Our Science

New Edition

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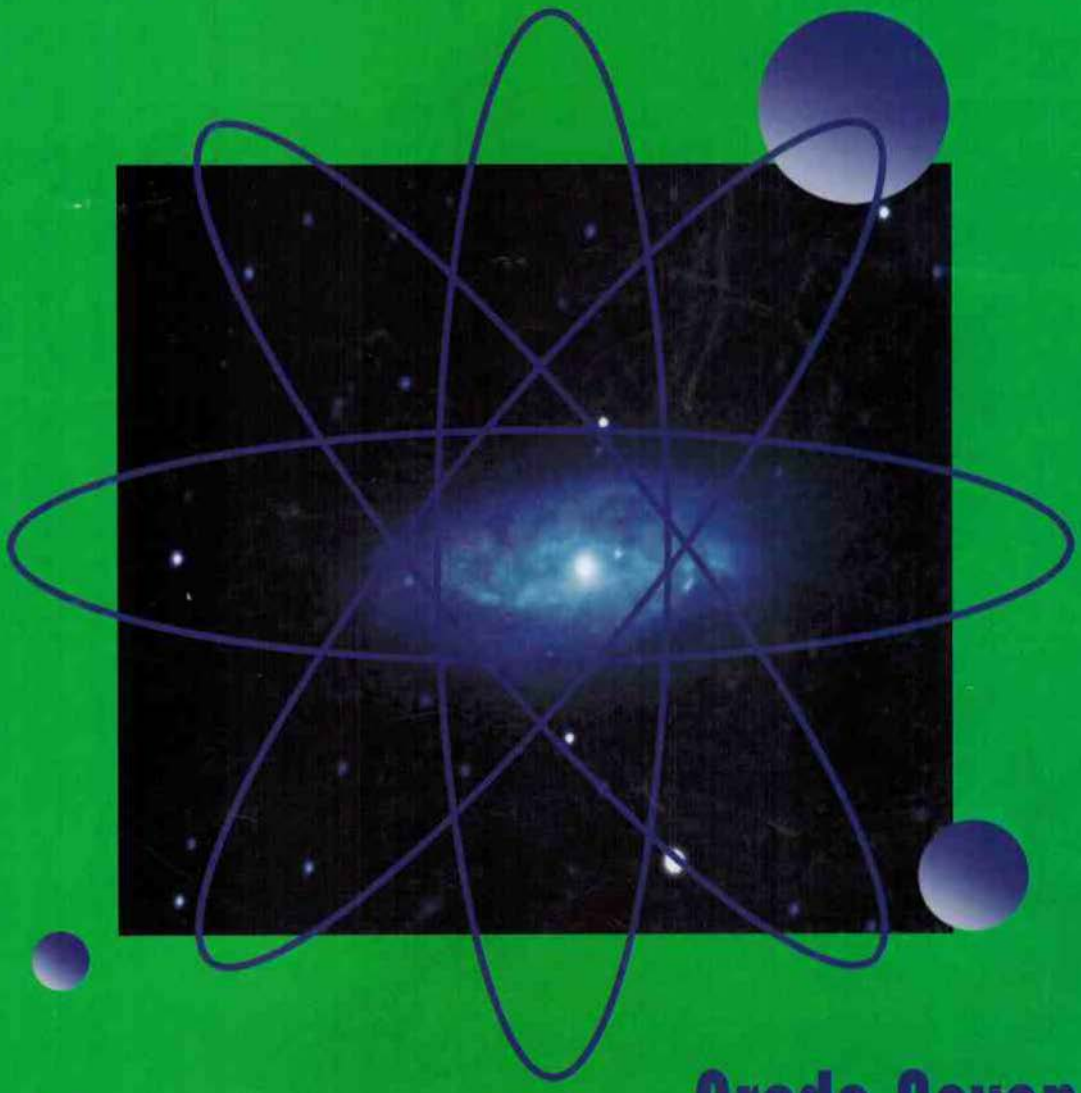

Grade-Seven

Our Science

Grade 7

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About the book

In order to make education useful and relevant to practical life, foster the feelings of nationality, national unity, democratic norms and values, inhibit basic human attributes like: honesty and morality which is required for social life, the process of revising school level curricula and textbooks has been going on.

In this book, attempts have been made to include examples and activities related to real life experience. Most of the activities included in this book can be conducted by using locally available materials. Initially written by Dr. Ganesh Bahadur Mali, Sunita Malakar and Jiban Hari Shrestha, this book has been thoroughly revised by a revision panel comprised of Rakesh Shrestha, Shankar Man Shrestha, Rabindra Kshetri, Ramesh Kumar Shrestha, Achala Thapa and Nanda Kaji Shrestha. Suggestions given by the subject committee members Shiva Prasad Satyal, Jagannath Awa, Gopal Prasad Adhikari, Kedar Govinda Amatya and Kirti Prasad Pandey. Its language was edited by Ganesh Prasad Bhattarai. CDC is grateful to all those involved in developing this book.

Textbook is an important tool of teaching learning process. Inquisitive students and experienced teachers can use various resources in teaching learning the subject matter in order to achieve the objectives specified by the curriculum. Due to the lack of additional materials, the classroom teaching is found entirely based on textbooks. In this context sufficient attempts have been made to bring this book up to the standard. However, the Curriculum Development Center anticipates constructive suggestions from the valued readers.

Government of Nepal
Ministry of Education
Curriculum Development Centre
Sano Thimi, Bhaktapur

Preface

Now that the overwhelming majority of people in Nepal question the quality of education, it is, indeed, desirable to do something about it. One of the major tasks of the government is to provide quality education to all the people. In this context, Curriculum Development Centre (CDC) is the authorized institution in the country to design and develop textbooks and teachers' guides to be used throughout the kingdom to meet this challenging need. Likewise, Janak Education Materials Centre (JEMC) also plays an equally crucial role by printing and distributing the textbooks to all the public schools across the country. To cater for the needs of both private and public schools, JEMC has come one step ahead by translating the authorized version of Nepali books into English. The Centre is confident that it will be able to provide English version books in different subjects to the learners step-by-step.

JEMC really feels proud of accomplishing a substanial job of translating school texbooks into English for English medium learners across the country.

This book is translated by Tanka Lal Gaire and Jaya Prasad Lamsal from Nepali version *Hamro Bigyan* of Grade 7 . We are highly grateful to Rakesh Shrestha, Pramod Kumar Shah and Jagannath Awa of CDC who were involved in subject matter and language editing. The JEMC invites positive suggestions from all the concerned to make the book even better.

We would like to express our sincere thanks to the teachers of some renowned schools of 5 Development Regions who have assisted in evaluating the proposed translated lessons and all the others who have also contributed to the preparation of these books.

Finally, we would also like to express our gratitude to CDC for giving us an opportunity to translate the government textbooks into English in order to cater the needs of the pupils of English medium school.

Date: 2062, Baishakh

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CONTENTS

Physics

Chemestry

Biology

Zeology and Astronomy

Unit - 1

FORCE

We need force to perform everyday life activities. The force is applied to kick a football, to stop a moving football, to lift the glass on the table, to walk, to run, to open the door and so on. No work can be done without force. Thus, force is applied to move an object when it is at rest and to stop an object when it is in motion.

The force is defined as an external agent, which tries to change the state of an object from rest to motion or motion to rest.

Types of forces

Forces are of different kinds.

1. Pulling force

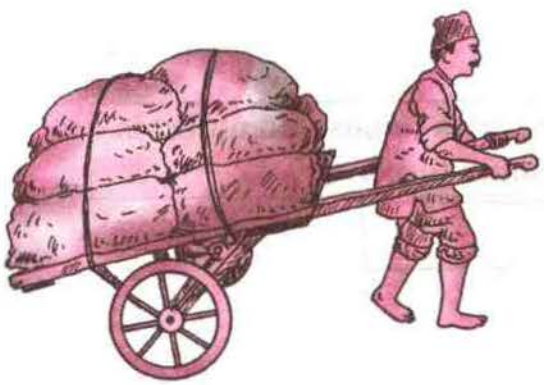


Fig No. 1.1 Pulling a Cart

Pulling water from a well

In this figure a woman is pulling water from a well and a man is pulling a cart. Force is applied to pull the water from a well, and in the same way, force is also applied to pull the cart. In the Terai, we can see carts being pulling by a horse, bullock or oxen. It is easier to pull a lighter body than a heavier body. Thus, the force is applied to pull all kinds of objects (bodies).

The force that pulls or tries to pull an object is called pulling force.

2. Pushing Force

In this figure, a man is pushing a loaded cart. What kinds of work need pushing force? Have you ever seen vehicles (Car, Jeep etc.) fallen into a muddy road? People must push it to take out of the ditch. Pushing force is also applied to move a cycle while carrying it without riding.

Pushing force is also applied while playing football, volleyball and carrom. In these all activities, the force acts as a pushing force. That force which is used to push an object (body) is the pushing force.

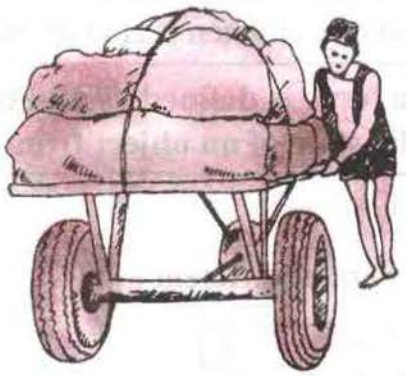


Fig No. 1.2 Pushing a Cart

The force which pushes or tries to push an object is called pushing force.

3. Centripetal force and Centrifugal force

How do you feel while sitting in a bus, when it is going through the turning? The vehicle turns in the turning and passengers also turn to the opposite direction of the bus. A kind of force is produced while moving round the turning. This force pushes the passengers away from the centre. It is called centrifugal force. A man or a bicycle

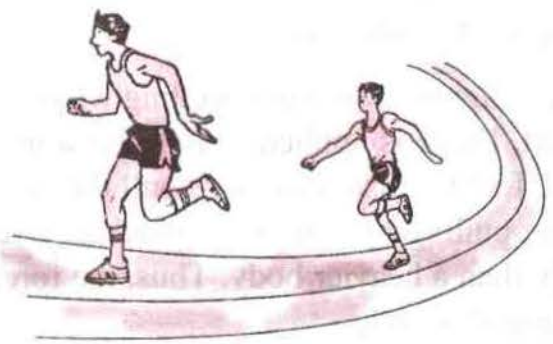


Fig No. 1.3 Running on the Turning road.

running in a circular path tilts towards the centre. That kind of pulling force is known as centripetal force. It helps to balance a man or a bicycle while running. If this force does not exist then a man or a bicycle goes straight ahead in stead of going aling to the circular path or bends.

Thus, the body (object) can move on a certain circular path if the centripetal force is balanced by the centrifugal force.

Activity 1

Rotate a small rubber ball or a piece of rubber by tying it with a string about 20/25 centimeters long. Pullout the hand from the string while it is rotating. Which force (what kind of force) is exerted on the piece? Why did the piece of rubber go straight away? When the string is being held by hand, the piece of rubber does not go straightaway because the centripetal force is attracting it towards the centre. Due to this, it can rotate along the circular path. Due to the centrifugal force the piece of rubber tends to go away from the centre of the circle/ circular path. When the string is tightly held by hand, the string pulls that piece of rubber towards the centre. The force exerted on the string is a centripetal force. When the centripetal force is equal to the centrifugal force, then the body remains rotated in the circular path. When the centrifugal force is greater, the body goes away from the centre and when the centripetal force is greater, It is attracted towards the centre.

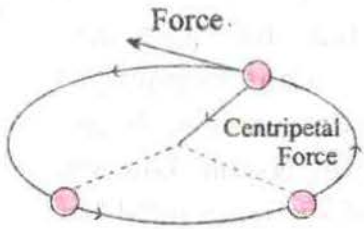


Fig. No. 1.4

When a body is rotating about the centre point, two kinds of forces are working there. The force which tries to pull the body away from the centre is called centrifugal force and the force which attracts the body towards the

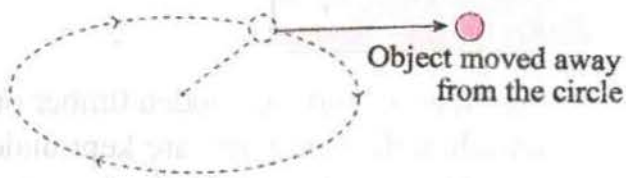


Fig. No. 1.5

centre is called centripetal force. The body continues to rotate in a circular path until these two forces are balanced.

4. Magnetic Force

Have you ever seen magnet? You may have played with magnets. Magnet attracts iron.

Suspend a bar magnet tying with a string as shown in the figure. Take another bar magnet in your hand and try to bring its north pole close to the N-pole of the suspended bar magnet, Observe what happens ? Write in your note book. Again bring N-pole Towards S-pole of the suspended bar magnet and observe, what happens? Write in your note book.

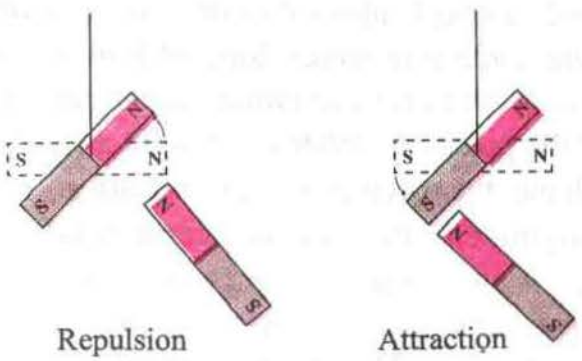


Fig. No. 1.6

There is repulsion between N-pole and N-pole. The North pole of the suspended bar magnet is pushed. During the attraction between N-pole and S-pole, the South pole of the suspended bar is pulled. In this way, the force is produced in the magnet. In many factories, the heavy items of iron are moved from one place to the other place with the help of magnet. Thus, the heavy works can be done with the help of magnet.

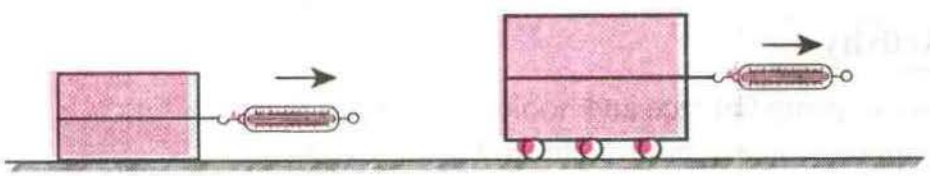
The force produced by the magnet is called magnetic force.

5. Frictional force

It is difficult to slide a wooden timber on the surface of the land but it is easier when the iron pipes are kept under it. In the former case there is greater friction where as in the later case there is less friction. Friction resists the movement of a body. Friction is created in the opposite direction of the moving body.

Activity 3

Place a wooden block on the surface of a table and attach the spring balance on it with the help of a string. When pulling the spring balance the wooden block is also pulled. The pointer of a spring balance shows the amount of force required to pull the block. Again, pull the wooden block by putting some pencils (2/3) in contact under it and read the amount of force shown by the balance. Friction is created when sliding the wooden block. We need much force to pull an object due to the existence of friction. When the body is rolling, less friction exists and less force is required. Force is created by friction, this force resists the movement of the body. Much frictional force is created which sliding than while rolling it. Calculate the difference of frictional force in the experiments mentioned above.



Pulling a wooden block Pulling the block putting pencils under it

Fig. No. 1.7

Have you ever ridden a bicycle? What is needed to stop the moving bicycle? What amount of force is required to stop the bicycle? How does it stop when we apply the brakes? Observe carefully. When we apply the brakes the rubber of the brakes is tightly stuck the rim of wheels. Due to this, the friction is created and it causes the bicycle to stop. The amount of force required to stop the bicycle is created due to friction. In the same way, force required to stop motorcycle, motor vehicles, train, aeroplane etc. is created by friction.

The force created by friction is called frictional force.

6. Gravitational force

When we throw a ball upward, it falls down towards the earth , after some time. If a piece of stone is thrown up, it will also fall down. Similarly, fruits from the trees fall down towards the earth. Towards earth means towards the centre of the earth and towards sky means away from the centre of the earth. Water flows downward. Rivers also flow downwards from a higher place. Rain water, snow balls also fall down due to the force of gravity. What is the reason behind this phenomenon? The earth attracts all the objects towards its centre. The force by which the earth attracts all the objects towards its centre is called gravity.

Fig. No. 1.8
Fruits falling down from a tree.

Activity 4

Take a spring balance and hookup a stone of mass of approximately 50g. Note down the extension in the spring balance. Again, hook up (suspend) another stone of mass of about 100 g. Observe and find the difference between these two experiments. The extension of spring is more in 100 g. mass. What is the reason behind this? What conclusion can we draw from this experiment? The force of gravity is less in light objects where as it is more in heavy objects. We can compare the gravity of the objects by suspending them in spring balance. There is a scale in spring balance which can help to measure the gravity of an object.

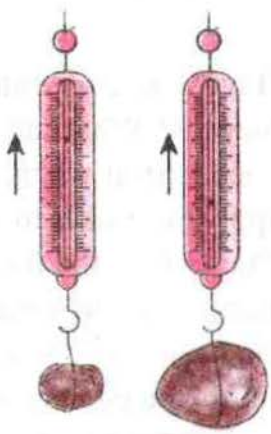


Fig. No. 1.9

We can measure the gravity of any object with the help of a spring balance. Newton is the unit of

gravity but gram is written in the spring balance. It can easily be converted into Newton. Weight is the measure of gravity. As you know from the above examples that the earth attracts all the bodies towards its centre. The earth also attracts the moon. Similarly, the sun also attracts the earth. Due to this reason, the earth cannot go away (escape) from the sun, the moon also cannot go away from the earth. Not only in the case of the sun, earth and moon, but also other bodies in the space attract each-other. The attraction is present in between planets of solar system, satellites and stars. The force of attraction between two bodies is called gravitational force.

The force of attraction between two objects is called gravitational force.

Effects of force

If the force is applied to an object, it shows the following effects:

(A) Force changes the state of rest or motion of a body.

Activity 5

Keep a tennis ball on a table and push it slightly with your hand, Now keep your another hand on the opposite side of the moving ball. Initially, the ball is at rest, after applying force by the hand it comes into motion. If you block the motion of a ball with your other hand, it will come into a state of rest.

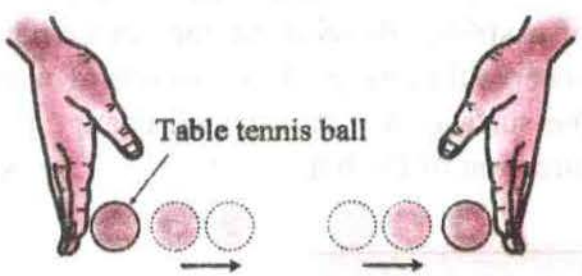


Fig No. 1.10

(B) Force changes the shape and size of a body

We cannot observe the change when we apply a small amount of force to an object but we can see the change in an object if we apply a large

amount of force to it. If we put a small (light weight) object on a table, we cannot see any effect but if we put a heavy weight object on the table which is heavier than the capacity of that table, we can easily see the effects on the table.

Activity 6

Take a rubber eraser. Insert two nails each of an inch near the ends of the eraser. What change do you observe in the eraser? You will observe both the ends of the eraser near the nails expand.

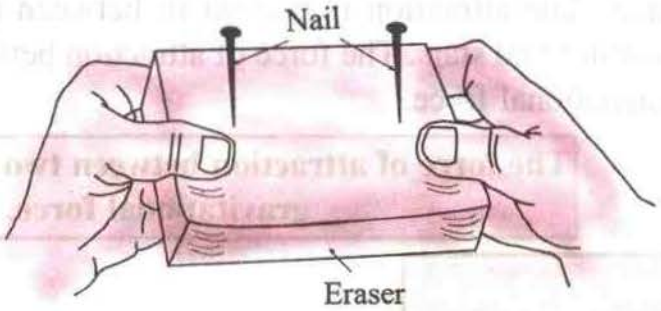


Fig. No. 1.11

(C) Force Changes the direction of a moving object.

Activity 7

Suspend a small rubber ball with the help of a string. Blow it on the lower part observe the change. If the air is blown on the surface of a ball, it will change the direction of the ball.

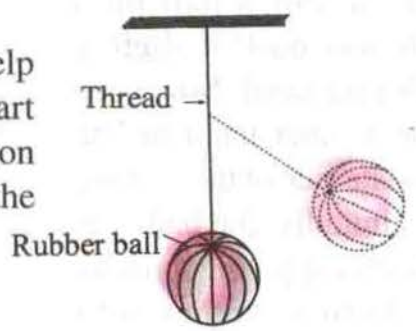


Fig. No. 1.12

Frictional Force

All the bodies have some roughness in their surfaces. There are projections and depressions on the surface of the bodies. When two solid bodies are in contact with each other, the projections of one fit into the depression of the other. This gives rise to the frictional force. In this way the friction is created due to the roughness of surface. Friction is less on

the smooth surface in comparison to the rough surface because smooth surface has fewer projections and depressions. No body has a perfectly smooth surface.

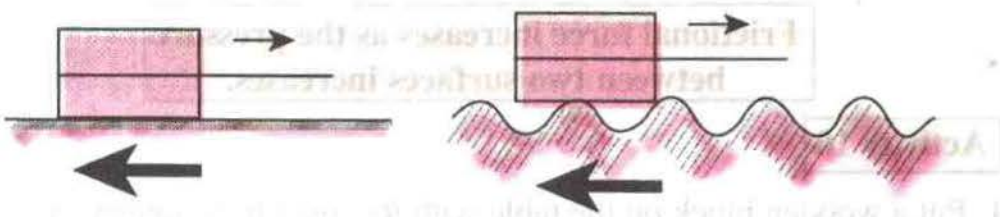


Fig. No. 1.13

Activity 8

1. Place a wooden block on a rough floor. Attach the spring balance on it with the help of a string and pull it. Note down the force required to slide the wooden block over the floor.
2. Pull the same wooden block placing on a smooth surface (e.g. glass, desk etc.). Then note down the force required to slide the wooden block.

From the above activities, we see that much more force is required to pull the wooden block on a rough surface in comparision to the smooth one. What is the reason behind it? Rough surface has more friction. That is why more force is required to pull the wooden block.

Frictional force increases according to the increase in roughness of the surface in contact.

Activity 9

1. Repeat the second sub- activity of activity 8 and note down the force.
2. Again add one book (mass) on the wooden block and pull it by means of spring balance, then note down the force.

Why is there difference in force to pull the wooden block between activities 1 and 2 ?

Which one has required the greater force?

Adding some books on the wooden block causes the increase in mass as well as in weight . The pressure on the surface increases with the increase in weight of the wooden block which causes the increase in friction.

Frictional force increases as the pressure between two surfaces increases.

Activity 10

1. Put a wooden block on the table with its breadth in contact. Attach a spring balance and pull it. Then note down the force required to slide this block.
2. Again put the same block on the table with its thick side in contact. Pull this block with the help of a spring balance and note down the force required to slide it.

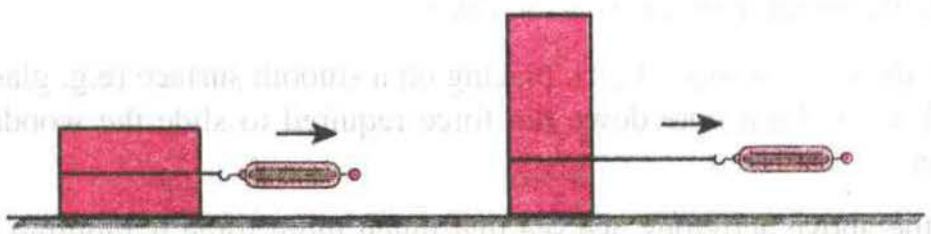


Fig. No. 1.14

The force required in both the cases is the same. Can you explain, why? When we keep the wooden block with its breadth in contact, the area of the surface in which the friction is created increases but the frictional force does not increase.

Frictional force does not depend on the area of surface in contact.

Effects of friction:

(1) We have to apply brakes to stop a moving bicycle, motorcycle, motor vehicles (car,bus, truck) etc. You have already studied that the frictional force can stop these vehicles, when the brakes are applied to them.

(2) Movable parts of different machines need oil regularly. Can you explain why? The parts of different machines are lubricated by using oil or grease, as a result, the friction becomes less and it is easy to handle the machines. The machines having greater friction are difficult to handle because the friction wastes the energy. Wastage of energy is converted into heat energy. Due to this, the machines become hot and at is difficult to work.

Some portion of the force applied in the machine is converted into heat and reduces its efficiency.

Have you seen the wear out of tools like knife, sickle, spade etc.? Every simple spade machine becomes thiner and thiner if you use them continuously for a long time. What do we do when axe, scissors etc. are to be sharpened? When we rub these household tools with a rough stone, grind stone etc., then they become sharp.

Simple machines wear out due to friction.

Activity 11

Rub your hands for a while. How do you feel? Why is so happened? Can you explain?

Unit of force and measurement

The measurement of force is taken by comparing with the standard force. The force exerted by the earth on an object of mass one kilogram is called one kilogram force. One kilogram force is equal to 10 Newton. The standard unit of force is Newton. It is written N in short.

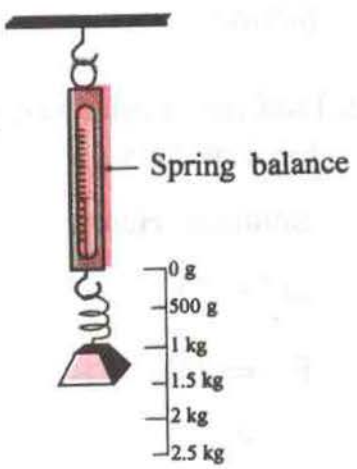


Fig. No. 1.15

Activity 12

Suspend a spring balance as shown in the figure. Measure the extension of the spring

by suspending 500g. mass. Then suspend the 1 kg mass to the spring and measure the length of extension. You will find the extension double of the previous one. In this way, we can find the measurement of force by suspending the certain mass to the spring balance.

Mathematical problem related to force

The force on any object of certain mass is calculated by using the following formula:

Force = mass ∞ acceleration.

or, $F = m \times a$

$(N) = (kg) \times (m/s^2)$

Example:

1. Calculate the force required to bring a motor (car) of 1500 kg. in motion with an acceleration of 5 m/s^2.

   Solution: Here: $m = 1500$ kg
   $a = 5\ m/s^2$
   $F = ?$

   we have
   $F = m \times a$
   or, $= 1500 \times 5$
   $= 7500$ N.

   Therefore, 7500 N force is required to bring that motor (vehicle) in motion.

2. Find the acceleration of a body of 5 kg. mass when you apply the force of 20 N.

   Solution: Here,

   $m = 5$ kg
   $F = 20$ N
   $a = ?$

   We have, $F = m \times a$

   or, $a = \frac{F}{m} = \frac{20}{5} = 4 m/s^2$

Therefore, the acceleration of that mass is 4 m/s^2.

Summary

1. Force is defined as an external agent which tries to change the state of a body from rest to motion or motion to rest.
2. The force which pulls or tries to pull an object is called pulling force.
3. The force which pushes or tries to push an object is called pushing force.
4. The force produced by the magnet is called magnetic force.
5. The force of attraction between two heavenly bodies is called gravitational force.
6. The force with which the earth pulls the object towards its centre is called the force of gravity.
7. The frictional force is increased with the increase in the roughness of the surface in contact, similarly, frictional force increases as the weight of the sliding body increases.
8. Friction does not depend upon the surface area.
9. Friction reduces or stop the motion of the body.
10. Some portion of the force applied in the machine is converted in to the heat energy and it reduces the efficiency of the machines.
11. Friction causes the wear out of the machines.
12. 1 kilogram force is equal to 10 Newton.

Do, observe and learn

1. Take two bottles of glass or plastics having equal capacities. Fill one of them completely with water and the next one half and push them with equal force. Which one will go farther? What do you learn by this experiment? Keep in mind that glass bottles should not be broken while pushing.
2. Make a paper fan. Show the face of the fan towards moving air. The fan rotates. Which force causes the fan rotates? Find the reason.
3. Take a piece of iron wire, bar or nail. Rub it in the surface of rough stone for sometimes. Touch it and find the difference. Do you find any difference in the iron wire? Find the reasons.

Exercise

1. Write short answer.

(a) What is meant by force?
(b) Write about the pulling force with examples.
(c) If the pulling force is equal to the frictional force what will be the state of the body? Write with reasons.
(d) How can we show the magnetic force?
(e) What are the effects of friction?
(f) If a stone is thrown up (towards sky), it will return to the earth. Why?
(g) If a piece of stone is rotated with the help of string, it will go straight away. Why?
(h) What is centrifugal force? Write with examples.
(i) The moon cannot escape from the earth, why?
(j) How is frictional force produced? Write.

2. Write which one force is applied in the following action.

(a) Moving of leaves due to wind.
(b) Falling of a mango from a mango tree.
(c) Finding the lost niddle with the help of magnet.
(d) Kicking of a ball.
(e) Catching of ball by the goal keeper.

3. Tick the right statement (✓) and cross (×) the wrong one.

(a) The Earth is surrounded by air due to the gravity.
(b) If a vehicle does not change it's position after applying the force, it means there is no use of force.
(c) 100 gram weight is equal to 10 N.
(d) There is a vast difference between weight of a body and the force of gravity exerted on that body.
(e) While turning of bicycle or motorcycle it should be tilted toward the centre.
(f) When the magnet attracts an iron nail, this type of force is called pulling force.

(g) The frictional force only hampers the works of our daily life.
(h) All the bodies have their rough surfaces.

4. Fill with proper words in the blanks.

(a) The external agent which changes or tries to change the state of the body is called .....
(b) ..... force is used to pull the water from a well.
(c) ..... force is used to fly a kite.
(d) N-pole of one magnet and N-pole of another magnet ..... each other.
(e) Mango fruits fall down due to .....
(f) The frictional force does not depend upon the .....
(g) The force changes the ..... of an object.
(h) The unit of force is .....

5. Show the differences.

(a) Pulling force and pushing force
(b) Centrifugal and centripetal force
(c) Gravitational force and gravity
(d) Frictional force and centrifugal force.

6. Select the correct answer.

(a) Which work can not be done by the force?
(i) Change in the shape of a body.
(ii) Change in the direction of the motion of a body.
(iii) Change in mass of a body.
(iv) Change in motion of a body.

(b) Which force is applied to cut the tree with an axe?
(i) Pulling force (ii) Pushing force.
(iii) Frictional force (iv) Centrifugal force.

(c) What is the cause of increase in frictional force?
(i) Increase in the surface area of a body.
(ii) Increase in volume of a body.

(iii) Increase in mass of a body.
(iv) None of the above.

(d) Which force helps the body to move in a circular path?

(i) Centrifugal force (ii) Centripetal force
(iii) Gravitational force (iv) (i) and (ii) both

(e) What is the weight of 2 kg mass

(i) 20 N (ii) 2 N (iii) 0.2 N (iv) 200 N

7. Match the following

(a) Pulling force ( ) Playing carrom.
(b) Pushing force ( ) Applying brakes in the bicycle
(c) Frictional force ( ) Force of string while rotating a stone tied with it.
(e) Centrifugal force ( ) Ploughing field.
( ) Falling down the piece of stone.
( ) Escaping the rotating piece of wood.

8. (a) Draw a figure of a revolving wooden block tied with a string and indicate the direction of centrifugal and centripetal force on it.
(b) Draw a figure of box. Indicate the force on it and the pushing force with arrow.
(c) Draw a figure of any wooden box sliding on the floor. Show with an arrow the pulling and pushing force.

9. Calculate the force required to produce an acceleration of 5 m/s^2 on a car of mass 1000 kg. (Ans: 5000 N)

10. When a force of 30 N is applied to a body of mass 2 kg, find the acceleration produced in the body. (Ans.: 15 m/s^2)

Unit - 2

MACHINE

We use a sickle to cut rice plants. We use an axe to chop firewood. A pair of scissors is used to cut cloth (make pieces of cloth). A Pulley is used to pull the house building materials (Building Materials) up and down. To load heavy loads in a vehicle, an inclined plane is used. Screw driver is used to open and tight the screw. These machines are seemed to be very simple but they help us to make our works easier, faster and more convenient. These are called simple machines.

Types of simple Machine:

Simple machines are divided into following catagories according to their structure and work:

1. Lever
2. Pulley
3. Wheel and axle
4. Inclined plane
5. Screw
6. Wedge

Lever

Lever is a rigid bar, which is capable of turning about a fixed point. An effort is applied to balance the load. The fixed point about which the lever can turn is called fulcrum. The distance between the fulcrum and load is called load arm and the distance between fulcrum and effort is called effort arm.

During the balanced condition of a lever, the in put is equal to the out put

$\therefore$ In put = out put

Or, Effort × Effort arm = load × load arm

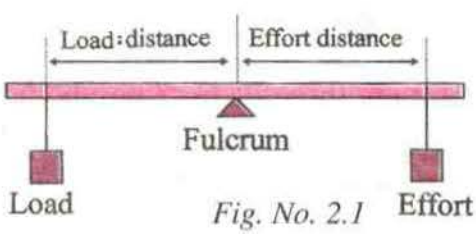
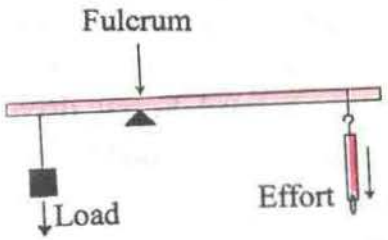


Fig. No. 2.1

1. First class lever:

In this lever, the fulcrum is situated between load and effort.



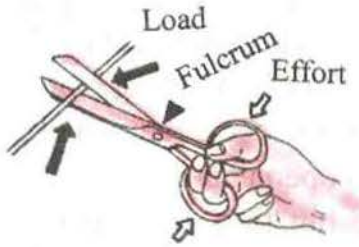
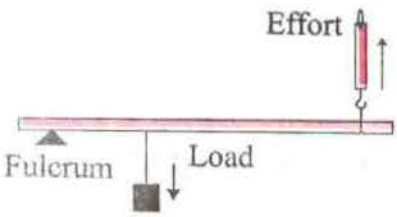


Fig No. 2.2

2. Second class lever:

In this type of lever, the load is situated between the fulcrum and the effort. Here, the force is magnified.



