

FOUNDATION & OLYMPIAD

CLASS-VI

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INDEX

TOPIC	PAGE NO.
1. PHYSICS	1-24
2. CHEMISTRY	25-48
3. MATHEMATICS	49-77
4. BIOLOGY	78-100
5. SOCIAL SCIENCE	101-112
6. ENGLISH	113-118
7. MENTAL ABILITY	119-123

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MOTION AND MEASUREMENT OF DISTANCES

Terminologies

Transportation, Physical quantity, System of measurement, Measurement of length, Area & Volume, Rest and motion, Linear motion, Random motion, Periodic motion, Distance, Speed

INTRODUCTION

In daily life, the importance of measurement is well known. When we have to bring fruits, vegetables etc. from the market then the seller measures their quantity using beam balance and we have to pay him accordingly. The tailor needs exact measurement of our body to stitch our dresses. We always have an approximation that how much time will be spent on a journey for our convenience. Thus we can conclude that measurement is an essential part of everyday life.

1.1 TRANSPORTATION

The process of travelling / moving people or goods from one place to another is called transportation. Transportation takes people to where they want to go and brings to them what they need. No trade is possible without transportation. Transportation is an integral part of our lives from times gone by. Prehistoric people used to mainly travel and even carry goods on foot as there were no other means known to them. It was around 5000 B.C. when people began the use of animals to haul their loads. Later on wagons and sailing vessels were invented to ease



Fig. 1 : Transportation– Past and present

People used to drag their loads along the ground. Gradually, they also learnt to make sledges from logs, poles, rawhide etc to enable them to transport their load. At the same time they also started to build wooden rafts from logs / reeds to transport goods across water. As time went by they learnt to build canoes which could be paddled by hand or with poles which ultimately led to the making of boats. These boats were of a very fragile nature and were mainly used across rivers and lakes.

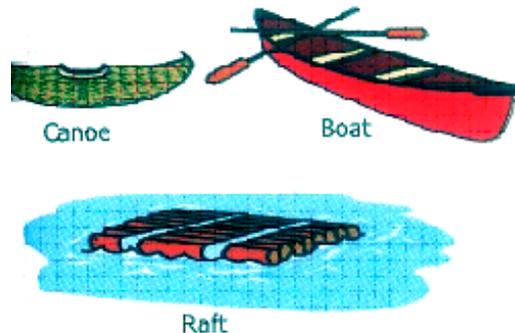


Fig. 2

Ask yourself

- 1._ Give two examples of modes of transport on land.
- 2._ Give two examples of modes of transport in air.
- 3._ Give two examples of modes of transport on water.
- 4._ Compare the primitive mode of transportation to that of modern mode of transportation?
- 5._ Why were the primitive mode of transportation made up of wood?



1.2 PHYSICAL QUANTITIES

Any quantity that we study in physics (e.g. length, mass and time) and can be measured is called physical quantity.

To measure physical quantities such as mass, time and length, we use units such as kilogram, second and metre.

Unit : A physical quantity (Such as length) has to be measured with respect to some known quantity. This known quantity is called a unit.

(a) History of length measurement

In ancient times, different body parts were used to measure length. The distance between the tip of the thumb and the tip of the little finger of a fully stretched hand was termed a **hand span** . The distance between the tip of the middle finger and the elbow was termed a **cubit**, **Foot**, **Stride**, **Fathom** and **Yard** are some more units based on the length of body parts. However, it was soon realized that these units were not very reliable, as the length of body parts can vary from person to person.

We need standard units of length and other physical quantities to obtain the same value for a measurement. However, people across the world might adopt different standard units. For example, gram and pound are units of mass used by people of different countries. To solve this problem, we need a set of standard units which is acceptable throughout the world.

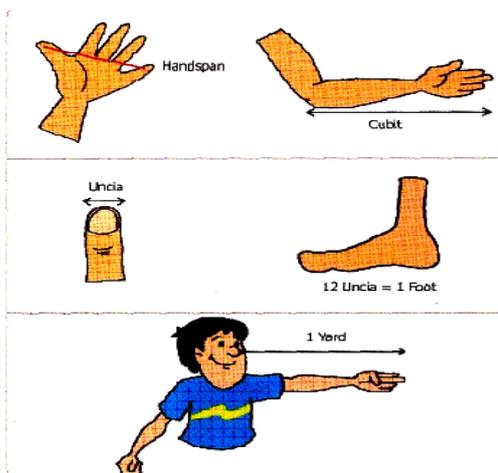


Fig. 3

(i) Drawbacks :

Measuring units as above which were based on men's measurements were not accurate and failed because not all men were of the same size. In modern measuring systems, the measuring tools consist of units based on measurement standards agreed upon by users of the system.



Fig. 4 : Need for standard units

(b) Standard system measurement

Standard units are those that have a fixed quantity and, therefore, do not vary from person to person and place to place. For example, the metric system, created by the French in 1790, is a standard set of units.

Adopting standard units of measurement solves only half the problem. People in different countries may be using different sets of standard units for measurement. For example, gram and pound are set of units. The adoption of SI units has made it easier for scientists of different countries to communicate their results to one another.

The SI system of units was adopted in 1960 by the General Conference of Weights and Measures. SI is the short form of system of International Units (in French). The SI unit of length is the metre. Other common standard units of length are inch, millimetre, centimetre, kilometre, and so on.

SI unit of mass and time are kilogram and second respectively.

Depending on the size of the object we wish to measure, we have to choose an appropriate unit. For example, we use metre to measure the length of a piece of cloth, kilometre to measure the distance from one place to another, millimetre to measure the thickness of the hair, and so on. Units of length can be interconverted by multiplying or dividing their values by 10, 100, 1000, and so on.

A commonly used unit for measuring large distances is the kilometre (represented as km). Commonly used units for measuring small distances are the centimetre (cm) and millimetre (mm).

$$1000 \text{ m} = 1 \text{ km} \qquad 100 \text{ cm} = 1 \text{ m} \qquad 1000 \text{ mm} = 1 \text{ m}$$

For measuring lengths smaller than the metre, its sub-multiples are used. For lengths greater than the metre, its multiples are used, Those are given in following table:-

Name of the unit	Symbol	Relation in terms of metre
millimetre	mm	1/1000
centimetre	cm	1/100
decimetre	dm	1/10
metre	m	1
decametre	dam	10
hectometre	hm	100
kilometre	km	1000

(i) Relation between some units :

$$10 \text{ mm} = 1 \text{ cm}, 10 \text{ cm} = 1 \text{ dm}, 10 \text{ dm} = 1 \text{ m};$$

$$10 \text{ m} = 1 \text{ dam}, 10 \text{ dam} = 1 \text{ hm}, 10 \text{ hm} = 1 \text{ km}$$

(c) Measurement of length, area & volume

(i) Measurement of length

(A) Using ruler :

The length of an object is the distance between its ends. It can be measured using a ruler, a measuring tape, a metre rod, and so on whichever is convenient for the required purpose.

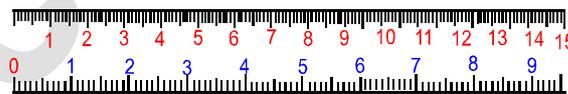


Fig. 5 : A Ruler

While measuring length using a ruler, we have to take the following precautions :-

1. Care should be taken to keep the ruler along the length of the object

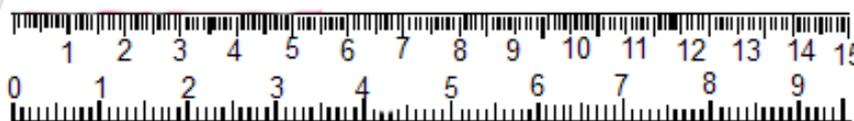


Fig. 6 : The ruler should be kept along the length of the object

- If the edge of the ruler is worn out or broken, the measurement should be started from any other mark that is fully clear.

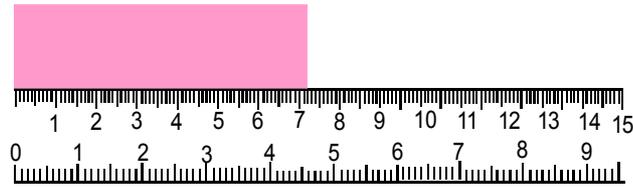


Fig. 7 : Measurement should only be started from a mark that is fully clear.

- Eyes should be exactly above of the point where the measurement is to be taken.

ACTIVITY : To measure the height of a person.

Materials required : Measuring tape, a thick book, and a pencil.

Procedure : To measure the height of your friend, make him / her stand absolutely straight with his/her back against a wall. Place a thick rigid book on his/her head and make a mark on the wall where the underside of the book touches the wall. Measure the length from this mark to the floor with the help of the measuring tape. This gives the height of your friend make sure he/she is not wearing shoes to gain some extra inches.

(B) Using divider to measure length

A divider is used to measure the distance between two points. The correct use of a divider can give a fairly accurate measurement. The divider is placed such that its two points are at the two ends of the length to be measured. Then, without disturbing the divider, the distance between the two points is measured with a ruler.

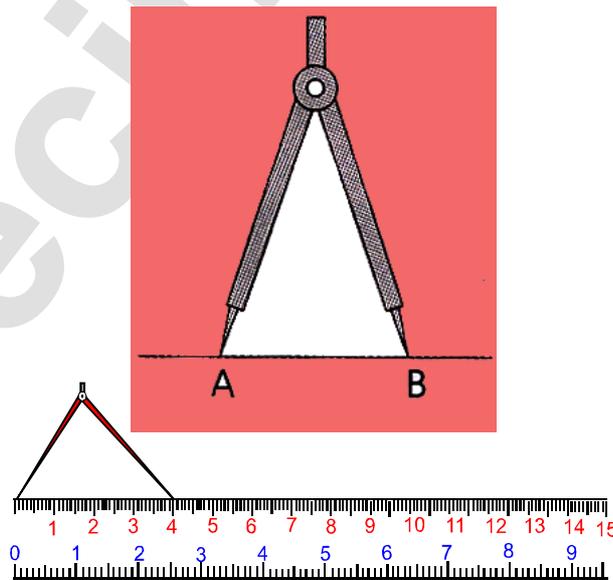


Fig. 8 : Measurement of a length using divider

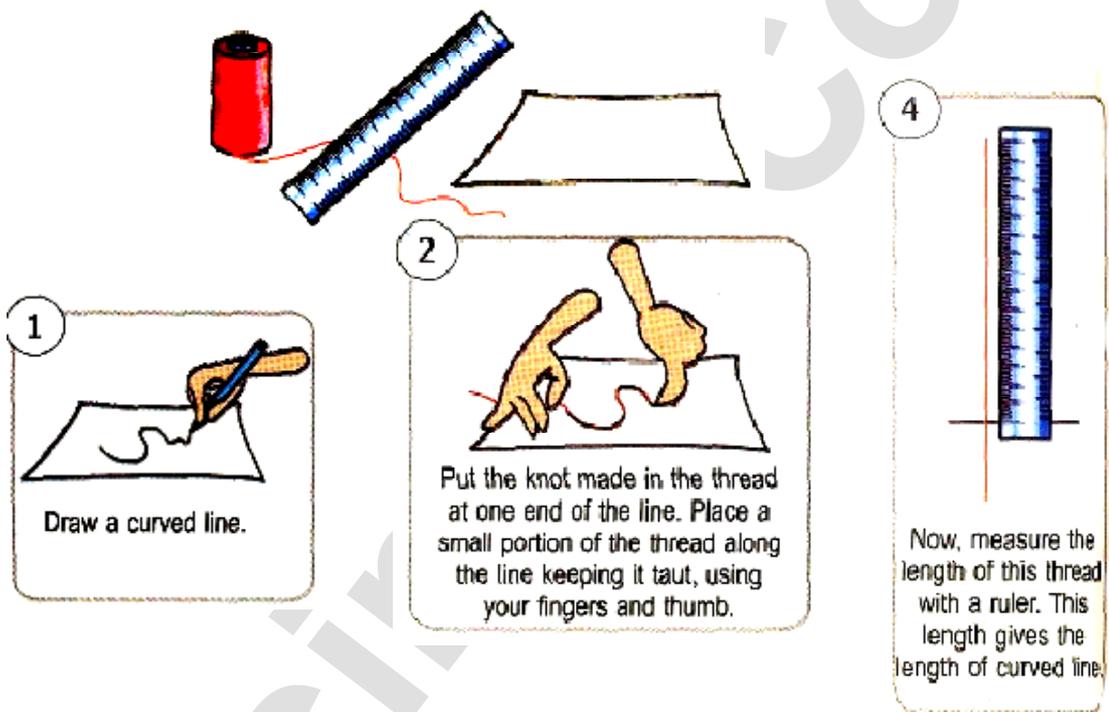
(C) Measuring the length of a curved line

We can measure the length of a curved line using a string. The string is placed along the curved line and its ends are marked on the string. The length of the string between the marked points is measured with a ruler.

ACTIVITY : To measure the length of a curved line using a metre scale.

What you need:

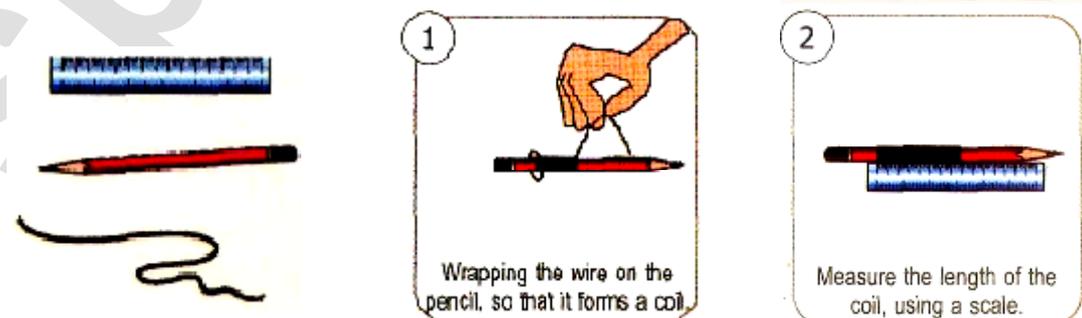
- A thread
- A ruler



ACTIVITY-: Can you measure the thickness of a thin wire?

What you need:

1. A pencil
2. A ruler
3. A thin wire



We have seen how we can measure very small lengths or thickness using indirect methods. However, the same lengths can also be measured using special instruments, like the Vernier Calliper and the Screw Gauge in the laboratory.

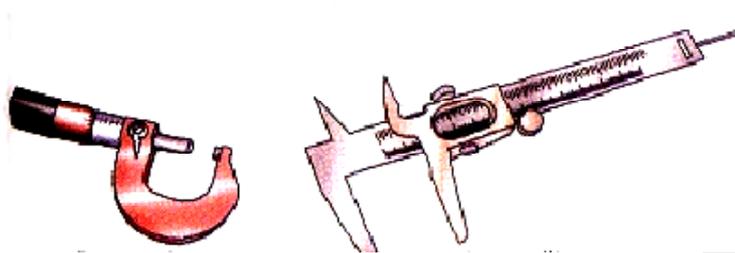


Fig. 9 : (a) Screw Gauge (b) Vernier calliper

(ii) Measurement of area

The amount of surface covered by the object is called its area. The measurement of area counts two dimensions.

The SI unit of area is square metre, represented as m^2 . This is the area covered by a square whose length and breadth are 1 m each.

The area of regular surfaces (squares, rectangles etc.) can be measured by using the following formula:

area of a square = length \times length

area of a rectangle = length \times breadth

eg. How many m^2 are equal to 1 cm^2 area?

$$\begin{aligned} \text{Sol. } 1\text{ cm}^2 &= 1\text{ cm} \times 1\text{ cm} \\ &= (1/100)\text{m} \times (1/100)\text{ m} \\ &= (1/10000)\text{m}^2 = 10^{-4}\text{ m}^2 \end{aligned}$$

(iii) Measurement of volume

The amount of space occupied by an object is its volume. The SI unit of volume is the cubic metre represented as m^3 .

The litre (represented as l) is an important unit of volume used in the everyday life.

1 litre = 1000 ml

1 m^3 = 1000 litres

The litre is also known as 1000 cm^3 .

Since 1 litre = $(1/1000)\text{ m}^3$.

$$1\text{litre} = \frac{(100\text{cm})^3}{1000} = 1000\text{cm}^3$$

The volume of a liquid is more often expressed in millilitres.

The volume of a solid that has a regular shape can be calculated using a mathematical formula. The formula for determining the volumes of some regular solids are:

Volume of a cube = l^3

where l is the length of the side of the cube.

Volume of a cuboid = $l \times b \times h$

where l is the length, b is the breadth, and h is the height of the cuboid.

e.g. Volume of a cube of side 1 m

$$= 1\text{m} \times 1\text{m} \times 1\text{m}$$

$$= 1 \times 1 \times 1 \text{ m}^3$$

$$= 1 \text{ m}^3$$

Volume of a cube of side 1 cm

$$= 1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$$

$$= 1 \times 1 \times 1 \text{ cm}^3 = 1 \text{ cm}^3$$

Volume of a cube with sides 10 cm

$$= 10 \times 10 \times 10 \text{ cm}^3 = 1000 \text{ cm}^3$$

Volume of a cube with sides 1 dm

$$= 1 \times 1 \times 1 \text{ dm}^3 = 1 \text{ dm}^3$$

$$1000 \text{ cm}^3 = 1 \text{ dm}^3$$

$$1 \text{ litre} = 1000 \text{ ml}$$

$$1\text{l} = 1000 \text{ ml}$$

$$\text{or } 1 \text{ cm}^3 = 1 \text{ ml}$$

Volume of a cylinder = $\pi r^2 h$

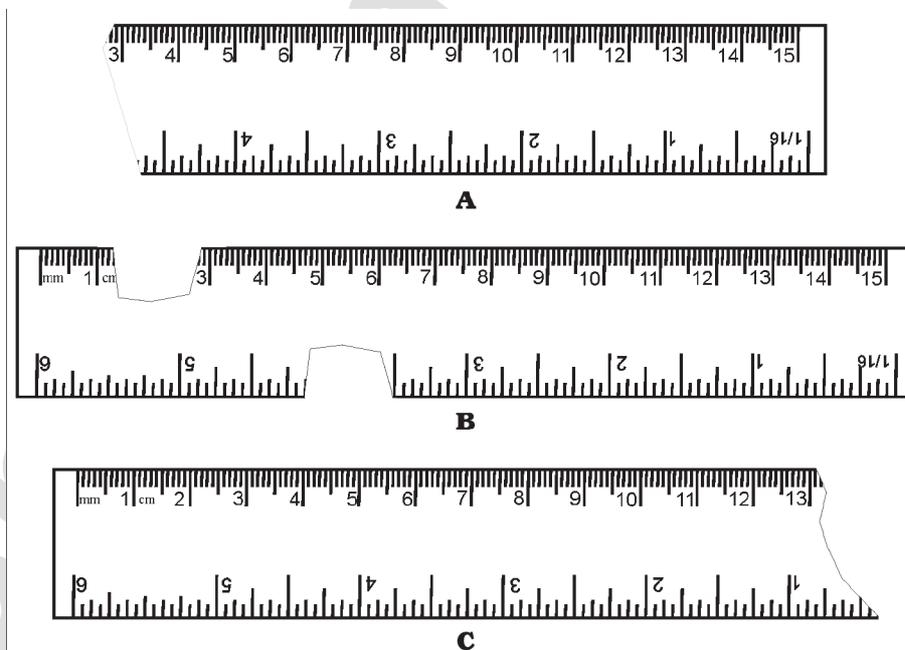
where r is the radius and h is the height of the cylinder.

In the laboratory the volume of a liquid needs to be measured accurately. For this purpose, a measuring cylinder is used. A measuring cylinder is a cylindrical glass container that has markings/graduations on it. Measuring cylinders are available in different sizes, ranging from 10 ml to 1000 ml (i.e., 10 cm³ to 1000 cm³).

Ask yourself



- You are provided three scales A, B and C as shown in figure to measure a length of 10 cm.



For the correct measurement of the length which scale will you use.

2. 500m = _____ km
3. Arrange the following length in increasing magnitude
1 meter, 1 centimeter, 1 kilometer, 1 millimeter.
4. Height of person is 1.65m express it in cm and mm
5. Find the cost of fencing a square park of side 300 m at the rate Rs. 25 per meter

1.3 CONCEPT OF REST AND MOTION

(a) Rest :

An object is said to be at rest if it does not change its position with respect to its surroundings with the passage of time.

(b) Motion :

A body is said to be in motion if its position changes continuously with respect to the surroundings (or with respect to an observer) with the passage of time.

(c) Rest and motion are relative terms :

Motion is relative rather than an absolute term.

An object may be in motion with regard to another object but it may be stationary with respect to a third object. For example, suppose you are sitting in a train and you pass a person standing alongside the tracks. The person standing along the tracks will see you and everyone else on the train as being in motion. But the person sitting next to you on a train will be stationary with respect to you.

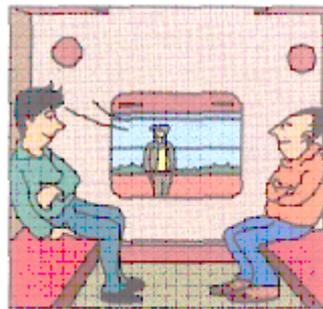


Fig. 10

Even as you sit reading this page, you are moving rapidly because the earth is rotating on its axis. You are also moving along with the earth as the earth revolves around the sun. In addition, the sun, the earth and rest of the planets in our solar system are involved in the general rotation of our galaxy within the universe.

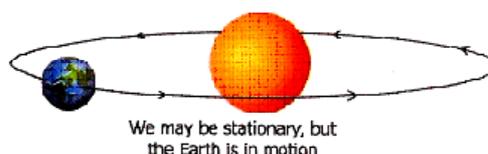


Fig. 11 :

(d) Types of motion

(i) Linear motion (or translatory motion) :

Motion along a straight line is known as linear motion.

Eg. The motion of a moving car, a person running, a stone being dropped, motion of a train on a straight track .

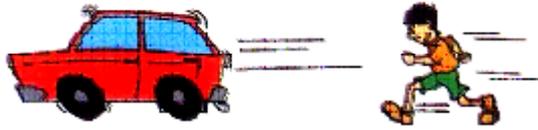


Fig. 12 : Linear motion

(ii) Random motion :

Motion that does not follow a fixed direction is called random motion. Consider the movement of a bird in flight, a hockey player running after the ball, an ant crawling on a sheet of paper, a child playing in a playground. All the above do not follow a set pattern and hence are examples of random motion.

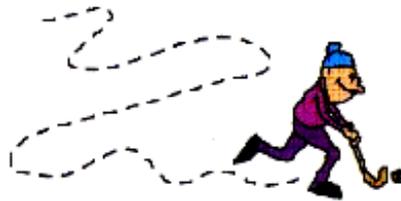


Fig. 13 : Random motion

(iii) Periodic motion :

A motion in which a body repeats its path in the fix interval of time are called **periodic motion**.

Types of periodic motion :

(A) Circular motion :

A periodic motion in which a body revolves around a fix point on the circular path is called **circular motion**.

Eg. Motion of the tip of the clock's arm, motion of the earth around the sun.



Circular Motion

Fig. 14 : Circular motion



Fig. 15 : Periodic motion

(B) Oscillatory Motion

The to and fro periodic motion of a body around a fix point is called oscillatory motion.

Eg. The motion of a simple pendulum, a body suspended from a spring, motion of a swing (also called to and fro motion)

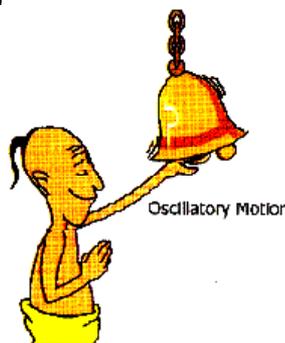


Fig. 16 : Oscillatory Motion

(iv) Combined motion :

Sometimes body possesses two types of motion at the same time. For example, the wheel of a moving car rotates as well as moves forward, when you roll a coin on the table it moves in circular path as well as moves forward.

