across any dog, cat, monkey-bitten person, then direct him to the nearby hospital. Never try to harm any animal.

Louis Pasteur discovered the treatment for rabies. Rabies virus is injected into the hare and is made artificially diseased. Then the tissues of its spinal cord are used to make the vaccine.

12. AIDS

The full form of AIDS is Acquired Immune Deficiency Syndrome. This is caused by HIV (Human Immune Deficiency Virus). The HIV virus enter the white blood cells and destroy the immunity power of the body. (at the same time the white blood cells makes antibodies against them but they are unable to fight against the HIV)

HIV virus is found in the infected persons' fluids as blood, saliva, man's sperms woman's genital discharges and mother's milk.

Symptoms of AIDS :-

AIDS can be recognized by the following symptoms

1. very fast weight loss.
2. cold and fever persistent for months and cough with phlegm.
3. frequent watery bowels persistent for months.
4. feeling too tired, fatigue.

5. swelling on lymphs nodes and pain in joints.
6. white rashes in the mouth.
7. small pimples/rashes all over the body with itching and burning sensations.

NOTE :-

1. We cannot recognize AIDS by the given symptoms as these symptoms are common to other diseases also, therefore blood test is a must.
2. Symptoms of AIDS are not seen immediately after the entry of HIV. It is only seen after 3-15 years.
3. Even though infected with HIV, a person may seem quite healthy and this is capable of infecting other persons with HIV.

Prevention :-

Health education provides knowledge and understanding of AIDS. Proper knowledge is the only basis of prevention of AIDS.

16.4 A Genetic disease - Sickle celled Anaemia

You must have heard of sickle celled anaemia. It is prevalent in some of the castes of Chhattisgarh. Come let us see what is this sickle celled anaemia or sickling.

Sickle celled anaemia is caused due to genetic disorder in the red blood cells of the body. In this the round red blood cell become sickle shaped. Normal red blood cells help in the transport oxygen in the body and when they become sickle shaped oxygen transport is decreased. Along with these they accumulate in groups in the small blood capillaries of the various parts of body and causes pain and hinders its proper function.

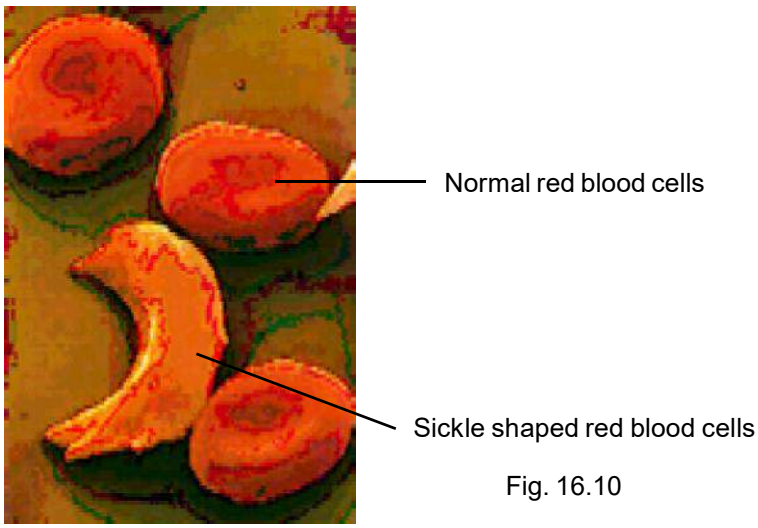


Fig. 16.10

This disease is found in these geological areas where malaria is prevalent. Some scientists believe that the blood cells have acquired such shapes to protect itself from the malarial parasites.

Difference between RBC & sickle celled blood cells	
Common blood cells	**Sickle celled cells**
They are round shape	They are sickle shaped
They are soft and elastic	They are less soft and comparatively less elastic.
They flow easily in the capillaries	They get entangled in the groups in capillaries
Their life is of 120 days	They get destroyed soon and their life span is only for 20 days

Symptoms of sickle cell Anaemia.

1. Due to lack of blood i.e anaemia the body looks pale or white.
2. Fatigue and heavy breathing.
3. Irritable and shows less interest in food.
4. Swelling and pain in fingers toes and joints
5. Frequent fever and cold
6. Enlarged spleen.
7. Hindered growth in children

What a sickle celled anemic person must do

1. Drink more water.
2. Have balanced diet.
3. Get a blood test every month.
4. Take medicine on doctor's advice for increase of blood.