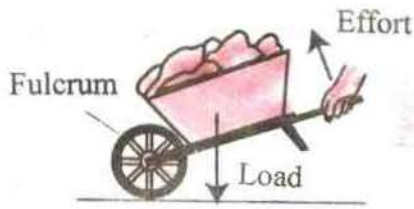
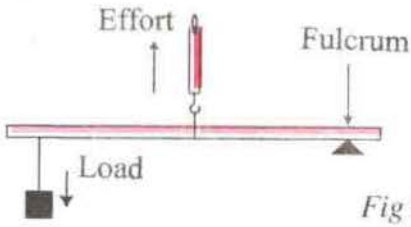


Fig No. 2.3

3. Third class lever

In this type of lever, the effort is situated between load and fulcrum.



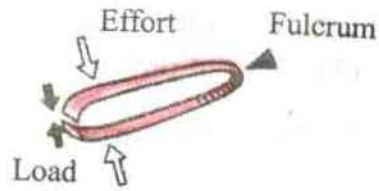


Fig No. 2.4

There are three distinct points in lever which are effort point, load point and fulcrum point. Effort arm is the distance between fulcrum point and effort point. Load arm is the distance between fulcrum point and load point.

Activity 1

Take a wooden scale of 30 cm in length as shown in the figure. Make a hole at the midpoint of the scale which should be exactly 15 cm from the either end. The hole should be large enough in size so that the tip of a ball pen can enter easily in to the hole.

Insert the tip of a ball pen or a piece of wire in that hole and balance the scale with the help of stand.

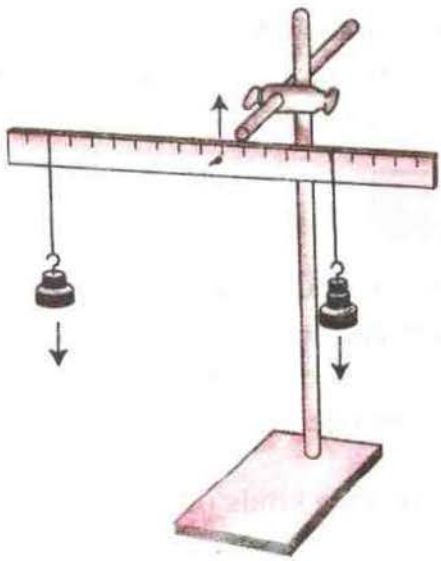


Fig. No. 2.5

Now, suspend different standard weights to both ends of the scale and balance it. Convert the mass in to effort. 1 kilogram mass is equal to the 10 Newton effort. Consider the mass on the left side as load and right side as effort. Keep the load in different distances from the fulcrum and balance with efforts.

Make a table and fill up the result of the experiment as shown below.

Example:

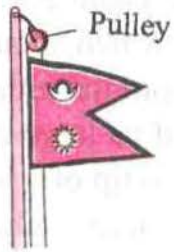
Left side			Right side		
Effort(N)	Effort distance	Effort × E.d.	Load(N)	Load distance	Load × L.d
5	6	30	3	10	30

If we use the lever in a rightway, generally the following condition will satisfy, L × L.d = E × E.d but due to the friction during the course of action, to some extent, some errors approximately, L × L.d = E × L.d can be seen.

More effort is required, if the effort distance is short. If the load distance is short, the less amount of effort is required to lift the heavy load. We

can change the effort distance according to our need in this type of lever. In the same way, the equation E × E.D = L × L.d is valid for second and third class levers also.

Pulley



Pulley is a grooved wheel over which rope is passed. Effort is applied at one end of the rope and load to be lifted is tied at the another end. Pulley is another type of simple machine.

There are two kinds of pulleys: Fixed pulley and movable pulley.

(1) Fixed pulley:

In a flag pole a fixed pulley is used. When the rope is pulled, the flag is raised. In this case, the pulley just change the direction of the force.

(2) Movable pulley:

In the right figure, the pulley is raised along with the load when the load is lifted. In this type of pulley, effort required to carry a load is half of the load and the effort moves two times the distance travelled by the load.

We use the required number of pulleys (fixed and movable) to make our jobs easy and fast. The group of fixed and movable pulleys is called combined pulley.

By performing experiments (1) and (2), we can minimize the effort to lift the load and also change the direction of effort.

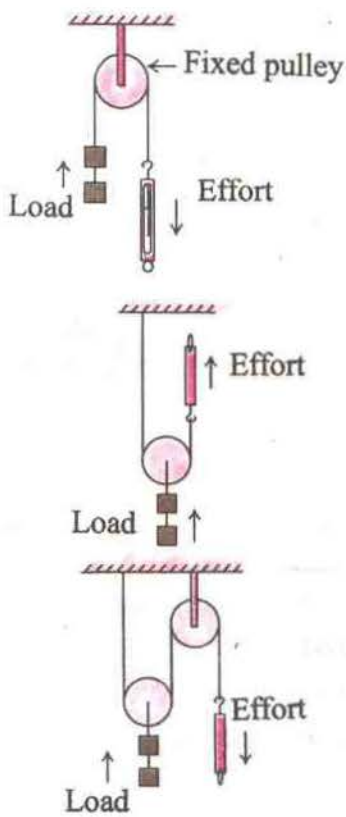


Fig. No. 2.6

Wheel and Axle:

In this simple machine, the wheel is attached to the axle. When the wheel is rotated, the axle rotates itself. The diameter of wheel is grater than the diameter of axle.

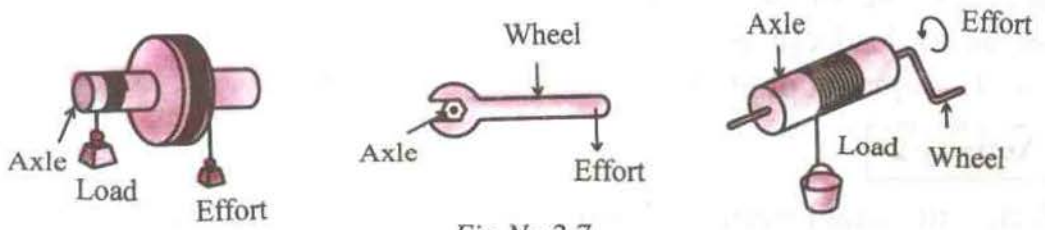


Fig No.2.7

Effort applied to the wheel is magnified and maximum effort is produced in the axle. There may be difference in shape of the wheel and axle. If the effort is applied to move any kind of simple machine and work is done on the load that kind of simple machine is also called a wheel and axle. We find several examples of simple machines used in our daily life. For example: Steering of vehicles, handle of bicycle, pedal of bicycle, handle of door, wrench, fly-kite, etc.

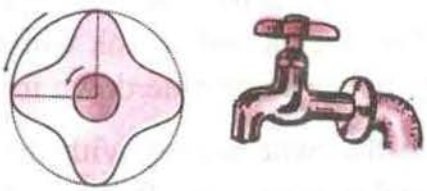


Fig No. 2.8

Take an example of upper movable part of a water tap. More force is required to turn the axle but if we join the handle to the axle, the less force is required to turn it. The force applied to the wheel and axle depends upon their diameters. If the handle is turned 90· the axle is also turned 90· but the distance travelled by them is different due to the difference in their diameters. The handle should travel greater distance but the force required is less.

Inclined Plane

Slopy roads, ladder, a wooden plank setting inclined to the land etc. are some examples of inclined plane. It helps to bring the load to the top or height. Using inclined plane, the heavy load can be lifted with less amount of effort.

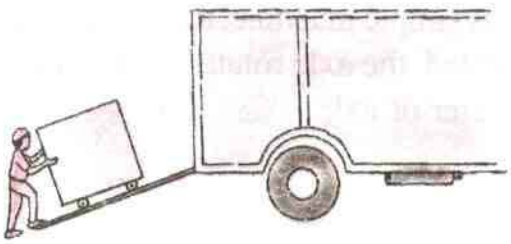


Fig No. 2.9

Activity 2

Weigh the small trolley, or a wooden duster with the help of a spring balance. Note down the weight as shown by the spring balance. Now incline the wooden plank of length 50cm. with the wall of bricks compiled up to the height 30 cm. as shown in the figure. Pull the object placing it on the inclined plank with the help of a spring balance. Read the spring balance and note down in the following table.

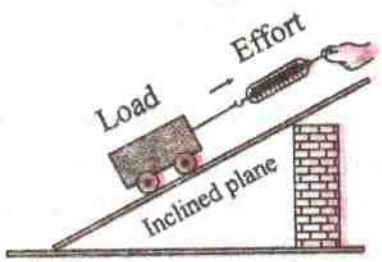


Fig No. 2.10

Again, do the experiments with the planks having 1 mm and 2 mm lengths, and measure the efforts required to pull that object.

Inclined plane		Load	Effort	Conclusion
Fixed Height	Length			
30cm.				
30cm.				
30cm.				
30cm.				
30cm.				

Effort is reduced when the length of the plank is increased by keeping the load and height fixed.

Screw

Screw is one of the most useful simple machines in our dailylife. Screw is a modified form of an inclined plane which has a hard metal rod having a well-cut spiral thread on its surface. As the height of a inclined plane increases, the height of thread also increases spirally.

Inclined plane having low slope Inclined plane having high slope

Fig No 2.11

Wedge

Wedge is used in our dailylife in the form of various tools/equipments. All tools having sharp edges are wedges such as nail, knife, khukuri, axe etc. A wedge may be a piece of metal or wood which is thick and blunt at one end but sharp at the other end. The effort is applied to the thick and blunt end. Wedges are used in different kinds of work such as to lift and push the load, to cut things, to split things, to make holes etc.

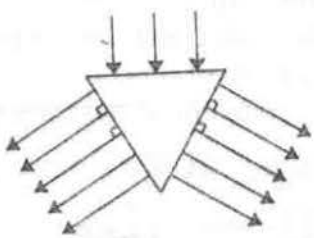


Fig No. 2.12

Some simple machines:

Different kinds of simple machines are used in our dailylife. They are used for different works according to their types. For example, to open the lid of a bottle, an opener is used where as a hammer is used to push a nail in.

Activity 3

Recognize the following simple machines and fill up the table with their names and uses. Draw the figures in your note copy.

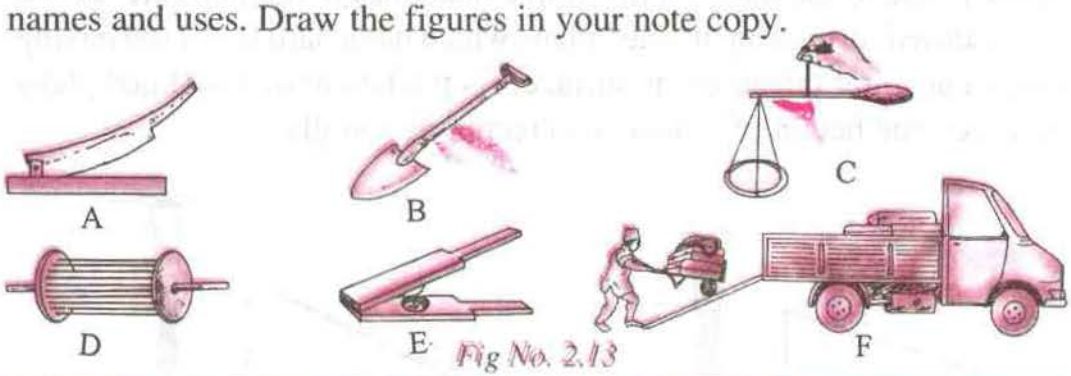


Fig No. 2.13

S. No.	Name of simple machines	Use
A		
B		
C		
D		
E		
F		

Need of simple machine:

We have to do different works in our dialylife. Some works are easy to do while others are difficult. Moreover, some works need more manpower and time to complete. We need machines to perform this type of work. Application of machine can help to increase effort and make the work easier. Also, it can chage the direction of force and increase the speed of work.

Following are the simple machines used for different works:

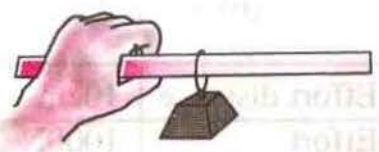
Fig No. 2.14

Summary:

1. With the help of simple machine:
   (a) More load can be lifted by applying less effort.
   (b) We can change the speed of work. To raise the speed of work, more effort is needed. Less effort is required if the speed of work is lowered.
   (c) We can change the direction of effort according to our need.
2. According to the principle of lever,
   Effort × Effort distance = load × load distance
3. Less effort is required if the effort distance is long.

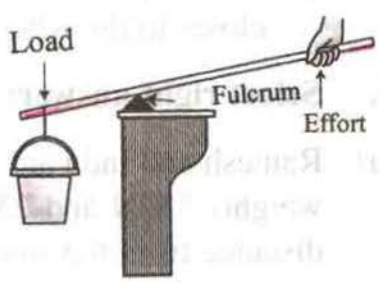
Observe, do and learn

1. Catch a rod as shown in the figure. Suspend a load at a distance of 10cm from your hand.



   (a) Move the load 10cm from your hand. What do you feel?
   (b) Move the load 10cm from your hand again and again. What do you feel each time?
   (c) Can we lift the load if it is suspended at the end?
   (d) What do you learn by this experiment?
   (e) Write the name of different simple machines used in your home and classify them according to their structure and use.

2. Take a stick of 50cm length and a bucket having stones and sand. Make a lever as shown in the figure. Keep the lever in balanced condition by pressing the another side of stick with your hand. Write down, how do you feel when you put your hand near the fucrum and far from the fulcrum?



Exercise

1. Write short answer:

(a) 500 N. load is tried to lift in first class lever by applying 100N effort. If the load distance is 200 cm., what will be the effort distance? Draw the figure also. (Ans. 1 meter)

(b) Define lever and pulley.

(c) Draw a clear figure of lever and pulley.

(d) Draw a clear figure of inclined plane and wedge.

(e) Write the name of different simple machines used in your home and classify them according to their structure and use.

(f) 500N load is going to be lifted by using a first class lever. Different efforts and their respective effort distances are given in the following table, find the value of load distances in (a), (b), (c) and (d).

Effort distance	10cm	(a)	40 cm	(c)	100cm
Effort	1000N	500N	(b)	200N	(d)

(Answer: (a) 20cm (b) 250N (c) 50cm (d) 100N)

2. Give reason:

(a) It is easy to open the lid of a can by using a spoon.

(b) The road is made longer in hilly regions with several bends.

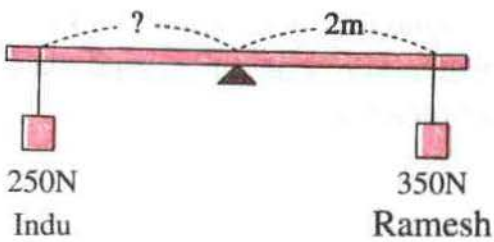
(c) Iron sheet cutting scissors have short sharp edge where as the sharp edge of scissors for cutting clothes is long.

(d) It is easy to lift the load in the wheel barrow if the load is put closer to the wheel.

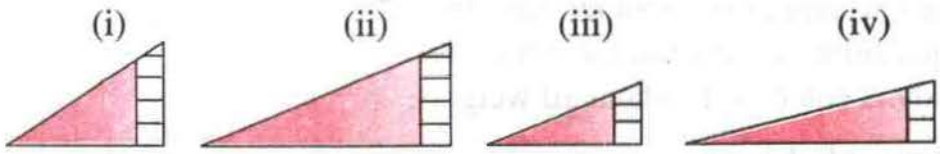
3. Select right answer:

(a) Ramesh and Indu are going to play seesaw. Ramesh and Indu have weights 350N and 250 N respectively. Ramesh is sitting at 2 m distance from the fulcrum. What is the distance from the fulcrum that Indu has to seat on to lift Ramesh ?

(i) 1m (ii) 1.5m (iii) 1.8m (iv) 2.8m



(b) Which one inclined plane requires less effort to pull the roller having load 20N.



densities. The substance having the highest density will sink at the bottom and the substance having the lowest density will float at the top.

4. Elasticity of object:

Objects like spring (made up of iron or steel), rubber can be stretched longer by applying external force to them. As soon as the force is with drawn, they regain their ori inal shape and size. This property of an object is called elasticity. Some object has high elasticity and some do not show the property of elasticity.

5. Hardness of an object:

The hardness of one object can be known by comparing the hardness of another. A soft substance can be easily scratched whereas a hard substance is difficult to scratch. A piece of glass is harder than iron.

6. Size of an object:

Most of the objects have definite shapes but a few of them do not have definite shapes. Solids have definite shapes but liquids and gases have no definite shapes. They take the shape of the vessels in which they are kept. Substances around us are divided into solid, liquid and gas according to their properties.

Measurement of volume

We need different kinds of substances in our daily life. We also need liquid substances like kerosene, diesel, petrol, alcohol, spirit, milk etc. How can they be measured? Have you ever bought oil or kerosene? The shopkeeper sells these liquid substances by using measuring vessel. Measuring vessels like 'mana', 'pathi' were used some years ago but now-a-days litre is being used, explain why?

Litre gives the volume of liquid substance. Liquid substance occupies space if it is kept into the measuring vessel. The space occupied by any substance is called its volume. We use millilitre unit to measure the volume of liquid less than a litre.

1 litre equals 1000 millilitres, that is, 1 L= 1000ml.

The space occupied by any object is called the volume of that object.

PRESSURE

Properties of objects

We see a number of things around us. For example bricks, stones, books, plates, cups, bags, rubber, water, kerosene, milk, sand plastic etc. These all things have their own characteristics.

1. Mass of the object:

The quantity of matter contained in a body is called mass of that body. Beam balance is used to measure the mass of the body. In a beam balance a body kept at one pan is balanced by keeping some standard weights on the other pan. In the equilibrium condition, the mass of the body is equal to the standard weights.

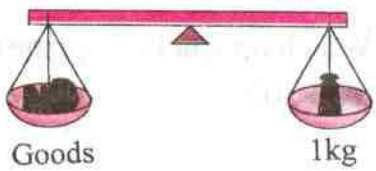


Fig No. 3.1

2. Volume of object:

Every object occupies some space. The space occupied by an object is equal to the volume of that object. Larger objects occupy greater space and smaller objects occupy lesser space. In the figure, the difference between level A and level B gives the volume of the stone.

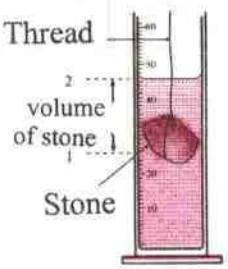


Fig No. 3.2

3. Density of object:

The body is light or heavy depending on the compactness of mass present in that body. Density of an object is defined as the mass per unit volume (compactness) of the object. Put the different substances into a cylinder containing water and stir. After sometime, you will find that these substances will be settled on the cylinder according to their

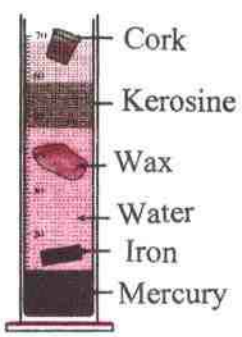


Fig No. 3.3

Take an onion bulb and cut it. Take out a fleshy leaf (layer) from the several layers of onion. Peel off the thin upper membrane of this leaf with the help of a knife or blade and place it on the glass slide. Put one drop of safranine solution on the onion membrane kept in a slide and cover it with a cover slip. Examine under a microscope.

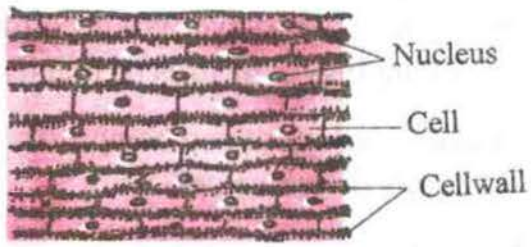


Fig No. 13.4

You will observe a brick like arrangement of cells. All the cells are adjoined. Thin cell wall, prominent nucleus and faint protoplasm can be seen in that cell.

(b) Human cheek cells:

We can see our cells like in plants. Scrap gently the inside of your cheek with the help of match stick or scalpel and place on a slide. Make it thin by rubbing with the help of another glass slide using one of its ends. Then cover it with a cover slip. The air from outside should not enter into the slide while covering it with a cover slip. Now examine under the microscope.

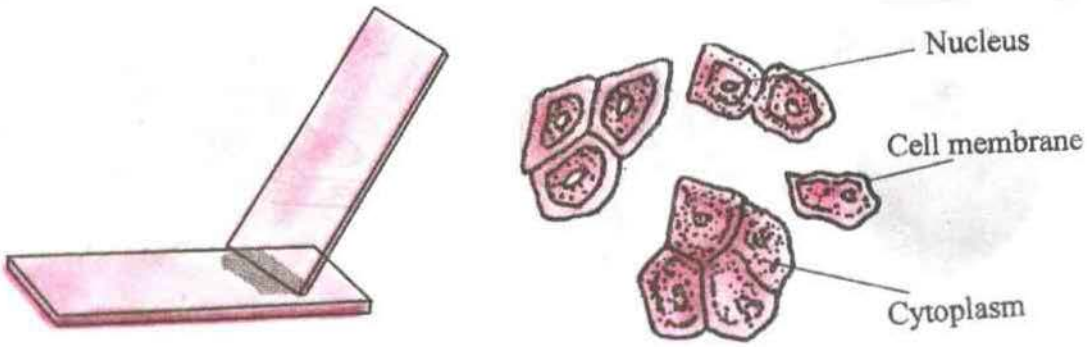


Fig No. 13.5

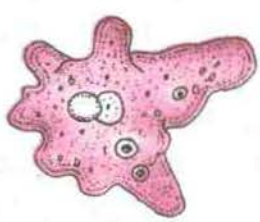
Animal cell	Plant cell
1. Cell wall is absent	1. Cell wall is present.
2. Vacuoles are small and few in number	2. Vacuoles are big and in large numbers.
3. Plastids are absent.	3. Plastids are present.
4. Centrosome is present	4. Centrosome is absent
5. Cytoplasm is present in a whole cell.	5. Cytoplasm is thinly spread on the sides of the cell.

Summary

1. All living things are cellular.
2. All life processes take place in the cell.
3. The shapes and sizes of cells differ from one another.
4. The structure of animal and plant cells differ from one another.
5. The plant cell has cell walls, plastids and large vacuole.
6. Cell wall is made of non-living substance, cellulose.
7. In an animal cell, centrosome is present, vacuoles are small and temporary.

Do, observe and learn:

1. Take an egg. Observe the outer part of an egg carefully. Break slowly and put it into a cup. Observe, what did you see? Draw the figure of the parts seen and write down their names.
2. Take some water from the pond near your home/school. Put one drop of water on a glass slide and cover it with a cover slip. Examine under microscope. Take the help of your teacher as per your need. Which one of the following is seen? Identify.



Amoeba

Paramecium

Euglena

Chlamydomonas

The unit of volume for a regular solid is cubic metre. The volume of an object having length 1m, breadth 1m and height 1m is cubic metre or 1 m^3. We use cubic centimetre for measuring the volume of an object less than a cubic metre.

$\therefore$ 1 cubic metre = 10,00,000 cubic centimetre.
Similarly, 1 millilitre = 1 cubic centimetre.
1 litre = 1000 cubic centimetre.
1 cubic metre = 1000 litre.

A cubic meter is the unit for measuring the volume of any object, but liquid substances are also measured in litre. 1 cu.m = 1000*l*.

(a) Volume of solid:

Have you seen a match box, brick, paper box, etc.? What are the shapes of these objects? They are rectangular in shape. It is easy to measure the volume of such objects. We use ruler to measure the length, breadth and height of the objects. The volume of an object is measured by multiplying its length, breadth and height.

Volume (V) = Length (l) x breadth (b) x height(h)

Activity 1

Measure the length, breadth and height of your room. Calculate the volume of the room. Similarly, measure the length, breadth and width of your science book. Calculate the volume of the book.
In the same way, we can measure the volume of different kinds of objects having rectangular shapes.

Take a piece of stone. What is its shape? How can you measure the volume of such objects having an irregular shape.

Activity 2

Take a measuring cylinder and fill half of the cylinder with water. What is the level of water? Note down in your exercise book. How can we measure the volume of water in a measuring cylinder. First, observe the level of water inside the cylinder. Look straight at the level of water. What happens when you keep your eyes up and down from the water level? If your eye falls above the surface of water, the volume of water seems to be high. Similarly, if you keep your eye below the surface of the water, the volume of water seems to be low. Again, we see the upper meniscus at both ends of the water level (surface). We should measure the volume of lower meniscus without measuring volume of upper meniscus.

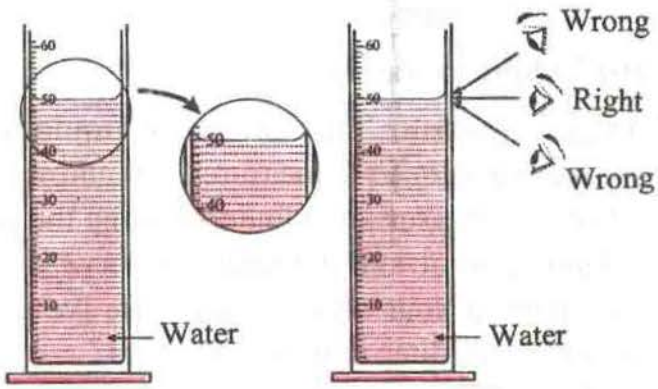


Fig. No. 3.4

In this way, after finding the correct volume of water, now tie a thin string around a piece of stone and drop it into a cylinder slowly until it is fully immersed in water. Note the volume of water raised inside the cylinder.

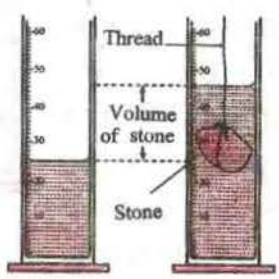


Fig. No. 3.5

Fill in the gap depending upon your experiment:

- volume of water (surface) in the cylinder .....ml.
- Volume of water after immersing the piece of stone ..... ml.
- Volume of the piece of stone ..... ml.

In this way, the volume of an irregular solid body (object) can be measured. While lowering the stone in the measuring cylinder, the process

should be carried out very gently. Otherwise if it is carried on suddenly, the water in the cylinder will splash out and the correct measurement cannot be obtained.

(b) Volume of liquid:

Traders measure the volume of liquid substances in litre. We use measuring cylinder to measure the liquid substances in science laboratory. There are measuring cylinders having the capacities 10ml., 25ml, 50ml, 100ml, 250ml and 1000ml. Observe different kinds of measuring cylinders in your school. Have you seen small units (Graduations) to measure milliliter in these cylinders?

Activity 3

Take a measuring cylinder. Pour some water into it. Observe the level of water inside the cylinder. Is the level of water flat ? The middle of water surface is seen depressed whereas in its sides raised. The upper level of liquid is concave in shape. Liquids like water, oil, kerosene, alcohol, sprit etc. are attached on the wall of the vessels. These liquids have concave surfaces.

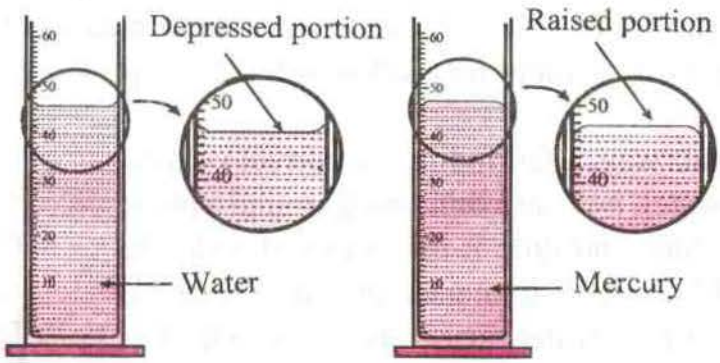


Fig. No. 3.6

But mercury is a liquid which doesn't attach on the wall of the vessels. Such liquids have convex surface which is raised in the middle and depressed at the sides.

The volume of liquids having concave shape are measured from the lower flat portion. The volume of liquids having convex shape are measured from the upper flat surface. While measuring the volume, we have to contact our eyes at the level of the liquid. The volume of liquid

seems to be lower when your eye contacts below the level of liquid and the volume of liquid seems to be higher when your eye is contacted above the level of liquid. Measure the volume of different liquids by considering the above facts.

(c) Volume of Gas:

Gases have no fixed volume because they can be compressed. Have you seen the act of pumping air in to a bicycle tube or football? The more air is pumped in a football. If we have compressed more air into the ball, it will become tight and stronger. Thus, the volume of air depends upon the amount of pressure exerted upon it. The volume of air in the football can be measured.

Activity 4

Take a water trough. Fill 3/4 of its portion with water. Take a measuring cylinder and fill it completely with water. Cover its mouth with your hand and invert it in the trough and remove your hand. In this process air should not be entered into the cylinder. Now take a balloon filled with air and hold its mouth tightly. Dip the balloon in the water through so that the mouth of the balloon is inside the mouth of the cylinder and release the mouth of the balloon. The air bubbles begin to collect inside the cylinder with the down ward displacement of water. The water level decreases in the cylinder. Measure the volume of air inside the cylinder by observing the level of water. Note down the level of water in the lower meniscus inside the cylinder, this gives the volume of air inside the balloon.

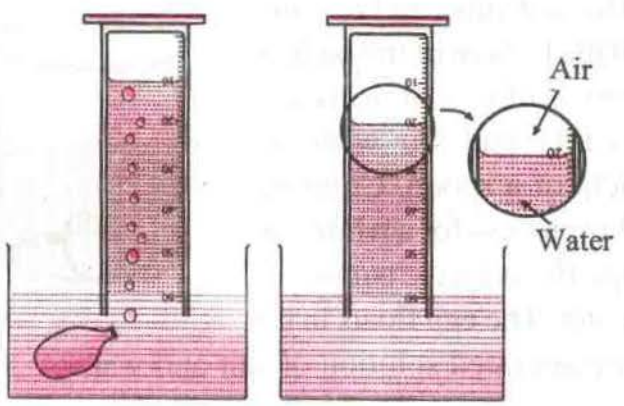


Fig No 3.7

Sinking and floating:

Some objects sink in water, some objects do not sink. Generally, objects heavier than water sink in water but the objects lighter than water don't sink in water.

Activity 5

Collect the pieces of wood, plastic, iron, stone, eraser etc. Take a beaker and fill it with water. Put each collected materials one by one in the water. Observe which of them sink in water and which of them float on water? Fill in the following table.

S. N.	Material	Floats/sinks in water	Lesser/Higher density than water
1.	Piece of wood		
2.	Plastic		
3.	Eraser		
4.	Piece of iron		

Activity 6

Take a beaker fill it with water and drop an egg. The egg sinks and remains at the bottom of the beaker. Put some salt into the beaker and stir with the help of a spoon. Continue this process for a while, the egg floats on the surface of water. The egg floats in the concentrated solution of salt and water.

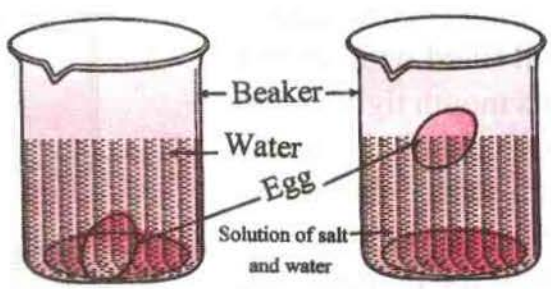


Fig No. 3.8

Density and relative Density:

We say: Iron is heavier than wood. But we have seen that a stick of firewood is heavier than a nail of iron. If we take 1 kg iron and 1 kg aluminum, their volume will be different. Conversely, if we take the equal volume of iron and aluminum, their mass will differ.

In this way, density is used to describe the difference between the mass of iron and aluminum having equal volumes.

The mass of a unit volume of a body is called the density of the body.

$$\text{Density (D)} = \frac{\text{Mass(m)}}{\text{Volume(V)}}$$

If the mass of a body is measured in kilogram (kg) and volume in cubic metre (m^3), the unit of density is kg/m^3. But if we measure the mass of a body in gram (g) and volume in cubic centimeter (cm^3), then the unit of density is g/cm^3.

Activity 7

Take two equal pots of the small size having regular shapes. Fill one of them completely with sand and another with water. Weigh each of them separately. Find the volume of these pots. Calculate the density of sand and water.

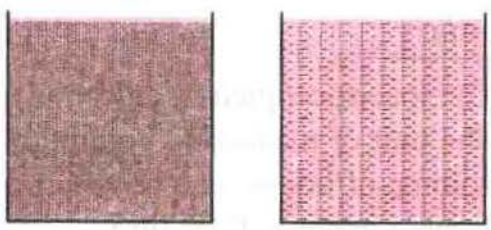


Fig No. 3.9

Relative Density:

The ratio between the densities of two bodies is called relative density. Water is a standard substance, when we divide the density of a body by density of water, we get the relative density of that body.

$$\therefore \text{ Relative density} = \frac{\text{Density of substance}}{\text{Density of water}}$$

Activity 8

Repeat the activity 7. Calculate the relative density of sand. If any two of mass, density and volume of a body are known, we can find the 3rd one by calculation (applying formula).

Example:

Find the density of iron having mass 40,000 kilogram and the volume 5 cubic meter.

solution:

We are given,

volume of iron (v) = 5 m^3

mass of iron (m) = 40,000kg

using formula,

$$\text{Density} = \frac{\text{mass of body}}{\text{volume of body}}$$

$$\text{ie, } D = \frac{m}{v}$$

$$= \frac{40{,}000\text{kg}}{5\ m^3}$$

$$= 8000\ \text{kg/m}^3$$

Therefore, the density of iron is 8000 kilogram per cubic metre.