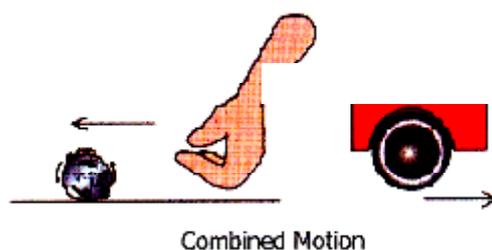


Fig. 17 : Combined Motion

(e) Distance & Speed :

(i) Distance : **Distance** is the actual path travelled by a body in a given time. Consider a body travelling from A to B along any path between A and B. The actual length of the path that a body travels between A and B is known as the distance. Here if the body goes from A to B via C, the distance travel will be ACB.

The distance travelled will be different for different paths between A and B.

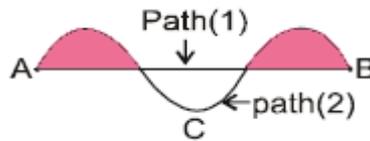


Fig. 18 : Distance

(ii) Speed : The distance travelled by a body in unit time is called its speed. Therefore, speed = Distance/Time

Or $s = \frac{d}{t}$. SI unit of speed or average speed is m/s.

Here d= distance, s= speed, t = time

(A) Uniform Motion : A body has a uniform motion if it travels equal distances in equal intervals of time, no matter how small these time intervals are.

For example, a car running at a constant speed of say, 10 m/s, will cover equal distances of 10 metre, in every second, so its motion will be uniform.

(B) Non-Uniform Motion : A body has a non-uniform motion if it travels unequal distances in equal intervals of time. For example, if we drop a ball from the roof of a building, we will find that it covers unequal distances in equal intervals of time. It covers :

4.9 metre in the 1st second,

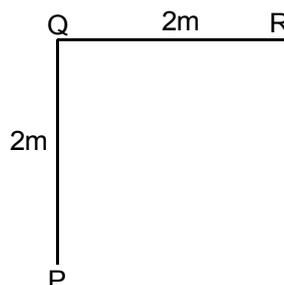
14.7 metre in the 2nd second,

24.5 metre in the 3rd second, and so on.

Ask yourself

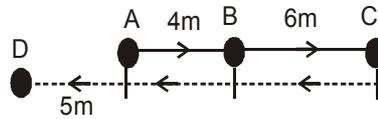


- 1._ Give two examples of periodic motion.
- 2._ Correct the following.
 - (i) The motion of a swing is an example of rectilinear motion.
 - (ii) The instrument used to measure speed is called as odometer.
- 3._ What types of motion do the following objects have.
 - (a) the needle of sewing machine
 - (b) the smoke from a incense stick
 - (c) wheels of a moving car
- 4._ A motorcycle travels a distance of 248 km in 4 hours what would be the speed of motorcycle?
- 5._ A body travels along the path of PQR. what is the distance travelled by the body.





A body starts from A and moves according to given figure. (body retraces the path after C then reaches to D)



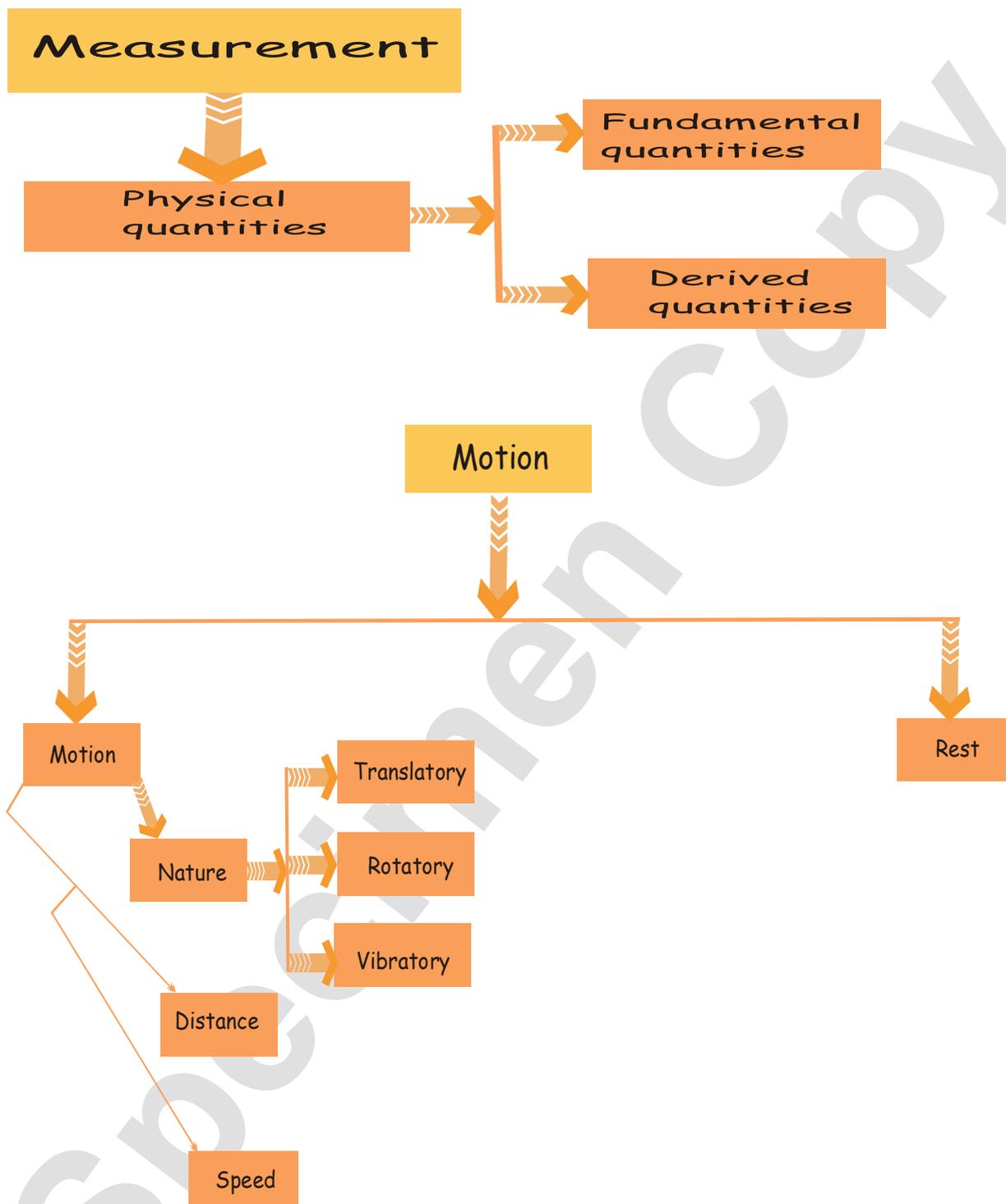
The distance and displacement are as follows for different path.

Path	Distance	Displacement
AB	4m	4m
ABC	10m	10m
ABCB	16m	4m
ABCA	20m	0m
ABCAD	25m	-5m

Summary

- The process of travelling / moving people or goods from one place to another is called transportation.
- Any quantity that we study in physics (e.g. length, mass and time) and can be measured is called physical quantity.
- In the SI unit, length is measured in meters.
- The amount of surface covered by the object is called its area SI unit of area is square metre, represented as m^2 .
- The amount of space occupied by an object is its volume SI unit of volume is the cubic metre represented as m^3 .
- An object is said to be at rest if it does not change its position with respect to its surroundings with the passage of time.
- A body is said to be in motion if its position changes continuously with respect to the surroundings (or with respect to an observer) with the passage of time.
- Types of motion are: linear, random, circular, periodic, oscillatory and combined motion.
- Motion along a straight line is known as linear motion.
- Motion that does not follow a fixed direction is called random motion.
- A motion in which a body repeats its path in the fix interval of time are called periodic motion.
- Distance is the actual path travelled by a body in a given time and the distance travelled by a body in unit time is called its speed.

CONCEPT MAP



EXERCISE >> 01**SECTION -A (FIXED RESPONSE TYPE)****MULTIPLE CHOICE QUESTIONS**

- 1._ Mode of transportation was revolutionised by the invention of
(A) bullock cart. (B) car. (C) wheels. (D) cycle.
- 2._ In which year people began the use of animals to haul their loads?
(A) 6000 BC (B) 5000 BC (C) 4000 BC (D) 3000 BC
- 3._ Long ago, people developed boats on the pattern of
(A) streamlined shape of birds. (B) streamlined shape of fish.
(C) streamlined shape of submarine. (D) elongated shape of python.
4. The fastest way to travel is :
(A) Water (B) Road (C) Air (D) Train
5. Who invented the Aeroplane ?
(A) The Wright Brothers (B) Alexander Graham Bell
(C) James Watt (D) Thomas Newcomen
6. The S.I. system of measurement is the abbreviation of
(A) International Measurement System. (B) Standard of India.
(C) International System of Units. (D) International Standard of Units
7. The S.I. unit of mass is
(A) kilogram. (B) centigram. (C) milligram. (D) tonne
- 8._ The distance between Amit's school and home is 4750 metre. This distance in kilometre is
(A) 4.75 km. (B) 47.50 km. (C) 0.475 km. (D) 475.0 km.
- 9._ One metre square is equal to
(A) 100,000 centimetre square. (B) 10,000 centimetre square.
(C) 1000 centimetre square. (D) 100 centimetre square.
- 10._ 1m^3 is equal to
(A) 1000 cm^3 . (B) $100,000\text{ cm}^3$.
(C) $10,00,000\text{ cm}^3$. (D) $100,00,000\text{ cm}^3$.
11. The SI unit of length is :
(A) Kelvin (B) Metre (C) Ohm (D) Centimetre
12. The area of rectangle is given as the product of length:
(A) Breadth (B) Side (C) Volume (D) None of these

13. 1 dm is equal to :
 (A) 1/10 m (B) 1/100 m (C) 100 m (D) none of these
14. $1 \text{ cm}^3 = \underline{\hspace{2cm}} \text{ m}^3$
 (A) 10^{-6} (B) 10^{-3} (C) 10^9 (D) 10^6
15. What is the correct ascending order ?
 (A) 1cm, 1dam, 1dm, 1m (B) 1cm, 1dam, 1m, 1dm
 (C) 1m, 1dm, 1cm, 1dam (D) 1cm, 1dm, 1m, 1dam
16. A body whose position with respect to surrounding does not change, is said to be in a state of :
 (A) Rest (B) Motion (C) Vibration (D) Oscillation
17. When a bus is passing by a standing man , then we can say that
 (A) the bus is in motion. (B) the man is in motion.
 (C) both are in motion. (D) both are at rest.
18. The revolution of moon around the earth is an example of
 (A) non-periodic. (B) curvilinear motion.
 (C) periodic motion. (D) oscillatory motion.
19. A distance is always :
 (A) shortest length between two points
 (B) path covered by an object between two points
 (C) product of length and time
 (D) none of the above
20. S.I unit of speed is :
 (A) ms (B) $\frac{\text{m}}{\text{s}}$ (C) $\frac{\text{m}}{\text{s}^2}$ (D) none of these
21. Speedometer measures :
 (A) Speed (B) Acceleration
 (C) Distance (D) Instantaneous velocity
22. Motion of the pendulum is :
 (A) Linear (B) Circular (C) Rotational (D) Oscillatory
23. Motion of a dropped stone from some height above the earth's surface :
 (A) Linear (B) Circular (C) Rotational (D) Vibrational
24. Motion of the point on blade of a moving fan :
 (A) Linear (B) Circular (C) Oscillatory (D) Vibrational

25. The motion which repeats itself after a regular interval of time :
 (A) Periodic (B) Non Periodic (C) Rotational (D) Vibrational.

FILL IN THE BLANKS

- (i)_ No trade is possible without _____ (transportation / Sun)
- (ii) The determination of the size or magnitude of something is called _____ (motion / measurement).
- (iii) One metre is equal to _____ cm. (10 / 100)
- (iv)_ SI unit of length is _____. (m^2 / m)
- (v)_ A body repeating its motion after certain interval of time is in _____ motion. (Periodic / Non Periodic)
- (vi) A moving object _____ (can / cannot) have more than one type of motion.
- (vii) A stone thrown up in the air is an example of _____ (linear / rotational) motion.
- (viii) Plucked strings of a guitar are an example of _____ (Periodic / Non Periodic) Motion.
- (ix)_ In rectilinear motion, object moves in a _____ line. (straight / zig-zag)
- (x) Motion of a child on a swing is called as _____. (Periodic / Non Periodic)
- (xi) Motion of the needle of a sewing machine is called as _____. (Oscillatory / linear)
- (xii) Motion of the wheel of a bicycle is _____. (linear / Circular)

TRUE / FALSE

- (i)_ Prehistoric people used animals to carry there loads
- (ii)_ We can measure length of curve path by beam balance.
- (iii)_ S.I system was introduced in year 1990.
- (iv)_ S.I unit of length is centimeter.
- (v) Rectilinear motion is when an object travels in the straight path.
- (vi) Km/hr, m/s, km/min, m/min, m/hr are the units of speed.
- (vii)_ Motion of earth around sun is random motion

MATCH THE COLUMN

<u>Column-1</u>	<u>Column-2</u>
(i) Unit of length	(a) Motion along straight line
(ii) Linear motion	(b) Oscillatory Motion
(iii) Unit of mass	(c) Metre
(iv) To and fro periodic motion	(d) Pound

SECTION -B (FREE RESPONSE TYPE)**VERY SHORT ANSWER TYPE**

- 1._ Define transportation
- 2._ Define physical quantities
- 3._ How will you measure the length of curved line?
4. Distinguish between the state of rest and motion.
5. What are the types of motion ?
6. Define distance along with its SI unit.
7. Define speed along with its formula & SI unit.

SHORT ANSWER TYPE

- 8._ What are the advantage of Modern means of transport?
- 9._ What are disadvantage of modern means of transport?
10. Why handspan, cubit and footstep can not be used as a standard unit ?
11. State the importance of measurements.
12. Discuss the use of divider.
- 13._ Why could you not use an elastic measuring tape to measure distance
14. The distance between Radha's home & her school is 3250 m. Express this distance in Km.
15. State the difference between circular motion & oscillatory motion with example.

LONG ANSWER TYPE

- 16._ What are the advantages of wheel?
17. What is the SI system of units & explain why such a system is needed ?
18. While measuring the length of a knitting niddle the reading of the scale at one end is 3 cm & at the other end is 33.1 cm. What is the length of the needle?
- 19._ How are the motions of a wheel of a moving bicycle and a mark on the blade of a moving electric fan different? Explain.
- 20._ While travelling in a train, it appears that the trees near the track are moving whereas co-passengers appear to be stationary. Explain the reason.
21. Write down the similarities (in motion) between :
(i) Movement of the earth about its axis and the movement of the rotating top.
(ii) The birds in the sky and fish in a pond.
22. If an object moves with the speed 18 km/hr in 20 minutes. Find the distance covered by the object in S.I unit
23. Find the speed of vijay if he covers a distance of 20 km in 0.5 hour.
24. Convert the followings
(i) 54 km/hr = ? m/s (ii) 15 m/s = ? km/hr

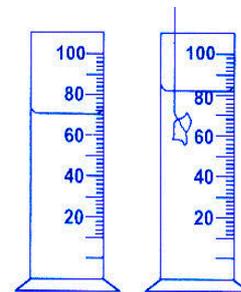
EXERCISE >> 02**SECTION -A (COMPETITIVE EXAMINATION QUESTION)****MULTIPLE CHOICE QUESTIONS**

1. Who made the first steam engine ?
(A) Thomas Newcomen (B) James watt
(C) A.Graham Bell (D) Wilbur Wright.
- 2._ Measurement means the comparison of
(A) two known quantities.
(B) two unknown quantities.
(C) an unknown quantity with all known quantities of different kind.
(D) an unknown quantity with some known quantity of same kind.
3. The smallest time measured by a wrist watch accurately is
(A) 1 milli second (B) 60 second (C) 1 second (D) 1 hour
- 4._ In five minutes, distance between a pole and a car changes progressively. What is true about the car ?
(A) Car is at rest (B) Car is in motion
(C) Nothing can be said with this information (D) None of the above

- 5._ A kite flying in the sky undergoes
 (A) translatory motion. (B) random motion.
 (C) periodic motion. (D) oscillatory motion.
6. An example of translatory motion is
 (A) a car moving on a curved path.
 (B) a ball tied to a string and whirled around.
 (C) a striker moving across a carrom board.
 (D) the child moving on a swing.
7. The motion of the arms of a soldier marching along the road is
 (A) Circular (B) Oscillatory (C) Rotatory (D) Non periodic.
- 8._ The SI unit to measure the mass of a block of wood is
 (A) kilogram (B) gram (C) centigram (D) pound
- 9._ Volume of cuboid of length, breadth and height 2m, 3m and 4m respectively in
 (A) 20 m² (B) 24 m² (C) 25 m² (D) 30 m²
- 10._ Foot, stride, fathom are the units of :
 (A) Time (B) Length (C) Mass (D) Weight
11. One centimeter is equal to
 (A) 10 km (B) 0.00001km (C) 0.01 km (D) 0.001km

Direction: Refer to the given figure and answer questions 12 and 13.

12. Given figure shows a measuring cylinder before and after the immersion of an irregular solid object. The volume of the object is :
 (A) 82 cm³ (B) 12 cm³
 (C) 30 cm³ (D) 18 cm³



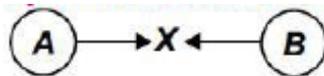
13. If the mass of the object is 36 g, the density of the object is if its, volume is 9 cm³ :
 (A) 1 g/cm³ (B) 2 g/cm³ (C) 3 g/cm³ (D) 4 g/cm³
14. Submultiple micro is equal to
 (A) 1/1000000 (B) 1/100000 (C) 1/10000000 (D) 1/1000
15. Which of the following statements is incorrect regarding the symbol used for a unit of a physical quantity ?
 (A) The symbol named after scientist should have capital letter.
 (B) They take plural forms
 (C) They can be written in full.
 (D) They should be written only in the agreed symbols.
16. In 10 minutes, a car with speed of 60 kmh⁻¹ travels a distance of :
 (A) 6 km (B) 600 km (C) 10 km (D) 7 km

SECTION -B (TECHIE STUFF)

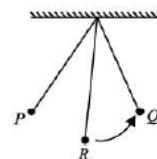
17. A kilometre has lesser magnitude than
(A) 10000 metres (B) 995 metres. (C) 990 metres (D) 1000 metres.
18. The motion of the blades of a food processor is an example of
(A) oscillatory motion (B) curvilinear motion.
(C) rotational motion (D) vibrational motion
19. Choose the incorrect statement from the following.
(A) Distance between Delhi and Hyderabad is of the order of km.
(B) Hundred centimetres make one metre.
(C) 1 tonne is equal to 106 g.
(D) A simple pendulum is used to measure the mass of a bob.
20. Which of the following statements is false?
(A) The motion of a swing is rectilinear as well as circular.
(B) A guitar shows vibratory motion.
(C) Pendulum of a clock shows oscillatory motion.
(D) A ceiling fan shows rotatory motion
21. When a drill bores a hole in a piece of wood, it describes
(i) Rotatory motion (ii) Translatory motion
(iii) Curvilinear motion (iv) Oscillatory motion
(A) (iii) & (iv) (B) (i) & (ii) (C) (i) & (iii) (D) (i) & (iv) .

EXERCISE >> 03**(PREVIOUS YEAR EXAMINATION QUESTIONS)**

1. Two identical metal balls A and B moving in opposite directions hit each other at point X as shown in the figure. Changes are most likely to be appear in their **(NSO-2012)**



1. Shapes (A) 1 and 3 only
2. Speeds (B) 2 and 3 only
3. Directions (C) 2 and 4 only
4. Volumes (D) 1, 2 and 3 only
2. A simple pendulum oscillates between point P and Q shown in figure and its time period is T. If time taken to go from R to Q is t, which of the following relation is correct? **(NSO-2013)**

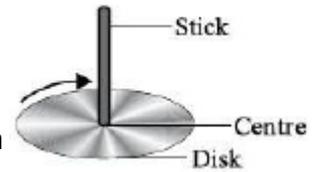


- (A) $t = T$ (B) $t = \frac{T}{2}$ (C) $t = \frac{T}{4}$ (D) $t = \frac{T}{8}$

3. A circular disk with a stick moving about its axis through the centre is shown in the figure. Which of the following type of motion is described by the stick? **(NSO-2013)**

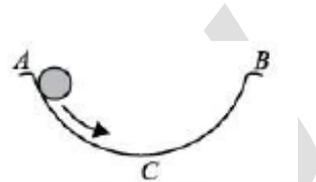
(A) Rotatory motion
(C) Rectilinear motion

(B) Periodic motion
(D) Circular motion



4. Amit rolled a small steel ball at edge A of the glass bowl as shown in the figure. Which of the following statement is true about the situation if there is no friction between the surfaces of the ball and the bowl? **(NSO-2013)**

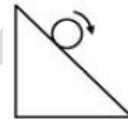
(A) The ball will roll out of the glass bowl near edge B.
(B) It will keep moving between point A and B and will never stop.
(C) It will not move at all since friction is required for movement.
(D) It will stop at centre point C.