How do we prevent sickle celled anaemia

This is a genetic disease which is inherited from the parents.The patients of this disease are of two types:

1. Carriers of sickle cell.
2. sufferers of sickle cell

Carriers of sickle cell are usually healthy and do not show any symptoms and lead a normal life. A carrier person doesnot know that he is a carrier of sickle cell. When a sickle cell carrier marries another sickle cell carrier or sufferer then they are more chances to have sickle cell anemic children. If two sickled cell anemic persons marry their children will be suffering from sickle celled anaemia. So before marriage boys and girls must get their blood tested for this disease.

NOW ANSWER THESE

1. What are the main symptoms of rabies?
2. Write the full form of AIDS virus.
3. What are the symptoms of sickle cell anaemia?
4. What are the differences between normal blood cell and a sickle cell?

16.5 Vaccination

Vaccination is the method by which any living organisms immunity power is developed against any disease.

Vaccination chart (for children)

Age group	*Vaccination*	*Against diseases*
Birth to 12 months	*BCG*	*Tuberculosis*
1 ½ months	*DPT-1*	*Whooping cough, Diphtheria, Tetanus*
	OPV-1	*Polio*
2 ½ months	*DPT-2*	*Whooping cough, Diphtheria, Tetanus*
	OPV-2	*Polio*
3 ½ months	*DPT-3*	*Whooping cough, Diphtheria, Tetanus*
	OPV-3	*Polio*
9 – 12 months	*Measles*	*Measles*
16 – 24 months	*DPT booster*	*Whooping cough, Diphtheria, Tetanus*
	OPV booster	*Polio*
5 – 6 years	*DT*	*Whooping cough, Tetanus*
10 – 16 years	*TT*	*Tetanus*

WE HAVE LEARNT

- Always eat fresh and hot food to avoid diseases.
- Always keep the food, water, fruits and vegetables covered. Always wash fruits and vegetables before use.
- Always clean your hands with soap before eating your food, also after using the toilet.
- Do not allow wastes and water to accumulate near your house, school, village. They must be thrown in proper pits.
- Use phenyl in toilets and drains.
- A sick person must be kept in a clean and isolated room.
- A sick person must be given sufficient rest and care.
- A sick, person must not be allowed to spit anywhere, he must be given a mud bowl filled with sand or ash to use as a spittoon. Afterwards this must be thrown away or buried.
- The sick person's clothes must be washed separately in Dettol and dried in the sun.
- The sick person must be given boiled and cool water, fluids, nutritious and easily digestible foods.
- All children must be given vaccination against diseases regularly.
- No medicines must be taken without the doctor's advice and proper knowledge.
- If any person, anywhere near your house, street or village is suffering from any disease, then advise him to take a treatment.
- Micro organisms which cause diseases are called disease causing micro organisms.
- Loss of water from the body due to frequent vomiting and bowels is called dehydration.
- ORS (oral rehydration solution) must be used to stop dehydration.
- Flies are the carriers in diseases as cholera, dysentry, diarrhoea, and polio.
- Female Anaphelus mosquito is the carrier of malaria germs.

- Filarial disease is caused due to culex mosquito bite.
- For prevention against polio, children in the age group of 0 – 5 years must be given oral polio vaccine.
- HIV (human immuno deficiency virus) causes AIDS. Proper knowledge about this disease is the only prevention against this disease.
- Cholera, typhoid, dysentry, diarrhoea etc are caused due to infected water, so drinking boiled water is a safe method.

QUESTIONS FOR PRACTICE

1. Fill in the blanks.

1. To avoid dehydration a sick person must frequently take .....solution.
2. Female Anopheles mosquito bite causes .....disease.
3. If a healthy child suddenly starts sneezing and there is watery discharge from his nose then he may be suffering from.....disease.
4. A child has one of his legs swollen and fat and the other one of normal size then he is suffering from .....disease.
5. Lymph canals are affected by .....disease.
6. In ..... and .....diseases the central nervous system is affected.
7. After entering human body the HIV destroy the .....cells.

