Science and Environment

Grade - 7

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Ministry of Education
Curriculum Development Centre

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Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education purposeful, practical, relevant and job-oriented. It is necessary to instill the feeling of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline and self-reliance so as to develop in them social and personal skills as well as the basic competencies of language, science, occupation, information and communication technology, environment and health, and life skills. It is also necessary to enable them to appreciate, preserve and promote arts and aesthetics, social norms and values and ideals. Moreover, in order to develop an equitable society, it is necessary to inculcate students with respect for ethnicity, gender, disabilities, languages, religions, cultures and regional diversity. Likewise, education should also help them to be well-informed of human rights and social norms and values so as to make them capable of playing the role of responsible citizens. This textbook has been developed in this form based on the Basic Education Curriculum, 2069 (Grade 7), incorporating the feedback obtained from various schools, workshops and seminars and interaction programmes attained by the teachers, students and parents.

This textbook was translated and edited by Prof Dr.Anjana Singh, Lavadev Bhatta, Kishore Nepal and Dambardhoj Angdembe. In bringing out this text book in this form, the contribution of the Executive Director of CDC Mr. Khagaraj Baral, Deputy Director Dinesh Khanal, Prof Dr. Hridayaratna Bajracharya, Prof Dr Chidananda Pandit, Umanath Lamsal"Umesh", Parvati Bhattarai, Uttara Shreshtha, Bijay Kanta Mishra is highly commendable.

Language of this book was edited by Nim Prakash Sing Rathor and Ramesh Dhakal. The layout design of the book was done by Jayaram Kuikel. The illustration of the book was done by Sunil Ranjit and Gautam Manandhar. CDC extends sincere thanks to all those who have contributed in the development and revision of this text book.

Textbook is considered as an important tool of learning. Experienced teachers and curious students can use various learning resources and tools to achieve the competencies targeted by the curriculum. An attempt is made to make this textbook activity oriented and interested as far as possible. The teachers, students and other stakeholders are expected to make constructive comments and suggestions to make this book a more useful learning material.

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Content

S.No.	Topics	Pagenumber
Physical		
1.	Measurement	1
2.	Force and Motion	13
3.	Simple Machine	23
4.	Pressure	30
5.	Energy, Work and Power	34
6.	Heat	40
7.	Light	47
8.	Sound	53
9.	Magnet	58
10.	Electricity	63
Chemistry		
11.	Matter	72
12.	Mixture	78
13.	Metal and Nonmetal	86
14.	Some Useful Chemicals	92
Biology		
15.	Living Beings	95
16.	Cell and Tissue	113
17.	Life Process	121
Geo & Astronomy		
18.	Structure of the Earth	128
19.	Weather and Climate	135
20.	Earth and Space	144
Environmental science		
21.	Environment and its Balance	152
22.	Environmental Degradation and its Conservation	165
23.	Environment and Sustainable Development	180

Unit 1

Measurement

We perform various activities in our daily life. While performing such activities, we need to take the measurement of several things. Measurement of an object is to find the accurate quantity of the object. In ancient time, people used to apply various traditional methods for measurement. The length was used to be measured by *cubit palm, angul etc*. These ways of measurement had no uniformity because the size of a hand varied from person to person. That's why people used certain measurement as standard measurement unit. In Nepal, units such as mile, gauge, foot were used to measure length and *paau, sher, dharni* were used to measure the mass whereas *maana, pathi, murri* were used to measure the quantity of grains. There was no uniformity of such measurement systems with other countries. So, it was necessary to bring change for the uniformity in the measurement. In order to fulfill this lacking, an internationally recognized unit i.e. SI unit was accepted all over the world.

SI Unit

The international convention of scientists held in Paris in 1960 decided to adopt an international system of unit which is known as SI unit (System International de units). According to this system, the various fundamental units are as follows:

Physical Quantity	Fundamental Unit	Symbol
Length	Metre	(m)
Mass	Kilogram	(kg)
Time	Second	(s)
Temperature	Kelvin	(K)
Electric Current	Ampere	(A)
Luminous Intensity	Candela	(cd)
Amount of Substance	Mole	(mol)

Those above mentioned units of measurement are accepted universally. 1 metre should have exactly the same length in every part of the world or elsewhere. Similarly, 1 kilogram mass refers the same quantity of an object all over the world.

Length

The distance between two points is called length. Height of the person means the distance between the top of head to his feet. The length, breadth, height, thickness, depth, diameter,etc are examples of the length.

Figure no. 1.1

Measurement of length

Activity 1

List out the measuring scales used in your surrounding and write their uses in the given below.

S.No	Name of measuring scale	Uses
1		
2		
3		
4		
5		

The uses of scale depends upon their structure. Shorter length is measured by using small scale whereas longer length is measured by using measuring tape. The measuring tape is portable and can be rolled up after its use. The small and hard scale of geometry box helps to draw straight lines. It is easier to measure the length of the clothes with hard iron scales in cloth shopes.

Unit of length

The SI unit of length is metre(m). There are so many smaller and longer units besides metre. The relationship among them is given below.

10 millimetre (mm) = 1 centimeter (cm) 10 centimetre (cm) = 1 decimetre (dm)

10 decimetre (dm) = 1 metre (m) 10 metre (m) = 1 decametre (dam)

10 decametre (dam) = 1 hectometre (hm) 10 hectometre (hm) = 1 kilometre (km)

Out of these units of length, millimetre, centimetre, metre and kilometre are in common use.

1 centimeter (cm) = 10 millimeter (mm) 1 metre (m) = 100 centimeter (cm)

1 kilometer (km) = 1000 metre(m)

Measuring length accurately

You should take the following precautions in order to measure the length of an object correctly:

1. Error due to wrong sight angle

The measuring scale used may be thick. While measuring with thick scale the reading becomes either more or less than the actual value. In figure, the reading by the eye of position 'a' & 'c' gives the incorrect reading whereas reading by the eye of position 'b' gives the correct reading. The eye should be placed exactly above the point from which the length is to be measured.

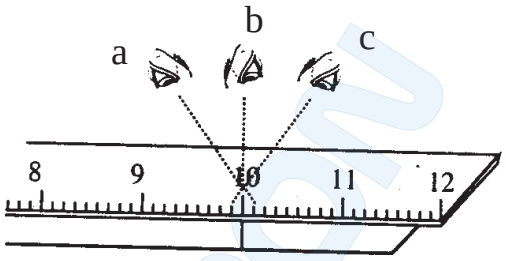
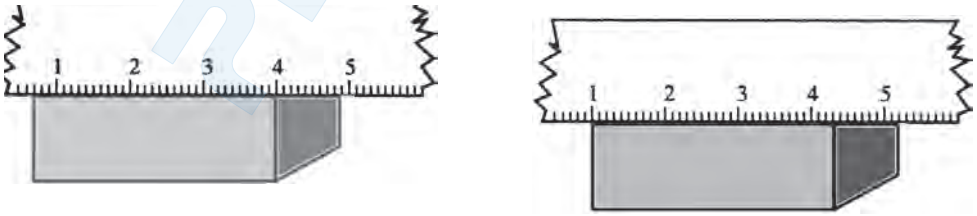


Figure no. 1.2

2. Error due to damaged edges of measuring scale

After using the scale for a long time, its end begins to corrode. Do not use the ends of a corroded scale while taking measurements. The edges of scale some times get damaged with use and this can lead to errors. We must not start from the damage edge. Instead we should start from some other mark to get correct measurement.



Wrong measurement

Correct measurement

Figure no. 1.3

3. Error on the position of scale

The ruler (scale) should be placed parallel to the measuring side. There will be error if the scale is placed on slanting to the measuring side.

Wrong measurement Correct measurement

Figure no. 1.4

Measurement of diameter of a spherical body

Place the spherical body in between two rectangular blocks in a plane surface. Place a scale between the faces of two blocks and measure their distance. This gives the diameter of the sphere.

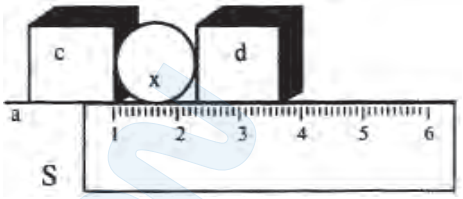


Figure no. 1.5

Activity - 2

Measure the following objects and fill the table given below.

S.no.	Object	Length	Breadth	Height/thickness	Circumference	External diameter
1.	Geometry box					
2.	Science book					
3.	Coin					
4.	Bench					
5.	Blackboard					
6.	Classroom					

The length, breadth, height, thickness, circumference, diameter, etc. can be measured by using scale.

Mass

The amount of the matter contained in a body is called its mass.

A light object contains less matter in it. So, it has less mass. Similarly, a heavy object contains more matter in it. So, it has more mass.

Measurement of mass

In order to find out the mass of an object, we need to measure the object by using a physical balance. A physical balance has two pans. The body whose mass is to be measured is kept in one pan and standard weights are kept in other pan. The beam of physical balance becomes horizontal when the mass of the objects is equal to the total mass of the standard weights on the other pan. The pointer at the centre of

physical balance is given to check whether the masses in two pans are equal or not. The pointer at the centre becomes vertical when the mass of unknown object kept in one pan is equal to the total of the standard weights kept in another pan.

Unit of mass

The SI unit of mass is kilogram (kg). There are other units of mass which are smaller or bigger than kilogram.

1 ton = 1000 kilograms (kg) 1 kilogram (kg) = 1000 grams (g)

1 gram (g) = 1000 milligrams (mg)

Activity - 3

Take a physical balance and its standard weights. Put the objects whose mass is to be determined at the left pan of the balance. In the other pan, keep on adding standard weights one by one till the beam of the balance becomes horizontal. If the beam of the balance is horizontal, note the mass of the standard weights. Thus, noted mass of the standard weights is equal to the mass of the objects of left pan.

Figure no. 1.6

Time

The interval between two events is called time. Such as the rising of the sun from the east is an event. The rising of the sun on the next day is another event. The interval between these two events is the time of one day. Similarly a day is divided into 24 equal interval. Here day, (second, minute, hour) night, month, year, etc. are the units of time.

Measurement of time and its unit

Time is measured by using clocks or watches. There are different kinds of clocks and watches. The fundamental SI unit of time is second.

Figure no. 1.7

60 seconds = 1 minute 60 minutes = 1 hour

24 hours = 1 day 365 days = 1 year

Area

The plane surface covered by a body is called its area. It is measured in square metre or square centimeter.

Regular and irregular objects

Activity - 4

Place a coin in a paper and draw its outer surface with the help of a pencil. Put the coin up and observe how much space does it occupy. The plane space occupied by that coin on the paper is its area. In the same way, the space occupied by our foot in the ground is the area of our foot.

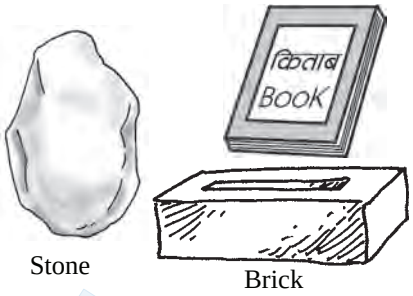


Figure no. 1.8

Activity - 5

Take a piece of a stone, a brick and a book. Now observe their outer surfaces. What differences do you see in their shapes? How is the surface of the book or brick? Is their surface regular or not? Is the surface of the stone regular? Compare it. Several objects around us which have geometrical shapes are called regular objects. They have fixed shape such as, bricks, books, copy, marbles, ball, etc. The objects which don't have fixed geometrical shapes are called irregular objects. Such as, piece of stones, pieces of bricks, pieces of paper ,etc.

Area of regular plane surface

Several objects around us have various shapes. Among them, some have fixed and regular shape. Such as coin is circular in shape. Books and copies are rectangular in shape. By using various formula, we can calculate the surface area of such regular objects. The formula to calculate the area of some regular shaped objects are as follows:

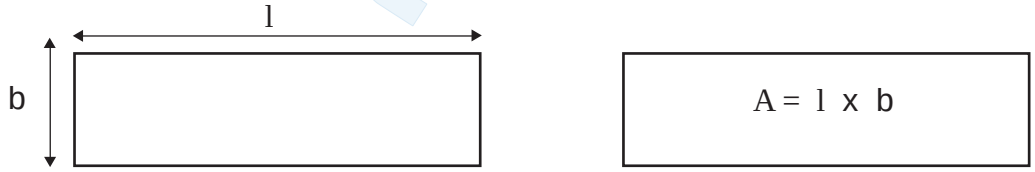


Figure no. 1.9

a. Area of rectangle (A) = length (l) x breadth(b)

b. Area of square object (A) = $(\text{length})^2 = l^2$

c. Area of circular object (A) = πr^2 ($\pi = 22/7$)

(r = radius)

Example 1

If a rectangular room is 5 metre long and 3 metre wide, then find the area of the room?

Solution:

Here,

Length of the room (l) = 5m

Breadth of the room(b) = 3m

Area of the room (A) = ?

According to formula

Area (A) = l x b

= 5 m × 3 m = 15 m^2

∴ The area of the room is 15m^2.

Activity 6

Find the area of the cover page of your Science and Environment book by using formula. Similarly, find out the area of your classroom by measuring its length and breadth.

Area of irregular plane surface

Several objects around us do not have fixed shape. For example, a piece of paper, a piece of stone, a leaf, etc. They have irregular shape. We can't determine the area of such objects by using formula. We can determine the area of an irregular surface by using a graph paper.

Activity 7

Take a graph paper and place it on the table. Put a piece of stone over the graph paper and trace the boundary of the stone. Remove the stone and count the number of enclosed squares. While counting the squares, the number of full and more than half enclosed square should be counted, while less than half are ignored. The number of square thus counted gives the area of that stone.

Volume

In our daily life we need different liquids like milk, kerosene, petrol, diesel, etc. How can we measure their volumes? Do you know? Have you ever been to shop to buy kerosene? Which instrument does the shopkeeper use to measure those liquids? In ancient time, those liquids were measured in *Maana* and *pathi* but liter was not used on those days,why?

Litre is unit of volume of liquid. When liquid is kept in a measuring vessel, it occupies space. The space occupied by liquid is its volume. The space occupied by any object is called its volume. It is measured in cubic metre (m^3). The volume of liquid is also measured in litres. 1 cubic metre is equal to 1000 litres.

Volume of liquid

The volume of a liquid is measured in litre. For small volume of a liquid less than litre, we express the volume in millilitre.

1 litre = 1000 millilitre

1 ml = 1 cm^3 (cc)

For measurement of the volume of a liquid in the science laboratory, measuring cylinder is commonly used. There are 10,25,50,100,250,500 and 1000 millilitre capacity cylinders available to measure volume of a liquid.

Measurement of volume of liquid

Activity 8

Take a measuring cylinder and pour some amount of water in it. What is the shape of the surface of water in measuring cylinder? Observe carefully. Is the level of water plane? The level of water is not a plane but curved such that the middle portion more depressed than its sides. Such a curved surface is called concave surface. Water, oil, kerosene, alcohol, spirit, etc. wet glass surface. So, they form a concave surface in a glass vessel. Though mercury is a liquid, it doesn't stick on the glass surface. The mercury liquid surface is more depressed at the sides than at the middle. Such type of surface is called convex surface.

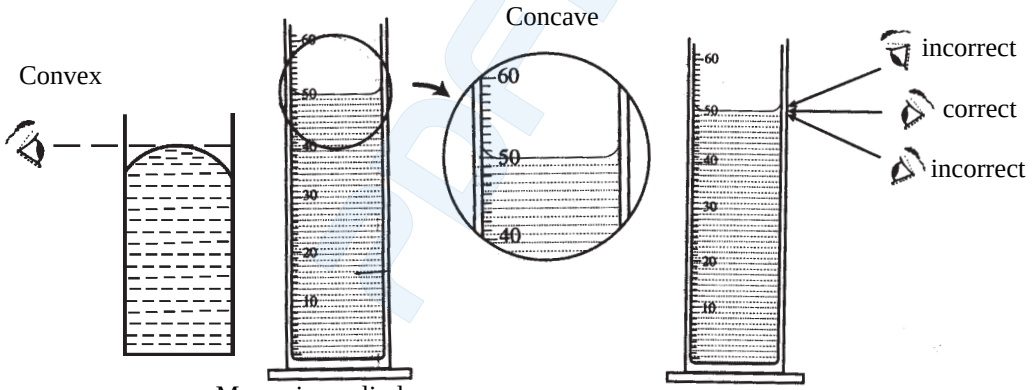


Figure no. 1.10

The volumes of the liquids which make concave shape is measured from the lower meniscus. Whereas the volume of the liquids which make convex shape is measured from the upper meniscus. While taking the reading of water level, the eye should be kept straight at the same level of liquid. If the eye is kept lower than the water level, the volume of water seems less lower than its actual value and if the eye is kept above the water level, the volume of water seems more.

Volume of regular solid objects

Have you ever seen the box of chalk, matchsticks, bricks? What are their shapes? Those objects are rectangular in shape. Volume of such objects can be determined easily. Volume of such rectangular objects can be determined by measuring its length, breadth and height or width.

Volume of rectangular object = length (l) x breadth (b) x height (h)

$\therefore$ V = l x b x h

In a cube, its all sides are equal. So, the volume of a cube is given by formula.

Volume of cube (V) $l \times l \times l = l^3$ or $(\text{side})^3$

Volume of Sphere

The objects like marble or ball is sphere.

Volume of sphere = $\frac{4}{3} \pi \times (\text{radius})^3$

$$V = \frac{4}{3} \pi r^3 \text{ where } \pi = 22/7$$

Volume of irregular solid objects

Take a measuring cylinder and fill it partially with water. Mark the level of the water and note down. Take a stone and tie it tightly with a string and lower it slowly into the cylinder. The water level rises. Note down the water level. Now, find the difference between the two of water levels, which gives the volume of the stone.

Suppose : Initial water level = V_1

Water level with stone = V_2

Then, volume of stone (V) = $V_2 - V_1$

Example : 2

In the adjoining figure, calculate the volume of the stone immersed in water.

Solution

Here, Initial volume of water (V_1) = 200 cm^3

Volume of water along with stone (V_2) = 250cm^3

Volume of stone (V) = ?

Now, V $= V_2 - V_1$

$= 250cm^3 - 200cm^3$

$= 50\ cm^3$

Therefore, volume of the stone is 50cm^3.

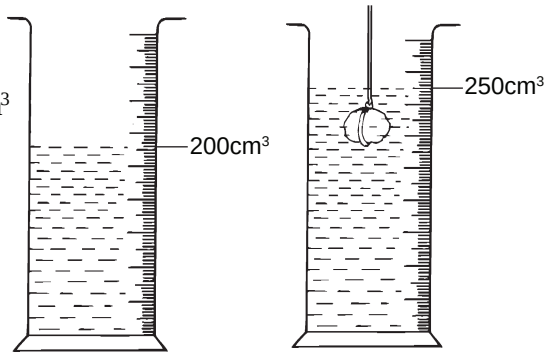


Figure no. 1.11

Experimental activities

1. Take a physical balance with standard weight masses. Place an object on a pan and put standard weights on the other pan and adjust till the beam is perfectly horizontal. Observe the mass of the standard weights while the beam is perfectly horizontal.
2. Find the volume of (a) Pebble (b) Spoon.

Summary

1. The SI system is developed to bring uniformity in measurement across the world.
2. Solid objects may be of regular as well as irregular shapes.
3. The plane surface occupied by an object is its area. Square metre or square centimetre are units of area measurement.
4. Area of rectangular surface = length x breadth.
5. Area of irregular surface can be measured by using a graph paper.
6. The space occupied by a surface is called its volume.
7. The volume of liquid is measured by using measuring cylinder.
8. The volume of an irregular solid can be found by using a measuring cylinder.
9. Volume of rectangular faced object = length x breadth x height.
10. 1 cubic metre is equal to 1000 litre.

Exercise

1. Fill in the blank spaces with suitable words.

(a) To find the correct quantity of an object, ... must be taken.

(b) The object which has fixed geometrical shape is known as .....object.

(c) The unit of area is .....

(d) The volume of liquid can be measured by .....

2. Choose the correct answer.

(a) Which instrument is used to measure the volume of a liquid in a laboratory ?

(i) Scale (ii) Physical beam

(iii) Measuring cylinder (iv) Maana

(b) How many litres are there in 1 cubic metre?

(i) 100 litre (ii) 1000 litre

(iii) 10,000 litre (iv) 10 litre

(c) What is the SI unit of electric current ?

(i) volt (ii) Ohm

(iii) Watt (iv) Ampere

(d) Which squares are counted to determine the area of an irregular surface?

(i) full square only

(ii) full and more than half squares only

(iii) full, more than half and exactly half squares only

(iv) full, more and less than half all squares.

3. Answer the following questions

(a) What is the SI unit?

(b) Why is the system of SI unit developed?

(c) What is volume ?

(d) How is the volume of a rectangular object determined?

(e) How is the volume of an irregular object measured?

(f) How is the volume of a rectangular room measured?

(g) Write the differences between regular and irregular objects.

4. The length, breadth and the height of a box is 50cm, 20cm and 10cm respectively, then find

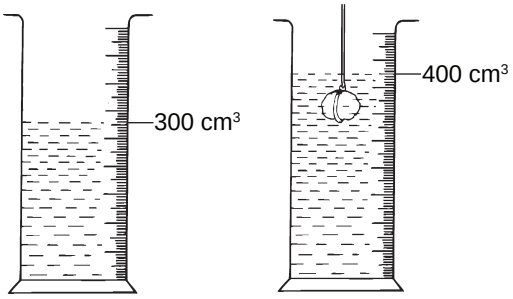
(i) surface area of its base

(ii) volume

($1000\ cm^2$, $10000 cm^3$)

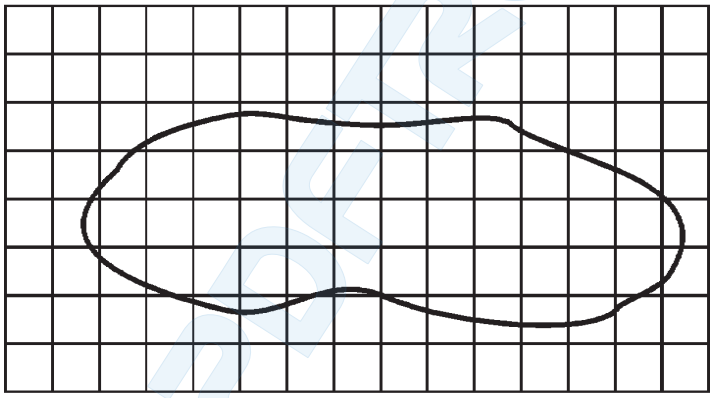
5. If the radius of a coin is 20 cm, find its surface area. ($12.57\ cm^2$)

6. Calculate the volume of the solid object immersed in the water in the adjoining figure. ($100cm^3$)



7. Find out the area (by counting) of given irregular object of the figure.

($43cm^2$)



Unit - 2

Force and Motion

Force is experienced in push or pull. Force is exerted in push or pull. Force is involved in walking, opening door, brushing our teeth, washing, etc. Without force, work cannot be done. Force changes the state of rest of a body to motion and motion to rest.

Force is defined as an external agent which changes or tends to change the state of a body from rest to motion or motion to rest.

Types of force

There are many types of forces. Some of them are discussed below:

Centripetal force

A person running or riding a bicycle in a circular path need tilts toward centre, why? Similarly passengers in a bus tends to swing in opposite direction while the bus takes a turn in a curved road. why?

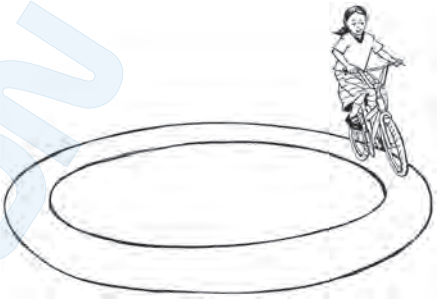


Figure no. 2.1

The force which keeps a body moving uniformly along a circular path and always directed along the radius towards the centre is called centripetal force. In the absence of centripetal force the body will be moved away from the center. The force acting in opposite direction to centripetal force is called centrifugal force.

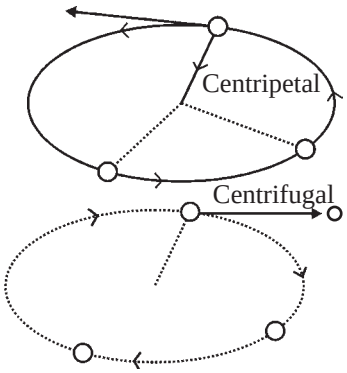


Figure no. 2.2

Activity 1

Tie a small piece of wood or a small rubber ball with a string about 30-40 cm long. Hold the string tightly in your hand and rotate it as shown in the figure. Leave the string while rotating toward the safe place where your friends are not staying. That ball or wood along with string flies away. Why? Due to centripetal force on rotating the object takes the circular path and directed toward the centre. Due to centrifugal force, on leaving string, the object moves away from the centre.

Figure no. 2.3

Activity 2

Take a small plastic bucket or empty vessel and fill some water in it. Tie a 50 cm long string on its handle as shown in fig. 2.4. Hold one end of the string tightly in your hand and rotate in circular path. While rotating, the bucket at a constant speed, the water does not spill out, why? Discuss with your friends about the reason.

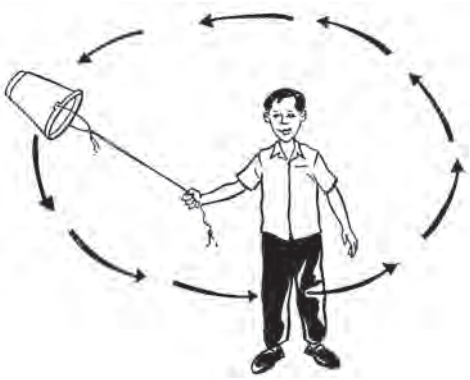


Figure no. 2.4

2. Gravitational force

If we throw any object towards the sky, it comes down to the earth after a certain time.

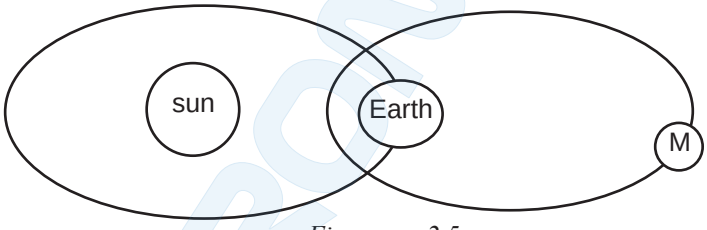


Figure no. 2.5

Ripened fruits from trees fall down to the earth. Water also flows to the downward direction. The earth pulls every object towards its centre. The force with which the earth pulls any object towards its centre is called the force of gravity. Similarly, others planets and satellites also have the force of gravity. Due to the gravity of the earth, every object falls toward the centre of earth. The reason that the rain drops, snow hill etc fall downward is also the gravity of the earth.

The earth attracts the moon and in the same way the moon also attracts the earth. Similarly, the sun and the moon also attract each other toward themselves. Thus, the force of attraction between any two bodies in the universe is called gravitational force or simply gravitation.

3. Magnetic force

A magnet attracts magnetic substance towards it. They are iron, cobalt and nickel. A magnet has two poles, the North pole and South pole. The opposite pole of a magnet attracts each other whereas like pole repels each other. The force of attraction or repulsion exerted by magnets is called magnetic force. With the help of such magnetic force, heavy iron objects can be lifted.

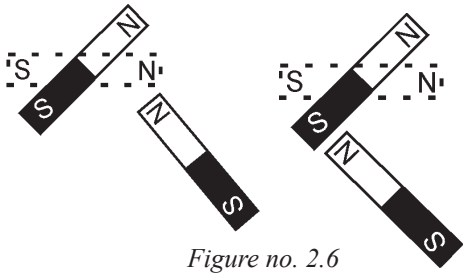


Figure no. 2.6

The force produced by magnet is called magnetic force.

Activity 3

Suspend a bar magnet freely using a thread. Take another bar magnet in your hand and try to bring its South pole near to the North pole of suspended bar magnet. What will happen? Observe. Again bring its South pole near to the south pole of suspended bar magnet. What will happen? Observe. There is repulsion on North-North pole of magnets whereas there is attraction on South-North pole of two magnets. It means like poles repel each other while the unlike poles attract each other. The force of pulling during attraction and the force of pushing during repulsion is formed.

4. Electrostatic force

When a plastic comb or pen is rubbed with dry hair, it can pick up small bits of paper if placed close. This is because the comb or pen accepts electrons from the atoms of hairs. Due to which the comb or the pen acquires negative charge. When we place the comb or the pen nearer to the bits of papers the paper acquires positive charges by induction and the positive charge of bits of papers are attracted by the negatively charged comb or pen. So, the bits of papers are pulled to the comb or the pen. Thus in nonmetals like plastics, rubber, wood, polyester, the electric charge produced from friction is formed which is called static electricity.

A combed comb attracting small bits of papers

Figure no. 2.7

The force exerted by the electrically charged body on other charged or neutral bodies is called electrostatic force.

5. Frictional force

Students, have you ever ride bicycle? What you have to do to stop the moving bicycle? How do the bicycle stop when brake is applied? Observe carefully and discuss with your friends.

Friction exists when two surfaces are in contact against each other. The direction of frictional force is always opposite to the direction of the movement of an object. It opposes the motion of the objects. When the brakes are applied on the bicycle, the rubber of the brakes press on the ring of tyres due to which an opposite force is developed between the surfaces and bicycle comes on rest.

Thus frictional force is defined as a force that restricts the motion of one body moving over another.

Friction is less on the smooth surface and more on the rough surface. It increases with increase in the roughness of the surface. We can walk, run, stop the bicycle, motorcycle, car, etc. by the friction. The friction produced on the part of machine decreases the efficiency of the machine. So, the lubricants are used in the parts of machine to reduce the friction.

Questions

1. Why do we fall down when we walk over slippery surface or peel of a banana?
2. Why are the lubricants used in the parts of sewing machine?

Distance and displacement

There are so many paths to go from one place to another. Among them, some may be straight and some may be curved. In the given figure 2.9, to move from P to Q, any paths A,B and C can be used, which are of different lengths. Can you guess which is the shortest path?

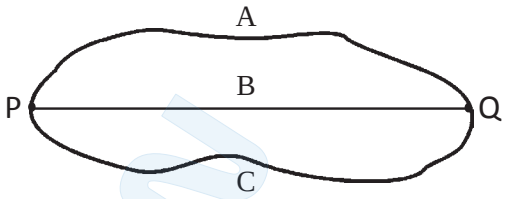


Figure no. 2.9

Path B is the shortest path between point P and Q, as it is straight path. This shortest distance between the two points P and Q is called displacement. But the length covered on the path A and C is the distance. The SI unit of distance and displacement are metre (m). Displacement must be specified with direction. For example Pokhara is 200 km far from the Kathmandu refers that the path (distance) between Pokhara and Kathmandu is 200 km but if it is said that Pokhara is 150 km west from the Kathmandu is displacement. Distance is scalar quantity where as displacement is vector quantity.

The shortest distance covered by moving body in a particular direction is called displacement. The actual length of the path covered by a moving body is called distance.

Scalar and vector quantity

The physical quantities which have only magnitudes but no direction are called scalar quantities. Examples, distance(meter), mass (kilogram), time(second), speed(meter per second), etc.

The physical quantity which have magnitude as well as direction is called vector quantity. Examples - displacement (metre and direction is also indicated), velocity, acceleration, etc.

Speed and velocity

Some animals run fast and some slowly. In the same way, some people can run fast and some can't. A man can run 5 metre per second refers that he covers 5 metre distance in every second of the time. Similarly, sound covers 330 meter in every second of time refers to the speed of sound. The distance travelled by a body per unit time is called speed. The SI unit of speed is metre per second (m/s).

Mathematically,

$$\text{Speed} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

The fast moving body has high speed and the slow moving body has low speed. There is magnitude in the speed but not the direction. So, the speed is scalar quantity.

Example 1:

If a bus travels 1000 metre distance in 50 second, what is the speed of the bus?

Solution:

Distance travelled = 1000 m

Time taken = 50 s

Speed = ?

According to formula,

$$\text{Speed} = \frac{\text{Distance travelled}}{\text{Time taken}}$$

$$= \frac{1000}{50} = 20\text{m/s}$$

$\therefore$ The speed of that bus is 20 m/s.

Velocity

The distance travelled by a body per unit time in a particular direction is called velocity. Its SI unit is also metre per second (m/s). There are magnitude and direction in the velocity. So, velocity is a vector quantity.

Mathematically,

$$\text{Velocity} = \frac{\text{Distance travelled in a particular direction (m)}}{\text{Time taken (s)}}$$

Though, the uses of speed and velocity is the same in the daily life but they have different meanings in science. Let's see the difference between speed and velocity.

Speed	Velocity
1. The distance travelled by a body per unit time is called speed.	1. The distance travelled by a body per unit time in a particular direction is called velocity.
2. It is scalar quantity.	2. It is vector quantity.

Uniform and variable velocity

If a body covers equal displacement in equal interval of time, the velocity is called uniform velocity.

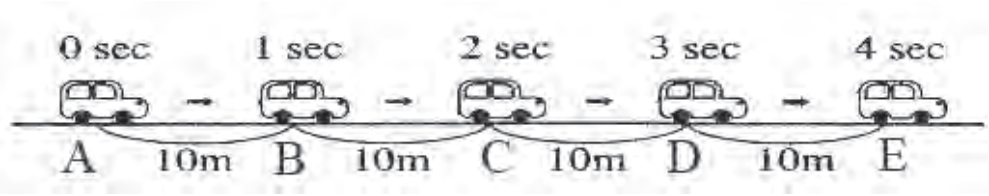


Figure no. 2.9

If a body does not cover equal displacement is equal interval of time, the velocity of the body is called variable velocity. In such velocity, the distance covered by the object in each second varies.

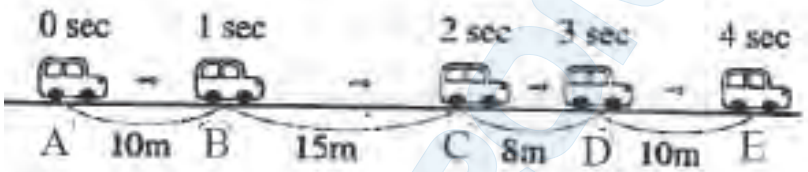


Figure no. 2.9

When a body moves in a non-uniform motion, its velocity changes continuously. In such situation we use average velocity.

$$\text{Average velocity} = \frac{\text{Total displacement}}{\text{Total time taken}}$$

Example 2

If a car takes 5 minutes to travel a distance of 6 kilometre, find the average velocity of that car.

Solution:

Here, Total time taken = 5 min

= 5 x 60s

= 300s

Total displacement (s) = 6km

= 6 x 1000

= 6000m

Average velocity ($\bar{v}$) = ?

According to formula,

$$\text{Average velocity } (\bar{v}) = \frac{\text{Total displacement (m)}}{\text{Total time taken (s)}}$$

$$= \frac{6000}{300}$$

$$= 20 \text{ m/s}$$

$\therefore$ The average velocity of car is 20m/s.

Acceleration

The acceleration of a ball moving down in the inclined plane and the bicycle in the slanting road increases gradually. Similarly, the velocity of any object falling from certain height towards the earth surface also gradually increases. *Thus, the rate of change of velocity of a moving body is called acceleration.* The unit of acceleration is metre per square second (m/s^2).

Mathematically,

$$\text{Acceleration (a)} = \frac{\text{Change in velocity (m/s)}}{\text{Time taken(s)}}$$

$$= \frac{\text{Final velocity (v) - Initial velocity (u)}}{\text{Time taken(t)}}$$

Example 3.

The velocity of a car increases from 10m/s to 30m/s in 10 second. Find the acceleration of the car.

Solution:

Here, Total time taken = 10s

Initial velocity (u) = 10m/s

Final velocity (v) = 30m/s

Change in velocity = v - u = 30m/s - 10m/s

= 20m/s

Now,

$$\text{Acceleration (a)} = \frac{\text{Change in velocity}}{\text{Time taken}}$$

$$= \frac{20\text{m/s}}{10\text{s}}$$

$$= 2\text{m/s}^2$$

$\therefore$ The acceleration of the car is 2m/s^2

Experimental activity

Mark 100 metre distance in a ground or in a road. Complete the race by five students one by one in that marked distance. Note down the time taken by each student. Calculate how much distance is travelled by each student in 1 second.

Summary

1. Force is defined as an external agent which changes or tends to change the state of a body from rest to motion or motion to rest.
2. There are several types of force such as

   (a) centripetal force (b) gravitational force

   (c) magnetic force (d) electrostatic force

   (e) frictional force
3. The shortest distance covered by a moving body in a particular direction is called displacement.
4. The physical quantity which has magnitude only is called scalar quantity and the physical quantity which has magnitude as well as direction is called vector quantity.
5. The rate of change of distance by a body is called speed.
6. The rate of change of distance by a body in a particular direction is called velocity.
7. The rate of change in velocity is called acceleration.