Summary

1. The space occupied by any object is called the volume of that object.
2. The unit of measuring volume of objects is cubic meter (m^3). The volume of liquids can be measured in litre.
   1 cubic meter = 1000 litre.
3. Volume = length x breadth x height
4. While measuring the volume of liquid using a measuring cylinder, if the surface is concave, it is measured from the lower miniscus and if the surface is convex, then it is measured from the upper miniscus.
5. The volume and shape of a solid objects are fixed. Liquids have fixed volume but no fixed shape. Gas substances have no fixed shape or volume.
6. The mass of a unit volume of a body is called density of that body. The unit of density is g/cm^3 or kg/m^3.
7. Any substance sinks in the liquid if it has more density than that of liquid and floats in the liquid if it has less density than the liquid.
8. Relative Density = $\frac{\text{Density of substance}}{\text{Density of water}}$

Do, observe and learn

1. Write the name of different liquids used in at your home. Again write their names according to the decreasing order of densities.
2. How much cubic metre the air occupies in your bed room? Measure it.
3. Take a glass bottle or plastic bottle and make a measuring cylinder. Measure the water in a measuring cylinder. Pour it into the cylinder you have made. Label it with the piece of paper and make scale on it.
4. Observe by putting few drops of water on the leaf of 'karkalo' or on a piece of paper with oil coatation. Observe the surface of water and write what do you find?

Exercise

1. Write short answers:

(a) What is volume? How can we measure the volume of rectangular solid?

(b) How can we find the volume of irregular solids?

(c) What are the points to be considered while measuring the volume of liquids? What is the unit to measure the volume of milk?

(d) What is meant by density? A body has 380g. mass and 50cm^3 volume, calculate the density of that body. (Ans.: 7.6 g/cm^3)

(e) Which kind of objects float in water? Do all the objects that float on water float in oil? Explain with reason.

(f) Why is it difficult to measure the volume of gas?

(g) Calculate the volume of a body having mass 1300 kg and density 2.6 g/cm^3 (Ans.: 0.5 m^3)

(h) Calculate the mass of which the piece of ice has volume 5 m^3. (Density of ice = 920 kg/m^3 (Ans.: 4600 kg.)

(i) What do you mean by relative density?

2. Convert the following:

(a) 5 cubic metres into litre.

(b) 1500 cubic centimetres into litre.

(c) 5300 litres into cubic metre.
(d) 2.5 litres into cubic centimetre.
(e) 3300 cubic centimetres into litre.

3. Fill in the blanks:

(a) A body floats in water if its ..... is less than that of water.
(b) Water remains at bottom when we mix water and oil because water has ..... density.
(c) The unit of volume is .....
(d) When we measure volume in cubic metre and mass in kilogram, the unit of density is .....
(e) Gases have no ..... volume.

4. Draw the figures of one measuring cylinder with mercury and another cylinder with water. Show in figures the surface level of water and mercury. To measure these two substances, where should be the level of eye? Show with arrow.

5. Tick (✓) the right answer and cross (x) the wrong one:

(a) Two substances having different densities and equal volumes, have different masses. ( )

(b) Two substances having same masses but different densities, have same volume. ( )

(c) A piece of plastic remains (sink) at the bottom of oil vessel because plastic has less density. ( )

(d) Volume $= \frac{\text{length x breadth}}{\text{height}}$ ( )

6. Select the correct answer:

(a) The unit of density is:
(i) gram per cubic centimeter (ii) gram per cubic metre.
(iii) kilogram per cubic centimeter (iv) kilogram per litre.

(b) A and B are two different substances. A has the greater density than B. If A and B have the same volume, then

(i) mass of A is greater than B.
(ii) B has greater mass than A.
(iii) A and B have the same masses.
(iv) None of the above.

(c) Which one substance floats in the liquid?

(i) Substances having less density than liquid.
(ii) Substances having equal densities.
(iii) Substances having greater density than liquid.
(iv) substances having greater mass.

(d) Which one formula is correct to find density?

(i) $M = D \times V$ (ii) $V = D \times M$

(iii) $D = \frac{V}{M}$ (iv) $D = \frac{M}{V}$

(e) What is the density of a body having mass 5000 gram and volume 100 cubic centimeter?

(i) 5 gram per cubic centimeter.
(ii) 0.5 gram per cubic centimeter.
(iii) 50 gram per cubic centimeter.
(iv) 0.2 gram per cubic centimeter.

Unit - 4

HEAT

Heat is a form of energy. We can use heat for various purposes. We use heat for cooking food, drying clothes, ironing clothes, keeping our body warm, running vehicles, running factories etc. Thus, heat energy is essential for our life. Heat produces various effects on different bodies.

Effects of heat

Matter exists in three states. They are solid, liquid and gas. The state of matter changes due to heat.

(A) Solid State:

A solid matter has fixed volume and shape. Table, duster, stone, soil, etc. are some examples of solid. Ice, snow etc. are also examples of solid state. These substances quickly melt into water due to heat. The temperature of air is greater than these substances. These substances melt slowly due to the effect of hot air. Frost falls in the morning then melts slowly after ward. Can you explain why? Similarly, ice and snow melt slowly after some time of falling. Why this happens? Observe the state of ice and snow after melting.

Activity 1

Take a candle and burn it. Observe carefully the burning of candle and write the answers of the following questions:

Did you find the burning of thread inside the candle?
Did you see the melting of wax?
Why does the wax melt?
Why does the melted wax flow down?
What heppened to the melted wax after it flowed down?

Solid changes into liquid on heating.

(B) Liquid State:

You have known that snow and ice are converted into water when they gets heated. In the same way, wax changes into liquid wax on heating. Water is a liquid, likewise oil, sprit, turpentine oil, kerosine, alcohol etc. are also liquids.

Liquid substances have volume but no fixed shape. These substances get the shape of vessels in which they are kept. Have you ever seen the process of making ice? How can it be prepared? When water is cooled, it changes into ice. Have you ever seen the freezing of water outside your house, in winter season? When water is heated, it vapourizes into steam. When the vapour is cooled, it changes into water. The other liquids such as alcohol, kerosene, spirit, oil etc. get converted in to gas state (steam) when they are heated. Vapour (steam) is a gas state of water. In the same way, liquid wax gets converted into gas when it is heated.

When liquid substance is heated, it gets converted into gas state.

(C) Gas State:

Air, water vapour, oxygen, nitrogen, carbondioxide, etc. are all gases. Generally, gases are colourless. They have no fixed shape and volume. Due to this gas can not be seen. We can not see air. Gas is converted into liquid on cooling. This fact can be observed by doing experiment.

Activity 2

Take a beaker and fill it with water, then heat it. Place a watch glass containing some water on the top of the beaker. You can see the water droplets on the back side of the watch glass. How did the water form there? The water in the beaker gets converted into vapour on heating. When the water vapour comes in contact with the bottom of the watch glass having cold water, the cold

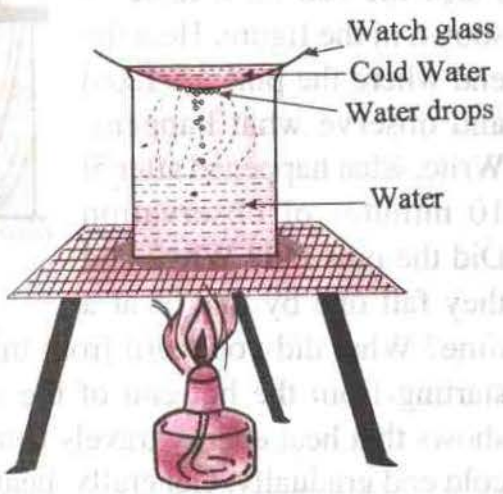


Fig No. 4.1

water in the watch glass helps in condensation of the water vapour. In this way water is converted into water vapour on heating and water vapour is converted into water on cooling.

Gas converts into liquid on cooling.

Transmission of heat

Heat can be transmitted to different objects. Heat can be transmitted from one object to another object. Heat can also be transmitted from one place to another place. We can experience the process of transmission of heat in our daily life.

Why do the substances become hot when they are heated? Why do hot objects become cool? When heat is transferred to a substance it becomes hot and when heat is tranferred from the substance, it becomes cool. The process of transformation of heat from one part to another is called transmission of heat.

Activity 3

Take a metal sheet or rod of 15cm long. Fix pins with the help of wax on the sheet. Place the rod on a table as shown in the figure. Heat the end where the pins are fixed and observe what happens. Write, what happened after 5/ 10 minutes of observation Did the pins fall? Why? Did they fall one by one or at a time? What did you learn from this? The pins begin to fall one by one starting from the hot end of the sheet (or rod) to the other end. This shows that heat energy travels from the hot end of the sheet towards its cold end gradually. Generally, heat transmits in metals. Heat can not be transmitted in wood, rubber, plastic, glass, stone, brick. Therefore plastic

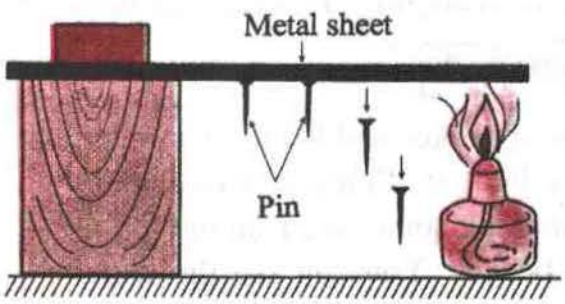


Fig. No. 4.2

handles are used in most of the cooking pots like fry pan, kettles, spoons etc.

Transmission of heat in solid materials:

The students sit on the bench making a row as shown in the figure 4.3. The teacher gives a book to the first student who passes it to the second and the second passes it to the third and so on till the book reaches the last student. In this process students do not change their positions. Just as the book was passed from one student to other, heat travels from one molecule to another. In this process also molecules do not change their positions, but they are vibrated in their own positions due to heat. If we heat the metal sheet, its molecules will not change their own positions. The molecule of the heated end gives heat to the neighbouring molecule.

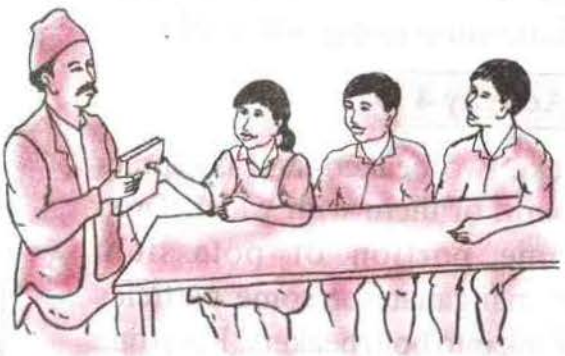


Fig No. 4.3

This molecule also gives heat to its neighbouring molecule. In the similar fashion, the heat travels from one end to another end. This way of transformation of heat is called conduction. Those substance, which allow heat to flow through them easily are called good conductors of heat and those which do not allow heat to flow through them are called bad conductor of heat.

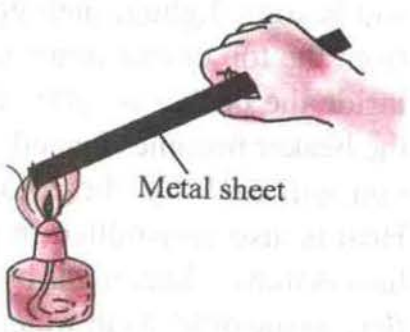


Fig N0. 4.4

The process of transmission of heat in solids without the actual movement of particles from their positions is called conduction.

Transmission of heat in gas and liquid:

In solids and liquids molecules can transfer from one part to the other part easily. Therefore, air blows and water flows. If we heat any gas or liquid substance, the hot substance will expand and become light. The lighter particles move upward and cold particles around these particles take the place of hot and lighter particles. In this way, the heat is transmitted in gas and liquid.

Activity 4

Take two beakers and fill three-fourth of them with water. Drop some portion of potassium permanganate or some particles of ink into both beakers. Keep one beaker on a tripod stand with wiregause and heat it. Keep another beaker as it is. Observe side by side and note down. What do you see?

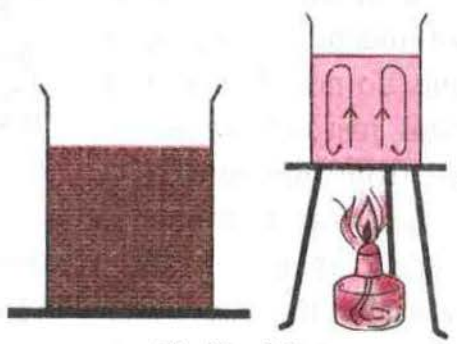


Fig No. 4.5

In the first beaker you will see that the coloured water gets heated slowly and become lighter, then goes upward, at the same time the cold water from the top comes down towards the bottom. This process happening inside the beaker is called convection. In this way, all the water inside the beaker becomes heated after some time. But in another other beaker, you will find that the colour spreads slowly. There is no convection. Heat is also transmitted in gas by the process of convection. It means, heat is transmitted in gas by the actual movement of molecules from one part to the other as in water. We feel hot if we put our hand at the top of the flame but we do not feel hot at the bottom and sides.

In gas and liquid, the hot molecules become lighter and go upwards and cold molecules take place of hot molecules at the bottom. These cold molecules also get heated and go upward. This way of transmission of heat in liquids and gases is called convection.

The process of transmission of heat in gases and liquids due to actual movement of their molecules (particles) is called convection.

Transmission of heat in vaccum:

In solids, heat is transmitted by the process of conduction and in liquids and gases heat is transmitted by the process of convection. Therefore solids, liquids and gases are the medium of transmission of heat. Heat is also transmitted without medium, there is no other medium between the sun and the earth. The air is present up to 300 kilometer from the surface of the earth. After that there is a vaccum. Heat is transmitted from sun to earth. It means, heat can be transmitted without medium.

Fig No. 4.6

The process of transmission of heat without any medium is called radiation.

Thermometer:

We can feel the hotness and coldness of any body through the sense of touch in general. The degree of hotness or coldness of a body is called temperature. We feel hot when we touch the body with temperature greater than in our body comparatively. In the same way, we feel cold when we touch the body with temperature less than in our body.

Thermometer is an instrument which is used to measure the temperature of body. Our body remains healthy if the temperature is fixed, otherwise we become ill. If the temperature of our body increases due to any reason, it is called "fever". To measure fever is to measure the temperature of our body. Instrument used to measure temperature is called a thermometer. Thermo means "heat" and meter means "measurement".


Fig 4.7

How can we measure the temperature using a thermometer? A simple thermometer is a thick capillary tube made up of glass. Both the ends of glass tube are sealed. The upper end is narrow whereas the lower end is wide. The thin wider part is called bulb.

The capillary of thermometer is as thin as hair. The wall of the tube is thick which has capillary. Mercury is kept in the bulb which is a white and shining liquid. It is metal and good conductor of heat. When the bulb of thermometer comes in contact with hot body then the mercury inside this bulb gets heated and volume rises. The mercury rises up to the capillary due to expansion of volume. The mercury rises in the capillary according to the hotness. We can find the temperature by reading the marks in the capillary up to which the mercury is reached.

A thermometer is based on the principle that liquid materials expand on heating. Generally, alcohol or mercury can be used as liquid in a thermometer.

Thermometric liquid:

(a) Mercury:
- It has a uniform rate of expansion of volume.
- It is shiny and opaque so that it is clearly visible in glass.
- It has high boiling point 357° C, so it can be used to measure very high temperatures.
- But we can not measure very low temperature because it has freezing point- 39° C

(b) Alcohol:
- It is a colourless liquid.
- It volume expansion rate is six times greater than that of mercury.
- It is cheaper than mercury
- It can be coloured brightly and can be made more visible.
- It has very low freezing point-117° C, hence it can be used to record very low temperatures.
- But it has 78° C boiling point, it can not be used for measuring high temperatures.

Activity 5

Observe the alcohol thermometer and mercury thermometer carefully. Note down the lowest temperature written in these thermometers. Measure the temperature of room, water, ice, hot water, your body etc. by using thermometer.

Determination of fixed points in thermometer:

The process of making scale in the thermometer by marking right numbers in right places is called calibration. For this, we have to determine two fixed points first, and mark them in the thermometer.

Upper fixed point:

The boiling point of pure water is fixed at standard atmospheric pressure (760 mm Hg). It is called upper fixed point.

The upper fixed point in the thermometer is 100°C or 212° F.

Lower fixed point:

The temperature at which the pure ice melts at standard atmospheric pressure, is fixed. This temperature is called lower fixed point. This temperature is 0° C or 32° F. while constructing a thermometer, these two points are fixed in the tube of the thermometer. The distance between these two fixed points is divided into hundred equal parts in a celsius thermometer whereas the distance between these two fixed points are divided in to 180 equal parts in a fahrenheit thermometer.

Activity 6

Determine the boiling point of water:

Take a round bottom flask and fill half of it with water. Fit a rubber cork containing two holes at the mouth of the flask. Insert a thermometer in one hole and L-shaped glass tube on the other hole. Heat the water in the flask. Note down the temperature of

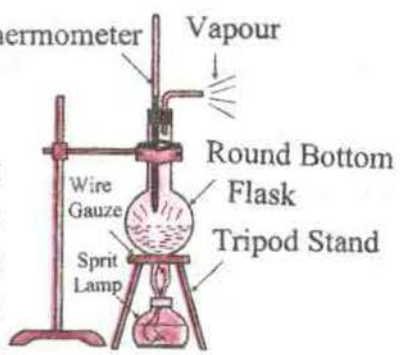


Fig No. 4.8

thermometer every minute. Note the temperature after boiling of water. When the level of mercury becomes stationary for 15 minutes, mark the level of mercury, that is the boiling temperature or boiling point of water. Water boils at 100° C at the see level.

Activity 7

Determine the melting point of ice:

Take a glass tube and fix it on an iron stand, place a beaker under a funnel. Make small pieces of ice, put the pieces of ice in the funnel. Insert the bulb of thermometer in the middle of the funnel. The level of mercury falls down gradually. Note the temperature of thermometer every minute. Finally the level of mercury becomes stationary, that is the melting temp. of ice or melting point of ice.

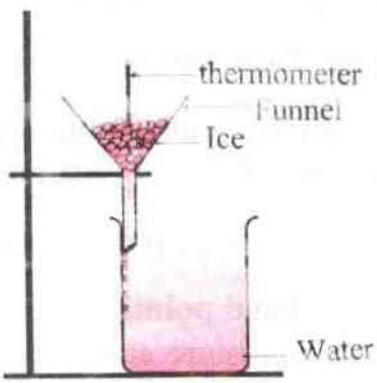


Fig No. 4.9

Thermometric Scale:

Generally, three types of scales are used in a thermometer.

Celsius: In this scale, boiling point of water is taken as 100° C and the melting point of ice is taken as 0°C

Fahrenheit: In this scale the boiling point of water is taken 212° F and the melting point of ice is taken as 32° F.

Kelvin: In this scale, the boiling point of water is taken as 373°k and the melting point of ice is taken as 273°k.

(According to international convension 273° K is written as 273K only)

Summary

1. The size of any body increases on heating whereas it decreases on cooling (ie, expands on heating and condenses in cooling)
2. The volume of solid, liquid and gas increases on heating and decreases on cooling.
3. Solids have fixed shape and volume.
4. Solid converts into liquid on heating.
5. Liquid substance converts into gas on heating and it converts into solid on cooling.
6. Gas gets converted into liquid on cooling.
7. The process of transmission of heat in solids without the actual movement of molecules from their positions is called conduction.
8. The process of transmission of heat in liquids and gases due to actual movement of molecules from their positions is called convection.
9. The process of transmission of heat without any medium is called radiation.
10. An instrument used to measure the temperature is called thermometer.
11. A thermometer is based on the principle that liquid substances expand on heating and contract on cooling.
12. In order to measure very high temperature, mercury thermometers are used while in order to measure very low temperatures, alcoholic thermometers are used.
13. The boiling point of pure water is 100° C and the freezing point is 0° C at normal pressure (standard atmospheric pressure-76· mm-Hg)
14. Celsius, fahrenheit and kelvin are the three scales of thermometer.

Do, observe and learn

1. Insert the mouth of the small necked bottle into a ballon. Heat the bottle and observe what happens? Again, cool the bottle. What happens? What did you learn from this?

2. Take a clinical thermometer and insert its bulb in your mouth. Mercury rises in the tube of thermometer. It shows the temperature of your body. What did you learn from this activity?

3. Cut aluminium coil and suspend it with the help of string. Keep burning candle under the suspended coil. Observe, what happens? What did you learn from this? disscuss.

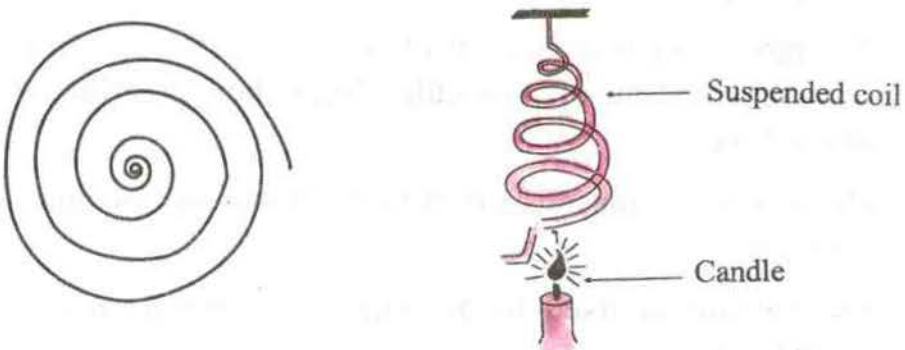


Figure No. 4.10

4. Take a glass and put some cold water. After a while, pour some hot water into this glass. Touch the water at the surface. Lower your finger up to the bottom of the glass gradually. How did you feel? It is hot at the upper part where as it is cold at the lower part. Explain why.

5. Burn a wooden stick. How long did you hold the end of this stick? Observe whether the end becomes heated or not? Why this happend? Can you explain?

Exercise

1. Write short answers:

(a) Mention the 5 works of heat in our daily life.
(b) Does the heat affect the matters?
(c) A metal ring is heated before fitting it on the perimeter of the wheel of a cart. Explain why?
(d) The ballon filled with hot air blows upward, why?
(e) What are the states of matter? How can we change the states?
(f) Mercury is used in thermometer, why?

2. Match the following:

(a) Transmission of heat in solid	( ) Radiation
(b) Glass	( ) Good conductor
(c) Transmission of heat in liquid	( ) Bad conductor
(d) Glass of steel	( ) Convection
	( ) Conduction

3. Fill in the blanks:

(a) The body expands on heating and ..... on cooling.
(b) The expansion in gas is greater than in .....
(c) When the liquid substance is cooled, then it converts into .....
(d) Cold water is ..... than hot water.
(e) Cool air goes .....

4. Tick (✓) the correct answer and cross (x) the wrong one.

(a) The hot ball of iron remains hot if it is abandoned/(left free). ( )
(b) The molecules do not change their position during conduction.( )
(c) Convection keeps the air of room fresh. ( )
(d) Liquid substance is expanded more than gas substance. ( )
(e) Heat is transmitted from the sun by the process of radiation. ( )

5. Choose the correct answer:

(a) The process of transmission of heat in vaccum is .....

(i) Conduction (ii) Convection
(iii) Radiation (iv) All of the above

(b) What will not happen when the substance is heated?

(i) Increase in breadth (ii) Increase in length
(iii) Increase in volume (iv) Increase in mass

(c) Which of the following has fixed shape and volume?

(i) Ice (ii) Water
(iii) Vapour (iv) Milk

(d) Which substance is not a liquid?

(i) Spirit (ii) Wax
(iii) Alcohol (iv) Turpentine

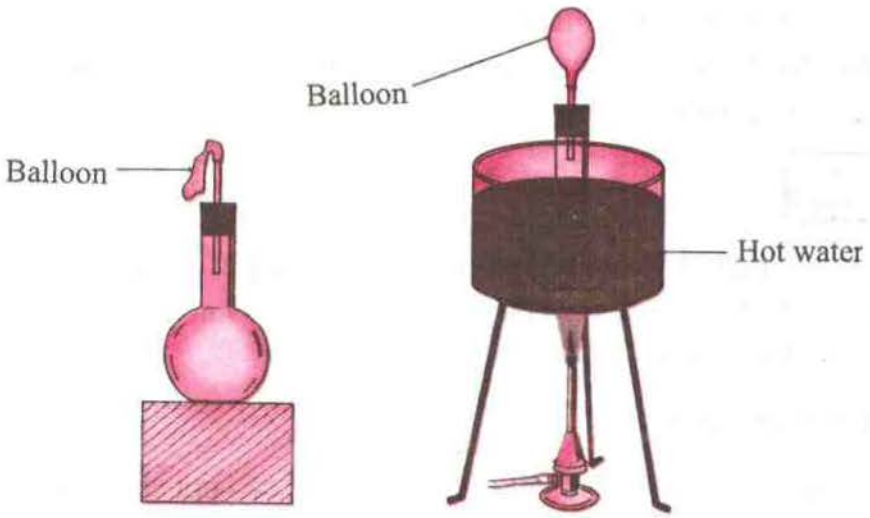
(e) Which one is radiation in the following situations?

(i) The spoon gets heated when it is kept in the sun light.
(ii) The spoon gets heated when it is dipped into hot water.
(iii) The spoon becomes hot if it is heated by the spirit lamp.
(iv) Water becomes hot when the hot ball of iron is kept in to cold water.

6. Differentiate between:

(i) Conduction and convection.
(ii) Transmission of heat and expansion.
(iii) Good conductor and bad conductor.
(iv) Heating ice and heating of water.

7. Observe the following figure. What does the following figure show? Write the conclusion.



Unit - 5

LIGHT

Light is a form of energy. There are two different theories about the light. According to first theory, light is composed of small particles. Another theory says: light is a wave because it can be transmitted and reflected or refracted.

Shadow

Shadow is created when we stand in the sunlight. Every opaque body has its shadow when it is kept in the sun light. Our shadow walk as we walk and stop when we stop walking.

Reflection of light

We can easily see objects kept in light but we can not see objects kept in dark places. Light is necessary to see every object. When light falls on the surface of the objects, some portion of the light return to the same medium and falls on our eyes, which enables us to see them. The phenomenon of returning of light to the same medium is called reflection. Maximum portion of the light is reflected from some kinds of objects. These objects shine when the light falls on the surface of these objects.

Phenomenon of returning of light from the surface of the body is called reflection of light.

Activity 1

Take a small mirror and go out of the classroom. Let the sun light to fall on it. Adjust the mirror to let the reflected light fall on the wall of your class room. In this activity the reflected light should not fall

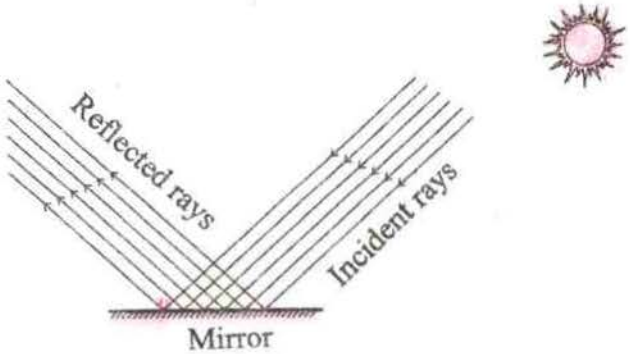


Fig No. 5.1

straight in your eyes. It is bright, so it may harm your eyes. In this activity, the ray of light falling on the surface of mirror is called incident ray. And the ray of light returning from the surface of mirror is called reflected ray. The line which is drawn perpendicular to the surface of mirror is called normal

The ray falling on the surface of an object from the source of light is called incident ray and the ray returning from the surface of an object is called reflected ray.

Reflection at plane mirror:

Have you ever used the mirror to see your face? Due to plane and shining surface of mirror, your face can be seen clearly. One surface of the mirror is smooth and shining. We draw a line segment to represent the mirror. We draw no. of small lines on one surface to represent the shaded or silvered surface. Regular reflection of light takes place from the surface of water, glass, nickel, smooth and polished surface of metals etc. in order to use a mirror in different activities, a mirror is fixed with a small wooden piece. This wooden piece helps the mirror to stand in an erect position.

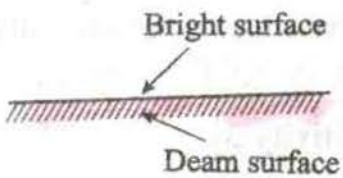


Fig No. 5.2

Activity 2

Put the books on a table in such a way that the height of books is about 4/5 centimeter. Adjust the outer pipe of a dotpen or piece of a polythene pipe to the surface of the mirror so that it should be inclined in the surface of mirror. One end of the pipe should be joined to the surface of mirror. Put a

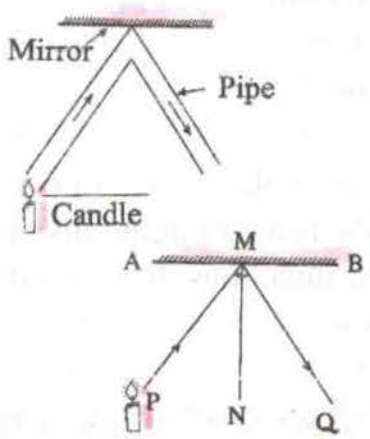


Fig No. 5.3

candle or any shining object (marble) near the other end of the pipe. Adjust another pipe on the surface of mirror as shown in the figure, then observe from the end of second pipe. Did you see the candle? If you did not see it, adjust the angle made by the second pipe with the surface of mirror and observe again. Keep it as it is when the candle is seen clearly. Draw straight line on the place of both pipes. To perform this, draw lines after removing the pipes from the surface of mirror. Again, draw a perpendicular line at the point in which the pipe makes an angle. Following figure will be made. What did you know from this activity? The light of a candle goes to the surface of the mirror through first pipe and returns from the surface of mirror through second pipe. The light comming from the second pipe falls on the eyes of the viewer, then the candle is seen clearly. In this way, light is reflected from the surface of mirror. In figure, PM is incident ray and MQ is reflected ray. MN is normal which is perpendicular to the mirror. PMN is the angle of incidence whereas QMN is the angle of reflection. These two angles are equal.

Acitivity 3

Take a wooden board. Fix small pieces of mirror with the help of glue. The surface of one piece should not be placed with the surface of another piece. Fix 6/7 pieces of mirror and repeat activity 1. Did you see the reflected rays reflecting in the same direction? Why did the reflected rays scatter? Discuss with your friends.

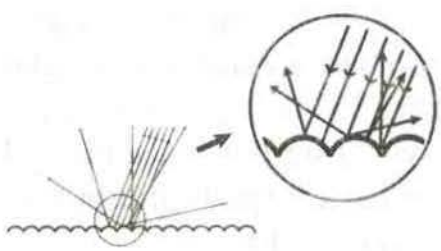


Fig No 5.4

In activity 2, the surface of pieces is not plane but it is rough (zig-zag). When the beam of light falls on these types of surfaces, it will scater in different directions. It is called irregular reflection. Irregular reflection takes place when surface is rough. Irregular reflection takes place from the wall, table, bench, book etc. because they have rough surfaces.

Regular reflection takes place on plane surfaces while the irregular reflection takes place on the rough surfaces.

Laws of reflection:

During reflection light follows some rules/laws which is called laws of reflection. Can you say, what are they?

Activity 4

Fix a white sheet of paper on a table or wooden board (drawing board). Draw a straight line AB in the middle of the paper. Draw lines PM, QM,RM and NM in the middle point M of line AB making the angles 30·, 45·, 60· and 90· respectively.

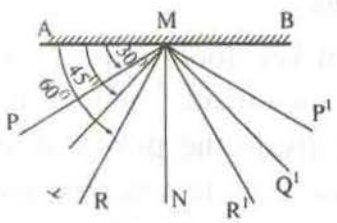


Fig No 5.5

Now, keep a mirror upright on the line AB. Lines should lie on the face of mirror. Fix two pins on the line PM vertically. It indicates incident ray. Fix two pins observing the images of former pins on the surface of mirror. They should be in straight line. Remove these two pins and draw straight lines to the surface of mirror. It represents the reflected ray. Now measure the incident angle and reflected angle and write in the following table. Similarly repeat the above activity by fixing the pins in remaining lines QM and RM. Measure the angle of incident and the angle of reflection. Put them in the following table.

S.N.	Angle of incidence	Angle of reflection	Result	Conclusion
1	PMN=	P' MN=	PMN= P'MN	
2	QMN=	Q'MN=		
3	RMN=	R'MN=		

In this activity, you will find that the angle of incidence is equal to the angle of reflection. It is the first law of reflection of light. In this activity, incident ray, reflected ray and the normal lie in the same plane at the same point. That plane surface is a surface of paper. It can be known from the activity 2. The ray coming through one pipe reflects through the another pipe. Due to this the flame of candle kept on the side of 1st pipe is seen from the end of the 2nd pipe. Repeat this activity again.

Laws of reflection of light:

1. Angle of incidence is equal to angle of reflection.
2. Incident ray, reflected ray and the normal lie in the same plane at the same point.

Image:

When you look at your face in a mirror (looking glass), you will see your face inside the mirror, which is your image. Images of objects are seen inside the mirror when they are kept infront of the surface of a mirror. Like in a mirror, the image can be seen on the surface of water, glass and on smooth surfaces. When we throw a piece of stone in the surface of water, then the waves are produced.

Plane surface vibrates and become zig-zag. In this surface, the image of objects can not be seen.

Activity 5

Take a plate or Dekchi or any flat pot and put some water into it. Do not disturb it for a while. Observe when the surface becomes plane, whether the image is seen or not. Now disturb the water. Does the image disappear? Explain why. Regular reflection of light takes place when the surface is plane. Image can be seen only when the regular reflection takes place. When the surface of the water is disturbed or move, then irregular reflection will take place. Image can not be seen, when the reflection is irregular. Due to this fact, the image can not be seen on paper, wall having rough surface. The image can be seen clearly if the surface is more smooth.

Activity 6

Write letters B, C, R, S, D, U on a piece of paper and hold the paper front of a plane mirror. You will see the images of these letters in the plane mirror. Do you recognize the images of letters easily looking at the mirror? Write the differences between letters and their images you have seen. Again look at the images of letters like A, O, U, M. What did you find? Do you observe any differences?