2. Find which statements are correct and which are wrong. Correct the wrong statements.

1. T.A.B vaccine is against typhoid.
2. Tuberculosis is caused by vibrio cholery.
3. To prevent mosquito bite , mosquito nets must be used.
4. Excreta of the persons from dysentry and diarrhoea must not be left open, but be covered by sand or ash.
5. Using the handkerchiefs and towels used by a person suffering from cold and flu, does not affect a healthy person.
6. To prevent filarial mosquitoes must be destroyed.
7. Rabies is caused by the bite of any dog or cat.

3. Choose the correct alternative-

1. Disease caused by bacteria and virus is :-
   a. hereditary disease b. contagious disease
   c. scurvy d. non contagious disease
2. BCG is used against :-
   a. polio b. tuberculosis c. typhoid d. malaria
3. Which is a bacteria borne disease?
   a. chickenpox b. typhoid c. rabies d. influenza
4. Malaria is spread by :-
   a. male culex mosquito b. male anaphelus mosquito
   c. female anaphelus mosquito d. female culex mosquito
5. Chill and shivering is a symptom of which disease :-
   a. typhoid b. cholera c. malaria d. tuberculosis
6. The disease caused by a protozoa is;-
   a. dysentry b. malaria c. diarrhoea d. all of these.
7. Dysentry is caused due to :-
   a. drinking contaminated water b. eating too much
   c. drinking clean water d. eating salads

4. Answer the following questions :-

1. What are the measures taken against prevention of tuberculosis?
2. What is dehydration ? How can you treat it?
3. If there are pits filled with water and mosquitoes breeding in it, near your house, then what diseases may infect you?
4. If your friend is having spasms and cramps in his abdomen and is having frequent bowels. Can you tell your friend is suffering from which disease and why?
5. Name two viral diseases and their symptoms.
6. Name a disease caused by a worm.
7. Which diseases are caused by flies?
8. Why is it necessary to match the blood test reports before marriage?

17 ADOLESCENCE

17.1

In class 6th you have learnt about 'Growth in living organisms'. Growing up is a natural process. In human beings, growth begins from the day one. But upon crossing the age of 10 or 11 there is a sudden sprout in growth which becomes noticeable. The changes taking place in the body are part of growing up. They indicate that you are no longer a child but are on the way of becoming an adult.

Activity 1

Put a tick mark (√) in the table 17.1 showing the changes that have taken place in your childhood friends of your neighbourhood or class/school, who have played and studied with you since their childhood.

TABLE 17.1

S.No.	Changes from Childhood to till now	Peer - 1 (Boy/ Girl)	Peer - 2 (Boy/ Girl)
1.	Increase in height.		
2.	Change in voice.		
3.	Changes in body shape.		
4.	Get acne and pimples on the face.		
5.	Muscles become stronger.		
6.	Larynx is prominently visible.		
7.			

You have seen that the human body undergoes several changes during its life time. The period of life, when the body undergoes changes, leading to reproduction maturity, is called adolescence. These changes mark the onset of puberty. The most important change which

marks puberty is that boys and girls become capable of reproduction. Puberty ends when an adolescent reaches reproductive maturity.

Adolescence begins around the age of 11 and lasts up to 18 or 19 years of age. Since this period covers the teens (13 to 18 or 19 years of age), adolescent are also called 'teenagers'. In girls, adolescence may begin a year or two earlier than in boys.

Adolescence is a period of change in a person's way of thinking. Intellectual development also takes place and they tend to spend considerable time in thinking.

However, an adolescent may feel insecure while trying to adjust to the changes in the body and mind. But as adolescent learners you should know that there is no reason to feel insecure. These changes are a natural part of growing up.

17.2 Changes during Adolescence

17.2.1 Increase in Height - The most conspicuous change during adolescence is the sudden increase in height. At this time the long bones, that is the bones of the arms and the legs elongate and make a person tall. Table 17.2 gives the average rate of growth in height of boys and girls with age. For example, by the age 12, a boy has reached 84% of his probable full height, while a girl has reached 91% of her full height. These figures are only representative and there may be individual differences. Use the table and calculate with the help of formula given below how tall you are likely to be.

TABLE 17.2

Age in years	% of full height	
	Boys	Girls
08	72%	77%
09	75%	81%
10	78%	84%
11	81%	88%
12	84%	91%
13	88%	95%
14	92%	98%
15	95%	99%
16	98%	99.5%
17	99%	100%
18	100%	100%

Calculation fo full height (cm) $= \frac{\text{Present height (cm)}}{\%\ of\ \ full\ height\ at\ this\ age\ (as\ given\ in\ the\ chart)} \times 100$

Example -

Ramesh is 9 years old and 120 cm tall. At the end of the growth period he is likely to be -

According to the table 17.2

$$\frac{120}{75} \times 100\ cm = 160\ cm\ tall$$

Initially, girls grow faster than boys but by about 18 years of age both reach their maximum height. The rate of growth in height varies in different individuals. Some may grow suddenly at puberty and then slow down while others may grow gradually.