8. When a body travels equal distance in equal interval of time, its velocity is called uniform velocity.

9. When a body travels unequal distance in equal interval of time, its velocity is called variable velocity or non-uniform velocity.

10. $$\text{Speed} = \frac{\text{distance travelled (m)}}{\text{time taken(s)}}$$

11. $$\text{Velocity} = \frac{\text{distance travelled in particular direction (m)}}{\text{time taken(s)}}$$

12. $$\text{Acceleration} = \frac{\text{change in velocity (m/s)}}{\text{time taken(s)}}$$

Exercise

1. Fill in the blank spaces with suitable words.

(a) The force with which the earth pulls the objects towards its centre is called the force of .....

(b) The shortest distance covered by a moving body in a particular direction is called .....

(c) The physical quantity which has magnitude and direction is called .....

(d) The rate of change of ..... is known as acceleration.

2. Choose the best one answer from the given alternatives.

(a) What is the force experienced by a body moving in a circular path acting towards the center?

(i) Centripetal force (ii) Gravity

(iii) Fractional force (iv) Gravitational force

(b) What is meant by displacement?

(i) The shortest distance between two points

(ii) The largest distance between two points.

(iii) The length of path of two points.

(iv) None of above.

(c) What is the rate of change of velocity of a moving body?

(i) Speed (ii) Velocity (iii) Acceleration (iv) Motion

(d) By which unit is the velocity measured?

(i) metre (ii) metre per second

(iii) metre per second per second (iv) per second newton

(e) What is the reason behind that the ripened fruits fall toward the earth's surface?

(i) attraction force (ii) repulsion

(iii) gravity (iv) fractional force

3. Differentiate between.

(a) Uniform velocity and Non-uniform velocity.

(b) Gravitational force and gravity.

(c) Magnetic force and electrostatic force.

(d) Speed and velocity.

4. Write short answers of the following questions.

(a) What is centripetal force? Give examples.

(b) The stone thrown towards sky always falls down, why?

(c) How can we show the magnetic force on a magnet? Illustrate with example.

(d) Why the stone moves away when the string is broken during rotation?

(e) How is the frictional force produced?

5. An object moves 100 m distance in 5 seconds. Find its speed ?

6. Find the distance covered by a car in 10 seconds, if it is moving at the speed of 20m/s.

7. The velocity of a vehicle increases from 10m/s to 20 m/s in 5 seconds. Find the acceleration of the car.

Unit 3

Simple Machine

In our daily life, we use several types of devices to make our work easier. *Hasia* and *Khurpa* are used to cut grass and firewood in the village. Axe is used to cut the trees and chop firewood. Similarly, spade is used to dig field. The devices such as *chuleshi, knife*, forceps, *sarauto*, shovel, *charkha* are used in our household work. A pulley is used to draw water from a well in Terai region. A plank is used to drag heavy load to the truck. We can screw or unscrew a nut by using a screw driver. All these devices are used to make our work easier and convenient to do. Though these machines are very simple in construction, their uses make the works faster, easier and the work can be done with less effort. Such machine which is simple in construction are simple machines.

A simple machine is a simply constructed device which makes our work easier, faster and convenient with less effort.

Types of simple machine

On the basis of construction and function, simple machines are classified into six groups.

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

1. Lever

Have you seen the scissors, physical balance, *dhikki, sarauto*, forceps and the rod used to roll huge stone? Those rigid bars are used to lift the heavy object with the support of a fixed point. Such devices are levers.

Lever is a long rigid bar capable of moving about an axis or a fixed point called fulcrum. The force applied to move or lift the object is called effort. The object, which has to be moved or lifted by a lever is called load. Sometime, levers are used to cut or make pieces too. In such cases, those works are also known as load.

On the basis of the location of fulcrum, load and effort, levers are classified into three groups.

a. First class lever

b. Second class lever

c. Third class lever

(a) First class lever

The lever in which, the fulcrum lies at any point between the load and the effort is called first class lever. For example, scissors, *dhiki*, beam balance, crow bar etc.

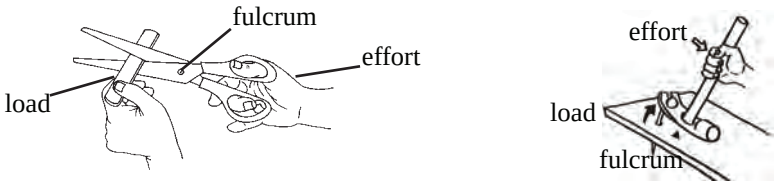


Figure 3.1

(b) Second class lever

The lever in which, the load lies at any point between the fulcrum and the effort is called second class lever. For example: *sarauto*, lemon squeezer, wheel barrow etc.

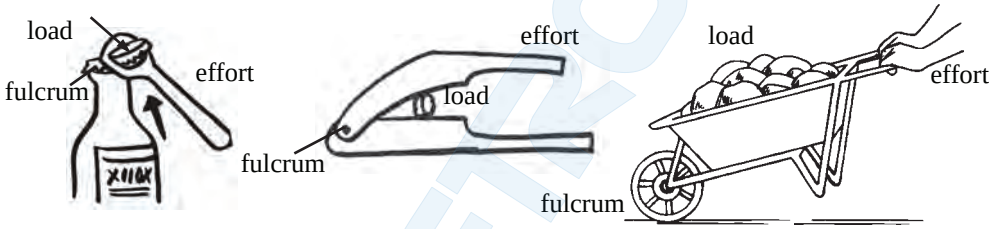


Figure 3.2

c. Third class lever

The lever in which, the effort lies at any point between the load and the fulcrum is called third class lever. For example fire tongs, shovel, turning the pages of book or human forearm etc.

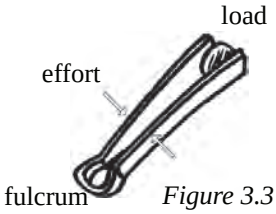


Figure 3.3

2. Pulley

Have you ever seen a pulley used to draw water from a well? Pulley is a grooved wheel over which rope is passed. A pulley helps to lift a heavy load to a great height. The load is fixed at one end of the rope and the effort is applied at the another end. By pulling the rope down, the load can be lifted upward. Generally, pulley are of two types.

(a) Fixed pulley (b) Movable pulley

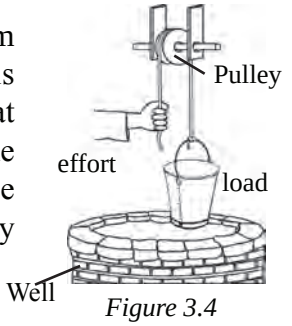


Figure 3.4

(a) Fixed pulley

The pulley which rotates in a fixed point is called fixed pulley. For example, pulley used to draw water from a well.

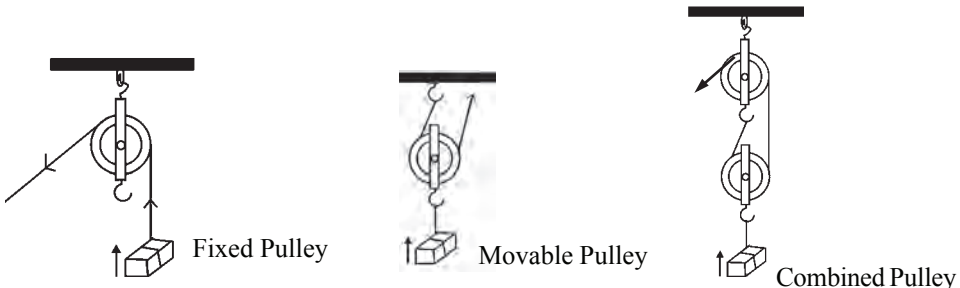


Figure 3.5

(b) Movable pulley

The pulley which moves up and down with load is called movable pulley. Such pulley is used to lift heavy load.

The pulley which is made by the combination of fixed pulley and movable pulley are called combined pulley. It makes work easier and faster. It helps to do work easier which needs more effort.

3. Wheel and axle

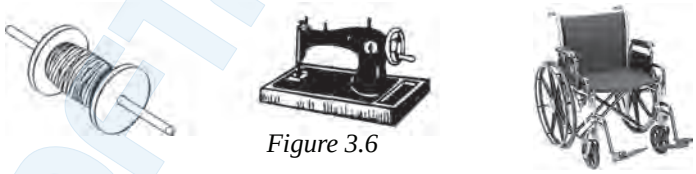


Figure 3.6

Have you seen the handle of cycle, rotating paddle of cycle, rotating handle of door, flying kite with italic and using sewing machine. Have you seen that the stearing of vehicles is rotated left, right for its turning? In such devices, the axle are fixed on the wheel. The axle rotates while the wheel is rotated. Wheel and axle work together. The diameter of wheel is greater than that of axle. Such devices are wheel and axle.

Two cylinders of different radii in which both the cylinders spin on the same axis together are called wheel and axle. Effort is applied in the wheel and the axle do work against the load. The diameter of the wheel is greater than that of the axle, so the small amount of force applied on the wheel is multiplied on the axle. It makes work easier and faster. If such type of event happens on load while effort is applied on a simple machine is called as wheel and axle. For example, opening and tightening of nut with screw driver.

4. **Inclined plane**

Have you seen a wooden plank used to load goods into truck? Have you seen or used ladder or staircase. The slanting surface along with ground as plank, ladder, stair case steep slope land are inclined plane. It is easier to push the heavy load with less effort.

A flat surface that is slanted at a certain angle with the horizontal surface is called inclined plane. For example, roads up hill, stairs, etc.

It is easier to do work if vertical height is less and the length of plank is longer. If the length of plank is shorter than the height of inclined plane a larger effort is required. The roads going up a mountain are made winding so that the slope is gradual and automobiles with heavy load can easily climb.

Activity 1

The figures given below show the act of the loading up heavy loads to a truck. In which figure, it seems easier to do work? Why? Discuss with friends and submit the conclusion to the teacher.

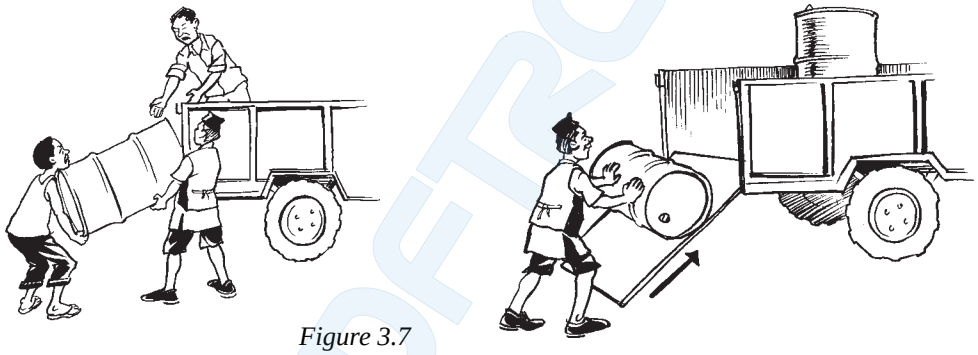


Figure 3.7

5. **Screw**

Screw is a simple machine having thread along the cylindrical surface. For example, screw nail, jack screw, driller, etc.

Screw is a spiral rigid inclined plane. As the slanting surface increased in inclined plane, the thread of screw increases in height. The effort is applied to the head of the screw with the help of screw driver to drill the screw into a block of wood. Similarly, an automobile can be lifted up alone with the help of a jack screw.

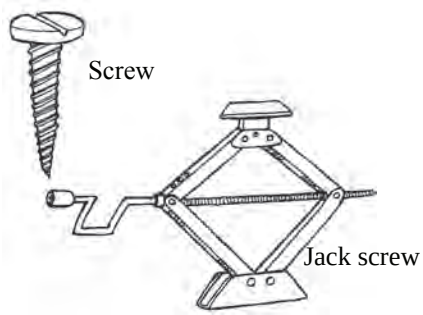


Figure 3.8

6. **Wedge**

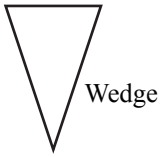


Figure 3.9

We can easily sew the clothes with sharp nail. It is easier to cut the vegetable with sharp knife or *chulesi*. Wood can be cut, split easily by sharp axe. Why those devices are made sharp? Sharp edged knife, *chulesi, khukuri*, axe, *hashia*, nail, pin, needle, etc. are wedge.

A block having one flat and other sharp end is called wedge. For example: axe, khukuri, knife, etc.

Wedge makes cutting easier and faster. For example, when an axe is struck against a log of wood the axe will stick into the wood. The dipper the axe sticks the wider will be the splitting.

The more sharper surface, they multiply the effort and make the work easier.

Activity 2

Identify the given simple machines and write their name and uses in the table given below.

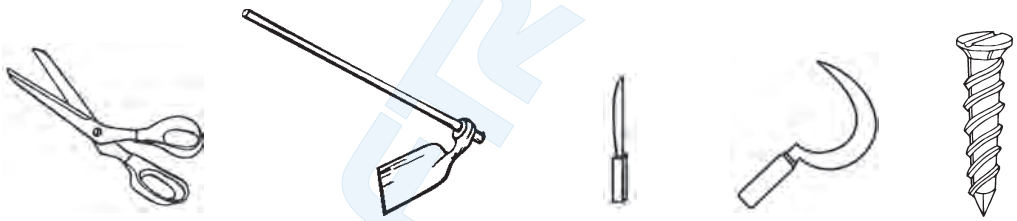


Figure 3.10

S. No.	Simple machine's name	Uses
(a)		
(b)		
(c)		
(d)		
(e)		

Project work

Collect the simple machines which you use in your daily life and classify them.

Summary

1. A simply constructed device which makes our work easier, faster and convenient with less amount of effort is called simple machine.
2. Generally, simple machines are of six types. They are

   (a) Lever (b) Pulley (c) Wheel and Axle

   (d) Inclined plane (e) Screw (f) Wedge
3. Lever is a long rigid bar capable of moving about a fixed point.
4. Fulcrum, load and effort lie on the middle on the first, second and third class lever respectively.
5. Two cylinders of different radii in which both the cylinders spin on the same axis together are called wheel and axle.
6. Fixed and movable pulley are the two types of pulley.
7. It is easier to lift the heavy load by using the inclined plane.
8. With the help of jack screw, heavy vehicles can be lifted easily.
9. The more sharper the edge of wedge, more easier easy to do the work.
10. The two co-axial cylinders of different diameters working together is wheel and axle.

Exercise

1. Fill in the blank spaces with suitable words.

a. Simple machine makes the work ..... and faster.

b. A pair of scissors are the example of ..... class lever.

c. The uses of pulley makes easier to the heavy objects.

d. Winding road, staircase are the examples of .....

e. An iron nail having threads along its cylindrical surface is .....

2. Choose the best answer.

a. A spoon used to open the lid of a can is ....

(i) first class lever (ii) second class lever

(iii) third class lever (iv) none of them.

b. Which simple machine is used to tight the screw with screw driver?

(i) Lever (ii) Wheel and Axle

(iii) Inclined plane (iv) Wedge.

c. Which category of the simple machine is *lattai* to fly kite?

(i) Lever (ii) Wheel and Axle

(iii) Pulley (iv) Wedge

d. Which type of the simple machine is the axe?

(i) Lever (ii) Screw

(iii) Wedge (iv) Inclined plane

e. Which type of the simple machine is winding road in hill?

(i) Lever (ii) Wedge (iii) Screw (iv) Inclined plane

3. Classify the given simple machines into separate group.

Paddel of cycle, *dhiki*, ladder, wheelbarrow, winding road, screw driver, broom, spoon, shovel, screw nail, jack screw, axe, nail, wheel chair.

4. Give the short answer.

(a) What is a simple machine?

(b) What is lever?

(c) How many types of lever are there? What are they?

(d) What type of simple machine is wheel and axle? Explain with example.

(e) What is pulley? What is its use?

(f) What is the use of inclined plane?

(g) Which one is easier to to chop the wood with blunt or sharp axe? Why?

(h) Mention the uses of a jack screw.

5. Draw neat and clean diagram of following simple machines.

(a) Different level levers (b) Compound pulley

(c) Wheel and axle (d) Wedge.

Unit 4

Pressure

We can walk easily on barefoot on muddy road but not on gravel road, our feet get hurt and it becomes difficult to walk for us. Why is it so?

Activity 1

Poke yourself with the sharp end of your pencil. Now repeat the same thing with the blunt end of your pencil in the same part. What difference do you get in these two activities?

You feel more pain when you poke with the sharp end than with the blunt end of the pencil, Why?

When a force is applied on a body in large area, the effect is lesser and in a small area, the effect is greater. This force acting per unit area is called pressure.

Measurement of pressure

The pressure exerted due to the force applied on certain area depends upon the effectiveness of that applied force. The pressure increases with the increase in the amount of force applied. Pressure increases with the decrease of the surface area of the body where the force is applied and vice versa.

Force applied on any area = F

Area = A

Now, Pressure $P = \frac{F}{A}$.

The unit of force is Newton (N) and that of area is m^2. So, the unit of pressure is N/m^2 . This is also called pascal (Pa).

1 pascal = 1 N/m^2.

Example 1

A sack of rice of weight 2000N occupies an area of $2m^2$. Calculate the pressure exerted by the sack on the ground. If the sack is kept in such a way that it covers of $4m^2$, find the new pressure it exerts on the ground? Calculate the pressure difference.

Here,

Weight of an object or force(F) = 2000N

Area occupied (A) = $2m^2$

Now, Pressure (P) = $\frac{F}{A}$

$= \frac{2000\ N}{2\ m^2} = 1000\ N/m^2 = 1000$ pa.

Again,

Forc (F) = 2000 N

Area (A) = 4 m^2

Now,

Pressure (P) = $\frac{F}{A}$

$= \frac{2000\ N}{4\ m^2} = \frac{500\ N}{m^2} = 500$ pa

Figure no. 4.1

Here, when the area covered decreases the pressure increases and when the area covered increases the pressure decreases. When area covered is doubled, the pressure exerted is half.

Questions

1. How do the flat feet of camel help to walk them in sand of desert?
2. When the lady with flat slippers walking on muddy path, the feet don't deep on the path. But if she uses heel shoes, the feet deep on the path? Why is it so?

Difference between force and pressure

Force	Pressure
1. The pulling and pushing action of the body is called force	1. Force acting normally to the unit surface area of any body is called the pressure.
2. The S.I unit of force is Newton (N).	2. The S.I unit of pressure is Newton per metre square (N/m^2) or pascal(Pa).

Application of pressure

Pressure plays an important role in our daily life. The tip of halo used in ploughing field is made sharp so that farmer can exert more pressure by applying less force. Similarly, the *kodhalo* is also sharp to plough the field. *Hasiya, khurpa* are also made sharper to cut and chope the wood.

More pressure is not always useful. In such case, the pressure is needed to be controlled. Such as tractors ploughing fields have large and wide rear wheels, so that they don't sink deeper on ground. Similarly, the heavy truck

Iron nail

Truck with many wheels

Figure no. 4.2

has more number of tyres so that they exert less pressure on the road.

Questions

1. The foundation of a constructing building is made wider. Why?
2. What is the reason behind that the iron nail is made sharp at the tip?

Experimental activities

Put your all books and copies inside a flat armed bat and carry on. Now, replace the arms with thine rope or string and do the same as previous which one of them you feel comfortable to carry? Why, give reason?

Summary

1. Force acting normally to the unit surface area of any body is called the pressure.
2. Force is measured in Newton(N), area in metre square (m^2) and pressure is measured in Newton per metre square (N/m^2) or pascal.
3. Increase in force increases the pressure. But increase in area decrease the pressure and vice versa.
4. Pressure has important application in our daily life. Some times it needs to increase the pressure and decrease too.
5. Knives, *khukuri* and *hasia* are made sharper to make the chopping easy. Likewise, the rear wheels of heavy lorry or buses are doubled to carry heavy loads easily by reducing pressure on the road.

Exercise

1. Fill in the blank spaces with suitable words.

a. Pressure exerted on any object depends on force and .....

b. If the area on which the force is exerted decrease, ... increased.

c. Pressure is measured in .....unit.

d. The tip of a nail is made .....to make easy to drill into the clothes.

2. Give reason.

a. The foundation of a house is wider than its wall.

b. The tip of the nail is sharp.

c. The flat and long shoes are used to walk on snow.

d. The rear wheels of tractors are wider.

e. Football players have studs on their boots.

3. Give short answers.

a. What is pressure? What is its unit?

b. On which factors does pressure depend on?

c. What are the applications of pressure in our daily life? Give any two examples.

d. What difference is felt if we stand up with one foot than that with two feet?

4. Solve the following problems.

a. A box of weight 200N is placed on a ground of $20m^2$. Find the pressure exerted by the box.

b. The weight of a person is 400N. He exerts 400 N/m^2 pressure if he stands with both feet. Find the area of the floor covered by his both feet.

Unit 5

Energy, Work and Power

Energy

After having food, the work can be done for a long time. But in the hunger stage, the work can't be done for a long time and feel tired. Why is it so? Work can't be done in hunger? What is the reason behind it.

We get energy from food. We can do various works by such energy. Human along with all living organisms get energy from food. Energy makes body capable to do work. Vehicles like motorbike, aeroplane, tractor, etc. get energy from petrol and diesel. Electrical appliances like radio, television, telephone, etc. operate by electricity. Energy produces force on human or other appliances to do work.

So, energy is the capacity to do work. Energy is measured in joule.

Types of energy

We perform several activities in our daily life. To perform such activities, various forms of energy are used. The main forms of energy are:

1. Mechanical energy
2. Chemical energy
3. Heat energy
4. Light energy
5. Sound energy
6. Electrical energy
7. Magnetic energy
8. Nuclear energy

1. Mechanical energy

The energy possessed by a body due to its motion or position is called mechanical energy. There are two types of mechanical energy.

a. Potential energy

The energy possessed by a body because of its position, and state is called potential energy. For example, a stretched rubber, water stored in a dam, winding the watch, kicking a ball, etc.

Figure no. 5.1

b. Kinetic energy

The energy possessed by a body because of its motion is called kinetic energy. For example: a rolling ball, a flying bird, flowing water, blowing air, moving vehicles, etc. posses kinetic energy.

When we kick a ball, it rolls on the ground. The foot you lift to kick the ball has potential energy. And the rolling ball, after you kick, has kinetic energy.

Activity 1

Take a ball with your friends and go to the ground. Place that ball on the ground and kick it by lifting the leg slightly. Again lift your leg up to greater height than previous and kick the ball one by one. What differences did you get ? What is the difference in the stored energy while lifting your leg slightly or to greater height? In which condition does the ball go far? Discuss.

2. Chemical energy

The energy released from the chemical reaction and stored in the body is called chemical energy. For example, food, coal, wood, petrol, kerosene, etc. contain the chemical energy.

3. Heat energy

When we rub our hands, we feel warm. The heat energy is released during the rubbing of hands. The energy which is formed by the vibration of molecules of the body is called heat energy. For example; firewood, oil, gas, etc. give heat energy on burning.

4. Light energy

Light is a form of energy. It gives the sensation of vision. Plants make their food in the presence of sun light. Burning candle, wood, bulb, sun, etc. give heat as well as light energy.

5. Sound energy

The energy produced by a vibrating body is called sound energy. For example vibrating bodies like madal, guitar and flute produce sound energy.

Activity 2

Take a steel bowl. Hit it gently with a spoon. The sound is produced on bowl. If you touch the bowl, you will notice that the bowl is vibrating. While touching that bowl, the vibration and sound also stops. From the activity, it can be concluded that the vibrating bodies produce the sound.

Figure no. 5.2

6. Electrical energy

The energy which is formed by the flow of electrons through a conductor is called electrical energy. Electrical energy operates different appliances such as radio, television, mobile, telephone, calculator, computer, electrical bulb, fan etc are operated by electrical energy. electric energy is produced by cells and batteries as well as by dynamo or generator.

7. Magnetic energy

The energy obtained from magnet is called magnetic energy. Magnet is used for the production of hydroelectricity, making telephone, radio, microphone and to lift heavy loads too.

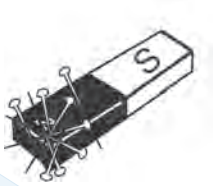


Figure no. 5.3

Activity 3

Take a bar magnet. Take some small iron nails or pins. Now, hold the bar magnet near to that nails or pins. Magnet attracts those pins. If the magnet is held up those pins are also held up. In this way, the magnet works. Similarly, the heavy loads can be lifted with the help of magnet.

8. Nuclear energy

The energy which is generated during the process of disintegration or combination of nucleus is called nuclear energy. In the sun, the light and the heat energy are formed by the method of nuclear reaction. Electrical energy can also be generated by nuclear energy.

Work

We perform various types of activities like reading, writing, playing, digging field, carrying load, selling good by sitting shop and giving security by the guard. According to science, are those all work? Is the meaning of work same in our daily practice and science?

Force is necessary to do work. The force pulls or pushes objects. Work is said to be done, if a force is applied on an object produces motion. Work is not done, if the applied force does not produce motion. So, a person carrying a load is not said to be doing work if he stands at the same place. To do work, a body should move through a distance on applying force.

Work is said to be done if the force acting upon a body makes it move through some distance. Work is measured in Joule.

$\therefore$ Work (W) = Force (F) x distance (d)

While doing work, the more force you applied, the more work you have done. Similarly, the more distance is covered, the more work is done. So, the product of force and distance travelled give the magnitude of work. In SI unit, force is measured in Newton(N), distance in meter(m) and work in joule (J).

Question

Is a guard standing with a gun in front of a building doing work as per science?

Types of work.

There are two major types of work often done

1. Work done against gravity
2. Work done against friction

1. Work done against gravity

Earth attracts every object toward its centre. This force of attraction is called gravity. When we lift any abject from the surface of earth, we apply force against the gravity. This work is called work done against gravity. For example, pulling a bucket of water from a well, lifting any object from the ground, walking uphill, etc. are work done against gravity.

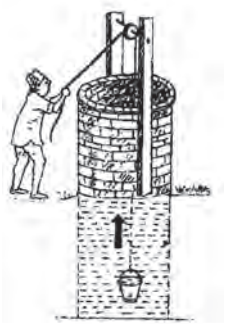


Figure no. 5.4

2. Work done against friction

When an object is pulled or pushed a force is produced in the opposite direction. This opposing force is called friction. The work done by pulling or pushing a body over the surface of another body is called work done against friction. For example; walking, cycling, pushing cart, walking with heavy load, etc.

Figure no. 5.5

Power

Ram digs a piece of land in 3 hours but Shyam takes 2 hours to dig the same piece of land. What is the difference in their work?

Both of them do the same work. But Shyam does the work in less time than Ram. In turn we can say, Shyam does more work per unit time than Ram. The person who does more work in less time is said to have more power.

Work done per unit time is known as power. Its SI unit is watt.

Mathematically,

$$\text{Power (P)} = \frac{\text{Work done (w)}}{\text{Time taken(t)}}$$

$$\text{or, } P = \frac{W}{t}$$

In SI unit, the unit of work is Joule(J) and that of time is second (s). So, the unit of power is Joule per second or watt. 1 Joule per second is 1 watt. If we know the power of any machine, we can find how fast it works. The power of mechanical devices is measured in horse power.

1 horse power (h.p) = 746 watt.

1000 watt = 10^3w = 1kw (kilowatt)

1000000 watt = 10^6 w = 1 Mw (Megawatt)

Project work

1. Visit the mills, ghatta or any industries in your locality. Write what of energy is used on those.
2. Take a spring balance attached with a brick or piece of wood. Pull it on rough surface as well as in smooth surface. In which condition, the more work is done? Why?

Summary

1. The capacity to do work is called energy. Energy is measured in Joule.
2. The product of force and the distance covered along the direction of force is called work. Work is measured in Joule.
3. Work = Force x distance.
4. Works are of two types.
   (a) Work against gravity
   (b) Work against friction
5. The work done when a body is lifted from the surface of the earth is called work against gravity.
6. The work done by pulling or pushing body on the surface of another body is called work done against friction.
7. Work done per unit time is called power. Its unit is joule per second or watt.

8. The energy possessed by a body by virtue to its position or state is called potential energy.
9. The energy possessed by a body due to its motion is called kinetic energy.
10. There are different forms of energy. They are

(a) Mechanical energy	(b) Chemical energy
(c) Heat energy	(d) Light energy
(e) Sound energy	(f) Electrical energy
(g) Magnetic energy	(h) Nuclear energy

Exercise

1. Fill in the blank spaces with suitable words.

(a) The capacity to do work is .....

(b) Work depends on ..... and .....

(c) The rate of doing work is called .....

(d) Energy stored in a running object is .....

(e) Energy stored in a stretched object is .....

2. Complete the formula.

(a) Work = ... x distance.

(b) Power = $\frac{\text{Work done (joule)}}{\text{.....}}$

3. Differentiate between

(a) Work and Power

(b) Work against gravity and Work done against friction.

(c) Kinetic energy and Potential energy.

4. Give short answer.

(a) What is energy? Write its unit.

(b) Write the different types of energy.

(c) What do you mean by work done? What is its unit?

(d) What are different types of work done? What are they?

(e) What is power? Give one example.

(f) What is sound energy?

Unit 6

Heat

Heat is a form of energy. We can feel the warmth of heat. Heat gives us warm. We can determine which one is hot and cold by touching. Heat flows to the skin when we touch the hotter body than skin and heat flows to colder body from the skin when we touch the colder body than the skin.

Activity 1

Rub your hands. What do you feel? Why the hands get heated? Rub the iron knife or iron piece in the stone or in a cemented floor. Will they get heat? Matter is composed of a large number of molecules. When the matter gets heat, the molecules begin to vibrate rapidly. The energy which is formed by the vibration of molecules of the body is heat energy.

Question

What is the reason that when a matchstick collided to the side of a match box gets burn?

Transmission of heat

We give heat to the base of pot to make tea. But the another part of the pot also get hot. Why? The glass also becomes hot when the hot tea is poured, why? We feel hot when we touch hot water and cold when we touch ice, why is it so?

Heat flows from one body to another body. Heat always flows from hotter body to colder. When we touch the hot water, the heat transfers to our skin. So we feel warm. Similarly the heat transfers to the ice when we touch the ice. So we feel cold. The process of transfer of heat from one point to another is called transmission of heat. There are three ways in which transmission of heat takes place.

1. Conduction
2. Convection
3. Radiation

1. Conduction

Take an iron rod or steel strip of 15 cm length. Fix the pins with the help of wax on the rod as shown in figure. Place the rod on the table as shown in figure. Now heat the end of the rod and observe it.

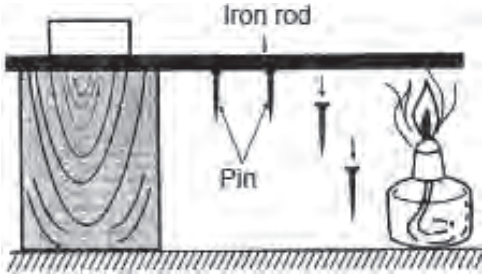


Figure 6.1

What did you see after some times? Did the pins drop? Why? Did the pins fall together or one by one? What conclusion do you make from this? Write.

The nails begin to fall one by one starting from the hot end of the rod to the other end. It concludes that heat is transmitted from hot end to the cold end in the solid. Heat transfers in the solid by conduction process.

Students are sitting on the benches in the figure alongside. The teacher gives the book to the first student who passes it on to the second and the second passes it to the third. In this process, the students do not change their position but the book reaches at the corner of the bench.

Figure 6.2

Similarly, the molecules do not change their position while the heat is transmitting in the solid. The molecules get vibration in their position. The molecules of the rod at the heated end get heat energy and give some heat to its neighbouring molecules. These molecules also give heat to their neighboring molecules. In this way, heat is transmitted from hot end to the cold end in the solid. Such transmission of heat is conduction. The body through which heat can flow easily is called good conductor of heat and the body through which heat can not flow easily is called bad conductor of heat.

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

Question

The handle of teapot, kettle or other cooking utensils is provided with hard plastic, why?

2. Convection

Activity 3

Take two beakers and fill three fourths of each of them with water. Drop some amount of ink in both of them. Keep a beaker on a tripod stand and heat it. Put the next beaker as it is. Observe the both beakers clearly. What do you see? What are the differences that you observe in those beakers? In heated beaker, the colored water from the bottom of the beaker rises to the top and the cooler water

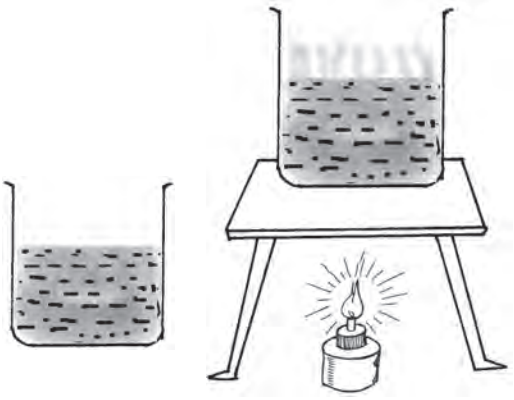


Figure 6.3

comes down to take the place of hot water. The transmission of heat in the water of beaker is convection. By the convection process, the whole water gets heated after sometimes. But in the next beaker the colour spreads slowly. There is no convection.

Heat is transferred in gases convection process. The heat is also transformed by molecules in air as the heat transferred in water.

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

The earth surface gets heated by the sun at day time. Thus, the air above the land becomes warm and rises. The cold air moves toward the earth surface and takes its position. This movement of air is wind. The main reason of the movement of air is convection. Such motion of cold air toward earth surface and the motion of hot air in upward direction is convection.

Questions

1. We feel warm when we put our hand above the candle but can't feel warm in the sides. Why?
2. The flame of burning objects goes upward. Why?

Radiation

Why do we feel warm in the sun at day time? How does the heat transfer from the sun to earth though there is vacant in between?

The heat and light are generated by the sun in the form of wave. Such waves do not need any medium to travel. So, the heat reaches on the earth surface without any medium. Such transmission of heat energy without medium is radiation. In vacuum, heat transfers by the process of radiation.

The heat transfers by the conduction process in the solid whereas the heat transfer by the convection process in liguid and gas. But the heat transfers by the radiation process in vacuum.

The process of transfer of heat from one place to another place without any medium is called radiation.

Question

We feel warm when we stay near to the fire or heater. How does the heat reach to us?

There is no medium in between fire or heater and us. So, the heat doesn't transfer by the process of conduction. The hotter molecules move upward by convection. So, the heat can't reach to us by convection process. There is no medium in between fire source and us, but the heat travels. So, this process of transmission of heat is radiation.

Thermos flask and its uses

A thermos flask is an insulating storage vessel which keeps its contents in the constant temperature for long time. It keeps hot liquids hot and cold liquids cold for a long time.

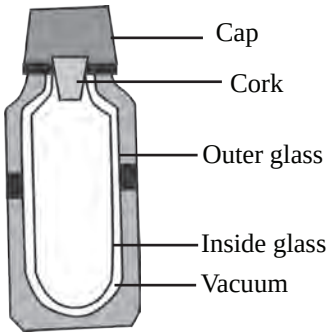


Figure no. 6.4

It consists of doubled layered glass bottle. Between the layers, a vacuum is created. The walls of the glass are silvered and this is fitted inside a plastic or metallic case. The case is covered with a wooden or a plastic cork. Since, glass is the bad conductor of heat. So transfer of heat by conduction is impossible. The vacuum between the double layers of glass prevents heat transfer by convection too. The silver coating on the glass reflects and prevents heat transfer by radiation. Thus, the heat inside the thermos flask cannot be transferred outside by all three modes of conduction, convection and radiation. As a result, the hot water inside the flask remains hot and cold liquid kept inside remains cold.

Temperature

Our sense of touch gives the idea about either it is hot or cold. The hotness and coldness of body is its temperature. When we touch any body with higher temperature than our body, we feel warm. When we touch any body with lower temperature than our body, we feel cold.

The degree of hotness and coldness of a body is called its temperature.

Thermometer

The device which is used to measure the temperature of a body is called thermometer. The word thermometer has been derived from two latin words 'thermo' which means heat and 'meter' which means to measure. If the temperature of our body increases due to any reason, it is called fever. To measure fever, we should measure the temperature of our body.

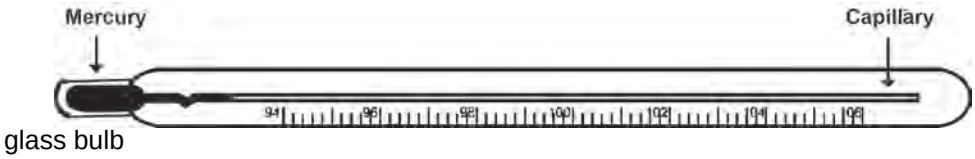


Figure no. 6.4

How is thermometer used to measure the temperature?