5. A ball is rolling down on an inclined plane as shown in the figure. Which type of motion, the ball is undergoing? **(NSO-2013)**

(A) Circular and linear
(C) Rotational and linear

(B) Periodic and rotational
(D) Translatory only



6. Match the following using the most convenient unit **(NSO-2013)**

Column-I

(a) One rupee coin
(b) Cricket field
(c) Paddy field
(d) Country

Column-II

1. m^2
2. Hectare
3. km^2
4. cm^2

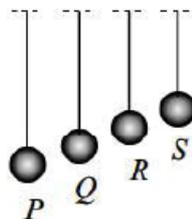
(A) a-2, b-4, c-1, d-3
(C) a-3, b-4, c-1, d-2

(B) a-4, b-1, c-2, d-3
(D) a-1, b-2, c-3, d-4

7. Consider the motion of the tip of the minute hand of a clock. In one hour **(NSO-2014)**

(A) The distance covered is zero
(B) The displacement is zero
(C) The average speed is zero
(D) None of these

8. There are four pendulums as shown in the given figure. Which of the following pendulums has the longest time period? **(NSO-2014)**



(A) P

(B) Q

(C) R

(D) S

9. Match the Column-I with Column-II and mark the correct option. **(NSO-2014)**

Column - I

(a) 300 mm
(b) 300 cm
(c) 300 m
(d) 300 km

Column - II

(i) 3 m
(ii) 30 cm
(iii) 300000 m
(iv) 30000 cm

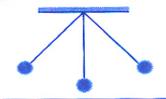
(A) (a)-(iv) (b)-(i) (c)-(iii) (d)-(ii)
(C) (a)-(ii) (b)-(i) (c)-(iii) (d)-(iv)

(B) (a)-(ii) (b)-(i) (c)-(iv) (d)-(iii)
(D) (a)-(i) (b)-(ii) (c)-(iii) (d)-(iv)

10. Which of the following pairs relating different units are incorrect ? **(NSO-2015)**
 (i) 10 cm = 1 dm (ii) 20 m = 2000 km
 (iii) 30 mm = 30000 cm (iv) 40 m = 400 dm
 (A) (i) and (ii) (B) (ii) and (iii) (C) (iii) and (iv) (D) (i) and (iv)

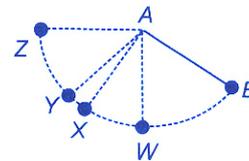
11. Match the column I with column II and select the correct option from the given codes **(NSO-2015)**

- (a) (b) (c)
 (A) (i), (iii) (ii), (iii) (i), (ii)
 (B) (i), (ii) (i), (iii) (ii), (iii)
 (C) (i), (ii) (i), (ii) (ii), (iii)
 (D) (ii), (iii) (i), (ii) (i), (iii)

	Column I		Column II
(a)		(i)	Circular Motion
(b)		(ii)	Periodic Motion
(c)		(iii)	Oscillatory Motion

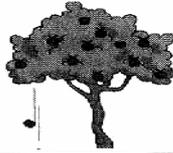
12. A pendulum bob pivoted at point A, starts swinging from point B. Assuming that there is no loss of energy to the surroundings, at which position will the bob next come to a momentary rest ? **(NSO-2015)**

- (A) W (B) X (C) Y (D) Z



13. What causes a moving body to resist a change in its state of motion ? **(NSO-2015)**
 (A) Its acceleration (B) Its speed (C) is inertia (D) Its weight

14. Match column-I with column-II and select the correct option. **(NSO-2016)**

	Column-I		Column-II
(i)		(a)	Rectilinear motion
(ii)		(b)	Oscillatory motion
(iii)		(c)	Curvilinear motion
(iv)		(d)	Rotatory motion

- (A) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a) (B) (i) - (c), (ii) - (a), (iii) - (d), (iv) - (b)
 (C) (i) - (d), (ii) - (a), (iii) - (b), (iv) - (c) (D) (i) - (d), (ii) - (b), (iii) - (a), (iv) - (c)

ANSWER KEY >>

EXERCISE # 1

**SECTION -A (FIXED RESPONSE TYPE)
MULTIPLE CHOICE QUESTIONS**

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13
Ans.	C	B	B	C	A	C	A	A	B	C	B	A	A
Ques.	14	15	16	17	18	19	20	21	22	23	24	25	
Ans.	A	D	A	A	C	B	B	A	D	A	B	A	

FILL IN THE BLANKS

- (i) Transportation (ii) Measurement (iii) 100 (iv) Metre
- (v) Periodic motion (vi) Can (vii) Linear (viii) Periodic motion
- (ix) Straight (x) Periodic motion (xi) Oscillatory (xii) Circular

TRUE/FALSE

- (i) True (ii) False (iii) False (iv) False
- (v) True (vi) True (vii) False

MATCH THE COLUMN

- | | |
|--|---|
| <p>Column 'A'</p> <ul style="list-style-type: none"> (i) Unit of length (ii) Linear motion (iii) Unit of mass (iv) To and fro periodic motion | <p>Column 'B'</p> <ul style="list-style-type: none"> (c) Metre (a) Motion along straight line (d) Pound (b) Oscillatory Motion |
|--|---|

SECTION -B (FREE RESPONSE TYPE)

- 18. 30.1cm 22. 6km 23. $40 \frac{\text{km}}{\text{h}}$ 24. (i) $15 \frac{\text{m}}{\text{s}}$ (ii) $54 \frac{\text{km}}{\text{h}}$

EXERCISE # 2

**(COMPETITIVE EXAMINATION QUESTION)
MULTIPLE CHOICE QUESTIONS**

Ques.	1	2	3	4	5	6	7	8	9	10	11	12
Ans.	A	D	C	B	B	C	B	A	B	B	B	B
Ques.	13	14	15	16	17	18	19	20	21			
Ans.	D	A	C	C	A	C	C	A	B			

EXERCISE # 3

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9
Ans.	B	C	A	B	B	B	B	A	B
Ques.	10	11	12	13	14				
Ans.	B	C	C	C	B				

MATTER & ITS SEGREGATION

Terminologies

Pure Substance, Mixture, Homogeneous Mixture, Heterogeneous Mixtures, Handpicking, Threshing, Winnowing, Sieving, Magnetic Separation, Sublimation, Sedimentation and Decantation, Loading, Filtration, Evaporation, Condensation, Centrifugation, Separating Funnel, Saturated Solution, Unsaturated Solution, Supersaturated Solution, Crystallisation, Fractional Distillation.

INTRODUCTION

There are a large number of things around us which we see and feel. For example, we can see a book in front of us. A book occupies some space. The space occupied by the book is called its volume. If we pick up the book, we can also feel its weight. So, we conclude that the book has some mass. We cannot see the air around us, yet if we fill a balloon with air and then weigh it carefully, we will find that not only does air occupy space (bounded by the balloon), but it also has mass.

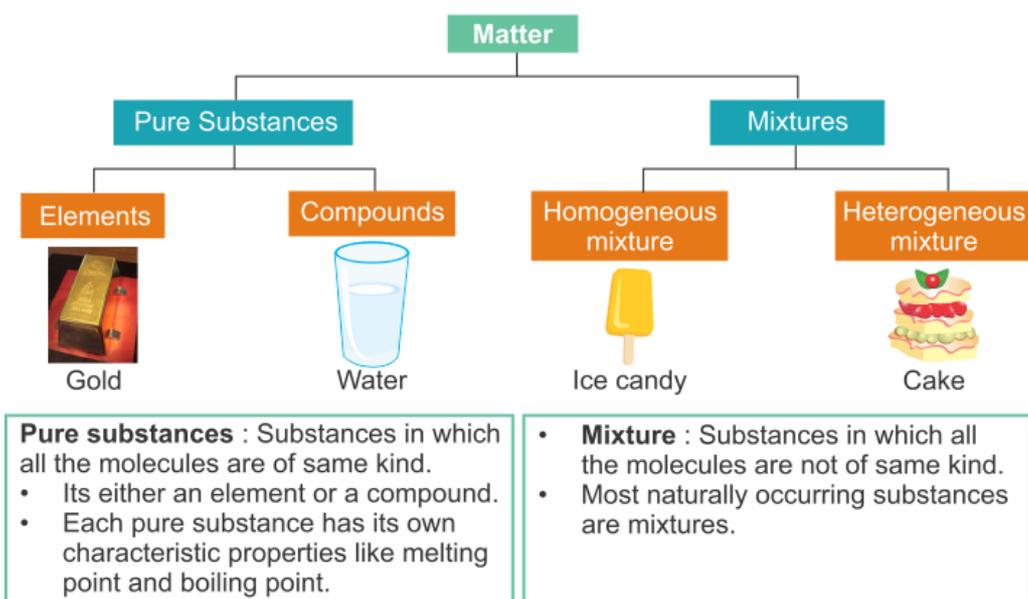
1.1 CLASSIFICATION OF MATTER

Matter Anything that has mass and occupies space is called matter.

- (i) Making it simpler, all materials or substances are made up of matter.
- (ii) All matter is made up of tiny particles like atoms or molecules.

Classification is the grouping together of things that are similar to each other in some of their properties. For instance, if we are given some items like pencil, chalk, skirt, blouse, ink, shirt, pen, trousers, we would group or classify the similar items as follows.

Pure Substances and Mixed Substances



Types of mixtures :

There are essentially two types of mixture- Homogeneous and Heterogeneous

Homogeneous mixture :

If we mix a spoonful of salt in a glass of water, we cannot see the particles of salt with our naked eye as they get uniformly dissolved in water. The first sip taste as salty as the last sip.

“Mixtures that have the same uniform composition throughout are called homogeneous mixtures.” Some examples of homogeneous mixture are salt mixed in water, juice, tea, and air.

Heterogeneous mixture :

If you take a spoonful of sand and mix it in one glass of water, the particles are visible and settle down when left undisturbed for some time. **“Mixtures are called heterogeneous mixtures as they do not have a uniform composition throughout”**. Some examples of heterogeneous mixture are mud mixed in water, mixture of oil and water, and soil.



Particles are uniformly dissolved in water

Homogeneous mixture-tea



Particles are not uniformly dissolved in water

Heterogeneous mixture-mud in water

Ask yourself _____



- 1._ How can we conclude that air is a matter?
- 2._ Explain why cold cannot be considered as matter ?
- 3._ What do you mean by pure substance?
- 4._ Explain how mixture of salt and water is homogeneous mixture ?
- 5._ Explain heterogeneous mixture with two example ?

1.2 SEPARATION OF THE COMPONENTS OF A MIXTURE

It is sometimes essential to separate the constituents of a mixture. For example, one has to remove impurities from water, to make it fit for drinking. Tea leaves are separated from tea by using a strainer. Gardeners remove stones from the soil. Stones and husk are removed from rice before cooking.

Need of Separation :

- ☆ To obtain two different but useful components of a mixture (e.g., butter is a useful component which is separated from milk by churning).
- ☆ To remove harmful components or impurities of a mixture (e.g., small pieces of stones and husk are separated from rice or dal before cooking).
- ☆ To remove useless components of a mixture (e.g., tea leaves are separated from tea).

Method of Separation :

Large number of substances available in nature are mixed with certain other substances. Thus, in order to use them we separate them by various methods. Separation can be done on the basis of difference in physical properties like weight, size, magnetic property, solubility, melting point & boiling point.

(a) Separation of Two or More Solid Mixture

Solid constituents of a mixture can be easily separated if there is a marked difference in their size or colour. Other physical properties such as magnetic nature or solubility in a particular solvent are also helpful. The following techniques can be used to separate the constituents of a mixture of solid.

(i) Handpicking :

This method can be used when the components of the mixture differ in size, shape, or colour and are present in small quantities. In this method, the components of the mixture are separated by hand. For example, stones can be removed from rice by handpicking.

**(ii) Threshing :**

The process that is used to separate grain from stalks is threshing. In this process, the stalks are beaten to free the grain seeds. Sometimes, threshing is done with the help of bullocks. Machines are also used to thresh larger quantities of grain.



Activity -1

Aim : To separate components of a mixture of two or more solids

Materials required : Dals of different colours.

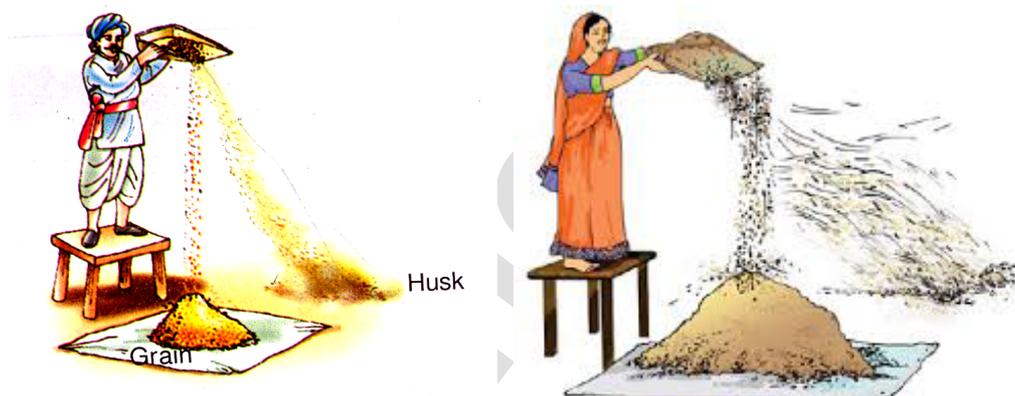
Procedure : Bring about one tablespoonful each of different dals (yellow, green, black, pink, etc.) to the class. Mix them in bowl. Now, try to separate the different dals. Were you able to separate them ? How did you do that ?

Conclusion : We can separate a mixture of different coloured dals by hand.

(iii) Winnowing :

Winnowing is used to separate heavier and lighter components of a mixture by wind or by blowing air. This method is commonly used by farmers to separate lighter husk particles from heavier seeds of grain.

The husk particles are carried away by the wind. The seeds of grain get separated and form a heap near the platform for winnowing. The separated husk is used for many purpose such as fodder for cattle.

**(iv) Sieving :**

In a flour mill, impurities like husk and stones are removed from wheat before grinding it. Usually, a bagful of wheat is poured on slanting sieve. Sieving removes pieces of stones, stalk and husk that may still remain with wheat after threshing and winnowing.

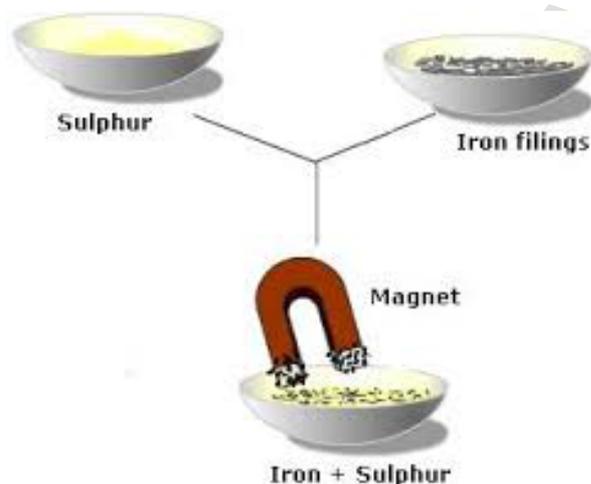
Similar sieves are used at construction sites to separate pebbles and stones from sand.



(v) Magnetic Separation :

A mixture of solid can be separated by magnetic separation if one of the constituents of the mixture is a magnetic substance, that is it can be attracted by a magnet.

In an iron ore, iron metal is separated from the non-magnetic impurities using the method of magnetic separation. Since iron particles are magnetic in nature, they are attracted by a magnet and collected on one side. The impurities are left behind and form a separate pile. Let us perform the following activity to separate a mixture of iron filings and sand using a magnet.

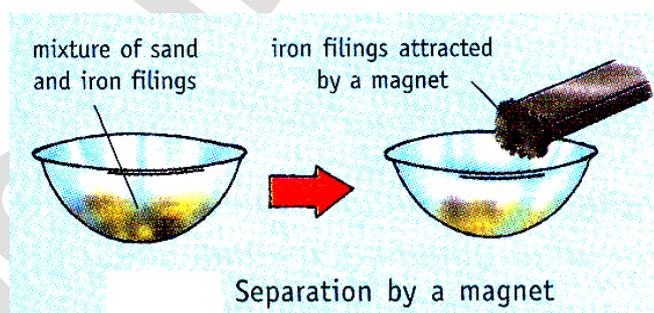
**Activity -2**

Aim : To separate components of a mixture of two or more solids

Material required : Bowl, iron filling, sand, magnet bar.

Procedure :

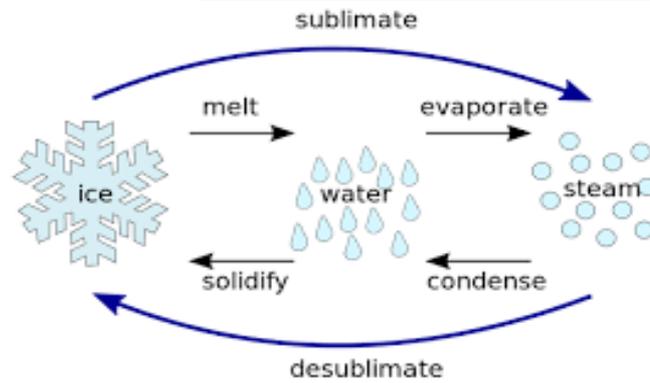
Take a bowl and mix some sand and iron filings in it. Now take a magnet bar and roll it gently over the mixture. The iron filing will be attracted by the magnet. Brush the iron filings off the magnet and collect them separately. Repeat this procedure several times till there are no more iron filing left in the original mixture



Conclusion : We can separate a mixture of different magnetic element.

(vi) Sublimation :

This technique of separation of a mixture of solids can be used if one of the constituents of the mixture sublimates, that is, on heating, it changes directly to gaseous state without passing through the liquid state. Substances that sublime are iodine, camphor, naphthalene, ammonium chloride and dry ice. A mixture of ammonium chloride and sodium chloride can be separated by sublimation.



Process of sublimation of ice and water

(b) Separation of Insoluble Solid in Liquids

Solids such as chalk powder, sand and dust particles are insoluble in water. Particles of such type can be separated from their solutions using one of the following methods –i) sedimentation and decantation, ii) filtration, and iii) loading.

(i) Sedimentation and Decantation :

Sometimes, it may not be possible to separate components of a mixture by winnowing and hand-picking. For example, there may be lighter impurities like dust or soil particles in rice or pulses. Rice or pulses are usually washed before cooking. When you add water to these, the impurities like dust and soil particles get separated. These impurities go into water, which becomes a little muddy.

When the heavier component in a mixture settles after water is added to it, the process is called **sedimentation**. When the water (along with the dust) is removed, the process is called **decantation**.

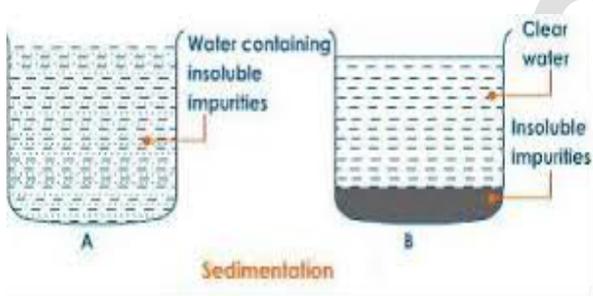


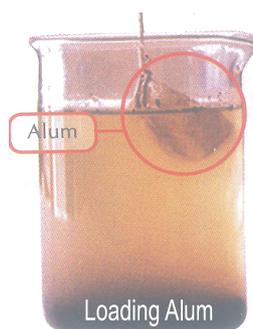
fig. Sedimentation



fig. Decantation

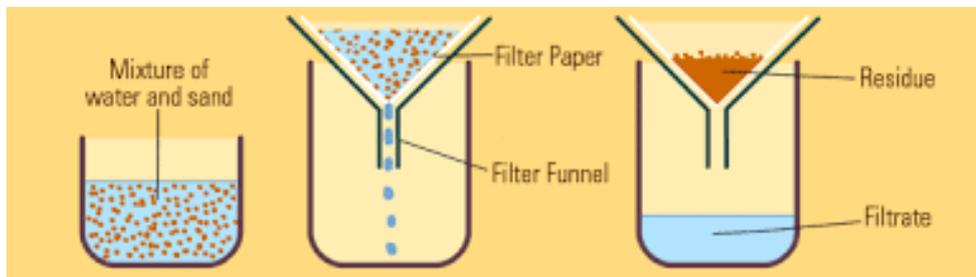
(ii) Loading :

This method is used to separate very fine particle of an insoluble solid that remains suspended in a liquid. Due to their tiny sizes, their sedimentation takes a very long time. Loading is commonly used to get clear water from such dirty water. Loading is method in which a special substance called alum is used to load the suspended particles to make them heavy and increase their sedimentation speed.



(iii) Filtration :

The process of separation of insoluble solids from their solutions using a filter is called **filtration**. The filter allows the liquid to pass through and retains the solid particles. The filter used may be a filter paper, a fine muslin cloth, or a fine mesh. The solid particles retained by the filter form the **residue**. The clear liquid collected after the filtering process forms the **filtrate**. The strainer, used to remove tea leaves from tea, is an example of a filter.

**ACTIVITY-3**

Aim : To separate the mixture of insoluble solids in liquids by sedimentation and decantation.

Materials Required : Six test tubes, sand, rice, dal, water, test tube stand.

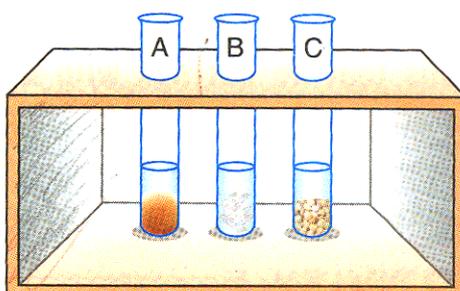
Procedure : Take three test tubes and make these mixtures.

- * Mixture of sand in water (Test tube A)
- * Mixture of rice in water (Test tube B)
- * Mixture of dal in water (Test tube C)

Observe whether sand, rice and dal have settled down in the respective test tubes. Now, separate sand from water by slowly tilting test tube A and pouring the water into another test tube, without disturbing the sand. Repeat the activity with test tubes B and C.

Observation : The three mixtures obtained are mixtures of insoluble solids in liquids. Sand, rice and dal settle down in the respective test tubes. They are separated from water by slowly tilting the test tube. The water obtained by separating the mixture of sand and water is not absolutely clear. Small particles of sand can be seen floating in it.

Conclusion : A mixture of insoluble solid in a liquid can be separated by sedimentation and decantation.



(c) Separation of Soluble Solid in Liquids**(i) Evaporation :**

The process of conversion of water into its vapour below its boiling point is called evaporation. The process of evaporation takes place continuously wherever water is present.

Sea water contains many salts mixed in it. One of these salts is the common salt. When sea water is allowed to stand in shallow pits, water gets heated by sunlight and slowly turns into water vapour, through evaporation. In a few days, the water evaporates completely leaving behind the solid salts. Common salt is then obtained from this mixture of salts by further purification.



The story of salt
Seawater has salt dissolved in it.



To obtain salt, seawater is collected in shallow pits and allowed to stand.



Sun's heat evaporates the water. Salt, which is left behind, is collected.

**(ii) Condensation :**

Have you ever noticed that water drops condense under the metal lid that has been used to cover a vessel containing just boiled vegetables or milk ?

It is because the hot milk or vegetables give out water vapour. These vapour on coming in contact with relatively cold metal lid liquify to form droplets of water. This process of changing water vapour into the liquid state on cooling is called condensation.

Ask yourself

- 1._ Define the terms handpicking and threshing by giving examples.
- 2._ How a mixture of iron filling and sulphur powder can be separated?
- 3._ Which property among ammonium chloride and sodium chloride is different ?

- 4._ Give two examples of solids which are soluble and insoluble in water.
- 5._ Why water droplets are seen on the surface of water bottle containing cold water ?

1.3 OTHER SPECIAL TECHNIQUES

○ Centrifugation :

Centrifugation is a technique used to speed up sedimentation of fine particles suspended in a solid-liquid mixture.

The principle of centrifugation is that an object, when spun at high speed, experiences an outward force away from the centre of rotation.

The mixture is placed in a centrifuge tube. When this tube is rotated at high speed in a centrifuge machine, the solid particles move towards the bottom of the centrifuge tube. The liquid on top (supernatant liquid) can be poured off and in this way the solid particles are separate from the mixture.

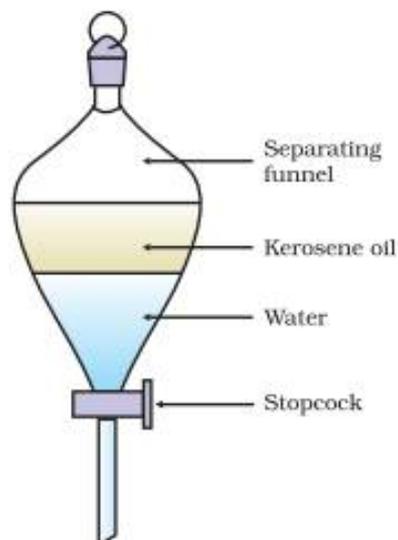
Visit a nearby dairy, and observe the process of obtaining cream by churning of milk. The technique of centrifugation is used in this process.



Centrifugation

○ Separating funnel :

The separation of two immiscible liquids is based on the difference in their densities. The apparatus used for separation is separating funnel. It is a long glass tube provided with a tap at its bottom.





Ask yourself _____

- 1_. Define the principle of centrifugation technique.
- 2_. Write two application of centrifugation technique.
- 3_. Why separating funnel is not implemented for separation of two miscible liquid ?
- 4_. Among mixture of benzene and water identify the bottom layer and top layer in separating funnel.
- 5_. How the mixture of benzene, water and mercury can be separated ?

1.4 CAN WATER DISSOLVE ANY AMOUNT OF A SUBSTANCE

Many substances dissolve in water and form a solution. The solution made in water are called **aqueous solutions**.

Activity : Pour half a cup of water in the beaker. Add one teaspoonful of salt and stir it well, until the salt dissolve completely. Again add a teaspoonful of salt and stir well. Go on adding salt, one teaspoonful at a time and stir.

After adding a few spoons of salt, we find that some salt remains undissolved and settles at the bottom of the beaker. This means that no more salt can be dissolved in the amount of water we have taken. The solution is now said to be **saturated**.

Now, add a small quantity of salt to this saturated solution and heat it.