You must have noticed that height of an individual is more or less similar to that of some family member. This is because height depends on the genes inherited from parents. It is however very important to eat the right kind of food during these growing years. This helps the bones, muscles and other parts of the body get adequate nourishment for growth.

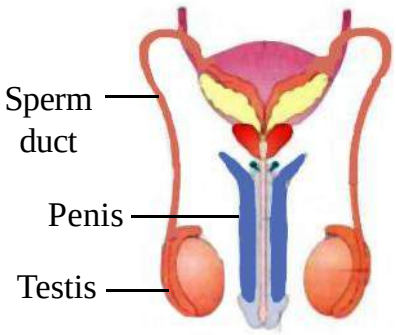
17.2.2 Change in Body Shape - Have you noticed that boys in your class have broader shoulder and wider chests than boys in junior classes? In boys the muscles of the body grow more prominently than in the girls. Thus changes occurring in adolescent boys and girls are different.

17.2.3 Voice change - Did you notice that sometimes the voice of some of the boys in your class cracks? At puberty, the voice box or the larynx begins to grow. Boys develop larger voice boxes. The growing voice box in boys can be seen as a protruding part of the throat called Adam's apple. In girls the larynx is hardly visible from the outside because of its small size.

17.2.4 Increased Activity of Sweat and Sebaceous Glands - During puberty the secretion of sweat glands and sebaceous glands (oil glands) increases. Many young people get acne and pimples on the face at this time because of the increased activity of these glands in the skin.

17.2.5 Development of Sex Organs - Its considered to be the most important change at puberty, where in the sex organs of human develop completely and become reproductive. You have read about the human reproductive system in class 7, now let's know something more about it.

(a) Male reproductive organs - The male reproductive organs include a pair of testes (singular testis), two sperm ducts and a penis (fig17.1a). On maturity the testes produce millions of tiny male gametes called sperms. Sperm is a single cell with a small head, a middle piece and a tail (fig17.1b) .



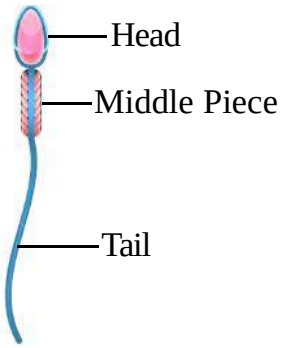
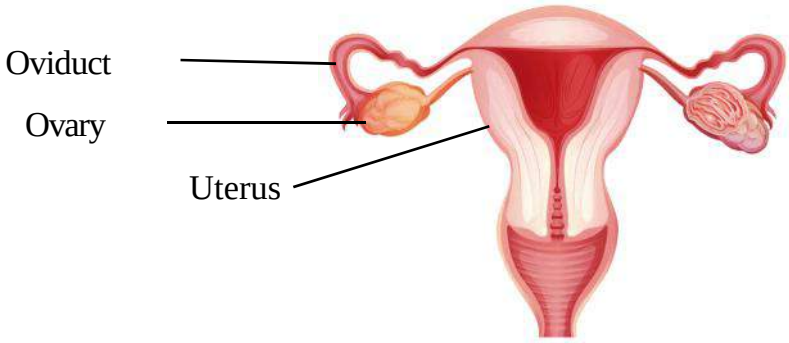


fig17.1a fig17.1b

Fig. -17.1 Male reproductive organs

(b) Female reproductive organs - The female reproductive organs are a pair of ovaries, oviducts (fallopian tubes) and the uterus (fig.17.2a). The ovary produces female gametes called ova (eggs) (fig.17.2b). At puberty in girls, the uterus increases in size and a single matured egg (ovum) is released in to the oviduct by one of the ovaries every month. Uterus is the part where development of the baby takes place. Like the sperm, an egg is also a single cell.