Thermometers are cylindrical glass tubes with a very fine pore. Both the ends of the glass tube are sealed. The either end of the stem is a bulb containing mercury or alcohol. When the bulb of the thermometer is placed in hot water, the mercury rises in the capillary tube up to a mark, which reads, gives the temperature. A thermometer is base on the principle that fluids expand on heating and contract on cooling. Since, mercury is sliver shiny, So that it is clearly visible in glass. The freezing point of mercury is -39°C and boiling point is 357°C. The colored alcohol is also used in thermometer whose freezing and boiling point is -115°C and 78°C respectively. Because of low boiling point of alcohol (78°C), the higher temperature can't be measured with the alcoholic thermometer. Generally, alcoholic thermometer is used to measure the room temperature.

The bulb of thermometer is deeped inside the water to measure its temperature. The mercury on the bulb get heated by the water. The mercury level rises in the capillary tube up to a mark which gives the water temperature.

According to necessecity on thermometer, any units Celsius, Fahrenheit and Kelvin can be used.

Project work

Measure the temperature of water, ice, hot water, your body, room and represent them in table.

Summary

1. Heat is a form of energy which gives us sensation of warmth.
2. The process of transfer of heat from one part to another is called transmission of heat.
3. There are three modes of heat transfer

   (a) conduction (b) convection (c) radiation
4. The process of transfer of heat in solids without the actual movement of molecules from their positions is called conduction.
5. The process of transfer of heat in liquids and gases due to actual movement of their particles is called convection.
6. Heat is transmitted from one part to another without any material medium is called radiation.

7. A thermos flask is constructed in such a way that heat can't be transmitted by any mode of conduction, convection and radiation.
8. The degree of hotness and coldness of the body is called temperature.
9. The instrument which is used to measure the temperature of a body is called thermometer.
10. A thermometer is based on the principle that fluids expand on heating and contract on cooling.
11. Mercury and colored alcohol are used in thermometer.

Exercise

1. Fill in the blank spaces with suitable words.

a. Heat is a form of .....

b. Heat transfers in solids by the process of .....

c. Heat is transmitted from one part to another without any material medium is called .....

d. The degree of hotness and coldness of the body is .....

e. Thermometer is used to measure ..... of the body.

2. Choose the best answer.

(a) What is the mode of transmission of heat in vacuum?

(i) conduction (ii) convection

(iii) radiation (iv) all of those

(b) What is the mode of transmission of heat by the help of molecules?

(i) conduction (ii) convection

(iii) radiation (iv) temperature.

(c) What is the boiling point of mercury?

(i) 39°c (ii) 100°c

(iii) 212°c (iv) 357°c

(d) What is the mode of transmission of heat in gas and liquid?

(i) conduction (ii) convection

(iii) radiation (iv) none of them.

(e) Among the given process, which one is the radiation?

(i) The spoon gets heat on sunny day.

(ii) The spoon inside the hot water gets heat.

(iii) The spoon gets heated by burner.

(iv) The water gets heated when hot iron is placed on it.

3. Differentiate between.

(a) Conduction and convection

(b) Good conductor and bad conductor of heat.

4. Give short answer.

(a) What is transmission of heat?

(b) What is conduction?

(c) How does the wind blow?

(d) What is temperature?

(e) What is the use of thermometer?

(f) Write the uses of thermos flask?

(g) How do the thermometer measure the temperature of a body?

(h) How does the heat of the sun reach the earth?

5. Draw a neat diagram of a simple thermometer.

Unit 7

Light

It is impossible to see around us in an absolutely dark room. If we switch on the light, the objects around us become visible. What thing makes us visible?

Light is the form of energy, which makes the objects visible. Without light, we can't see anything. When light falls on a body, some of it gets absorbed by the body, some of it gets transmitted through it while some of it gets reflected.

Reflection of light

When light falls on the surface of the objects, some portion of the light may return back to the same medium and falls on our eyes, which enables us to see them. The object shines if it reflects more light. The object does not shine if it disperses more light after strike on it. Plain surface reflects more light so it shines where as rough surface doesn't reflect more light, so it does not shine.

The phenomenon of returning of the light in the same medium when it falls on the surface of a body is called reflection of light.

The figure shows the process of refection of sun light by a plane mirror. The ray of light which comes from the sun to the plane mirror is incident rays. The rays that return after strike on the plane mirror are reflected rays.

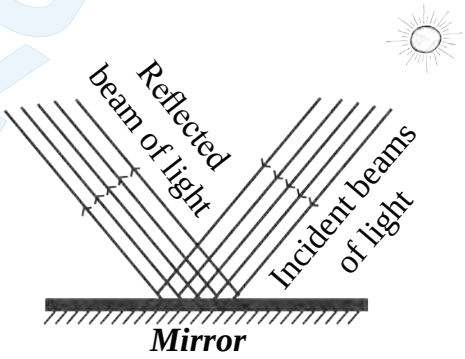


Figure no. 7.1

The ray of light that comes from the source and falls on the reflecting surface is called incident ray. The ray that returns into the same medium after the incident ray strikes on a reflecting surface is called reflected ray.

Types of reflection of light

There are two types of reflection of light

1. Regular reflection
2. Irregular reflection

1. Regular reflection

Activity 1

Regular reflection of light

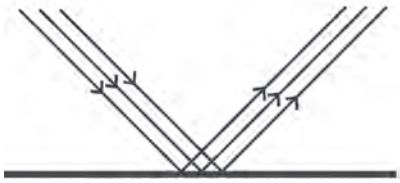


Figure no. 7.2

Take a plane mirror and stand out in the sun. Hold the mirror in such a way that sun light falls on the mirror and direct the reflected light on a wall inside your classroom. You see a bright light of the same shape of the mirror on the wall. Now move the mirror left, right randomly. That bright light also move. This shows that the light reflected from the mirror moves in a definite direction. Such reflection of light is regular reflection. While doing this activity, the reflected rays should not be focused on human eyes directly. That may damage the eyes.

The reflection where the parallel rays of incident light get reflected parallelly is called regular reflection. Still water surface, glass, polished surface, smooth surface etc reflect light regularly. The regular reflecting object is shiny. Images are formed in smooth surfaces due to regular reflection. We see our face when we look at the mirror. The face we see in the mirror is the image. Like in mirrors, image are formed in still water surface, glass surface, highly polished and plane surface.

2. Irregular reflection

Activity 2

Now, repeat activity 1 with a irregular surface of mirror. Do all the reflected rays move on same direction?

Irregular reflection of light

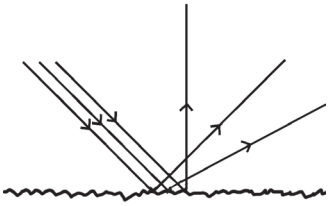


Figure no. 7.3

Use this process by using a small piece of wood or paper. Will you get the shiny part on the wall of your classroom? Why are the reflected rays scattered?

In this case, you cannot see the reflected light. This is because the light reflected from the surface of the wood or paper is scattered into different directions. Such reflection of light is irregular reflection of light.

The reflection of light in which parallel rays of incident light get reflected in different directions is called irregular reflection. The irregular striking surface takes place due to the irregular surface of striking due to which the image can't be formed.

Question

The steel utensils are shiny whereas the wood on utensils aren't. Why?

Laws of reflection of light

Light follows certain rules during reflection. Those rules of reflection of light are laws of reflection of light. What are those rules?

Activity - 3

Fix a white paper in a table. Draw a line AB in the middle of the paper and mark its mid point as M. From point M, draw lines PM, QM, RM and NM making angles 30°, 45°, 60° and 90° respectively. The line NM which is 90° to the mirror is normal. Now place the plane mirror strip along the line AB. Fix two pins on the line PM, which represents the incident ray.

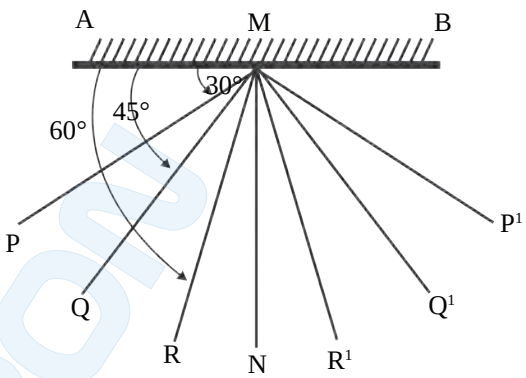


Figure 7.4

The angle (∠PMN) which is formed by incident ray with normal is called angle of incidence. Look at the images of two pins in the mirror and fix two more pins such that the image of the pins fixed on the line PM lie on the same, plane. Put the pins out and mark the position of all the pins and join the line. This straight line denotes reflected rays. The angle (∠PMN) which is formed by reflected ray with normal is called angle of reflection. Now measure the angle of incidence angle of reflection and fill the table given below. Now repeat the experiment by fixing the pins on lines QM and RM and fill the table with their measuring the angles.

S. No	Angle of incidence	Angle of reflection	Result	Conclusion
1.	∠PMN = 60^0	∠P'MN = 60^0	∠PMN = ∠P'MN	Angle of incidence = Angle of reflection
2.	∠QMN =	∠Q'MN = ...		
3.	∠RMN =	∠R'MN = ...		

In this experiment, we get angle of incidence and angle of reflection are equal. Similarly, incident ray, reflected ray and normal lie on the same point and same plane of the paper.

Laws of reflection of light

1. The angle of incidence is equal to the angle of reflection.
2. The incident ray, the reflected ray and the normal lie in the same plane.

1. Periscope

Periscope is a simple instrument which is based on the laws of reflection. It helps to see the objects at height from base. It enables the caption under water in a submarine to observe objects above the surface of water.

Essential materials

a) Circular or rectangular paper pipe or tube

(b) Two plane mirror pieces

(c) Glue to stick the mirror

(d) Scissors

(e) Colors.

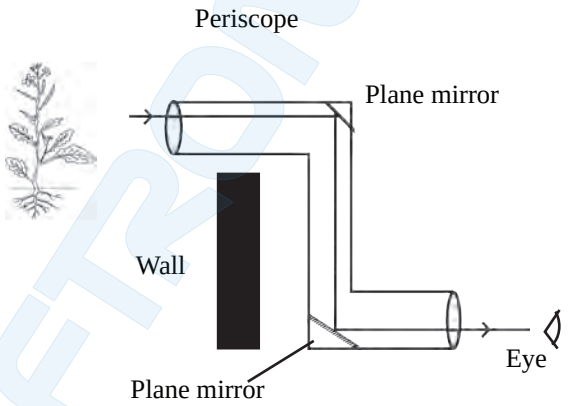


Figure no. 7.5

Construction method

Take circular or rectangular paper pipe. If not possible make the pipe of paper and fix two plane mirrors at the two corners of the tube parallel to each other and inclined at 45° in each circular hole of opposite sides of the tube using sticky glues. Now, make the hole on the tube by cutting their ends. Join those tube in Z-shape and make as shown in figure. Now color the outside position of the tube to make your periscope more attractive. On viewing from the lower mirror of the periscope, we can see the object on the height. So, it is used to see the object on height from the lower place.

Kaleidoscope

Kaleidoscope is an simple optical instrument which is based on the principle of law of reflection of light. It can be used as a toy.

Essential materials

1) Three mirror rectangular strips
2) Plain thin white paper
3) Rubber (circular)
4) Black paper
5) Colorful bangle pieces

Kaleidoscope

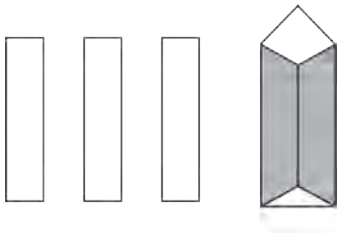


Figure no. 7.6

Construction method

Take three equal mirror strips and drag their edges on the stone or on cemented wall to blunt them. While doing that you need to be careful of those. Arrange those strips to an equilateral triangle shape with their shiny face inside. Tape together the mirrors and tight it with circular rubber. Cover one end of the instrument using plane thin white paper and triangular part with black paper. Now your kaleidoscope is prepared. Place colored pieces of broken bangles in one side of the tube and look it through the other end. What type of pattern is observed? Now rotate the tube keeping the piece of bangles. What do you observe?

Summary

1. Light is the form of energy which gives the sensation of vision.
2. The phenomenon of returning of the light in the same medium when it falls on the surface of a body is called reflection of light.
3. The ray of light that comes from the source and falls on the reflecting surface is called incident ray. The ray that returns into the same medium after the incident ray strikes on a reflecting surface is called reflected ray.
4. A smooth surface produces regular reflection whereas rough surface produces irregular reflection.
5. The angle which is formed by incident ray with normal is called angle of incidence and the angle which is formed by reflected ray with normal is called angle of reflection.
6. The angle of incidence and angle of reflection are equal in regular reflection of light.
7. The incident ray, reflected ray and normal lie on the same plane.

Exercise

1. Fill in the blank spaces with suitable words.

a) The bunching of light back from the surface of a body is .....

(b) The sun ray should not directly focus on .....

(c) Rough surface produces ..... reflection of light.

(d) Plane mirror forms .....

2. Choose the correct answer.

a) In which object the regular reflection takes place?

(i) white paper (ii) black board

(iii) table (iv) plane mirror.

(b) Why is an object seen?

(i) reflection of light (ii) blocking of light

(iii) colorful object (iv) passing through the object

(c) According to the laws of reflection of light,

(i) Incident ray and reflected ray are equal.

(ii) Angle of incidence and angle of reflection are equal

(iii) Angle of incidence is greater than angle of reflection.

(iv) Angle of reflection is greater than angle of incidence.

3. Differentiate between.

(a) Incident ray and Reflected ray.

(b) Regular reflection and Irregular reflection.

4. Give short answer

(a) How can we see objects?

(b) What is reflection of light?

(c) Write two laws of reflection of light.

(d) Why is image not formed on the rough surface?

5. Draw a diagram to show the reflection of light.

6. How is periscope prepared?

7. How does kaleidoscope work?

Unit 8

Sound

In our everyday life, we hear different types of sound. Like human voice, chirping of birds, sound on radio, television, motor, machine, etc. But how are these sounds produced ? Do you know?

Activity 1

Take a ruler, place it in the table such that half of its part is project out from the edge of the table. Hold one end of the ruler (scale) by your hand in table and allow the ruler to vibrate by pressing it in its free end. What have you observe ? Discuss.

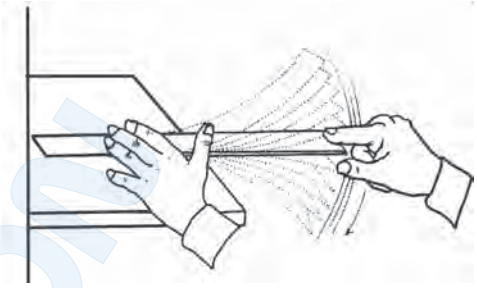


Figure no. 8.1

In such condition, the sound is produced by ruler (scale) and becomes softer in passage of time. How is that sound produced?

Activity 2

Take a steel plate and beat it with spoon. Put your fingers in the plate and you will feel vibration on it. When you touch the plate, the vibration on it stops and ultimately the production of sound also stops.

Sound is the form of energy which is produced by the vibrating object. The waves are formed on vibrating objects. Waves transmit the sound energy in the medium like solid, liquid and gas.

Wave

Activity 3

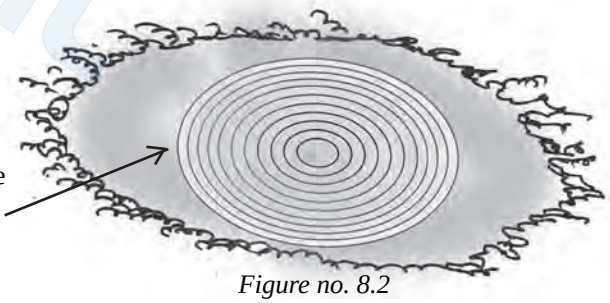


Figure no. 8.2

Throw a small stone into the pond, lake or on still water. Waves distribution in all direction on the water surface is seen. It produces a disturbance in which the water molecules vibrate up and down and form waves which move continuously towards the edge of the pond. During vibration on any object, the waves are formed as the

waves fomed in the water.

There are two types of waves

1. Transverse wave 2) Longitudinal wave

1. Transverse wave

The wave which forms on water is transverse wave. In this wave, the particles of medium vibrate up and down perpendicular to the direction of propagation of wave. Observe the following activity for transverse wave.

Sound wave

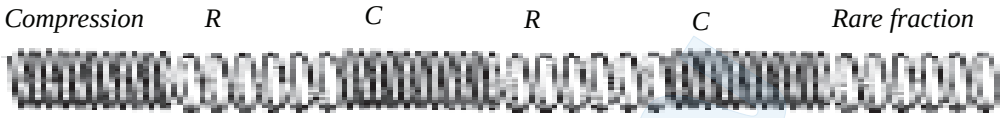


Figure no. 8.3

Take a coiled spring wire of one metre in length and hold its ending by two friends. Now, let one end be free and observe it. Which regions vibrate? If you observe the wire closely, you will see its to and fro motion continuously. Some of the adjacent coils come closer to one another (compression) while some go farther from one another (rare fraction). The wave which propagates in the form of compression and rarefaction is called longitudinal wave. In this type of wave molecules of the particle of the medium vibrate to the direction of wave.

Propagation of sound

The process of traveling of sound from the source to reach our ear is called propagation of sound. Sound propagates through longitudinal wave. Sound wave requires a medium to travel. The sound wave can origin and travel through solids, liquids and gases.

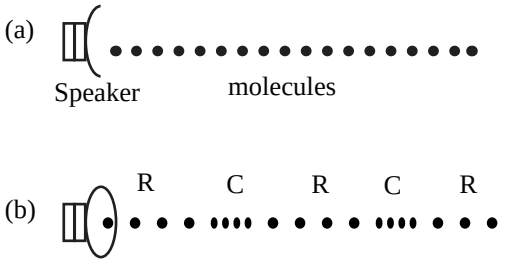


Figure no. 8.4

How does sound travel in different media?

When a body vibrates molecules at the point of the vibration transfers the vibration to the molecule next to it. This molecule now transfers the vibration to its neighboring molecules and so on. The molecules in the medium move backward and forward which causes compression and rarefaction. This process of compression and rarefaction makes the wave move forward and propagate the sound. The propagation of sound in a medium depends upon its density, temperature, humidity etc.

Speed of sound on different medium

A medium is required to travel the sound wave. But the speed of sound is different in different mediums. The molecules in solid are compact to one another. So, when a molecule is set into vibration, they quickly set their neighboring particles in motion. So, the wave travels quickly from one molecule to another. That's why the sound transmits faster in solid. The speed in steel is about 5200m/s. But in liquids, the particles are loosely packed. So, the vibration of one molecule to reach its nearest other molecules takes more time. Thus, the speed of sound is less in liquids. Similarly, in gases, the particles are very loosely packed and therefore, the speed of sound is lesser or slower.

Propagation of sound through solids

Activity - 4

Take two metal cans or match stick boxes or small cylinders of bamboo. Seal one opening of that cans or cylinders. A 5m long and thick string is passed through them and make knot at each end with the help of small pieces of stick. Hold a can or match stickbox of cylinder and request your another friend to hold the another can or match stickbox or cylinder and walk away from each other to keep the thread completely stretched. Now speak softly at one end and listen to the another end by another friend. Did you hear a sound?

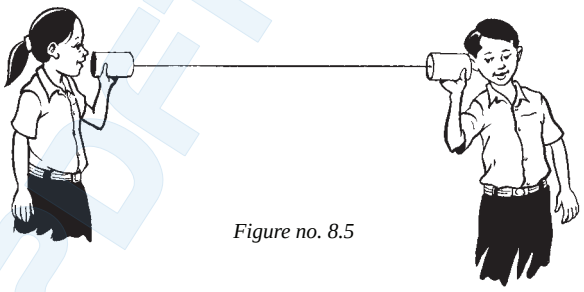


Figure no. 8.5

Activity - 5

Keep your one ear pressed down on the surface of the desk. Tell your friend to write or knock gently at the surface of bench at the other edge. Did you hear any sound? Discuss.

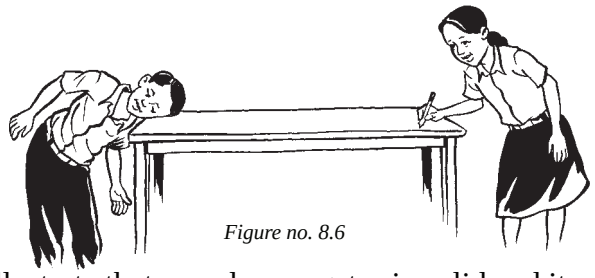


Figure no. 8.6

These activities illustrate that sound propagates in solid and its speed is the highest in solids.

Propagation of sound through liquids

Activity - 6

Take a bucket full of water. Take two small pieces of stone and strike them inside the water. Do you hear any sound outside? Similarly take a metal beaker and immerse in the water and strike it with a piece of stone or a metal rod. Do you hear any sound outside?

The sound propagate in liquid medium as in solid. The speed of sound in water is about 1500m/s. Sound travels faster in solid than in liquid.

Propagation of sound through air

The waves from the source of sound are transmitted in all direction in the air. When these sound waves reach to our airs, we hear the sound. The speed of sound is the least in the air than that of liquid and solid medium. The speed of sound in air is about 332m/s.

For the propagation of sound at least a medium of solid, liquid or gas is needed but it can't propagate in vacuum.

Questions

Why can't we hear sound in the moon ?

Experimental activities

(a) Study the activities 1 and 2 and demonstrate that the sound is produced from vibrating object.

(b) Study the activity 5 and demonstrate that the sound propagates in the solid.

Summary

1. Sound is the form of energy which is formed by the vibration of objects.
2. Sound transmits in solid, liquid and gas by producing vibration on there.
3. Sound propagates by longitudinal waves.
4. A wave in which the particles of the medium vibrate along the direction of propagation of the wave is called longitudinal wave.
5. The speed of sound is highest in solids which is because the molecules of solid are closely packed.
6. The speed of sound in a medium is affected by its density, temperature and humidity of the air.
7. The speed of sound in water is about 1500m/s and that in the air is about 332m/s.

Exercise

1. Fill in the blank spaces with suitable words.

a. Due to vibration in an object, …… energy is produced.

b. Sound propagates through …… wave.

c. The speed of sound in air is ……

d. The speed of sound in water is about ……

e. To propagate the sound, it needs ……

2. Choose the correct answer.

a) Which of the following causes the production of sound?

i. Vibration of object ii. Length of object
iii. Solid object iv. Gaseous object

b) In which of the followings sound can't travel?

i. Solid ii. Liquid iii. Gas iv. Vacuum

c) In which medium does sound travel with maximum speed?

i. Solid ii. Liquid iii. Gas iv. Vacuum

d) What is the speed of sound in air?

i. 232m/s ii. 332m/s iii. 1500m/s iv. 5200m/s

3. Give short answer.

a. How is sound produced?

b. With which type of wave does sound propagate?

c. What type of wave is longitudinal wave?

d. In which medium does the speed of air is the greatest? Why?

e. What factors affect the propagation of sound?

4. Describe an experiment to show the propagation of sound in water?

Chapter 9

Magnet

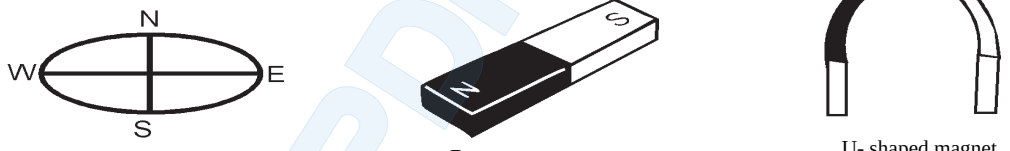
Have you seen magnet? What does it do? What happens when small pieces of iron or pins are brought near to a magnet?

Magnet looks like iron. Magnets attract small pieces of irons, nails, pins, dust of iron toward them. So, we can use magnet to collect the pieces of iron while scattered. Magnet has a kind of energy which we call the magnetic energy. Magnets are used in radio, transistor, microphone, speaker, telephone, fan, generator, etc. Natural magnet and artificial magnet are two types of magnet.

Natural magnet

The magnet which is obtained from nature is called natural magnet. About 2000 years ago, a person named Magnes found a particular stone with different feature in Magnesia, a place in Asia Minor. He named that stone as lodestone. It attracted iron materials. The lodestone attracts pieces of iron. It had a property of showing north and south directions when suspended freely by silk thread. Lodestone is the natural magnet. Lodestone does not have definite shape and it is not found everywhere in nature. So, people started to make magnets themselves on their desired shape and size.

Artificial magnet



Compass Bar magnet U- shaped magnet

Figure no. 9.1

Magnets made by man are called artificial magnets. As per the human need, bar magnet, horse shoe magnet, round magnet, compass, etc. are made.

Artificial magnets are of two types- permanent and temporary magnet.

Permanent magnet

The artificial magnet which retains its magnetic properties for longer periods time after the magnetization is called permanent magnet. The magnets made from the magnetic substances like iron, cobalt, nickel, steel, etc. are permanent magnet. Permanent magnets are used in different electrical appliances speakers, radio, television, etc.

Temporary magnet

An artificial magnet which does not retain its magnetic properties for longer time after the magnetization is called temporary magnet. For example; when electric current is passed in an insulated wire wrapped around an iron nail, or soft steal, the nail or steal becomes magnet. On stopping the current, that loses the magnetic property. Such magnet is temporary magnet. These type of magnets are used in generators, electric motor, fan etc.

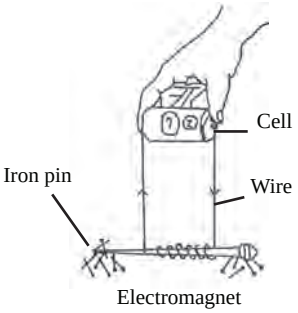


Figure no. 9.2

Activity 1

Suspend a bar magnet freely with an un-spun silk thread. In stationary, what does it show? Observe it.

Differences between Natural and Artificial magnets.

Natural magnet	Artificial magnet
1. Magnet found in nature is called natural magnet.	1. Magnet made by man is called artificial magnet.
2. Natural magnet is not found everywhere.	2. Artificial magnet can be found everywhere.
3. Natural magnet does not have definite shape. For example: limestone.	3. Artificial magnet can be made of definite shape. For example: bar magnet, horse shoe magnet, U shaped magnet

Making magnets

There are various methods of making magnet. Magnetic substances can be used to make magnet. Non magnetic substances can't be used to make a magnet. Among all magnetic substances iron is generally used for magnetization. A magnetic substance can be converted into magnet by following methods.

a) Using magnet

There are various methods to make magnet by using magnet. Among them, some important methods are as follows:

i) Single touch method

ii) Divided touch method

i. Single touch method

Activity 2

Take a strip of iron on the table. Stroke a strong bar magnet of south pole to that magnetic substance from one end to the other end. Lift the magnet, bring it back to the first end and repeat the stroke as previous. On stroking several times to that iron, it becomes magnet. The end from where stroking started becomes a similar pole and other ends become the opposite that of stroking pole. This method of making magnet is called single touch method. Using this method nail, paper pin, blade, etc. can be easily converted into a magnet.

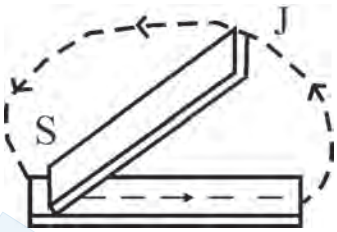


Figure no. 9.3

ii. Divided touch method

Activity 3

Take a strip of iron on the table. Take two strong bar magnets and place different poles of those magnets at the center of magnet and then stroke towards their respective end. After reaching the ends, lift the magnets and bring them again to the middle of the strip. Rub again as before and repeat this process again and again. Check whether the strip is magnetized or not? Identify the originated poles on that strip.

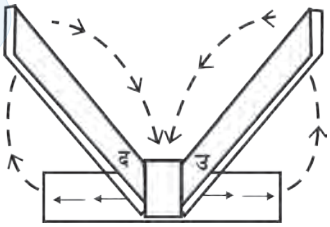


Figure no. 9.4

The end of the strip from which the magnet is left becomes the opposite poles of the magnet. Such method of making magnet is divided touch method.

b) Electrical method

Activity - 4

Take an iron nail of 5 cm and 1 metre insulated wire. Wrap the insulated wire around the nail 50 times. Then connect the terminals of the wire to the terminal of a battery. Now bring some paper pins close to the nail and observe. Iron nail attracts the paper pins. In this way, we can make magnet with the help of electricity which is temporary. Such magnets are used in electrical bell, electrical motor, fan, etc.

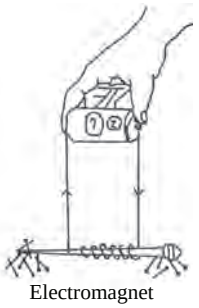


Figure no. 9.5

Thus, the magnet which is made temporary with the use of electricity is called electromagnet.

Questions

1. Why should naked copper wire not be used for the magnetization?
2. While making electromagnet, the wire must be coiled in the same direction, why?

Uses of magnet

Magnets are used in following purposes

1. To identify the geographical direction.
2. Making various electrical appliances like electri bell, fan, speaker, micro oven, etc.
3. Lifting the heavy objects.
4. Magnetic therapy.

Experimental activities

1. Study the activity - 2, make a magnet and find its magnetic poles.
2. Study the activity 5, make a electromagnet and find its magnetic poles.

Summary

1. Magnet has magnetic energy.
2. The magnet which is found in nature is called natural magnet.
3. Loadstone is a natural magnet.
4. Magnets made by men are called artificial magnets.
5. Artificial magnets are of two types- permanent and temporary magnet.
6. The magnet which is made with the use of electricity is called electromagnet.
7. With the help of magnet, magnetic substances can be changed into magnet.
8. Magnets are used in radio, micro phone, speaker, electrical motor, generator, etc.

Exercise

1. Fill in the blank spaces with suitable words.

a. Loadstone is _____ magnet.

b. _____ can be made by magnetic objects.

c. Magnets made by men are _____.

d. The magnet which is made with the help of electricity is _____.

e. Magnet has _____energy.

2. Choose the best answer.

a. A freely suspended bar magnet always shows

i. East-west ii. North-South

iii. South-East iv. North-West

b. Which of these is not an artificial magnet?

i. Loadstone ii. Compass

iii. bar magnet iv. horse shoe magnet

c. Which one of these is a temporary magnet?

i. Compass ii. bar magnet

iii. electromagnet iv loadstone

3. Differentiate between.

a) Artificial magnet and natural magnet

b) Permanent magnet and temporary magnet

c) Loadstone and electromagnet

4. Give short answer.

a. What is magnetic energy?

b. What is magnetic substance?

c. What is natural magnet?

d. What type of magnet is called artificial magnet?

e. Write two methods of making magnet.

f. Write any house hold appliances which make use of magnets.

5. How can you show that the electromagnet is temporary magnet?

6. Classify with the help of magnet that the objects of your house are either of magnetic substances or not?

Chapter 10

Electricity

Static electricity

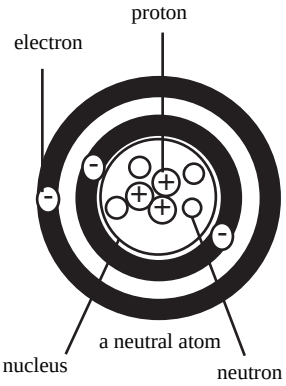
We may often hear a cracking sound, when we take off our polyester, nylon or woolen clothes, why? While changing such clothes in dark room, the cracking sound is followed by sparks of light. Why is it so?

Activity - 1

Take some bits of paper in table. Comb dry hair with plastic comb and bring it near the bits of paper. What happen? Is it noticed that the comb attracts them?

Why is it so? The comb gain the property of attracting bits of paper is said to be electrified or charged. Comb attracts the bits of paper due to such charge.

How does the charge originate on body? All the matters are composed of atoms whereas atoms are composed of sub-particles. There are two constituents of atoms. One is the nucleus at the centre of the atom and another is negatively charged electrons revolve round the nucleus. A nucleus consists of protons and neutrons. Proton is positively charge particle whereas neutron is chargeless. The atom is electrically natural as the number of protons and electrons are equal in the atom. The atom which has more electrons acquires negative charge and the atom which has more protons than electrons acquire positive charge. When two bodies of different nature are rubbed together there is transfer of electron from one body to another body. The body which loses electrons is positively charged because the number of protons will be greater than that of electrons of the atom and the body which gains electrons is negatively charged.



When hair is combed by a plastic comb, electron from the atom of the hair is transferred to the plastic comb. That's why the comb becomes negatively charged and the hair becomes positively charged.

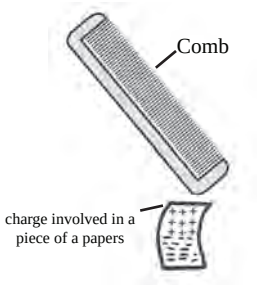


Figure no. 10.1

How does the negatively charged comb attract the bits of papers?

In the beginning, there is not any charge on the bit of papers. When a negatively charged comb is brought near to the bits of papers, new charges are developed on them. The negative charges on the plastic comb cause to develop the positive charges at the near end of the comb and negative charges at the opposite end of each bit of papers. There is repulsion between the similar charges and attraction between opposite charges. So, the comb attracts the piece of papers.

The charge developed on bad conductors and non metal like plastic, wool, nylon, polyester, due to the friction stage on the point where they produced. So, the charges are generated while wearing the clothes of nylon, polyester, wool, etc. During changing such dresses, charges are transferred and produced crackling sound. Such crackling sound is followed by sparks of light in dark.

The electricity which is produced by the friction on bad conductors is called static electricity.

Effect of static electricity

There are so many effects of static electricity, one of them is lightening. Have you ever seen the lightening with thunderstorms during raining? How does lightening occur? Can you explain?

Lightening is the electric discharge. It was confirmed by Benjamin Franklin in 1752.

How lightening is formed?

Figure no. 10.2

Clouds are made of many tiny vapour droplets. They change into tiny water droplets due to cold in cloud. These tiny water droplets descend downward. But the heat from the atmosphere evaporates the droplets and rise above. During this rising and falling of the water droplet, charges are developed in cloud. Generally, positive charge are developed in the upper part of the cloud and negative charge are developed in the lower part of the cloud. The electrons from the negatively charged clouds are

transferred to the clouds with positive charge. This sudden transfer of electrons produce intensive spark of electricity. So, we can see bright light in the sky during lightening. This heat makes the air in the path of lightening very hot. This hot air expands but also cools quickly and comes back to its original position. This sudden expansion and contraction of air produce a loud sound which we called the thunder.

The heat, light and sound released during the flow of electrons from the negative charged clouds to the positively charged is called lightening.

How do the lightening strike in earth?

When positively charge or negatively charge cloud pass near to the earth, they induce charge to the earth surface through the tall trees and buildings. Trees and buildings are the bad conductors so the positive charge induce on them if the negatively charged cloud pass through it.

Such attraction of opposite charges release electricity which is lightening when strike and damage trees and houses.

Figure no. 10.3

Question

(a) Why should we not stand under a tall tree and buildings during a lightning?

(b) How can the tall building and houses be saved from lightning? Explain

Have you seen the Trishul made up of copper on the top of tall buildings? Trishul are connected to the ground with the help of copper wire which is called earthing or grounding. The copper wire transfers the electricity generated during lightning at the top of house and discharge into the ground without any damage to the building.

Figure no. 10.4

Current electricity

Electricity is a kind of energy. Electric cells, dynamo or generator can produce electrical energy it can be converted into heat, light, sound, magnetic energy etc. We use electrical energy for lighting, heating, using fan, operating radio,

television and telephone. To use the electrical energy, it needs to flow in the fixed path which is called electric circuit.

Electric circuit

Activity 2

Take a dry cell, copper wire, switch and a bulb and connect them as shown in figure.

Switch on then the bulb glows. Now, switch off then the bulb does not glow. While the bulb glows we can say that current flows through the circuit. While the bulb does not glow, we can say that the current is not flowing in the circuit.

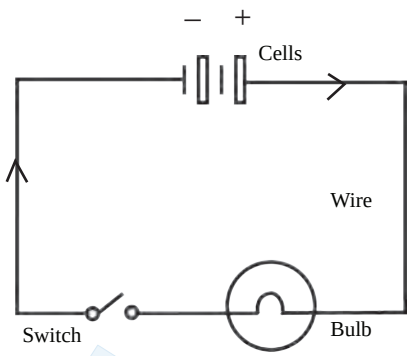


Figure no. 10.5

Dry cell is the source of electricity here. The bulb is a load. The device which produces electricity is called the source of electricity. The device which is operated by using electricity is called load.