We find that now salt dissolves in it. Such solution which contains more amount of substances dissolved in it than required to form a saturated solution is called **super saturated solution**. Let this hot solution cool. We notice that salt appear to settle at the bottom of the beaker again.

A solution that contains less amount of solute than required to form a saturated solution is called an **unsaturated solution**.

Ask yourself _____



- 1_. Explain the term solute and solvent.
- 2_. Give an example of non-aqueous solution.
- 3_. What is difference between unsaturated and super saturated solution ?
- 4_. Write the difference between saturated and unsaturated solution.
- 5_. How will you find that the solution is super saturated ?



● CRYSTALLISATION

The process by which an impure compound is converted into its crystals is known as crystallisation. This is based upon the principle that when a crystal is formed, it tends to exclude the impurities which remain in the solution.

Advantages of crystallisation over evaporation : Crystallisation is a better technique than evaporation to purify a solid because of the following reasons :

(i) During evaporation, the solution is heated to dryness. During this heat treatment, some solids may decompose or some solids, like sugar, may get charred.

(ii) Both for evaporation or crystallisation the solution of the impure solid is prepared in water or any other suitable solvent. This solution is then filtered to remove insoluble and suspended impurities. However some soluble impurities may still be present even after filtration. Therefore, when such a solution is evaporated, the impurities get deposited along with the solid and thus contaminate the solid. In contrast, when the solution is allowed to stand for crystallisation, crystals of the pure solid separate out leaving the impurities in the solution.

● FRACTIONAL DISTILLATION

The process of separating two miscible liquids from one another by heating them at controlled temperature. Petrol, diesel, kerosene etc., are obtained by this process from petroleum which is a mixture of all these constituents.

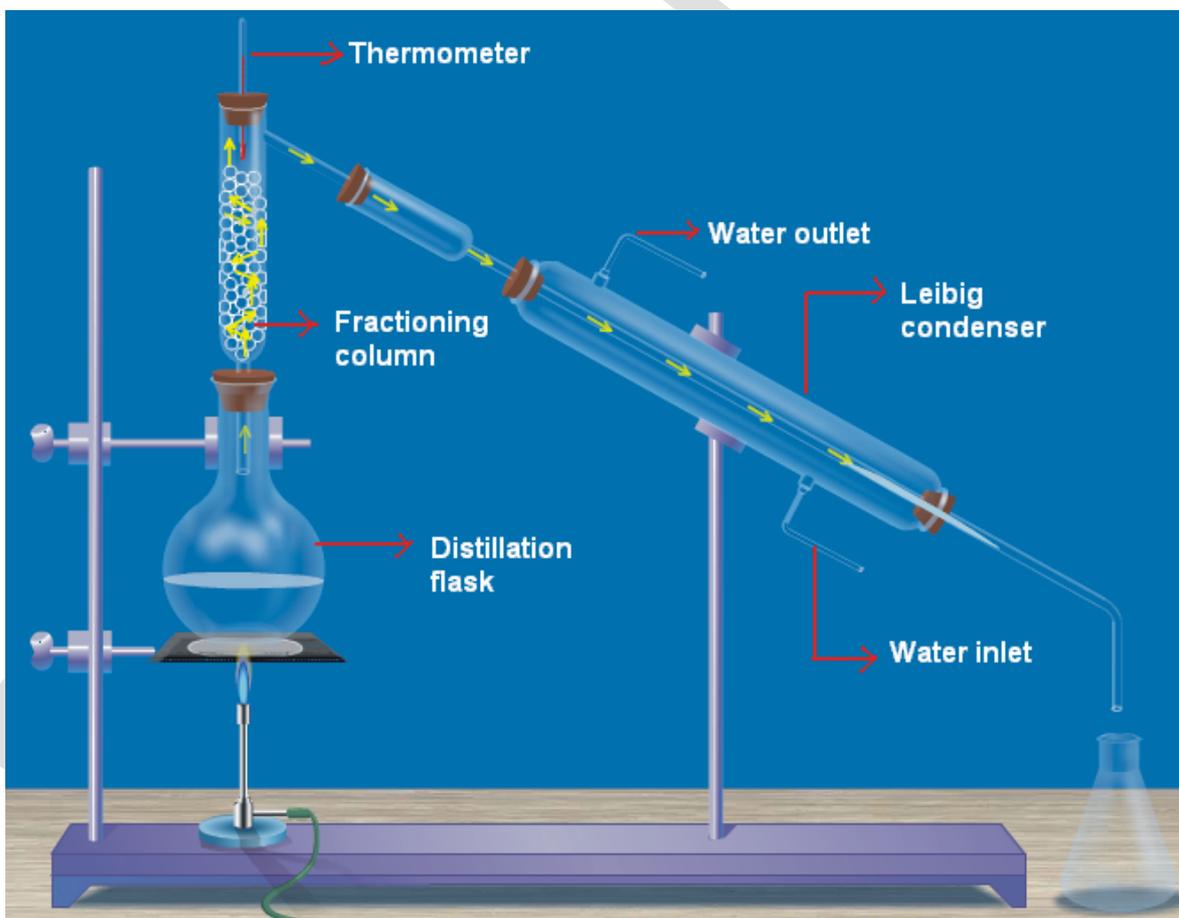
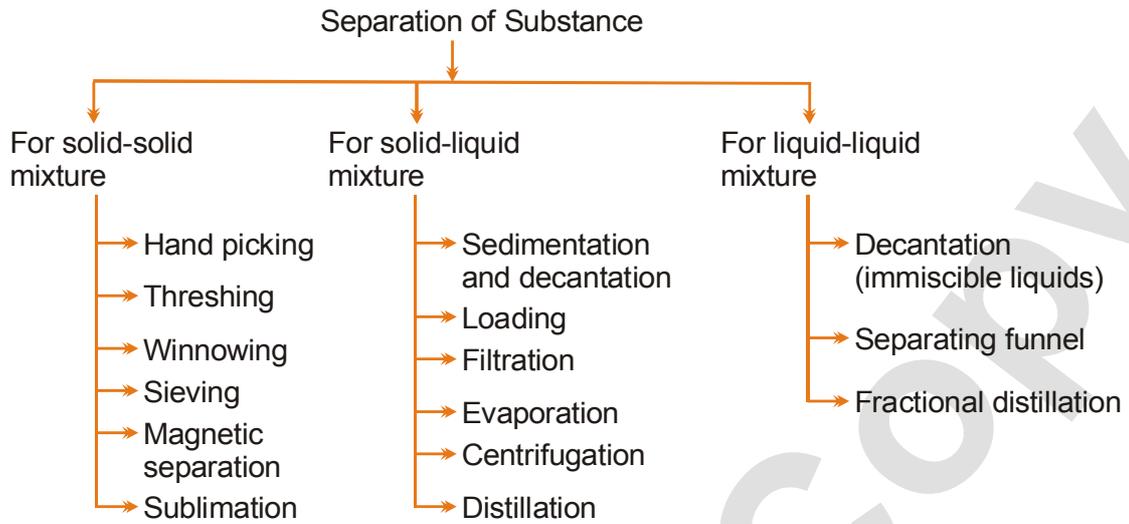


Figure : Fractional distillation

Summary

- Classification is the grouping together of things that are similar to each other in some of their properties.
- Mixtures that have the uniform composition throughout are called homogeneous mixtures.
- Mixtures that have non-uniform composition throughout are called heterogeneous mixtures.
- Difference in size, colour, magnetic nature or solubility in a particular solvent are used for separation.
- Handpicking is the process of separating solids by hand. Stones can be removed from rice by handpicking.
- Threshing is the process of separating grains from stalks by hitting them against hard surface. Machines are also used to thresh larger quantities of grain.
- Winnowing is the process of separating grain from the husk.
- Sieve is a metal plate with holes, used for removing solids particles of different sizes. Sieves are used at construction sites to separate pebbles and stones from sand.
- Substances that sublime are iodine, camphor, naphthalene, ammonium chloride and dry ice (solid CO_2).
- Decantation is the process of transferring (pouring out) a clear liquid (after sedimentation), without disturbing the sediment (insoluble heavy particles).
- Loading is the process of increasing the rate of sedimentation in a suspension, by adding chemicals, such as alum. Loading is commonly used to get clear water from dirty water.
- Filtration is the process of separating the insoluble suspended solids of various sizes from a suspension by using a filter. The strainer used to remove tea leaves from tea, is an example of a filter.
- Evaporation is the process of converting a liquid into its vapour, by heating it below the boiling point of the liquid.
- Condensation is the process by which water vapour change into the liquid state on cooling.
- The technique of centrifugation is used to obtain cream from milk.
- Separating funnel is a type of funnel provided with a tap, used for separating two immiscible liquids.
- A solution in which no more amount of solute can be dissolved is called a saturated solution.
- A solution that contains less amount of solute than required to form a saturated solution is called an unsaturated solution.
- A solution that contains more amount of solute than required to form a saturated solution is called a super saturated solution.

CONCEPT MAP



EXERCISE >> 01**SECTION -A (FIXED RESPONSE TYPE)****MULTIPLE CHOICE QUESTIONS :**

- 1._ Which of the following is/are element -
(A) Iron (B) Silver (C) Oxygen (D) All of these
- 2._ Which among the following is homogeneous mixture -
(A) Sand and water (B) Chalk powder and water
(C) Oil and water (D) None of these
- 3._ Homogeneous mixture -
(A) Have uniform composition
(B) Do not have uniform composition
(C) May or may not have uniform composition
(D) None of these
- 4._ Pure substance are those substances -
(A) Made of only one kind of particles (B) Cannot be separated by physical process
(C) Can be separated by physical process (D) Both (A) and (B)
5. Handpicking method can be used for separating mixture of -
(A) sugar powder and salt (B) red and blue coloured balls of different size
(C) oil and water (D) milk and cream
6. Technique used to separate grains from stalks is -
(A) hand picking (B) threshing (C) winnowing (D) sieving
7. The method used to separate heavier and lighter components of a mixture is –
(A) hand picking (B) threshing
(C) winnowing (D) sieving
8. Grain and husk can be separated by –
(A) hand picking (B) threshing (C) winnowing (D) sieving
9. Sieving is used to -
(A) separate impurities from wheat (B) separate pebbles and stones from sand
(C) separate impurities from flour (D) All of these
10. Mixture of salt and iron powder is separated by -
(A) hand picking (B) magnetic separation
(C) sieving (D) churning
11. Alum is used in-
(A) loading (B) filtration
(C) evaporation (D) distillation

12. The process used for separating constituents while preparing fruit juice is -
 (A) condensation (B) evaporation (C) threshing (D) filtration
13. The difference between sieving and filtration is of -
 (A) size of particles (B) phase of particles
 (C) density (D) None of these
14. We can obtain sugar from sugar solution by -
 (A) sedimentation (B) evaporation (C) filtration (D) decantation
15. Salt is obtained from sea water by the process of -
 (A) filtration (B) winnowing
 (C) evaporation (D) decantation
16. The steam when comes in contact with cold surface, converts in water. The process is called -
 (A) evaporation (B) condensation (C) sublimation (D) melting
17. Cream is separated from milk by _____ and tea leaves are separated from tea by _____.
 (A) filtration, decantation (B) winnowing, filtration
 (C) decantation, filtration (D) decantation, decantation
18. The mixture of sand, salt and water can be separated by—
 (A) sublimation (B) filtration
 (C) distillation (D) (B) followed by (C)
- 19._ The spinner in washing machine dries clothes works on the principle of :
 (A) Evaporation (B) Sedimentation
 (C) Filtration (D) Centrifugation
- 20._ Two immiscible liquids are separated by :
 (A) Evaporation (B) Winnowing
 (C) Filtration (D) Separating funnel
- 21._ After centrifugation when sublimate settles clear liquid
 (A) can be allowed to rest (B) can be allowed to form crystals
 (C) can be decanted off (D) can be evaporated
22. A solution is prepared by dissolving sodium chloride in water. It is called -
 (A) nonaqueous solution (B) aqueous solution
 (C) alcoholic solution (D) heterogeneous solution
23. When more quantity of salt is added to saturated solution of salt, then it :
 (A) settles down at the bottom of the container
 (B) remains suspended in the solution
 (C) starts evaporating
 (D) reacts with the solvent (water)
- 24._ Solubility depends on:
 (A) temperature (B) solute (C) both (A) and (B) (D) none of these

FILL IN THE BLANKS

1. A _____ substance has only one kind of matter.
2. The composition and properties of a _____ mixture is uniform throughout.
3. An _____ is a homogeneous mixture of two or more metals.
4. Chalk powder added in water is an example of a _____ .
5. When the heavier component in a mixture settles after water is added to it, the process is called _____ .
6. Camphor is separated from common salt by _____
7. _____ (Grains/Leaves) can be separated from stalk using threshing.
8. Corn is separated from husk by the process _____ .
9. Simplest way of separating broken rice from whole rice is _____ .
10. A _____ cannot dissolve more of a given substance at a given temperature.

TRUE / FALSE

1. A mixture of milk and water can be separated by filtration.
2. A mixture of powdered salt and sugar can be separated by the process of winnowing.
3. Separation of sugar from tea can be done with filtration.
4. Grain and husk can be separated with the process of decantation.

MATCH THE COLUMN

- | | |
|---|---|
| <p>1. Column A</p> <ol style="list-style-type: none"> 1. Separation of mixture of sand and water 2. Rice and suji 3. Two immiscible liquid 4. Process of making sedimentation of dust particles faster. 5. Milk, ink and pickle | <p>Column B</p> <ol style="list-style-type: none"> a. sieving b. example of mixture c. oil and vinegar d. filtration e. loading |
| <p>2. Match the following</p> <ol style="list-style-type: none"> 1. Stone and rice 2. Water and rice 3. Water and oil 4. Sand and Sawdust | <ol style="list-style-type: none"> a. Decantation b. Hand picking c. Winnowing d. Filtration |

SECTION -B (FREE RESPONSE TYPE)**VERY SHORT ANSWER TYPE**

1. How can you decide whether a substance is pure or not ?
2. What type of mixtures can be separated by filtration ?
3. Can a mixture of salt and sugar be separated by filtration ?
4. Name the apparatus that can be used to separate a mixture of mustard oil and water ?
5. What are aqueous solutions ?

SHORT ANSWER TYPE

6. Give any four example of mixtures found on a kitchen shelf.
7. Why do we need to separate different components of a mixture ?
8. Why is loading used to separate suspended impurities ?
9. What is evaporation ? How is it useful to us ?
10. Name any two methods, which are used to separate:
(a) Solid-solid mixtures (b) Liquid-solid mixtures

LONG ANSWER TYPE

11. Why is salt a pure substance whereas salt solution is considered to be a mixture ?
12. Name and describe briefly a method which can be helpful in separating a mixture of husk from grains. What is the principle of this method?
13. Draw a well-labelled diagram for the setup used for filtration. Explain its working.
14. Name the method of separation that can be used in the following situations.
(a) Accidental mixing of mustard oil and water.
(b) Adulterated urad dal having papaya seeds in it.
(c) You visit a village where the water drawn from the well is not transparent.
(d) If you find that your bhel puri has large number of cut green chillies.
15. Differentiate between each of the following pairs :
(a) Homogeneous and heterogeneous solutions
(b) Pure and mixed substances
(c) Solute and solvent
(d) Sedimentation and decantation
16. Lemonade is prepared by mixing lemon juice and sugar in water. You wish to add ice to cool it. Should you add ice to the lemonage before or after dissolving sugar ? In which case would it be possible to dissolve more sugar ?

EXERCISE >> 02**SECTION -A (COMPETITIVE EXAMINATION QUESTIONS)****MULTIPLE CHOICE QUESTIONS :**

- Solutions are :
(A) heterogeneous mixtures (B) compounds
(C) homogeneous mixtures (D) elements
- Winnowing is the method used to separate :
(A) chaff from grain (B) stones from rice
(C) oil from water (D) salt from sand
- During filtration the substance left behind on the filter paper is called :
(A) distillate (B) filtrate (C) sublimate (D) residue
- A mixture of sand and water can be separated using :
(A) threshing (B) sedimentation (C) winnowing (D) sieving
- Loading is a process in which :
(A) impurities become heavy and sink to the bottom
(B) impurities float on the top
(C) impurities vaporize
(D) none of these
- Fractional distillation is used to separate liquids having an appreciable difference in their :
(A) size and shape (B) solubility (C) boiling points (D) none of these
- The constituents of a mixture are present in :
(A) a fixed ratio (B) a variable ratio (C) the ratio of 2 : 1 (D) none of these
- How can a saturated solution be made unsaturated?
(A) by increasing temperature (B) by adding more amount of solvent
(C) Both (A) and (B) (D) by decreasing temperature
- The methods of separating components of a given mixture are based on the :
(A) physical properties and state of the components
(B) colour of the components only
(C) state of the components
(D) none of these
- Pickout the mixtures from the following list :
(A) gold (B) a salt solution (C) silver (D) copper

SECTION -B (TECHIE STUFF)**CONCEPTUAL QUESTIONS**

- Why crystallisation is a better technique than evaporation ?
- Explain why fractional distillation but not simple distillation is used to separate a mixture of two miscible liquids whose boiling point differ by about 25°C.
- The boiling point of liquid oxygen and liquid nitrogen are -183°C and -196°C respectively. Which will evaporate first, liquid oxygen or liquid nitrogen ?

EXERCISE >> 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. Observe the given figures carefully.

[NSO 2013]



Process X



Process Y

Identify X and Y respectively.

- (A) Decantation, Sieving (B) Sieving, Decantation
(C) Winnowing, Threshing (D) Threshing, Winnowing

2. Kanya has a material X whose molecules are separated by large distances or spaces. Nidhi has a material Y which takes the shape of its container. Gagan has a material Z which has no definite volume.

Which of the three materials is/are in gaseous state ?

[NSO 2013]

- (A) X (B) Y (C) Both X and Y (D) Both X and Z

3. When a block of ice is dropped gently into a glass of juice, the liquid level in the glass rises. We can conclude from this observation that the block of ice _____ . [NSO 2013]

- (A) Occupies space (B) Has a fixed mass
(C) Can be compressed (D) Has a definite shape

4. Ritika mixed lemon juice with water to prepare lemonade. She added ice to cool it. After adding a few spoons of sugar to this solution, she found that _____ sugar can be dissolved. The solution is now said to be _____. This is because _____ amount of sugar dissolves in water on _____. [NSO 2013]

- (A) More, pure, high, heating (B) Less, saturated, low, heating
(C) Large, impure, more, cooling (D) No more, saturated, less, cooling

5. Ravi wrote two terms 'X' and 'Y' about a solution.

[NSO 2013]

'X' means 'no more will dissolve'.

'Y' means 'how much will dissolve'

- (A) Insoluble, Amount (B) Saturated, Solubility
(C) Solubility, Volume (D) Insolubility, Saturated

6. Heat from the Sun changes water from liquid to gas. This change of state is called _____

[NSO 2013]

- (A) Evaporation (B) Saturation (C) Distillation (D) Condensation

7._ Fill in the blanks by choosing the correct option. A mixture contains different substances P, Q and R, P is a liquid which is insoluble in water. Q particles are small and soluble while R particles are small, heavy and insoluble in water. Substance P is separated from the mixture by _____. Substance R is separated from the mixture by _____. Substance Q is recovered from water by _____.

[NSO 2013]

- (A) Hand picking, magnetic separation, decantation
- (B) Decantation, filtration, evaporation
- (C) Winnowing, decantation, filtration
- (D) Sieving, hand picking, decantation

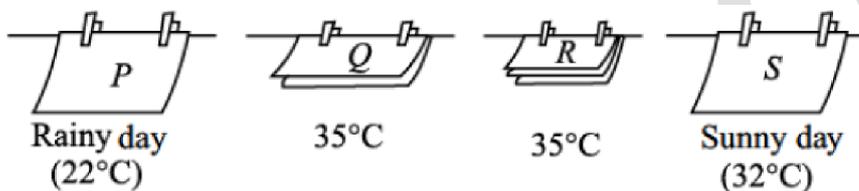
8._ Which of the following mixtures cannot be separated by the method of winnowing ?

[NSO 2014]

- (A) Kidney beans and chick peas
- (B) Potato wafers and biscuits
- (C) Rice flakes and corns
- (D) Sawdust and sand

9._ Four identical towels were hung out to dry under different conditions.

[NSO 2014]

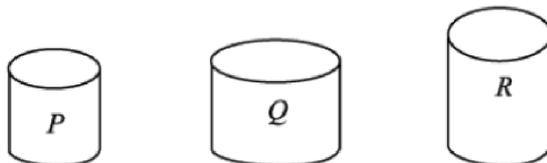


Arrange them in order, beginning with the towel that would take the longest time to dry.

- (A) P, Q, R, S
- (B) P, R, Q, S
- (C) R, P, Q, S
- (D) S, Q, R, P

10._ Ritu has 500 cm³ of oxygen in a small tank and she wants to transfer all of it to another container. Which of the following containers would be able to hold all the oxygen gas ?

[NSO 2014]



Volume = 250 cm³ Volume = 400 cm³ Volume = 550 cm³

- (A) R only
- (B) Q and R
- (C) P, Q and R
- (D) None of these

11._ A mixture of four different powders is taken in a petri dish. The properties of the powders are listed below in the table.

[NSO 2014]

Powder	Colour	Soluble in water	Magnetic in nature	Conductor of electricity
1	Grey	No	Yes	Yes
2	Blue	Yes	No	Yes
3	White	Yes	No	No
4	White	No	No	No

Which pair of substances would be most difficult to separate ?