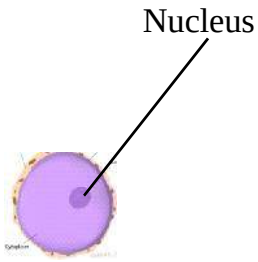


Fig. -17. 2 a Female reproductive organs Fig. -17. 2 b Ovum

(C) Fertilization - As you know the first step in the process of reproduction is the fusion of a sperm with an ovum.Such fusion of egg and sperm is called fertilization(fig.17.3 a). When this fertilization occurs inside the female body it is known as internal fertilization like in human, cat, cow etc and the type of fertilization in which the fusion of a male and a female gamete takes place outside the body of the female is called external fertilization, like in frog, fish and in most aquatic animals.

As a result of fertilization a zygote is formed. Which later forms the embryo and finally develops in to a new off spring

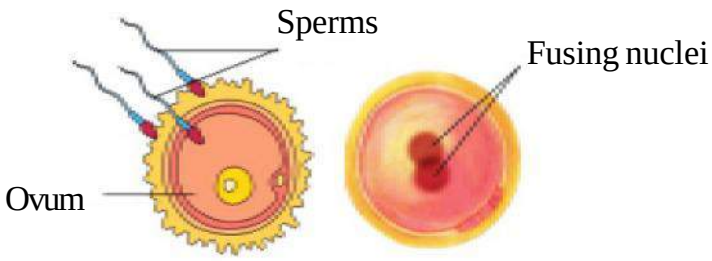


Fig. 17.3 Human (a) fertilization (b) Zygote

In human and other mammals the complete development of embryo into a new born individual takes place in the uterus of the female body. Such animals are known as viviparous. While those animals which lay eggs, which later hatches out into a new individual are known as oviparous. Can you name same oviparous animals?

In microorganisms asexual reproduction occurs like hydra reproduce through budding. A small knob like structure develops which later grows into a bud and finally separates out as a new individual. Unicellular amoeba reproduces by binary fission in which the nucleus and cell divides into two independent parts and each part grows into a new individual.

NOW ANSWER THESE

1. Mention the main characteristics of adolescence?
2. What are the reasons of acne and pimples on the face of adolescents?
3. Why do adolescents feel insecure?
4. What are the main differences between viviparous and oviparous animals?
5. What is fertilisation? Explain.

17.3 Secondary Sexual Characters

You know that the testes and ovaries are the reproductive organs. They produce the gametes that are, sperms and ova. In girls, breasts begin to develop at puberty and in boys facial hair like moustaches and beard begin to grow. As these features help to distinguish the male from the female they are called secondary sexual characters. Boys also develop hair on their chest. In both boys and girls hair grows under the arms and in the region above the thighs or the pubic region.

The changes which occur at adolescence are controlled by hormones. Hormones are chemical substances secreted by endocrine glands.

At the onset of puberty, the male hormones or testosterones begins to be released by the testis. This causes changes in boys, for example the growth of facial hair. Once puberty is reached in girls, ovaries begin to produce the female hormone or estrogen which makes the breasts to develop. Milk secreting glands or mammary glands develop inside the breasts. The production of this hormone is under the control of another hormone secreted from an endocrine gland called pituitary gland.

17.4 Role of Hormones in Initiating Reproductive Function -

Endocrine glands release hormones into blood stream so as to reach a particular body part called the target site. The target site responds to the hormone. There are many endocrine glands or ductless glands in the body. The testes and ovaries secrete sex hormones. Further the sex hormones are under the control of hormones from the pituitary gland -