A closed and continuous path along with battery, connecting wire, a switch and load in which electric current flows is called electric circuit.

Closed and open circuit

Repeat the activity 2, when the switch is on, the bulb glows or the load works. Such electric circuit is closed circuit. Similarly, in above activity when the switch is off or the circuit is disconnected anywhere, the bulb does not glow or the load does not work. Such electric circuit is open circuit.

The electric circuit in which the load is working is called closed circuit and the electric circuit in which the load is not working is called open circuit.

Electric-circuit symbol

While drawing electric circuit, it is difficult to draw actual diagrams of all the components connected. So, different components of electricity represented are replaced by their symbols in the electric circuit. Some symbols of electric circuits are as follows:

Electrical devices	Symbol
Wire	
Wires crossing without contact	
Joint wires	
Switch	
Electric cells	
Many cells (Battery)	
Resistance	
Electric bulb	
Voltmeter	
Ammeter	
Fuse	

A closed circuit containing one bulb, a switch, wire and two cells is shown in right side in the figure.

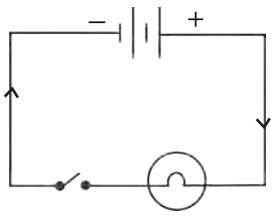


Figure no. 10.6

Combination of cells

We use more than one cell in torch light, radio etc to operate. In our daily life, we have to use many cells connected together for operation, which is known as combination of cells. Such combination is called battery. There are two types of combination of cells.

a) Series combination b) Parallel combination

a) Series combination

The combination of cell in which the negative end of first cell is connected to the positive terminal of second cell, the negative end of second cell to the positive end of third cell and so on is called series combination. In series connection, the addition of each cell results to increase the electric pressure. For example, electric pressure of one cell is 1.5 volt. The electric connection of two cells gives 3 volts. The connection of three cells gives 4.5 volts and the connection of four cells gives 6 volt. As the increase of the number of cells in this combination, the brightness of the bulb increases.

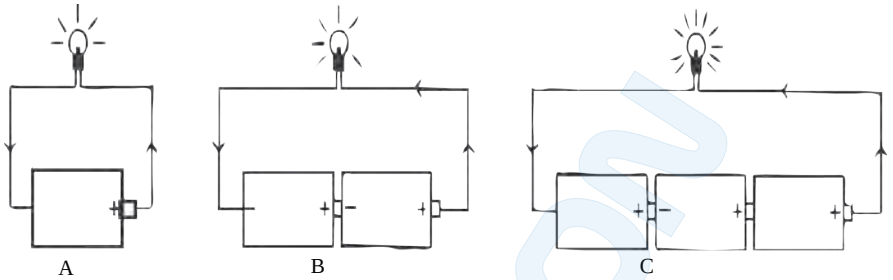


Figure no. 10.7p

Activity 3

Arrange the cells as shown in figure (a), (b) and (c) and connect the bulb separately. Complete the table with the conclusion you have drawn.

Figure	Number of cell	Brightness	Conclusion
a	1		
b	2		
c	3		

b) Parallel combination

The combination of cells in which all the positive ends of cells are connected to one point and all negative ends to the other point, is called parallel combination. In such combination, the bulb glows for longer time. The addition of cells in this combination does not increase the electric pressure. So, the brightness of the bulb remains same.

Activity 4

Arrange the cells as shown in figure (a), (b) and (c) and connect the bulb. Complete the table with the conclusion you have drawn.

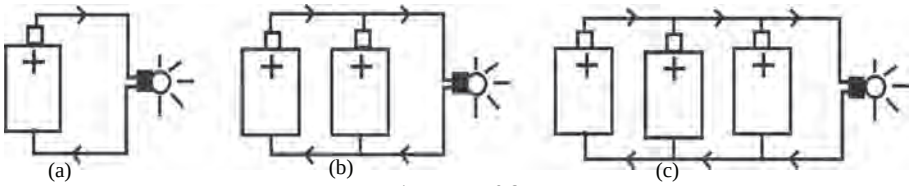


Figure no. 10.8

Figure	Number of cell	Brightness	Conclusion
a.	1		
b.	2		
c.	3		

Project work

1. Study activity 1 and show demonstrate the process of producing of static electricity.
2. Study activity 2 and make electric circuit.

Summary

1. The electricity which is produced by the friction of bad conductor is called static electricity.
2. Lightning is also one of the effects of static electricity.
3. Electricity is a kind of energy. Electricity can be connected into heat, light, sound, magnetic energy, etc.
4. A close and continuous path along with source, load, switch and connecting wire in which electric current flows is called electric circuit.
5. Closed circuit and open circuit are two types of circuit.
6. The circuit in which the current flows in a complete path is called a closed circuit.
7. The circuit in which the current does not flow in a complete path is called an open circuit.
8. Electric circuit symbols are used while drawing the electric circuit.
9. The process of using two or more than two cells in a circuit is called combination of cells.

10. Series combination and parallel combination are two types of combination of cells.

11. When the negative pole of one cell is connected to the positive pole of another cell and so on the cells are said to be in series connection.

12. When two or more cells are connected with their positive terminals together and their negative terminals together, they are said to be in parallel combination.

Exercise

1. Fill in the blank spaces with suitable words.

a) Electricity is a type of .....

b) The electricity which is formed by the friction is .....

c) Unlike charges ……each other.

d) ..... does not work in open circuit.

e) When the cells are connected in series, the ..... of cell increases.

2. Choose the correct answer.

a) The electricity which is produced by the friction of insulators is

i. Current electricity ii. Static electricity

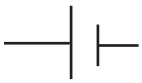
iii. Electric pressure iv. Current

b) Which of the following is the effect of static electricity?

i. Lighting bulb ii. Working of radio

iii. Lightning iv. Ringing bell

c) What is the symbol of a bulb?

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

d) Which is the electric device (load)?

i. Magnet ii. Bell of cycle

iii. Cell iv. bulb

e) What difference is observed in brightness of bulb when cells are added in series combination?

i. increase the brightness ii. Decreases the brightness

iii. Remains constant iv. Nothing happens

3. Differentiate between

a) Source of electricity and load.

b) Open circuit and closed circuit.

c) Series combination and parallel combination.

4. Write the symbol of the following electrical components.

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

5. Draw an electric circuit with the connection of a bulb, switch and a cell.

6. Answer the questions.

a. What is static electricity?

b. What are used to compose an electric circuit?

c. A plastic comb while combing attracts small bits of paper on it. Why?

d. What is the importance of series combination of cells?

e. Why is the electric symbol used in an electrical circuit?

Chapter 11

Matter

We can see object with the help of light. We can identify a object by listening to the sound from the object. Are light and sound matter? Then, what is matter?

Substances around us, which do not occupy space or the things which do not have weight and volume are not matter. For example, light, sound, shadows, etc are not matters.

Substances having mass and volume are called matters.

States of matter

Our all food items like lentils (Dal), rice, bread, milk, curd and water are matters. Air is also a matter. Are these all in the same state?

Matters exist in three states. They are solid, liquid and gas.

Solid: Matters with fixed shape and volume are solids. Molecules of solids are compact with each other so they are hard and rigid. For examples, stone, wood, book, etc.

Liquid: Matters, which have not fixed shape but fixed volume, are liquids. Molecules in liquid are less compact than solid so that they can flow. Liquid gets the shape as the shape of the container in which it is kept. As for example water, milk, oil, kerosene, etc.

Gas: Matters which do not have fixed volume and shapes are called gases. The intermolecular space in gas is greater than that of liquid or solid. These matters get the shape of container in which they are contained. Air, oxygen, hydrogen etc are examples of gas.

Elements

Different types of matters are found around us. Among them, some matters cannot changed into other simpler substances through any process such matters are called elements. As for example, Hydrogen is an element. We can not get other element from hydrogen. Similarly, gold cannot be further divided into simpler substances so it is an element. Till now, 92 elements are found in nature. Other 26 elements synthesized by scientists. Including both natural and artificial elements, 118 elements are known to us. At room temperature and normal atmospheric pressure elements are found in solid, liquid and gas states. As Gold, Silver and Iron are found in solid state and Bromine and Mercury are in liquid state. Similarly, Hydrogen, Oxygen and Nitrogen are found in gaseous state.

Symbols

An element is represented or symbolized by the first letter of the name of the elements called symbol. In some elements, symbols are derived from the Latin name of the

elements. It is often possible to use two or more letters as the symbol of an element if two or more elements have their names started with common letter. The abbreviated form of an element is called symbol of element..

Name and symbol of some elements

Names and their symbols of twenty elements are given below in the table

S.N	Name of element	Symbol
1.	Hydrogen	H
2.	Helium	He
3.	Lithium	Li
4.	Berilium	Be
5.	Boron	B
6.	Carbon	C
7.	Nitrogen	N
8.	Oxygen	O
9.	Fluorine	F
10.	Neon	Ne
11.	Sodium (Natrium)	Na
12.	Magnesium	Mg
13.	Aluminium	Al
14.	Silicon	Si
15.	Phosphorus	P
16.	Sulphur	S
17.	Chlorine	Cl
18.	Argon	Ar
19.	Potassium (Kalium)	K
20.	Calcium	Ca

Compound

Substances like water, common salt and sugar are compound. Two or more than two elements are combined to form a compound. Similarly, common salt (sodium chloride) is made up of sodium and chlorine. Properties of both hydrogen and oxygen are not found in water because it is made by chemical reaction between these two elements. Hence, a new substance made up of two or more elements chemically combined in a fixed ratio is a compound.

Differences between element and compound

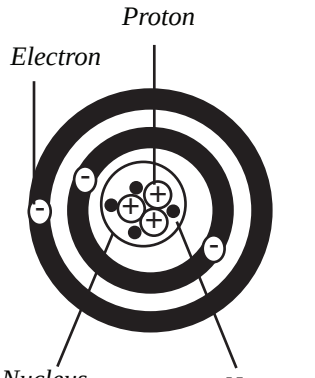
Element	Compound
1. It is made up of similar types of atoms. 2. It cannot be changed into other simpler substances through chemical change. As for example: Hydrogen,Oxygen,Gold, Cupper, Iron, etc	1. It is made up of two or more elements that are chemically combined in a fixed ratio. 2. It can be simplified into simpler form through chemical change. As for example: Water, Common Salt etc

Atom

Any element cannot be divided through chemical reaction. Smallest particle of an element also cannot be broken through chemical reaction. Such smallest particle of an element is an atom.

The smallest particle of an element, which can take part in a chemical reaction, is called an atom.

Atoms of one element are similar and entirely different from the atoms of other elements. Atom of hydrogen has entirely different properties than that of oxygen atom. Similarly, there are 118 types of atoms of 118 types of elements.



a neutral lithium atom

Figure no. 11.1

Molecule

Matters are made up of tiny particles. These particles are called molecules. Entire properties of compound exist in its molecule. For example, a spoon of sugar and its single particle both have sweaty taste.

The smallest particle of compound in which all properties of compound exist is called a molecule.

Molecules of elements are made up of similar types of atoms. As for example, hydrogen molecule is made up of two hydrogen atoms. Molecules of compound are made up of different types of atoms as for example; one molecule of water is made up of two atoms of hydrogen and one oxygen atom.

Molecular formula

Chemical substances are represented by writing a group of symbols of elements from which it is formed. As for example, common salt is represented as sodium chloride (NaCl). Similarly, sodium chloride is represented in group of symbols of Sodium (Na) and Chlorine (Cl) as NaCl. So, NaCl is molecular formula of sodium chloride. Likewise, hydrogen chloride is represented as HCl, water H_2O and carbon dioxide as CO_2.

A group of symbols of elements that represents a molecule of a compound or an element is called molecular formula.

To write molecular formula of any compound, elements from which that compound is made should be known at first. Later, ratio of those elements should be known. As for example, water is made up of two hydrogen and one oxygen atoms.

$2H_2 + O_2 \rightarrow 2H_2O$

Carbon dioxide is formed from carbon and oxygen $C + O_2 \rightarrow CO_2$

Change in matter

When a heat is given to a piece of ice melts into water. Again if the water is cooled, it turns into ice.Such changes are of shape and size of the substance only but not of its properties. Thus, a physical change is the temporary change which only in the physical state, colour, shape of a substance without affecting its chemical properties.

Burn a piece of paper. It changes into ash and smoke. From which we can't remake that piece of paper. The properties of ash and smoke are different from the properties of the paper. Such change is called chemical change.

Thus, a chemical change is the permanent change in which an entirely new substance is formed with different properties.

The difference between physical change and chemical change are given below.

Physical change	Chemical change
1. The properties of the new substance remain the same. 2. No new substances are formed 3. The change can be reversed. 4. The charge is generally temporary	1. The properties are changed. 2. New substances with different properties are formed. 3. The charge cannot be reversed. 4. The change is permanent.

Summary

1. Substances that occupy space and have mass are kwon as matter.
2. Matters are found in three states as solid, liquid and gas.
3. Matters, which cannot be broken into any other simpler matter, are called elements.
4. The abbreviated form of an element is symbol.
5. The matter formed through chemical reaction of two or more elements is known as compound.
6. The smallest particle of an element, which can take part in chemical reaction, is called atom.
7. The smallest particle in which all the properties of matter exist is called molecule.
8. There are two types of changes: physical change and chemical change.
9. The temporary change which brings about the change in the physical state, colour, shape of substance without affecting its chemical properties is called physical change.
10. A permanent change in which an entirely new substance in formed with different properties is called permanent change.

Exercise

1. Fill in the blanks.

a) Substances that have mass and ……..are called matter.

b) Simpler ……cannot be found from one element.

c) The matter formed from chemical reaction of two or more elements is…….

d) The smallest particle of an element is called……..

e) The smallest particle in which all……..of matter exist is called molecule.

2. Choose the correct answer of the followings:

a) A pure substance which cannot be changed into another substance.

i) element ii) compound iii) matter iv) mixture

b) What is the smallest particle of compound in which properties of compound exist?

i) atom ii) molecule iii) particle iv) element

c) What type of change takes place while burning paper?

i) state change ii) physical change

iii) chemical change iv) change in appearance

d) What is the symbol of calcium?

i) K ii) Na iii) C iV) Ca

e) How many elements exist in nature?

i) 92 ii) 105 iii) 109 iv) 118

3. Differentiate between.

a) atom and molecules

b) element and compound

c) physical change and chemical change

4. Write Short Answer of Each Questions.

a) What is matter?

b) How many states of matter are found? What are they?

c) What is element? Write any four examples of it.

Chapter 12

Mixture

Dear students, what substances do you use daily? From what are these formed? Are these formed from similar types or different types of matters? Discuss with your friends.

We come across different kinds of substances in our daily life. Among them, some exist in pure and some in impure form. Different substances are mixing in impure form of matter. Such mixed matters are mixtures. The combining components in a mixture can be separated in our necessary by different methods . This process of separation of its components from mixture is called separation of mixture.

Methods of separating mixtures

There are different types of mixtures. As for example:

mixture of solid and solid (camphor and sand),

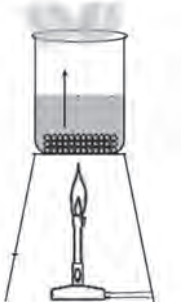
mixture of solid and liquid (salt and water, soil and water) and

mixture of gas and gas- air (Nitrogen, Oxygen and other gases).

Same method is not applicable for the separation of all types of mixtures. Depending on the nature of components, methods are adopted. Some methods of separating mixtures are explained below.

Evaporation

How can salt be separated from the mixture of salt and water? What properties make these two components distinct? In this methods, the mixture is heated to convert liquid into vapor and the solid particles remain as residue in a container. Like wise, from the mixture of salt solution, salt can be separated by using the evaporation method for this heat the evaporating dish with salt solution .The water of dish begins to vaporize and the solid particles of salt remain left in dish.



Evaporation

Figure no 12.1

Evaporation is used for the separation on of the mixture of solid and liquid. So components of homogeneous mixture are separated through this method.

Being vapour, solvent mixed with air on heating However, solute does not melt by heating and it does not evaporate. Therefore, solute obtained as solid crystal. Method of separating solute from solution in such way is called evaporation.

The method of separating components of mixture through the formation of vapour from solvent and solute in solid form is called evaporation.

Activity 1

The mixture is taken in a porcelain basin. It is heated gently. After some time solvent evaporates gradually and salt remains in the porcelain basin in the form of crystal.

Thinkable question:

How is common salt prepared from seawater?

Sublimation

Activity 2

Take a mixture of sand and camphor in a basin. Cover the basin with an inverted funnel. Cover the funnel with inverted test tube. Moreover, cover the test tube with wet clothes or paper to make it cold. Heat the basin until the vapour of camphor begins to evolve. Stop heating and let it cool. Vapour of camphor condensed and collected in the cooler part of the test tube in solid form. Camphor changes into gas on heating and it again changed into liquid on cooling. This process of separating mixture is known as sublimation. This method can be used in separating mixtures of Iodine and sand or separating mixture of dry ice and sugar.

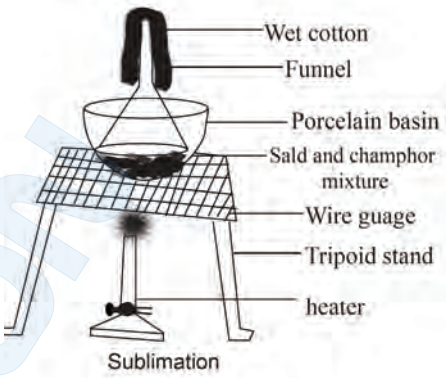


Figure no 12.2

The process of changing definite solid directly into gas on heating and again into solid on cooling is called sublimation.

Centrifuging

Activity 3

Take sand, chalk dust and water in a plastic bottle. Tie mouth of bottle with a thread and spin it for a while with high speed. After sometimes observe what happen. Sand settles at the bottom of bottle. Chalk dust seems just above the sand. Likely, heavier substance separates and settles down and lighter substance remains above it.

Figure no 12.3

The process of separating the mixture of heavier and lighter substance by rotating the mixture in high speed is called centrifuging method.

Now a days, machines fitted in electric motor are used for centrifuging. Such machines are called centrifuge. Mixture containing test tube is kept in the machine. Due to high-speed rotation, heavier substance separates and settles down and lighter substance comes above it.

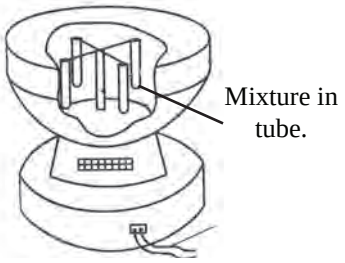


Figure no 12.4

Thinkable questions

1. How is curd formed of milk is rotated rapidly with the help of wooden rod to produce ghee from it?
2. Can heavier substances can be separated through centrifuging method?

Crystallization

Activity 4

Take some water in a basin, go on adding copper sulphate until it dissolves completely, and stir it. At certain condition, it will not dissolve any more copper sulphate. This is saturated solution. Heat the saturated solution gently and add some amount of copper sulphate. Transfer the basin above the cooled water to make it cold. After cooling it, crystals of copper sulphate are formed. This process is known as crystallization. In most of the salt, crystals are prepared in this way. Crystals are the geometrical shaped solid substances.

Figure no 12.5

The process of separating a pure substance in the form of crystal from its hot saturated solution by cooling is called crystallization.

Crystalline substances may be mixed with other substances. Crystallization method help to obtain pure substance from impure mixture. Impure substances are not found in crystals.

Activity 5

Prepare a saturated solution of potash alum (Phitkiri) in hot water. Make it saturated by the addition of more potash alum. Make the nodes at the tip of thread and put it in solution as shown in the figure.

After cooling, the crystals are seen on the tip of thread. If a solution kept in stationary condition, size of crystals become large. Crystals of large size can be prepared in suchway.

Figure no 12.6

Same as above

Do you see the thread kept in sugar candy (Mishri)? How is thread kept in the sugar candy?

Uses of Mixture

Dear students, all of you may drink tea. How is tea prepared? Do you cook dal and vegetables? What items are mixed there?

There is great importance of mixture in our daily life. We use mixture to prepare our foods and construction of buildings too. Some of the major uses of mixture are:

1) Plants get necessary things like water and salts from soil in the form of mixture.
2) Mixture of cement, sand and water is used for construction of buildings, plaster, construction of bridge and roads.
3) Mixture is also used for preparation of medicines.

Solution

Homogeneous mixture of two or more than two substances is called solution. Mixed substances in solution cannot be seen and separated easily. For example, mixture of sugar and water. Mainly two types of substances they are present in the solution.

Solution = solute + solvent

Substance that gets dissolved in solvent is called solute and substance that dissolves solute in it is called solvent. For example; in sugar solution, sugar is solute and water is solvent. Similarly, in salt solution, salt is solute and water is solvent.

Concentrated and dilute solution

Activity 6

Take some water in two beakers. Furthermore, put two drops of ink in one beaker and four drops in another and observe these. What difference is obtained between these two solutions? The colour of solution in the beaker having four drops of ink is seen concentrated than the solution having two drops.

Likewise, the solution having more amount of solute is more concentrated and solution with less amount of solute is less concentrated solution. Solution becomes dilute if less amount of solute dissolves in it.

Concentration of any solution depends upon the amount of solute dissolved in it. In comparison, the solution which contains more amount of solution is known as concentrated solution. Similarly, comparison the solution which contains less amount of solute is known as dilute solution.

Activity 7

Put half of clean drinking water in two beakers. Stir the solution by adding a spoon of salt in first beaker and two spoons in second. Take a spoon of water from each cup and take taste of both. Which cup's water is more salty? The water of second beaker is more salty because more amount of salt is dissolved in it. Join these two salty solutions first is dilute and second is concentrated solution. (Any solution should not be kept in mouth.)

Unsaturated, saturated and super saturated solution

Activity 8

Take half a glass of water. Stir it by adding a spoon of salt in water. Salt gets dissolved in water. Stir again by adding a spoon of salt in it. Thus, the solution, which can dissolve in this way, is called unsaturated solution.

The solution which can dissolve more amount of solute in at a particular temperature is called unsaturated solution.

In above experiment, go on adding salt and stirring, no extra salt can be dissolved in the solution. This is called saturated solution at that temperature.

The solution that cannot dissolve any more solute in it at a particular temperature is called saturated solution.

Now, heat the saturated solution for some time. Stir it by adding some salt again. Again, salt gets dissolved in it. On adding extra amount of salt and stirring solution cannot dissolve the extra salt again. such solution is called super saturated solution.

On cooling and adding some extra amount of solute in it, solution form crystals of solid substance.

The solution, which dissolves more solute than required to make saturated solution, is called super saturated solution.

Activity 9

Prepare unsaturated, saturated and super saturated solutions in three different glasses. Then put a small piece of salt in each glass respectively and observe these.

a) Salt dissolve in the first cup i.e. called unsaturated solution.

b) Salt remains un-dissolved in the second cup i.e. called saturated solution.

c) Size of salt piece becomes large in the third cup, i.e. called super saturated solution.

Application of solution in daily life

Different plants and animals use essential substances in the form of solution for example:

1. Plants absorb minerals in the form of solution to prepare food.
2. After digestion, our food is mixed in the blood in the form of solution.
3. Aquatic plants and animals respire by using dissolved oxygen in water.
4. We use solutions of various kinds while drawing, panting and making inks.
5. Most of the drinking substances are found in the form of solution.
6. Most of the medicines are found in the form of solution.

Experimental activities

1. By studying activity 2, separate the mixture of sand and camphor using sublimation method.
2. By studying activity 5, prepare the crystals of sugar from saturated solution of sugar as the same method used in preparation of crystals of potash alum (Fitkiri) from the saturated solution.

Summary

1. The process of separating its components form mixture is called method of separating mixture.
2. Nature of components of mixture should be known to separate the mixture.
3. Homogeneous mixture of solid and liquid substances is separated by evaporation method. In this method,solvent is evaporated and solute remains in the form of solid.
4. Some particular solid substances directly change into gas on heating without changing into liquid. In this way, the method of separating mixture by changing solid directly into gas and gas into solid is called sublimation method.
5. The method of separating the mixture of heavyr and light insoluble substances by rotating it through high speed is called centrifuging method.
6. Particles of substances with definite geometrical shape are called crystals.
7. Generally the crystal of a substance has same shape.
8. Crystals can be prepared by cooling hot saturated solution. This process is known as crystallization.

9. Crystallization method is used to get pure crystalline substance from its mixture.
10. Large sized crystal can be prepared from hot saturated solution by cooling it slowly in normal temperature.
11. Homogeneous mixture of two or more than two substances is called solution.
12. Solution is made up of solute and solvent.
13. Solution having relatively more amount of solute is called concentrated solution and having less amount of solute is called dilute solution.
14. The solution, which can dissolve more amount of solute in it at a particular temperature, is known as unsaturated solution.
15. The solution, which can not dissolve more amount solute in at a particular temperature, is called saturated solution.
16. The saturated solution, which can not dissolve more amount of solute at high temperature, is called super saturated solution.
17. There is great importance of solution in our daily life. Plants absorb required substances from soil in the form of solution. Aquatic plants and animals get dissolved oxygen in water for respiration.

Exercise

1. Fill in the blanks:

a) ……..... method is used for separating common salt from sea water.

b) Mixture of sand and …….....is separated by sublimation method.

c) Extraction of ghee from milk and curd is done by…….....method.

d) Sugar candy (Mishri) is prepared from …….....method.

e) The method of separating solute in the solution by changing solvent into vapour is called…….....

f) Solute and …….....are the components of solution.

g) The solution with more amount of solute is called …….....solution.

h) The solution having …….....amount of solute is called dilute solution.

2. Give short answers.

a) What is evaporation?

b) What is sublimation?

c) What types of mixtures are separated by centrifuging method?

d) Write the name of two mixtures, which can be separated by sublimation method.

e) How are crystals prepared?

f) What is solution?

g) What type of solution is known as saturated solution?

h) What is the importance of solution in daily life? Write any three points.

3. Explain the method of separating the components of following mixture with figure.

a) Sugar and water

b) Sand and camphor

c) Crystal of copper sulphate from copper sulphate solution

4. Nature of components of mixture should be known to separate the mixture why? Explain with example.

5. Naphthalene balls are kept in the box containing clothes to prevent clothes from bugs. After some time, balls become small and finally disappeared. How this has happened? Write suitable reason.

6. Which method is used to obtain common salt from rock salt? Why?

7. Write any four importance of mixture.

8. Distinguish between

a) Concentrated solution and dilute solution

b) Saturated solution and unsaturated solution

9. How saturated, unsaturated and super saturated solutions identifed. Explain this writing with experiment.

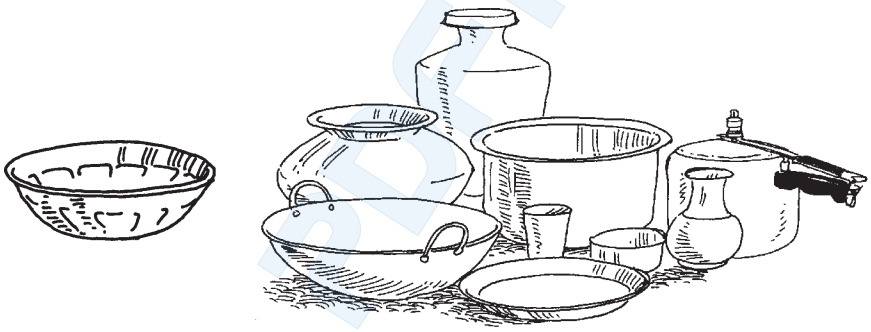
Chapter 13

Metal and Nonmetal

There are different matters around us. Among these, some matters are pure and some are impure or mixed. Elements are the examples of pure substance. Including both 92 natural and 26 artificial altogether, 118 elements are discovered so far. All these elements possess their own properties. On the basis of their properties, elements can be classified as metals, nonmetals, and metalloids in three groups. Some elements are hard, malleable, sonorous, lustrous, conductor of heat and electricity. Such elements are called metals. As for example: Iron, Gold, Silver, Copper, Aluminum, etc. Some elements are soft, non-lustrous, not-malleable, bad conductor of heat and electricity. Such elements are called non-metals. As for example: Sulphur, Oxygen, Iodine, Chlorine, etc. Some elements show the properties of both metals and nonmetals. These elements are called metalloids. For example, Silicon, Germanium, Arsenic, etc.

Metal

Do you cook food or tea in the kitchen? Which type of utensils do you use there? All of you see the pots used in cooking rice, dal, and vegetables by your parents. What matters are used to form such pots?



Utensils made up of different metals

Figure no 13.1

Since ancient time, people are using metals. Appliances of aluminum, iron, and copper are used in home for cooking purpose. All of these metals have some similar properties, so these are used in daily life.

Solid, hard, malleable, ductile, lustrous and sonorous elements are called metals.

Properties of metals

In low temperature and normal pressure, most of the metals are found in solid state. However, mercury is a liquid metal.

Following are the common properties of metal:

1. Metals are hard and brittle.
2. Metals possess metallic luster.
3. Metals are malleable or metal can be beaten into a thin plate.
4. Metals are good conductor of heat and electricity.
5. Metals emit sonorous sound when hammered.

   For example: Iron, Copper, Gold, Silver, Aluminum, etc.

Non-metal

Non-metals are found in three states like solid, liquid and gas. Most of these are soft. Non-metals are used in different purposes such as construction of buildings, and preparation of different medicines.

These elements, which are found in solid, liquid and gaseous states, soft, non-lustrous, non malleable, are, called nonmetals.

Properties of non-metals

Nonmetals have their own distinct properties. Some common properties of nonmetals are as below.

1. Non-metals are found in three states like solid, liquid and gas.
2. Non-metals are soft.
3. Non-metals are non-lustrous but iodine has its own luster.
4. Nonmetals are not malleable and ductile.
5. Most of the nonmetals are bad conductor of heat and electricity.

Activity 1:

Do the following tasks with the help of the things that are at your home or your surroundings. Such as; cupper wire, cell, iron wire, coin, iron nail, hammer, rope a piece of wood, piece of brick, pencil, etc. Differentiate between metal and non-metal by filling in the following table on the basis of these works.

1. Observe by scratching these things with an iron nail. Which things can be easily

scratched? Differentiate the hardness of metal and non-metal on its basis.

2. Observe by striking with a pencil. From which thing, does the sharp sound come?
3. Observe by breaking a piece of iron wire and same sized piece of wood. Which one is broken easily?
4. Rub on a coin with a piece of a brick and observe the place rubbed on which shines more?
5. Strike on the piece of brick and observe. Which one can be stretched or made thinner?
6. Heat a piece of wood and the iron wire by holding one edge of them. Which of the edge heats faster?
7. Connect a bulb with a cell with the help of copper wire and light it. Now join a piece of wood or thread instead of the wire. Does it light?

Based on the activities properties shown by metals and nonmetals fill in the given table:

SN	Properties	Metals	Nonmetals
1	state	solid	solid, liquid and gas
2	hardness	…….	……..
3	tinkling sound	……..	…….
4	brittleness	……	……
5	luster	……	……
6	ductility	……..	…….
7	malleability	……..	…….
8	conduction of heat	……..	……..
9	conduction of electricity	……	……

Alloy

Homogeneous mixture of two or more than two metals or metals with nonmetals is called alloy. Since ancient time, people are using alloys in their daily life. Properties of metals are also found in alloys. Some examples of alloys are following:

a) Iron + Carbon = Steel

b) Copper + Zinc = Brass

c) Copper + Tin = Bronze

d) Iron + Chromium + Carbon = Stainless steel

These alloys have distinct properties than their mixing components. People are using alloys for following reasons.

a) To increase hardness.

b) To make strong.

c) To make coloured.

d) To reduce melting point.

e) Prevent from rusting.

Activity 2

What are the alloys that are used in your home? Write their names. Ask with aged persons of your community about uses of these alloys in ancint time. Why are they used? Write a conclusion and show to your teacher.

Some useful alloys and non-metals

Brass

Brass is a useful alloy. It is formed from copper and zinc. This alloy is used to make pots. Brass is yellow coloured.

Bronze

Bronze is formed from the homogeneous mixture of copper and tin. Bronze is of light yellow colour. Household appliances like plates, bowl, cooking pot are made from bronze. Appliances formed from bronze look beautiful. There is not rusting in it. Appliance can be made by melting it in less temperature in comparison to other metals.

Sulphur

Sulphur is a useful nonmetal. People are using it from a long time. It is mainly used as explosive gunpowder. In addition to this, it is used to make crakers (pataka). It is also used in the manufacture of medicines of cuts and wounds. It is not a water-soluble chemical.

Iodine

Iodine is a useful chemical. People are using it from a long back time. Iodine is also essential for our body. Deficiency of iodine causes swelling of thyroid glands of neck which is called goiter. Deficiency of Iodine in pregnancy period may retard metal growth of newborn child. Thus, iodine is mixed with food items. Tincture iodine is manufactured by mixing alcohol with iodine. It is used to relief cuts, wounds as

antiseptic. It is also used as painkilling ointment called iodex, which is used in the paining part of body. Material used in matchstick also formed from it.

Experimental activity

1. Study the activity 1 and find the differences between metals and non-metals.
2. Make the list of alloy used in your home and village.

Summary

1. Solid, hard, malleable, lustrous elements are called metals.
2. Nonmetals are found in three states as solid, liquid and gas.
3. Nonmetals are soft and these have nonmetallic luster.
4. Metals are hard, lustrous, conductors of heat and electricity.
5. Alloys are formed by mixing two or more than two metals or metal with non-metals.
6. People using alloys for increasing hardness, reducing melting point, coloring, and making rust resistance substance.
7. Alloys like Brass and Bronze are used to make household appliances.
8. Iodine is useful chemical, which is used as medicine.
9. Tincture iodine is formed from the mixture of alcohol and iodine.
10. Sulphur is used as medicine and ammunition (gunpowder).

Exercise

1. Fill in the blanks.

a) Metals are found in……states.

b) Nonmetals are……..of heat and electricity.

c) Brass is formed from……..and …….

d) …….is formed from copper and tin.

e) …….causes deficiency of iodine.

2. Write short answers.

a) What is metal?

b) What types of matters are called non-metals?

c) Write two examples of alloy.

d) What are the uses of alloys?

3. What are the uses of following?

   Brass, Bronze, Sulphur, Iodine

4. Write differences between metals and nonmetals.

5. Any one of the substance is given to you, how do you differentiate that it is metal or nonmetal? Write with suitable activities.

Chapter 14 Some Useful Chemicals

We use different kinds of chemical substances in our daily life. Use of these chemicals makes our work easier. Soap and detergents are used in washing clothes. Clothes become clean due to the use of detergent. Similarly, dettol is used in cuts and wounds to prevent it from action of micro-organism. Plants and minerals are main sources of chemicals. Chemical fertilizers are used in growth and development of plants. Here, we are discussing about such chemicals.

A. Phenol

Phenol is a useful chemical. It is extracted from processing of petroleum product. It belongs to a farming of alcohol. It is moderately soluble in water. Phenol is used as antiseptic in the hospitals. It is also used to disinfect around home and kill housefly. It is used to manufacture of medicines, fibers, paints and plastics in industries. Solid form or concentrate phenol is poisonous and it is corrosive to skin. Tablets of phenol are used as insecticides.

B. Dettol

Do you see using dettol during dressing the cuts and wounds? It is very essential chemical for first aid. It makes the skin free from germs. So nowadays dettol is mixing in some soap. It is used to wash soft skin of child, which prevent the action of microorganisms. Some drops of dettols are also used during washing clothes of child. Dettol antiseptic soap is used for cleaning face to prevent it from wound of pimples. Dettol is useful chemical to save the skin and make it free from germs.

C. Detergents

You may see the powder used to wash clothes by dissolving in water. Such powder gives lather when dissolve in water. It is called detergent. It is more soluble than soap. Detergent is synthesized from petroleum product and the smelly flavour is added. Detergent removes the dirt of cloth. Detergent is harmful for plants if they are exposed to it. Therefore, we should be careful while using it.

D. Chemical fertilizers

If we continuously grow same types of crops in the same land for a long times it leads to loss of minerals from the soil. Fertility of soil decreases if minerals are not present in it. Thus, minerals should be added in the soil. Those substances, which are used to increase the fertility of soil, are called fertilizers. Fertilizers manufactured from the mixture of chemical substances are called chemical

fertilizers. Chemical fertilizers are manufactured by the mixing of compound containing nitrogen, phosphorus, and potassium elements, which are essential for plants.

Nitrogen is essential for growth of plants. The deficiency of nitrogen results in yellow leaves, under developed flowers and abnormally smaller seeds. Thus, nitrogen-containing fertilizers are essential for plants. Fertilizers like ammonium nitrate, urea and ammonium sulphate are used for nitrogen.