Look at the plane mirror and close your right eye., you will see the left eye closed. Raise your left hand looking at the mirror, you will see the that your right hand is raised.

Phenomenon of the apparent change of right and left sides by a plane mirror is known as lateral inversion

Activity 7

Fix a white sheet of paper on a table or drawing board. Draw a line M_1 M_2 in the middle of the paper. Keep a mirror upright on the line. Fix a pin infront of the mirror 10cm away from the middle. Again fix two pins P and Q such that the image I of a pin and these two pins lie on the same straight line.

Similarly fix two pins R and S on the other side of O.

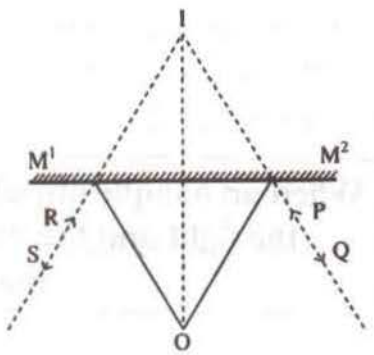


Fig No. 5.6

Now, remove the mirror and all the pins P,Q,R, S and O. Mark the position with a pencil. Join points P and Q with a line. Again join the points R and S with a line. Produce PQ and RS back, then they will meet at I where the image of pin is formed. Measure the distance between I and mirror and O and mirror and note down in your note copy.

The distance from image I to the mirror= ..... cm.
The distance from O to the mirror = ... cm.

Does the image distance equal the object distance? The distance of image depends up on the distance of object. Thus, if the object is close to the mirror, the image also comes closer. Similarly, the image of the object is seen farther from the mirror if the object is kept away from the mirror. Object distance is always equal to the image distance.

Activity 8

Take a carboard sheet and cut it making different shapes such as circular, rectangular, triangular, square and elliptical etc. Take ball, book, pen etc. with these shapes and go out of the room in the sun light. If the sun light is not present there make your room dark and use torch light. Show these all materials on the light one by one observe the images. Expose the book in the sunlight and turn it showly. Did you find any differences in the image? In the same way, expose the ball in the sun light and turn it. Did you observe any change in image?

The shape of the image is the same as the shape of the object. The image of the round shaped object is always round. Do you observe your images (shadow) in the morning, in the noon (mid day) and in the evening? Are they all same? Is your image short at noon? Why? Sun lies straight over our head at mid day (at noon).

When an opaque object is placed in the way of light, it blocks the light and the dark figure is formed on the screen, that is called shadow.

Summary

1. The phenomenon of returning of light in the same medium is called the reflection of light.
2. The ray coming from the source of light to fall on the surface of an object is called incident ray and the ray which is returning from the surface of an object is called reflected ray.
3. Regular reflection of light takes place from the plane surface whereas irregular reflection of light takes place from the rough surface.
4. The angle between the incident ray and normal is called angle of incidence and the angle between the reflected ray and normal is called angle of reflection.
5. In the regular reflection of light, the angle of incidence is equal to the angle of reflection.

6. During the regular reflection of light, incident ray, reflected ray and the normal lie on the same plane.
7. Image of an object is formed in the mirror (looking glass).
8. The phenomenon of the apparent changes of right and left side by a plane mirror is called lateral inversion.
9. During regular reflection, the image distance is equal to the object distance.
10. When an opaque object blocks the light, it forms shadow.

Do, observe and learn

1. In the evening, light a lamp and form the (shadow) of your hands on the wall. Observe different shapes of the shadow by changing the positions of fingers. Observe the following figure for sample.
2. Erect the plane mirror on a table. Light a candle infront of the mirror. Erect another candle behind the former candle. In such a way that it should coincide the position of image of 1st. Measure the distances of both the candles. What did you learn from this activity?

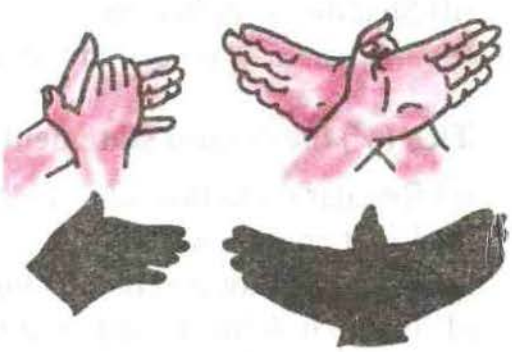


Fig. No. 5.7

3. Erect a stick on the floor infront your house or on the floor of your balcony. Measure the length of the image of the stick in the morning, in the noon and in the evening. Did you find any changes in the length of the image? Why is this happened?

Exercise

1. Write short answer:

(a) How can we see objects?

(b) How can we see on image in the mirror?

(c) What is an image?
(d) Explain why you cannot see an image on the rough surface?
(e) What is reflection of light?
(f) Write two laws of reflection of light.
(g) How is a shadow formed?
(h) The length of shadows differ in the evening and day time. Explain why?
(i) What is lateral inversion?
(j) Which one object does not form a shadow?

2. Fill in the space with correct word:

(a) Returing of light ray from the surface of the object is .....
(b) ..... reflection takes place when the light ray strikes on a piece of mirror.
(c) We should not let the sun light fall on ..... directly.
(d) Shadow is formed due to ..... light.
(e) ..... is seen in the plane mirror.

3. Tick (✓) the correct statement and cross (✗) the incorrect one.

(a) Regular reflection takes place in rough surface. ( )
(b) Light enables us to see objects. ( )
(c) Shadow is formed on blocking of light. ( )
(d) Image is formed due to regular reflection. ( )
(e) Letters A, O, V are seen inverted in the mirror. ( )

4. Differentiate between the followings:

(a) Shadow and image.
(b) Incident ray and reflected ray.
(c) Rough surface and plane surface.

5. Tick (✓) the best one:

(a) Regular reflection takes place in ...
(i) white paper (ii) Black board
(iii) Table (iv) Mirror

(b) The reason for appearing the objects is .....

(i) reflection of light (ii) Blocking of light

(iii) Straight travelling of light (iv) Colour in the objects.

(c) Which of the following is not necessary to form shadow?

(i) Light (ii) Opaque object

(iii) Transparent object (iv) Screen

(d) Which of the following alphabets will be inverted in a mirror?

(i) A (ii) N

(iii) V (iv) W

6. Match the following:

(a) Lateral invesion ( ) Opaque object

(b) Regular reflection ( ) Rough surface

(c) Irregular reflection ( ) Plane surface

(d) Shadow ( ) Right side, left side

7. Draw a figure showing reflection of light.

Unit - 6

SOUND

Sound is a form of energy. It is produced due to vibration of object. The vibration in an object can be produced by plucking, stroking, blowing and hitting. If the vibration in the object stops, then the sound will also stop.

Activity 1

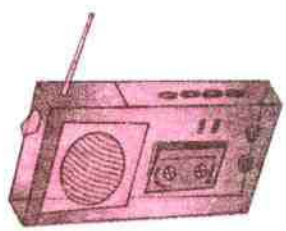
Put your finger on your throat. How do you feel before and after making sound. In the above activity, sound comes during the period of vibration. Sound will stop as the vibration stops.

Sources of sound:

All objects which vibrate continuously or the objects that we make vibrate, are called the sources of sound. Sound is produced around us. Sound is produced at home, neighbourhood, school, play ground, runway, meeting etc. The sources of sound in the places mentioned above are men, birds, bell, whistle, guitar, madal, radio etc.

Guitar

Madal



Radio

Fig No. 6.1

Sound is being produced due to continuous vibration. Sound spreads around the source in the form of waves. We hear sound when the waves strike on our ear drum. We can recognize the objects depending upon the sounds produced by them.

Activity 2

Take a rubber band and hold one end under your teeth and the other end in your hand. Pull the rubber band with your other hand from the middle

portion. What do you observe and feel? In this activity, the vibration of rubber band is short and the sound produced is not so sharp. Sound stops as the vibration in rubber band is stopped. Take a tuning fork, strike its prong against a rubber sole of a shoe or a hard rubber pad. Now, bring a piece of paper near the prong. What do you feel? You listen 'Karkar' sound from the piece of paper. We can feel the vibration of prong by touching it with finger lightly. We can observe the situation of the vibrating prong by striking it on the table-tennis ball suspended on a string.

Activity 3

Take a plastic whistle and observe it. Now blow it. Which part of the whistle vibrates continuously and produces sound? Which type of sound is produced? Feel that. When we blow a whistle, the small ball inside it vibrates continuously and then sound produced. In the same way. Can we produce sound from the lid of fountain pen with the help of our mouth on blowing? Feel it. Find out, which part vibrates continuously?

Activity 4

Take a madal, keep it vertically so that its smooth black surface remains horizontal. Now put few dust of chalk on the black surface. Beat the madal near the outer ring. What does happen? Observe carefully. What do you see? When you beat it continuously, you will notice the dust of chalk jumping up and down showing the black surface of madal vibrating. We learned from the above activities that there are different objects which are the sources of sound. They can be brought into continuous vibration by plucking, blowing, hitting etc. We hear different sounds during vibration. Some sounds are sharp and some sounds are not sharp.

Activity 5

Hold a piece of chalk in different angles and write or hit on the blackboard placed in your classroom. Listen to the different sounds produced in this activity. Similarly, feel the sounds produced on hitting the board by duster,

slowly, moderately and strongly. What is the conclusion? We learned from the above activity that different sounds are produced in different situations.

Activity 6

Take a hacksaw. Keep it on a table and press on the different parts and observe the vibration of remaining parts which is remained out side of the table. Note down the situations that produce sharp sound and (not sharp sound). Do you observe any differences in sounds if the length of part that remained out side the table is more or less.

Sound is produced due to continuous vibration in the objects. We have discussed this in the above activities. The hearing process includes the following three states:

(1) Source of sound
(2) A medium of transmission for transmitting sound
(3) Sound receiver

A vibrating body produces sound. Sound travels through medium like solids, liquids and gases. We can hear sound through our ears. Our ears act as sound receiver. Generally the rate of vibration must be at least 20 vibrations per second to produce sound. Similary, the velocity of sound is greater in solid medium than in liquid medium and the velocity of sound in liquid medium is greater than in gas medium. Sound can not travel through vaccum.

Summary

1. Sound is a form of energy. Vibrating body produces sound.
2. Vibration of different bodies produce different sounds. There are different sources of sound around us.
3. Continuous vibration can be produced in the bodies by plucking, hitting, blowing, stroking etc.
4. Sound can be transmitted through three medium: solid, liquid and gas by the process of vibration.

5. Sound should pass through different states for reaching the ear.
6. The velocity of sound is greater in solid medium than in liquid and gas.

Do, observe and learn

Take a metal wire about 1 meter long. Fix two nails on the plane surface and stretch two ends of a wire on the nails. Observe the different sounds by plucking the wire in different parts. Fold the small piece of paper and put it on the wire and pull. What happens? Why did it so happen? Write with reasons.

Exercise

Write in brief:

1. How can we produce sound?
2. Write 4 ways of producing sound with examples.
3. Write three states of transmission of sound.
4. In which medium (object) does the sound travel fast and in which medium (object) the sound travel slowly.
5. In which medium sound can not travel.
6. What do you mean by the source of sound? What are its types?
7. How can the sound be transmitted around the source?

Unit - 7 MAGNET AND ELECTRICITY

How can we collect the pins scattered on the floor easily and quickly. This work can be done by using a magnet. If we bring a magnet near these pins, they will attach on to the pole of a magnet. Magnet is used in dynamo of a bicycle, electric motor, telephone receiver, loud speaker etc.

Magnet

The substance, which can attract iron and other materials made of iron and always rests in the North-South direction when suspended freely is called magnet.

Properties of magnet:

1. Magnetic substances: A magnet attracts only some substances like iron, steel, nickel, cobalt etc. These are called magnetic substances.
2. Magnetic poles: The magnetic substances like iron fillings are attracted more on the ends of each magnet. These two ends of a magnet are called poles. They are always in pair.
3. North pole and South pole: When a magnet is suspended freely and horizontally, the magnet will come to rest pointing to the earth's north and south directions. The end of magnet which points towards the north is called north pole and other end which points towards the south is called south pole. Magnet can be used as compass.
4. Law of magnetic poles: If we bring the North-pole of one magnet near the N-pole of an other magnet suspended with the help of string, they will repel each other. In the same way two South poles also repel each other. But if the North-pole and South-pole come closer to each other, they will attract each other. Thus, like poles repel and unlike poles attract.
5. Magnetic field: The region around a magnet in which its influence can be felt is called magnetic field.

Activity 1

Take a bar magnet and suspend it freely by a piece of thread (on a string). The magnet comes to rest after some time. Observe the direction pointed by the two ends of the magnet. Which direction is north and which direction is south? The end which is pointing towards north is called North pole and the other end which is pointing towards south is called South pole.

Fig No 7.1

Activity 2

Mark N-pole and S-pole of a bar magnet used in activity 1. Bring the North pole of the other bar magnet near the N-pole of suspended bar magnet. What do you observe? In the same way bring the South-pole of the other magnet near the South pole of the suspended magnet. Observe, what will happen? Similarly, bring the North pole of other magnet near the South pole of suspended magnet. Observe, what will happen?

Like poles repel and unlike poles attract each other.

Activity 3

Place a white piece of paper or a plane sheet of glass over a bar magnet fixing in between two books. Sprinkle some iron dust filling on the sheet. Tap the surface of the sheet gently. Observe, what will happen to these iron fillings. What kind of shape do the iron fillings take? Draw figure of that shape (pattern).

The region around a magnet in which its influence can be felt is called magnetic field.

Activity 4

Take a used saving blade. Make it magnet. Check, whether it is magnetised or not? Break this blade magnet into two pieces carefully and observe each piece, whether they are complete magnets or not. Again

break these two pieces into two pieces each. Check these four pieces whether they are magnet or not. Can you conclude by observation?

Poles are always in pair. We cannot find the magnet having a single pole.

Methods of making Magnet:

There are several methods of making magnet. Among them, only some simple methods are mentioned here. Magnetic substances can be converted into magnet but non-magnetic substances cannot be converted into magnet.

Activity 5

Place an iron bar on a table. Take a bar magnet in your hand and keep its north pole at one end of the iron bar (say A). Rub the magnet along the iron bar to the other end (say B). At the other end B, lift the magnet and again place on the first end A and repeat the same process as in the first turn. In this way, if you rub the iron bar upto 50 turns, it will become a magnet. We can easily convert the materials like pin, blade, clip, nail etc. into magnet applying this method.

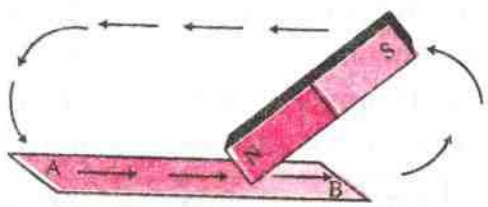


Fig No. 7.2

Activity 6

Take a one-meter long insulated wire and an iron nail about 5 centimeter long. Wrap the iron nail with the insulated wire for about 50 turns. Connect the terminals of wire with the terminals of cell. Bring some pins close to the iron nail. What do you observe? In this way, we can make the magnet with the help of electricity.

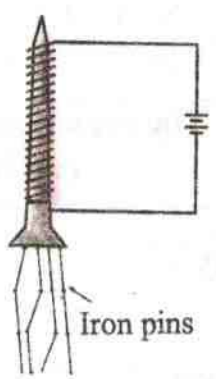


Fig No. 7.3

Magnet made by using electricity is called electro magnet.

Things to be considered while making magnets:

1. Do not use naked wire. Electric current can not flow through the coil of a naked wire. But current flows through the nail, which causes short circuit.
2. Turning of wire should be one way, while wrapping.

Magnetic Induction:

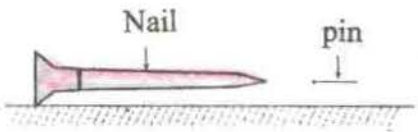


Fig No. 7.4

Activity 7

Place an iron nail on a table as shown in the figure. Put a pin near an iron nail. Observe that, whether the nail attracts the pin or not. Discuss the reason. Bring N-pole of a magnet close to the end A of nail, then observe whether the nail attracts the pin or not. What is the reason behind this? Discuss.

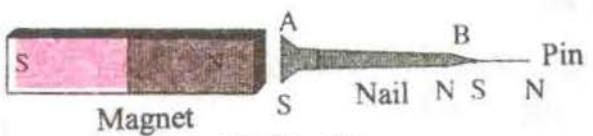


Fig No. 7.5

Magnetic property develops in the iron nail when it is near or in contact with a magnet, that is why nail attracts the pin. End A of the nail becomes South pole. The magnet made by this process is temporary. In this activity, if the magnet is weak, magnetic property is induced only when the magnet comes in contact with the nail.

The process by which a piece of magnetic material becomes a magnet when it is placed near or in contact with a magnet is called magnetic induction.

Magnetic induction takes place just before the nail is attracted. In this way, the nail becomes a temporary magnet. In magnetic induction, the end near or in contact with the magnet develops opposite polarity. Due

to this fact, magnet attracts the nail (unlike poles repel and like poles attract).

Electricity

Electricity is also a kind of energy. Electric energy can easily be converted into sound energy, magnetic energy, heat energy, light energy etc. We can use electricity for lighting, heating, driving motor vehicles, making electro magnet, ringing bell etc.

Sources of electricity:

The devices which produce electricity are called sources of electricity. There are various methods and devices for producing electricity. Here, we discuss about the main devices or methods.The main sources of electricity are as follows:

1.Cell 2. Photo cell 3. Dynamo or Generator.

Cell:

Have you ever seen a cell? What is the structure of the cell? How does it produce electricity? In simple cell, two plates of copper and zinc are dipped in solution of sulfuric acid (dilute). The zinc plate acts as negative electrode and the copper plate acts as positive electrode. As a copper wire connects the two electrodes to an electric bulb, the electric circuit completed and the bulb begins to glow. In this process the electric current is supplied from the plate of copper to the negative electrode. We use cell in torch light also. Such type of cell is called dry cell. dry cell does not contain any solution. If any solution (liquid) is used in this cell, it will be difficult to carry it from one place to another.

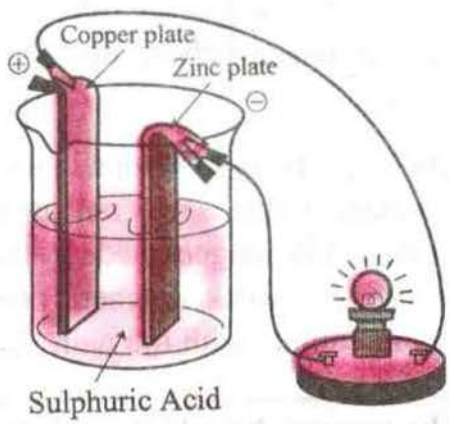


Fig No. 7.6

Activity 8

Take a dry cell, two pieces of connecting wires (about 25cm long), and a torch-bulb. Observe the dry cell. In this cell '+' is written at one end and '-' is written at another end. '+' sign indicates positive electrode and '-' sign indicates negative electrode. Now, join the dry cell to the bulb using connecting wires as shown in the figure. Does the bulb glow? How?

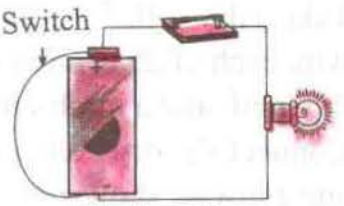


Fig No. 7.7

Chemicals are used in simple cells and dry cells. These cells produce electricity due to chemical reaction. Such type of cells are run down due to use. They cannot be used for long time.

Photo cell:

Have you seen a solar calculator? Dry cell or electricity is not required to operate it. Dry cell is used in simple calculator. It should be changed from time to time. Photo cells are used in solar calculator. When light falls on a photo cell, electric current is produced. Due to this electricity, calculator starts to work. number of-cells is joined in series to make a solar battery. Solar battery has been used in remote places where the supply of electricity is not available.

Dynamo or Generator:

Have you seen a dynamo used in a bicycle? Generator is a bigger dynamo, It produces large amount of electricity. Turbine of a generator rotates due to the force of water. The electricity produced in this way is called hydro electricity.

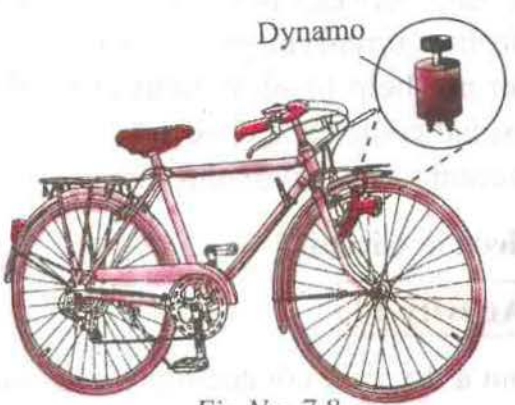


Fig No. 7.8

Conductor and Insulator

Activity 9

Take a dry cell, 3 pieces of wire each of 25 centimeter in length and a torch-bulb. Connect the dry cell, wire and bulb as shown in the figure. Now collect some small objects like pieces of iron wire, pieces of a copper wire, pieces of paper, pieces of stone, piece of brick, pieces of wood etc. Join these objects one by one on X and Y (free ends of a wire).

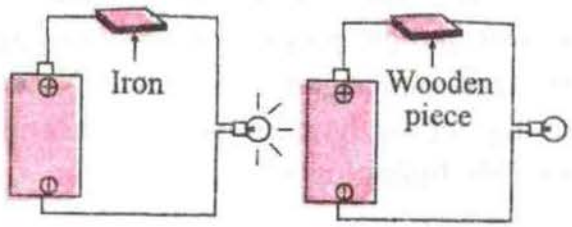


Fig No.7.9

Now, fill the following table after carrying this activity:

S.N.	Material	Bulb glow/does not glow	Good conductor/Bad conductor
1.	Coin		
2	Piece of brick		
3	Piece of copper		
4			
5			
6			
7			

Those substances which can help to glow the bulb after placing them in the gap between free ends of a connecting wire are good conductors. Electric current can pass through these materials. Those substances which can not help to glow bulb after placing them are bad conductors or insulators the gap between two free ends (X and Y) of connecting wire. Current can not pass through these materials.

Electric Circuit

Activity 10

Join a dry cell, connecting wire, switch and torch-bulb as shown in the figure. Now press the switch. The bulb glows.Which path and direction

does the current take? The current flows from positive electrode of a cell through the wire switch and bulb. The current returns from the filament of a bulb through wire to negative electrode.

Again, the current flows from negative electrode to positive electrode through the path inside the cell. In this way, the current flows in a cyclic path. It is a sample of electric circuit. When current flows through the filament, it will become heated (inflammable). Observe what happens when the switch is off.

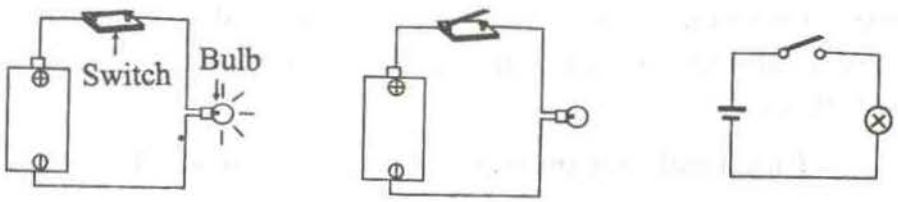


Fig No. 7.10

When the switch is off, the bulb does not glow. Current cannot flow due to the open circuit. Now observe carefully. How is the circuit joined inside the bulb? Current flows through the electrical appliances when they are in use. Electrical appliances do not work if the current does not flow through these appliances.

The closed path in which the current flows is called an electric circuit. The essential parts of a circuit are: load, source, wire and switch.

1. Closed and open circuit:

Repeat the activity 10. When the switch is on the bulb glows, in other word the load works. Such a circuit is called closed circuit. When the switch is off, the bulb does not glow, in other word, load does not work, Such type of circuit where there is disconnection in the circuit is called open circuit.

2. Short Circuit:

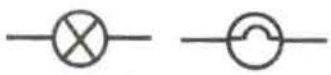
Activity 11

Repeat activity 10. Now connect directly the negative and positive terminal of a cell with a good conductor wire. Observe, whether the bulb

glows or not. Why did it not glow bulb? discuss what do we call this circuit? Load does not work when there is short circuit because the current does not flow throughout the load in this condition. Current flows directly through the wire. The age of a cell decreases due to short circuit. There is a danger of fire in the houses because of short circuit in the house hold supply. Maximum heat produces the fire.

Symbols of electric circuit:

While drawing electric circuit, it is difficult to draw the picture of the various components connected. To over come this problem, we use different symbols to represent the different components. These symbols are as follows:

Electrical component	Symbol
Bulb	
Wire	
Connected wire	
Switch	
Cell and battery	
Resistance	

Uses of electricity:

Electricity is the most essential energy. The electricity is required to perform various activities. Let us discuss some of the uses of electricity.

1. **Light**
   Electricity can be used to light our house, rooms, streets, floor etc. In a simple bulb, there is a filament coil made of tungsten metal. As soon as electricity is passed through the bulb, the filament becomes hot and emits light.

2. **Heat**
   We use an electric heater to cook our food. When electric current is passed through a nichrome wire, it becomes red-hot and emits light.

Electric heater contains a coil of nichrome wire which has a higher melting point.

3. **Electric bell:**
Electric bell contains a temporary magnet. When electric current is passed through the electric bell, the bell rings.

4. **Telephone:**
Electricity is widely used in the communication. The receivers and microphones of the telephone need electricity to work. A little amount of electricity flows in this system.

5. **Electric motor:**
Electric motors are used in pump set, trollybus, factories etc. Electricity is used in electric motors.

6. **Electronic devices:**
Electricity is required to run the electronic devices such as watch, radio, calculator, transistor, television, computer etc.

Summary

1. Electricity is a kind of energy. It can be converted in to heat, sound, light, magnet etc.
2. Cell, photo cell and dynamo are some sources of electricity.
3. The closed path in which current flows is called electric circuit. Essential components for a simple electric circuit are: source, load, switch and wire.
4. The circuit in which there is no gap or discontinuity due to which current can flow easily through it is called a closed circuit.
5. The substances through which electricity can pass easily are called conductors and the substances through which electricity cannot pass at all are called insulators.
6. Electricity is essential for our daily life.
7. The disconnecting condition of circuit in which the load does not work, is called open circuit.
8. The circuit in which the negative terminal of a cell is directly connected to the positive terminal of that cell is called short circuit.

9. The magnet made by using electricity is called electro magnet.
10. The process by which a magnetic material becomes a magnet when it is placed near or in contact with a magnet is called magnetic induction.
11. The main properties of magnet are:
    (a) It attracts magnetic materials.
    (b) It always rests pointing North-South directions when suspended freely by a thin thread.

Do, observe and learn:

1. Take a magnet, compass and iron nail. Place the nail on a table. Bring the North pole of the magnet near one end of the nail. Which pole is formed on the other end of the nail? Check with a compass. Again, bring the South pole of a magnet near the same end of the nail. Which pole is formed? Observe carefully. What did you learn from this activity?
2. Observe the components inside the bulb. What did you see?

Exercise

1. Give short answers to the following questions:

(a) Name the types of energies into which electricity can be converted.
(b) In an electric circuit, which one terminal of cell supply the electric current.
(c) What are the components of electric circuit?
(d) Define magnetic induction.
(e) What are the short comings of short circuit?
(f) What is magnet? What are the properties of magnet?
(g) What are the laws of magnet?
(h) Define magnetic field.

2. Fill in the space with correct word.

(a) Electricity is a kind of .....
(b) The device which produces electricity from light is .....

(c) The substance which cannot flow electricity is .....
(d) The devices which utilize electricity are called.....
(e) The component that does not work in circuit .....

3. Tick (✓) the correct sentence and cross (x) the wrong sentences:

(a) Calculator is a electrical device ( )
(b) Photo cell is a electrical device ( )
(c) The magnetic energy is induced in a block of wood, due to effect of magnet. ( )
(d) In a simple cell zinc plate acts as a positive terminal. ( )
(e) Air is also a good conductor. ( )

4. Select the best answer:

(a) Which electric circuit flows electric current?

(i) (ii) (iii) (iv)

(b) Which one is the symbol of bulb?

(i) (ii) (iii) (iv)

(c) Which of the following is not a conductor of electricity?

(i) coin (ii) Glass rod (iii) nail (iv) steel spoon

(d) Which one is an electronic device?

(i) Electronic watch (ii) Bell of a bicycle
(ii) Sewing machine (iv) compass

(e) Which one is not required to complete the electric circuit?

(i) switch (ii) cell (ii) compass (iv) load

5. Differentiate between the followings:

(a) Electric device and source of electricity.
(b) Conductor and insulator
(c) Open circuit and closed circuit

6. Match the following:

(a) electricity	(	)	closed circuit
(b) Photo cell	(	)	energy
(c) Copper wire	(	)	source of electricity
(d) Telephone	(	)	device
	(	)	conductor

7. Draw a figure of an electric circuit made by joining bulb, switch, cell and connecting wire.

8. Write the symbols of the following components:

(a) cell (b) bulb (c) resistance (d) wire (e) switch

Unit - 8

MATTER

There are numerous substances around us which are made up of matter. Some of these substances are pure and other substances are impure. Two or more substances constitute a mixture. The water in a glass is said to be pure if it contains no other substances in it. Generally, the water contains air, mineral etc. It is difficult to obtain pure substances in nature. Most of the substances we found are mixtures.

Element and compound

Every substance is made up of elements whether it is pure or mixture. Substances are made up of elements as the houses are made up of bricks. We cannot sub-divide element into the simpler form. For example we cannot get other elements from hydrogen. Similarly, we cannot sub divide gold to get any substances. That is why it is called element. In nature, 92 elements are found like hydrogen, oxygen, carbon, nitrogen, iron, gold etc. Scientists have been able to synthesize 17 elements in the laboratory. Thus, more than 109 elements are known to us. In compounds, two or more than two elements are combined in a fixed ratio. Water is a compound. It is formed due to chemical reaction between hydrogen and oxygen. Thus, during formation of water, 2 parts of hydrogen is combined with 1 part of oxygen. In the same way, carbon and oxygen are combined with each other to form carbon dioxide. Thus, compounds are formed by chemical reactions between two or more elements. An element is a substance which cannot be sub divided into simpler substances.

Differences between element and compound:

Element	Compound
1. Element is made of similar type of atoms.	1. Two or more element are combined.
2. It can not be changed into other simpler substances by any physical or chemical means.	2. It can be further subdivided into simpler substances through chemical reaction.

3. About 109 elements are known.	3. Lakhs of compounds are known.
4. Iron, gold, copper etc. are elements.	4. Sodium chloride, water, lead nitrate, copper sulphate etc. are compounds.

Elements having the atomic number from 1 to 20

Scientists studied the properties of the elements after the invention of new elements. Since the number of elements was increasing, they made researches into the elements. They found some elements having similar chemical and physical properties. The elements having similar properties were grouped together. The elements were arranged in a table in a particular order called periodic table. The elements having atomic number from 1 to 20 are arranged in this order:

Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII	Group VIII
H (1)							He (2)
Li (3)	Be (4)	B (5)	C (6)	N (7)	O (8)	F (g)	Ne (10)
Na (11)	Mg (12)	A1(13)	Si (14)	P (15)	S (16)	C1(17)	Ar (18)
K (19)	Ca (20)						

[In the periodic table, the elements are written in increasing order of their atomic number.]

In the above table, we get similaries in the same group of elements.

Physical and Chemical Change

Different kinds of changes take place around us. Among them, some are given below:

(a) Ice $\xrightarrow{\text{Heat}}$ Water $\xrightarrow{\text{Heat}}$ steam

Steam $\xrightarrow{\text{cool}}$ Water $\xrightarrow{\text{cool}}$ Ice

Gold $\xrightarrow{\text{Heat}}$ Liquid gold $\xrightarrow{\text{cool}}$ Gold

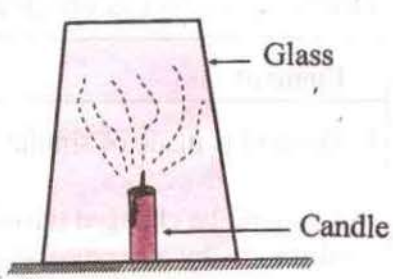


Fig 8.1

Activity 1

Put a piece of wood in a test tube. Close the mouth of the test tube and heat the tube at the end where the wood is placed. Does the wood burns?

Does it extinguish after some times? Why does this happen? We can make the following table to differentiate between physical and chemical change:

Physical change	Chemical change
1. The properties of the new substance remain the same.	1. The properties are changed.
2. New substances are not formed.	2. New substances with different properties are formed.
3. The change can be reversed back.	3. The change cannot be reversed.
4. The change is temporary.	4. The change is permanent.

Activity 2

Burn a magnesium ribbon and observe the changes. Is it chemical change?

Note: This activity should be carried out under the supervision of your teacher. Magnesium ribbon should be burnt by holding it with a fire tong.

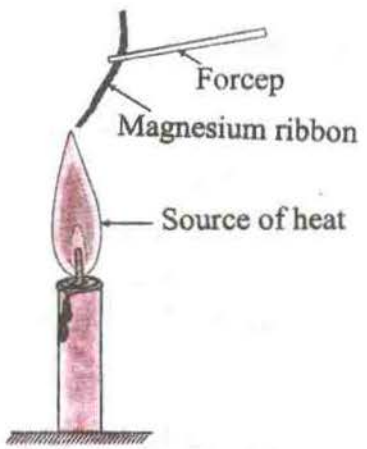


Fig No. 8.2

(b) Paper $\xrightarrow[\text{Heat}]{}$ ash + gas + heat energy

Milk $\xrightarrow[\text{Microbes}]{}$ Curd

Wood $\xrightarrow[\text{Heat}]{}$ ash + heat energy + gas

In example (a), heat causes the change but on cooling ice, steam and gold get their original states.