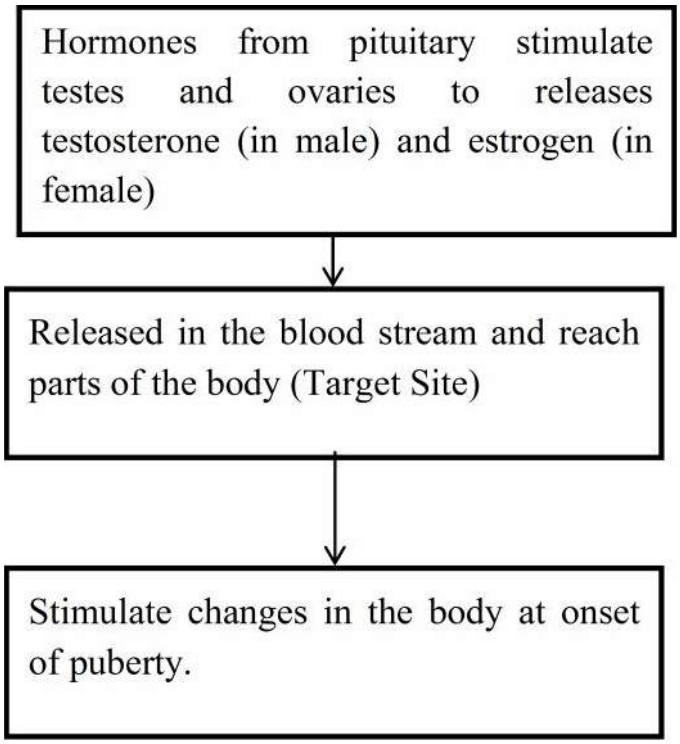


Fig. 17.4 The onset of puberty is controlled by hormones.

17.5 Reproductive Phase of life in Human

Adolescents become capable of reproduction when their testes and ovaries begin to produce gametes. The capacity for maturation and production of gametes lasts for a much longer time in males than in females.

In females the reproductive phase of life begins at puberty (10 to 12 years of age) and

generally lasts till the age of approximately 45 to 50 years. The ova begin to mature with the onset of puberty. One ovum matures and is released by one of the ovaries once in about 28 to 30 days. During this period the wall of the uterus becomes thick so as to receive the egg, in case it is fertilized and begins to develop. This results in pregnancy. If fertilization does not occur the released egg and the thickened lining of the uterus along with its blood vessels are shed off. This causes bleeding in women which is called menstruation. Menstruation occurs once in about 28 to 30 days. The first menstrual flow begins at puberty and is termed as menarche. At 45 to 50 years of age the menstrual cycle stops. Stoppage of menstruation is termed as menopause. Initially menstrual cycle may be irregular. It takes some time to become regular.

Menstrual cycle is controlled by hormones. The cycle includes the maturation of the egg, its release, thickening of uterine wall and its break down if fertilization doesn't occur. In case the egg is fertilized it begins to divide and then gets embedded in the uterus for further development.

NOW ANSWER THESE

1. Name the hormones responsible for the changes occurring in adolescence at puberty.
2. What is the span of reproductive life in females?
3. What do you understand by secondary sexual characters?

17.6 How is the sex of the baby determined?

Inside the fertilized egg or zygote is the instruction for determining the sex of the baby. This instruction is present in the thread like structures, called chromosomes in the fertilized egg. You can recall that chromosome is present inside the nucleus of every cell. All human beings have 23 pairs of chromosome in the nuclei of their cells. Two chromosomes out of these are the sex chromosomes, named X and Y. A female has two X chromosomes, while a male has one X and one Y chromosome.

No. of chromosomes in human being -

In female - 22 pairs + XX (one pair)

In male - 22 pairs + XY (one pair)

When a sperm containing X chromosome fertilises the egg, the zygote would have two X chromosome and develop in to a female child. If the sperm contributes a Y chromosome to the egg (ovum) at fertilisation the zygote would develop into a male child.

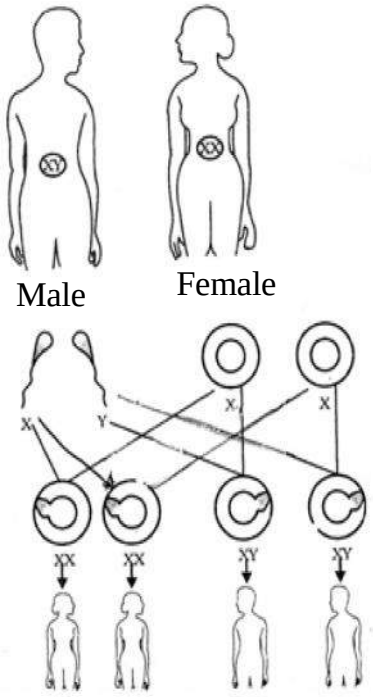


Fig. 17.5 Sex determination in humans

Now you know that the sex chromosomes of the father determine the sex of an unborn baby. The belief that the mother is responsible for the sex of her baby is completely wrong and to blame her for this is totally unjustified.

17.7 Reproductive Health

The physical and mental well being of an individual is regarded as an individual's health. To keep the body healthy every human being, at any age needs to have a balanced diet. The person must also observe personal hygiene and undertake adequate physical exercise.

During adolescence, however these become even more essential as the body is growing.