Phosphorus is essential for development of roots and fruits of plants. Phosphorus helps in the development of seeds in crops. So ammonium phosphate, super phosphate, powdered bones, etc. are used for phosphorus. Potassium element is essential to increase the disease resistance capacity of plants. Potassium helps for preparing foods, synthesis of protein, development of leaves and seedlings in plants. Potassium chloride, potassium nitrate, potassium sulphate and ash are used for potassium. Excessive use of chemical fertilizer damages the soil. So use of fertilizers should be limited.

Project work

What are the chemicals used in your home? Write their names and applications.

Summary

1. We use different types of chemical substances in our daily life.
2. Phenol is useful chemical, which is synthesized from petroleum product.
3. Dettol is used to prevent the entrance of microorganisms in cuts and wounds.
4. Detergent is used to remove dirt from the clothes.
5. Detergent is synthesized from petroleum product.
6. Chemical fertilizers are used to add the essential elements for plants in the soil.
7. Mainly nitrogen, phosphorus and potassium elements are present in the soil.
8. Phenol is spread around the home to disinfect and prevent from housefly.
9. Excessive use of fertilizers results harm.

Exercise

1. Fill in the blank spaces.

a) ……is used to make skin free from germs.

b) Detergents removes the…….of cloth.

c) …….are used to add the minerals in soil.

d) ……..is essential for growth of plants.

2. Select the correct answer from the following

a) Which is the function of detergent?

i) bathing ii) washing

iii) dressing the cuts and wounds iv) put in food

b) What is the function of dettol?

i) to make skin free from germs ii) washing clothes

iii) to relief the wounds iv) to soften the skin

c) Which compound is used to remove bad smelling and kill housefly around home?

i) detergent ii) iodine iii) phenol iv) dettol

d) Which element is essential for growth and development of roots of plant?

i) nitrogen ii) phosphorus iii) potassium iv) calcium

3. Write short answer in brief

i. Write names of any four chemicals, which are used in domestic purpose?

ii. What are the functions of phenol?

iii. What are the functions of dettol?

iv. What is detergent?

v. Why are chemical fertilizers essential?

Unit 15 Living Beings

There are various types of living being found on the earth. These are divided into two main kingdoms namely animal and plant. All the plants fall into plant kingdom. Similarly all the animals fall into animal kingdom. Scientists have divided the animals into two main categories invertebrates and vertebrates. Likewise all plants are divided into flowering and non flowering.

Vertebrates

The animals having vertebral bones are known as vertebrates. Human, monkey, cow, buffalo, chicken, birds, fish, frog, snakes, etc. are vertebrates. The vertebral bones help to support the animal's body weight. These animals live in water, on land or both water and on land. Vertebrates are divided into two groups according to its ability to adapt to the change in temperature. There are cold blooded, which can not change its body temperature and warm blooded which can.

A) Cold blooded animals

Cold blooded animals are those animals whose body temperature changes according to the surrounding environmental temperature, e.g. fish, frog and wall lizard. Cold blooded animals belong to pisees, amphibians and reptiles.

B) Warm blooded animals

Warm blooded animals are those animals whose body temperature does not change according to the surrounding environmental temperature. E.g. man, cow, buffalo, tiger, rhinoceros and different varieties of birds lie in this group. All of the above stated animals' body temperature is always constant even though the surrounding environmental temperature changes; for e.g. human body temperature is always 37°C (98.6F). During unhealthy state the body temperature is more or less than the normal condition.

Vertebrates are divided into five classes according to its body structure which is as follows:

1. Pisces-asala, rhohu, sea-horse, etc.
2. Amphibia-frog, salamander, etc.
3. Reptilia- lizard, crocodile, snake, tortoise, etc.
4. Aves- chicken, pigeon, lophophorus, etc.
5. Mammalia- human beings, bats, whale, cow, etc.

1. Pisces

All kinds of fishes belong to this class. They have a streamlined body structure. The characteristics of this class are as follows:

a) Their body structure is flat, long and covered with scales.

b) They live in water.

c) They have fins which aid them in swimming.

d) They have respiratory organs on either side of their head known as gills.

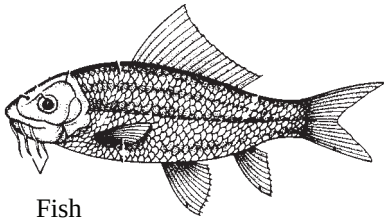
e) They are cold blooded vertebrates.

f) Their body is divided into three parts, head, tail and main body.

g) They have two chambered heart.

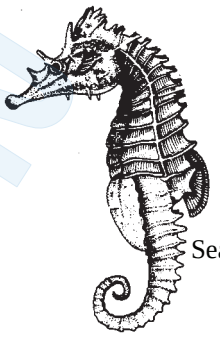
h) They lay eggs.

Example: asala, rohu, sea horse, etc.



Fish

Figure no. 15.1



Sea Horse

Figure no. 15.2

2. Amphibia

This class of animals inhabit both in land and water. Therefore, these are known as amphibia. Their life begins in water. They have the following characteristics:

a) They have moist and slippery skin.

b) They are cold blooded.

c) They have three chambered heart.

d) They have four limbs.

e) Tadpoles respire through gills. However, once they mature they respire through their skin while under water and through lungs when on land.

f) They lay eggs in water.

Example: frog, toad, salamander, etc.

Frog

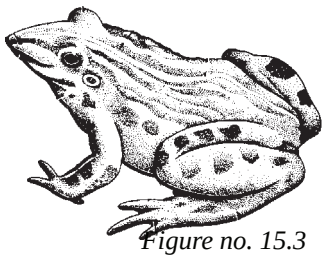


Figure no. 15.3

Salamander

Figure no. 15.4

3. Reptilia

This class of animals travel by crawling. Most of these inhabit on land. Some are also found to be living in water. They have the following characteristics:

a) There body is divided into four parts; head, neck, spine and tail.

b) They have dry skin and rough scales.

c) They are cold blooded.

d) They have three chambered heart.

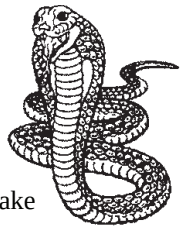
e) They respire through lungs.

f) They lay eggs on land.

Example: snake, crocodile, tortoise, lizard, wall lizard, etc.

Lizard

Figure no. 15.5



Snake

Figure no. 15.6

4. Aves

All kinds of birds fall into this category. Their characteristics are as follows:

a) Their body is covered with feathers.

b) Their body consists of a pair of wing, a pair of leg and a beak.

c) They respire through lungs.

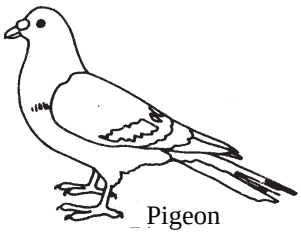
d) They are warm blooded.

e) They have four chambered heart.

f) They have light and hollow bones.

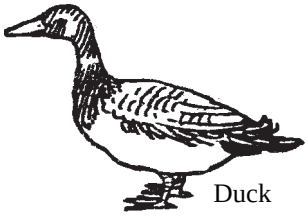
g) They lay eggs.

Example: pigeon, duck, chicken, lophophorus, peacock, crow, etc.



Pigeon

Figure no. 15.7



Duck

Figure no. 15.8

5. Mammalia

This class is composed of highly developed animals. Most of the mammalian live on land. Some inhabit in water while others fly. E.g. Whale and dolphins live in water while bats fly. They have the following characteristics.

a) They are warm blooded.

b) Their body is covered by fur.

c) They have mammary glands (Milk secreting glands).

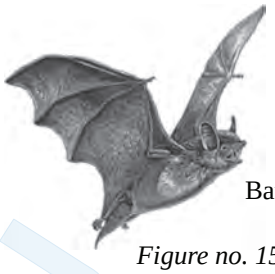
d) They give birth and feed milk to their young one.

e) They respire through lungs.

f) They have four chambered heart.

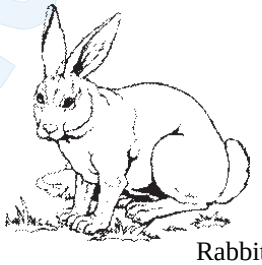
g) They have a pair of external ears (Pinna).

Example : human beings, bats, whale, cow, buffalo, etc.



Bats

Figure no. 15.9



Rabbit

Figure no. 15.10

Activity 1

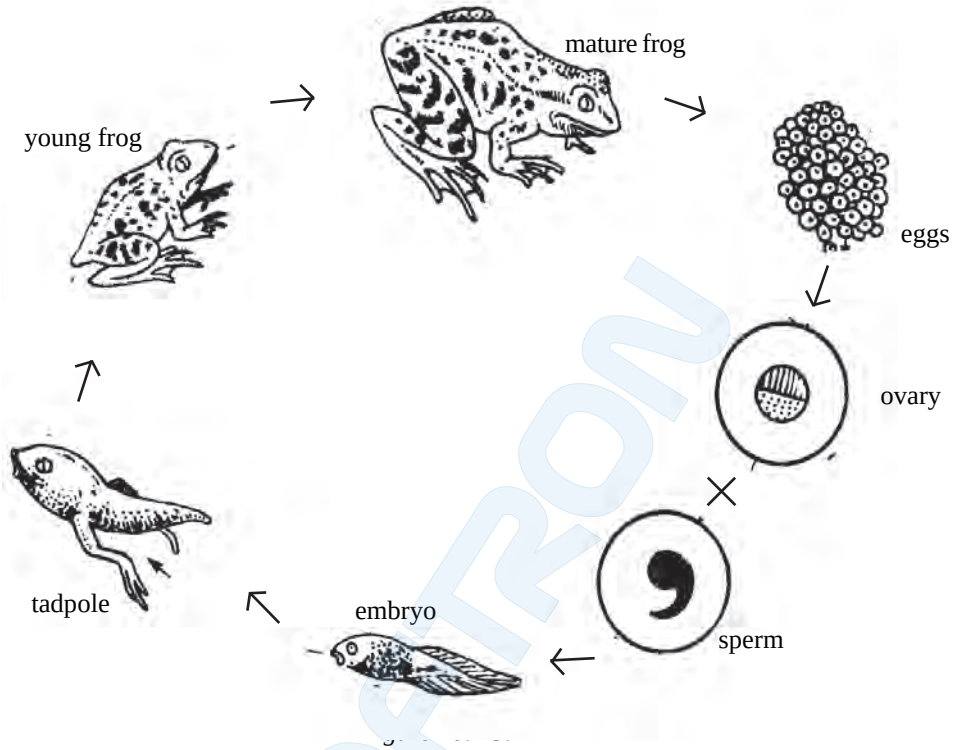
What are the different types of animals found in your locality? List the vertebrates found in your locality near lakes, rivers and jungles. Which class do they fall in? Tabulate your data in the given table.

S.N.	Pisces	Amphibia	Reptilia	Aves	Mammalia
1.					
2.					
3.					

Life cycle of a frog

Life cycle is the complete sequence of events undergone by organisms of a particular species from a fusion of gametes in one generation to the same stage in the following generation. Frogs are amphibians (they live both on land and in water). During early monsoon they come out from underground. They are mostly sighted near streams,

rivers, lakes, ponds, paddy fields. Rainy season is their mating season. In the evening during rainy season male frogs croak in order to attract the females. Females are slightly larger in size than males. During egg laying season female frogs have more pronounced abdomen due to the production of large number of eggs.



They lay their eggs in water. The eggs are round and are covered by a jelly like substance. Once in water this jelly like substance tends to stick together and forms a cluster of eggs which floats on the surface of water. Male frogs spray their sperms over these clusters of floating eggs.

Sperms are of minute size consisting of a small head and a long tail. The tail helps the sperm to swim. This sperm breaks the jelly covering of the egg cell and fuses with the egg. The fusion of sperm and egg forms a zygote. This process of zygote formation is known as fertilization. Hence, fertilization in frogs takes place outside the body. This type of fertilization is known as external-fertilization.

Nuclear division starts once the zygote is formed. Series of such divisions lead to embryo development. These embryos develop into larva. When the larva comes out of the egg it is known as tadpole. Tadpole has a large head and a short tail. At this stage the ventral side of the head consists of adhesive glands. This gland helps the tadpole to adhere to the plant leaves. During this stage the tadpole does not feed. It

survives by in taking nutrients from its own body.

Three pairs of external gills are developed on either side of the head. Tadpoles respire oxygen through these gills. At this stage, tadpoles' mouth open is which consists of teeth. These help in consumption of small aquatic plants. During this period, tadpoles tail is developed and its body starts growing. Gradually, the external gills starts degenerating and internal gills starts developing to replace the external ones. These internal gills are covered by a layer of skin. Somewhere during this time the tadpole develops a number of organs such as eyes, nostrils, oesophagus etc. At this stage the tadpole respires through the internal gills. Using its long tail to swim, it feeds on soft aquatic plants and algae.

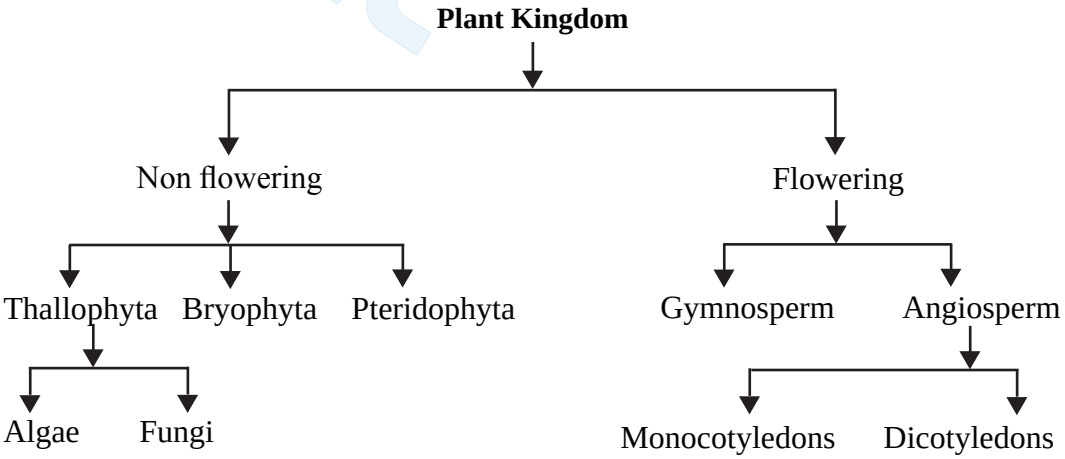
At this stage, tadpoles start developing hind legs. Forelegs are also developed during this time; these are covered by the skin layer which also covers the gills. Now the lungs start developing. Gills begin to degenerate and the tail starts to shorten. The tadpole now develops mouth which consists of jaws and teeth. After sometime the tadpole develops into a small frog. In this manner a fully developed frog is formed. Once, fully developed the female frog starts laying eggs. In this way the frog completes its life cycle.

Classification of plants

There is a wide varieties of plants found on the surface of the earth. These plants range from microscopic plants to large trees. These plants may be flowering or non-flowering. On this basis, plants are broadly divided into two categories:

1) Cryptograms or non-flowering plants

2) Phanerograms or flowering plants



1. Cryptograms or non flowering plants

Non flowering plants do not flowers. These are less developed plants. On the basis of their development they are divided into three division.

a) Thallophyta

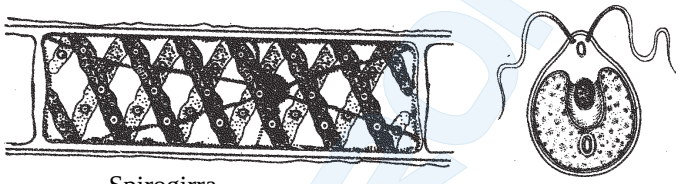
b) Bryophyta

c) Pteridophyta

a) Thallophyta

Plants that do not have well-differentiated body fall into this group. They are further divided on the basis of the presence of chlorophyll. These subdivisions are i) algae and ii) fungi.

i) Algae



Spirogirra Chlamydomonas

Figure no. 15.2

a) They consist of chlorophyll.

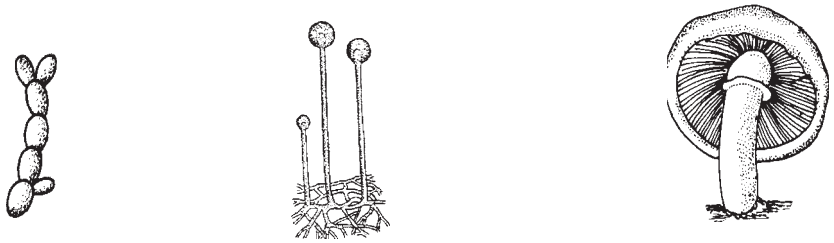
b) They photosynthesize.

c) They usually grow on damp and moist areas.

d) Some of these are microscopic.

Example: Spirogirra, Chlamydomonas

ii) Fungi



Yeast Mucor Mushroom

Figure no. 15.3

a) They lack chlorophyll

b) These are mostly black, white and brown in colour.

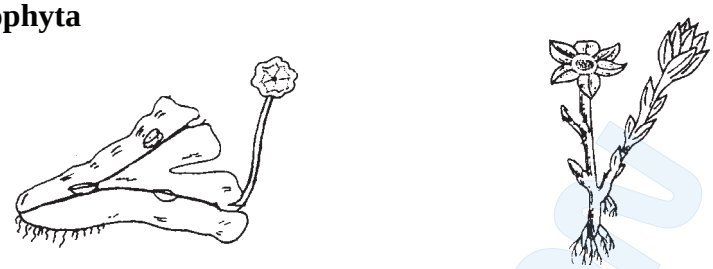
c) They do not photosynthesize.

d) These are parasitic plants.

Some of them are microscopic while others are observable by naked eyes.

Example: Mushroom, Yeast, Mucor

b) Bryophyta



Marchantia Moss

Figure no. 15.14

These are often known as the plant amphibians. Its bodies can be differentiated into stem and leaf like structures.

a) They grow in damp areas.

b) They are multicellular and have chlorophyll.

c) They have structures similar to roots known as Rhizoids.

Example: Liverwarts, Moss, Marchantia.

c) Pteridophyta

The body of these plants can be divided in to root, stem and leaves. They have specialized tissue for transportation of water and other substances.

Ferns Clubmoss Horse tails

Figure no. 15.15

a) They are the most developed amongst the non flowering plants.

b) They have well differentiated root, stem and leaves.

c) Since they have chlorophyll they photosynthesise.

d) These plants can be found in damp and moist area.

Example: Marsiellia, Ferns, Horsetails, Clubmoss.

2. Phanerograms or flowering plants

These plants are highly developed. They produce flowers. These are further divided into : a) gymnosperm and b) angiosperm.

a) Gymnosperm

i) These plants range from medium to large size.

ii) They have needle like leaves.

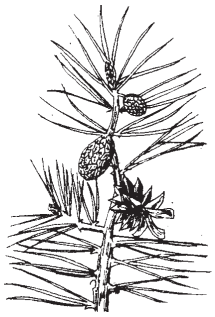
iii) They mostly grow in dry areas.

iv) Plants in this group grow naked seeds and do not bear fruits.

v) They are perennial, evergreen and woody.

Example: Pine, Deodar, Cycas.

Cycas



Pine

Figure no. 15.16

b) Angiosperm

i) Their size ranges from small to large.

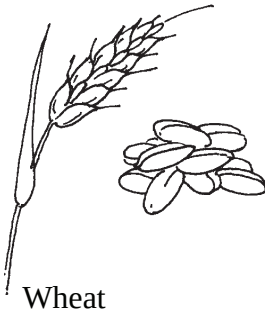
ii) These plants can be found both on land and in water.

iii) The seed develops inside an organ. This organ eventually modifies to become a fruit.

They are further sub-divided into two groups on the basis of the number of cotyledons present in the seed. 1) monocotyledonous and 2) dicotyledonous

1) Monocotyledonous

paddy(Rice)



Wheat

Maize

Figure no. 15.17

a) They have fibrous roots.

b) These plants have long leaves with parallel venation.

c) Their seed has only one cotyledon.

Example: Rice, Wheat, Maize, Bamboo, Onion

2) Dicotyledonous

a) Plants consist of tap roots.

b) Broad leaves with reticulate venations.

c) Their seed has two cotyledons.

Examples: Mustard, Gram, Peas, Beans, Apple, Orange

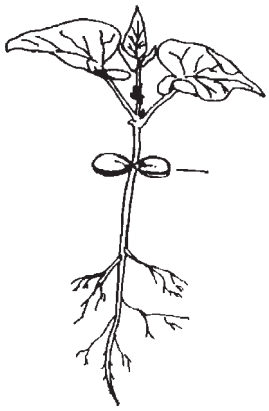


Figure no. 15.18

Activity 2

What are the various plants found in your locality? List the plants found in your locality near lakes, rivers fields, garden, grasslands and jungles. Which class do they fall in? Tabulate your data in the given manner.

S.No.	Non flowering				Flowering		
	Thalophyta		Brayophyta	Pteridophyta	Gimnosperm	Angiosperm	
	Algae	Fungi				Monocot	Dicot
1. 2. 3.							

Differences between non-flowering and flowering plants

S.N	Non-flowering	Flowering
1.	Plants are less developed.	Plants are highly developed.
2.	Roots, stem, leaves are not differentiated.	Developed roots, stem, leaves and flower.
3.	Some have chlorophyll and some do not, eg algae,fungi:	Presence of chlorophyll e.g. mustard, gram, peas etc.

Activity 3

Observe the plants in the surrounding area and try to find out the similar and dissimilar characters. Tabulate your data in the following manner.

Similar characters

SN	Non flowering	Flowering
1.		
2.		
3.		

Dissimilar characters

SN	Non flowering	Flowering
1.		
2.		
3.		

Structure of flowering plants and its activity

You all must have observed the flowering plants in your home and school area. There are various flowering plants in nature. Most of the flowering plants consist of roots, stem, leaves, branches, buds, flower and fruits. These plants germinate from seeds. All varieties of flowering plants have similar structure.

Activity 4

Uproot a flowering plant. Carefully clean with water to remove soil. Draw a well labeled diagram of a flowering plant. Flowering plants have two parts.

a) Underground the soil - Root system

b) Above the soil - Shoot system

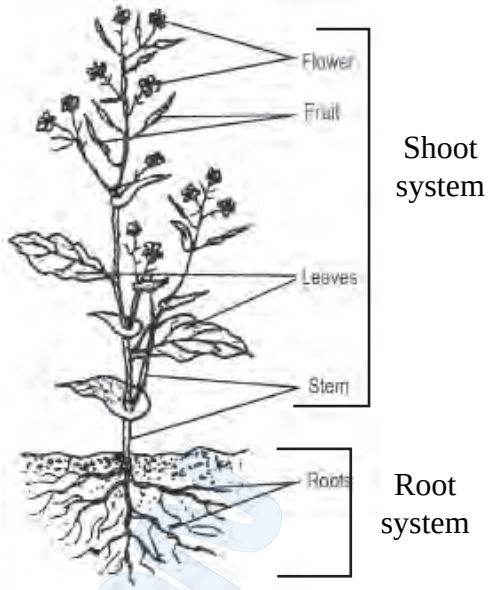


Figure no. 15.19

a) Root system

The parts of plant under the ground are known as root. Generally roots are white, brown or pale yellow in colour. Roots are divided into two types as fibrous and tap root.

i) Fibrous root

Roots developed from the seeds in rhizoids form is known as fibrous roots. These roots are similar, e.g., maize, paddy, onion roots, etc.

Figure no. 15.20

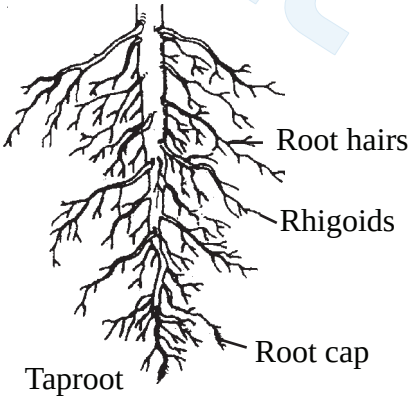


Figure no. 15.21

ii) Tap root

The main part of the plant under soil is known as tap root. The branches of the tap root are known as root hairs. The tip of root is protected by root caps as they are very fragile. e.g., gram, peas, mustard that is in dicotyledonous.

Activity 5

Put moist cloth or cotton on two different plates. Place soaked barley seeds in one plate and soaked mustard seed in another and place it in a warm place. Sprinkle water if necessary. After few days rooting can be seen. Observe the kind of roots in each plant. Comparing the difference between the two kind of roots, draw a well labeled diagram.

Function of roots

1) It helps the plant stand upright.
2) It absorbs water and minerals from the soil and transports it throughout the plant body.
3) Some plants have edible roots. Example: Carrot, Radish, Yam, Sweet Potato etc.

Shoot system

Portion of the plant above the soil is known as stem. This system comprises of stem, leaves, flowers and fruits. Leaf and stems are the vegetative parts while flowers are the reproductive parts.

Stem

Stem is the hard portion of the shoot. Part of the stem closest to the ground is thick. Further up it starts decreasing in diameter. Generally, the stem is cylindrical in shape. Leaves and branches can be seen growing out of the stems. The area of the stem from where the leaves and branches emerge is known as nodes. The separation between two nodes is known as internodes. Buds are present at the apex of the stem which helps the plant grow. In some plants buds are present at the junction of the leaves and stem. Some plants have strong, sturdy stems while others have thin, weak and hollow stems. It is at the stem where the fruits and flowers grow.

Figure no. 15.22

Function of Stem

1) It translocates water and minerals absorbed by the roots to the leaves.
2) It transports starch from leaves to other parts of the plant.
3) Stems which have chlorophyll photosynthesize.
4) Some stems are transformed into nutrient preserving organs which are present under the soil. Examples of these are potato, onion, ginger, etc.
5) Stem helps to support leaves, fruit and flower.

Leaf

Leaf is an important part of the plant. Leaf grows out of the stem and branches. Its green colour is due to the presence of chlorophyll. Leaf can be divided into three main parts as leaf base, petiole and lamina. Leaf base joins the leaf to the stem. Leaves are usually flat in shape. This flat section of the leaf is known as lamina. The edge of the plant may be smooth or ridged. The section of the leaf which joins the lamina to the stem is known as petiole. If a single leaf emerges from a petiole it is known as a simple leaf. E.g., mustard leaf. Lamina contains a thick midrib. Veins branches out of this thick midrib which forms a network of veins throughout the leaf. Some veins run parallel to the midrib. This kind of arrangement is known as Parallel Rib.

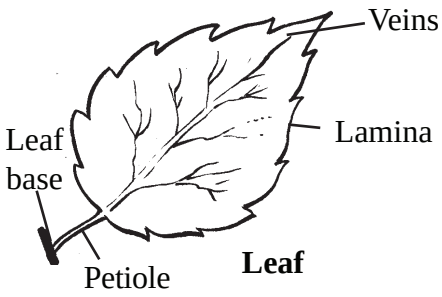


Figure no. 15.23

Function of Leaf

1) Leaves are the main photosynthetic organ.
2) Stomatal pores present in the leaf helps in gaseous exchange.
3) Stomata also help in transpiration of water.

Activity 6

Collect different types of leaves and observe the arrangement of veins in it. Compare the kinds of arrangement of the veins and annotate them.

Flower

Flower is the reproductive organ of the plant. Some plants are unisexual or bisexual. Only one type male or female reproductive sex is present in the unisexual plants. Both reproductive organs are present in bisexual plants. Flower can be divided into main four parts arranged into ring forms encircling each which are as follows:

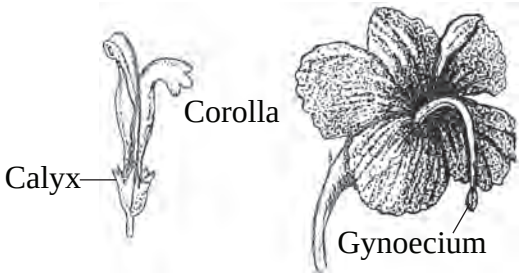


Figure no. 15.24

Calyx, Corolla, Androecium and Gynoecium

Calyx

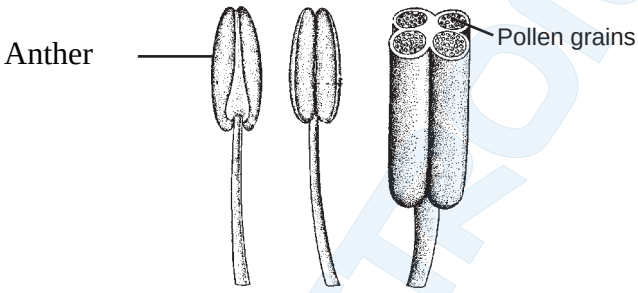
The outer ring of flower is calyx. This is made up of sepals. Sepals protects the inner parts of the flower during the bud stage.

Corolla

The inner ring of calyx is known as corolla. This is made up of coloured petals consisting of pleasant smell. The system attracts insects and helps in pollination. They are beautiful in appearance.

Androecium

Androecium is the male organ. It consist one or more stamens. Each thin long portion is known as filament while the bulging end is known as anther. Pollen grains are formed within anther. These are small dusty yellow powder.



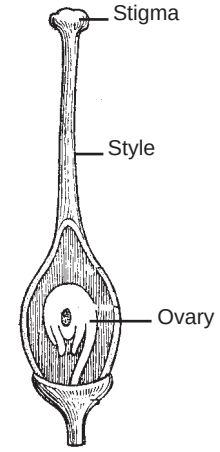
Stamen

Figure no. 15.25

Gynoecium

Gynoecium is the female organ. This is made up of one or more carpel and pistil. Each carpel is divided into three parts as ovary, style and stigma. The lower bulging part is ovary, the middle long part is style and the upper part is known as stigma. Ovum is formed within ovary. This is known as female gamete.

Complete flower consist of calyx, corolla, male (androecium) and female (gynoecium) organs. If any one of these organs are missing in the flower then this type of flower is known as incomplete flower.



Gynoecium

Figure no. 15.26

Pollination

The process reaching pollen grains in the pistils of stigma is known as pollination. Pollination occurs in two processes that is self-pollination and cross pollination. The process of reaching pollen grains in the stigma of the same flower is known as self pollination. Self pollination occurs in the bisexual flower.

Fertilization

The process of fusion of male and female gametes to form zygote is known as fertilization. After pollination each pollen grain forms pollen tube and reaches to ovary. Female gametes are present in the similar ovules. The tip of the pollen tube ruptures as it reaches ovules. Male and female gametes fuse to form a zygote. Zygote changes into embryo. Seeds forms from embryo and give rise to plants.

Practical activity

1. What are the plants found in your locality? List the plants found in your locality near lakes, rivers, land and jungles. Which class do they fall in? Compare between the classes and write down the result.
2. Based on activity 3 make a comparative study on non flower and flowering plants.
3. Collect the different types of flowers and study their different parts and make a neat diagram.

Summary

1. Animals containing vertebral bones are known as vertebrates
2. Cold blooded animals are those animals whose body temperature changes according to the surrounding environmental temperature.
3. Warm blooded animals are those animals whose body temperature does not change according to the surrounding environmental temperature.
4. Vertebrates are divided into five classes according to its body structure which are as follows: Pisces, amphibian, reptilian, aves, mammalian.
5. Frogs lay eggs in water. Tadpoles' life cycle completes in water. Tadpoles respire through gills.
6. Fertilization of eggs occurs outside the frog's body which is known as external fertilizaiton
7. Frog can live on land and in water.
8. According to the nature of flowering plants can be divided into two groups as flowering and non-flowering plants.
9. Non flowering can be divided into three divisions as follows: Thalophyta, Bryophyta and Pteridophyta.
10. Chlorophyll containing plants are algae while non chlorophyll plants are fungi.
11. Flowering plants are divided into two divisions as Gymnosperms and Angiosperms.

12. Roots, stem, leaves, flower and fruits are well developed in flowering plants.
13. Plants consisting of fibrous roots, one cotyledon seed with parallel venations in leaves are known as monocotyledons.
14. Plants consisting of tap roots, two cotyledon seed with network of venations in leaves are known as dicotyledons.
15. Roots of plant help plants to stand upright on ground. Roots help to absorb water and minerals from the soil.
16. Plant leaves help to produce nutrients to plants and in respiration.
17. The reproductive organ of plant is flower. Some plants are unisexual or bisexual.
18. Complete flower consist of calyx, corolla, male organ and female organ.
19. Male organ is androecium and female organ is gynoecium.
20. Process of reaching pollen grains from anther to stigma is known as pollination.

Exercise

1. Fill in the blanks:

a) The body of vertebrates is covered by ……

b) Fish respire through ……..

c) Fungi group of plants does not contain …….

d) …….. organ of plant is flower.

e) Roots help to absorb water and ……. from the soil.

2. Tick the correct answer.

a) Which is the following animals belong to vertebrates?

i. Butterfly ii. Snail iii. Worm iv. Fish

b) Which animal gives birth to young one directly ?

i. Pigeon ii. Bats iii. Parrot iv. Peacock

c) Which organ is used generally for respiration by animals that live in water?

i. Skin ii. Respiratory tube iii. Gills iv. Lungs

d) The plants that cannot be differentiated into roots, stem and leaves are kept in

i. Thalophyta ii. Brayophyta iii. Pteridophyta iv. Angiosperm

e) What is the function of sepals?

i. Produce pollen grains ii. Produce eggs

iii. Produce colour in flowers iv. Protect flower buds

3. Short answer questions.

a) List down the classes of vertebrates.

b) List down how many divisions are there in non flowering plants.

c) What do you understand by bisexual plants?

d) Write down any two functions of roots.

e) What are the main parts of a flower?

4. Differentiate between the followings:

a) Warm blooded animal and cold blooded animal b) birds and bats

c) Algae and fungi d) monocot and dicot

e) Tap root and fibrous root

5. Give two characteristics of the following group of animals:

a) Fish b) Bisexual c) Reptilia d) Aves e) Mammals

6. Draw a well labeled diagram of life cycle of frog and explain in detail.

7. Draw a neat well labeled diagram of egg.

8. Write two different characteristics of aves and mammals.

9. Draw a flow chart of plant kingdom.

10. Write down the two important functions of the following parts of a plant.

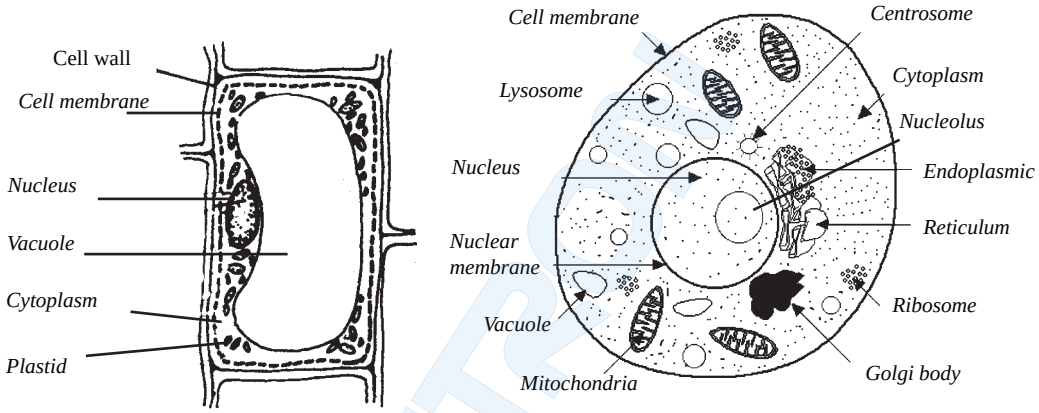
a) Stem b) Leaf c) Flower

Unit 16

Cell and Tissue

Cell

The small structure that are the basic building units of plant and animals are known as cells. Microscope is needed to observe them. Life cycle of all plants and animals starts from cells. The cell is called the structural and functional unit of life.



Plant cell *Figure no. 16.1* **Animal cell**

Part of cell

The cells have various parts, which are mantioned below.

a. Cell wall b. Plasma membrane or cell membrane

c. Cytoplasms d. Vacuole e. Nucleus

a. Cell wall

The thick, strong and rigid outer protective covering of a plant is known as cell wall. Cell wall is compared of dead cells known as cellulose.

Functions

1. Cell wall provides structural strength to plants.
2. It protects plasma membrane or cell membrane and other features.
3. It helps to transfer substances inside and outside of the cell.

b. Plasma membrane or cell membrane

Plasma membrane or cell membrane is situated inside the cell wall of a plant cell. Animal cell does not consist cell wall. Cell membrane is made up of protein and lipid. This is the outermost covering of the cell that separates the contents of the cell from its eternal environment. The plasma membrane allows or permits the entry and exit of some materials in and out of the cell. It also prevents movement of some other materials. Therefore, cell membrane is called a semipermeable membrane.