- (A) 2 and 4
- (B) 2 and 3
- (C) 3 and 4
- (D) 1 and 2

12._ Match the Column-I with Column-II and select the correct option from the codes given below :
[NSO 2014]

Column-I

Mixture

- a. Flour and Iron powder
- b. Pulses and Rice flour
- c. Kidney bean and Lady's fingers
- d. Coconut oil and water
- e. Sugar dissolved in water

- (A) a-iv, b-i, c-ii, d-iii, e-v
- (C) a-v, b-iii, c-iv, d-ii, e-i

Column-II

Method

- i. Decantation
- ii. Evaporation
- iii. Hand picking
- iv. Sieving
- v. Magnet

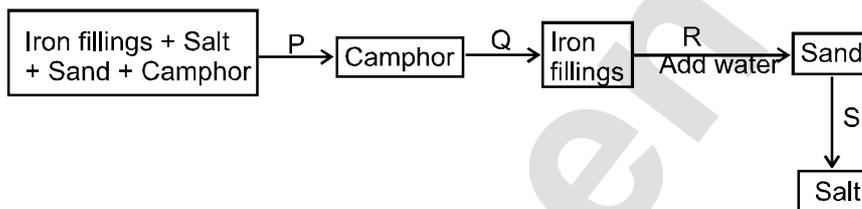
- (B) a-i, b-ii, c-iv, d-v, e-iii
- (D) a-v, b-iv, c-iii, d-i, e-ii

13._ Identify the incorrect statements from the following :

[NSO 2014]

- (A) Interparticle distance is more in gas
- (B) Solid has definite shape and volume
- (C) Ice is heavier than water
- (D) Matter can be changed from one form to another

14. Study the given flowchart and identify the processes P,Q,R and S involved in the separation of the mixture :
[NSO 2015]



- (A) P-Sublimation; Q-Magnetic separation; R-Filtration; S-Evaporation
- (B) P-Magnetic separation; Q-Filtration; R-Sublimation; S-Evaporation
- (C) P-Evaporation; Q-Magnetic separation; R-Filtration; S-Sublimation
- (D) P-Sublimation; Q-Magnetic separation; R-Evaporation; S-Filtration

15. A mixture contains three different substances X, Y and Z. They are of same size and colour. X particles are heavy and nonmagnetic, Y particles are light and nonmagnetic while Z particles are magnetic. Which of the following methods can be used to separate these particles ?
[NSO 2015]

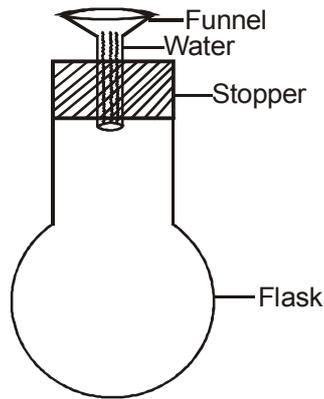
- (A) Handpicking followed by filtration
- (B) Winnowing followed by magnetic separation
- (C) Magnetic separation followed by sieving
- (D) Sublimation followed by distillation

16. Which of the following is correctly matched ?
[NSO 2015]

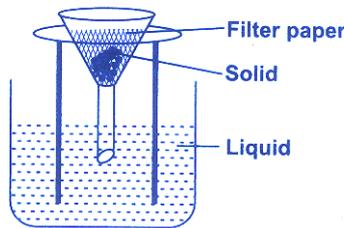
- i. No more salt can be dissolved -Saturated solution.
- ii. Milk and water can be separated by-Filtration.
- iii. To separate heavier and lighter components-Winnowing
- iv. To obtain butter from milk- Sieving

- (A) i and iii
- (B) ii and iv
- (C) i, iii, and iv
- (D) All of these

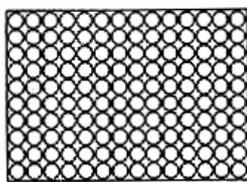
17. A funnel is fitted into a stopper that closes the mouth of a flask as shown in the given diagram. Virag wants to fill the flask with water but water does not flow in when it is poured into the funnel. This is because _____ . [NSO 2015]



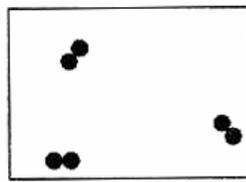
- (A) The air pressure inside the flask is lower than the pressure of water in funnel.
 (B) The space in the flask is occupied by air.
 (C) The funnel is too small for water to flow through.
 (D) The mouth of the flask is not sealed tightly enough.
18. The given diagram shows a method by which a solid can be separated from solid-water mixture. Which one of the following could be that solid ? [NSO 2015]



- (A) Salt (B) Sugar (C) Sand (D) Ice crystals
19. The given diagrams represent two elements: [NSO 2016]



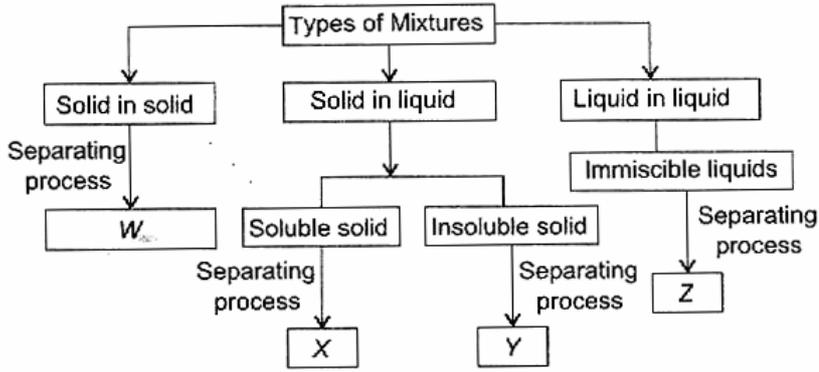
Element X



Element Y

- Which of the following statements is true about X and Y?
- (A) Particles of element X can move freely in all directions.
 (B) Element Y is incompressible in nature.
 (C) Element X is a solid and element Y is a gas.
 (D) Element X is less denser than element Y

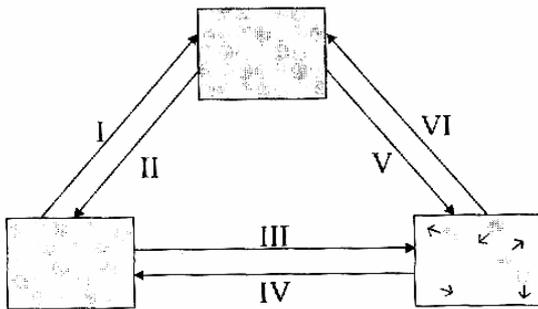
20._ Substances W, X, Y and Z are obtained from different types of mixtures by using appropriate separating processes as shown in the given flowchart : [NSO 2016]



Separating processes used to obtain W, X, Y and Z respectively are

- (A) Winnowing, filtration, sedimentation and evaporation
- (B) Sedimentation, winnowing, filtration and separating funnel
- (C) Handpicking, sedimentation, winnowing and evaporation
- (D) Sieving, evaporation, filtration and separating funnel.

21._ The given diagram describes the changes that take place between different states of matter : [NSO 2016]



The processes in which energy is given out are

- (A) I and III only
- (B) I, IV and V only
- (C) I, II and IV only
- (D) None of these.

22._ Sonali mixed a packet of salt in a small amount of sand and then tried to recover the salt by the usual processes of sedimentation, decantation or filtration followed by evaporation. To her surprise, she could recover only a small part of the salt that she had taken. The possible reasons could be [NSO 2016]

- I. Salt also got evaporated along with water.
 - II. The quantity of salt was much more than that required to form a saturated solution.
 - III. The undissolved salt remained mixed with sand
 - IV. The quantity of water taken was insufficient to dissolve all the salt.
- (A) II and III only
 - (B) I and IV only
 - (C) II, III and IV only
 - (D) All of these

ANSWER KEY >>

EXERCISE # 1

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE ANSWERS :

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	D	A	D	B	B	C	C	D	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	A	D	B	B	C	B	C	D	D	D
Que.	21	22	23	24						
Ans.	C	B	A	C						

FILL IN THE BLANKS

- | | |
|------------------|--------------------------|
| 1. Pure | 2. Homogeneous |
| 3. Alloy | 4. Heterogeneous mixture |
| 5. Sedimentation | 6. Sublimation |
| 7. Grains | 8. Winnowing |
| 9. Sieving | 10. Saturated solution |

TRUE / FALSE

1. False 2. False 3. False 4. False

MATCH THE COLUMN

1. 1-d, 2-a, 3-c, 4-e, 5-b 2. 1-b, 2-d, 3-a, 4-c

EXERCISE # 2

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	A	D	B	A	C	B	C	A	B

EXERCISE # 3

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	D	D	A	D	B	A	B	A	B	C	B	D	C	A	B
Que.	16	17	18	19	20	21	22								
Ans.	A	B	C	C	D	D	C								

Terminologies

Natural Numbers, whole numbers, predecessor, successor, face value, place value, indian system , international system , estimation , roman numerals

INTRODUCTION :

Knowing our numbers help us in counting objects in large numbers and representing them through numerals. Numbers help in communicating through suitable number names and to count concrete objects

We use numbers and know many things about them. We can also add ,subtract, multiply and divide them. Looking for patterns in numbers, finding the greatest and smallest numbers or the place value and face value of a digit and many other interesting things regarding numbers were also studied.

1.1 NUMBERS**(a) Natural Numbers :**

Look at the picture and answer these questions :

1. How many birds are there ?
2. How many persons are there ?
3. How many trees are there ?

The answer to these questions are respectively 1, 2 and 3.

But what are 1,2,3 ? They are symbols representing the first three counting numbers.

Counting numbers are called **natural numbers**.

Thus 1, 2, 3, 4, 5, 6, etc ., are all natural numbers.

**(b) Whole Numbers :**

All natural numbers together with 0 (zero) are called **whole numbers**.

Thus, 0, 1, 2, 3, 4, etc., are whole numbers.

Clearly, every natural number is a whole number but every whole number is not a natural number as 0 is a whole number which is not a natural number.

(c) Predecessor- Successor of a Number :**Predecessor :**

Predecessor is 1 less than the given number.

For Ex. : Predecessor of 59028 is 59027.

Successor :

Successor is 1 more than the given number.

Successor of 9999 is 10000.

(d) Comparison of Numbers :

(a) Greater number has more number of digits.

(b) To compare two numbers having same number of digits, start comparing from the left most position. If the leftmost digits are equal, move to the next digits.

Illustration 1.1

Which is greater of 270346 and 48356?

Sol. 270346 has 6 digits

48356 has 5 digits

6 digits are more than 5 digits

\therefore 270346 is greater than 48356

or $270346 > 48356$

Greater number has more number of digits

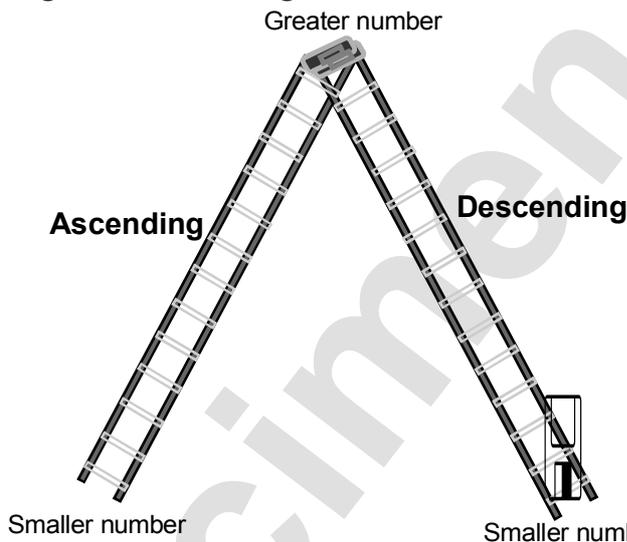
Illustration 1.2

Find the greatest and the smallest numbers from the following group of numbers :

23787, 6895, 24569, 24659

Sol. Greatest number : 24659

Smallest number : 6895

Ascending And Descending Order :

Ascending order – arrangement of numbers from smallest to largest

Descending order – arrangement of numbers from largest to smallest

Illustration 1.3

Arrange the following numbers in ascending order : 257536, 38952, 385081, 365062

Sol. The smallest number is 38952. Other numbers greater than 38952, in order are 257536, 365062 and 385081.

\therefore The numbers in ascending order are :
38952, 257536, 365062, 385081

Illustration 1.4

Arrange the following numbers in descending order : 19710, 887151, 453212, 925473

Sol. The greatest number is 925473. Other numbers smaller than 925473 in order are 887151, 453212 and 19710.

\therefore The numbers in descending order are :
925473, 887151, 453212, 19710

(e) Face value and Place Value:

The basis of the number system is place value. It is the place value which gives value to the number.

→ **Definition :**

Face value of a digit in a numeral is the value of the digit itself at whatever place it may be.

Place value of a digit in a given number is the value of the digit because of the place or the position of the digit in the number.

Place-value of a digit = Face-value of a digit \times value of the place

Place value and Face Value :

Every digit has two values – the place value and the face value. The face value of a digit does not change while its place value changes according to its position and number.

Number	Digit	Face Value	Place Value
53,694	5	5	50,000
	3	3	3,000
	6	6	600
	9	9	90
	4	4	4

(f) Expanded Form :

If we express a given number as the sum of its place value, it is called its expanded form.

Illustration 1.5

Express

(i) 3,64,029 (ii) 2,75,00,386 in expanded form.

Sol. Place value of 3 = 3×100000

Place value of 6 = 6×10000

Place value of 4 = 4×1000

Place value of 0 = 0×100

Place value of 2 = 2×10

Place value of 9 = 9×1

\therefore The expanded form of 3,64,029 is

$$3 \times 100000 + 6 \times 10000 + 4 \times 1000 + 0 \times 100 + 2 \times 10 + 9 \times 1$$

Likewise, the expanded form of 2,75,00,386 is

$$2 \times 10000000 + 7 \times 1000000 + 5 \times 100000 + 0 \times 10000 + 0 \times 1000 + 3 \times 100 + 8 \times 10 + 6 \times 1$$

Let us take a number, for example: 2,45,13,768.

C	TL	L	T-Th	T	H	T	O
2	4	5	1	3	7	6	8

Here the place value of 2 is 2,00,00,000 (two crore).

The place value of 4 is 40,00,000 (forty lakh).

The place value of 5 is 5,00,000 (five lakh).

The place value of 1 is 10,000 (ten thousand).

The place value of 3 is 3000 (three thousand)

The place value of 7 is 700 (seven hundred).

The place value of 6 is 60 (sixty).

The place value of 8 is 8 (eight).

In words : Two crore forty-five lakh thirteen thousand seven hundred sixty-eight.

In figures : 2, 45, 13, 768

$$\begin{aligned} \text{In expanded notation : } & 2,00,00,000 + 40,00,000 + 5,00,000 + 10,000 + 3,000 + 700 + 60 + 8 \\ & = 2 \times 1,00,00,000 + 4 \times 10,00,000 + 5 \times 1,00,000 + 1 \times 10,000 + 3 \times 1000 + 7 \times 100 + 6 \times 10 + 8 \times 1 \end{aligned}$$

Illustration 1.6

Write the following in expanded form and write the place value of the digit 3 in each case.

- (a) 6307825 (b) 80930090

Sol. (a) $6307825 = 6000000 + 300000 + 7000 + 800 + 20 + 5$
 Place value of 3 is 300000

(b) $80930090 = 80000000 + 900000 + 30000 + 90$
 Place value of 3 is 30000

Illustration 1.7

Write the short form of $8000000 + 60000 + 500 + 30 + 9$

Sol.	T-L	L	T-Th	Th	H	T	O
	8	0	0	0	0	0	0
			6	0	0	0	0
					5	0	0
						3	0
							9

Number = 8 0 6 0 5 3 9

(g) Indian & International System Of Numeration

Suppose a newspaper report states that Rs.2500 crore has been allotted by the government for National Highway construction. The same amount of Rs.2500 crore is sometimes expressed as Rs. 25 billion. In the Indian system, we express it as Rs. 2500 crore and in the International system, the same number is expressed as 25 billion. Hence we need to understand both the systems and their relationship.

INDIAN SYSTEM OF NUMBERS

Crores		Lakhs		Thousands		Ones		
Ten Crore	One Crore	Ten Lakh	One Lakh	Ten Thousand	One Thousand	One Hundred	Ten	One
10,00,00,000 9 Digits	1,00,00,000 8 Digits	10,00,000 7 Digits	1,00,000 6 Digits	10,000 5 Digit	1,000 4 Digits	100 3 Digits	10 2 Digits	1 1 Digit

INTERNATIONAL SYSTEM OF NUMBERS

Billions			Millions			Thousands			Ones		
Hundred Billion	Ten Billion	One Billion	Hundred Million	Ten Million	One Million	Hundred Thousand	Ten Thousand	One Thousand	One Hundred	Ten	One
100,000,000,000 12 Digits	10,000,000,000 11 Digits	1,000,000,000 10 Digits	100,000,000 9 Digits	10,000,000 8 Digits	1,000,000 7 Digit	100,000 6 Digits	10,000 5 Digits	1,000 4 Digits	100 3 Digit	10 2 Digit	1 1 Digit

(i) Reading and Writing of Numbers :

In Indian System of numbers, we divide the given number into periods starting from the right. The first, period called units period consists of 3 digits while each of the next periods called thousands period, lakhs period, crores period respectively consists of 2 digits. Each period is separated by a comma (,).

In International System of Numbers we make groups of 3 digits starting from right and separate each group by using a comma (,).

Now consider the six digit number 764325. In the Indian system, the number 7 is in the place of lakh and therefore the number is named as seven lakh sixty-four thousand three hundred twenty-five. It is written as 7,64,325. In the International system, this number is named as seven hundred sixty-four thousand three hundred twenty-five and is written as 764,325. The first three digits form the right-hand side are considered as ones, i.e., 325 ones and the next three digits to the left of the digit 3 are considered as thousands, i.e. 764 thousands.

Illustration 1.8

Write the name of the numbers according to Indian system of numeration .

- (a) 1275834 (b) 30870209

- Sol.** (a) 12,75,834 = Twelve lakh seventy five thousand eight hundred thirty four
 (b) 3,08,70,209 = Three crore eight lakh seventy thousand two hundred nine

Illustration 1.9

Write the name of the number according to International system of numeration.

- (a) 7452283 (b) 48049831 (c) 699985102

- Sol.** (a) 7452283 = 7,452,283 = Seven million four hundred fifty two thousand two hundred eighty three.
 (b) 48049831 = 48,049,831 = Forty eight million forty nine thousand eight hundred thirty one.
 (c) 699985102 = 699,985,102 = Six hundred ninety nine million nine hundred eighty five thousand one hundred two.

(h) Making Numbers**(i) Making number without repetition of digits :**

In case of non-repetition of digits, it is better if we start making the number from left.

Illustration 1.10

Write the greatest and the smallest 5-digit numbers by using each of the digits 8, 4, 7, 0, 2 only once.

- Sol.** For the greatest number, we write the greatest digit 8 in the T-thousands column. Next smaller digit in the thousands column and so on.
 \therefore The greatest number = 87420.

T-Th	Th	H	T	O
8	7	4	2	0

For the smallest number, we write the smallest digit in the T-thousands column. But here 0 is the smallest digit. 0 is not written on the extreme left of a number. So, we write 2 in the T-thousands column and 0 in the thousands column. Next digit greater than 2 is written in the hundreds column and so on.

\therefore The smallest number = 20478

T-Th	Th	H	T	O
2	0	4	7	8

Illustration 1.11

Make the greatest and the smallest 5-digit numbers using any five different digit with 4 in the tens place.

Sol. First of all write 4 in the tens column. For the greatest number, we write the greatest digit 9 in the T-thousands column, next smaller digit in the thousands column so on.

T-Th	Th	H	T	O
9	8	7	4	6

∴ The greatest number = 98746

For the smallest number also, write 4 in the tens column first of all. Then write 0 in the thousands column. Write 1 in the T-thousands column. Next greater digit in the hundreds column and so on.

∴ The smallest number = 10243

T-Th	Th	H	T	O
1	0	2	4	3

(ii) Making number with repetition of digits :

In case of repetition of digit, it is better if we start making number from right.

Illustration 1.12

Write the greatest and smallest numbers of 4 digits using all the digits 8,0, 5.

Sol. For greatest number, select the smallest digit 0 and write in the ones column. Next greater digit is written in the tens column. Next greater digits 8 is written in the hundreds column. Since no digit greater than 8 given, so we repeat 8 in the thousands column.

Th	H	T	O
8	8	5	0

Greatest Number

∴ The greatest number = 8850

For smallest number, select the greatest digit 8 and write in the ones column. Next smaller digit in tens column and so on. Repeat the smallest digit in the end. But here 5 is smaller than 8 and then comes 0 which cannot be repeated in the end.

So, we write 5 in the end and repeat 0 in the tens place.

Th	H	T	O
5	0	0	8

Smallest Number

∴ The smallest number = 5008

NOTE:

- i. For greatest number, greatest digit is repeated.
- ii. For smallest number, smallest digit is repeated.



Ask yourself

1. Subtract the successor of 99 from the predecessor of 201.
2. Arrange the following in ascending order : 1345, 87654, 98845, 10034, 2453
3. Write the expanded form of the following :
(a) 87609 (b) 900376
4. How many millions make 3 crores ?
5. Write the number 999999998 in the Indian system in numeral form and in words.
6. Form the largest and smallest 4-digit number using digits 9,3,0 , 1.
7. What is the smallest 3-digit number which does not change if digits are written in reverse order.

1.2 ESTIMATION

You must have come across news headlines involving large numbers. For example, '50,000 people participated in the marathon.' '5 lakh people gathered for a dip in the Ganges.'

We also see and read news about disasters, strikes, bandhas, etc. For example, '80 crore rupees lost due to the fire.'

'9 lakh people evacuated.'

'The loss due to bandh is 1 crore.'

The numbers mentioned above do not represent the exact number of people or rupees. They are only speaking of a nearest value.

Rounding up off numbers is an approximation. This means that when we speak of 50,000 people, what we really mean is the crowd was between 45,000 and 55,000.

This rounding up helps us to get approximate answers in addition, subtraction, multiplication and division.

Suppose Rs.3847 and Rs.8348 are the costs of a DVD player and a T.V., respectively. If a friend asked you how much you paid for these two items, you need not to add the correct value of each. You can say that it costs you around Rs. 12,000. When we are cooking for a party, the approximate number of people expected for the party, and the approximate quantity of each item required per person are considered. Similarly, the quantity of things to be purchased for a party, the amount of cement to be purchased to construct a wall, the amount of paint to be bought to paint a house are all approximations.

(a) Estimating (Rounding) to the Nearest Ten :

To round off a number to the nearest ten consider the ones digit. If the ones digit is 5 or greater than 5, then change the ten's digit to the next higher digit and ones digit to zero. If the ones digit is less than 5, then leave the tens digit unchanged but change the ones digit to zero.

(b) Estimating (Rounding) to the Nearest Hundred :

To round off a number to the nearest hundred, consider the tens digit. If the ten's digit is 5 or greater than 5, then change the hundreds digit to the next higher digit and tens, ones digits to zeros. If the tens digit is less than 5, then leave the hundreds digit unchanged but change the tens and ones digits to zeros.

(c) Estimating (Rounding) to the nearest Thousand :

To round off a number to the nearest thousand, consider the hundreds digit. If this digit is 5 or greater than 5, then change the thousands digit to the next higher digit and change all the other digits before that to zeros. If the hundreds digit is less than 5, then leave the thousands digit unchanged but change all the other digits before that to zeros.

(d) Estimation in Sums or Differences :

Illustration 1.13

Estimate and compare with the actual sum

(a) $730 + 998$ **(b)** $12904 + 2888$

Sol. (a) We round off to the nearest hundred

700
+ 1000
<hr/>
1700

730 is rounded off to 700

998 is rounded off to 1000

Estimated sum = 1700

Actual sum = $730 + 998$

$= 1728$

Estimation is quite reasonable.

(b) We round off to the nearest thousand

12904 is rounded off to 13000

2888 is rounded off to 3000

Estimated sum = 16000

Actual sum = $12904 + 2888 = 15792$

12904
+ 2888
<hr/>
15792

Estimation is quite reasonable

Illustration 1.14

Give a rough estimate and also a close estimate of $439 + 334 + 4317$

Sol. Rough estimate : $400 + 300 + 4000 = 4700$

For closer estimate, we round off to the nearest hundred

439 is rounded off to 400

334 is rounded off to 300

4317 is rounded off to 4300

Closer estimated sum = 5000

400
300
+ 4300
<hr/>
5000

Illustration 1.15

Estimate $8325 - 491$

Sol. If we round off to thousand, we get

8325 rounds off to 8000

491 rounded off to 0

Estimated difference = $8000 - 0 = 8000$

This does not give a reasonable difference, so we round off to the nearest hundred.

8325 rounds to 8300

491 round to 500

Estimated difference = 7800

This is reasonable estimation.

(e) Estimation in Products :

While estimating in products, we adopt the following rules :

(i) Round each factor to its greatest place, in other words, if a factor contains 2 digits, round it off to the nearest ten and if it contains 3 digits, then round it off to the nearest hundred and so on.

(ii) Do not round off any 1-digit factor.

Illustration 1.16

Estimate the following products :

(a) 87×313 (b) 9×795

(c) 898×785

- Sol.** (a) 87 is rounded off to 90
313 is rounded off to 300
 \therefore Estimated product = $90 \times 300 = 27000$
- (b) 9 is not rounded off [\therefore it is a one-digit no.]
795 is rounded off to 800
 \therefore Estimated product = $9 \times 800 = 7200$
- (c) 898 is rounded off to 900
785 is rounded off to 800
 \therefore Estimated product = $900 \times 800 = 720000$

(f) Estimation in Quotients :

In the process of estimation in quotients, we round off the dividend and the divisor before the process of division.

Illustration 1.17

Estimate the following quotients :

(a) $81 \div 17$ (b) $7525 \div 365$

- Sol.** (a) 81 is rounded to 80
17 is rounded to 20
To get the estimated quotient think of dividing 80 by 20 or 8 by 2.
 \therefore Estimated quotient = $\frac{8}{2} = 4$
- (b) 7525 is rounded to 8000
365 is rounded to 400
To get the estimated quotient think of dividing 80 by 4.
 \therefore Estimated quotient = 20

Illustration 1.19

The population of Rajasthan is 5,64,73,122, of Goa is 13,43,998 and of Karnataka is 5,27,33,958. What is the combined population of the three states.