17.7 .1 Nutritional Needs of the Adolescents - Adolescence is a stage of rapid growth and development. Hence the diet for an adolescent has to be carefully planned. You may have already learnt what a balanced diet is. Recall that a balanced diet means that the meal should include proteins, carbohydrates, fats and vitamins 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 builds blood and iron-rich food such as leafy vegetables, jaggery, meat, citrus fruits, Indian gooseberry (amla) are good for adolescents.

17.7.2 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 cleaned every day. If cleanliness is not maintained there are chances of catching bacterial infection. Girls should take special care of cleanliness during the time of menstrual flow. They should keep track of their menstrual cycle and be prepared for the onset of menstruation.

17.7.3 Physical Exercise -All young boys and girls should take walks, exercise, and play outdoor games. Walking and playing in fresh air keeps the body fit and healthy.

17.8 Myths and Taboos

There are many wrong notions which you should now be able to discard as sensible adolescents. For example; there are myths and taboos regarding bodily changes that adolescents experience. Some of these are given below and you can argue why these are myths and not facts.

1. A girl becomes pregnant if she looks at boys during menstruation.
2. The mother is responsible for the sex of her child.
3. A girl should not be allowed to work in the kitchen during menstruation.
4. A girl is considered unholy during menstruation.

You may come across many other myths & taboos, discard them.

Activity 2

Collect data on the number of children in your class who exercise regularly and who do not exercise regularly. Did you notice any difference in their fitness and health? Prepare a report on the benefits of regular exercises.

17.9 Say "No" to Drugs -

Adolescence is a period of much activity in the body and mind which is a normal part of growing up. So do not feel confused or insecure. 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 will feel like taking them again and again. They harm the body in the long run. 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 normal person from an infected person by sharing the syringes used for injecting drugs. It can also be transmitted to an infant from the infected mother through her milk. The virus can also be transmitted through sexual contact with a person infected with HIV.

17.10 Child Marriage is Harmful

You might know that in our country the legal age for marriage is 18 years for girls and 21 years for boys. This is because teenage mothers are not prepared mentally or physically for motherhood. Early marriage and motherhood cause health problems in the mother and the child.

NOW ANSWER THESE

1. Which chromosomes are responsible for the determination of sex in human?
2. Why the diet of an adolescent should be carefully planned?
3. Why it is important to maintain personal hygiene during adolescence?

WE HAVE LEARNT

- Children in the age group of 11 years to 19 years are called adolescents.
- Adolescence or the onset of puberty marks the beginning of reproductive life.
- The onset of puberty brings about maturing of the reproductive organs. Hair grows at various places on the body. Breasts develop in girls and facial hair (moustache and beard)

appear in boys. Voice of boys becomes hoarse as voice box enlarges during adolescence .

- Children gain height during adolescence.
- The onset of puberty and maturity of reproductive parts are controlled by hormones.
- Hormones are secretions of endocrine glands which are powered directly into the blood stream.
- Testosterone is the male hormone and estrogen is the female hormone. The uterine wall in female prepares itself to receive the developing fertilized egg. In case there is no fertilization the thickened lining of the uterine wall breaks down and goes out of the body along with blood. This is called menstruation.
- Sex of the male child depends on whether the zygote has XX or XY chromosomes.
- It is important to eat balanced food and maintain personal hygiene during adolescence.

QUESTION FOR PRACTICE

1. Find out the correct and incorrect sentences. Make necessary corrections to the incorrect sentences-

i. Mothers are responsible for the sex of the unborn child.

ii. Children gain height during adolescence.

iii. During menstruation girls should not be allowed to work in kitchen.

iv. Children in the age group of 13-19 are called infants.

v. The zygote with XY chromosome pair develops into a male child.

vi. Body of girls becomes unholy during menstruation.