Functions

1. It gives shape to cell.
2. It protects cell organelles.
3. Permits the entry of useful material and exit of unwanted materials.

c. Cytoplasm

The cytoplasm is the fluid content inside the plasma membrane. It contains many specializes cell organelles. Each of these organelles performs a specific function of the cell. Cell organelles are enclosed by membranes. These organelles are living while inclusion bodies are non-living. In plant cytoplasm there is presence of big and stable vacuole. While in animal cell there are small and unstable vacuoles. Each organelles performs a specific function for the cell. Cytoplasm constitute of water, protein, fats, carbohydrate and minerals.

1. Endoplasmic reticulum (ER)

The endoplasmic reticulum (ER) is a large network of membrane - bound tubes and sheets. Rough endoplasmic reticulum (RER) contain ribosomes reticulum (SER) does not contain ribosomes. The RER manufacture protein. Smooth endoplasmic reticulum (SER) does not contain ribosomes.The SER helps in the manufacture of fat molecules, or lipids, important for cell function. Some of there proteins and lipids help in building the cell membrane known as membrane biogenesis. During cell division these produce cell plate.

2. Ribosome

Ribosomes are small and round in shape. Rough endoplasmic reticulum (RER) contains ribosomes. Ribosomes manufacture proteins.

3. Golgi body

Golgi body consists of a system of membrane bound vesicles arranged

approximately parallel to each other in stacks. It helps in cell division. It manufacture protein, sugar and enzymes and functions include the storage, modification and packaging of products.

4. Lysosomes

Lysosomes are a kind of waste disposal system of the cell. Structurally, lysosomes are membrane bound sacs filled with digestive enzymes. They are also called suicidal bags as the cell dies when they burst.

5. Mitochondria

Mitochondria are rod like cylindrical shaped and rough organelle. These are small and big in size. The energy required for various chemical activities needed for life is released by mitochondria of the cell. It takes part in cellular respiration.

6. Centrosome

Centrosome is found only in animal cell. It is found near the nuclear and helps in cell division. During cell division centrosome divides into two centrioles.

7. **Plastid**

Plastids are present only in plant cells. They are found in various shapes. According to colour plastids can be divided into 3 types.

a. **Leucoplast:** This is white or colourless plastid. It is present in roots and stem. It stores starch.

b. **Chromoplast** : They are colored plastics. There are found in flowers and fruits. They produce colors in flowers.

c. **Chloroplast:** These are green plastids. They are found in leaves and peels. Chlorophyll present in chloropl helps photosynthesis and produces nutrients for itself.

8. Granules

The non-living inclusion bodies in the cytoplasm is known as granules. Granules are made up of starch, glycogon and fats.

d. Vacuole

Vacuoles are storage sace of solid or liquid contents. Vacuoles are small sized in animal cells while plant cells have very large vacuoles. In plants cell vacuoles are full of cell sap and provide turgidity and rigidity to the cell. They are stable vacuoles. In animal cell, vacuoles are small and unstable. The vacuoles include

amino acids, sugars, various organic acids and some proteins.

Functions

1. It makes cell rigid.
2. It balances water in the cell.
3. It balances sugar level.
4. It stores, waste substances.

e. Nucleus

Round object in the central part of the cell is known as nucleus. The liquid inside the nucleus is known as neucleoplasm. The central part of nucleus is known as nucleolus. The nucleus contains chromosomes, which are visible as rod - shaped structures only when the cell is about to divide. Chromosomes contain information for inheritance of features from parents to next generation. Chromosomes are composed of DNA and protein. Functional segments of DNA are called genes.

Functions

1. Takes part in cell division.
2. Takes part in reproduction.
3. Helps to transfer heridity from parents to off spring.
4. Controls all the functions within the cell.

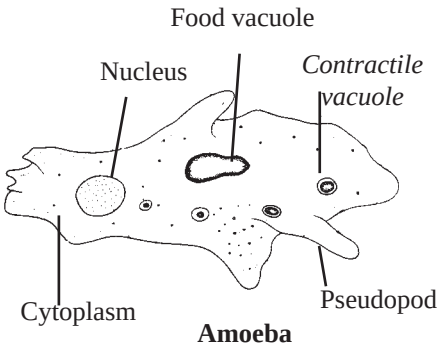
Unicellular and multicellular animals

All the organisms that we observe around are made up of cells. A single cell may constitute a whole organism as in *Amoeba, Chlamydomones, Paramecium* and *bacteria*. These organisms are called unicellular organisms (uni = single). Many cells group together in a single body and assume different functions in it to form various body parts in multicellular organisms (multi = many) such as some fungi, plants and animals. A cluster of cells at a definite place in the body. This cluster of cells, called a tissue is arranged and designed so as to give the possible efficiency of function. The organ is made up of tissues. The collection of organs makes structural organizations of organs and organ system. The process of taking nutrients, respiration and waste disposal system occur in a single cell in unicellular organism. But in cases of multicellular organism it occurs in different organ systems.

Amoeba

Amoeba is a single cell organism. It completes its life cycle, nutrient intake, respiration, waste disposal, reproduction, etc. all in a single cell. Amoeba is found in soil, water and sometimes in human body. There are different types of amoeba. It is

a microscopic organism. It does not have fixed shape. It produces appendages for locomotion. It takes food with the help of pseudopodia that is false appendages. Therefore shape of amoeba constantly changes.



Amoeba

Figure no. 16.1

Amoeba is covered by cell membrane known as protoplasm. There are two layers. Outer layer is ectoplasm and inner layer is endoplasm. The cell membrane helps amoeba for transfer of oxygen and water. Similarly it helps to exit carbondioxide.

There are two types of vacuoles known as food vacuole and contractile vacuole. In food vacuole food and water is collected. Enzyme in the protoplasm digest the food particles and unwanted materials is collected in contractile vacuole. The materials are excreted through cell membrane.

At the central body of the amoeba a round nucleus is present. This helps cell to grow and also help for cell division.

Entamoeba histolytica present in water enters human intestine and causes dysentry. *Entamoeba coli* is found in large intestine. They live on undigested food particles.

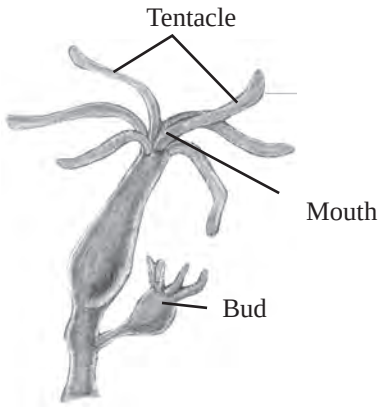


Figure no. 16.3 **Hydra**

Hydra

Hydra is a multicellular organism. It lies in coelenterates phylum. In this phylum, most of the animals live in water. There is hollow cavity in the body. They consist of mouth but do not contain anus. There are tentacles around the mouth. Tentacles helps for locomotion to catch food and to put food in the mouth.

Movement of Hydra

Figure no. 16.4

During locomotion tentacles helps to stand and the lower body part comes up. It moves from one place to another as it is playing summer sault. The body is made of two layers of cells. One make up cells on the outside of the body ie. ectoderm and the other makes the inner lining of the body,ie. endoderm. These cells help to

make tissues. These tissues help in catching food, digestion, locomotion and also for stretching and contraction of the body. Life cycle of hydra completes due to the help of these tissues. The reproduction of hydra occurs through formation of bud. This bud starts growing into a complete hydra and separates from its present forming a daughter hydra. This processs is known as budding.

Practical exercise

1. Take one piece of onion. Take a thin slide of onion and put it on a slide and cover it with a covers slip. Observe under microscope and draw the figure.
2. Draw a well labeled diagram of plant and animal cell.

Summary

1. The small structures that are basic building units of plant and tissue are known as cells.
2. The cells have special features known as organelles.
3. Outer layer of plant cell is cell wall and animal cell is cell membrane.
4. Plant cell and animal cell have some similarities and some disimilarities.
5. Plastid is present only in plant cell and centrosome is present only in animal cell.
6. Mitochondria helps to release energy. Therefore it is known as power house of the cell.
7. The main part of cell is nucleus. This helps in cell division.
8. Some animals are uni-cellular and some are multi-cellular.
9. Amoeba is small cellular organism with no definite shape.
10. Amoeba is free living or parasitic organism.
11. Entamoeba histolytica causes dysentry in our body.
12. Hydra lies in coelenterate phylum with hollow cavity in the body.
13. Hydra consists mouth but not anus.
14. Hydra consists tentacles around the mouth.
15. Body of hydra consists of two layers.
16. The multiplication of hydra occurs due to budding.

Exercise

1. Fill in the blank spaces.

(a) The body of animals is made up of .....

(b) There is a big permanent ..... in a plant cell.

(c) The cell wall is made up of non-living .....

(d) Plastid is found in .....cell only.

(e) The shape of amoeba is .....

2. Choose the best answer.

(a) The outer most part of animal cell is

(i) Cell wall (ii) Cell membrane

(iii) Nucleus (iv) Vacuole

(b) Which cell organelle is not present in the plant cell?

(i) Plastid (ii) Nucleus

(iii) Centrosome (iv) Vacuole

(c) Which one of the following is multi cellular organism?

(i) Amoeba (ii) Paramecium

(iii) Euglena (iv) Hydra

(d) What is the function of tentacles of hydra?

(i) Reproduction (ii) Respiration

(iii) Locomotion and capturing food (iv) Digestion

(e) Name the part where amoeba stores food .....

(i) Food vacuole (ii) Contractile vacuole

(iii) Vacuole (iv) Pseudopodia

3. Give short answer:

(a) What are cell organelles? Name few of them.

(b) Name the cell organelles which are found in plant cell but not in animal cell.

(c) What is the function of vacuole in plant cell?

(d) Why is mitochondria is also known as power house of cell?

(e) What are the functions of tentacles in amoeba?

(f) How does hydra move? Explain.

4. Draw well labelled diagram of,

(a) Animal cell (b) Plant cell

(c) Amoeba (d) Hydra

5. Show the movement of hydra with diagram.

6. Write short note on

(a) Plastids (b) Cytoplasm (c) Nucleus

Unit 17

Life Process

Every living organisms have various types of processes for their survival. The processes like respiration, nutrients intake, exertion are important for both plants and animals. Simple organism has simple type of life process. In case of developed organisms life process is complicated.

The basic functions performed by living organisms to maintain their life are called life processes.

Respiration

To perform any kind of work we need energy. Where do we get energy from? When we are hungry we feel difficult to work and sometimes can not work, why?

We obtain energy from food. Food is a kind of fuel which provides energy to all the living organisms. Most living things need oxygen to obtain energy from food. This oxygen reacts with food molecules (like glucose) present in the body cells and burns them slowly to release energy. The energy released is stored in the cells. The body can use this stored energy wherever it wants to do so. The process of releasing energy from food is called respiration. Respiration process is different in plants and animals.

Breathing and respiration

The mechanism by which organisms obtain oxygen from the air and release carbon dioxide is called breathing. Breathing is a physical process. Respiration is more complex process. Respiration includes breathing as well as the burning (oxidation) of food in the cells of the organism to release energy. The process of breathing involves the lungs of the organism whereas the respiration involves the mitochondria in the cells where food is oxidised to release energy.

Respiration in animal

Different animals have different modes of respiration. For example, simple unicellular animals like Amoeba, respiration takes place by the simple diffusion of gases through the cell membrane. Other examples: porifera, coelenterata. Most of the animals have, specific organs for respiration.

(i) Skin: The animals like earthworm, leech, or frogs which live in the soil has their skin absorb oxygen from air and remove carbondioxode.

(ii) Trachea : The insects like cockroach, butterfly, grasshopper, housefly and a mosquito, has tiny holes called spiracles on their body and air tubes called trachea which is known as respiratory organ. Spiracles help to absorb oxygen and release corbondioxide.

(iii) **Gills :** The aquatic animals like fish, prawns, tadpoles and mussels have gills as the respiratory organs which extract oxygen disolved in water and take away carbondioxide from the body. There gills are covered by a lid known as operculum.

(iv) **Lungs :** The respiratory organs of the land animals such as man (humans), frogs, reptilia, birds and mammalia are lungs. They intake oxygen through lungs and release carbondioxide.

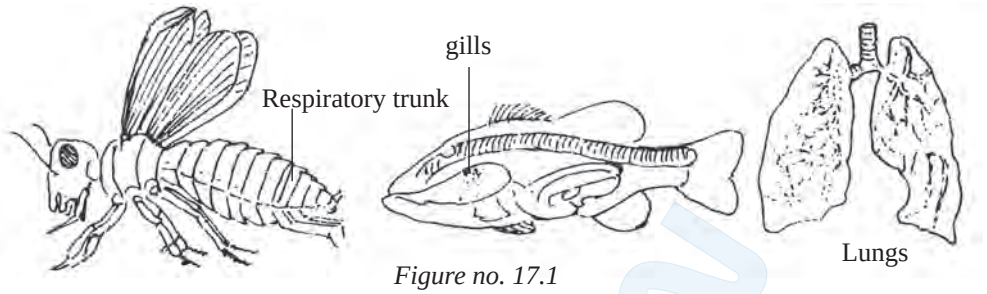


Figure no. 17.1

Respiration in human body

In human beings, many organs take part in the process of respiration. We call them as organs of respiratory system. The main organs of human respiratory system are: nose, nasal passage (orirsal cavity), trachea, bronchi, lungs and diaphragm.

The human respiratory system begins from the nose. Nose consist of two holes called nostrils. There is a passage in the nose behind the nostrils which is called nasal passage (or nasal cavity). The air (oxygen) for respiration is drawn into the body through the nostrils. This air goes into nasal cavity. The trachea is a tube which is commonly known as wind pipe. The oxygen coming from the nostril during breathing passes through trachea. Trachea such into two bronchi (singular - bronchus)

The smallest brochioles have tiny - air sacs at their ends. These air sacs absorbs oxygen and diffuses in blood. Blood diffuses oxygen to different cells in the body. The reaction between oxygen and glucose take place and then water, energy and carbondioxide are released. Corbondioxide and water are released as waste materials. In this way, the process of gaseous exchange is completed in the human respiratory system.

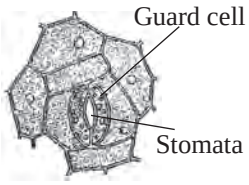


Figure no. 17.2

Respiration in plant

Respiratory process in plants is simple in compare to animal. Plants need energy. Energy is obtained by the process of respiration. Plants use oxygen of an for respiration and release carbon dioxide. Thus, the respiration in plants also involves the exchange of oxygen and carbon dioxide. There are presence of small pores in leaves known as stomata. They are found in ventral side of the leaf and young stems. Stomata is protected by guard cells which is in bean shaped. Guard cell are found in both sides of the stomata. Movement of guard cells helps to open and close the

stomata pores. Through the stomata plants obtain oxygen and release carbondioxide. In unicellular plants, respiration takes place through the outer covering. All the parts of a plant like root, stem and leaves perform respiration individually.

Human digestive system

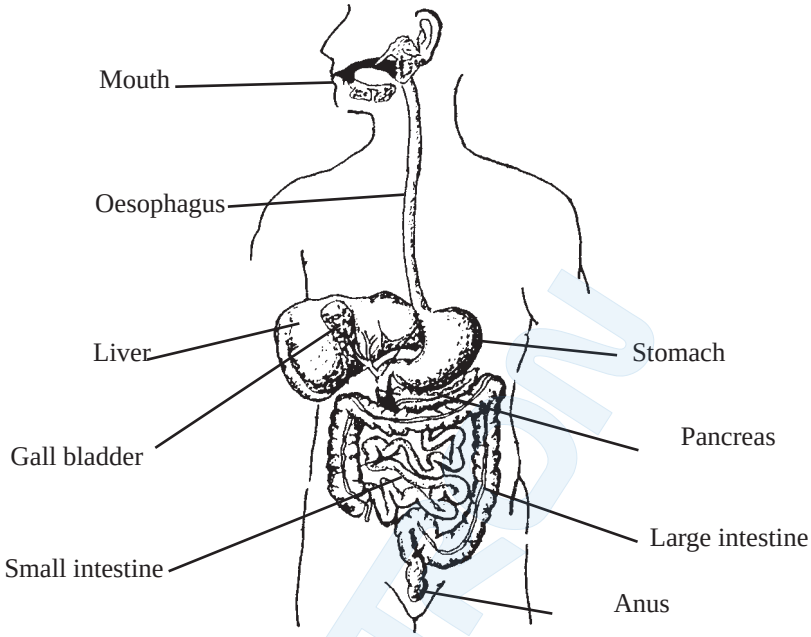


Figure no. 17.3

We need food to gain energy. Food we eat does not convert to energy directly. For this purpose there are different organs which takes part. The nutrition in human beings (or man) take place through human digestive system. The human digestive system consists of the alimentary canal and its associated glands. The group of organs which takes part in digestion of food is known as digestive system.

Digestive system can be divided into two groups:

1. Alimentary canal
2. Digestive glands

1. Alimentary canal

Alimentary canal starts from mouth and ends to anus. This canal is somewhere wide and in some places narrow. The various organs of the human digestive system in sequence are, mouth, oesophasus (food pipe), stomach, small intestine, large intestine and anus.

2. Digestive glands

In human beings, the digestive of food begins in the mouth itself. The salivary glands help in chemical digestion by secreting enzymes. The chemical digestion of food

is brought by biological catalysts called enzymes. The enzymes convert food into simple compounds and helps in absorption of nutrients by the body.

Salivary glands and enzymes

S.N	Place	Salivary gland	Digestive juice	Enzymes
1.	Mouth	salivary gland	saliva	salivary amylase
2.	Stomach	gastric gland	gastric juice	Hydrochloric acid, pepsin
3.	Liver	liver	bile juice	
4.	Beneath stomach	pancrease	pancreatic juice	Trypcin, amylase, lipase
5.	Small intestine	intestinal	intestinal juice	Amino peptidases lipase

Process of digestion

The digestion of food starts as soon as we put food in our mouth. This happens as follows: The mouth cavity (or buccal cavity) contains teeth, tongue and salivary glands. The teeth cut the food into small pieces, chew and grind it. Thus, the teeth help in physical digestion. The salivary glands in our mouth produce saliva. Our tongue helps in mixing this saliva with food. Saliva is a watery liquid so it wets the food in our mouth. The wetted food can be swallowed more easily.

The human saliva contains an enzyme called salivary amylase which digests the starch present in food into sugar. The slightly digested food in the mouth is swallowed and goes down the food pipe called oesophagus. The oesophagus carries food to the stomach. The gastric juice in the stomach contains hydrochloric acid, enzyme like pepsin and mucus. Due to presence of hydrochloric acid, the gastric juice is acidic in nature. In the acidic medium, the enzyme pepsin begins the digestion of proteins present in food to form smaller molecules. The microorganisms present in the food particles are killed due to acidic nature. The partially digested food then goes from the stomach into the small intestine. Bile from liver break the fats present in the food. Pancreas is a large gland lies parallel to and beneath the stomach. Pancreas secretes pancreatic juice which contains digestive enzymes like pancreatic analyze, trypsin and lipase. The enzyme anylase breaks down the starch, the enzyme tyrosine digest the proteins and the enzyme lipase breaks down the emulsified fats. The cells of small intestine contain glands which secrete intestinal juice. The villi in the small intestine absorbes the digested food and pass through the walls of the small intestine and goes to the blood. The undigested food goes to a wider tube called large intestine. The walls of large intestine absorb most of the water from the undigested food. The undigested semi solid food is passed out from a body through anus as faeces.

Glucose, fructose, lactose are formed from digestive process. These nutrients passes to the cells of our body through the blood. The nutrients converts into energy in

the cells due to reaction with oxygen. Carbohydrates in food gives energy. Energy and heat is produced from fats and oils. Protein helps in multiplication and repair of cells and tissues. Minerals help in making blood, teeth and bones strong and healthy.

Excretion in living beings

There are different types of waste materials produced in our daily life. The process of disposing waste materials and harmful substances out of the body system is known as excretion. There are different organs which excrete these unwanted materials.

Excretion in plant

Plants intake carbondioxide and release oxygen during nutrients production. During respiration plants obtain oxygen and release carbondioxide. Plants obtain ammonia and produce organic materials. The excess water is released through leaves. During excretion process in plant resins, gum, latex (milk like substance), oil etc gets stored in different parts of the plants. These does not harm plants.

Excretion in animal

The aquatic microorganisms release excess water from the surface of the body. Amoeba excretes unwanted materials from contractive vacuoles. The simple and less developed animals excrete unwanted materials from its surface of the body. They do not have any special organs for excretion. In well developed animals excretion occurs through skin, nose, mouth, lungs, large intestine, liver, kidney, etc.

Hydra excrete, unwanted substances through mouth. Earthworm, leech and insects have digestive system. The animals excrete unwanted materials through anus. Fishes release carbondioxide through gills. Frogs release carbondioxide through both skin and lungs. In well developed animals, excretion occurs through anus and urethra. Some of them release through skin as well.

Excretion in human body

Excretion system in human body occurs through various parts.

Lungs

During respiration carbondioxide is released through lungs to nostrils.

Skin

Through skin unwanted materials like urea, minerals and excess water are excreted as sweat.

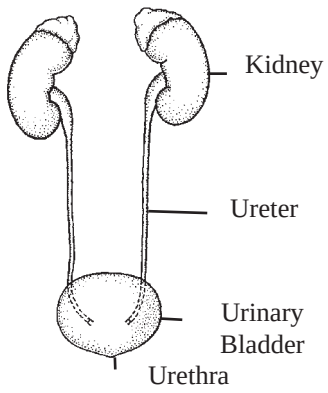


Figure no. 17.4

Kidney

The excess water, minerals, urea, uric acid, etc. are released from body by filtration through kidney.

Liver

Liver helps to excrete ammonia, urea, toxins. The excreted unwanted materials go through liver to blood and gets filtered in kidney. Where urine is formed and released out of the body.

Large intestine

Undigested food materials from large intestine are passed through anus. This process is known as excretion process.

Practical exercise

1. Make a drawing of a plant leaf to show absorption of water from soil and release of excess water through leaf into the atmosphere. Draw a conclusion on this aspect.
2. Prepare a model of a lung using the following materials.

Balloon - 1, bottle - 1, cork, thin plastic sheet, rubber tube, Y shaped tube, thread, etc.

Summary

1. The basic functions performed by living organisms to maintain the life on this earth are called life processes.
2. In all kinds of life, oxygen is obtained and carbondioxide is released out during respiration.
3. Simple organisms use surface of the body for respiration process.
4. In multicellular organisms respiration occurs through organs like skin, wind pipe, gills, and lungs.
5. Stomata in plants help in respiration.
6. Digestive system helps in conversion of organic food into important minerals for life.
7. Digestive organs help in digestive system.
8. Digestive juices are produced from digestive organs. This is known as enzymes.
9. In simple living organism excretion process occurs through surface of the body.
10. Skin, nose, mouth, large intestine, kidney, etc. organs are involved in multicellular organisms for excretion system.
11. In respiration process in human beings, nose, wind pipe and lungs are involved.

Exercise

1. Fill in the blanks.

(a) Breathing is the taking of ..... and releasing of .....

(b) The undigested materials are excreted through ..... in well developed animals.

(c) Fishes and tadpoles respire through .....

(d) The excess water in plants are released through ..... in the atomophere.

(e) Excess urea, minerals and water are released through human skin as .....

2. Choose the correct answer from the following.

(a) What is released out during respiration?

(i) oxygen (ii) carbondioxide (iii) urea (iv) minerals

(b) Which organ takes place in respiratory process?

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

(c) Which organ is involved during breathing in plants?

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

(d) What is the chemical known in digestive juice?

(i) harmon (ii) enzyme (iii) vitamin (iv) carbohydrate

(e) Which organ is involved in insects for respiration?

(i) skin (ii) gills (iii) respiratory tube (iv) lungs

3. Short answer questions.

(i) What is life cycle?

(ii) What does it mean by respiration process?

(iii) From which place simple organisms respire?

(iv) What is excretion?

(v) Write down the organ which play role in excretion in human beings.

4. Draw a neat diagram showing human digestive system.

Chapter 18

Structure of the Earth

We construct our homes on the surface of earth. We do farming and build structures like roads, canals, drainage, etc. on the earth crust. On digging land, soft soil is on the surface of earth. Hard part comes on digging down deep. Such hard part is known as rock.

Rock

The solid and hard matter of the earth is called rock. Most of the part of earth surface is formed from the rocks. Mountains around us are also formed from rocks. Moreover, soil is formed from the breaking down of rocks into pieces. Hence, small pieces of rocks found in the soil.

Figure no. 18.1

Structure of rock

Rocks are of different shapes and colours. Small stones, concrete, and sand are also the forms of stones. Rocks are formed from combining different types of elements. Proportion of elements varies in different types of rocks.

Physical properties of rocks

a) Structure

Some rocks are composed of bigger granules while some rocks are composed of smaller granules. Also some rocks are formed in the layers. The rocks with bigger granules are rough and the rocks with smaller granules are slippery.

b) Hardness

Rocks are of both hard and soft types. Hard and soft rocks can be identified by tracing over them. The rock which is easily traced is soft rock and the rock which is not easily traced is hard rock.

Colour

Rock have different types of colours. For example; red, green, black, white, etc. None of the two rocks have the same colour.

Types of rocks

According to origin and the process of formation, the rocks are classified into three categories as below.

a) Igneous Rock b) Sedimentary Rock c) Metamorphic Rock

a) Igneous rock

Inside the earth, there is high temperature. As a result, all the matters in it are found in liquid state (molten mass). This molten mass is called magma. Due to different geological reasons, the magma comes out of the surface of the earth, which is called lava.

Figure no. 18.2

Matters like hot ash, vapour, molten rocks and magma come out from the weak zone of the earth by making path through small hole. The temperature of lava gradually decreases and the solid mass turns into rocks. The rock which is formed in this way is called igneous rock. The hole formed when lava comes out of the earth surface is called crater.

Igneous rocks are formed from the time of origin of the earth so, these are also called primitive rocks. This kind of rock is mostly found in the volcanic zones. Since, rock is formed from the lava hence, fossils are not found in this rock. The water cannot pass through the igneous rock but after long time its outer part becomes somewhat soft.

Some important igneous rocks

i) **Granite:** Granite is a plutonic rock. Sometimes magma does not come to the surface and turns solid before reaching the surface. The rock formed in this way is called plutonic rock. Granite is brownish black in colour. It is hard and strong. This kind of rock is used in construction work.

ii) **Pumice:** The lighter igneous rock, which possesses numerous holes (pores) is called pumice.

iii) **Obsidian rock:** Obsidian rock is just like a glass and weak rock. This is also called volcanic rock.

b) Sedimentary rock

Due to air, water, heat, etc. erosion and weathering process of materials continued on the earth surface. The particles formed due to weathering are taken away from one place by river water, glacier, wind, rain etc. These particles deposited to another place. Number of layers is formed due to the deposition of such materials continues for a long time. They

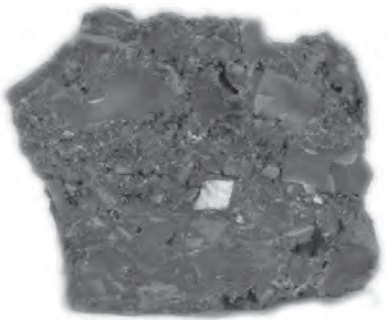


Figure no. 18.3

begin to become harder due to the pressure exerted by upper to the lower layer. The rock, formed in this way, is called sedimentary rock.

The water of rivers, streams, cascade, etc. takes away solid sand, stone pieces and plants run with it. They lie in the bottom of the sea, make layers in course of time, become hard and solid, and become sedimentary rocks. In the hills the sediments brought by rivers and tributaries lie in the plains and become solid thus forming sedimentary rocks. Fossils are also contained in sedimentary rocks. We can find the age of rocks from the fossils. Sedimentary rocks is smooth in comparison of other rocks. Different layers are found in sedimentary rocks. There are different types of sedimentary rocks. Among them, some important sedimentary rocks are as following.

i) **Conglomerate:** Conglomerate is also known as concrete rock. Conglomerate is formed from combining the small pieces of stone, gravel sand, etc. so that conglomerate is formed from joining of small pieces of stones through quartz mineral. If these are joined by silica, the rock becomes much harder than other types of conglomerate.

Figure no. 18.4

ii) **Sand Stone:** Sand stone is formed by the combination of sand particles. Layers of sand sre connected together by silica. Strongly connected sand stones are hard whereas loosely connected sand stones are soft.

Figure no. 18.5

iii) **Shale**: Smaller particles than sand are known as silt. There are even smaller particles than silt, which form a special type of soil called clay. The rock formed from the combination of silt and clay is called shale. This type of rock is black and soft.

Figure no. 18.6

iv) **Limestone:** Some rocks are formed from the fossils of the living organism. The outer covering of some marine animals formed from shell. This type of covering protects them. After the death of such animals, the shells and pieces of bones form the layers on the bottom of sea. Limestone formed due to pressure exerted on these layers. This is fine granular rock. This kind of rock is red, brown, white and black in colour.

Figure no. 18.7

c) Metamorphic Rock

Figure no. 18.8

Igneous and sedimentary rocks undergo and change due to heat and temperature. These rocks change from one form to another. In the metamorphism of rocks, all or some of their minerals may get change. The rock, which formed due to metamorphism of one form to another, is called metamorphic rock. Metamorphic rooks are found inside of the earth.

Process of formation of metamorphic rocks

i) Due to high pressure and temperature for a long time in sedimentary and igneous rock the change takes place and metamorphic rocks formed. For example,

Rock	**Metamorphic Rock**
Silica	Quartzite
Limestone, Dolomite	Marble
Coal	Graphite
again Graphite	Diamond
Granite, Diorite	Schist, Gneiss
Shale	Slate

ii) Change on the sedimentary and igneous rock may result metamorphic rocks formed. Sometimes the rocks formed by metamorphosis of igneous and sedimentary rocks may undergo change and form next metamorphic rock. Examples of sedimentary rocks formed from fine particles or granular layers of sediments are slate and schist rocks.

Identification of rocks

Activity 1

Write characteristics of igneous, sedimentary and metamorphic rocks in the table given below.

S.N.	**Igneous Rock**	**Sedimentary Rock**	**Metamorphic Rock**
1.			
2.			
3.			
4.			
5.			

Collect the rocks from your surrounding and classify them under which above group they belong.

Uses of rocks

The rocks are used in various ways. Some of their uses are:

a) Hard types of rocks like stones are used in construction of buildings and their gravels are used in construction of roads.

b) Different shapes can engrave on the stones. Rocks are also used in construction of idols.

c) Different types of marbles are used in decoration of houses and temples.

d) Granite are used in construction of temples and roofs of houses.

e) Slates are used for writing purposes.

f) Gems can obtain from rocks.

Important rocks found in Nepal

1) **Conglomerate:** The small round pieces of gravel like pieces, sand, etc. may combine to form conglomerate. Conglomerates found in the banks of rivers of Nepal.

2) **Sandstone:** The major components of sand stone are sand and silica. Different layers of sand may be connected by silica, clay soil, etc.

3) **Silica:** Sand is formed from weathering of different types of rocks known as silica. It is a compound of silicon and oxygen.

4) **Limestone:** Limestone is formed from calcium carbonate. This rock is fine granular rock. It has brown, white, red, and black colour. It is used in production of cement. It is found in Godabari, Vaise, Chovar, Udayapur, Jogimara, etc.

5) **Marble:** Marble is formed from the metamorphosis of limestone. It is used in construction of buildings, temples, etc. It is found in Godabari.

6) **Slate:** It is also metamorphic rock. It is used to make roofs of houses and as black board in schools. Great mine of slates is found in Bandipur of Tanahu district.

Practical activities

Collect different types of rocks find in your surrounding of residence and observe their structure. How many types of rocks are there? Classify them and prepare a report on it.

Summary

1. Hard and solid substances present on the surface of earth are called rocks.
2. There are three types of rocks like igneous rock, sedimentary rock and metamorphic rock.
3. The mixture of hot liquid and gas inside the earth is called magma.
4. Magma that comes out of the surface of earth is called lava.
5. Rock formed due to the cooling and solidification of magma that comes out from the surface of earth is called igneous rock.
6. The materials such as soil, sand, pieces of rocks, dead bodies of plant and animals etc. on the surface of the earth are transported by river and are deposited on the bank of river, plane surface and bottom of oceans, one after another in the from of layers. After a long time, thus deposited materials charge into a rock called sedimentary rock.
7. Metamorphic rock is formed from the metamorphosis of sedimentary and igneous rock.
8. In the form of stones and gravels, rocks can be used in construction of houses, buildings, bridges and roads.
9. Marble used in decoration of houses and temples.
10. Gems can obtain from rocks.
11. Conglomerate, sandstone, silica, limestone, marble and slates rocks found in Nepal.

Exercise

1. Fill in the blank spaces.

a) There are three types of rocks i.e. igneous rock,……and metamorphic rock.

b) …….rock formed from the different layers.

c) …….of organism also found in sedimentary rock.

d) …….rock formed from the metamorphosis of igneous and sedimentary rocks.

e) …….rock used in production of cement.

2. Select correct answer from the given answers

a) In which type of rock given below, fossil is not found?

i) Granite ii) Sandstone iii) Limestone iv) Slate

b) Which of the following is metamorphic rock?

i) Silica ii) Diamond iii) Dolomite iv) Pumice

c) Which rock is used to produce cement?

i) Marble ii) Sandstone iii) Limestone iv) Pumice

3. Differentiate between.

a) Igneous and sedimentary rock

b) Sedimentary and metamorphic rock

4. Classify the following rocks

Marble, Pumice, Slate, Obsidian, Limestone

5. Write answer in brief

a) What is rock?

b) How are igneous rocks formed?

c) What type of rock is called sedimentary rock?

d) Which rock consists of fossils?

e) How are metamorphic rocks formed? Give example also.

6. Write any four uses of rocks.

Chapter 19

Weather and Climate

Weather is the atmospheric condition created by sun, water, air, temperature etc. It is chargeable in each and every moment. Once it is sunny at a particular place, it may change into windy, cloudy and rainy in short period. Cold, hot, sunny, rainy, etc. are the types of weather.

Cloud

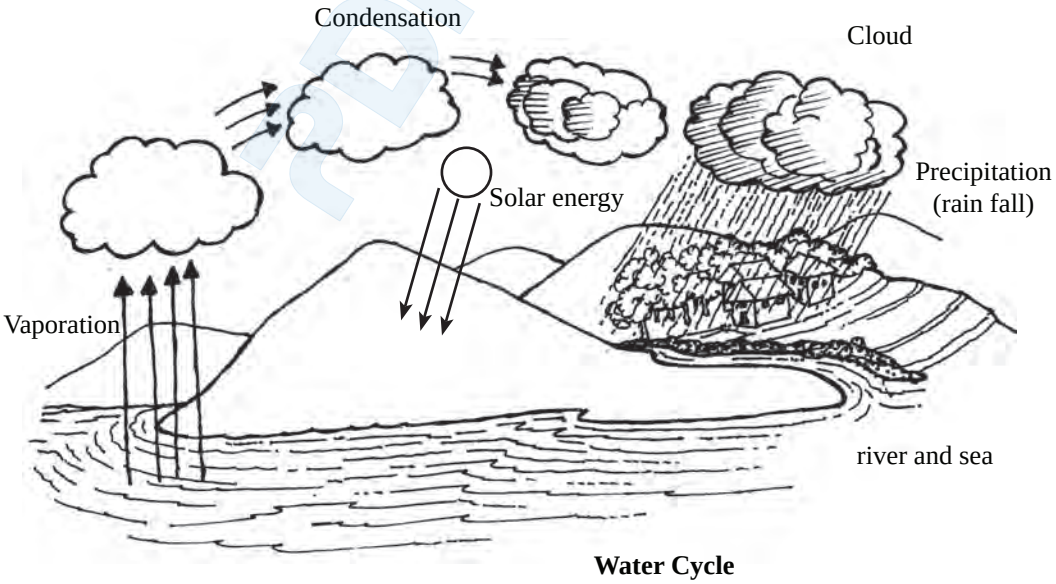
Have you ever seen cloud in the sky? How does it form?

Water contains in ocean, river, lake, pond, etc. changes into vapour due to the solar heat. This vapour of water goes up to the atmosphere. Then water vapour becomes cool as it goes up in the atmosphere. This water vapour gets mixed with different dust particles found in the cold atmosphere which turns into the form of clouds.

Rain

We have seen raining mostly in the months of Asar and Shrawan or during in monsoon. Do you know how does it rain?

Winds carry clouds from one place to another. When clouds move it reaches hills and forests. In this time cloud becomes cold and vapour become water. In this way water falls to ground as a rain.



Water Cycle

Figure 19.1

Activity 1

Take a kettle and fill it half with water. Cover the kettle with a plate containing water or ice and boil it. Water vapour evaporates and gets in contact with cold plate. The vapour condenses to water and falls down. Rainfall occurs by similar manner. Water becomes vapour when it is heated. Cloud forms when vapor cools and then rain falls as precipitation after condensation.