Sol. Population of Rajasthan = 5,64,73,122

Population of Karnataka = 5,27,33,958.

Population Goa = 13,43,998

\therefore Total population of three states = 5,64,73,122 + 13,43,998 + 5,27,33,958 = 11,05,51,078

i.e. Eleven crore five lakh fifty one thousand seventy eight.

Illustration 1.20

What must be added to 34,52,629 to make it equal to 6 crore.

Sol. 6 crore = 6,00,00,000

\therefore required number = 6,00,00,000 – 34,52,629 = 5,65,47,371

Illustration 1.21

There are 785 students on roll in a residential public school. If the annual fee per student is Rs. 62,606. What is the total fee collected annually by the school.

Sol. Annual fee of one student = Rs. 62,606

Number of student = 785

\therefore Total annual collection of fee = Rs. 62,606 \times 785 = Rs. 4,91,45,710

Illustration 1.22

Find the number of pages in a book which has on an average 207 words on a page, and contains 201411 words altogether.

Sol. Number of pages = $201411 \div 207 = 973$

Thus, the number of pages in the book = 973

Ask yourself



- 1._ India's population has been steadily increasing from 439 millions in 1961 to 1028 millions in 2001. Find the total increase in population from 1961 to 2001. Write the increase in population in Indian System of Numeration, using commas suitably.
- 2._ In 2001, the populations of Tripura and Meghalaya were 3,199,203 and 2,318,822, respectively. Write the populations of these two states in words.
- 3._ Out of 180000 tablets of Vitamin A, 18734 are distributed among the students in a district. Find the number of the remaining vitamin tablets.
- 4._ Chinmay had Rs 610000. He gave Rs 87500 to Jyoti, Rs 126380 to Javed and Rs 350000 to John. How much money was left with him ?
- 5._ A factory has a container filled with 35874 litres of cold drink. In how many bottles of 200 ml capacity each can it be filled ?
- 6._ A box contains 50 packets of biscuits each weighing 120g. How many such boxes can be loaded in a van which cannot carry beyond 900kg ?
- 7._ A merchant has 120 litres of oil of one kind, 180 litres of another kind and 240 litres of a third kind. He wants to sell the oil by filling the three kinds of oil in tins of equal capacity. What should be the greatest capacity of such a tin ?

1.4 ROMAN NUMERALS

One of the earliest systems of writing numerals is the Roman Numeral system. This system is still in use in many places. For example, some faces of clocks show hours in Roman numerals; we use Roman numerals to write numbered list; etc.

Unlike the Hindu-Arabic numeral system, Roman numeral system uses seven basic symbols to represent different numbers. The symbols are as follows :

I = 1, V = 5, X = 10, L = 50, C = 100

D = 500, M = 1000

(a) Rules To Form Roman Numerals :

We can form different Roman numerals using the symbols and the following rules.

Rule-1 If a symbol is repeated one after the other, its value is added as many times as it occurs. For example

$$III = 1 + 1 + 1 = 3$$

$$XX = 10 + 10 = 20$$

Rule-2 The symbols I, X, C and M can be repeated up to a maximum of three times. For example

$$I = 1,$$

$$II = 2,$$

$$III = 3$$

$$X = 10,$$

$$XX = 20,$$

$$XXX = 30$$

$$C = 100,$$

$$CC = 200,$$

$$CCC = 300$$

$$M = 1000,$$

$$MM = 2000,$$

$$MMM = 3000$$

Rule-3 The symbols V, L and D (i.e., 5, 50, and 500 respectively) can never be repeated in a Roman numeral.

Rule-4 If a symbol with a smaller value is written on the right of a symbol with a greater value, then its value is added to the value of the greater symbol. For example

$$XII = 10 + 2 = 12,$$

$$LX = 50 + 10 = 60,$$

$$DCCCX = 500 + 300 + 10 = 810$$

Rule-5 If a symbol with a smaller value is written on the left of a symbol with a larger value, then its value is subtracted from the value of the greater symbol. For example,

$$IV = 5 - 1 = 4, IX = 10 - 1 = 9, CD = 500 - 100 = 400,$$

$$VI = 5 + 1 = 6, XI = 10 + 1 = 11, DC = 500 + 100 = 600$$

Rule-6 The symbols V, L and D are never written to the left of a symbol of greater value i.e. V, L and D are never subtracted

The symbol I can be subtracted from V and X only.

The symbol X can be subtracted from L, M and C only.

The symbol C can be subtracted from D and M only.

Rule-7 If a bar is placed over a numeral, it is multiplied by 1000.

$$\bar{V} = 5000, \bar{L} = 50000$$

Illustration 1.23

Write the Roman Numerals

- (a) 105 (b) 213 (c) 4592 (d) 5839
- Sol.** (a) $105 = 100 + 5 = CV$ (b) $213 = 200 + 10 + 3 = CCXIII$
- (c) $4592 = \overline{IV} DXCII$ (d) $5839 = \overline{V} DCCCXXXIX$

Illustration 1.24

Write in Hindu Arabic numerals:

- (a) CXXXV (b) CXLI (c) \overline{VI} CMXXI (d) \overline{XL} I CCVI
- Sol.** (a) $CXXXV = C + XXX + V = 100 + 30 + 5 = 135$
- (b) $CXLI = C + XL + I = 100 + 40 + 1 = 141$
- (c) \overline{VI} CMXXI = \overline{VI} + CM + XX + I = $6000 + 900 + 20 + 1 = 6921$
- (d) \overline{XL} I CCVI = \overline{XL} I + CC + VI = $41000 + 200 + 6 = 41,206$

Ask yourself

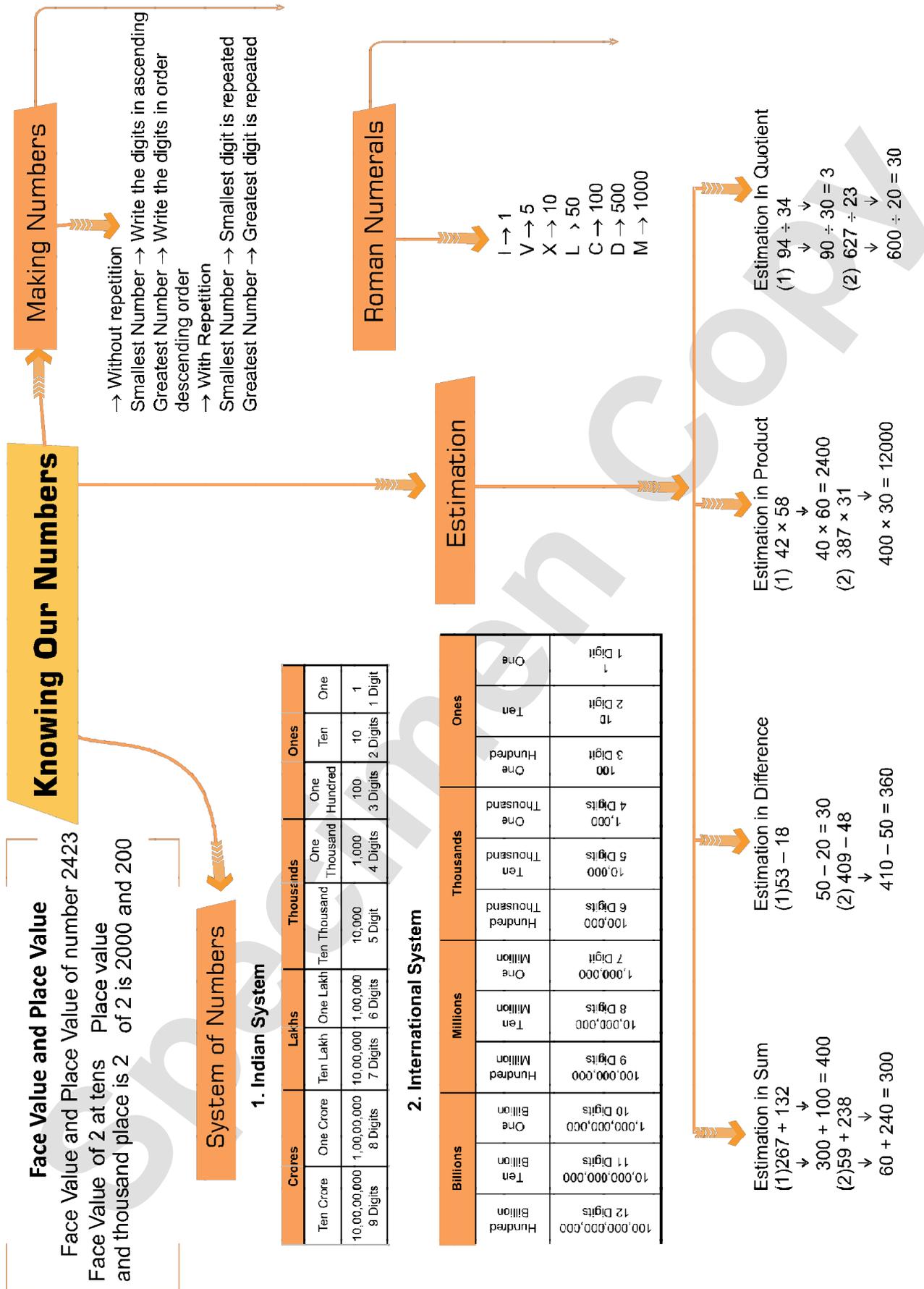
- Express each of the following numbers as a Roman numerals :
 (a) 26 (b) 63 (c) 72 (d) 99
 (e) 556 (f) 769 (g) 26495
- Write each of the following in Hindu-Arabic numeral :
 (a) CLXVI (b) CDXLVI (c) DCCLXVI (d) \overline{LIX} CLXIX
 (e) \overline{XXVI} CDXCV
- Which of the following are meaningless ?
 (a) XD (b) LVV (c) MMMCCXI (d) \overline{III} CCS
- Find the greatest among IV, V, VI and VII
- Write the sum of XX and XXIX in Roman numerals.

**Add to Your Knowledge**

- What comes after a million ? Billion , Trillion , Quadrillion , Quintillion , Sextillion , Septillion , Octillion , Nonillion, Decillion and Undecillion.
- From number 0 to 1000 , the letter 'A' only appears in 1000 (One thousand)
- Prime numbers :** Prime numbers are natural numbers greater than 1 and each of which is divisible by 1 and by itself only. For example : 2, 3, 5, 7, 11, 13, 17, 19, 23, ... etc.
- If unit digit is x and tens digit is y, then two digit number is of the form $10y+x$.
- Divisibility :**
Division Algorithm : General representation of result is,

$$\frac{\text{Dividend}}{\text{Divisor}} = \text{Quotient} + \frac{\text{Remainder}}{\text{Divisor}}$$
Dividend = (Divisor × Quotient) + Remainder

Concept Map



Summary :

1. The set of natural numbers is $N = \{ 1, 2, 3, \dots \}$
2. The set of whole numbers is $W = \{ 0, 1, 2, 3, \dots \}$
Both the above sets are infinite sets i.e. there is no greatest number.
3. The smallest natural number is 1 and the smallest whole number is 0.
4. The Successor of a given whole number is 1 more than the given number , e.g. the Successor of 25 is 26.
5. The Predecessor of a given whole number is 1 less than the given number , e.g. the Predecessor of 100 is 99.
6. Every digit in a numeral has two values - the Place value and the Face value.
 - (a) The face value of a digit does not change
 - (b) The place value changes according to its position in the number. Each place represents ten times the one which is immediately to its right , e.g. in the number 5555 starting from the right place values of 5's are 5, 50, 500, 5000 respectively, while the face value remains same i.e., 5
7. There are two system of numeration - the Indian and the International.
 - (a) In Indian system of numeration, the periods are crores, lakhs, thousands and units
 - (b) In International system of numeration , these are billions, millions, thousands and units.
8. For rounding off a number to the nearest 10, 100, 1000..ets. we look at the digits at a lower place , i.e. ones , tens , hundreds, ... etc. If the digits at ones, tens or hundred is less than 5, the number is rounded off downwards otherwise upwards.
9. Roman numeration system has seven basic symbols as
I for 1 V for 5 X for 10 L for 50 C for 100 D for 500 M for 1000

EXERCISE >> 01**SECTION -A (FIXED RESPONSE TYPE)****MULTIPLE CHOICE QUESTIONS :**

1. The successor of 49,999 is :
(A) 49,998 (B) 50,000 (C) 49,990 (D) 49,000
2. Which one of the following is the smallest numeral ?
(A) 15673 (B) 15700 (C) 15198 (D) 15623
3. 789500 comes just after :
(A) 789400 (B) 789501 (C) 789499 (D) 789498
4. The place value of 9 in 7690453 is:
(A) 900 (B) 9000 (C) 90000 (D) 90
5. Which digit is at thousands place in 57, 168 :
(A) 6 (B) 7 (C) 1 (D) 8
- 6._ The product of the place values of two 2's in 428721 is
(A) 4 (B) 40000 (C) 400000 (D) 40000000
- 7._ $3 \times 10000 + 7 \times 1000 + 9 \times 100 + 0 \times 10 + 4$ is the same as
(A) 3794 (B) 37940 (C) 37904 (D) 379409
- 8._ In Indian system of Numeration, the number 58695376 is written as
(A) 58,69,53,76 (B) 58695,376 (C) 5,86,95,376 (D) 586,95,376
- 9._ Express seventy-four thousand five hundred seventy in figures:
(A) 74560 (B) 74580 (C) 74570 (D) 74571
- 10._ 9745679 is smaller than one crore by
(A) 254000. (B) 254321. (C) 254799. (D) 254856.
11. The successor of the greatest 4- digit number is
(A) 9999 (B) 9998 (C) 9909 (D) 10000
12. The largest number using each of digits 5, 7, 8, 9 is :
(A) 9875 (B) 5879 (C) 8759 (D) 7589
13. The smallest 4-digit number using 2, 0, 9, 5 is :
(A) 9520 (B) 0295 (C) 2059 (D) 5209
- 14._ The largest 4 - digit number , using any one digit twice , from digits 5,9,2 and 6 is
(A) 9652 (B) 9562 (C) 9659 (D) 9965

15. Find the difference in the place value of the digit 5 in the number 57568.
(A) 49500 (B) 45900 (C) 49000 (D) 49050
16. In the product of 37 and 23, what is the place value of the digit which is prime ?
(A) 500 (B) 700 (C) 800 (D) 50
17. What is the difference of 1 million and 900 tens?
(A) 100900 (B) 991000 (C) 91000 (D) 919000
18. How much is 50 less than by 1 million ?
(A) 9950 (B) 99950 (C) 999950 (D) 9999950
19. How many numbers of 3-digit are formed by using the digits 0, 1, and 2 ?
(A) 5 (B) 6 (C) 10 (D) 4
20. Using the digits 1, 4, 6 and 8 each only once, how many four digit odd numbers can be formed?
(A) 4 (B) 5 (C) 3 (D) 6
- 21._ When rounded off to nearest thousands, the number 85642 is
(A) 85600 (B) 85700 (C) 85000 (D) 86000
- 22._ The greatest number which on rounding off to nearest thousands gives 5000, is
(A) 5001 (B) 5559 (C) 5999 (D) 5499
- 23._ Rough estimate (by rounding off to nearest tens) of $439 + 334 + 4317$ will be
(A) 4055 (B) 5550 (C) 5090 (D) 5975
24. Which of the following numbers when rounded off to the nearest ten thousand gives 50000 ?
(A) 492811 (B) 495213 (C) 589200 (D) 513076
25. Which one of the following is the best estimation of 5663×2234 ?
(A) 5000×2000 (B) 5700×2200 (C) 5660×2230 (D) 5660×2300
26. 1 quintal = kg
(A) 10 (B) 100 (C) 1000 (D) 100000
- 27._ $2\text{km} + 1\text{m} + 3\text{cm} = \dots\dots\dots$
(A) 200101cm (B) 200102cm (C) 200103cm (D) 200104cm
- 28._ What is the cost of a banana, if one dozen banana costs Rs. 24-
(A) 3 (B) 2 (C) 4 (D) 1
- 29._ A train moves at a uniform speed of 45km/hr. How much distance will it cover in 36 hours?
(A) 1630 (B) 1640 (C) 1620 (D) 1615
- 30._ Weight of one bag is 14Kg 35g. The weight of 18 bags is
(A) 250Kg 300g (B) 252Kg 130g (C) 252Kg 630g (D) 253Kg 630g
31. LXV can be written in Hindu Arabic numeral as :
(A) 55 (B) 60 (C) 65 (D) 70
32. I as a Roman numeral, am CMXCIX. Break me up and then can you recognize me ?
(A) 9910 (B) 999 (C) 1109 (D) 1119

33. The greatest among IV, V, VI or VII would be
(A) IV (B) V (C) VI (D) VII
34. Which of the number shown below is meaningless ?
(A) VIII (B) XX (C) XVI (D) VXXX
35. Which of the following numbers in Roman numerals is incorrect?
(A) LXXX (B) LXX (C) LX (D) LLX

FILL IN THE BLANKS

1. Smallest natural number is _____
2. 1 crore = _____ lakh
3. The smallest 4-digit number with four different digits is _____.
4. The total number of 4 digit number is _____
5. 564 when estimated to the nearest hundred is _____.
6. 1678 when estimated to the nearest thousand is _____.
7. 100 m = _____ cm
8. 650 km = _____ m
9. Which symbols are never repeated _____
10. The predecessor of XI is the whole number _____

TRUE / FALSE

1. 99999 just comes before 1000000.
2. The successor of the greatest 5-digit number is 100000.
3. The difference in the face value and the place value of 5 in 85419 is 85414.
4. 100 lakhs make a million .
5. The estimated value of 46,530 to the nearest hundred is 46500.
6. The estimated value of 450 to the nearest hundred is 400.
7. 1km = 100 m
8. 100m = 1cm
9. In Roman numeration, a symbol is not repeated more than three times.
10. In Roman numeration. If a symbol is repeated. Its value is multiplied as many times as it occurs.
11. XXIX = 31
12. LXXIV = 74
13. The number LIV is greater than LVI.

MATCH THE COLUMN

- | | | |
|-----------|---|--------------------|
| 1. | Column-I | Column-II |
| | (A) 1 crore | (p) 1,000,000 |
| | (B) 1 million | (q) 100,000 |
| | (C) 100 thousand | (r) 10, 00,000 |
| | (D) 10 billion | (s) 1,00,00,000 |
| | (E) 10 lakh | (t) 10,000,000,000 |
| 2. | Column-I | Column-II |
| | (A) 9547999 comes just before | (p) 0 |
| | (B) 287 round off to nearest ten | (q) 3 times |
| | (C) 15 round off to nearest hundred | (r) 9548000 |
| | (D) I , X ,C ,M can be repeated of maximum of | (s) repeated |
| | (E) V , L ,D are never | (t) 290 |

SECTION -B (FREE RESPONSE TYPE)**VERY SHORT ANSWER TYPE**

- Write the Predecessor of 7000 ?
- Which is greater 72389 and 72391 ?
- Arrange the following in ascending order:
2345, 2543, 3452, 4325, 2435
- Write the greatest and the smallest 5 digits numbers by using each of the digits 3, 5, 7, 0, 9 only once?
- Write the greatest and smallest numbers of 4 digits using all the digits 7, 0, 6 ?
- Estimate the 278×361 products (by general rule)
- Estimate the following (by rounding off to nearest thousands):
(a) 3,456 (b) 7,850
- Alok and Anuj worked as salesperson at a bookstore. They sold 6283 story books in all. Anuj sold 3324 story books. How many story books were sold by Alok?
- In an election, the successful candidate registered 4,67,350 votes and his nearest rival secured 2,18,800 votes. By what margin did the successful candidate win the election?
- Write in numbers:
(a) IX (b) LXV
- Write in Roman numerals:
(a) 12 (b) 34

SHORT ANSWER TYPE

- 12._ As per the census of 2001, the population of four states are given below. Arrange the states in ascending and descending order of their population.
- | | |
|--------------------|-----------|
| (A) Maharashtra | 96878627 |
| (B) Andhra Pradesh | 76210007 |
| (C) Bihar | 82998509 |
| (D) Uttar Pradesh | 166197921 |
- 13._ Write the place value of each digit of number 560271
- 14._ Find the difference between place value and face value of digit 6 in 298654
- 15._ Find the product of place value of 8 and face value of 2 in 92486
16. Write the following numbers in expanded notation.
(a) 2,84,231 **(b)** 52,11,568 **(c)** 6,04,18,517 **(d)** 8,91,81,213
17. Write the following numbers as numerals.
(a) Sixty two lakh forty five thousand six hundred thirty five
(b) Nine crore fifty eight lakh sixty one thousand eighty nine
- 18._ In 2001, the population of Tripura and Meghalaya were 3,199,203 and 2,318,822, respectively. Write the populations of these two states in words.
- 19._ How many lakhs make five billions?
- 20._ Estimate the product of 287×231 by rounding off the first number upwards and the second number downwards.
- 21._ Give a rough estimate and a closer estimate of $4,89,342 - 48,365$.
22. 12 drums of milk have 84 litres of milk in them. Find the capacity of one drum in millilitres.
- 23._ Radius of the Earth is 6400km and that of Mars is 4300000m. Whose radius is bigger and by how much?
24. Write the equivalent Roman numeral of each of the following Hindu-Arabic numeral.
(a) 46 **(b)** 90 **(c)** 120 **(d)** 150
25. Write the equivalent Hindu Arabic numerals of the following Roman numerals.
(a) XXII **(b)** CCX **(c)** DCC **(d)** LXIII

LONG ANSWER TYPE

26. According to the 1991 census, the number of people who spoke the following languages were:
Assamese : 13079696
Hindi : 337272114
Konkani : 1760607
- (a)** Write the above numbers according to the Indian and International system of numeration.
(b) Write the above numbers in words according to the Indian system of numeration.
(c) Write the above numbers in words according to the International system.
27. Write all possible three digit numbers (without repeating the digits), by using the digits.
(i) 6, 7, 5 **(ii)** 9, 0, 2

28. Use the given digits without repetition and make the smallest and the greatest four digit numbers.
(i) 2, 1, 5, 6 (ii) 7,8,0,9 (iii) 4, 6, 3, 5 (iv) 8, 3, 2, 4
(v) 2, 5, 9, 0 (vi) 1, 9, 6, 3
29. Make the greatest and the smallest four digit numbers by using any one digit twice :
(i) 6, 3, 2 (ii) 1, 0, 6 (iii) 7, 9, 4 (iv) 2, 5, 0
30. Make the greatest and the smallest 4-digit numbers using any four different digits, with the condition given below :
(i) Digit 6 is always in thousands place (ii) Digit 4 is always in hundreds place
(iii) Digit 7 is always in tens place (iv) Digit 1 is always in ones place
(v) Digit 9 is always in thousands place (vi) Digit 0 is always in hundreds place
(vii) Digit 5 is always in tens place (viii) Digit 3 is always in ones place
- 31._ A mobile number consists of ten digits. First four digits are 9,9,7 and 9. Make the smallest mobile number by using only one digit twice from 8,3,5,6,0.
- 32._ In a five digit number, digit at ten's place is 4, digit at unit's place is one fourth of ten's place digit, digit at hundred's place is 0, digit at thousand's place is 5 times of the digit at unit's place and ten thousand's place digit is double the digit at ten's place. Write the number.
- 33._ Estimate each of the following by rounding off each number to nearest hundreds:
(a) $874 + 478$ (b) $793 + 397$
(c) $11244 + 3507$ (d) $17677 + 13589$
34. Give the approximate value by estimating.
(a) $3228 + 572$ (b) $8010 - 2507$ (c) 32×58 (d) 108×47
35. The number of candidates appearing for class 10 board examination conducted by CBSE was 14, 58, 937 in year 2002; 16, 93, 487 in year 2003; 24, 13, 468 in year 2004 and 40, 05,093 in year 2005. Find the total number of candidates who appeared for the examination in these four years.
36. The number of scooters produced in a year was 25, 43, 163. Out of these 16,43, 078 were sold. How many were still left ?
37. A milk depot sells 657 litres of milk every day. How much milk will it sell in 1 year ?
(Take 1 year = 365 days)
38. The students of class VI of a school collected Rs. 3, 37, 875 for Prime Minister's Relief fund. If each child contributed Rs. 255, how many children are there in the school ?
- 39._ The diameter of Jupiter is 142800000 meters. Insert commas suitably and write the diameter according to International system of Numeration.
- 40._ India's population has been steadily increasing from 439 million in 1961 to 1028 millions in 2001. Find the total increase in population from 1961 to 2001. Write the increase in population in Indian System of Numeration , using commas suitably.
- 41._ In a city, polio drops were given to 2,12,583 children on Sunday in march 2008 and 2,16,813 children in the next month . Find the difference of the number of children getting polio drops in the two months.
- 42._ Solve the following:
(a) V - I (b) VII - IV (c) IX - III (d) XL - VII
- 43._ Solve the following:
(a) X + V (b) V + III (c) XV + II (d) IX + IX
(e) VI + II