2. Choose the correct option -

i. Adolescents should be careful about what they eat, because-

A. Proper diet develops their brains.

B. Proper diet is needed for the rapid growth taking place in their body.

C. Adolescents feel hungry all the time.

D. Taste buds are well developed in teenagers.

ii. Reproductive age starts when -

A. Menstruation starts.

B. Breasts start developing.

C. Body weight increases.

D. Height increases.

iii. The right meal for adolescents consists of -

A. Chips, noodles, chocolate

B. Chapatti, dal, vegetables

C. Rice, noodles and chips

D. Vegetable, chips and cold drink.

iv. Following is male hormone -

A. Testosterone

B. Estrogens

C. Insulin

D. Thyroxin

3. Explain the followings-

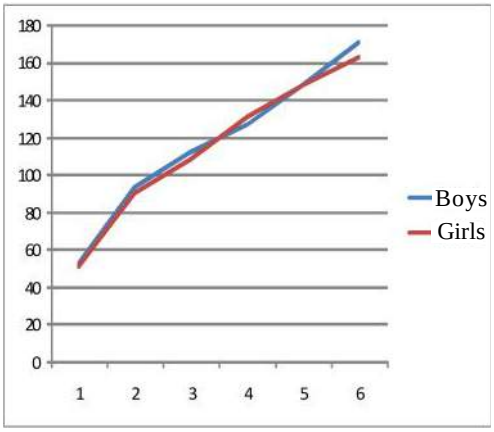
(a) Secondary sexual characters

(b) Sex determination in the unborn baby

(c) Oviparous and viviparous animals

(d) The table and graph below shows the data of the likely heights of boys and girls, as they grow in age. Draw same graphs showing height and age for both boys and girls in your copy. What conclusions can be drawn from the graph?

Age (years)	Height (cm)	
	Boys	Girls
0	51	51
4	94	90
8	112	108
12	127	131
16	148	148
20	171	163



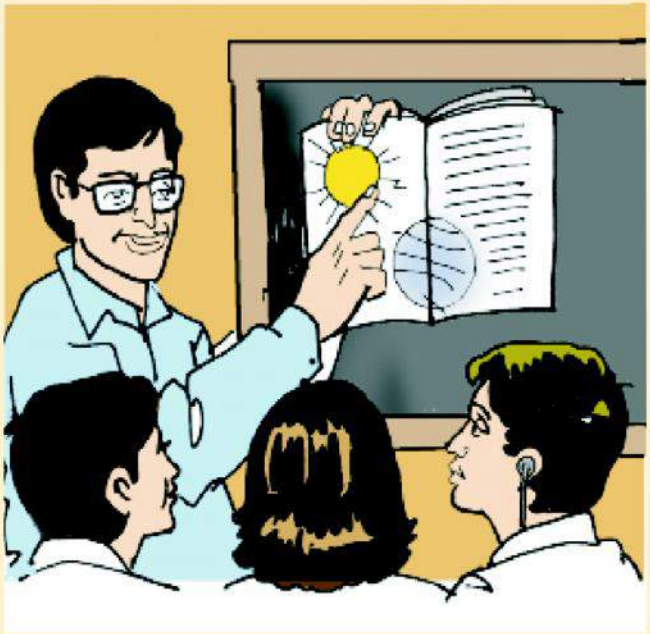
TRY TO DO THIS ALSO

1. Find out from your elders, relatives about their awareness of the legal status of early marriage. You may get information on it from your teacher, parents, a doctor or the internet. Write a two minute speech explaining why early marriage is not good for the couple.

2. Collect newspaper cuttings and information from magazines about HIV/AIDS. Write a one page article of about 15 to 20 sentences on HIV/AIDS.

3. In our country, according to a census, the ratio of female and male adolescents is 882 : 1000. Find out the concerns of community regarding the challenge of having a boy or girl is equal.

4. Put your ideas together and write a short note on the importance of knowing facts about reproduction.



If there are Hearing Impaired students in your class:

1. *To understand, these students need to see the blackboard, teacher's face, mouth and hands. They learn the pronunciation by looking at the movement of lips so make sure that they sit in the front rows.*
2. *All new words introduced in the classroom should be written on to the blackboard. If possible make pictures also. Ensure that such students wear their hearing aid at all times.*
3. *Hearing impaired students generally also have speech related difficulties. Listen to them with patience and give them the opportunity to express themselves.*
4. *Keep your hands away from your mouth and avoid eating or drinking while talking so that the child is able to observe you.*

If there are visually-impaired students in your class, extend your help:

1. *Always address visually-impaired students by their names and speak out whatever is written on the blackboard.*
2. *Familiarize these students with the way to the classroom, staircases, Principal's room, drinking water facility, toilet, playground and library. This will enable them to go about their tasks independently.*
3. *Visually-impaired students use the Braille script. If your school does not have sufficient resources, contact the nearest DIET office and agencies that provide Braille and audio books, cassettes and CDs.*