Snow

Have you ever seen white Himalayas covered with snow in northern part of our country? How does this snow come in the Himalayas?

When water vapour in cloud cools down to 0°C, it forms ice particles. These ice particles together form snow that fall in hilly mountainous region.

Dew drops

Do you see water drops on leaves, grass or on ground surface in winter morning? How does it occur ?

Since night is very cold in winter seasons, water vapor cools down to water droplets and is changed into dew drops. Therefore, morning dew drops are seen.

Air

Air is a mixture of different gases. Nitrogen content is 78%. and oxygen is 21% in air. There are carbondioxide, inert gases, other gases and water vapor in air. The earth is surrounded by a layer of air, which is called atmosphere.

Atmosphere

Atmosphere contains water vapor and dust particles too. When height from earth's surface increases layer of atmosphere becomes thinner and thinner. Atmosphere is divided into following five layers according to height.

1. **Troposphere**

   Troposphere is lowest level of atmosphere. This covers 16 kilometers height from the earth surface. In this layer heavy gas, water vapor and dust particles are found. Different climatic activities like wind, storm, cloud, thunderstorm, rain, hail stone, dew drops, fog, snow fall, etc. occur in this layer. Temperature falls the according to height from the earth's surface.

2. Stratosphere

The atmospheric layer just above the troposphere is called stratosphere. It is extended to about 16 to 50 kilometer from the surface of earth. In this layer temperature increases as the altitude increases. The upper part of this layer contains ozone gas. It prevents harmful ultraviolet rays entering to earth. Thus, it is also called protective layer of atmosphere.

3. Mesosphere

The level of atmosphere which lies above from the stratosphere is called Mesosphere. It is extend to about 50 to 80 kilometer from the level of earth surface. In this layer temperatures decreases as the altitude increases. Storms are continuously blowing. It is the coldest layer of atmosphere.

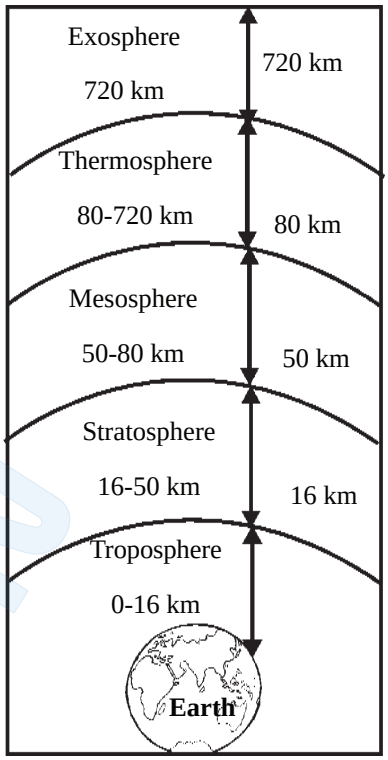


Figure 19.2

4. Thermosphere

The level of atmosphere upper than the mesosphere is called thermosphere. It is extended up to 80 to 720 kilometers from the earth surface. The temperature increases as the altitude increases. In the thermosphere air layer is very thin. The temperature is very high due to the cause of solar radiation. There are ions of gaes so that this layer is also called the ionosphere.

5. Exosphere

This layer is extended above 720 kilometers of height to the space from the earth surface. It is uppermost and thin layer of atmosphere. There is very negligible amount of air. It is outermost layer of atmosphere and so it is also called boundary region of atmosphere.

Wind

We feel strong movement of air in the month of Falgun and Chaitra. You might have seen blowing of light objects like piece of paper, leaves by the air. You may have seen the air made crops laid down in the field. This is because of moving air.

Can you say the cause of movement of air? Air is the mixture of different gases. The molecules of gases are weakly bonded with each other. These molecules expand easily by the solar heat. Thus the hot molecules become light and move up. The cold molecules come from surroundings to fill the vacant places of hot molecules that escape. Thus this process goes on continuously so that air moves from one place to another. Such kind of movement of air is called convection. The process of convection creates the movement of air known as air blowing or wind. The strong movement of wind is called storm.

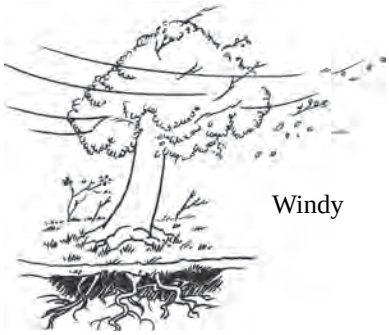


Figure 19.3

Strom blows away the roof of top houses, lay down the rice and maize crops, breaks down the branches of trees, and also blows sands, dusts, etc. from one place to other.

Movement of air

Cold air is heavier than hot air. During day, land is heated and consequently the air above the land gets heated. But ocean is less heated in comparison with land. So air above the ocean air is cold. The hot air of the land goes up and cold air from the ocean comes to fill that place. Thus air moves from sea or ocean to land during day. This movement of air is called sea breeze. At night time land becomes colder earlier than the ocean. So air above the land is colder than the air above the ocean. Thus, air moves from land to ocean. This movement of air is called land breeze.

Question for thinking

There is no remarkable change in the climate in island and land near by the ocean through out the year, why?

Weather information

Have you got weather related information through radio and television? Radio and television broadcast the weather information like storm, wind, raining, sunny and hot day of different places at different times. The weather is forecasted with the study of condition of sky, direction and movement of air, moisture and humidity of air, sunny condition, temperature and its situation, etc.

Weather is called condition of atmospheric situation created by sun, air, temperature, cloud, rain etc. The information of weather is given by the measurement of element which impacts the weather. To measure elements accurately, different kinds of machines are used.

The devices to measure weather elements are:

a) Barometer

b) Maximum and minimum thermometer

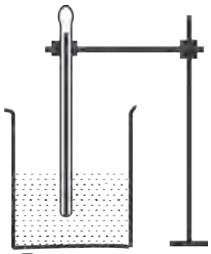
c) Hygrometer

d) Anemometer

e) Rain gauge

a) Barometer

Barometer is used to measures the atmospheric pressure. Atmospheric pressure determines the weather. Generally when the atmospheric pressure increases weather can be clear and when the pressure decreases weather can be cloudy and stormy.

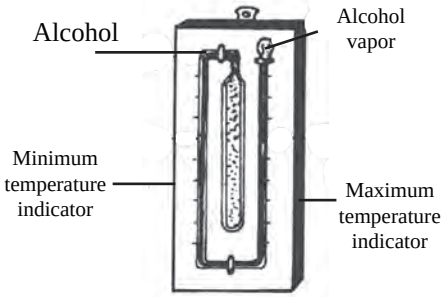


Barometer

Figure 19.4

b) Maximum and minimum thermometer

It is used to measure maximum and minimum temperature within 24 hours of a day. It measures highest and lowest temperature of a day at a particular place.

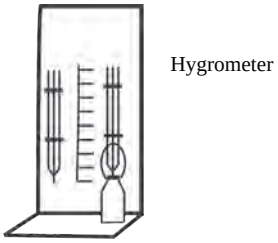


Maximum and Minimum thermometer

Figure 19.5

c) Hygrometer

Moisture in air is called humidity. Hygrometer measures the humidity of air. Decrease in temperature of atmosphere and increase of air vapour in atmosphere raises the humidity of air. Increase in temperature and decrease of water vapour in atmosphere decreases the humidity of air. Relative humidity is the ratio of water vapour to the total amount of water vapor contain in atmosphere where total amount of water vapour is taken as 100. As the moisture of air increases the relative humidity increases which makes the possibility of rain fall high.

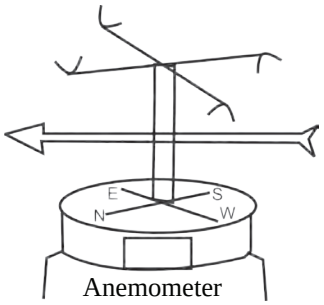


Hygrometer

Figure 19.6

d) Anemometer

The anemometer measures the speed and direction of moving air during the whole day. In the morning the speed of air is low and in the day times the speed of air increases. Speed of air is high at evening time in hilly region of Nepal.



Anemometer

Figure 19.6

e) Rain gauze

Rain gauze measures the amount of rainfall during rainy period. Rainfall measures in millimeter in unit. For example, 15 mm rainfall in Pokhara means if whole amount of water is collected at that place it covers 15 mm high from the level of land surface. In Nepal, rain fall occurs more in the month of Asar and Shrawan.

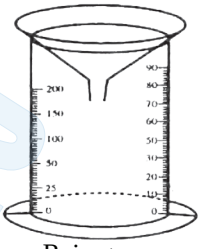

Rain gauze

Figure 19.7

Activity 2

Study the weather around of your school in the morning, day time and in the evening continuously for a week. Observe the condition of weather at the time when you go to school, at your break time, in the evening and when your school is off. Fill up your findings in the following table. Analyze the data and draw your conclusion that whether you can predict the condition of weather for coming days on the basis of this study or not.

S.N	Days	Condition of weather	Morning (10 pm)	Day time (1 pm)	Evening (4 pm)
1.	Sunday	a) Sunny b) windy c) Rainy d) Cloudy			

2	Monday	a) Sunny b) windy c) Rainy d) Cloudy			
3	Tuesday	a) Sunny b) windy c) Rainy d) Cloudy			
4.	Wednesday	a) Sunny b) windy c) Rainy d) Cloudy			
5.	Thursday	a) Sunny b) windy c) Rainy d) Cloudy			
6.	Friday	a) Sunny b) windy c) Rainy d) cloudy			
7.	Saturday	a) Sunny b) windy c) Rainy d) Cloudy			

Prediction of weather

Weather study centres are established in the different part of our country to record the condition of weather at different time at different places. By the information obtained from these stations, the trend of change of weather is analyzed and the weather for coming day is forecasted on the basis of these records. Now, weather is forecasted on the basis of the record obtained from satellite which is considered more reliable source. People make their programs on the basis of forecast of weather.

Experimental activities

Study the activity 2 and draw your conclusions for weather forcasting at your surrounding.

Summary

1. The immediate change in condition of sun, cloud, air, humidity, rain, etc, of any particular place is called weather.
2. Cloud forms from dust particles and water vapour present in atmosphere.
3. The vapour present in cloud is condensed and is converted into water drops that falls on the earth surface as rain fall.
4. Snow forms by extreme cooling of water droplets present in cloud.
5. In winter seasons, dew drop forms by cooling of water vapor containing in atmosphere.
6. The layer of air which covers the earth surface is called atmosphere.
7. Atmosphere is classified into Troposphere, Stratosphere, Mesosphere, Thermosphere and Exosphere on the basis of height from the earth surface.
8. The continuous movement of hot air going up and cold air coming down creates wind.
9. Sun, clouds, rain, atmospheric pressure, air humidity, flow of air, temperature, etc. are factors of weather.
10. Barometer, maximum and minimum thermometer, hygrometer, anemometer and rain gauze are used to measure weather elements.
11. Nowadays weather forecast sent from the satellite pictures.

Exercise

1. Fill in the blank spaces with appropriate words.

a) Atmosphere contains different gases, water vapor and ……

b) Just below the stratosphere is ……

c) Hot air is …….than cold air.

d) Water vapour becomes…….when it is cold.

e) ……..is used to find the speed of air.

2. Give the answer in brief.

a) What is weather?

b) Why is dew drop formed in cold weather?

c) Why we see dew drops early in the morning in winter season?

d) How does cloud forms?

e) In which condition rain fall occur?

f) In which place snow fall occur and why?

g) What are the layers of atmosphere ? Classify them on the basis of height from the earth's surface.

h) Why does the air blow from one place to another place ?

3. Explain an experiment of the phenomenon of rain fall with diagram?

4. How do we forecast the weather? What are the advantages of weather forecast?

5. Define.

a) Snow b) Cloud

c) Dew drop d) Humidity

6. What is mean by land breeze and sea breeze? Explain in brief.

Chapter 20

Earth and Space

Solar System

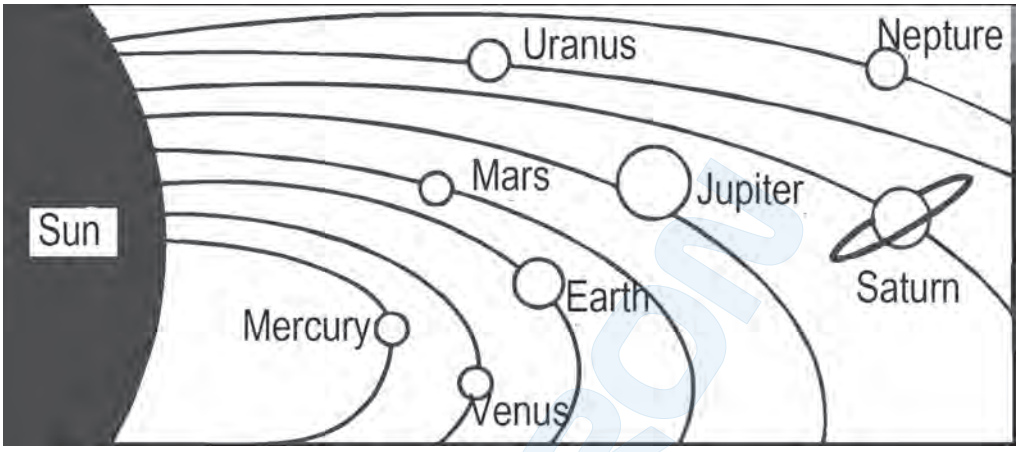


Figure no. 20.1

The family of sun including planets revolving round the sun and other smaller heavenly bodies, is called solar system. The sun is the centre of the solar system and the planets revolve round the sun in the definite orbit. Due to the effect of gravitational force between sun and planets, these planets are revolving round the sun. The masses with larger body that revolve around the sun are called planets. In addition to these the small objects like asteroids, comets, meteors and meteoroids are also in the solar system. The small objects that revolve around the planets are called satellites. They are also called the moons.

Sun

Sun is the major centre of solar system. The planets revolve round the sun due to gravitational force between sun and them. The sun is a star of medium size. It is nearer from the earth so it seems larger. It has its own heat and light energy. Temperature of its surface is about 5700°C and its inner part is 1,50,00,000°C . Diameter of sun is about 13, 92,400 km. The distance between the sun and the earth is about 1.5×10^{8} km.

Planets

Heavenly bodies, which do not have their own light and revolve round the sun, are called planets. There are eight planets in solar system. They are Mercury, Venus,

Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. The closest planet to the sun is the Mercury and the farthest one is Neptune. The Mercury is the smallest planet and Jupiter is the biggest planet. Mercury, Venus, Earth and Mars are called inner planets. Jupiter, Saturn, Uranus, and Neptune are called outer planet.

Description of the planets based on the distance from the sun

Mercury: It is the smallest and nearest planet from the sun. It takes about 59 days to complete one rotation on its axis and about 88 days to complete one revolution around the sun. It is nearest planet from the sun so during daytime it is extremely hot and extremely cold at night. Mercury has no atmosphere and no satellite.

Venus: Venus is somewhat smaller planet than earth. It takes about 243 days to complete its one rotation on its axis and about 225 days for the completion of a revolution a around the sun. It seems at the eastern direction before sunrise and western direction after sunset. It is brighter mass after sun and moon. It has no any satellite. Its diameter is about 12035.2 km. Its size is nearly equal to the size of the earth so it is also called twins of the earth.

Earth: Based on distance it is third planet from the sun. Its diameter is about 12672 km. It takes about 24 hour for a rotation and about 365 days for a revolution. Suitable environment for adaptation of life is present in the earth. The moon is its only one satellite. It is 1.5×10^8 km far from the sun.

Mars: Mars is also called red planet. It is farther from the sun than earth. Two white caps of ice are seen at the two poles of the Mars. Its diameter is about 6742.4 km. it takes about 24 hours and 37 minutes for the completion of a rotation and about 687 days for the completion of a revolution. It is 2.26×10^8 km far frm the sun.

Jupiter: Jupiter is the largest planet. It is 319 times bigger than earth. Its diameter is about 11, 39,040 km. It takes about ten hours to complete a rotation and about 12 years to complete one revolution. It has 67 satellites. Its outer surface is covered with cloud. A big red spot can be seen on the mid part of Jupiter.

Saturn: Saturn is the second largest planet after Jupiter. Three flat rings surround it. These rings are formed from pieces of ice. Its diameter is about 1, 15,811.2 km. It takes about 10 hours and 30 minutes to complete one rotation and about 29.5 years for one revolution. It has 62 satellites. Titan is its largest satellite. It is bigger than Mercury.

Uranus: Uranus is made up of fluids and gases. Its diameter is about 50,441.6 km. It takes about 17 hours and 14 minutes for one rotation and 84 years for one revolution. It has 27 satellites.

Neptune: Neptune is the farthest planet from the sun. It has 14 satellites. Its diameter

is about 48972.8 km. It takes about 16 hours for one rotation and about 164 years for one revolution.

Average distances from the sun, diameter, average daily speed, annual speed are given in the following table.

Name of Planet	Average distance from the sun(Km)	Diameter (KM)	Time of rotation (daily speed)	Time of revolution (annual)	Number of satellites
Mercury	5.76×10^7	4851.2	58.65 days	87.97 days	0
Venus	10.7×10^7	12035.2	243.02 days	224.7 days	0
Earth	14.88×10^7	12672	23 hours 56 min	365.25 days	1
Mars	22.56×10^7	6742.4	24 hrs 37 min. 22 sec.	686.98 days	2
Jupiter	76.8×10^7	1139040	9 hrs 55 min. 30 sec.	12 years	67
Saturn	144×10^7	115811.2	10 hrs 30 min.	29.5 years	62
Uranus	288×10^7	55441.6	17 hrs. 14 min. 24 sec.	84 years	27
Neptune	448×10^7	48972.8	16 hrs. 6min. 36 sec.	164 years	14

Star

Look up in the sky during clear night. Infinite number of light points can be seen. Such twinkling points of light are stars. These are distinct from the planets. Stars are hot and bright. Sun is also a type of star. Being closer than other stars, sun appears large. Other stars are at great distance away from the earth so they appear as fixed points of light. Some stars to appear bigger than sun and some are smaller. We obtain heat and light from the sun. Other stars are very far from the earth, so their heat and light cannot reach the earth.

Distance of stars

It is difficult to measure the distance of stars in kilometer because these are at great distance. Thus, their distance is measured in light year. The distance travelled by light in one year is called light year. Light travels 300,000 km in one second. It travels 9.5×10^{12} km distance in one year. This distance is known as one light year.

Brilliance of star

Different types of stars have different brilliance. The brilliancy of the star depends

upon the surface temperature, size and distance. The star, which is nearer and larger is more brilliance than the stars at farther distances and smaller in size.

Colours of stars

The temperature of the star determines the colour of stars. The stars, which appear red, have low temperature, white have medium and blue colored stars have high temperature. Thus, colors of stars give the information about their temperature. For example,

Color of star	Red	Orange	Yellow	White	Blue
Temperature	3000°c	4000°c	6000°c	11000°c	25000°c

Structure of stars

Stars are gaseous masses. Mainly these are formed from Hydrogen and Helium gases. Heat and light energy is emitted from stars through atomic reaction.

Motion of stars

Stars are not stationary. They are constantly in motion with reference to each other.

Difference between star and planet

Stars have their own light and heat but planets do not have. Planets revolve round the sun but stars do not revolve round the sun. Difference between stars and planets on the basis of surface temperature, colour and size are as follows.

Properties	Planets	Stars
Structure of surface	different types	formed from gases
Colour	different types	red, orange, white and blue
Temperature	-330°C to 865°C	3000°C to 25000° C
Size	4851 km to 1139040 km diameter	bigger than the sun but smaller than the planets.

Constellations

Look up at the sky during clear night. You can see infinite number of twinkling stars. Observe them in depth. Link the stars of a definite place from each other. You can imagine stars by making different shape.

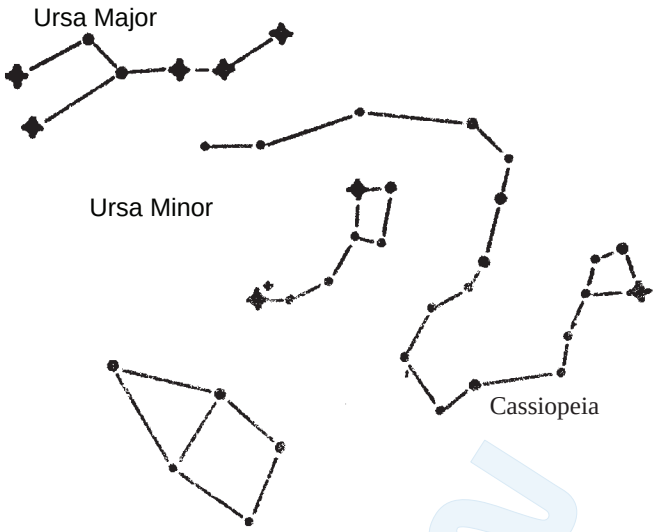


Figure no. 20.2

Astrologist have imagined such groups since ancient time. They had nominated the group of stars by imagination any object, any animal or any special type of person. Such groups of stars are called constellation. The group of stars which give the fixed shape of imeginary object, animal or a person is called constellation. Shapes of constellations are imaginary. There are 88 constellations known and 12 of them are considered as the sign of zodiac.

Ursa Major

Ursa Major is the most famous constellation. It is formed from the group of seven stars. It appears like a flying kite or a frying pan. Four stars are situated in rectangular in this constellation. Three stars are extended from one corner to another corner as a rope of a kite. The Dhurba Tara (Pole star) is about five times away from the two head stars of the Ursa Major. On observing complete appearance of this constellation, it resembles with great bear. It appears at the northern hemisphere of the earth in the sky.

Figure no. 20.3

Ursa Minor

This constellation is also a group of seven stars. Brilliance of stars in Ursa Minor is less than the stars of Ursa Major. Its shape resembles with small bear so it is called as little bear. It is also appears at the sky of northern hemisphere.

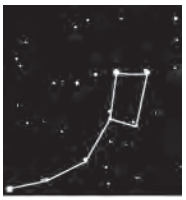


Figure no. 20.4

Cassiopeia

Shape of Cassiopeia appears as W. The distance of Cassiopeia and Ursa Major is about same from the Dhurba Tara (Pole star).

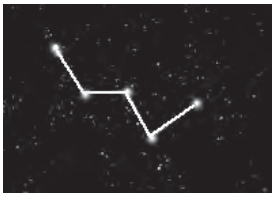


Figure no. 20.5

The Orion.

Imaginary shape of this constellation is as hunter. It is a group of about 16 bright stars.

Figure no. 20.6

Identification of constellations

Sky around the earth is divided into northern and southern hemisphere. Our country lies under northern hemisphere. Thus, we can observe stars of northern hemisphere only. The position of constellation becomes different in different months. Few constellations can be identified from our place. Great bear is the easily identifiable constellation among all constellations. It looks like a frying pan or deep spoon shaped. Among seven stars of Ursa, four are frying pan shaped and other three form the shape of handle. Dhurba Tara lies under Ursa Minor constellation. On stretching the line that comes from Ursa Major Cassiopia constellation can be found.

Experimental activities

1. Observe stars during clear night. Draw figures of any three constellations that you have observed.
2. Observe the stars gently in clear night and note down the colours of Stars seen.
3. Prepare a model of solar system with the help of balls of soil or spherical objects like TT balls and wire.

Summary

1. The family of sun including plants, satellites and other heavenly bodies is called solar system.
2. Sun is a star of medium size. We get heat and light from it.

3. The Heavenly bodies that revolve round the sun are called planets. They are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
4. The Heavenly bodies revolve round the planets are called satellites. For example, moon is a satellite of earth.
5. Heavenly bodies having own light and heat are called stars. Stars having more heat and light are blue and the stars having low temperature appear red.
6. Group of stars with fixed imginary shape is called constellation.

Exercise

1. Fill in the blanks spaces.

a) Sun is a ……

b) ……planets are in solar system

c) Planets do not have their own……..

d) Group of stars is called …….

e) One light year is equal to ……km

2. Select the correct answer from the given answers.

a) How many planets revolve round the sun?

i) 6 ii) 7 iii) 8 iv) 9

b) Which one is the smallest planet?

i) Mercury ii) Venus

iii) Neptune iv) Earth

c) Which one is the largest planet?

i) Saturn ii) Jupiter

iii) Neptune iv) Uranus

d) Which of the following heavenly body revolves round the planet?

i) Asteroid ii) Metor

iii) Satellite iv) Meteoroids

e) What is the reason that the planets are revolving round the sun?

i) Sun is a large star ii) Being closer to sun

iii) To get light of sun iv) Impact of gravitational force of sun

3. Differentiate the following:

a) Solar system and constellation

b) Star and planet

4. Write answers in brief.

a) What is solar system?

b) Which planet has ring around it?

c) What is constellation?

d) What is the shape of Ursa Minor?

e) Why is the distance between the stars measured in light year?

f) How can constellations be identified ? Explain.

Unit 21

Environment and its Balance

Natural resources

Anything which can be found in nature or environment and can be used is called the natural resource. Some of important natural resources are air, water, minerals, soil, forests, wildlife, plants, animals, streams, rivers, etc. Natural resources contain both living and non-living. Animals and plants come under living beings. Air, water, soil, minerals etc. come under non-living beings. Natural resources have made appropriate environment to survive for all the living beings.

Kinds of natural resources

Natural resources are divided into 3 division according to its functions and uses.

(a) Perpetual

(b) Renewable

(c) Non-renewable

(a) **Perpetual resource**

The natural resources that never ends and continuously producing are known as perpetual resources. Solar energy can be taken as an example. We get solar energy continuously from the sun. Similarly the example of perpetual resources are wind energy, volcano, running water, etc.

(b) **Renewable resource**

Human beings can obtain useful materials from forests, plants, animals, birds, air, water, soil, etc. as natural resources continuously. There kinds of resources can be re-established if destroyed or degraded. This kind of natural resources are known as renewable resources. This kinds of resources are affected by pollution. The resources may decline due to pollution. However renewable resources can be re-established e.g. clean air, fertile soil, grasslands or meadows, plants, etc.

(c) **Non-renewable resource**

The natural resources are those which can not be re-established are known as non-renewable resources, e.g., mineral, coal, petrol, diesel, kerosene, etc. The natural resources like natural oil, minerals, soil, sand, etc. cannot be used again. The resources of the earth are limited. The resources may exhaust due to continuous extraction. Therefore, there should be a system of management of natural resources.

Activity 1

Go for a tour near your living area. Collect the names of the natural resources. Catagorize the natural resources according to the following table.

S.No.	Perpetual resources	Renewable resources	Non-renewable resources

Importance of natural resource

There is an important bond between environmental living and non-living things. Living beings cannot survive without the help of non-living things. Every natural resource has its own importance, e.g., air, water, soil, plants, animals, etc. The importance of natural resources can be described as follows:

(a) **Food resources:** All living beings take food from natural resources. Plants absorb water and minerals from soil. Herbivorous animals eat grasses. Humans obtain food from cereals, oil and animals.

(b) **Habitat:** The habitat of animals are land, water, forests, etc. Natural resources give habitat for microorganims, plants, animals, and human beings.

(c) **Clean air:** Clean air is needed for all kinds of living beings which is obtained from nature.

(d) **Clean water:** Life is not possible without water. All kinds of living beings obtain clean water from nature.

(e) **Beauty:** Natural resources helps to balance its beauty of a particular place. Natural resources like forests, wild animals, birds, streams, rivers, mountains, hills, snow capped mountains (himalayas), lakes, pools, water falls, valley, etc. maintain beauty of the nature.

(f) **Tourists:** The beauty of the natural resources attract people. Therefore, the tourists travel from one place to another to observe. Natural resources also help in development of tourism.

(g) **Financial development :** Natural resources helps in financial development of a country. Natural resources help in development of factories industries, agriculture, tourism, etc. for increasement of financial development of a country.

Natural resource conservation

Human beings use natural resources for their living. Natural resources should be used in a controlled manner to avoid its wastage and use them in more effective way. By over uses, they may get destroyed and exhausted from nature. To protect humankind, we must protect the natural resources.

Water resources

The various sources of water on earth are known as water resources. Rain water, surface water and ground water are the three resources of water. Surface water is the important water resource. Two third of part of the earth surface is covered with water. The various resources of water which are available to us are: rains, streams, rivers, lakes, ponds, wells, water falls, glaciers, water spouts etc. Glaciers water is the main resource in Nepal. Rivers get their water supply from the melting of snow lying on the peaks of snow mountains (glaciers) as well as from rains which can be used to produce electricity. Proper use of water resources helps in producing electricity, water irrigation, drinking water and transportation.

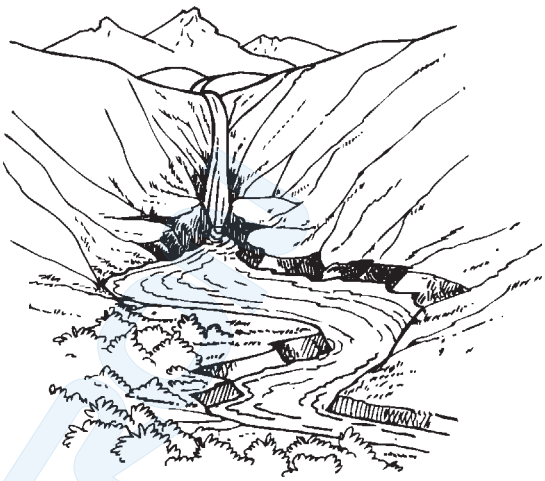


Figure no. 21.1

Importance and necessity of water resources

Water resources are important natural resources. The importance of water resources are:

1. Water resources help in producing electricity needed for industries, factories, etc.
2. In agriculture sector irrigation management can be done.
3. Management of drinking water can be done in urban cities and in villages.
4. Electric motor boats can be used as transportation.
5. The generated electricity can be used for transportation like cable car, bus, car, etc.
6. Water resources is important to preserve forests, plants and wild animals.

To fulfill the necessity of life for human beings and to balance the environmental condition on earth the water resources are necessary.

Conservation of water resources

Water resource is useful to fulfill the demand of the increasing population. The problem may create in future if we do not manage the water resources properly. Ground water is being used in uncontrolled manner in urban area. In this way, ground water supply may decrease and land may sink. Similarly, the level of water in lakes may decrease and increase in silt deposition. To conserve various types of aquatic life the natural water resources must be preserved. Therefore, to meet the necessity of life for human, to preserve habitat for aquatic life and continue the natural cycle water resources must be conserved.

Activity 2

Take a tour of water resource around your surrounding. Find out what are the important resources? Prepare a short report on the problems of that place and show it to your teacher.

Watershed

In most of the streams, rivers, lakes, pond, water reservoirs, etc. are fed by nearby running water. Those are known as watershed area. Therefore, the surrounding area around is known as the watershed area. Example: The steep area north to Kathmandu is watershed area. The water accumulated at Nagarjun Shivapuri National Park is the watershed area for Bishnumati, Bagamati and small streams and underground water resources. Similarly, in Pokhara, area surrounding Phewa lake is the watershed area. Makawanpur is situated from south to Kathmandu which is known as Kulekhani watershed area. At this area water has been collected and named as Kulekhani Indra Sarobar. This is the largest man - made lake in Nepal. In Nepal natural large watershed areas are Gandaki, Koshi, Karnali. In our country, we have other plenty small watershed areas.

Importance of watershed

Watershed area helps to overcome need of water for human, animals and plants. This way, it helps to preserve forests. It also helps to preserve agricultural land and production of agricultural products. Further, it helps to balance environmental system and preserve it.

Conservation of Watershed

Human have been using natural resources in massive for the fulfillment of their need. The increasing population has affected forests, land and sources of water. So conservation of watershed area is necessary. Grassland conservation, proper management of roads, dam construction education management and other important system must be performed. These help to conserve natural resources. Conservation of watershed helps in environmental conservation.

Wetlands

The swamps, or the lands that are always submerged under water is known as wetlands. The wetland is defined as the area submerged under water below about 6 metres. World's first wetland wildlife conservation is Koshi Tappu Wildlife conservation. According to IUCN survey, there are 163 in Terai, 164 in mountains and 78 in himalayan wetland areas are present in Nepal. The natural wetlands in Nepal are snow fed lakes, pools, swamps, rivers, streams, flood prone area, damp area. Similarly man-made wetlands are water reservoir area, ponds, barrage, channel, canals for irrigation, etc. Thus, Nepal is rich in wetland area.

Importance of wetlands

1. Wetland is the best habitat for birds.
2. Wetland helps in agricultural sector.
3. Wetland helps to balance ecosystem.
4. Wetland is the habitat of various living beings.
5. Wetland is the source of water. Human beings use water for various activities.
6. Wetland can be used for fisheries.
7. It also helps in development of tourism.

Therefore, wetland helps people in agriculture, industries, tourism, biological diversity conservation, etc.

Conservation of wetlands

Figure no. 21.2

Human activities have destroyed the wetlands. Example people have used excessive water, sometimes they dry the wetland for human settlements or turning into agricultural land, use for dumping industrial waste. Thus it has become necessary to conserve wetland area.

There had been an international conference treaty to conserve wetland area in 1971 A.D. at Ramsar in Iran. This agreement is known as Ramsar Treaty. The internationally recognized wetlands in Nepal are Koshi Tappu Wildlife Conservation, Chitwan Bis Hajari lake, Jagadishpur Water Reservoir in Kapilvastu and Ghodaghodi lake in Kailali.

Wetlands are very important for ecological balance, social development and biodiversity conservation. Therefore wetlands should not be misused by drying up of wetlands, turning up into human settlements or converting into cultivable lands. Therefore, wetlands must be conserved from being replenished or destroyed.

Activity 3

Go for a wetland tour near your habitat. Observe the birds inhabiting in the wetland. Explain its importance and problems of that wetland area. Prepare a short report on it.

Elements of environment

Environment consists of all types of living and non-living things. Environment consists of two components abiotic and biotic. Abiotic components are non living things e.g. air, water, soil. Biotic components are plants and animals. So, from the combination of two components, environment exists. Now, we are going to study these various components.

Air

Air is a mixture of gases. Air is the covering blanket of the earth. This covering is known as the atmosphere. There are various gases in the atmosphere. Air consists of Nitrogen 78%, Oxygen 21% and other gas1%. The other gases present in the air are carbondioxide, neon, helium etc. The air also consists of moisture and dust particles. All the living beings take oxygen and release corbondioxide during respiration process. Plants takes carbondioxide and releases oxygen while making food for themselves. In this way, exchange of oxygen and carbondioxide occurs in the atmosphere. Deforestation leads to decrease of oxygen level in the atmosphere. It affects adversely in the animal kingdom. Therefore, resulting is difficulty for animals to survive. Thus, gases in the air should be balanced. The air pollution occurs if the level of gases in the atmosphere decreases or increases. The gases release from industries, factories and vehicles like carbondioxide, sulphur oxide, nitric oxide etc. make the atmosphere polluted. Similarly, gases released from waste and rotten materials also increase air pollution.

Therefore, to make the environment balanced, planting of the saplings, proper waste disposal system, decrease the use of petrol, diesel, coal, kerosene, etc. should be maintained. These activities help the atmosphere to keep in balanced and also balance the environment.

Water

Water is one of the components of the environment. Water is the basic need for life. The earth consists of two third water and one part is land. Human body contains 70% water. Water resource can be divided into 3 parts. They are surface water, ground water and rain water. There should be balance between three bases. Surface water evaporates and goes to atmosphere and clouds are made. Clouds are converted into rain and water comes back to land. In this way, water that reaches land is absorbed through soil forming lakes, ponds, rivers and lead to sea.

People dug wells and use water pumps to extract ground water for use. This water is used for drinking, washing, irrigation and also for industries. In urban areas, water is used more so it can also affect the environment. Similarly, waste water produced from industries and factories can bring imbalance in the environment. Natural Sources of water must be maintained to balance the environment.

Land

The surface of the earth is land. Land is made up of soil and rocks. Soil and rocks both are environmental elements. Animal fossils and microorganisms are also present in soil. All kinds of organisms live on soil. Food production is obtained from soil for human. All kinds of cereals, fruits, vegetables grown in soil. Therefore, life of human depends on soil. Different types of plants grows on soil. Thus, soil is an important element.

Land is the important source for human. Human must preserve land for its own survival. Soil condition gets lower if nondegradable things like plastics and other are present in soil. This will adversely effect production of plants, water agriculture product and affect environmental condition. For the preservation of environment we should conserve land. Because land is the place where all kinds of plants and animals get shelter.