EXERCISE » 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

1. If 1 is added to the greatest 7 - digit number, it will be equal to
 (A) 100 thousand (B) 1 lakh (C) 10 lakh (D) 1 crore
2. Keeping the place of 6 in the number 6350947 same, the smallest number obtained by rearranging other digits is
 (A) 6975430 (B) 6043579 (C) 6034579 (D) 6034759
3. Re-arrange the digits of 1,02,35,007 to get the largest and the smallest number, the difference between the place value of 2 in these two numbers is
 (A) 0 (B) 8,000 (C) 20,000 (D) 18,000
4. The largest 4-digit number, using any one digit twice from digits 5,9,2 and 6 is
 (A) 9652 (B) 9562 (C) 9659 (D) 9965
5. The largest 5-digit number having three different digits is
 (A) 99987 (B) 98978 (C) 99897 (D) 98799
6. Total number of numbers which when rounded off to nearest ten give us 200 is
 (A) 9 (B) 10 (C) 8 (D) 7
7. The greatest number which when rounded off to the nearest thousand as 7000 is
 (A) 6500 (B) 6549 (C) 7499 (D) 6499
8. The smallest number which when rounded off to the nearest hundred as 600 is
 (A) 550 (B) 595 (C) 604 (D) 599
9. How many times does the digit "1" appear in numbers from 1 to 100 ?
 (A) 18 (B) 19 (C) 20 (D) 21
10. A, B, C and D are four 4 digit numbers, each having the digit 9 only once and in the place shown. None of the other digits are known
 (a)

9			
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 (b)

	9		
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 (c)

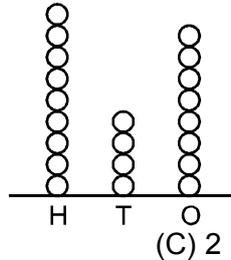
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 (d)

			9
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 What can be said about A, B, C and D ?
 (A) D is the smallest of the four numbers (B) B is larger than C
 (C) A is the largest of the 4 numbers (D) D is the largest of the 4 numbers
11. A 7 digit number starts with place in the Indian system.
 (A) lakhs (B) ten thousands (C) ten lakhs (D) crores
12. Place value of a digit increases by _____ times as it moves place by place from right to left.
 (A) 100 (B) $\frac{1}{10}$ (C) 10 (D) 1000
13. The number of match sticks that can be used to write 39 in roman system are
 (A) 8 (B) 9 (C) 3 (D) 6
14. How many five digits numbers are there ?
 (A) 99999 (B) 99000 (C) 90000 (D) 98999

15. The difference between the largest 5-digit number and the largest 5-digit number with three distinct digits is
 (A) 10 (B) 10012 (C) 12 (D) 123
16. The difference between the greatest and smallest numbers which when rounded off a number to the nearest tens as 540, is
 (A) 10 (B) 9 (C) 8 (D) 10
17. How many beads should be removed from the hundred's place in the abacus shown here if it has to represent a number between 550 and 650?



- (A) 4 (B) 3 (C) 2 (D) 1

SECTION -B (TECHIE STUFF)

18. 256002117116223 written according to international system in words as
 (A) Two hundred fifty six trillion two billion one hundred seventeen million one hundred sixteen thousand two hundred twenty three
 (B) Two hundred fifty six trillion one hundred seventeen million one hundred sixteen thousand two hundred twenty three
 (C) Two thousand fifty six trillion two billion one hundred seventeen million one hundred sixteen thousand two hundred twenty three
 (D) None of these
19. 10000000000567 written according to international system in words as
 (A) One hundred million five hundred sixty seven
 (B) One hundred trillion five hundred sixty seven
 (C) One hundred five thousand sixty seven
 (D) None of these
20. There are four prime numbers written in ascending order. The product of the first three is 385 and that of the last three is 1001, the last number is
 (A) 5 (B) 7 (C) 11 (D) 13
21. How many two-digit numbers are there which have different digits in the unit and tens place?
 (A) 72 (B) 80 (C) 81 (D) 89
22. The sum of three prime numbers is 100. If one of them exceeds another by 36, then one of the numbers is
 (A) 67 (B) 70 (C) 64 (D) None of these
23. On dividing 4150 by certain number, the quotient is 55 and the remainder is 25, the divisor is
 (A) 40 (B) 50 (C) 75 (D) 55

EXERCISE >> 03**(PREVIOUS YEAR EXAMINATION QUESTIONS)**

1. The diagram shows two numbers **(NSTSE 2009)**
- | | |
|---------|--------|
| 467,285 | 30,792 |
|---------|--------|
- Find the product of the place value of digit 6 and place value of digit 9.
- (A) 5,400,000 (B) 54,000 (C) 5,400 (D) 54
2. 1 million = _____ lakhs **(NSTSE 2009)**
- (A) 1 (B) 10 (C) 16 (D) 18
3. Which of the following has the greatest value? **(NSTSE 2009)**
- (A) $(2 \times 100,000) + (6 \times 100)$ (B) $(2 \times 100,000) + (5 \times 1,000)$
 (C) $(3 \times 10,000) + (6 \times 100) + (7 \times 10)$ (D) $(3 \times 10,000) + (5 \times 1,000) + (7 \times 10)$
4. The difference between the largest 8 digit number and the smallest 6 digit number is **(NSTSE 2010)**
- (A) 100099999 (B) 99899999 (C) 99989999 (D) 99998999
5. Rohan rolled 3 fair number cubes, and the numbers shown below came out on top. If each number is used only once, which group shows all the 3-digit numbers that can be made with these digits? **(IMO 2010)**
- | | | |
|---|---|---|
| 4 | 5 | 6 |
|---|---|---|
- (A) 456 565, 654, 544, 655, 645 (B) 456, 546, 654, 645, 556, 664, 555
 (C) 456, 465, 564, 654, 546, 444 (D) 456, 465, 564, 546, 645, 654
6. Ms. Neha needs to replace the batteries in 20 calculators. Each calculator uses 4 batteries. The batteries are sold in packages of 16. How many packages of batteries does Ms. Neha need to buy? **(IMO 2010)**
- (A) 64 (B) 4 (C) 80 (D) 5
7. Sneha earns Rs.110 each week taking care of pets. Which of the following is the best estimate of how much money she will earn in 28 weeks while taking care of the pets? **(IMO 2010)**
- (A) Rs.1000 (B) Rs. 500 (C) Rs. 9000 (D) Rs. 3080
8. Fill in the blank
 1 million = _____ hundred thousand. **(IMO 2011)**
- (A) One (B) Ten (C) Hundred (D) Twenty
9. Estimate the sum of $(21397 + 42505)$ to nearest thousand. **(IMO 2011)**
- (A) 64000 (B) 65490 (C) 70000 (D) 92000
10. Smriti bought 19 boxes of sweets. Each box contains 228 sweets. How many sweets would be left with her after giving 519 sweets to friends? **(IMO 2011)**
- (A) 766 (B) 3,813 (C) 4,332 (D) 4,851
11. Which of the given is the largest, when the digits in ten's and one's are interchanged with hundreds and thousands place respectively? **(NSTSE 2012)**
- (A) 8865 (B) 8765 (C) 7865 (D) 7875

12. What is the estimated sum of 21396 , 27808 and 42504 to the nearest ten ?(NSTSE 2012)
 (A) 91710 (B) 91700 (C) 91720 (D)91730
13. Which of the following rule is not satisfied for Roman numerals? (NSTSE 2012)
 (A) V,L,D are never subtracted. (B) C can be subtracted from X, M , D and L.
 (C) Only I,X,C,M can be repeated. (D) No symbol can be repeated more than 3 times.
14. Neha is getting ready for the state assessment, and is planning mini-lessons for students focused on particular difficulties that they are having with adding columns of numbers. To target her instruction more effectively, she wants to work with groups of students who are making the same kind of error, so she looks at a recent quiz to see what they tend to do. She sees the following three student mistakes.
 Which have the same kind of error? (IMO 2012)

$$\begin{array}{r} \text{(I)} \quad \overset{1}{3}8 \\ \quad \quad 49 \\ \hline \quad \quad + 65 \\ \hline \quad \quad 142 \end{array} \quad \begin{array}{r} \text{(II)} \quad \overset{1}{4}5 \\ \quad \quad 37 \\ \hline \quad \quad + 29 \\ \hline \quad \quad 101 \end{array} \quad \begin{array}{r} \text{(III)} \quad \overset{1}{3}2 \\ \quad \quad 14 \\ \hline \quad \quad + 19 \\ \hline \quad \quad 64 \end{array}$$

- (A) I and II (B) I and III (C) II and III (D) I, II and III
15. Solve the following Roman numerals.
 $LIX + XXXVI + IX + XC - LX$
 (A) CXXXVI (B) CXXXLIV (C) CXXVII (D) CXXXIV
16. A book of 1,456 pages has 9,95,904 words in it. The number of words in each page is_____. (IMO 2012)
 (A) 584 (B) 684 (C) 675 (D) 595
17. Match the Roman numerals given in Column-I with their correct Hindu-Arabic numerals given in Column-II. (IMO 2012)
- | Column-I | Column-II |
|-------------|-----------|
| (a) MDCLXX | (p) 1222 |
| (b) MMDCCII | (q) 1670 |
| (c) MCCLXVI | (r) 1266 |
| (d) MCCXXII | (s) 2702 |
- (A) (a) – (q), (b) – (r), (c) – (s), (d) – (p) (B) (a) – (q), (b) – (s), (c) – (r), (d) – (p)
 (C) (a) – (q), (b) – (p), (c) – (s), (d) – (r) (D) (a) – (q), (b) – (s), (c) – (p), (d) – (r)
18. Which of the following numbers when rounded off to the nearest hundred gives 15900? (IMO 2012)
 (A) 14955 (B) 14999 (C) 15086 (D) 15899
19. What is difference between the smallest 6-digit odd number and the largest 4-digit even number ? (NSTSE 2013)
 (A) 90002 (B) 90003 (C) 101113 (D)101121
20. What is the value of 108 thousandths multiplied by 15 ones ? (NSTSE 2013)
 (A) 1.62 (B) 15.108 (C) 108.0 (D)16.20
21. Which one of the following is the best estimation of 5663 x 2234 ? (NSTSE 2013)
 (A) 5000 x 2000 (B) 5700 x 2200
 (C) 5660 x 2230 (D) 5660 x 2330

22. Fill in the blanks:
Every natural number has a _____ except _____ and has a _____. (IMO 2013)
(A) Successor. 0, predecessor (B) Successor. 1, predecessor
(C) Predecessor. 0, successor (D) Predecessor. 1, successor
23. What is the difference in place value between the digits 8 and 6 in the numeral 8962321?
(IMO 2013)
(A) 7994000 (B) 7904000 (C) 7960000 (D) 7940000
24. A 29-inch colour TV set costs Rs. 532565 and a 21-inch model costs Rs. 318675. How much more does the bigger TV set cost (In Rs.)?
(IMO 2013)
(A) Two lakhs thirteen thousand seven hundred and ninety
(B) Two lakhs thirteen thousand eight hundred and ninety
(C) One lakh thirteen thousand nine hundred and ninety
(D) Two lakhs twelve thousand eight hundred and ninety
25. Which of the following statements is INCORRECT? (IMO 2013)
(A) The symbol X can be subtracted from L, M and C only.
(B) V, L and D are never repeated.
(C) V, L and D are never subtracted.
(D) I or V is written to the left of L or C.
26. The difference between place values of digit 5 in 456.385 is (IMO 2014)
(A) 49995 (B) 499.95 (C) 49.995 (D) 49.999
27. Find the value of CXVI + XIII + VI + CCLXV - XVI (IMO 2014)
(A) CD (B) CCCLXXXIV (C) CCCLXXXV (D) M
28. Estimate the following by rounding off each number to nearest hundreds.
78203 - 16407 (IMO 2014)
(A) 61700 (B) 62000 (C) 61800 (D) 61500
29. Latika's monthly salary was Rs. 30525. She spent Rs. 1800 and saved the rest. How much did she save in a year? (IMO 2014)
(A) Rs. 344700 (B) Rs. 315975 (C) Rs. 248960 (D) Rs. 212840
30. Mr. Kapoor left his office at 15:45 to attend a 3-hour seminar in Delhi. He took 2 hours 20 minutes to drive there but was 25 minutes late for the seminar. At what time did the seminar end? (IMO 2014)
(A) 21:05 (B) 22:10 (C) 21:30 (D) 20:40
31. Estimate the sum (21497 + 47807) to the nearest thousand. (IMO 2014)
(A) 59000 (B) 79000 (C) 69000 (D) 89000
32. The value of XVI + CCCVII = (IMO 2014)
(A) CCXXIII (B) CCCXIV (C) CCCXXIII (D) CCCXXV
33. Arrange the following in ascending order. (IMO 2014)
P: Eight thousand six hundred fifty two
Q: Ninety six thousand seven hundred forty one
R: Fifty nine thousand nine hundred eighty six
S: Eighty two thousand nine hundred six
(A) P. Q.R.S (B) Q. S. R. P (C) P.R.S.Q (D) P. R.Q.S

9._	Number of votes the successful candidate registered =	4,67,350
	Number of votes the rival secured	= 2,18,800
	Margin of votes	= 4,67,350 -2,18,800
		2,48,550

The successful candidate won the election by a margin of 2,48,550 votes.

- 10._ (a) 9 (b) 65 11._ (a) XII (b) XXXIV

SHORT ANSWER TYPE

- 12._ Ascending order - Andhra Pradesh , Bihar , Maharashtra , Uttar Pradesh
 Descending order - Uttar Pradesh , Maharashtra , Bihar , Andhra Pradesh
13. Place value of 5 = 500000
 Place value of 6 = 60000
 Place value of 2 = 200
 Place value of 7 = 70
 Place value of 1 = 1
- 14._ 594 15._ 160
16. (a) 2,00,000 + 80,000 + 4,000 + 200 + 30 + 1
 (b) 50,00,000 + 2,00,000 + 10,000 + 1,000 + 500 + 60 + 8
 (c) 6,00,00,000 + 4,00,000 + 10,000 + 8,000 + 500 + 10 + 7
 (d) 8,00,00,000 + 90,00,000 + 1,00,000 + 80,000 + 1,000 + 200 + 10 + 3
17. (a) 62,45,635 (b) 9, 58, 61, 089
- 18._ three million one hundred ninety-nine thousand two hundred three, two million three hundred eighteen thousand eight hundred twenty-two
19. 50000 Lakh 20. 300 × 200 = 60000
21. Rough estimate = 450000, Closer estimate = 440000 22. 7000 ml
- 23._ Earth, 2100 Km
24. (a) 46 = XLVI (b) 90 = XC (c) 120 = CXX (d) 150 = CL
25. (a) XXII = 22 (b) CCX = 210 (c) DCC = 700 (d) LXIII = 63

LONG ANSWER TYPE

	Indian System Assamese : 1,30,79,696	International System 13,079,696
26. (a)	Hindi : 33,72,72,114	337,272,114
	Konkani : 17,60,607	1,760,607

- (b) one crore thirty lakh seventy nine thousand six hundred ninty six
 Thirty three crore seventy two lakh seventy two thousand one hundred fourteen
 Seventeen lakh sixty thousand six hundred seven.
- (c) Thirteen million seventy nine thousand six hundred ninty six.
 Three hundred thirty seven million two hundred seventy two thousand one hundred fourteen
 One million seven hundred sixty thousand six hundred seven.

27. (i) 567 ,576 ,657 ,675 ,756,765 (ii) 209 , 290 ,902 ,920
28. (i) Greatest = 6521 Smallest = 1256
 (ii) Greatest = 9870 Smallest = 7089
 (iii) Greatest = 6543 Smallest = 3456
 (iv) Greatest = 8432 Smallest = 2348
 (v) Greatest = 9520 Smallest = 2059
 (vi) Greatest = 9631 Smallest = 1369
29. (i) Greatest = 6632 Smallest = 2236
 (ii) Greatest = 6610 Smallest = 1006
 (iii) Greatest = 9974 Smallest = 4479
 (iv) Greatest = 5520 Smallest = 2005
30. (i) Greatest = 6987 Smallest = 6012 (ii) Greatest = 9487 Smallest = 1402
 (iii) Greatest = 9876 Smallest = 1072 (iv) Greatest = 9871 Smallest = 2031
 (v) Greatest = 9876 Smallest = 9012 (vi) Greatest = 9087 Smallest = 1023
 (vii) Greatest = 9857 Smallest = 1052 (viii) Greatest = 9873 Smallest = 1023
- 31._ 7999003568 32._ 85041
- 33._ (a) 1400 (b) 1200 (c) 14700 (d) 31300
34. (a) $3228 \approx 3200$; $572 \approx 600$ $3200 + 600 = 3800$
 (b) $8010 \approx 8000$; $2507 \approx 3000$ $8000 - 3000 = 5000$
 (c) $32 \approx 30$; $58 \approx 60$ $30 \times 60 = 1800$
 (d) 108×47 ; $108 \approx 100$ $47 \approx 50$ $100 \times 50 = 5000$
35. 95,70,985 36. 9,00,085 37. 2,39,805 38. 1325 children
- 39._ 142,800,000 40._ 5890 Lakhs 41._ 4230
- 42._ (a) IV = 4 (b) III = 3 (c) VI = 6 (d) XXXIII = 33
- 43._ (a) XV = 15 (b) VIII = 8 (c) XVII = 17 (d) XVIII = 18
 (e) VIII = 8

EXERCISE >> 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	D	C	D	D	A	B	C	A	D	C	C	C	B	C	C	B	B	A	B	D
Ques.	21	22	23																	
Ans.	C	A	C																	

EXERCISE >> 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	B	B	B	D	D	D	B	A	B	D	A	B	A	D	B	B	D	B	A
Ques.	21	22	23	24	25	26	27	28	29	30	31	32	33							
Ans.	C	D	D	B	D	C	B	C	A	D	C	C	C							

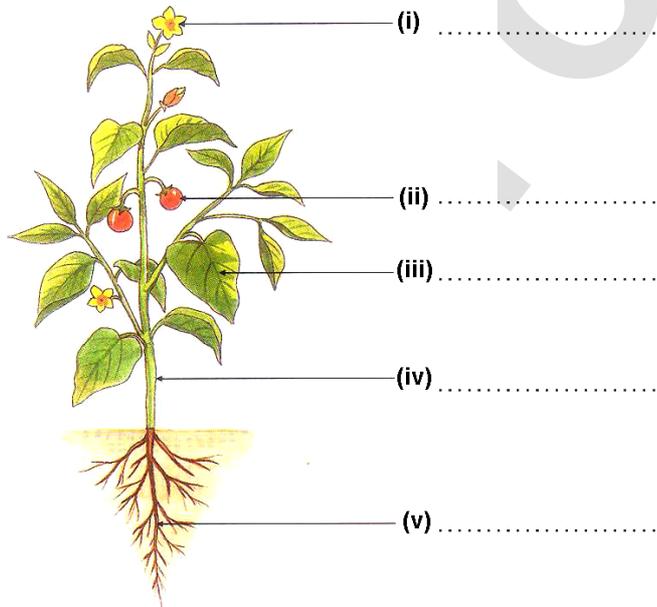
Terminologies

Root system, Shoot system, Prop roots, Node, Internode, Venation, Transpiration, Pollination, Stamen, Carpel, Cotyledons, Seed coat

INTRODUCTION

Plant are present all around us. They are living organisms which grow in a permanent site, absorbing water and minerals through its roots and synthesizing its own food using sunlight and green pigment chlorophyll.

Plants have organs and organ systems, though these are different from those in animals and human beings. Can you identify these parts of a plant :



1.1 DIFFERENT TYPES OF PLANTS

(a) Herbs :

- ²³/₁₁ Plants which have soft, green and perishable stems are called herbs.
- ²³/₁₁ They are generally smaller in size, they are not more than one metre in height
- ²³/₁₁ They may live for 1-2 seasons. Examples of some herbs are grass, maize, rice, mint, coriander, etc.



Fig.1.1 Mustard



Fig. 1.2 Dahlia

(b) Shrubs :

²³/₁₁ Plants with woody stems with branches of almost equal size arising from the stem immediately above the soil are called shrubs.

²³/₁₁ They are medium-sized plants which look like bushes.

²³/₁₁ They survive for many years, though less than trees.

Example : China rose, lemon, pomegranate, jasmine, nerium, etc.



Fig.1.3 Lemon



Fig.1.4 Rose

(c) Tree :

²³/₁₁ The trees are tall and big plants with one hard woody stem called trunk which bears woody branches, twigs and leaves.

²³/₁₁ Branches arise at some distance above the ground.

²³/₁₁ Trees generally survive for many years. **e.g.** Mango, neem, palm, banyan, etc.

- **Note :** Coconut and palm are also trees, though they do not contain branches.



Fig.1.5 Neem

(d) Creepers :

Plants with weak stems that can not stand upright and spread on the ground are called creepers **e.g.** Sweet potato, pumpkin, water melon, Bottle gourd, bitter gourd.



Fig.1.6 Water melon



Fig.1.7 Pumpkin

(e) Climbers :

Plants with weak stems which take support on neighbouring structure and climb up are called climbers. e.g. Betel, grape, Money plants, beans, etc.

Ask yourself

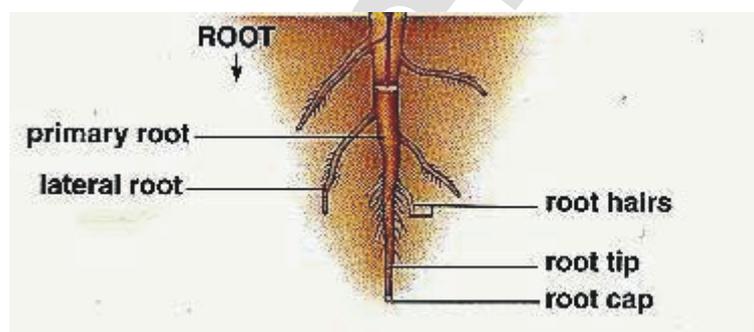
- Q.1 What do you mean by annual plant, biennial plant and perennial plants.
 Q.2 Which green has highest level of worldwide production (Hint : Rice is second)
 Q.3 Do all trees produce flowers ?
 Q.4 Is Pea a creeper or climber ?
 Q.5 What are deciduous trees.

**1.2 PART OF FLOWERING PLANTS****(a) Root system**

Root system is the underground, nongreen part of a plant. It consists of primary root and its branches.