In example (b), heat causes the change but on cooling they cannot get their original states. In this case, new substances are formed which are

different from the original one. In this type of changes, change takes place due to heat and any other means. Large amount of heat can also be produced in this case. The change in which new substance is produced without loosing its original properties, change takes place in state only, is called physical change. (a) is an example of physical change. The change in which new substances are formed which are different from the original substance in properties, is called chemical change. Chemical reaction takes place in this type of change. In many chemical reactions, heat is produced.

Do, observe and learn

1. Boil milk and cool it. Add a little lemon juice when it becomes warm. Observe, what type of change takes place after sometimes.
2. Light a match stick. Observe carefully. What type of change takes place?
3. Melt or burn a candle. Observe, how the candle melts or burns?

Summary

1. That substance which cannot be sub-divided into simpler substance, is called element.
2. The substance made of combining two or more substances due to chemical reaction, is called compound. In compound, elements are combined in a fixed ratio.
3. Elements are represented by symbols.
4. Heat causes the physical and chemical change in substances.
5. In physical change, substance changes its state but the property is the same. New substances are formed and they can be reversed back to their original states.
6. In chemical change, the substance changes it properties. New substances are formed with new properties and they cannot be reversed back to their original states.

Exercise

1. Write short answer:

(a) What is element? Give four examples of element.
(b) What is compound? Give four examples of compound.
(c) Why is water called compound?
(d) Differentiate between element and compound giving two examples.

2. Differentiate with examples:

(a) Atom and Molecule (b) Compound and mixture

3. Write the complete name of the following symbol:
Ar, Ca, Si, Au, Ag, Na, Cl, H, He, K, P, Si, Be, B, C, N, O, F, Ne, Mg, Al, S.

4. Write the name and symbol of elements having atomic number 1, 6, 12, 17 and 20.

5. What do you mean by physical change? Give four examples.

6. Make a table showing the differences between physical and chemical change.

7. Fill in the blanks:

(a) ..... is made of two or more than two substances.
(b) It is difficult to find ..... substance in nature.
(c) We can not find simpler element from .....
(d) ..... is a substance made up of two or more than two elements having new properties.
(e) ..... is formed due to chemical reaction between hydrogen and oxygen element.
(f) In compound, elements are combined in fixed .....
(g) In physical change, substance can be ..... in to its original state.
(h) The properties of substances ..... same in chemical change.

8. **Match the following:**

Atoms	**Atomic numbers**
H	3
Li	17
Na	20
Ca	15
Mg	11
Cl	12
	1

MIXTURE

Mixture is common in our every day life. We have seen sand grains mixed in rice, sugar solution, salt solution etc. Thus, a mixture is formed by mixing two or more substances. In a mixture, elements may be in combination or compounds.

(a) Homogeneous mixture:

In case of homogeneous mixture, the molecules of the components are intermingled uniformly. The molecules of the components cannot be seen by the naked eye.

Activity 1

Take two glasses or beakers. Fill half of the glasses or beakers with the water. Put a little salt in one glass and a little sugar in another glass. We can see undissolved salt and sugar in the glasses at first. Now the solutions of salt and sugar are formed in glasses, when we stir both glasses with the help of a glass rod. The salt particles and sugar particles cannot be seen in the glasses. Salt solution and sugar solution are homogeneous mixtures.

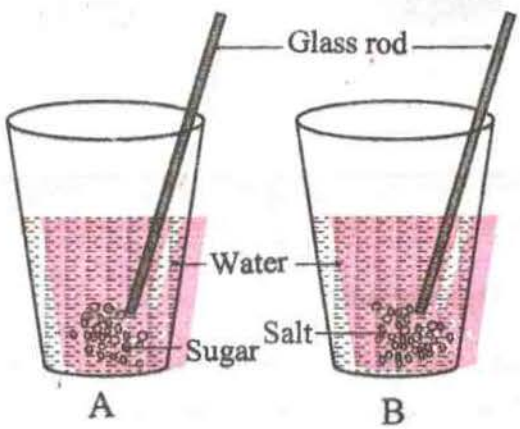


Fig No. 9.1

(b) Heterogeneous mixture:

In this kind of mixture, the molecules (particles) of the components are not mixed uniformly, such kind of mixtures are called heterogeneous mixtures. We can see or distinguish the particles or components by our nacked eye.

Activity 2

Take three glasses. Mark the glasses "A", "B" and "C". Put some equal amounts of large and small pea grains in glass 'A'. Again, put some iron filling and wood dust in the second glass 'B'. And put some sand and water in the 3rd glass 'C'. Stir these three mixtures with the help of a glass rod one by one. You can see the particles of the mixture by your naked eyes.

All these three mixture are heterogeneous mixtures. The sizes of particles are bigger in this type of mixture.

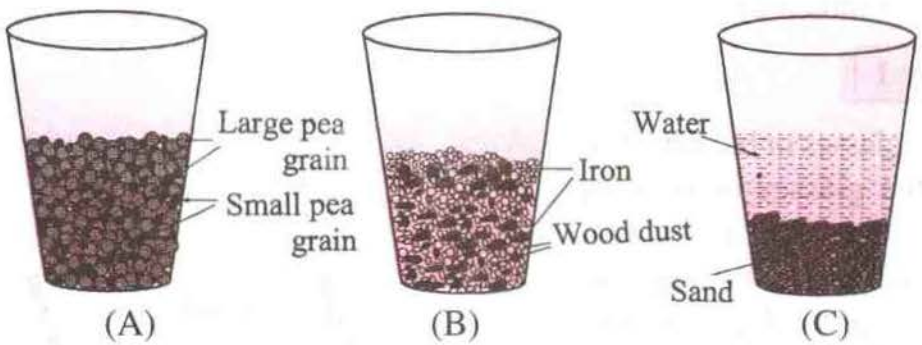


Fig No. 9.2

Methods of separation of mixture

1. Decantation:

Make a mixture of soil, sand and water in a beaker and leave aside for some time. Solid particles begin to settle down in the bottom of the beaker. Insoluble particles are settled down and clean water is remaind up. The sand can be separated by pouring off the water in to an other beaker. The process of pouring the clean water without disturbing the undissolved solid particles settled down in the bottom, is called decantation.

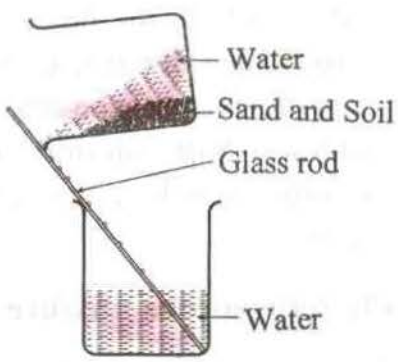


Fig. No. 9.3

2. Sedimentation:

Take a mixture of dust, mud and small particles of something in a beaker. Dust and mixed particle in mud are heavier and settle down in the bottom. Thus, the process of settling down of the solid particles that do not dissolve in water is called sedimentation. The clean water can be separated from the sediment by pouring it into the vessel.

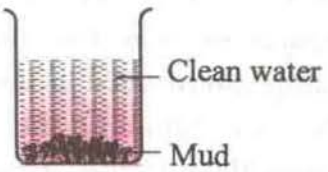


Fig. No. 9.4

3. Filtration:

This process is used when the solid particles dissolved are very small. It is a very common process of separation of mixture. The filter paper is folded as shown in the figure. The filter paper is made wet by sprinkling water on it. Then, the cone shaped filter paper is fitted in the funnel. Fix the funnel on a stand in such a way that the funnel should touch the beaker. Stir the mixture with a glass rod and pour the mixture into the filter paper slowly. The solid particles (undissolved) remain on the filter paper whereas the clean water passes through the filter paper and collected in the beaker. The solid remaining in the filter paper is called residue.

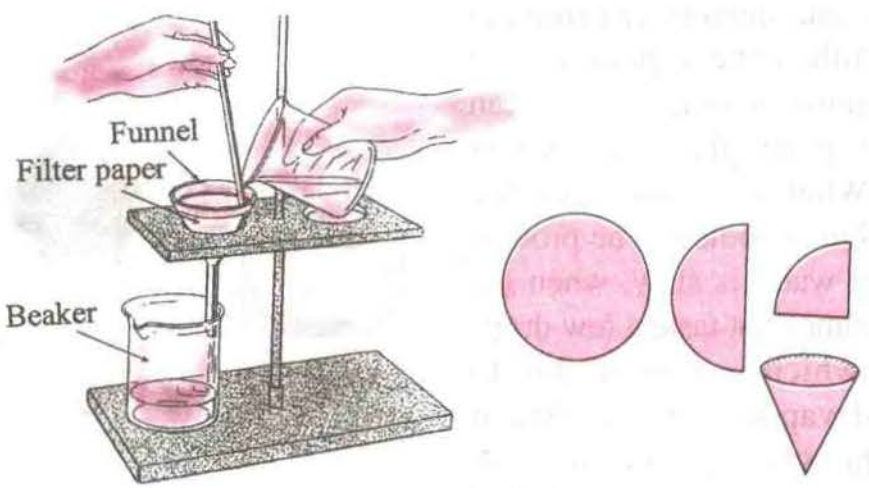


Fig No. 9.5

Thus, the process of separating small undissolved particles from the water is called filtration.

4. Sublimation:

Make a mixture of camphor and sand in a basin. Keep the basin on the source of heat. Gas burner or spirit-lamp can be used as a source of heat. Invert a funnel on the basin that can cover the mixture. Again invert a test tube over the funnel. Now heat the mixture gently. After some times, you will notice camphor being collected on the upper surface of the funnel. In this process camphor becomes vapour without melting. Wet cloth or wet paper can be used on the test tube to cool it. The phenomenon of changing any substance into gaseous state without melting on heating is called sublimation.

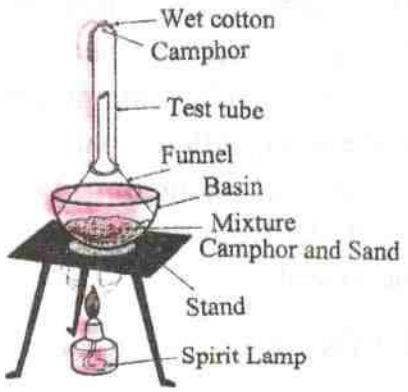


Fig. No 9.6

5. Distillation:

Water changes into vapour on heating. What will be formed when vapour is cooled?

Take some salt solution in a kettle and boil it. Collect the vapour in wet vessel as shown in the figure. You can use spoon, plate, glass etc. for this purpose. What is formed when the water vapour is cooled? The process of forming water is slow, when the vessel becomes hot taste a few drops of water which is formed due to cooling of vapour. Do you find it salty? In this way, water or any liquid is converted into vapour on heating and this vapour converts into liquid again on cooling. Due to this property,

Fig 9.7

the components of mixtures in liquid can be separated out. Distillation is the process by which the vapour is formed from the liquid substance on heating and vapour can be converted into liquid again on cooling. As in the above process only some portion of vapour can be converted into water but maximum portion of vapour is diffused in the air. We can save the wastage of vapour by using special type of vessels.

Uses of mixture

The mixtures are used in different areas of our daily life. We use mixtures in the construction of building, preparation of food and beverages ,etc.

Some of the uses are given below:

(a) Cement, sand, concrete and water are mixed for lintering (or dhalan) of houses and roofs.
(b) The mixture of cement, sand and water is used in plastering walls and joining bricks.
(c) Grains of tea, water and milk or sugar are mixed together to make tea.
(d) Plants take different nutrients in the form of mixture.
(e) In food and beverages, nutrient materials are mixed. We get energy from these nutrients in the food and beverages.

Summary

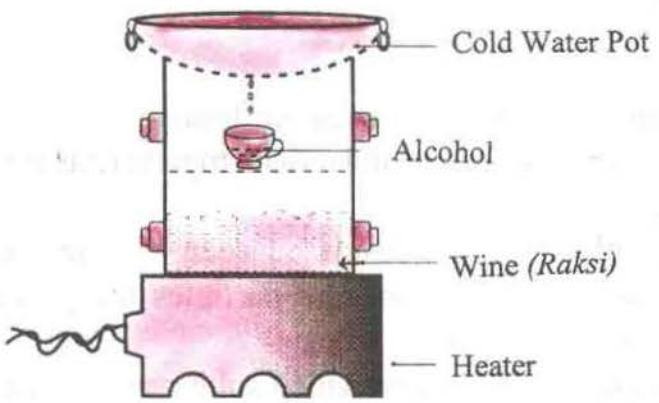
1. When two or more substances are brought together, they do not undergo chemical change and remain together, such a mass is called mixture.
2. The particles mixed cannot be seen by the nacked eyes in homogeneous mixture and the particles mixed can be seen in heterogeneous mixture.
3. Decantation is a process in which solid particles are settled down and the liquid is poured carefully in the other vessel.
4. Camphor, iodine, ammonium chloride are the substances that changes into gaseous state due to heat and they change into solid

on cooling. Such type of substance are separated from the mixture applying the process of sublimation.

5. Liquid substance changes into vapour on heating and it changes in to liquid again on cooling. To get the pure liquid from the mixture of liquid and other substances, we use distillation process. In this process, liquid is heated to convert it into gaseous state then it is cooled so that the liquid can be obtained from the mixture.
6. The nutrients are present in the form of mixture in the food materials.

Do, observe and learn

1. Take fitkiri (about mass 5/6 gram) and a little water and make solution. Keep this solution in a vessel without covering its mouth. Observe daily, how the amount of water in the vessel decreases? Write in your note book.
2. Separate alcohol and water from the mixture of wine using the cooking vessel as shown in the figure (glue cooking vessel). Wine is a mixture of alcohol and water. Alcohol boils at 78° C and water boils at 100° C. because this, wine should be heated slowly (gently). Lower the heat when the process of distillation begins. Let the mixture not overflow due to maximum heat. For this, remove the source of heat or extinguish the fine.



Exercise

1. Write short answers:

(a) What is a homogeneous mixture? Give two examples.
(b) Write a brief account of heterogeneous mixture with two examples.
(c) Write the name of two mixtures that can be separated by decantation process.
(d) Write the name of two mixtures that can be separated by sublimation process.
(e) Write two examples of mixtures that can be separated by distillation.
(f) Do you find any difference in taste, when the salt solution undergoes long heating.
(g) Write down two uses of mixture.

2. Write the definition of the following with an example:

(a) Distillation (b) Sublimation (c) Filtration

3. Write the methods used for the separation of the following mixtures:

(a) To separate salt from salt solution.
(b) To separate water from a mixture of sand and water.
(c) To separate iodine from a mixture of iodine and sand.

4. We use naphthalene balls in the cup board to protect the clothes from the bugs and other insects. After some time, they become small and finally disappear. Give reason, how this has happened?

5. Draw neat and labeled figures for the following processes.

(a) Formation of vapour on heating.
(b) Cooling of water vapour from the boiling of water.
(c) Separating the pure water by heating the solution of salt and water.
(d) Separation of camphor from the mixture of camphor and sand.

6. Use appropriate word in the blanks.

(a) A mixture of salt and ..... can be separated by using sublimation process.

(b) We can use ..... process to separate pure water from ocean water.

(c) We use ..... process to separate salt from ocean water.

(d) Liquid wax should be ..... to get solid wax.

(e) ..... should be given to melt ice.

7. Correct the following sentences (if necessary) and rewrite them.

(a) Water from the ponds becomes steam (vapour) which turns in to clouds and falls as rain, is an example of evaporation.

(b) If a solid changes into gaseous state due to heat, it is an example of evaporation.

(c) Drying of wet clothes is an example of sublimation.

(d) Iron dust and iodine can be separated from the mixture of iron dust and iodine by distillation.

(e) The vapour obtained from the heating of milk can be condensed into milk.

8. Explain with figure:

(a) Method for separation of sand and salt from the mixture of those two substances.

(b) Method for separation of salt and water from the mixture of those two substances.

(c) Method for separation of salt and camphor from the mixture of these two substances.

9. Write one example each for distillation and filtration processes used in your daily life.

Unit - 10

SOLUTION

The type of mixture in which two or more substances are intermingled together is called a homogeneous mixture . In this type of mixture, the particles of the components cannot be seen with the naked eyes. The sugar solution is an example of homogeneous mixture. The particles of the components can be seen in the heterogeneous mixture because the sizes of the particles are large and they do not mix uniformly. Rice coats mixed in rice, mixture of wheat grains and maize grains, etc. are some examples of heterogeneous mixture.

Activity 1

Take two glasses. Fill half of each glass with water. Add a tea spoonful salt in one glass and sugar in other glass and stir. In this process, the salt and sugar dissolve in the water. Homogeneous mixtures are formed in the two glasses. These two mixtures are solutions.

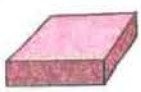
Solution

Homogeneous mixture of two or more substances is called solution. In solution, the substance that helps the other substance to dissolve is called solvent and the substance that dissolve is called solute. In a sugar solution, sugar is solute and water is solvent. Similarly, in case of salt solution, salt is solute and water is solvent. In a solution, the amount of solute is less than the amount of solvent.

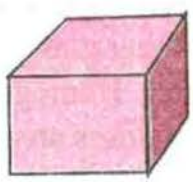
Activity 2

Take half a glass of water. Add a tea spoonful of salt in the water and stir it. Salt dissolves in water. Again add one spoon salt and stir. Again the salt dissolves and disappears. The situation comes in which the salt cannot be dissolved after continuation of this adding process. Such a solution is called saturated solution. The solution which can dissolve further amount of solute is called unsaturated solution. Here the added amount of salt can be dissolved before saturation. Now, heat the saturated solution for

sometime and add some (one spoon) salt and stir, the salt dissolves in the solution. After continuation of this process, a certain situation comes in which further salt will not be dissolved. Again dip one piece of salt in to this solution, the salt dissolved in the solution will collect around the piece of salt as solid particles. This kind of solution is called super saturated solution. in which further amount of solute can not be dissolved at certain temperature. But further amount of solute can be dissolved in an unsaturated solution at certain temperature. At a particular temperature, if the piece of solid solute substance is put into a solution, the dissolved solute particles in the solution will collect around the piece of solid, is called supper saturated solution.



Sugar Crystal



Salt Crystal

Fitkiri Crystal

Fig No. 10.1

Crystal

You can see a fixed geometrical shape if you observe a grain of sugar with the help of handlens. Similarly you can see the fixed geometric shape in the grains of common salt and fitkiri.
The substance which has fixed geometric shape is called crystal.

The crystal of the same substance are similar in stru ture and properties.

Activity 3

Take a porcelain basin and fill half of it with water. Put one spoonful copper sulphate and stir it. Copper sulphate dissolves and disappears. Put another spoonful of copper sulphate and stir. The saturated soluton of copper sulphate will form by continuing this process. Again heat the

solution for sometime and add some copper sulphate and stir it. Cool the porcelain basin when the solution becomes thicker. After sometimes you will get crystals of copper sulphate. Put these wet crystals of copper sulphate in a filter paper with the help of a glass rod. Filter paper absorbs the water and you will get crystals of copper sulphate.

(The process by which the solute from a solution of solid and liquid can be separated is called crystallization.)

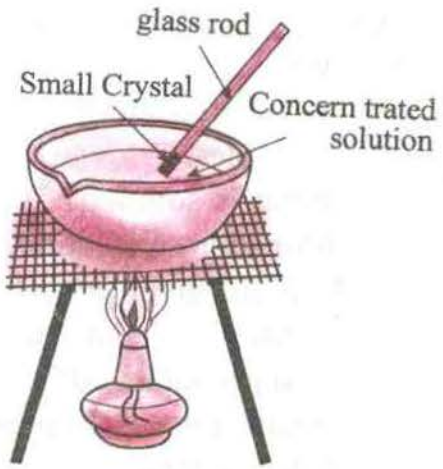


Fig No. 10.2

Summary

1. The homogeneous mixture of two or more substances is called solution.
2. The solution which cannot dissolve further amount of solute is called saturated solution.
3. The solution which can dissolve the further amount of solute is called unsaturated solution.
4. A saturated solution prepared at higher temperature gives solute if its temperature is lowered, such a solution is called super saturated solution.
5. The substance which has fixed geometrical shape is called crystal.
6. All crystal of the same substance possesses similar shapes and properties.
7. Crystallization is a process used to separate solid crystals from a solution.

Do, observe and learn

1. Make a saturated solution of sugar and water, then separate the crystals from the solution.

Exercise

1. Answer the following questions:

(a) What is meant by homogeneous mixture? Give two examples.

(b) What is meant by heterogeneous mixture? Illustrate with two examples.

(c) What is solution? What are the conditions required for the formation of solution?

(d) You are given a solution that contains a crystal of solute substance. Identify whether the solution is saturated, unsaturated or super saturated? How can you identify?

(e) What is crystal? Name two substances that are found in crystals.

(f) What is meant by crystallization? Write down the process.

2. Identify which statement is right and which is wrong.

(a) A Mixture of rice and wheat grains is homogeneous mixture. ( )

(b) In a solution, solvent is more and solute is less. ( )

(c) Saturated solution can dissolve more solute. ( )

(d) Super saturated solution contains undissolved substance in the solution. ( )

(e) Sugar grain has a fixed geometric shape. ( )

Unit - 11

WATER

Water is the most abundant and essential substance in the world. About three fourth of the surface of the earth is covered with water. It is present in the atmosphere in the form of vapour whereas it is in the form of snow in high mountains. It is also present under the surface of the earth in the form of underground water. The human body contains sufficient water-about 70% by volume. Similarly the fleshy fruits and vegetables contain about 90% water by volume.

Water is a useful substance. We use it for several purposes like drinking, bathing, washing clothes, cooking, cooling, growing plants and so on.

The main source of water is the sea. The other sources are ice, snow, rain, rivers/streams, wells, lakes, ponds and springs. Water stores in the reservoir is distributed through the taps. The underground water is received through the tube-well.

Water is a very important compound. It is colourless, odourless and tasteless. Water is found in the high mountains in solid state i.e. ice whereas in rivers, wells, ponds, lakes, oceans-it is in liquid state. Similarly water is present in gaseous state in the atmosphere.

The molecular formula of water is H_2O. Two parts of hydrogen and one part of oxygen combine to form water.

Hard and soft water

Generally water which produces lather easily with a soap is called soft water and it is called hard water if it does not produce lather easily with a soap. While bathing or washing clothes with a soap, sometimes the lather is not produced adequately and this is because of hard water. The tube-well or well water might be hard water whereas the rain-water is soft water.

Activity 1

Collect water from three different sources. Take three test tubes of the same size. Take equal amount of different water sample separately in three different test tubes as shown in the figure.

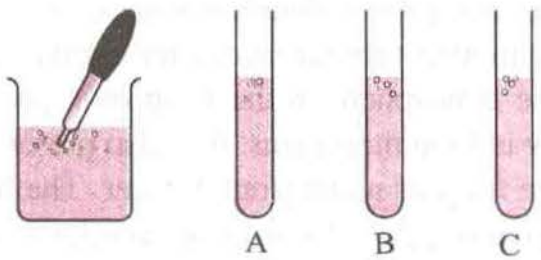


Fig.No. 11.1

Now prepare a solution of shampoo or soap in a separate beaker. Add three drops of soap solution each in each test tube containing water samples with the help of a dropper and shake them well equally. Observe the quantity of lather formed in the test tubes. The test tube having much more lather contains soft water sample and the one having least lather or no lather contains hard water sample. The hardness of water could be compared in this way.

Hardness of Water

The soluble salts of calcium and magnesium cause hardness in water. The hardness of water is of two types:

1) Temporary hardness
2) Permanent hardness

Temporary Hardness

The hardness of water is called temporary hardness if water contains soluble salts of calcium bicarbonate or magnesium bicarbonate.

Permanent Hardness

The hardness of water is called permanent hardness if water contains soluble salts of calcium sulphate, calcium chloride, magnesium sulphate and magnesium chloride.

Activity 2

Take a sample of rain water in test tube (a) and the solution of rain water and calcium chloride in test tube (b) in equal proportion.

Add three drops of soap solution in each test tube and shake them well equally (as in activity 1)

Fig No. 11.2

Water contained in test tube (b) is found to be hard.

Repeat this experiment replacing calcium chloride with other salts. You will find each time water becoming hard.

Method of removing temporary hardness of water.

1) By boiling

The temporary hardness of water can be removed by boiling it. On boiling, the salts of calcium bicarbonate and magnesium bicarbonate decompose as follows:

$$\text{Calcium bicarbonate} \xrightarrow{\text{heat}} \text{Calcium carbonate} + \text{Water} + \text{Carbon dioxide}$$

$$\text{Magnesium bicarbonate} \xrightarrow{\text{heat}} \text{Magnesium carbonate} + \text{Water} + \text{Carbon dioxide}$$

The salts of calcium carbonate and magnesium carbonate are insoluble ones, hence they cannot react with the soap. This causes the removal of temporary hardness of water.

2) By treating with lime water

If we add lime water into temporary hard water, reaction takes place between lime water and bicarbonate salts in the following way.

Calcium bicarbonate + Lime water → Calcium carbonate + Water

Magnesium bicarbonate + Lime water → Calcium carbonate + Magnesium hydroxide + Water

Calcium carbonate and magnesium hydroxide do not react with the soap. This causes the removal of temporary hardness of water.

Summary

1. Water is very essential substance for life.
2. In nature, water is available in solid, liquid and gaseous states i.e. ice, water and vapour respectively.
3. Two parts of hydrogen and one part of oxygen combine to form water.
4. Generally, the water which produces lather easily with soap, is called soft water and if it does not produce lather easily with a soap it is called hard water.
5. Water containing dissolved calcium bicarbonate and magnesium bicarbonate has temporary hardness.
6. Water containing dissolved calcium sulphate, calcium chloride, magnesium sulphate and magnesium chloride has permanent hardness.
7. The temporary hardness of water can be removed by boiling and by treating with lime water.

Do, observe and learn

Collect water samples from different sources of water. Prepare soap solution in a separate container. Now compare the hardness of each sample of water.

Exercise

Answer these questions briefly:

a) Write the names of five sources of water. Which one of these sources contains softest water? Give its reasons.

b) What is hard water? What are the types of hardness of water?

c) What are the substances that cause temporary hardness of water? How can such hardness be removed?

d) Make a list of the substances that cause temporary hardness and permanent hardness of water.

e) Describe with illustrations how you compare the hardness of different water samples.

f) What should be done to remove temporary hardness of water? Describe it with reactions.

LIVING BEINGS

Generally, living beings can be classified into *Animals and Plants*. All kinds of plants belong to the plant kingdom. Algae, mushroom, fern, grass, maize plant, pine, leechy, shal, apple, mango etc.are plants.

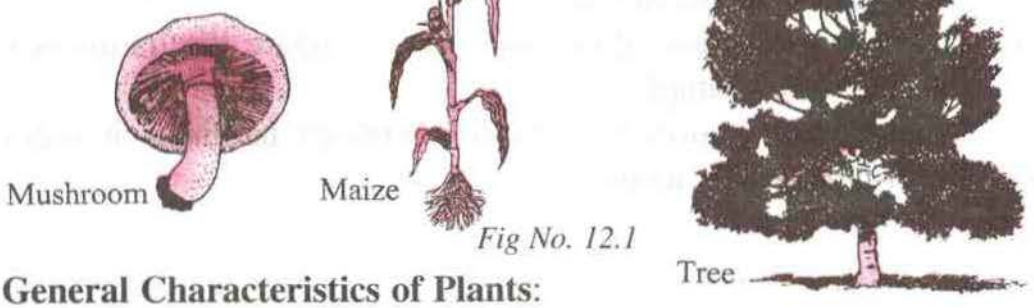


Fig No. 12.1

General Characteristics of Plants:

1. Plants have no locomotion like animals. Plants have roots, they can stay in one place with the help of roots.
2. Plants are green because they have chlorophyll in their cell.
3. Plants prepare food in the green leaves with the help of carbondioxide gas and water in the presence of sunlight.
4. All parts of the plants grow continuously (regeneration) for example, new branch grows from the broken branch, new leaves grow after falling down the old ones, bark comes on the cut and wounded parts.
5. Developed plants have roots, stems and leaves.

There are thousands of plants in the world. Among them some bear flowers and some do not. Plants are classified into two catagories: flowering plants and non-flowering plants.

A. Non-flowering plants (cryptogams)

These plants do not bear flowers . Some plants are medium size and some are microscopic (can be seen with the help of microscope and not by the nacked eye).

Activity 1

Observe non-flowering plants in the garden near your school or home and list 5 such plants.

Some non-flowering plants

1. Algae

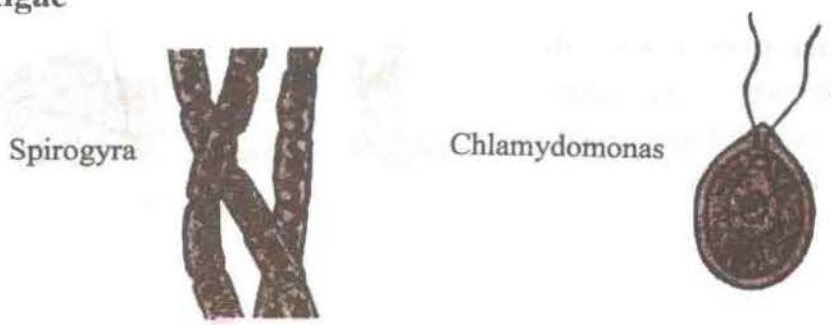


Fig No. 12.2

These are non-flowering green plants. They can prepare their food themselves.They grow on wet places and in water. Some of them are microscopic (can be seen only by using microscope).

Activity 2

Collect the pond water containing green and sticky substances and then put one drop on the glass slide. Observe the slide with the help of microscope so that you can see green and tiny plants which are algae.

2. Fungi

These are non-flowering plants without green colour. They may be white, black and brown. Generally they can grow on living being or on dead and decayed materials. Among them some plants can be seen by nacked eye (e.g. mushroom) and some cannot (e.g yeast, mucor).

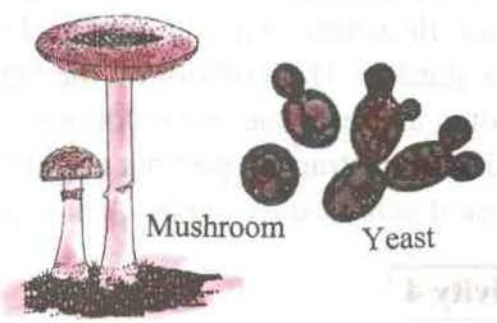


Fig No. 12.3

Activity 3

Keep one piece of wet bread in the warm place and cover it. After a day or two you can see cotton like white-black mucor growing. Keep a small piece of it on a slide and observe it with the help of microscope.

3. Moss and Liverwort

In the summer season, we can see carpet like non-green plants on the moist wall and moist stem of trees they are moss.

Fig No. 12.4

4. Ferns

Fern is a non-flowering plant growing on wet places. They are medium in size. Some kinds of ferns are used as vegetables and some are grown in the garden for decoration.

Fig No. 12.5

Flowering plants

Flower is a beautiful and attractive part of a plant. There are different kinds of flowering plants around us. Different flowers are planted in the house garden. The colours of the flowers are different. Some are white and some are red, blue, rosey, orange, violet, etc. Flower is not only the beautiful and attractive part but also it is an important part of a plant body because it can produce seeds. A new plant grows from the seed.

Activity 4

Observe and list 5 flowering plants on around your school or home.

Similarities between non-flowering and flowering plants

Non-flowering plants	Flowering plants
1. Most of the non-flowering plants are green except mushroom and mucor.	1. All flowering plants are green.
2. Non-flowering plants need sunlight, carbondioxide gas, mineral salts and water to prepare their food. Except those which grow on other living beings and dead and decayed things.	2. Flowering plants also need sunlight, carbondioxide gas, mineral salts and water to prepare their food.
3. They grow on warm and humid places, moist and cold places and in the water.	3. Flowering plants also grow on warm and humid places, moist and cold places, dry and hot places and in the water.

Dissimilarities between non-flowering and flowering plants

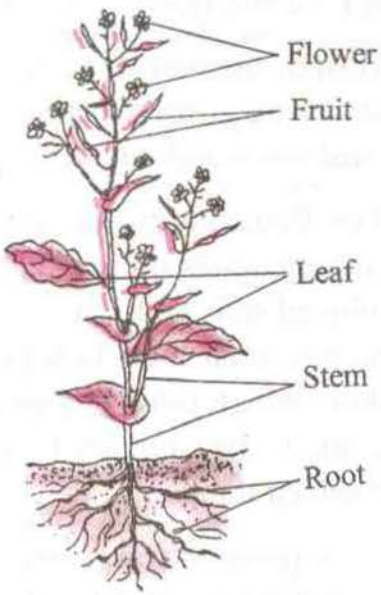
Non-flowering plants	Flowering plants
1. Not adequately developed.	1. Adequately developed.
2. Most plants have no distinct parts like algae.	2. Root, stem, leaves, flower, fruit and seed are the main parts of these plants.
3. Some plants are green (e.g.Fern) and others look white and brown due to lack of chlorophyll.	3. These plants have chlorophyll and look green.

Activity 5

Observe two non-flowering and two flowering plants.Discuss and draw conclusion about the similarities and dissimilarities found.

Structure and function of flowering plants

You have seen different kinds of flowering plants in your surroundings. Most of them have roots, stems, branches, buds, leaves, flowers and fruits. Such type of plants are developed from the seeds.There are different kinds of flowering plants in nature but they are similar in basic structure. In this lesson you will learn about the structure and funtions of different parts of a flowering plant.You can see mustard plant flowering in winter. The cropping of mustard is large in our country. Growing plants can be used as vegetable and oil can be produced from the seeds.