Plants

Plants range from small leafy grass to large trees. There are all environmental elements. The product which is useful for human being and animals are obtained from plants.. The metabolic activity is called photosynthesis and occur in plant cells. Especially in the chloroplasts. The process of photosynthesis needs sunlight and it manufactures of food with the help of water absorbed from the soil and carbondioxide

from the atmosphere. Besides food items, green plants also supply various other things such as timber, medicinal herbs, clothes, shelter. Plants can survive without animals but animals cannot survive without the plant. Plants help to maintain environmental balance. We already know that all living beings require oxygen produced by plants. In this way plants help to balance oxygen and carbondioxide gases in the atmosphere. Roots of the plants also help to stop soil erosion. Therefore, plants help to keep environmental balance by creating atmospheric balance, maintaining water cycle, soil condition, provide animal habitat and production of food for all kinds of animals.

Animals

Animals are important parts of environment. Microscopic organisms like amoeba, paramecium and insects like grass hopper to large animals like whale and elephants are the environmental elements. Animals depend on plants for food. After death they disintegrate and mix with the soil. After assimilation in soil they convert into nitrogen and into minerals. These are again absorbed by plants to produce food. In this way, animals play an important role in the environment. Carnivorous animals depend on herbivorous animals. Herbivorous animals depend on plants for food. In this way, a food chain cycle is formed. Humans make use of animals in different types of works. Cattle are used for food, lamb, sheep, goats for meat, mule and horses are used for transportation. If animals are destroyed or get extinct then it affects the other living animals which hampers the environment. Therefore, animals are important for environment balance.

Activity 4

Visit the area near to your living area and observe pond, lake, meadow, field or jungle. Examine the relation between environmental elements (air, water, soil, plants and animals).

Living community

Biotic elements refer to living community. Biotic elements is related to environment especially for habitat, food, living, etc. According to food chain the biotic elements are divided into three division that is producer, consumer and decomposer.

Producer

The earth consists of various types of plants. Most of the plants contain chlorophyll. Roots of the chlorophyll containing plants absorb water and minerals. Stomata present at the ventral side of leaf absorb carbondioxide from the atmosphere. In presence of sunlight chlorophyll containing plants produce glucose and oxygen with the help of water, minerals and carbondioxide. This process is known as photosynthesis. Plant which produce food for itself is known as autotroph. All self food producing plants are known as producers. These producers produce food for other living beings.

Microscopic algae plant are producers. Similarly grasses, paddy, wheat, maize all kinds of cereal plants are producers.

Aquatic organisms like fishes eat algae and some microscopic plants. All kinds of herbivores eat plants and fruits. The organisms mostly animals whose requirement are fulfill. The green plants are called producers. The green plants fulfill the requirements that orgaiems and other animals need. Animals are called producers. Decrease in plants production also decreases in organisms or animals.

Consumer

Those living beings which does not produce food by themselves and depend on other for food are known as consumer. The consumers are also known as heterotrophs. Animals, parasites and fungi come under this consumer group. These organisms get food from producers. Consumers can be differentiated into 3 types.

1. **Primary consumer :** All herbivores come under this. The animals depend on plants and plants products. Examples: cows, buffaloes, goats, sheep, and domestic animals. Wild animals like deer, antelope, rabbits, insects are primary consumer.
2. **Secondary consumer :** The animals providing food for other animals are referred as secondary consumer. Example: algae is eaten by small fishes and some organisms. The large fishes depend on these small fishes and organisms known as secondary consumers e.g. rabbits and deers are preyed on by leopard or foxes known as secondary consumer. Secondary consumers are both cornivores and omnivores. Carnivores only depend on other animals. Omnivores eat both animals and plants. Human are both herbivore and omnivore.
3. **Tertiary consumer :** These secondary consumer animal are preyed on by third consumer known as tertiary consumer. The wild animals like tiger, lion are tertiary animals. Similarly, animals in water like whale, shark, crocodile etc. are tertiary consumers.

In this way, consumers prey on different level of producers. If any level of animals are disturbed then population of other gets affected.

Decomposer

The microscopic organisms which decay, and mineralize the food are known as decomposer. The decomposers are microorganisms. The microbes like bacteria and fungi come under decomposer group. The food is digested and the soluble products are absorbed. Some microbes are complete parasites and live on dead and decaying things. The decomposers help in mineralization. Plant roots absorb the minerals to produce its own food. Therefore, there is a cycle of producers and consumers. This cycle is known as food chain.

There should be a balance among producers, consumers and decomposers. If one of

them is disturbed then the whole cycle gets disturbed. Example: If there is decrease in grass land then automatically herbivores are affected. If the herbivores like deer, rabbits, population decreases then the carnivores like leopard, tiger population also decreases. Therefore there should be balance among these.

Brain storming question

The farmers destroyed all the rice paddy of a particular environment area. Explain what kind of impact may occur?

Activity 5

Visit the places like pond, lake, field, grass land or jungle near your residence. Observe what are the producers, consumers and decomposer of the area. Collect data and differentiate as producer, consumer and decomposer.

Role of human in environmental balance

Man and environment

Humans live in different places on earth. Natural resources are used by humans for different jobs. Humans obtain habitat and food from land. They obtain timber, fire woods, medicinal plants from forests. Forests help in providing clean environment. Humans have developed animal husbandry for living eg. cows, buffaloes, sheep, ram, goats etc. are taken for animal husbandary. They graze on grass lands. Water resources have been used by humans. In agriculture sector and in animal husbandary lots of water is needed. Emission of gases and waste water from industries go to environment. Carbondioxide, sulphurdioxide like gases are increasing in the atmosphere. Similarly, liquid and solid waste materials are contaminating the source of water. On continuous cropping agriculture also brings soil changes. In this way, human activities have caused adverse impact on the environment.

Impact of manmade environmental degradation

For the fulfillment of human need, they change the natural biotic and physical environments. Human activity brings change in the environment. Human brings imbalance in the environment by cutting trees, hunting, release of toxic elements from industries, release of unwanted gases, etc. Excess use of natural resources brings imbalance between population and environment. Soil erosions, flood, landslides, heavy rainfall, etc. occurs due to environment imbalance. Urbanization also decreases the forests and wild life, dry up water resources and results to increase in air pollution. In this way, human activity has increased pollution and imbalance of water, land and air.

Impact of environmental degradation on human being

Destruction of environments affects human, plants and animals. Adverse affects on human due to destruction of environment are as follows,

a. Environment becomes unhealthy and unfavourable for human beings.

b. Problems like soil erosion, flood, land slides, etc.

c. Epidemic diseases like diarrhoea, typhoid, dysentry, etc.

d. Occurance of problems due to air pollution infects nose, ear, throat, eyes, etc.

e. Noise pollution brings hypertension, heart disease, insomnia, etc.

f. Decrease in agriculture products

g. Decrease in water resources

h. Destruction of ecosystem.

Role of human being on environment conservation

Human activities pollute the environment in turn humans will have to face its consequences. Since the human life is fully depended on the environmental condition, humans need to pay attention to its conservation. The main important base of life for human is environment. The environmental conservation of main elements like air, water, land, plants, animals should be preserved. The unwanted gases release in the atmosphere should be minimized. Solid waste and industrial wastes should not be released into water sources directly. Unwanted chemicals and non degradable materials should not be mixed in the land filling. Land should not be mishandled during the construction of road, bridge, industries and factories. Otherwise flood and land slide may occur. Deforestation should be stopped. During the use of timber the new saplings should be replaced. Poaching of wild animals must be stopped. Wild life conservation should be encouraged. Environmental elements should be conserved for environmental balance. Humans have an important role in the conservation of environment balance.

Study on areas like national park, wildlife conservation or protection near you habitat. Try to find out what kinds of action plans have been taken. Which are the environmental elements. How are they conserved. Prepare a report on it.

Practical activity

1. Study activity - 1 and the natural resources.
2. Study activity - 2 and find out the problems in the water resources. Report on your result.
3. Study activity - 3 and find out problems in wetland area. What are the possible solutions to the problems. Discuss among your friends.
4. Based on activity - 5 draw a food chain cycle.

Summary

1. Things that are available in nature and useful for all human beings are natural resources.
2. Natural resources can be categorized into three types, they are perpetual, renewable and non-renewable resources.
3. Human's life cycle runs by the use of natural resources.
4. Water that runs into streams, river, lakes, lagoons, ponds, water reserviors are the areas known as watershed, areas.
5. The surface of the earth submerged that are under water less than 6 meters are called wetland. e.g. swamps.
6. The basic elements for environment are air, water, land, plant and animals.
7. Living organisms of environment make the living community. They can be classified into producers, consumers and decomposers.

Exercise

1. Fill in the blank spaces.

(a) The resources that are available in nature freely are called .....

(b) The surface of the earth that are submerged under water like swamps are called .....

(c) Nitrogen in air is .....%

(d) Biotic can be divided into three divisions as producer, consumer and .....

(e) There are ..... number of national conservations.

2. Tick the right answer.

(a) Those living organisms produce their own food is known as

(i) producer (ii) consumers

(iii) decomposer (iv) herbivores

(b) Dead and decaying animals are acted upon by

(i) producers (ii) consumer

(iii) decomposer (iv) carnivores

(c) The earth's surface submerged under water below 6 meters or less like a swamp is known as

(i) water resource (ii) watershed

(iii) wetland (iv) lake

(d) What kind of natural resource is the solar energy?

(i) renewal (ii) reuse

(iii) fossil (iv) reduce

3. Short answer questions

(a) What are natural resources?

(b) Why should we conserve natural resources?

(c) What are the basic elements of environment ?

(d) What is meant by watershed area?

(e) What kind of area is wetland?

4. Write down the importance of natural resources in points.
5. Write down the importance and necessity of water resources.
6. How are the biotic elements classified? Explain the relationship between them..
7. What is the role of humans to make environment balanced.
8. What can be done for environmental conservation. Explain in brief.

Unit 22

Environmental Degradation and its Conservation

The surrounding around us is called environment. It is composed of different aspects. They are natural, biotic, social and physical. When these different aspects of environment are disturbed, it is known as Environmental Degradation. The changing aspects of environment is due to two main causes called as natural and man-made.

Natural disaster or calamity brings change in environment. The examples of natural calamities are flood, land slide, soil erosion, snowfall, earthquake, volcano etc. Examples of man made are deforestation, urbanization and industrialization. Here we are going to study on man-made environmental degradation.

1. **Deforestation**

   Forests are the important natural resource. The basic needs for human is obtained from forest like woods, timber, fine woods, herbs, grass etc. Due to population increase humans are using forest excessively. This results into deforestation.

   Causes of deforestation.

Figure no. 22.1

a. Cutting down of trees for making habitats

b. Converting forests area into cultivable lands.

c. Uncontrolled use of grass lands for animal grazing.

d. Burning fire in the jungle.

e. Industrialization.

f. Immigration.

g. Increase in construction.

h. Use forest product as fuel.

i. Natural disaster like - soil erosion, land slide, flood.

j. Urbanization

Effects of deforestation

Environment imbalance occur due to deforestation. Forests help in oxygen cycle, water cycle and other natural cycles. Climate is also affected by deforestation. The causes of deforestation are as follows:

a. Increase of carbondioxide and decrease of oxygen in the environment.

b. Effects in climate change.

c. Effects in water cycle. It affects on seasons and agricultural process.

d. Habitat for wildlife will be destroyed.

e. Herbs and products of forest will be affected and destroyed.

f. Extinction of animal and plants may occur.

g. Fertility of soil decrease.

h. Deforestation promote flood, land slide, soil erosion etc. natural calamity.

Therefore, forestation must be performed, awareness in public, proper use of jungle, grass land, meadows, should be done, forest. fire must be controlled and cutting down of trees must be stopped or forest conservation must be followed.

2. **Urbanization**

Urbanization is occurring in Nepal haphazardeously More people are attracted to urban cities for education, health, jobs and modern living style. Due to these reasons population in urban cities has increased. But drinking water and waste disposal system is not adequately organized. Cities have become polluted and harmful gaes have been released into the atmosphere. This has caused adverse impact on environment. The use of vehicles in large number result air pollution

and sound pollution. Fertile land are converted into habitats. We all use various forest products. Because of these activities climate, water, rivers, streams, forest, mountains, lake, fertile lands have been affected and depletion of environment has occurred.

3. **Industrialization**

Environmental pollution has occurred due to industrialization. Industrialization is the process of establishing more factories and industries for the economic development of the country. However, the emission of the gases and other unwanted products into the environment causes pollution. Industrial effluents have been released into the rivers which brings water pollution. Soot and fly ash released from industries brings air pollution. The unwanted sound released from factories is known as sound pollution. The non-degradable materials released from factories make the soil polluted. Unorganized establishment of industries lead to environment loss.

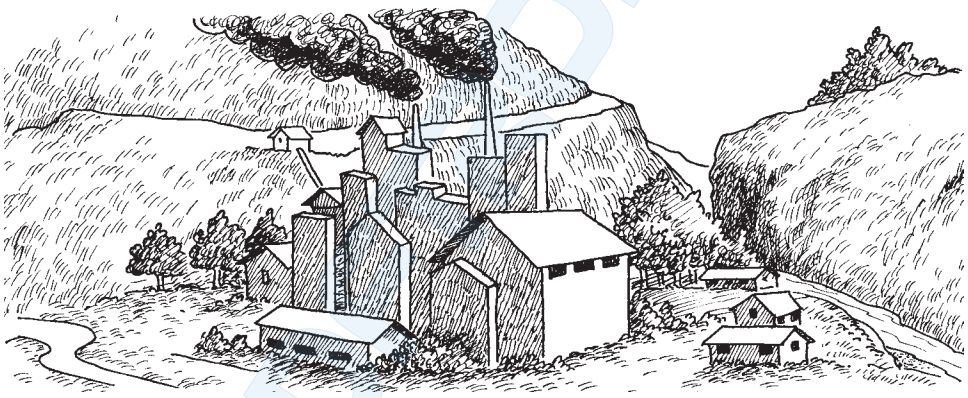


Figure no. 22.2

Activity 1

Find out how the industries in your locality have affected the surrounding environment. Observe and prepare a short report.

Destruction of natural resources and its effects

Humans have been using various natural resources for their own need. Increasing population consume more natural resources. Therefore the natural resources have been reducing day by day. It causes shortage of natural resources and adverse effect on environment. In unfavorable environment,it is difficult to survive life and the number of organisms starts decreasing. All kinds of elements like air, soil, water,

minerals, fuels, plants, animals etc. are natural resources. Humans depend on these natural resources.

Vegetation

Natural resources surrounding are plants, grasses, flowers, fruits and jungles. Human gets fire woods, timber, herbs, grasses, etc. from it. Grass lands and meadows are used for animal grazing. In this way, destruction of forests occur due to the over use of jungle. Following effects occur due to distruction of forest.

(i) Decrease of oxygen in the atmosphere.

(ii) Extraction of valuable plants and herbs.

(iii) Extinction of wildlife.

(iv) Conversion into desert.

(v) Natural disasters like flood, land slide, soil erosion, drought, heavy rainfall may occur.

Animals and Birds

Humans depend on animals and birds for various purposes. Domestic animals dependency like cows, buffaloes, horses, mule, goat, sheep, ram etc for milk, meat and transportation. Wildlife is another important resource. Deforestation leads to destruction of then habitat by which many animals have been extinct. Due to human activity forest and jungles have been destroyed as a result number of herbivorous animals are decreased. This in turn has affected carnivores. This affects in food chain cycle. Destruction in this way some of the species of animals and birds may get extinct.

Activity 2

Ask the old and elderly people in your village to know which animals were found in the past and in present days. Compare and discuss. On the animals that have decreased and not seen nowadays, list down their names.

Water Resource

One of the important natural resources is a water resource. Humans have used water resource for drinking, irrigation, industries, electricity production, fishery etc. Damage has been caused due to improper use of the water resources. Reduction in water resources reduce the aquatic life like, fishes and others. It affects water cycle loss of water source and drought may occur. In the urban areas due to water scarcity and demand of water, ground water has been extracted with the help of water pumps daily. This may result decrease in water level and land may sink. Most of the city lies near rivers. Humans release all kinds of waste into the rivers, which pollutes water

and reduces the source of clean water.

Fuel

The main energy in earth comes from sun. The solar energy helps plant to produce food for its growth. Timber and fire woods obtained from plants. Dead and decaying things and plant fossils, after a long period of time, convert into fuel like petrol, diesel, kerosene, coal, etc. These can be used as fuel. Nowadays, these kinds of fuel are used extensively. In return, there will be fuel crises for vehicles and industries.

Air

All living beings depend on air. During respiration they intake oxygen and release carbondioxide. Pure air is the necessity for all living beings. Unnecessary mix of other gases make air polluted. Due to air pollution, humans health can be affected. The immersions of gases from industries and factories make air polluted. The emitted gases like sulphur dioxide and nitrous oxides in atmosphere brings acid rain. This may corrode and harm fields, house, metallic roof tops, etc. Environment gets destroyed due to air pollution.

Land

Land is the habitat of all living beings. Land is composed of rocks and soil. It is the food producing place for living beings. If natural resources are destroyed these will be decrease in production. The ecosystem of land gets depleted. Which can bring changes in plants, water, agriculture production, climate, etc. It makes the human life difficult.

Minerals

A mineral is an element or chemical compound formed as a result of geological processes. Minerals are the valuable natural resources. Excess extraction reduces its availability in the earth. This is reducible element. These natural sources must be conserved. Sustainable management of natural resources is a difficult task.

Natural disaster

There are different types of processes occuring in the earth. Some of the process that occur in earth surface cause adverse effect in the environment are known as natural disaster. Examples are flood, land slide, earthquake, volcanoes, etc. They cause huge loss in finance and in life and it causes imbalance in the environment.

Earthquake

Figure no. 12.3

Most of you have experienced an earthquake. The shaking of earth is known as earth quake. The earth surface shaking to and fro or up and down shaking of earth surface is known as earthquake. A biggest earthquake struck in Nepal in 1990 B.S. There had been a great loss of finance and lives. Similarly in 2045 and 2072 B.S. there had been similar disaster occurred. Time to time, earthquakes occur in earth.

Causes of earthquake

(a) Rocks plates under the surface of earth expands and contracts. which results earthquake.

(b) The crust of earth contains large plates. When these plates move to and fro and earthquake occurs.

(c) Flood and land slides also causes earthquake.

(d) During eruption of volcanoes earthquake occurs.

(e) The man made blast for construction of roads and searching for minerals also can cause earthquakes.

Effects of earthquakes

(a) The nature of land may change. The plains may rise to mountains and mountains may become plains.

(b) The water sources may dry up and in some places new water sources may erupt.

(c) Earthquake may destroy roads, bridges, industries, factories, building etc.

(d) Land slide may occur in steep surface areas.

(e) There will be destruction of breaking water pipelines, electricity poles, telephone wires etc.

(f) Destruction of sewage and sewerage system.

Keeping safe from earthquake

(a) Earthquake proven buildings, bridges dams and factories should be made.

(b) During earthquake stay under the table or under the doorway.

(c) Instruction and knowledge of earthquake should be given to all.

(d) Stay in open area during earthquake. Do not go near electricity wires.

(e) Try to keep light emitting objects like torches in the house.

One can stay safe during earthquake by keeping above stated points in mind.

Volcano

Eruption of volcanos are natural process. The weak surface of the earth errupts releasing hot magma with along gases. The core of earth is very hot consisting of high temperature. The rocks are in liquid phase in core known as magma. During eruption of volcano the magma comes to the surface of the earth as lava. The liquid and the gases inside the earth continuously give pressure.

When the rain water, streams or rivers and sea water gets inside the earth, the heat of the inner core of the earth converts water into vapours. The vapours cover the place and can not stay for a long time which finds its way out causing volcanoes. During eruption of volcanoes the lava is piled up and forms a mountain known as volcanic mountain. During eruption of volcano, the gas, ash and liquids come out first through the mouth or opening called crater. Then, from time to time there is eruption of magma and fly ash- from the crater.

Volcano

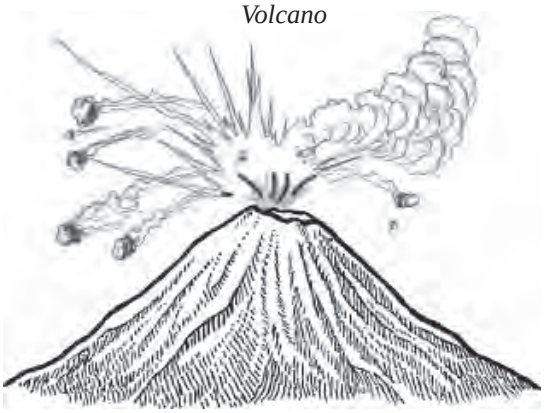


Figure no. 22.4

Effects of volcanoes

(a) The surface of the land changes.

(b) Man made construction will be destroyed.

(c) Fertile land and jungles will be covered by lava and flay ash.

(d) During volcanic eruption the waves may give rise to earthquake.

(e) The atmosphere becomes polluted due to dust, soot and fly ash.

(f) The presence of dust, soot, smoke may bring climate changes.

Activity 3

Visit the place near your living place where flood or land slide had occurred. Find out the cause of the flood or landslide.

Environmental sanitation

Lack of fresh air, water, land and food are the problem of the local area. The disposal management must be done for healthy environment. The utensils used by humans are not always toxic and polluted, but however if these are not well managed it will produce pollution.

The excessive and indiscriminate use of various types of natural resources is spoiling our healthy environment day by day. We can save our environment by practising the following:

Reduce, reuse and recycle

1. **Reduce**

   Reduce means that we use less natural resources by cutting down on which is leading to wastage. We should use less plastic materials. Thus this lead to less production of plastics. This might help to reduce the effect in environment.

2. **Reuse**

   Reuse means using the same things again repeatedly. If we reuse then the production of it reduce and adverse effect in environment is lessened. The plastic jars on bottles can be reused. This process helps in reducing wastages and decreases environment population.

3. **Recycle**

   Recycling the process of collecting the used and discarded items and send them

to the respective industries for making fresh materials, Examples: The papers and books we have used can be again send to factories for processing into fresh paper again.

Desearded items made of metals like aluminium and iron can be send to respective factories for making fresh metal objects. In this way wasted materials can be recycled.

In this way, less use, reuse and recycling process will reduce the wastage and keep environment pollution less. Thus environment management can be done.

Activity 4

Differentiate the daily usable items in your household as reduce, reuse and recycle. Explain in tabular form.

Efforts on Environment Conservation

We should manage environmental elements for environmental conservation and protection. The main user of environmental elements are humans. Therefore, it is our duty for its conservation. Therefore, steps should be taken for environmental conservation like creating awareness to public, planting new saplings, conservation of forest resources, cleaning of environment and protection of cultural heritage.

Unfair modification of our life-style has resulted the greater amounts of waste materials generation. Therefore, changes in attitude also have a big role to play.

For Environment conservation and protection the following points should be considered:

1. **Public awareness**

   The involvement of public is essential for environmental protection. Public must be educated for their involvement. The main medium of spreading the knowledge is education. Through the education, positive and negative effects on environment can be explained. Once if public understands about environment protection, they will participate in conservation. Therefore, they should be noticed through advertisement, education, workshop, training programmes at local level.

2. **Integrated conservation work**

   The construction of roads, bridges, canal, sewerage etc. leads to changes in environment. These activities may disturb the land, water, forest etc. Therefore, during these kinds of works simultaneously environmental conservation should be also performed.

3. **Public participation**

   As much as possible more people must be involved in environmental conservation

mechanism. If public are attached to conservation process then this programme will be successful.

4. A forestation

Deforestation is the main cause of environmental problem. Therefore, we should start plantation of new saplings in barren lands, fields, steep mountain areas. The bushes and trees at steep areas help to stop soil errosion. The forests are the local peoples property. The awareness in local people should be raised that the environment is their own property. It is important for sustainable life.

5. Forest conservation

People use various forest products. Growing population increases dependency on

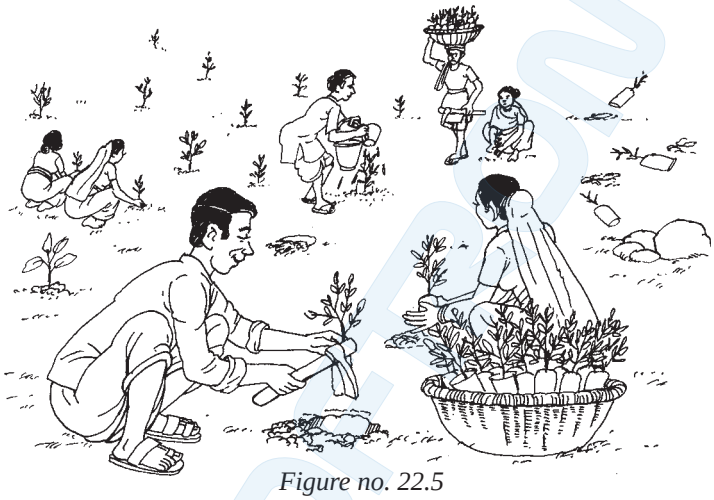


Figure no. 22.5

forest resources. This may results deforestation. Therefore, we should consider the conservation of forests. Participation of the local people can indeed lead to the efficient management of forest.

6. Cleaning of environment

Increasing population demand on the natural resources. The amount of waste materials are released due to human activities. Excess use of vehicles increase in pollution. The following activities should be adoped by the locals to maintain environment.

Points which will aid in environment conservation

(a) To clean surrounding house (habitat)

(b) Proper management of domestic waste

(c) Protection of water resources

(d) Use of biogas on solar energy as fuel

(e) Run the programmes for cleaning the surrounding environment

7. Protection of cultural heritage

Nepal is rich in cultural heritage. The various human activities have brought changes in these cultural heritages. Therefore protection of these should be performed from the local people themselves.

It can contribute the environmental conservation.

Activity 5

What kinds of approaches have been taken for environmental conservation in your village, street or neighbourhood?

Involvement of governmental agencies in environmental conservation

The problem of environment is worldwide. There have been problems observed in Nepal such as deforestation, landslide, soil erosion, water pollution, air pollution, noise pollution, chemical pollution, solid waste, climate change, biodiversity loss, green house effect, natural disasters etc. Some few governmental agencies play an important role in the sustainable management of the problems. They are as follows:

1. **Ministry of Science, Technology and Environment**

   Some measures are formulated for conservation of environment in Nepal for formulation of rules, regulations, strategies, plans, activities through Ministry of Science Technology and Environment. The main objectives of ministry are are follows:

   (a) Conservation of natural resources and cultural heritage.

   (b) Conservation of air, water and soil.

   (c) Development and promotion of traditional technology.

   (d) Researches in Science, Technology and Environment.

   (e) Provide opportunities and support to those who work and perform researches in the field of science, technology and environment.

   Major functions

   (a) Apply measures like rules, regulations, strategies, plans, activities.

   (b) To manage for field visits for feasibility study, and evaluation.

   (c) Strategies development for pollution control.

   (d) Development of human resource for controlling environment pollution

control through the study, researches, training, workshop, seminar etc.

(e) Develops memorandum on understanding between national, international and non governmental agencies.

(f) Develop public awareness environmental issues by publishing notices and advertisement through radio, television, news papers, meetings, workshop, internet, posters, etc.

2. **Ministry of Forest and Soil Conservation**

This ministry has been established to study and resolve the problems arising in forests and biodiversity. If researches on conservation of there. The main objectives of the ministry are as follows:

(a) For the conservation of forests maintain

(b) For conservation of natural environment such as forests, wildlife and plant.

(c) Conservation of herbs and forest products.

(d) Conservation of water reserves.

(e) Conservation of natural ecosystem.

To maintain the above stated objectives, the ministry has different departments. They are:

Department of Forest,

Department of Botany

Department of Wild Life Conservation

They have given the important support in environmental conservation and protector or protection.

Major functions

(a) Apply measures like rules, regulations, strategies, plans, activities

(b) Based on national forest conservation and protection develop various planning and act.

(c) Go for feasibility study for conservation programmes and evaluation and report.

(d) Development of commitment between international, national and non governmental agencies for conservation of nature programmes.

(e) Develop public awareness through radio, television, news papers, poster, meetings, workshop, seminar etc.

Forest department under ministry of forest takes care of whole forests area of Nepal for conservation, protection and management. The forest area is divided into Governmental and community forests for protection and use. The ministry makes rules and regulation for conservation. The proper use of forest produce and herbs. The department of land and water conservation helps in reduction of natural disasters like flood, landslide and water resource conservation etc. Similarly Department of National Park and wild life helps in conservation and management of various national parks for wild life protection, conservation, etc.

This further play role in conservation of biodiversity and runs various programmes. Thus it helps in preservation of natural ecosystem.

Process

Ministry of Education, Science and Technology and Ministry of Forest and Land Conservation both plays an important role in environmental conservation, protection and management.

Project works

1. Visit the area near your place where flood, land slide or some natural disaster had occurred in past. Find out the cause effects and prevention methods for it. Prepare a short report on it.
2. Participate in your surrounding area where environmental conservation programme has occurred. Write a short note on it.

Summary

1. The surroundings around us is environment.
2. Environmental damage is the reduction of the originality of natural and cultural aspects.
3. Environmental damage occurs due to natural and man made activities.
4. The main causes of man made destructions deforestation, organization and industrialization.
5. The destruction of natural resources causes the land turning into the deserts.
6. Environmental destruction occurs due to natural disasters like flood, land slides, fire, earthquake and volcanoes.
7. For the conservation of environment public awareness, combined conservation works, participation of local people, Forestation, forest conservation, cleanliness of environment, conservation and protection of cultural heritage must be adopted.
8. Cleanliness of environment can be performed by reduction, reuse and recycle.
9. Environment ministry, Forest ministry, Forest department, National parks, Wildlife department and National governmental agencies have major role in environmental conservation.

Exercise

1. Short answer question:

(a) What are the causes of deforestation?

(b) What is urbanization?

(c) How does industrialization brings environmental damage?

(d) What is natural disaster?

(e) What kind of activities can be done for environmental conservation?

2. Define

(a) Water resource (b) Minerals (c) Afforestation

3. Write short notes:

(a) Reduction (b) Reuse (c) Recycle

4. What are the effects of earthquake? Write some the preventive measures?
5. How can you explain that man is the cause for destruction of natural resources
6. Write down the effects of destruction of natural resources.
7. What are the activities performed for the environment conservation in your area. Explain in brief.
8. Write down the main functions of Ministry of science and technology for environmental protection
9. What are the environmental problems in your locality? Explain in brief. Write down what can be done to reduce the environmental problem from the local level participation.
10. Explain what kinds of activities have been performed by Ministry of Forest and Land Conservation for environmental conservation in Nepal?

Unit 23

Environment and Sustainable Development

Earth is the common habitat for all kinds of animals and plants. All living beings get necessary air, water, food from earth. The surrounding of earth is environment. It consist of animals, plants, microorganisms, air, water, light, soil, etc. In this way, all the living being and non living things in a combining form is known as environment.

Concept of development

Development means improvement in any area or subject. Humans perform various activities for their benefit. The signs of development are construction of roads, canal, channels for irrigation, bridges, dams for electricity production, big buildings, offices industries, factories. etc. In this way, various development tasks performed by humans make man made environment and natural environment slowly depleted. Due to natural environment destruction, it affects the man made environment and slowly gets affected as well.

Development and environment

Humans have been using natural resources for their necessity. However, continuous use damages the environment. The increase in population demands increase the use of resources. To meet the necessity, humans have used the resources extensively changing shape, size, function etc. of natural resources. Forests are cut to form cultivable lands and cutting trees from steep area in the mountains may result in land slides. Similarly construction of roads, bridges, industries, factories gives adverse impact on environment. Development will also be affected due to environmented damage. Flood and landslide affect human development. Therefore, developing environment management must be also considered. Therefore, the management of natural resources requires a long-term perspective so that the generations to come will not merely be exploited for short term gains. This is know as sustainable development.

Concept of sustainable development

Sustainable means lasting for long time. Whenever we think of development build up we should think of generations to come in future. This management of natural resources should ensure equitable distribution so that all people benefit from the development of these resources.

The concept of sustainable development encourages forms of growth that meet current basic human needs, while preserving the resources for the needs of future generations. For example, when installing drinking water taps in villages. We should

also think that whether two to four generations to come in future will be able to get benefit from this. Similarly, when forest production is used, the old trees should be replaced by new saplings plantation. When constructing channel or canals the dams should be built in such a way that the water in the rivers also continuously flows. Thus, sustaining the aquatic lives present there.

The General Assembly of United Nation in 1983 A.D. passed the resolution on sustainable development in 1987 A.D. including our common future act. After this act sustainable development has become famous worldwide.

Activity 1

Observe a place near your habitat where construction of development going on using natural resources. Find out what are the natural resources used. Try to find out what

Figure no. 23.1

kind of adverse affect is being affected due to this developmental work. Find out the positive and negative aspects. Try to develop a short report.

Nature friendly development

The kind of development that does not affect the nature and environment is known as eco-friendly development. Development and environment are the two different related subjects. Therefore, humans should consider the present and future generation to balance the environment during the developmental works. The developmental works may be eco- friendly works. The developmental works may be eco- friendly and sometimes not. The developmental programmes which create advance effect to the environment

should be stopped or at least should be lessened. In this way, only the sustainable development occurs. Humans are the responsible for environmental balance.

Therefore, when eco - friendly development is maintained then only the environment will be saved. In this way, the developmental works will also be sustained. To make eco - friendly development, the following points should be paid attention:

(a) Minimize air pollution

In this modern world emission of gases occur due to industrializations, factories, transportation lead to atmospheric pollution. Therefore, emission of gases should be lowered. Then by products produced from factories should be reused which will make the environment clean. In addition it will also help in environment conservation.

(b) Water resource conservation

Water is basis of life. Life without water is impossible. Therefore, when building a house or factories it should be taken care that water resources should not be hampered. Construction should not be placed near water resources. If these are paid attention then the water resources can not be dried and environmental conservation can be obtained.

(c) Conservation of land

Increase in pollution demand more habitat and industries. Therefore, fertile lands are also converted into land for housing and development of industries and factories. These kind of activities may lead to depletion of agricultural land resulting in food shortage. Therefore, conservation of fertile agricultural land should be done. During construction of roads land slide may occur in the steep mountains. In such places plantation must be done for the conservation of these lands.

(d) Conservation of river, lake and watershed areas

Development of constructions affect adversely in rivers, lakes and watershed areas. The effects on water resources must be minimum during construction of electricity power house, developing roads and factories.

The long term sustainable strategies must be applied for minimum effects on air, water, land in totality in the environment. Nowadays before performing construction environmental evaluation must be considered.

Sustainable development attempts in Nepal

Sustainable development is not a new context in Nepal. The elderly people's suggestion used to be taken during construction of any new planning. There used to be force on snow it can sustain for a longtime.

For example: When canal or dug wells are constructed in the village people used to take suggestion that it should serve the generations to come. They used to plant trees near taps and dug wells. It was a belief in Nepali culture that these trees should not be cut that is grown near water tap on well.

The attempts for the sustainable development in Nepal are as follows:

(a) Use of natural resources in less number so that can be saved for generations to come.

(b) Plantation of new saplings in place of use of forest produce.

(c) Make public awareness by various programmes.

(d) Give importance to environmental preservation during development of construction.

(e) The natural resources on earth are saved for future. All the people must take responsible for the conservation of environment.

(f) There are attempts made for wild life and environment conservation for eg. National Park, Wildlife reserves, conservation areas etc.

(g) Environment protection attempt for eco- conservation.

In this way, sustainable development involvement of governmental, non governmental, private and public awareness is necessary and plantation and various plans are running for environment conservation.

Activity 2

Try to see the activities for a week in surrounding area around you. Which activities are sustainable development? Explain with reasons.

Project work

In your village and surroundings try to find out sustainable development works. Is it environment friendly or not? Give a report with explanation.

Summary

1. The combination of all living and non living things on the earth is known as environment.
2. The improved way of work performed by human benefit is known as development.
3. There is a strong relation between development and environment.
4. The developmental work which does not adversely affect environment is known as sustainable development.
5. Sustainable development helps save of natural resources for generations to come.
6. In 1987 United Nations Environment Programme forged an agreement for sustainable development.

7. From the beginning Nepal has paid attention to sustainable development.
8. Plantation, wildlife conservation, Conservation of lakes, lagoon, wetland area are all environment conservation activities.
9. The developmental activity that does not harm nature is known as nature friendly development.

Exercise

1. Fill in the blank Spaces.

(a) Thee development that lasts for long is known as ----------

(b) The relation between living and non-living things is known as .....

(c) Sustainable development helps in ....

(d) The development activity that does not harm nature is know as friendly development.

(e) ..... development based development activity help in environment conservation.

2. Answer the following questions:

(a) What is development?

(b) What kind of development is sustainable development?

(c) Why is sustainable development needed? Give three reasons.

(d) What is nature friendly development? What is its importance?

3. Find out the development of construction works in your surrounding. Make a list which are the nature friendly development.
4. Explain what kind of activities have been going on in your village on sustainable development.
5. Explain what kind of relationship is present between development and environment.
6. Write down what kind of sustainable development attempts are going in Nepal.
7. Explain what kind of responsibility should be taken by human for nature friendly development.