Mustard plant
Fig No. 12.6

Activity 6

Take a mustard plant with flower. Wash the underground parts(roots) with water softly without making harm to other parts of the plant.Observe underground and above the ground parts carefully. Almost all flowering plants have mainly two parts :
(a) Underground part (root system) and
(b) Above ground part (shoot system)

a. Root system

Mustard is a dicotyledonous plant. It has tap root system. The tap root grows into the ground. It has primary root which goes staight down ward in the soil. Small branches of roots grow from the primary root which are called secondary roots. The growing area of the root is

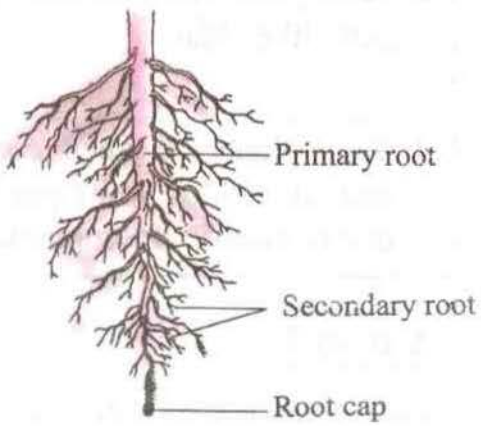


Fig No. 12.7

called root tip which is delicate and covered with root cap.
The main function of root is to give support to the plant. It also grabs the soil particles and ties them together.Root absorbes water and minerals from the soil.

b. Shoot system

This system has stem, branches, bud, leaves, flowers and fruit. Stem, branches and leaves are vegetative parts whereas flowers are reproductive parts of a plant.

Stem

Stem is an important part of a plant growing above the ground. It is green in colour. The lower part is thick and the upper part is thin. There are two types of buds in the stem one is apical(bud on the apex) or terminal bud and the other is auxillary bud (bud on the nodes).Apical buds help the plant to grow longitudinal whereas auxillary buds help to develop new branches and flowers.

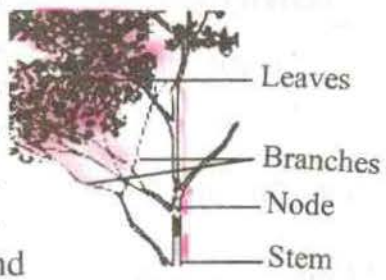


Fig No. 12.8

Generally, leaves are flat and not overlapped each other so that they all can get the sunlight equally for the preparation of food (photosynthesis). Leaves and branches are developed from the nodes in mustard plant. The part between two nodes is called internode. The stem helps the plants to stand upward. Mineral salt and water sucked by the roots is transported to other parts of the plant through stem. The food prepared in the leaf is transported through the stem.

Leaf

Mustard plant has simple leaves. The leaf consists of mainly three parts:

a. Leaf base
b. Petiole
c. Lamina or leaf blade

The leaf is attached with leaf base. The part between leaf base and lamina is called petiole. The terminating part of petiole which is flat and green is called lamina. There is mid rib in the centre of lamina from which small fibre like veins spread in the lamina. Mustard plant is a dicotyledonous plant and veins of the leaf are spread like a net like fashion. Such type of venation is called reticulate venation.

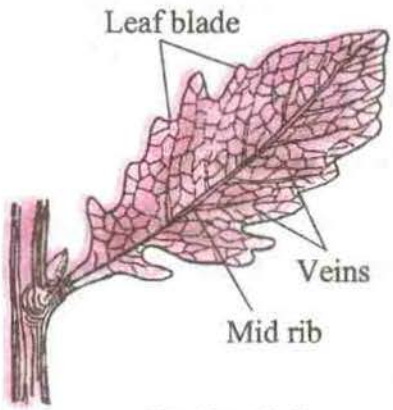


Fig No. 12.9

Activity 7

Collect the leaves of some flowering plants and compare them with the mustard plants on the basis of mid rib, veins etc.

The flower

Flower is a reproductive part of plant body.The flower of mustard plant is complete and bisexual. It consists of four parts :

There are four sepals and four petals in a flower of mustard plant. Sepals are green coloured. Sepals protect the buds. The inner part of the sepal is called petal. Petals are bright and yellow in colour and have scents. Inside the petals, there is a androecium consisting of 6 thread like structures known as stamen. They are in two circles.In the middle part of flower there is a female reproductive part called gynoecium. It is composed of two combined pistils.These four parts mentioned above play vital role in sexual reproduction.

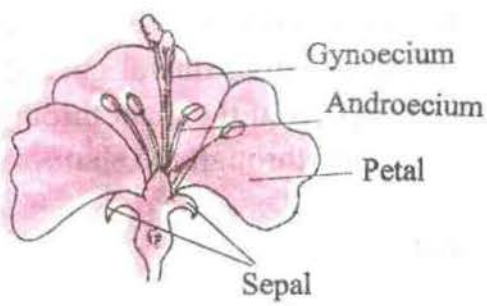


Fig No. 12.10

Vertebrates

We can find different kinds of animals in our surroundings. They are different from on another in various aspects such as shape, size, structure, habits and habitats etc. To make the study of animals easy and systematic, scientists have classified the animals into two groups :

1. Invertebrates
2. Vertebrates

The animals which have bones in their body are called vertebrates. Animals like cow, buffallo, dog, fish, hen, snakes, frog have backbones in their body.These animals cannot resist too hot and too cold.
Some animals live in water, some live on land and some live in both places. The backbones support their body and give shape also.

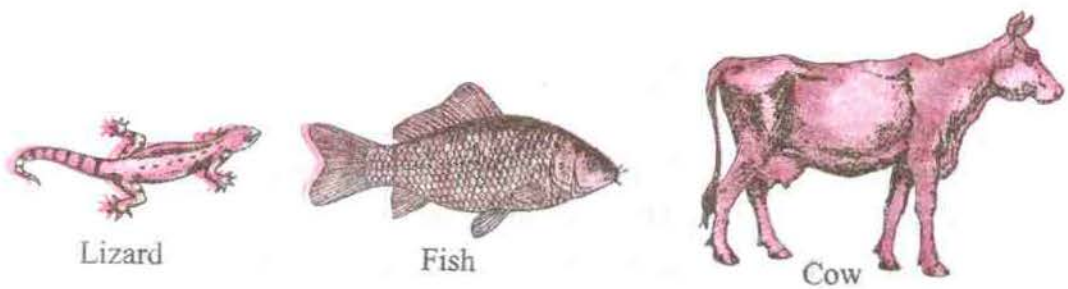
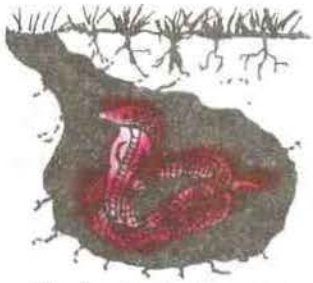
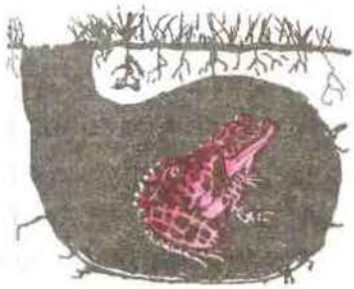


Fig No. 12.11

The animals which change their body temperature according to the temperature of surroundings are called cold blooded animals and those animals which do not change their body temperature according to the temperature of surroundings are called warm blooded animals. Fish, frog and lizard like animals are cold blooded animals. The temperature of such animals changes according to the surrounding temperature and these animals cannot resist too hot and too cold, that's why during winter season most of them go deep down in warmer places and remain inactive. This winter sleep is termed as Hibernation. They appear only when the surrounding temperaure is favourable to them.



Snake in the burrow



Frog in the burrow

Fig No. 12.12

The animals which do not change their body temperature according to the temperature of surroundings are called warm blooded animals. Different kinds of birds, dogs, horses, lions human beings etc.belong to this group. These animals have constant temperature in every climate.For example, the body temperature of human beings is constant at about 37 degree centigrade. If the temperature of human beings changes then they become ill.We wear warm clothes in winter season and thin and light clothes in summer to adapt our body temperature.

Vertebrate animals are classified into five groups:

1. Pisces	All kinds of fish.
2. Amphibia	Frog. salamander.
3. Reptilia	Tortoise, snakes, lizard, crocodile.
4. Aves	All kinds of birds.
5. Mammalia	Bat, monkey, whale, human beings.

Activity 8

Observe carefully the animals found around you and write down the name of those animals in the following table:

S.N	Pisces	Amphibia	Reptilia	Aves	Mammalia
1.					
2.					

1. Pisces

All kinds of fish belong to this group. Their bodies are boat shaped and streamlined.

General characteristics of pisces :

(a) They are cold blooded animals.
(b) They have fins in their bodies sothat they can swim in water.
(c) Respiration takes place through gills which are found under the head on left and right part.
(d) The body is covered with scales.
(e) Heart is two chambered.
(f) These animals lay eggs, so they are called oviparous.
Rohu, Asala, Sea-horse etc. are some examples of pisces.

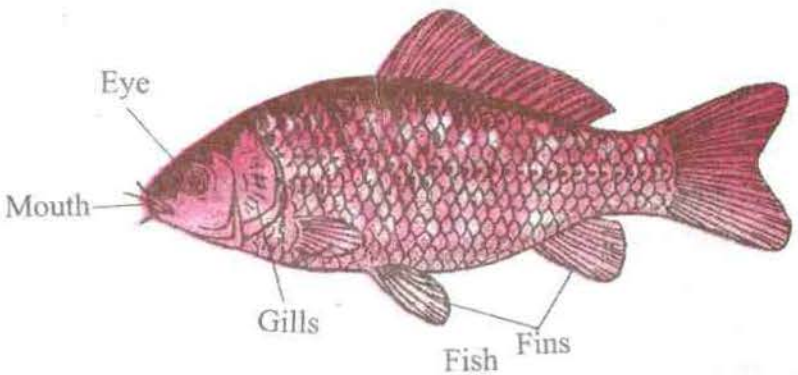


Fig No. 12.13

2. Amphibia

Frogs, toads, salamanders etc. belong to this group. These animals live in both places water and land, that's why they are called amphibians. Although these animals are more developed than the pisces, their early life starts in water.They can live in water and on land when they become adult.

Frog
Fig No. 12.14

General characteristics of Amphibians:

(a) They are cold blooded animals.
(b) The body is covered with smooth skin and moist.
(c) They have two pairs of limbs. Forelimb has four fingers whereas hind limb has five webbed fingers for swimming.

(d) Respiration takes place through gills in tadpole stage and they can breathe through the lungs and skins at the adult stage.
(e) The heart is three chambered
(f) The body is divided into two parts: head and trunk.
(g) They lay eggs in water. The body structure of adult is different from their early stage. For example, we can take tadpole and the adult frog.

3. Reptilia

Generally, the crawling animals belong to this group. Most of them live only on land whereas some can live in water, too.

General characteristics of reptiles:

(a) They are cold blooded animals.
(b) Their skin is dry and covered with hard scales. Their scales is different from the scales of fish.
(c) The body is divided into head, neck, trunk and tail.
(d) Respiration takes place through the lungs.
(e) The heart is three chambered.
(f) They lay eggs in land and well developed babies emerge from the eggs. Snakes, crocodiles, tortoises, lizards, ghariyals etc. are some examples of reptiles.

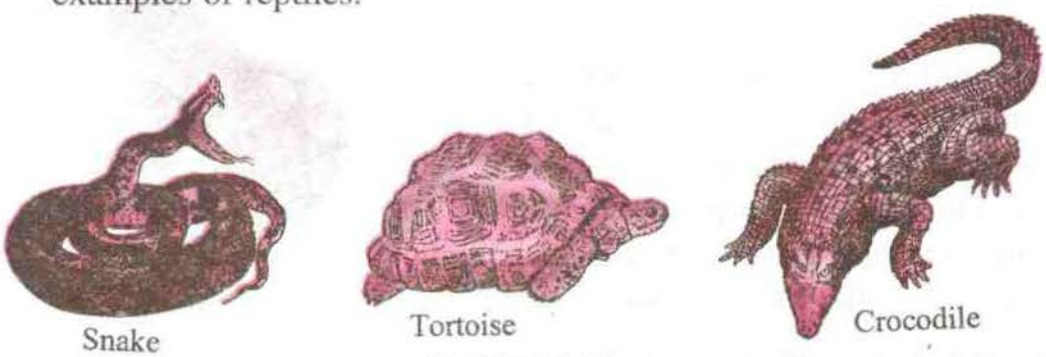


Fig No. 12.15

4. Aves

All kinds of birds belong to this group.They have feathers,that's why they can fly (aerial mode of life).They are also called flying vertebrates.Different kinds of birds are found in Nepal.

General characteristics of Aves :

(a) They are warm blooded animals.
(b) These animals have a pair of wings, limbs and a beak. The body is covered with light fur and feathers.
(c) Limbs have scales.
(d) The body is divided into head, neck, trunk and tail .
(e) They have hollow bones and air filled spaces (air sacs) in their bodies which help them to fly.
(f) The heart is four chambered.
(g) Respiration takes place through lungs. .
(h) They lay eggs and babies emerge from the eggs.
Pigeon, parrot, duck, hen, lophophorous, eagle, owl, crow, penguine etc. are the examples of aves.

Fig No. 12.16

5. Mammalia

The most developed animals belong to this group. They have mammary glands, which is the main characteristic of these animals. Most animals of this group are terrestrial (live on land). Whales, dolphins and bats are the exceptions. Whales and dolphins live in water whereas bat is a flying mammal.

General characteristics of Mammals:

(a) They are warm blooded animals.
(b) Their body is covered with small hairs.
(c) Respiration takes place through lungs.
(d) The heart is four chambered.

(e) They have Mammary glands. Females have well developed mammary glands for feeding milk to their babies.

(f) They directly give birth to their babies that's why they are called viviparous.

Bat, rat, rabbit, cow, lion, whale, dolphin etc. are the examples of mammals.

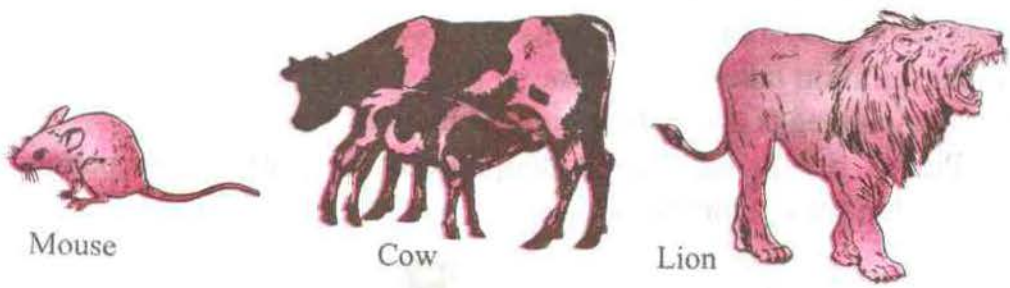


Fig No. 12.17

Summary

1. The general characteristics of plants are:
   - Presence of chlorophyll in their cells.
   - They prepare their food themselves by the process of photosynthesis.
   - Continuous growth of the body parts, that is, regeneration.
2. Mushroom, fungi, mucor, fern etc.belong to non-flowering plants (cryptogams).
3. Flowering plants have root, stem, leaf and flower.
4. Those animals which change their body temperature according to the temperature of surroundings are called cold blooded animals.
5. Those animals which do not change their body temperature according to the temperature of surroundings are called warm blooded animals. They have constant temperature in their bodies.
6. Vertebrate animals are divided in to five groups: pisces, amphibia, reptilia, aves and mammalia.

7. Fish live in water and have fins, gills and scales in their bodies.
8. Amphibians live in both places water and land.They have smooth body and lungs.
9. Reptiles are crawling animals with hard scales in their bodies. Some reptiles are aquatic and some are terrestrial.
10. Birds have fur, feathers, beak and wings in their bodies. Air sacs are present in their bodies to make them light and fly easily.
11. Hairs and mammary glands are present in the bodies of mammals and they have four chambered heart.

Do, observe and learn

1. Observe the fish and birds. Then write down the similarities and dissimilarities in the following table :

Animal	Similarities	Dissimilarities
Fish		
Bird		

2. Identify and list the name of animals you have seen around your surroundings on the basis of feathers, scales and hairs. Fill up the following table.

S.N	Feathers	Scales	Hairs
1.			
2.			
3.			

Exercises

1. Answer the following questions in brief.

(a) Write two general characteristics of plants.
(b) Give three examples of non-flowering plants.
(c) Show the differences between flowering and non-flowering plants (any three).

(d) Write the name of the main parts of mustard plant.
(e) What are the three characteristics that can help the birds fly.
(f) Which organ helps a tortoise to swim in water.
(g) What do you understand by warm blooded and cold blooded animals.
(h) Write the name of five animals which lay eggs and other five which give birth to the babies.

2. Tick (✓) the correct statements and cross (x) the flase ones.

(a) There is no chlorophyll in animal cell. ( )
(b) Rat is a vertebrate animal. ( )
(c) All animals are multicellular. ( )
(d) Rabbit is an egg laying animal. ( )
(e) Crocodile is a reptile. ( )
(f) Frog is an aquatic animal. ( )

3. Fill in the blanks:

(a) The root hairs ..... water and minerals from the soil.
(b) The body of cat is covered with .....
(c) Pigeon is ..... laying animal.
(d) ..... is found in fish, snake and lizard.
(e) ..... is present in the bodies of vertebrates.
(f) The warm blooded animals can tolerate ..... and .....

4. Match the following:

A	B
1. Four-chambered heart	( ) fish
2. Two-chambered heart	( ) Bird
3. Three-chambered heart	( ) Man
4. Lungs	( ) Tadpole
5. Gills	( ) Tortoise
	( ) Deer

5. Select the correct answer:

A. Which one is the function of sepal?
(i) To protect the bud of the flower.
(ii) To make the flower attractive.
(iii) To produce pollen grains, (iv) To produce ovule.

B. Which one is a vertebrate animal?
(i) Earthworm (ii) Butterfly
(iii) Bat (iv) Leech

C. Which animal gives birth to the baby?
(i) Parrot (ii) Peacock
(ii) Fish (iv) Pig

D. Which animal has no backbone?
(i) Wall lizard (ii) Cockroach
(iii) Lion (iv) Goat

E. Which one is the locomotory organ of duck?
(i) Wings (ii) Web
(iii) Waves of water (iv) Feather

F. Which one is the respiratory organ of aquatic animal?
(i) Lungs (ii) Skin
(iii) Gills or skin (iv) Trachea/windpipe

6. Draw figures of the following animals and plants:

Fish, Lizard, Cow, Frog, Parrot, Spirogyra, Mushroom, Fern.

7. Give three examples of egg laying and baby producing animals with figures.

8. Draw a figure of mustard plant and label it.

9. Identify the habitats of the follwing animals.

Crocodile, fish, tortoise, snake, man, rabbit, monkey, frog, horse, bat, pigeon, whale.

10. Visit a zoo or a picnic spot near your home with your family members or with your friends. What type of animals and plants you found there? List down the names of these animals and plants in separate tables.

CELL

The body of animal is made up of skin, muscles, bones etc. Whereas the plant body is made up of root, stem, leaf etc. Bodies of all animals and plants are made up of very small unit called cell. The body of every living being is made up of cells. The life processes required for a body, such as growth, locomotion, sense of response, respiration, reproduction etc. are taken place in the cell. Cell membrane, protoplasm, and nucleus are present in each cell. Cell is covered with cell membrane from the out side which can help to protect it. The space inside the cell membrane is filled with the semi-liquid, called protoplasm. It is a colourless substance like water. There are many other substances which are floating in the protoplasm, For example, vacuole, plastid, centrosome, mitochondria etc. All these parts (cell organelles) have different functions. A small egg shaped (rounded) mass found in the protoplasm, is called nucleus. It conducts the differents functions of cell. It has important role in cell division. Nucleus also helps to transfer the genetic characteristics to the new generation. The mitochondria is present in cell that can store the energy obtained from the food.

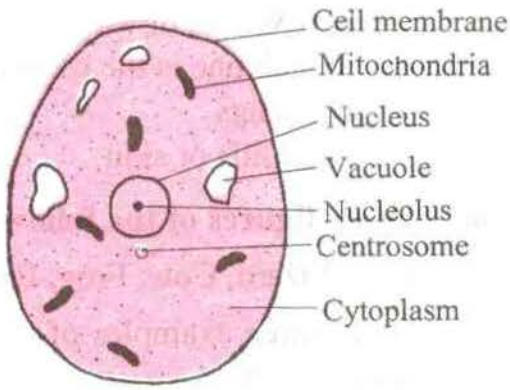


Fig No. 13.1

Structural and functional unit of a living thing is called cell or, cell is taken as a structural and functional unit of a living thing.

Shape and size of the cell

Cells are found in different shapes and sizes. Some are bigger while some are smaller, some are flat, some are elliptical, some are cubical,

spindle, spherical etc. The shapes of the cells in animals and plants are different. Generally, most of the cells are very small in size. They cannot be seen by the nacked eye. We need microscope to see these cells. But some cells are bigger in sizes so that they can be seen by the naked eye.

The smallest cell of human being is the red blood cell. The biggest and longest cell is the nerve cell.

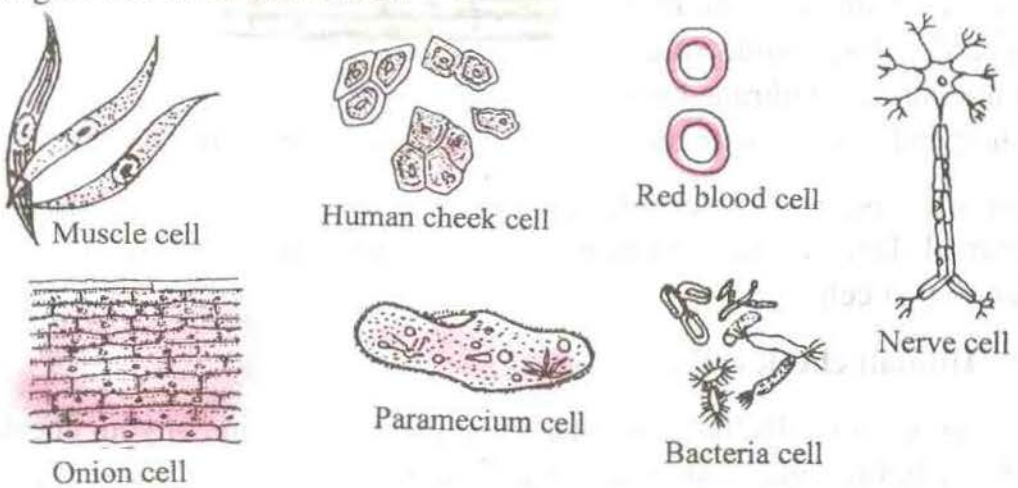


Fig No. 13.2

The shapes of the cells differ according to their functions. Unicellular organisms like amoeba, white blood cells (WBC)) frequently change their shapes whereas nerve cells, red blood cells (RBC), and plant cells have fixed shapes.

Activity 1

(a) Onion cell:

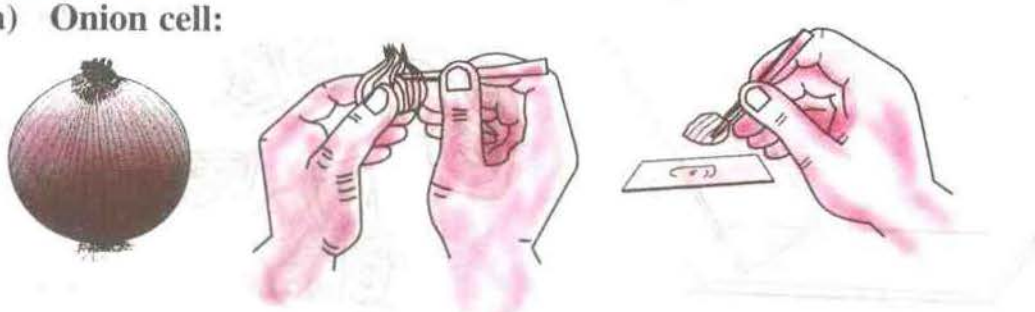


Fig No.13.3

Differences between plant cell and animal cell:

Animal and plant bodies are made up of cells. In plant cell, the outer most layer of the cell membrane is covered with a thick and strong layer. This is called cell wall. It is made of non-living substance, called cellulose. It can protect the cell from outside damage. Cell wall is absent in animal cell.

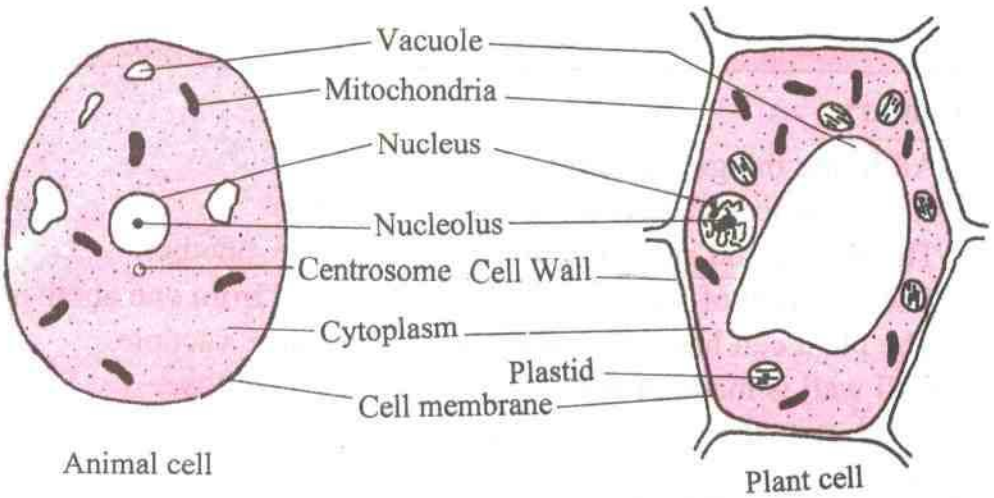


Fig No. 13.6

A plant cell has big vacuoles. These vacuoles are present in large number in a plant cell. In an animal cell, small and temporary vacuoles are present but they are limited in numbers. Different vacuoles have different functions. Some vacuoles store food and some collect water. Most of the plants have their leaves green. Plants look green due to the presence of chlorophyll. Flowers are of different colours. But the roots are white or brown in colour. Plastids are found in plants cell, due to plastids, different parts of a plant possess different colours. Such plastids are completely absent in an animal cell. An animal cell has centrosome but it is totally lacking in plant cell. In animal cell, the centrosome is present near the nucleus. It plays the important role in cell division. As shown in the above figure, the cytoplasm is present at the side of the cell due to vacuoles in the plant cell. But in an animal cell, all the parts of the cell is full of cytoplasm. Other substances are floating in this cytoplasm.

Exercise

1. Write in brief:

(a) What is cell?
(b) What are the functions of the following cell organelles: nucleus, cell wall, cell membrane, plastid, mitochondria, vacuole?
(c) Cells are of different shapes and sizes. Explain why?
(d) Write down the three differences found between the plant and animal cells.
(e) Why is cell important?

2. Fill in the blanks with an appropriate word:

(a) Different activities of a cell are conducted by .....
(b) Plant cell has a big .....
(c) ..... is found in animal but it does not find in plants.
(d) Cell wall is made of .....
(e) ..... is an important organelle of cell.

3. Tick (✓) the correct statement and cross (x) the wrong one:

(a) Some plants and animals have a single cell. ( )
(b) Cells have no different shapes and sizes. ( )
(c) In an animal cell, big size of vacuoles are present and they are large in number also. ( )
(d) The main function of cell is conducted inside the nucleus. ( )
(e) An egg is a cell. ( )

4. Match

A		B
(a) Amoeba	( )	Coloured plastid
(b) Red rose	( )	Non-living things
(c) Cell wall	( )	Unicellular organism
(d) Nerve cell	( )	Cell division
(e) Nucleus	( )	Long cell
	( )	Centrosome.

5. Choose the correct answer:

(a) The outermost layer of animal cell is called .....

(i) cell wall
(ii) cell membrane
(iii) Nucleus
(iv) None of the above

(b) Which one is not found in plant cell?

(i) Plastic
(ii) Nucleus
(iii) centrosome
(iv) plastic

(c) Which one is not an unicellular organism?

(i) Amoeba
(ii) Paramecium
(iii) Euglena
(iv) Earthworm

(d) What is the main function of nucleus?

(i) To help in cell division
(ii) To protect the cell
(iii) To help in growth of the cell
(iv) All of the above

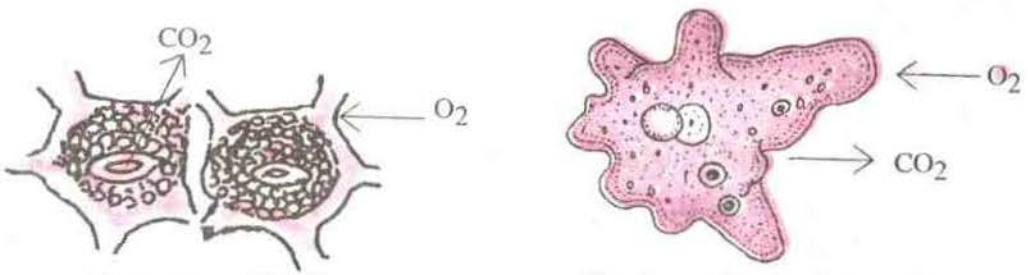
(e) What is the shape of amoeba?

(i) Fixed
(ii) Not fixed
(iii) Spindle
(iv) egg-shaped (elliptical)

6. (a) What are the differences between animal and plant cells? Show in figures.
(b) Draw a figure of a plant cell and label it, what can be seen under microscope.

Respiration

We can get energy from food. When oxygen is combined with food, it gives energy. All life processes of living beings are conducted due to this energy. All living things (Plant and animal) respire. Living beings take oxygen and give out carbon dioxide during breathing. The oxygen taken in this way is combined with carbohydrate and glucose present in food, and produces carbon dioxide, water and energy. Carbon dioxide gas is given out on breathing. Thus, the respiration is the process by which the energy is released after chemical breakdown of food due to oxygen.



Stomata of leaf Body surface of amoeba

Fig No. 14.1

Respiration takes place in different ways in plants and animals. Respiration process is simple in plants. It takes place through stomata in plants. Unicellular organisms living in water respire through the general body surface.

In multicellular animals, the breathing takes place through the different organs developed in their bodies:

(a) **Skin:** Some animals like earthworm, leech, frog have thin and moist skins in their bodies. These animals take oxygen and give out carbon dioxide through the skins.

(b) **Air tubes:** Insects have small air tubes in their bodies. Respiration takes place through these air tubes.

(c) **Gills:** Fish and tadpole respire through gills.

(d) **Lungs:** Adult frog, reptiles, birds and mammals have lungs in their bodies. respiration takes place through the lungs.

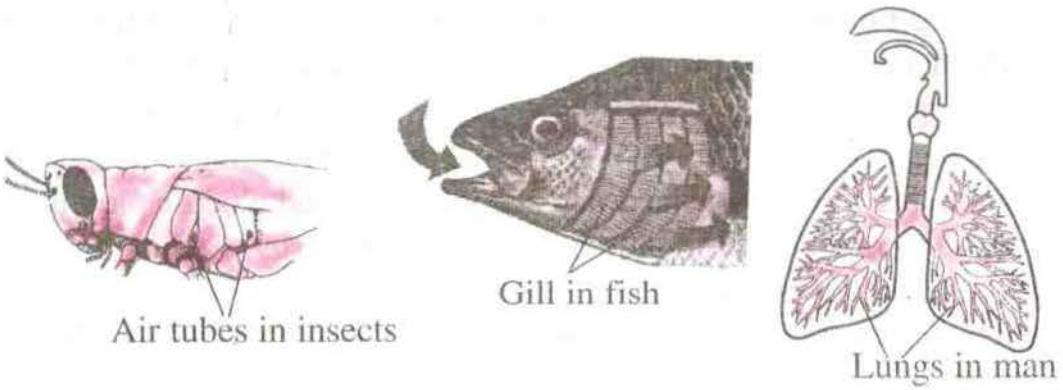


Fig No.14.2

Activity 1

The following activity can prove that the carbondioxide is exhaled during breathing.

(a) Take two round bottom flasks. Keep wet cotton at their bottoms. Put 10 soaked grams in the flask 'A' and 10 boiled grams in the other flask 'B'. Cover the mouth of each flask with a lid. Keep the flask 'A' in a place where it can get enough light and warmth until germination takes place. Take a test tube with lime water. When the seeds germinate, slowly open the lids of both flasks and invert the neck of the flasks in the test tube containing lime water. Shake well the test tube and observe that which one changes the lime water milky?

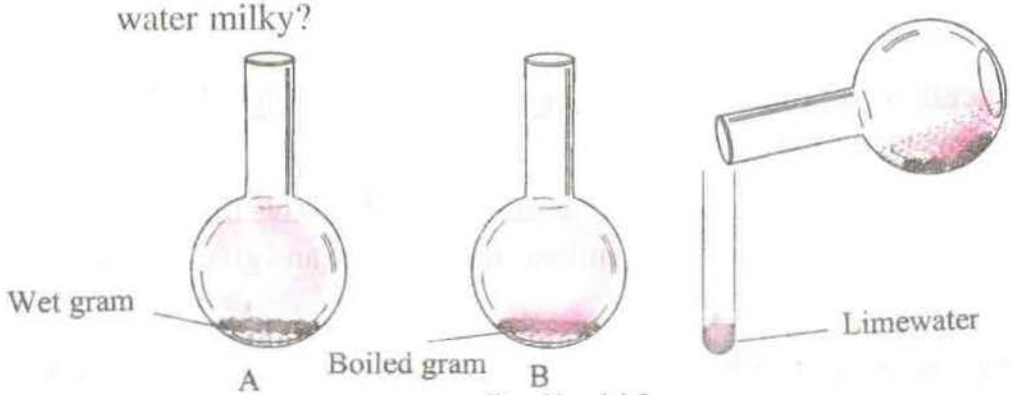


Fig. No. 14.3

(b) Take some lime water in a test tube. Using straw (plastic, tube) blow into the test tube slowly. Observe, what has happened to the colour of lime water? What is the conclusion?

In breathing process, oxygen is taken and carbon dioxide is given out. Different organisms have different organs for breathing.

Excretion

In all living organisms (animal and plant), various life processes take place in order to conduct daily life activities. Such activities not only produce useful materials but also form some waste materials. Carbon dioxide, urea, ammonia, water etc. are some examples of excretory materials produced by the complete digestion of carbohydrates, proteins and fats. Among them, all excreta are poisonous in nature and harmful to the body except water. It is necessary to throw these waste materials from the body. A living body has several organs to remove such excreta.

Excretion in plants:

(a) A plant takes carbon dioxide and gives oxygen during photosynthesis. A plant uses this oxygen for breathing. Thus, plants use the by-products produced in one activity in other activity.

(b) Ammonia is produced in digestion of protein compounds which is reused in the formation of new compounds.

(c) The dead bark of trees fall off as they become old. This is also a kind of excretion.

(d) Plants transpire excess water from the stomata present in their leaves. This is also an example of excretion.

Some waste materials of plants like gums, resins, latex, vapourable oils etc. are stored in different parts of a plant. They do not harm the plant. Generally, these types of excretory materials are stored in fruits, flowers, leaves, stems and roots of a plant. The lower aquatic organisms like amoeba, hydra, etc. don't have any special organs for excretion. They excrete waste material through the general body surface into water by

the process of diffusion. In higher organism, special organs or systems are present for excretion. Skin, nose, mouth, lungs, large intestine, liver, kidney are the main organs responsible for excretion.

Respiration in human beings

There is a well developed respiratory system in human body. Nose (Nostrils), wind pipe (Trachea) and lungs are organs of this system. Air from the atmosphere passes in the lungs through wind pipe. The process of taking oxygen and giving carbon dioxide takes place in air sacs present in the lungs. The air containing carbon dioxide gas is thrown out through nose. Blood absorbs oxygen from lungs and transports it to different parts of the body through blood vessels. In the cells, reaction takes place between the molecules of oxygen and glucose and energy is produced there. Carbon dioxide and water are produced as by-products which are to be thrown out of the body. The following activity shows the process of inhaling and exhaling of oxygen and carbon dioxide during respiration.

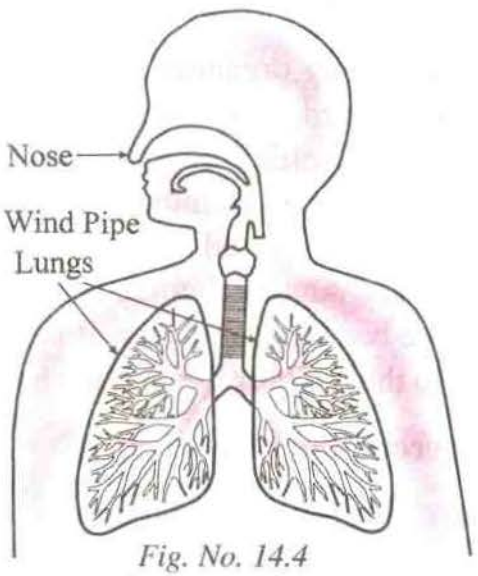


Fig. No. 14.4

Activity 2

Take a looking glass (mirror). Bring your mouth near the glass and blow into it. Did you see droplets of water on the surface of mirror? Where are they coming from?

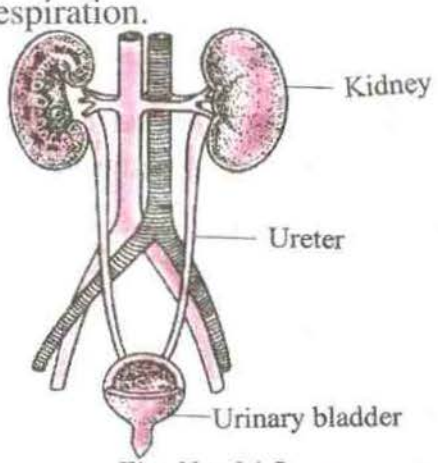


Fig. No. 14.5

Excretion in human beings

In human body, excretion takes place through different organs. Followings are some excretory organs of human body:

Lungs	The lungs remove carbon dioxide and water produced during breathing.
Skin:	Skin removes urea, mineral salts and excess water in the form of sweat.
Large intestine:	The undigested food passes out in the form of stool (faeces) through large intestine, rectum and anus.
Kidneys:	The undigested water, salts, urea, uric acid etc. are removed in the form of urine through kidneys.

Summary

1. Generally, the process of taking in oxygen and giving out carbon dioxide from a living body is called breathing.
2. Respiration is the process by which energy is released due to oxidization of food.
3. In plants, the respiration takes place through leaves in general.
4. In lower aquatic organisms, respiration takes place through the general body surface.
5. In higher animals, various organs like skin, wind pipe, gills, lungs etc. present in their bodies. They respire through these organs.
6. In plants, the waste materials produced during excretion from one activity are useful to another activity. Some waste materials are stored in various parts of a plant.
7. In lower animals the excretion takes place through the general body surface whereas excretion takes place through the special organs like skin, nostril, mouth, lungs, large intestine, kidneys etc. in higher animals.
8. Nose, wind pipe (Trachea) and lungs are the main organs of respiratory system in human body.

Do, observe and learn

1. (a) You can see lung, kidney-like organs of animals in a meat shop. Go there and observe carefully.
   (b) Buy a lung of (goat/ animal) from a meat shop or any other place with the help of your friends. Observe trachea, shape of the lung, structure etc. carefully. Draw a figure of this lung and label the parts in it.
2. Draw a big size figure of excretion process conducting through the kidneys in human body and label the different parts (organs) of it.
3. You are provided following materials. Prepare a model of lungs and demonstrate the air in taking and out going process. Balloon-2, Bottle-1, cork, thin plastic sheet, rubber tube, y-shaped tube, string (thread) etc.

Exercise

1. Write answer of the following:

(a) In winter (cold) season, we throw urine frequently which is clean and colourless. But in hot season, we do not throw urine frequently and it is not clean and clear. why? Can you give reason?
(b) Which organs take part in respiration in animals?
(c) What are the parts (organs) of plants that collect or store the waste materials produced during excretion.
(d) What are the excretory organs in human body? What types of waste materials they throw out of our body?
(e) What is meant by respiration?

2. Fill in the blanks:

(a) Breathing is to take in ..... and give out .....
(b) Urine contains ..... as main substance other than water.
(c ..... materials is thrown out of the body during excretion.
(d) In digestive system, the undigested food materials are removed through .....

3. Tick (✓) the correct statement and cross (x) the wrong one:

(a) The reaction between oxygen and food takes place inside the cell. ( )

(b) Unicellular animals respire through skin. ( )

(c) Respiration takes place through the lungs in insects. ( )

(d) Nose and mouth are also the organs of excretion. ( )

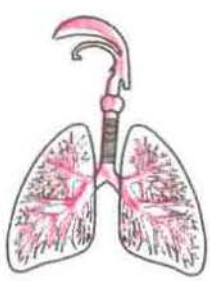
(e) Urea, uric acid, carbon dioxide are some examples of waste materials. ( )

4. Match the following:

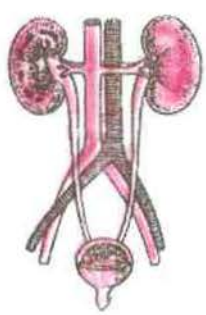
(a) Kidney	( )	sweats
(b) Lung	( )	urea
(c) Skin	( )	air
(d) Wind pipe	( )	respiratory organ
	( )	Blood circulation.

5. Write name of the following figures:

(a)



(b)



(c)

6. Define the following with examples:

Breathing, excretion, lungs, waste materials

7. Choose the correct answer:

(a) Which one is the air taking organ for breathing in plants?

(i) root (ii) flower
(iii) fruit (iv) leaf

(b) Which one organ takes part in respiration in a human body?

(i) lungs (ii) heart
(iii) urea (iv) skin

(c) Which materials release during respiration?

(i) water (ii) carbon dioxide
(iii) urea (iv): (i) and (ii) both.

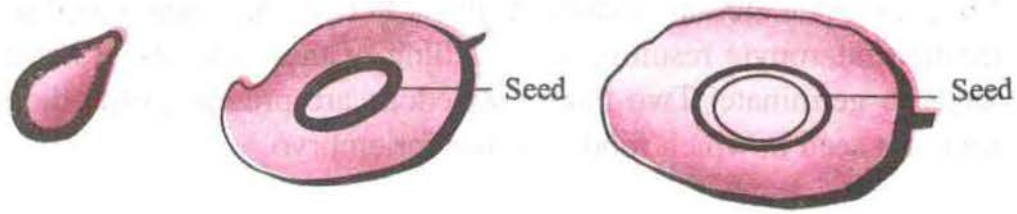
(d) During respiration, change in amount of nitrogen in air is .....

(i) maximum (ii) minimum
(iii) maximum and minimum alternatively
(iv) not changed.

Unit - 15

SEED

Seeds are of different shapes and sizes. Some seeds are big and some are very small that can hardly be seen. Pumpkin seed, mango seed, coconut seed etc. are some examples of bigger seeds.



Pumpkin seed Mango Seed Coconut seed

Fig. No. 15.1

Seeds of different plants vary in their structure, shape and size. However, the basic structure of all seeds is the same. To understand about the structure of different seeds, do the following activity:

Activity 1

Take some seeds of cereals like gram, pea, maize etc. and soak them in water for at least 12 hours. The seeds swell when they absorb water. Sketch the structure in your note book. Now carefully take out the seed coat, observe the internal parts and draw figures. Do you get any similarities?

Dicotyledonous seed

Gram pea bean castor

Fig. No. 15.2

The outermost layer of a seed is called seed coat or testa. It is a protective covering of a seed. It protects the seed from outer damage and microbes and insects.

Hilum is a distinct scar left by the stalk. It represents the point by which the seed is attached to the fruit.

There is a small pore near hilum, called micropyle. When the cereals like gram, pea etc. are soaked in the water, at that time water passes through micropyle resulting the swelling of these cereals. It helps the seeds to germinate. Two thick cotyledons are present inside the seed coat of a seed in which food is stored for embryo.

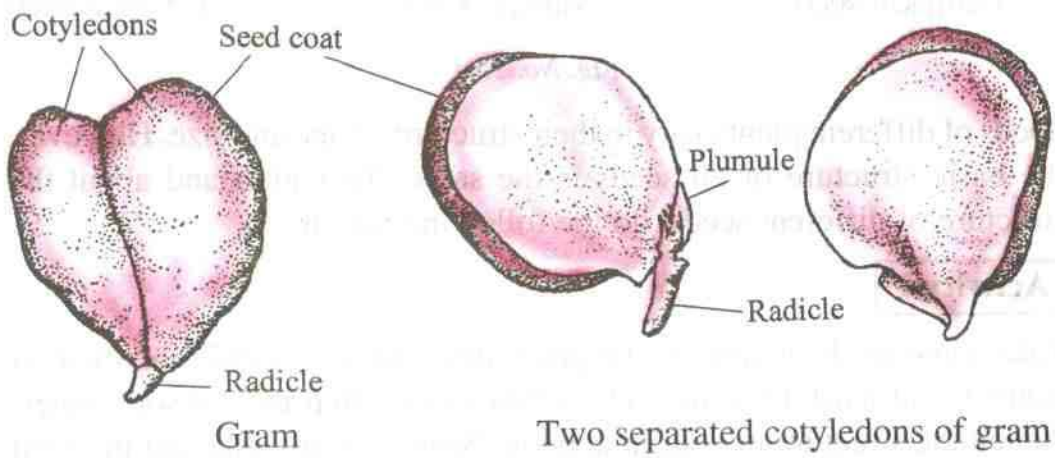


Fig No. 15.3

The cotyledons remain attached to the embryonic axis. If we separate these two cotyledons slowly, The small embryo is found attached with one of the cotyledons.

Embryo has two parts:

(i) Radical (Future root)
(ii) Plumule (Future stem)

Radical grows into root system and plumule grows into shoot system of plants. Cotyledons of seed store food for growing embryo. Embryo gets

food from the endosperm. Generally, it is absent in most of the seeds. Due to this, food is stored in cotyledons during the maturation of seed. Such type of seed is called non-endospermic seed. Bean, gram, pea etc. are non-endospermic seeds. The dicotyledonous seed of castor is endospermic one.

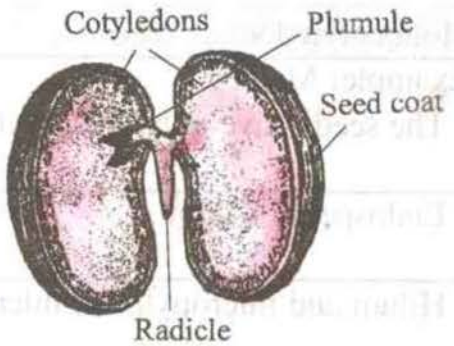
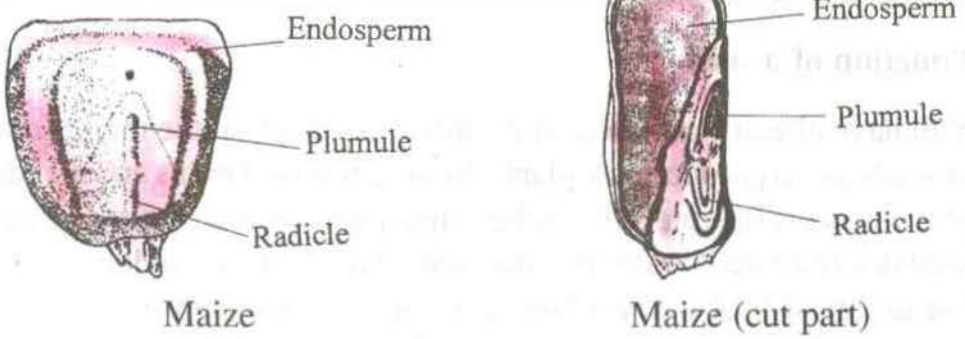


Fig No. 15.4

Monocotyledonous seed



Maize Maize (cut part)

Fig No. 15.5

Maize is an example of monocotyledonous seed. On one side of a maize grain, there is a light white coloured small elliptical (egg-shaped) area in which the embryo resides. The major portion of the seed (remaining portion) is occupied by yellow or white coloured food material which is called endosperm. Thus, maize is an endospermic seed. In a maize grain, a thin membrane separates the endosperm and the embryo. There is a radical in the pointed part of a maize seed whereas plumule is present in the flat part. Rice, wheat, barley etc. are also endosperm seeds like maize,.

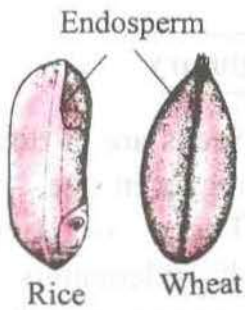


Fig No. 15.6

Differences between Monocotyledonous and dicotyledonous seeds:

Monocotyledonous seed	Dicotyledonous seed
(Example: Maize) 1. The seeds have only one cotyledon	(Example: Bean) 1. The seeds have two cotyledons.
2. Endosperm is large.	2. Generally endosperm is absent.
3. Hilum and micropyle are microscopic.	3. Hilum and micropyle are distinct.
4. Embryo is very small.	4. Embryo is large.
5. Plumule is very small.	5. Plumule is large.
6. Single grain acts as a seed, no separate seed.	6. Seed is present inside the fruit.

Function of a seed

You have already known in your previous class that the major functions of seeds are to produce new plants, to store food materials and the function of seed coat is to protect the embryo from microbes and insects. Actually, seed is a fertilized ovule. It is also called the embryo in dormancy state. For the growth of a new plant (germination), the embryo protected by the cotyledons is responsible. When the seed gets suitable conditions of air, water and warmth, it germinates into a seedling. Most of the seeds have to pass through a state of dormancy before germination. The seed just taken from a plant cannot germinate even when provided with all the conditions necessary for germination.

Summary

1. Seeds are of different sizes. Some seeds are small and others are bigger in size.
2. There are two kinds of seeds-monocotyledonous and dicotyledonous.
3. Seed protects the embryo and helps to grow it when the condition is favorable.

Do, observe and learn

1. Take some seeds of monocot and dicot plants. Keep them in the places where they can get favorable conditions for germination. Observe day by day alternately until the green leaves come out. Did you find any differences? Note down in your exercise book.

Exercise:

1. Write in brief:

(a) Give two examples of endospermic and non-endospermic seeds.
(b) Where do germinating seeds get food from?
(c) The newly made seed canot germinate even when it is provided with favorable conditions for germination. Give reason, why?

2. Correct (If necessary) and rewrite the following statements:

(a) The function of seed is to protect embryo.
(b) Stem grows from radical whereas plumule grows into root.
(c) Seeds in a fruit are attached with the help of micropyle.
(d) A thin membrane separates endosperm and embryo in maize grain.

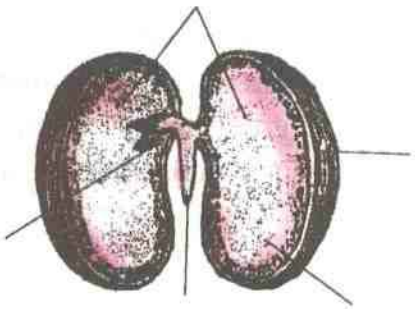
3. What are the functions of following parts of a seed:

(a) Seed coat
(b) Micropyle
(c) Endosperm
(d) Radical

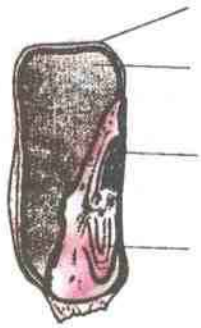
4. Differentiate between:

(a) Radical and plumule
(b) Endospermic seed and non-endospermic seed.
(c) Monocotyledonous seed and dicotyledonous seed.
(d) Hilum and micropyle

5. Label the given figures:



Seed of bean



Seed of maize.

Unit - 16

EARTH

The earth originated about 450 billion years ago. At that time, it was in the form of a red ball of molten mass. The earth rotates on its own axis and revolves round the sun. It takes 24 hours to complete one rotation in its own axis and one year for the one complete revolution round the sun. The earth is not perfectly round like a ball. It is somewhat flat at the two poles and bulging out at the equator. Because this we can compare the earth with an orange in terms of shape.

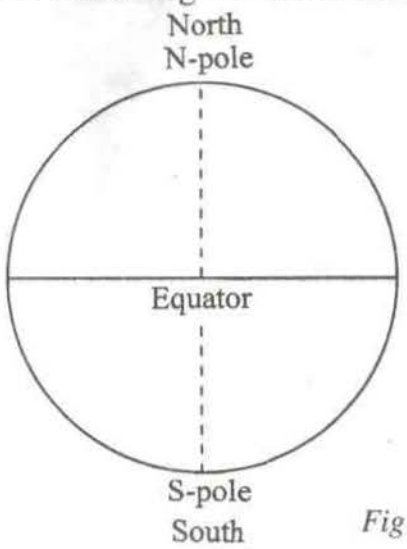


Fig No 16.1

Orange

The diameter at the equator is about 12,792 kilometer and it is 12,756 kilometer at the poles. Thus, the difference between two diameters is only 36 km. The earth appears approximately round from the space.

Inside the Earth:

The earth has been revolving round the sun and rotating on its own axis since its origin. Its outer surface seems to be cold and hard, but its inner part is hot and molten even now. The temperature of earth increases as we go deep. The condition of the earth is just like a roasted potato ball. It seems to be contracted and cold on the outer surface but it is hot in the centre. The outer surface of the earth contains mountains, plain land, ocean, solid rocks etc., but in the inner part, it contains molten rocks and metals.

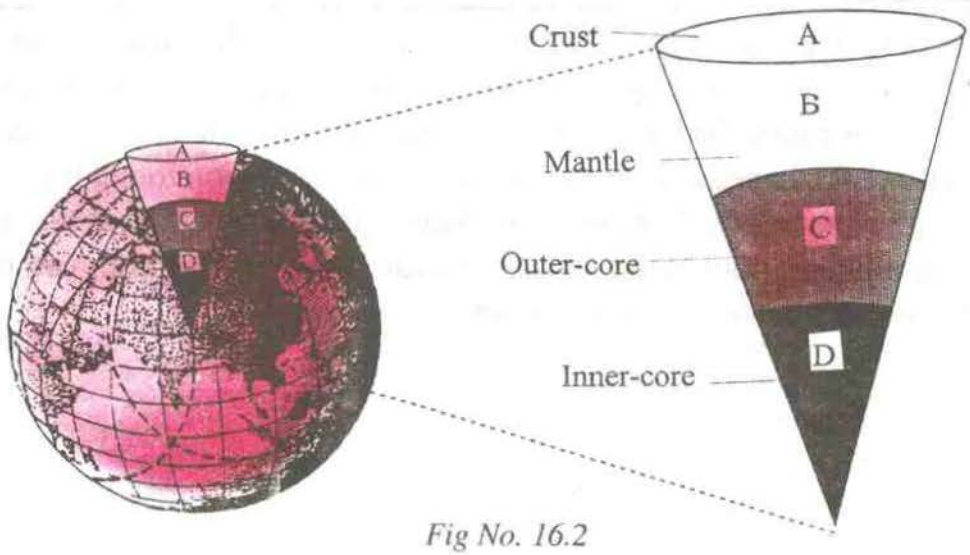


Fig No. 16.2

The earth is divided into 4 layers based on the structure and condition of the rocks. They are as follows:

(a) Outermost layer or crust
(b) Mantle
(c) Outer core
(d) Inner core

(a) Crust:

Crust has a thickness of about 5 km to 50 km. It has a major composition of silica and alumina. The atmosphere is present above the crust having thickness of about 300 km. Besides, the rocks, ocean, soft soil, plants and animals are found in this layer.

(b) Mantle:

The thickness of this layer is about 3000 km. The rocks in this layer are red hot and they are flexible. This layer contains mainly iron, magnesium and silica. The density of the rocks in this layer is 2 to 3 times greater than the rocks on the outer surface. The temperature of this layer is about 750° C to 2500° C.

(c) Outer core:

This is below the mantle. The thickness of this layer is about 2100 km. The metals such as iron, nickel, cobalt are found in molten state. The temperature of this layer may be 2500° C to 3000° C.

(d) Inner core:

This layer has a thickness of about 1300 km. In this layer iron and nickel are found in large amount. The temperature of this layer may be 3000° C to 5000° C. Due to high pressure, the materials at this layer are found in solid state. The rocks it this layer are 5 times denser (heavier) than the rocks of the outer core.

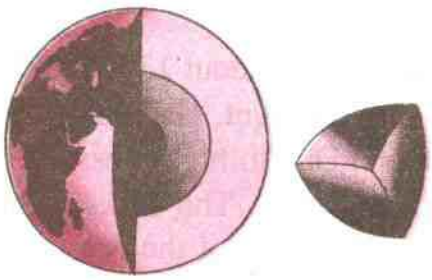
30% of the surface of earth is covered by land and about 70% is covered by water. The depth of the ocean is about 4000 m. It is 11,000 m. in some places.

Summary

1. Earth is a round-shaped heavenly body. The equatorial diameter of the earth is 12,792 km. and the polar diameter is 12,756 km.
2. The inner part of the earth is divided into four layers: Crust, Mantle, Outer core and Inner core.
3. The crust has a thickness of about 5 to 50 km. The rocks in the crust are hard.
4. The thickness of mantle is about 3000 km. The temperature of this layer is about 750° C to 2500° C. Rocks in this layer are flexible and like plastics.
5. The outer core is made of heavy metals such as iron, nickel, cobalt etc. They are in molten state. The temperature of this layer is about 2500° C to 3000° C. The thickness of this layer is about 2100 km.
6. The inner core is made of iron and nickel like metals. The temperature of this layer ranges from 3000° C to 5000· C. Due to maximum pressure the rocks are found in solid state.

Do, observe and learn

Prepare a model of the earth showing different layers inside it.



Model of the earth.

Make a ball of soil. Cut out 1/4 part of it when the ball becomes harder. Now use different colours to represent crust, mantle, outer core and inner core of the earth. You can use brown, red, yellow and white colours for crust, mantle, outer core and inner core respectively. On the outer surface of the earth, use blue colour for ocean and brown colour for land.

Exercise

1. **Write in brief:**
   (a) How long before the earth was originated?
   (b) What is the equatorial and polar diameter of the earth?
   (c) How many layers are there in the earth? What are they?
   (d) What kinds of materials are found in crust, mantle, outer core and inner core of the earth?
   (e) Write down the thicknesses of 4 layers of earth.
   (f) Although the inner core of the earth has very high temperature, it is found in solid state. Why?
2. Sketch different layers of the earth. Also give thickness and temperature of these layers.
3. What is the difference between outer core and inner core of the earth?

Unit - 17 SOIL EROSION AND DEPOSITION

The movement of soil due to different circumstances such as rainfall, land slide etc. is called erosion. Due to rain fall, strong water current in the river, wind, frost,glacier, extreme heat and cold effect on the rocks, they begin to crumble into pieces and in due course of time, turn into soil and sand. Earthquake also shakes the earth which makes the top soil weak. The soil, sand etc. are moved away by means of wind, rain fall, river water, erosion etc. and deposited somewhere. This process is called deposition. Generally, erosion and deposition go side by side.

Almost in all the parts of the earth, erosion and deposition take place due to wind, water and heat. We can get information about the erosion and deposition by observing the places around us, and find the answers of how and why. Hill sides, river sides are some special places where the erosion and deposition take place frequently. These places are proper for observation.

The main factors that cause the erosion are air, water and heat.

The atmosphere of the earth becomes hot and cold due to the sun. Wind is the result of moving air and water is the cause of river, frost glacier, tides etc.

How do these factors cause erosion?

Due to constant heat and rainfall on the rocks, they become weaker and weaker. The rocks begin to crumble into smaller pieces and becomes sand particles. The stones which undergo erosion become round in shape. The sand, soil and small pieces of stones or gravels are deposited at a certain distance on a plain surface by the river. As the rivers flow down

the hill, they carry boulders and stones with them. The boulders and stones get crushed and rubbed and they become smaller in size. A part of it changes into sand. These are deposited by the rivers as it flows down to the plain surface.

The soil from the earth surface is deposited away (at distance) due to speedy air or wind. Specially, in desert, wind moves sand particles. The sand particles thus moved hit the stones and rocks which undergoes erosion.

After erosion the sand is formed. Extreme heat helps in the expansion of the rocks in the day time and during night they cool down and become contracted. Thus heating and cooling go side by side. In the extreme hot places the process of heating and cooling of rocks take place. During many years the rocks and stones becomes weaker and weaker and finally converts in to soil. In the cold regions, water in the traps of rocks. Changes into ice. The ice occupies more space than water. Due to this reason, the rocks begin to crack. In due course of time, the rocks begin to break and change into smaller boulders. After erosion, soil, sand and pieces of stones are deposited at low land, bank of the river, at the base of the hills and other places and they convert into the soft soil. Plants grows in that soil where the water is available, and dead plants decay and mix with the soil then it becomes black.

Structure of the soil:

Due to frequent erosions and depositions, stones on the surface of the earth gradually change into the soil. The kind of soil formed in this way depends on the structure of stones. The colour of soil may be red, yellow, brown and black. The colour of soil may differ from place to place. Plant can grow on the top soil. The dead plants decompose into soil and small organism like earthworms, insects are present in this soil. They also die and decompose. The colour of top soil becomes black due to the colour of decayed plants and animals.

Soil Profile:

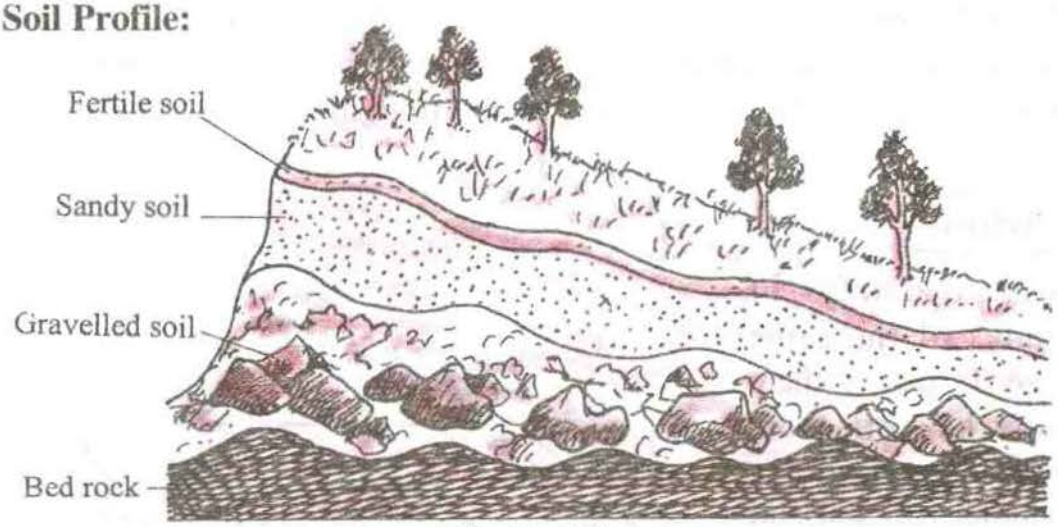


Fig No. 17.1

Soil profile is a figure which shows the different layers of soil and its composition. Generally, humus, dead and decayed plants and organisms, roots of plants and some organisms are present in the top soil. The colour of top soil is blacker than the sub soil. The soil becomes compact as we go deeper down due to the pressure created by the top soil. Soil also contains the pieces of stones (gravel). If we go further deeper down, we will get large rocks and stones. In the innermost layer of the soil, a flat single rock is found that is called bed rock. The profiles of the soil differ from place to place. We can get the bed rock at the short depth in mountains and hills. The layer of sand may be thicker in river banks or bed rock be found find at the short depth from the sand layer. In the sea beaches, we can find sandy rocks to the long depth. The bottom of the oceans are made of hard rocks (bed rock). In our garden the soil on the surface is fertile and black. When we go deeper down, we will get sandy soil and then gravel and bed rock gradually.

Soil Conservation:

Our lives depend on soil. Without soil no living beings can live. When the top soil is removed by erosion, we will have to face many problems. It will be our great loss if we loss the top soil. Due to this reason, the fertile soil should not be removed by air and water from the earth surface. We should be aware of soil conservation. Water can take the top soil

from the barren land away. Wind also can take top soil to the distant places. But vegetation and plants help to protect the soil from its removal. The wind and water do not erode the soil from the plantation areas.

Activity 1

Take two trays or plates of the same size. In one of them put the soil from barren land and in another tray put soil from grass land. Keep both the trays in an angle and sprinkle water.

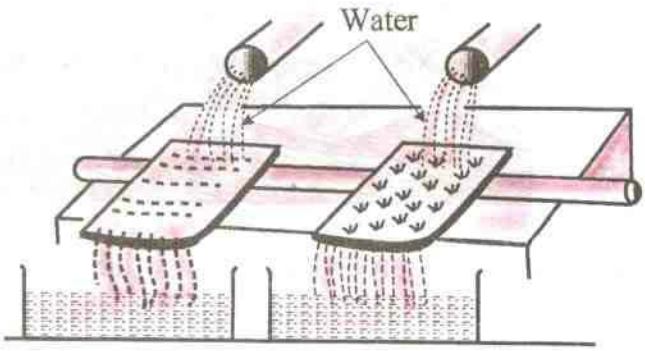
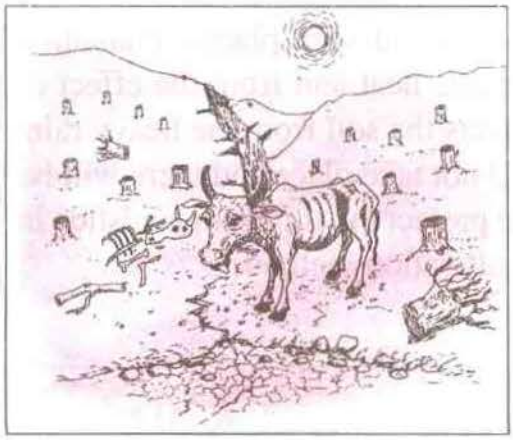


Fig No. 17.2

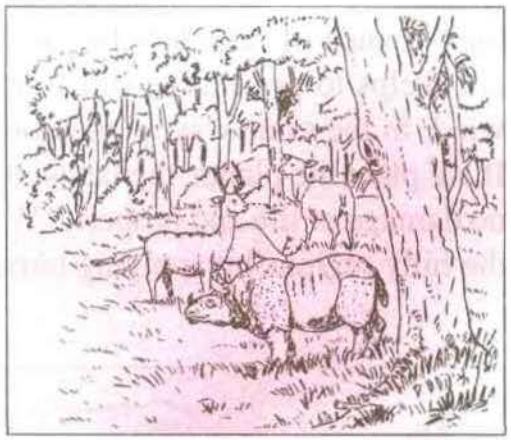
Pour the same quantity of water in the same manner. After some time, observe which soil is swept with the water easily. From this experiment you can conclude that plants or forest can conserve the soil. When the forest continues to decline, most of the places become barren lands. Besides this, the fertile lands become dry. Ultimately, this will give rise to the declining of water sources.

Forest conservation:

Forest is one of the important natural resources in Nepal. We have to be very careful about the distruction of the forest. People cut down trees for more space, more wood for cooking. Some times they set fire in the forest which damages forest life as well as forest. Over grazing of domestic animals is another factor which damages the forest. The above activities should be strongly prohibited for the shake of conservation of forest.



Barren (Deserted) Forest



Green forest

Fig No. 17.3

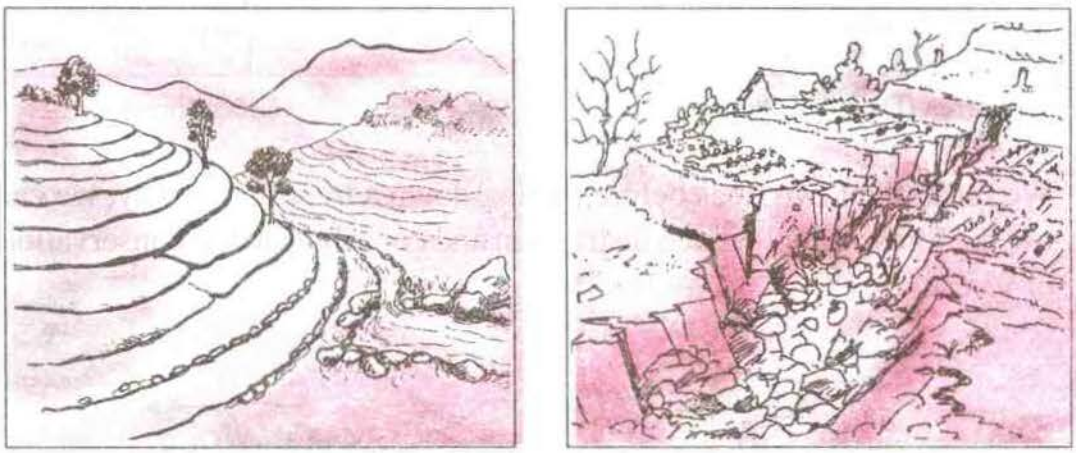
We must plant two trees before cutting down a tree. In this way, we can use the forest without much distruction and contribute to the conservation of forest.

Fig of plantation

Fig. No. 17.4

In the sloppy hill regions, every year land slides take place, which cause the damage of lives and properties. Mainly the land slides take place in the region where there is a less chance of rainfall. In such places, we can hardly find the plants, and the soil is weaker. Land slides also take place in places in the regions where there is a high chances of rainfall. In such places, the soil is found weaker and heavy rain sweeps the soil from the steep sloppy hills. We have to protect the soil where there is a

high chance of landslide by plantation around such places. Plantation also helps to protect the soil from extreme heat and from the effect of wind. In the same way, plantation protects the soil from the heavy rain. If we plant the plants, the landslide will not take place and there will be no damage of life and property. We can protect the soil from landslide in the hilly regions by applying terrace cultivation method.



Terrace cropping Land slide

Fig No. 17.5

Summary

1. Erosion on the rocks at the earth surface, is mainly due to rainfall, river, wind, glacier, frost, extreme heat and coldness etc.
2. The eroded materials are taken to a certain distance and left aside due to wind, rainfall, river, erosion etc. is called deposition.
3. Soil profile is the figure that shows the different layers of the soil and its composition.
4. Plants help to conserve the soil.
5. Forest can be conserved by not allowing the cutting down of trees, cutting of firewood, setting fire in the jungle, overgrazing of domestic animals etc. and planting trees.
6. Planting of trees protects the soil from land slide.

Exercise

1. **Give short answers:**
   (a) What is soil erosion?
   (b) What are the factors affecting soil erosion?
   (c) What is deposition?
   (d) How does rainfall cause soil erosion?
   (e) How do glaciers cause soil erosion?
   (f) How does frost help in breaking of rock in the hilly region?
   (g) What is soil profile?
   (h) Where do we find bed rock?
   (i) Why can't we live without soil?
   (j) Why do we need to plant trees?
   (k) Where do the rivers deposit the materials that they carry with?
2. How do the factors of soil erosion cause erosion? explain.
3. Why is the top soil different from that of sub soil?
4. How do afforestation help in controlling soil erosion? explain.
5. Why do soil erosion and deposition go side by side?
6. How do the rivers erode the rocks? explain.
7. Draw a figure of soil profile?
8. Explain with illustration to show that the plants can protect the soil.
9. What are the factors of deforestation? explain.
10. How can we conserve the forest?
11. Why do landslides take place? What should we do to protect from land slide?
12. **Fill in the blanks:**
   (a) The ..... part of the rocks become weak due to heat during day and cold in the night.
   (b) Due to the ..... of glaciers, the rocks break.
   (c) Deposition and ..... go side by side.
   (d) Rivers deposit the materials carried along with it at .....
   (e) Due to wind in the deserts, the ..... also change in to sand.
   (f) Forests are destroyed by uncontrolled .....

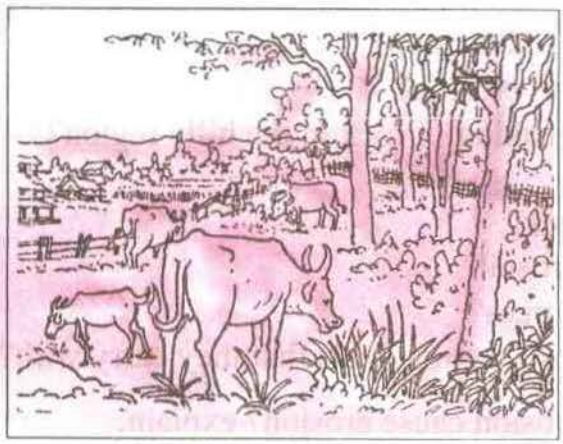
(g) Sub soil is ..... than top soil.

(h) There is more chance of ..... in barren hills.

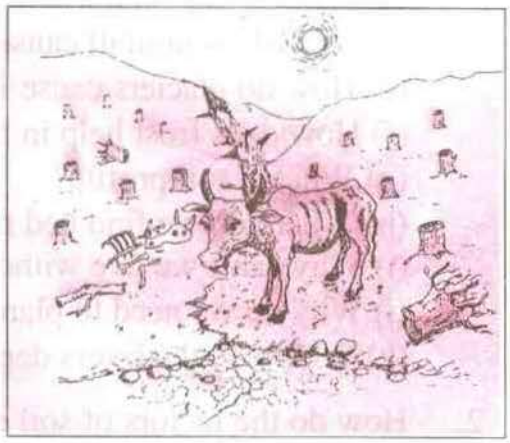
(i) The lower most strong rock is called .....

(j) There is no shortage of ..... in the forest area.

13.



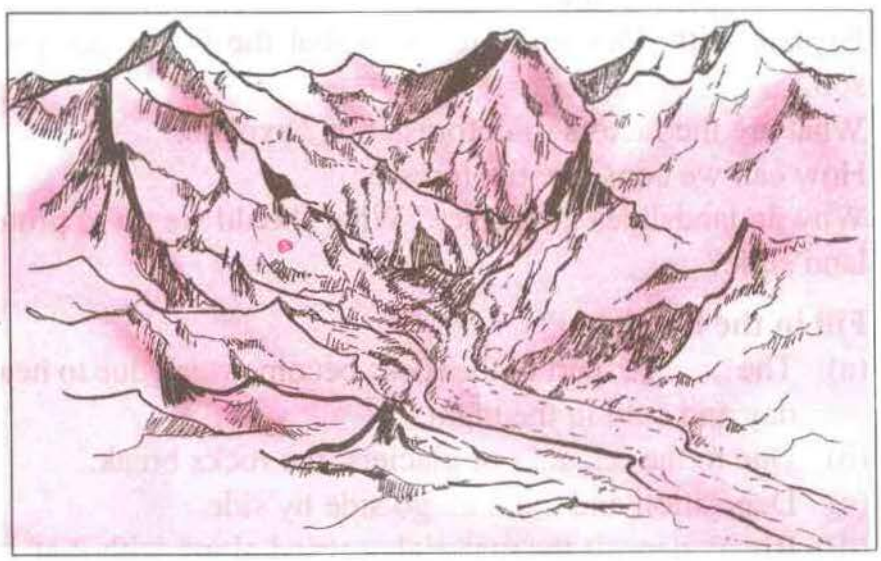
(a) Forest with green plants, wildlife, water sources



(b) Barren land

What are the differences between two figures as shown above? What are the causes of differences?

14.



What is shown in the above figure? How does it cause the soil erosion and deposition?

During sunny days, due to extreme heat, the surface water (ocean, lake, pond, river etc.) turns into vapour and goes upto the atmosphere. The water vapour combines with dust particles in the cold atmosphere and converts into cloud. The cloud moves in the direction of wind. During the course of movement, it reaches near hills and jungles. At that time, the cloud becomes cold and the water vapour gets condensed and falls down in the form of rain water.

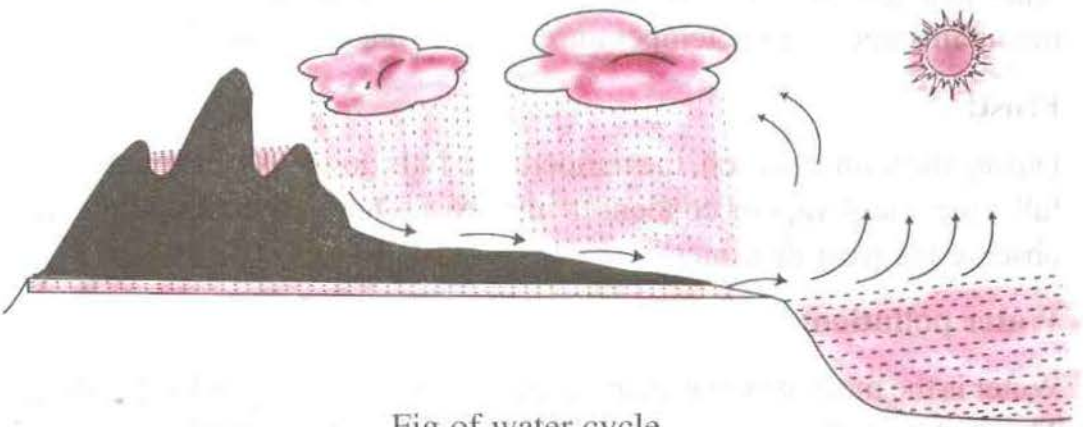


Fig of water cycle.
Fig No. 18.1

Heavy rainfalls on the earth surface during rainy season. It flows down wards in the form of river, stream, spring etc. Some of the rain water passes through the soil and rocks. The water thus absorbed flows from one place to the other places under the ground. The water remained under the ground is called ground water. The water continues its flow and finally collects in the ocean. Again the process repeats. In this way, the water cycle continues in the nature.

Cloud:

Due to the heat from the sun, the surface water changes into water vapour and goes upto the atmosphere. When the water vapour travels to a greater height, it gradually, becomes cold because of the very low temperature at high altitude. The form clouds water vapour and dust particles in the atmosphere.

Rain:

The wind blows the cloud along with, it from one place to the another. In due course of time, the cloud reaches the hilly regions, forests and condenses. As a result the water vapour gets converted into water droplets and falls on the surface of earth as rain.

Snow:

The water vapour present in the cloud converts into snow particles due to extreme cold. The snow particles thus formed are combined with each other and falls down as snow. We can see the snow falls in the high mountains because the temperature at these places is very low.

Frost:

During the winter season, the temperature falls down. As the temperature falls, the water vapour condenses into frost. Due to this reason, we can observe the frost in winter.

Water pollution:

Water is the most important substance for the survival of all living beings. The water is used for drinking, cleaning, cooking food, producing electricity and it is used in different factories also. Water is contaminated due to different factors. It is called water pollution. Followings are some factors which cause water pollution.

(1) By discharging urine and stools near the source of drinking water.
(2) By throwing household wastage near the water sources.
(3) By discharging industrial wastage into water sources which contains harmful chemical substances.
(4) By using water sources as cleaning place of cattles and clothes etc.

The use of polluted water causes the diseases like diarrhea, dysentery, typhoid etc.

Preventive measures of water pollution:

(1) Sewage should not be discharged near the source of water.
(2) Domestic wastage should not be thrown in the water sources.

(3) Industrial wastage containing harmful chemicals should not be mixed in the water sources.

(4) Water sources should not be used as washing places. (animal wash, clothes wash)

(5) Potash, chlorine should be used in water sources.

Summary

1. The surface water gets heated due to excessive heat of sun, and converts into water vapour. It goes up to high altitude. In due course of time, the water vapour gets condensed and converted into water. The water drops thus formed falls down as rain. This process repeats again and again and take a form of cycle, called water cycle.
2. Cloud is a combination of water vapour and dust particles in the atmosphere.
3. The water vapour present in cloud converts into the water by condensation and falls down as rain.
4. Due to excessive cold, the water vapour in the cloud condensed in to the snow.
5. Frost is formed due to excessive cooling of water vapour present in the atmosphere.
6. Water is contaminated or polluted due to different factors. It is called water pollution.

Do, observe and learn

(1) Observe any one water sources (pond, lake, river etc.) at your neighborhood. Is it polluted? What might be the reasons of water pollution? If it is polluted.

Exercise

1. **Answer the following questions:**
   (a) How does the water cycle continue in nature?
   (b) How is cloud formed?
   (c) Write down the condition for rain fall?
   (d) In which place, does snow fall?
   (e) During winter morning, we see frost, why?
   (f) Write three main causes of water pollution.
   (g) What are the effects of polluted water in human beings.

2. Illustrate the water cycle diagrammatically.

3. The frost takes place even when there is no cloud in the sky, What is the reason behind this?

Unit - 19 THE EARTH, THE MOON AND THE SUN

Earth is a member of the solar system. It lies in the third position from the sun. The distance of the earth from the sun is about 150 million km. In this planet, air, temperature and water are available for living beings. The average diameter of the earth is 12,700 km. It takes 24 hours to complete one rotation on its axis. Sometime the earth goes near the sun and sometimes it goes far away from the sun. Due to the position of the sun, moon and the earth, solar and lunar eclipses are seen. The moon is a satellite of the earth. The atmosphere is not present in the moon. It takes 28 days to complete one revolution round the earth. It also takes the same period of time to complete one rotation about its own axis. Due to this reason, the same side of the moon faces the earth. The moon revolves round the earth in a circular orbit. We see the sunrise in the east and the sun set in the west daily. The movement and position of the sun provide us the information about the day time. Due to the rotation of the earth on its own axis, we are able to see the different positions of the sun in the sky. In the day, the sunlight falls on the part of the earth which is facing the sun. The sunlight does not fall in all parts of the earth at a time. Due to this, different parts of the earth have different times. Therefore, the time for sunrise and sunset differs from place to place.

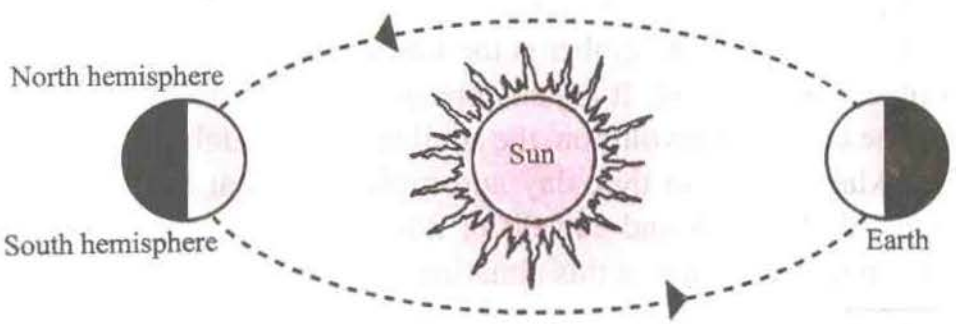


Fig No. 19.1

The earth is round. While revolving round the sun, its axis makes an angle with the orbit. Due to this reason, sunlight cannot fall equally on the earth. The sunlight falls straight in some regions of the earth surface and it makes an angle with the earth surface in same regions. The seasons change on the earth due to straight and inclined falling of sunlight on the earth surface.

On 21 June, the northern half of the earth tilts towards the sun. The southern half tilts away from the sun. Thus, 21 June is the longest day and the shortest night in the northern hemisphere. In this time, the season is hot there. Similarly, it is the shortest day in the southern hemisphere. Since this hemisphere is farther away from the sun, the season is cold there. The day and night are equal in the equator, due to straight light of the sun.

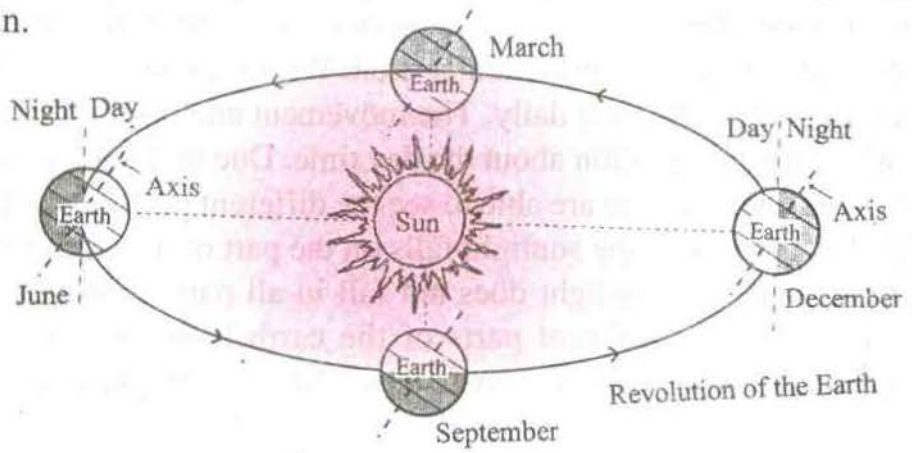


Fig No. 19.2

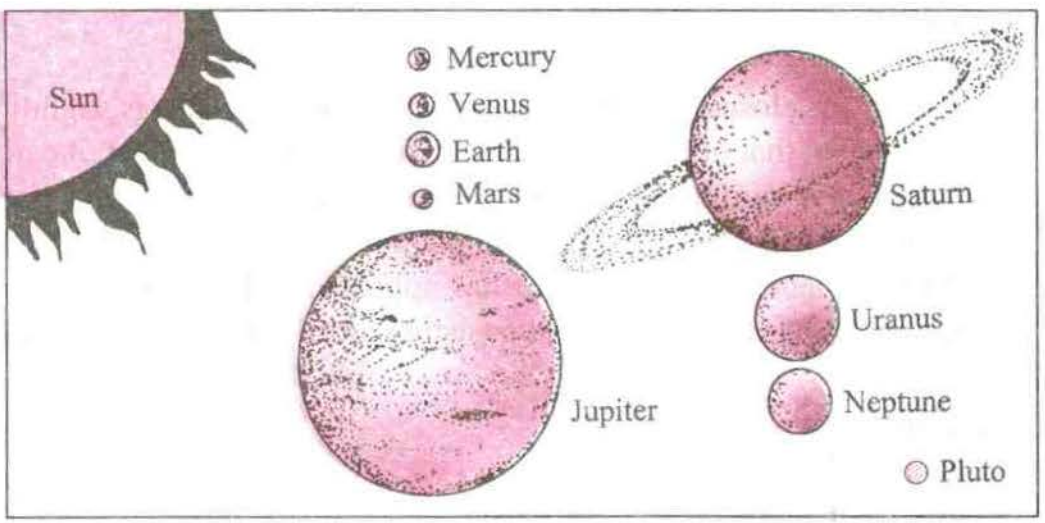
The sun light falls directly (straightly) in southern hemisphere on 22nd December. Thus, 22nd December is the longest day and shortest night in the southern hemisphere. It is just opposite in the northern hemisphere. During the course of revolution, the sunlight falls straight on the equator on 21st March. Due to this, day and night are equal again. Thus the positions of the earth and sun differ due to their speeds. The season changes in the earth due to this situation.

Activity 1

Record the time for sunrise and sunset for a week. Did you find any difference in the time of sunrise and sunset?

Solar System:

The solar system consists of the heavenly bodies revolving round the sun and the sun itself. Our earth also revolves round the sun. Earth is a member of solar system. Thus, the sun at the bodies which revolve round the sun are called planets. There are nine planets including the earth. They are all revolving round the sun. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto are the planets.



Solar system
Fig No. 19.4

These planets revolve round the sun in their elliptical orbits. They also rotate on their own axes. They remain in their own positions due to the gravitational force. Planets do not have their own light. They shine when the light falls on them. Mercury is the nearest planet to the sun and pluto is the farthest planet from the sun. Mercury takes about 88 days to complete one revolution around the sun whereas pluto takes about 248 years to complete one revolution around the sun. Jupiter is the largest planet and the pluto is the smallest planet, among the planets. Venus is the brightest planet.

Nine Planets in order of their average distances from the sun are as follows:

1. Mercury:

Mercury is the planet closest to the sun. It is the second smallest planet among the nine planets. It revolves round the sun with the fastest speed. We can see it at the time of sunrise and sunset for a while because it is very closer to the sun. It is very lighter than the mass of the earth. Since it is closest to the sun, it is extremely hot during day and extremely cold at night. It has no atmosphere.

2. Venus:

Venus is the closest planet to the earth. The size of venus is slightly smaller than that of the earth. Since it is the brightest planet, it can be seen as a morning star just before sunrise and an evening star just after sunset. It is covered with thick atmosphere. It is the third brightest planet in the space. It has approximately equal mass to the earth. It has an atmosphere consisting mostly of carbon dioxide.

3. Earth:

Earth is the planet in which we live. It has suitable environment for all living beings. Such environment cannot be found in other planets. The earth is the fifth largest planet of the solar system and its position is third from the sun. The inner part of the earth is solid in state. The moon is a satellite of the earth. The temperature of the earth is suitable for living organisms. The atmosphere of the earth consists of nitrogen, oxygen, argon, carbon dioxide, water vapour etc.

4. Mars:

The general colour of mars is reddish. It is estimated that the mars has carbon dioxide, nitrogen, argon and water vapour in its atmosphere. Both poles are covered with snow. They are called ice caps. The colour of the surface of this planet changes according to the time.

5. Jupiter:

Jupiter is the largest planet of the solar system. Its outer surface is covered with clouds. It has greater mass than the total mass of other (rest) planets. It can be observed as a twinkling star in the sky. Jupiter has a large red-spot at the central part.

6. Saturn:

Its size is nearly equal to the size of the Jupiter. It has three large and flat rings at its outer surface. These rings are transparent. The biggest satellite of this planet is titan.

7. Uranus:

Uranus is the planet which lies farther from the sun and earth. It is a cold planet. It is 15 times heavier than the earth. The atmosphere of this planet consists of hydrogen and helium.

8. Neptune:

It is also very far away from the sun. Neptune is a very cold planet. It is 17 times heavier than the earth. The atmosphere consists mainly of hydrocarbon.

9. Pluto:

Pluto is the farthest and smallest planet of the solar system. The information about the atmosphere of this planet is unknown till now. It is also a very cold planet.

All planets revolve round the sun. These planets rotate in their own axes also. The revolving path of these planets lies on the same surface. Only few planets are tilted. These planets have elliptical orbits. The rate of rotations of the planets are different. They also have no uniform revolution. For example, the earth takes about 24 hour or one day to complete one rotation on its axis whereas it takes 365 days or 1 year to complete one revolution round the sun. The following table gives the

information about average distance of the planets from the sun, diameter and time of revolution (daily and yearly):

Name of the planet	Average distance from the sun (Lakh kilometer)	Average diameter (Km)	Period of rotation (Day)	Period of revolution (Day)
Mercury	58 (approx)	5000	59 days	88 days
Venus	107	12100	243 days	225 days
Earth	150	12700	24 hours	365 days
Mars	226	6750	24 hr. 37 min.	687 days
Jupiter	768	1139040	9 hr. 55 min.	12 years
Saturn	1440	116000	10 hr. 30 min.	29.5 years
Uranus	2880	50440	17 hr. 14 min.	84 years
Neptune	4500	49000	16 hours	165 years
Pluto	5760	2262	6.5 days	248 years

Source: World Almanac, 2000

Besides these nine planets, There are other heavenly bodies like moon, comets (Lam Puchhre Tara), Meteors etc. in the solar system.

Moon:

The moon which is seen in the sky at night is a satellite of the earth. It is a natural satellite of the earth. The moon does not have its own light. It reflects sunlight which makes it shine brightly at night. The moon has no atmosphere and water on its surface.

The moon lies 384000 km. away from the earth. The diameter of the moon is 3660 km. It revolves round the earth. In the same way, it revolves round the sun along with the earth. Other planets have their satellites also.

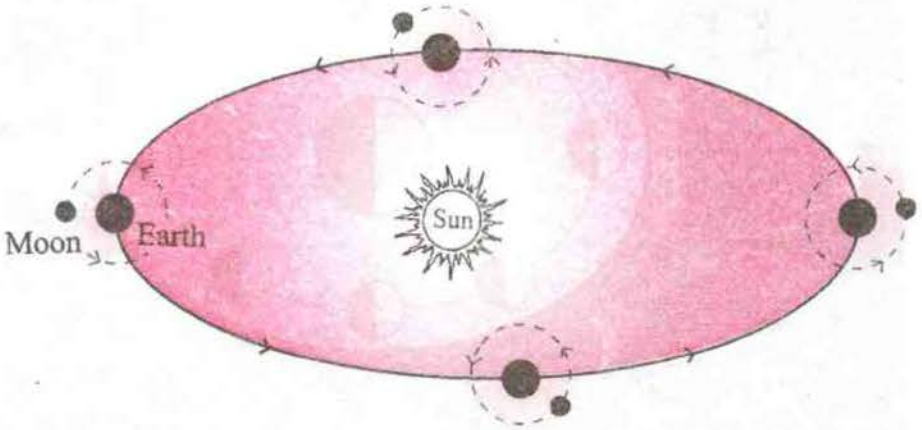
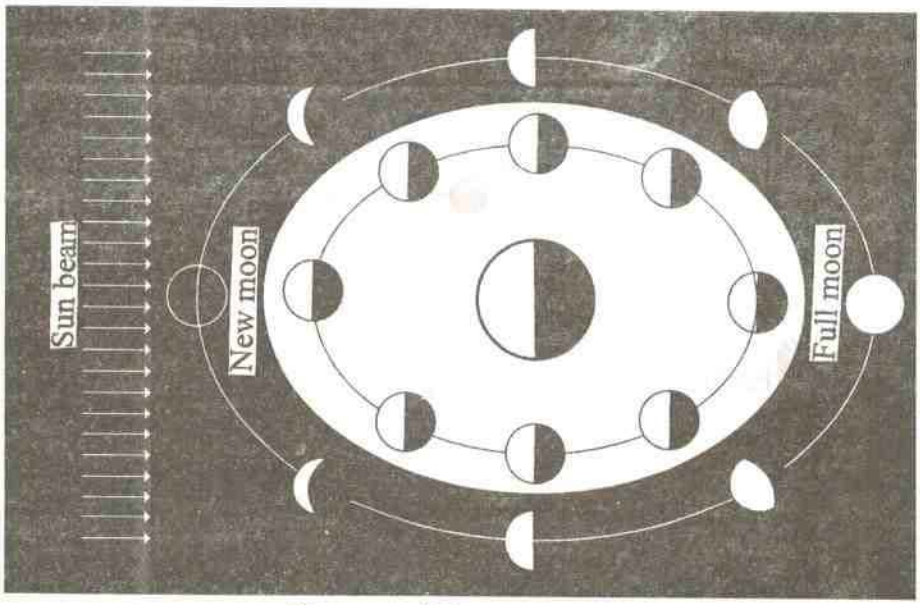


Fig No. 19.4

Phases of the moon:

Why does the moon change its shape? During a month, we can see different shapes of the moon, why? The moon seems to be bright because of sunlight. During the course of revolution, it lies in between the sun and the earth. At that time, the dark portion of the moon faces the earth and it cannot be seen from the earth. This phase of the moon is called new-moon or 'Aunsi'. Again, during revolution, the situation comes in which the sun, the earth and the moon lie in the same straight line. At that time, the earth lies in between sun and moon and the full bright moon can be seen from the earth. This phase of the moon is known as full moon or 'poornima'. The period between new-moon and full moon is called bright half and the period between full moon and new moon is called dark half. Each half has 15 days. In the moon, the shape of bright part changes day by day. The change in the shape of the moon that is seen from the earth is called the phase of the moon. The time of rotation of the moon is equal to the time of revolution which is 29.5 days. Due to this reason, always either side of the moon is seen from the earth. On the basis of the phase of the moon, monthly calendar is prepared. The period of new moon to new moon or full moon to full moon is one month, called lunar month.



Phases of the moon

Fig.No. 19.5

Activity 2

Make a record of your observation of the moon for 15 days (New moon to full moon and full moon to new moon) with figure.

Summary

1. The position of the sun differs due to the rotation of the earth.
2. The time of the sunrise and sunset differs from place to place and day to day.
3. The sun plays vital role in changing the season.
4. The sun itself and the heavenly bodies that revolve round the sun constitute the solar system.
5. Mercury, venus, earth, mars, jupiter, saturn, uranus, neptune, pluto (9 planets) moon and comets etc. are the members of solar system.
6. The average distance from the sun and diameter of these nine planets are different.
7. Rotation and revolution of all planets are different.
8. Moon is the natural satellite of the earth. It does not have its own light. It takes 29.5 days to complete one revolution around the earth.

9. Every month, the different bright shapes of the moon can be seen from the earth.

10. When the moon is in between the earth and the sun, the moon cannot be seen from the earth. It is called new moon. It generally falls every 15 days. In Aunsi (new moon), it is completely dark at night.

11. While revolving round the earth, the earth lies in between the sun and the moon in each 15 days. At that time the bright part of the moon faces the earth and the full moon can be seen. It is called 'poornima'.

12. The change in the shape of the moon that is seen from the earth is called phases of the moon.

Do, observe and learn

1. Prepare a model of the solar system on a chart paper (card board) from the data given in the above table [(page 140) in terms of diameter and average distance from the sun]. Take it help your teacher, if necessary.
2. Draw a clear chart of the phases of the moon. Show it to your teacher, whether it is right or wrong.

Exercise

1. Give answers:

(a) Why do we always see the shape of either surface of the moon?
(b) What is the solar system? What are its members?
(c) Name the nearest and farthest planets from the sun.
(d) What are the causes of the change in season? Explain.
(e) What is meant by the phase of the moon?

2. Write answers in single word:

(a) Which is the biggest planet of the solar system?
(b) Which is the smallest planet in the solar system?

(c) Which planet has rings around it?
(d) How long does the earth take to complete one revolution round the sun?
(e) How do day and night occur?

3. Tick (✓) the correct statement and cross (✗) the wrong one:

(a) There are 8 planets which revolve round the sun. ( )
(b) Planets do not have their own light. ( )
(c) The moon is a stallite of the earth. ( )
(d) The sun rises from the east and sets to the west. ( )
(e) Mars seems to be bright. ( )

4. Write correct word in the blanks:

(a) Sun is a .....
(b) Planets have no .....
(c) New moon and full moon falls in each ..... days.
(d) The change of seasons is due ..... of the earth.
(e) We have nine planets in our .....

5. Match the followings:

A	B
(1) Planet	( ) Moon
(2) New moon	( ) Uranus
(3) Satellite	( ) Dark night
(4) Mercury	( ) The hottest planet
	( ) The coldest planet

6. Tick the best answer:

(a) Which one heavenly body revolves along with the planet?
(i) satellite (ii) comet
(iii) meteors (iv) star

(b) What do we call for the path through which the planet revolves round the sun?
(i) orbit (ii) eclipse
(iii) year (iv) axis

(c) What do we call for the one complete revolution made by the earth around the sun?

(i) rotation
(ii) revolution
(iii) equator
(iv) motion of the earth

(d) What is the main cause of season change?

(i) rotation and the revclution of the earth
(ii) phases of the moon
(iii) position of the sun
(iv) motion of the moon.

7. Give reasons:

Try to walk with your bare foot in a sunny day. Why do you feel hot? Dip your foot in the pond or river near you. How do you feel? Why?

Glossary

Effort point-	The point at which direct effect of force falls.
Load point-	The point at which the direct effect of weight falls.
Fulcrum-	Supporting point of lever.
Wrench-	A kind of tool used to open a nut.
Lisnu-	A ladder made of wood.
Opener-	A kind of tool used to open the lid.
Beam balance-	A balance having pans on its both sides.
m^3 -	Cubic metre.
Measuring cylinder-	A liquid measuring a vessel.
Upper miniscus-	Projection of water surface.
Lower miniscus-	Depression of water surface.
Concave surface-	The surface in which the middle portion is depressed.
Convex surface-	The surface in which the middle portion is raised.
Transmission-	Transformation
Potassium permagnet ($KMnO_4$)-	potash
°C-	Unit for measuring temperature.
°F-	Unit for measuring temperature.
K-	Unit for measuring temperature.
Shadow-	The shape of object made by mirror or lens.
Angle of incidence-	The angle made by incident ray to the normal.
Angle of reflection-	The angle made by reflected ray to the normal.
Elliptical shape-	egg-shaped
Wave-	Disturbance in the particles of the medium.

Tuning fork-	A kind of forceps.
Prong-	The upper part of tuning fork.
hack saw-	A saw used to cut iron.
Sense organs-	eye, ear, nose, skin, tongue (organs used to get senses)
Compass-	A device used for showing directions.
Dynamo-	A device which produces a little amount of electricity.
Generator-	A device which produces electricity.
Periodic table-	The table in which elements are grouped in periods.
Atomic number-	The number of proton present in an atom of an element.
Cell-	The orbit where the electrons move.
Atmosphere-	Layer of gases around the earth.
Lime water-	Calcium hydroxide $Ca(OH)_2$
Chlorophyll-	The green pigment found in plants.
Vegetative parts-	Root, stem & leaf of a plant.
Tadpole-	The larva stage of a frog.
Ghariyal-	A kind of species of a crocodile.
Bed rock	A rock found in the innermost layer of the earth surface.
Semi permiable membrane-	A semi-permeable membrane is that which passes liquid through it.
Mitochondria-	A kind of organelle found inside the cell.
Axis-	A part of seed in which the embryo and cotyledons are joined together.
Anaerobic respiration-	Respiration in the absence of oxygen.
Aerobic respiration-	Respiration in the presence of oxygen.
Resine-	A kind of fluid that comes from the bark of pine tree.

Gum-	A glue that can help to attach any thing to the other thing.
Latex-	The white fluid that comes out from rubber plant or 'Lalupate'.
Volatile oil-	The scented oil produced by the special plants like 'Masala'.
Ammonia-	A kind of gas (NH_3)
Breathing-	Taking oxygen in and giving carbon dioxide out in plants/animals.
Cellular respiration-	Combustion inside the cell.
Dormant-	The inactive state of seed.
Transpiration-	Giving up water vapour from a plant.
Satellite-	A mass that revolves round the planet.
Natural satellite-	A natural mass that revolves round the planet (moon)
Artificial satellite-	A man made satellite.
Orbit-	The arbitrary path along which the heavenly bodies move around the mass. (elliptical path around the sun where planets revolve ar ' the sun.)
Axis-	An arbitrary line through which the mass revolve round itself.