(i) Characteristics of Roots :

- ²³/₁₁ They develop from the the radicle of the seed.
²³/₁₁ They grow towards soil and water.
²³/₁₁ They grow away from sunlight.
²³/₁₁ They do not have nodes and internodes.
²³/₁₁ They have many lateral branches, called secondary and tertiary roots.

**Fig.1.8 Part of root****(ii) Part of roots :**

- (A) Primary root** It is the main root. It develop from the radicle.It is thick and grows straight into the soil.
(B) Secondary root The side branches arising form the primary root are called secondary roots.
(C) Tertiary roots The branches of secondary roots are called tertiary roots.
(D) Root Cap The tip of each branch of the root has a protective cap-like structure. It protects the dividing soft tissue when root branches push their way through the soil.
(E) Root Hair Root and its branches are covered with the fine root hair. They help in the absorption of water and minerals from the soil.

(iii) Types of Root System

Root systems are of two types

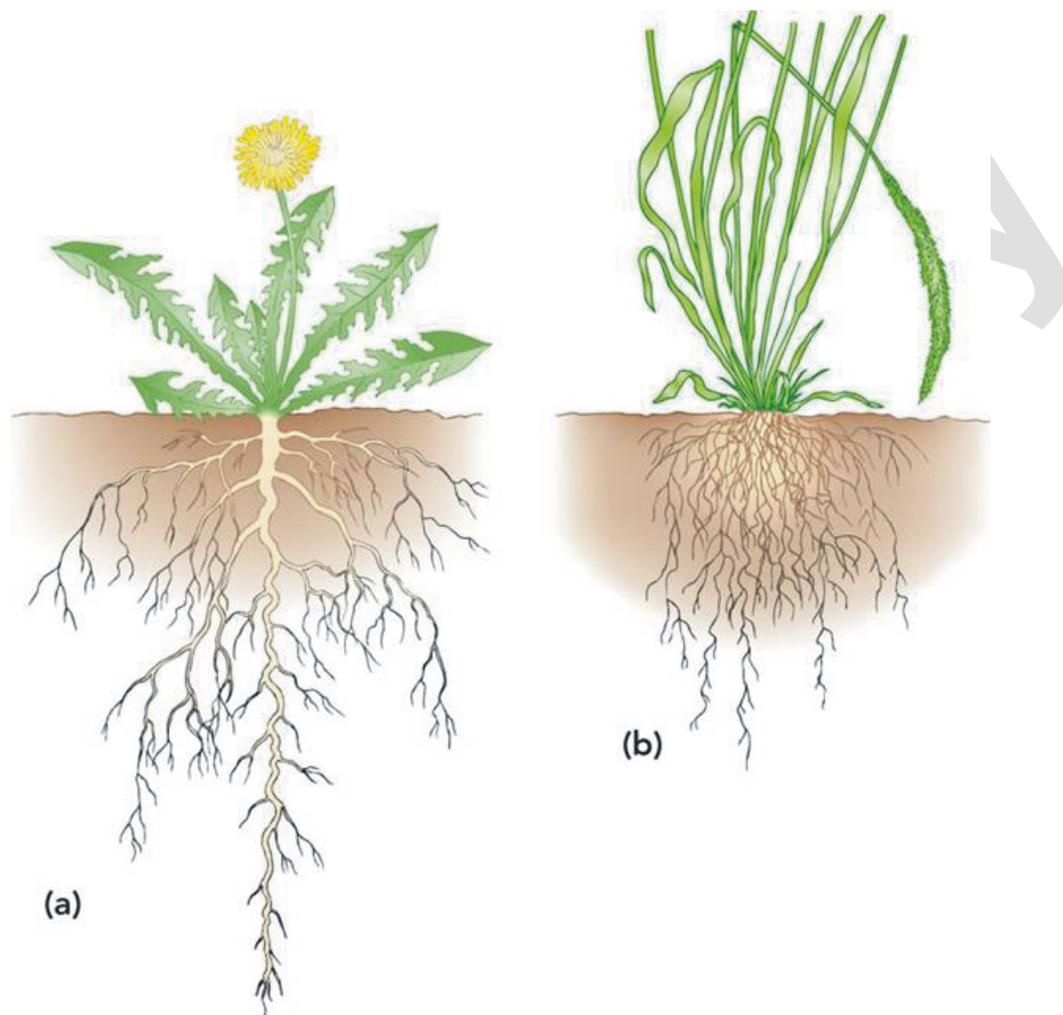


Fig.1.9 (a) Tap root (b) Fibrous root

- (A) Taproot System :** In this system, primary root is thick and long. It grows vertically downwards in the soil. It is also called the true root. Taproot is found in dicot plants, for example Mustard, Gram, Bean, Pea, Mango , Carrot, Radish, etc.
- (B) Fibrous Root System :** In this system, primary root is short-lived. It is replaced by a cluster of fibre-like roots. All the branches arise from the base of stem and spread out in the soil. Fibrous roots are found in monocot plants, for example , Maize, Wheat, Rice, Barley, Grasses, etc.
- (iv) Modifications of Roots:** In some plants, roots are specialised to carry out some other functions besides anchorage and absorption. These specialised functions are :
- (A) Storage of Food** The taproots of Radish, Turnip, Beetroot and Carrot store food. So, they are swollen and fleshy.

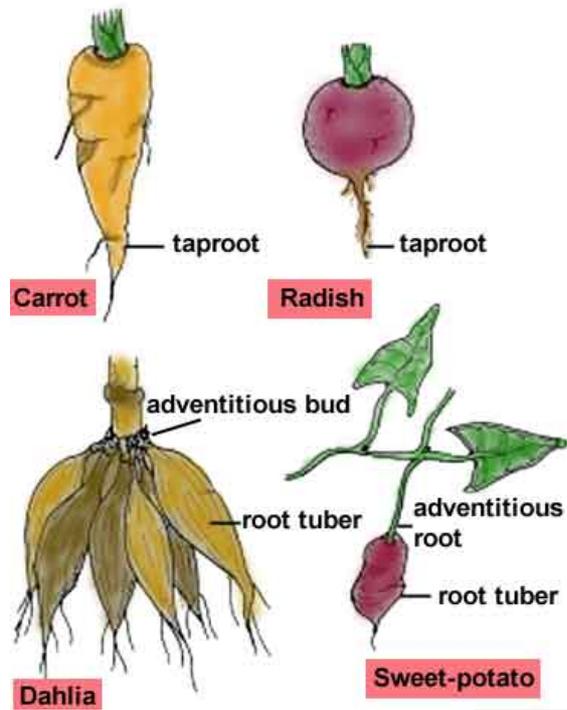


Fig.1.10 Carrot, Radish, Dahlia, Sweet potato

(B) Support Some roots provide support to the plant. The supporting roots are of two types : **Stilt roots** and **Prop roots**.

²³₁₁ **Stilt roots** In Bamboo, Maize and Sugarcane, adventitious roots arise from the lower nodes and grow downwards. They provide additional support to the plant.



Fig.1.11 Stilt roots



Fig.1.12 Prop roots

²³₁₁ **Prop roots** : In Banyan and Rubber tree, additional roots grow downwards from their horizontal branches. These rope-like roots are called prop roots. They penetrate into the soil and act as pillars to support the heavy branches.

(C) Climbing : The plants of Betel, Black Pepper and Money plant have climbing roots. These roots arise from the nodes. They help the plant to stick and limb up the wall rock or other trees.



Fig.1.13 Climbing root



Fig.1.14 Parasitic root

(IV) Parasitic roots : Plants like dodder have specialized roots arising from their system, which help them absorb water and nutrients from the host.

(V) Multiplication of the plant : Roots of plants like dahlia and asparagus can develop into new plants.

(VI) Pneumatophores: An aerial roots specialized for gaseous exchange. Like mangroves.



Fig.1.15 Pneumatophores

(v) Function of Roots

(A) Fixation : It fixes the plant firmly in the soil.

ACTIVITY 1

- **Aim :** To show that roots anchor the plant in soil
- **Materials Required:** A pot, garden soil, gram seeds and water.
- **Procedure:** Take a pot filled with garden soil. Place a few gram seeds in it. Water it daily for about a week. After a week, when seeds grow, try to pull out a seedling from the pot. How much force did you need to pull it out? Keep the pot for another week. The seedlings grow into small plants. Now, try to pull a plant from the pot. How much force did you need to pull the plant out this time?
- **Observation:** More force is needed to pull out the plant second time. This is because the root of the grown up plant is bigger than the root of seedling and has grown deep in the pot.
- **Conclusion:** It is concluded that roots anchor the plant firmly in the soil.

(B) Absorption : The root hairs help in the absorption of water and minerals from the soil.

ACTIVITY 2

- **Aim:** To show that roots absorb water
- **Materials Required:** A radish, glass, water, red colour and a knife.
- **Procedure:** Take a radish. Place it in a glass containing red coloured water. Leave the set-up for a day. Next day, take the radish out and cut it lengthwise.
- **Observation:** The red colour has spread throughout the radish and red-coloured tubes appear extending all along the length of the radish.
- **Conclusion:** The red colour shows the passage of water through the radish. So, it can be concluded that roots absorb water.

(b) Shoot System :

Shoot system is the aerial part of a plant. It includes stem, branches, leaves, flowers and fruits. It develops from the plumule of the seed.

(i) Stem : The stem is the main axis of the shoot system. It is green in herbaceous plants but woody and hard in shrubs and trees. The stem of tree is called the tunk. It is covered with bark.

(A) Characteristics of Stem

- ²³/₁₁ Stem grows towards light and away from the soil and water :
- ²³/₁₁ It has nodes and internodes.
- ²³/₁₁ Stem bears leaves, branches, buds, flowers and fruits.
- ²³/₁₁ The axillary buds give rise to new branches.
- ²³/₁₁ Young stems are green but older and woody stems are nongreen and hard.

(B) Function of Stem: The main functions of a stem are :

²³/₁₁ **Support** Stem supports branches, leaves, flowers and fruits. It keeps leaves spread out so that they can get enough sunlight.

²³/₁₁ **Conduction of Water and Food :** Stem transport water and minerals absorbed by the roots to different parts of the plant. It also conducts food manufactured in leaves to other parts of the plant.

ACTIVITY 3

- **Aim :** To show that water is conducted through stem
- Materials Required: A glass, water, red ink and a twig with white flower
- **Procedure :** Take a glass and fill one-third of it with water. Add a few drops of red ink in it and stir well. Now, cut obliquely a twig from a plant having a white flower (like Petunia or Balsam) and put it in the glass. Leave the set-up overnight. Observe carefully the next morning.
- **Observation :** Petals of flower and veins of the leaves have become red.
- **Conclusion :** This shows that red-coloured water has travelled up through the stem into leaves and flowers. The thin red-coloured lines are xylem vessels through which water travels from roots to different parts of the shoot.



Balsam stem

(C) Modifications of Stem In certain plants, stem is modified to carry out special functions besides, support and conduction. These functions are :

(I) Manufacture of Food: The green stem of annual plants synthesises food by photosynthesis. In cacti and succulents, the stem becomes green and leaf-like to make food.

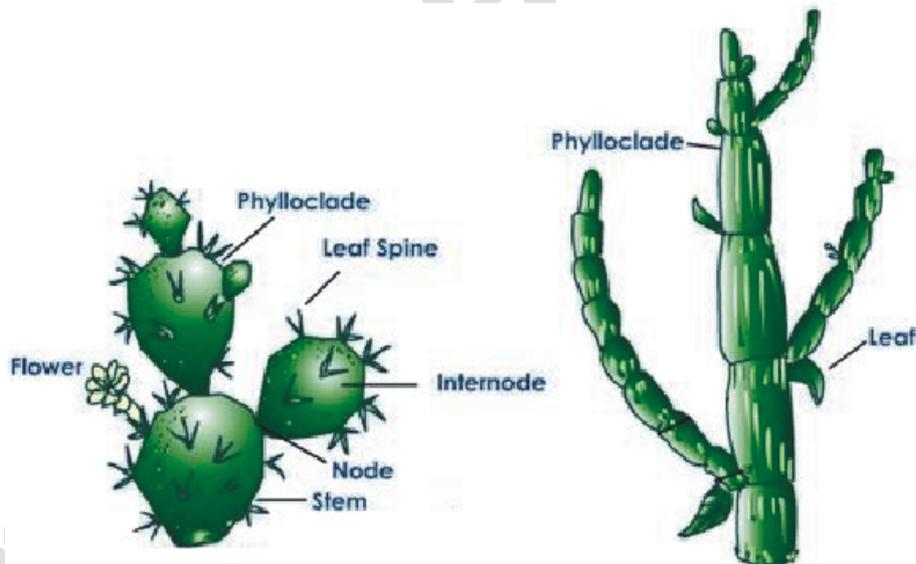


Fig.1.16 Opuntia, Muchlenbeckia

(II) Storage of Food : Stem store food.

²³/₁₁ **Rhizome :** in Ginger, the underground stem swells up in an irregular form and is called rhizome. It has nodes, internodes, buds and scaly leaves.

²³/₁₁ **Tuber :** Some stem have swollen underground structures. Used as storage organs for nutrients reserved , which help the plant to survive winter or adverse conditions. It might also have buds.e.g. potato.**Corms** are special tubers with rounded and condensed structure covered with scaly leaves.e.g. Gladioli and Zimikand.

23
11

Bulb : In Onion, Garlic Lily, etc., the leaves store food and become fleshy. They overlap each other and are attached, to a disc. This disc is the reduced stem. Such modified stems are called bulbs.

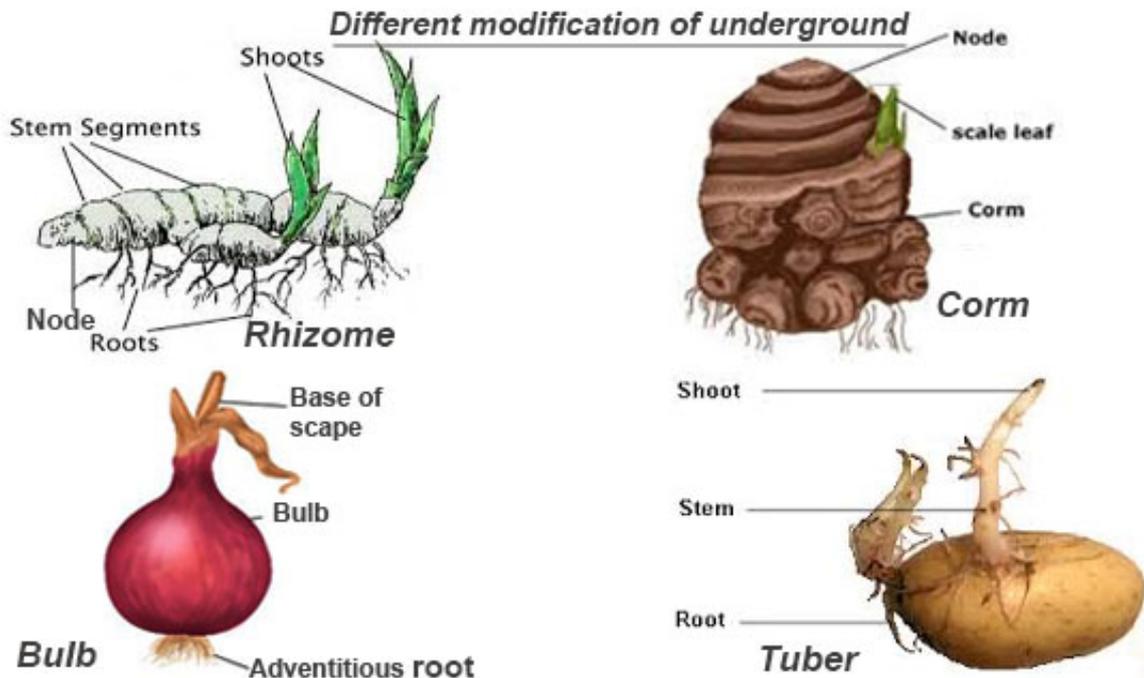


Fig.1.17 Storage of food

(III) **Stem tendrils** : In some plants like Grapevine and Passion flower, the stem is weak and some of its branches are modified into thread-like structure coil around the support called Stem tendrils.

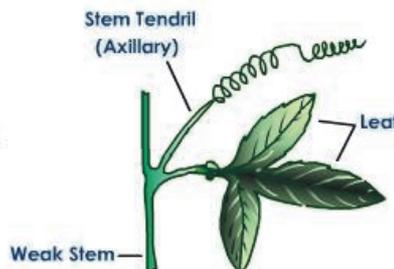


Fig.1.18 Stem Tendril (Axillary)

ACTIVITY 4

- **Aim** : To study that potato bears buds which grow into shoots
- **Required** : A potato, soil and water
- **Procedure** : Observe a potato from your kitchen and identify the depressions (eyes) having buds on its surface. Leave the potato for a few days or place it in moist soil. Take the potato out of the soil after a week and observe it.
- **Observation** : The buds in the eyes of potato have started growing into aerial shoots.
- **Conclusion** : This shows that potato bears buds which grow into new shoots.



(ii) **Leaves – The food Factories of Plant**

(A) Parts of leaf :

- 23
11 **Petiole** : The parts of a leaf by which it is attached to the stem is called petiole.
- 23
11 **Lamina** : The broad green part of the leaf is called lamina
- 23
11 **Midrib** : A thick vein in the middle of the leaf is called the midrib.
- 23
11 **Veins** : Lines on the leaf are called veins.

NOTE :

LEAF VENATION : The design made by veins in a leaf is called the leaf venation

²³₁₁ **Reticulate venation :** If leaf design made by veins in a leaf is net like on both sides of midrib the venation called Reticulate.eg. Leaves of Mango, Pea etc.

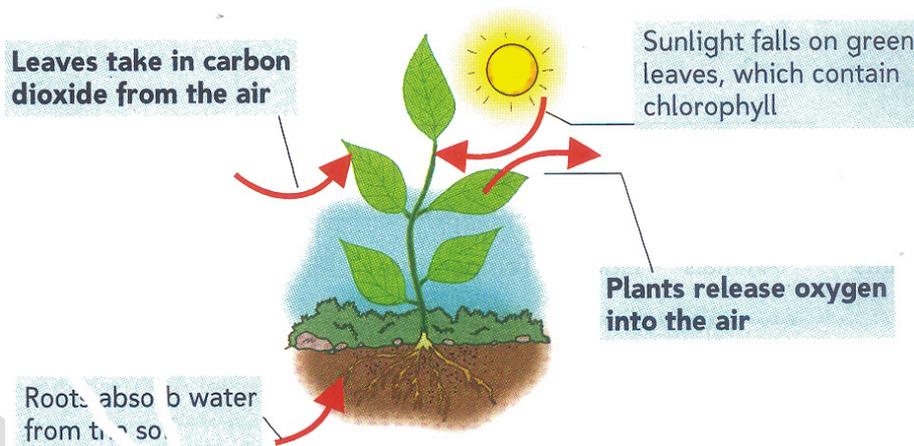
²³₁₁ **Parallel venation :** If veins are parallel to one another in a leaf then venation called parallel venation. eg. leaves of grass.



Fig.1.19 Parts of Leaf and Leaf venation

(B) Functions of Leaf :

(I) Manufacturing of Food : Green plants make their own food by the process of photosynthesis. It is the process by which leaves combines carbon dioxide and water with the help of green coloured substance (chlorophyll) in the presence of sunlight to prepare their food and release oxygen.



Diagrammatic representation of photosynthesis

Fig.1.20 Photosynthesis

(II) Transpiration : The excess of water absorbed by the root hairs is lost from the surface of leaf through the stomata in the form of vapour. This process is called transpiration. Plants release a lot of water into the air through this process.

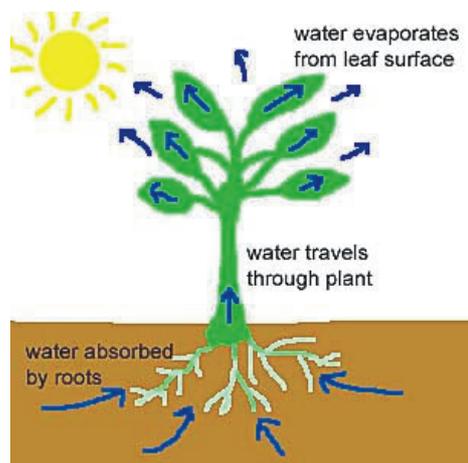


Fig.1.21 Transpiration

(III) **Gaseous exchange** : Exchange of gases occurs during respiration and photosynthesis through stomata

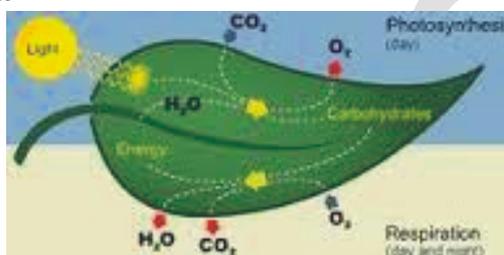


Fig.1.22 Gaseous exchange

(C) **Types of Leaf :**

(I) **Simple leaf** : A leaf that consist of a single lamina, which is not divided into segments. Plants like mango, guava and money plant have simple leaves.

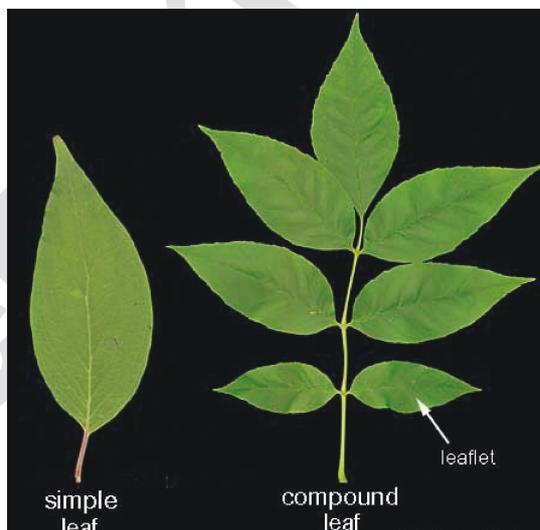


Fig.1.23 Simple leaf & Compound leaf

(II) **Compound leaf**: The leaf in which the lamina is divided into several small segments or leaflet each attached to the same petiole. The leaflet may be arranged on opposite sides of the petiole like in rose and neem or may arise from a common point at the petiole like in palm leaves.

- (D) Modification of leaf :** In some plants, the leaf or part of leaf is modified to perform some special functions. These modifications are : -
- (I) Leaf Tendrils :** In climbers, the leaves or leaflets are modified into spring-like structures called leaf tendrils. They coil around some object and provide support to the weak stem to climb up, e.g., sweet pea.

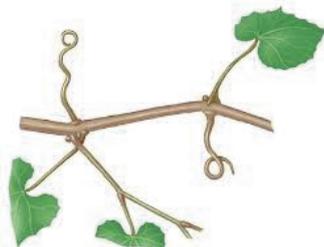


Fig.1.24 Leaf Tendrils

- (II) Leaf Spines :** In prickly poppy, leaf margins bear spines to protect the plant from grazing animals. In cacti, the leaves are modified into spines to avoid loss of water by transpiration.

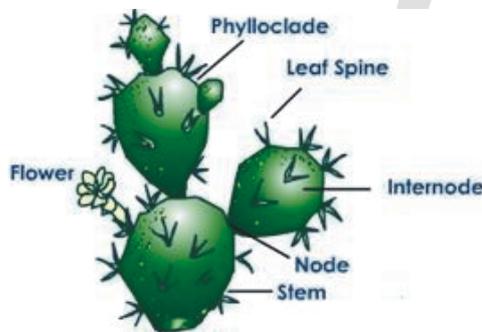


Fig.1.25 Opuntia

- (III) Insect-eating (insectivorous) plants :** The leaves are modified into pitcher, bladder or flytrap for catching and digesting insects.



Fig.1.26 Venus Fly-Trap and Pitcher plant

- (IV) Vegetative propagation :** In some plants, leaves bear buds in the marginal notches from which new plants grow and develop. eg. Bryophyllum, Begonia.

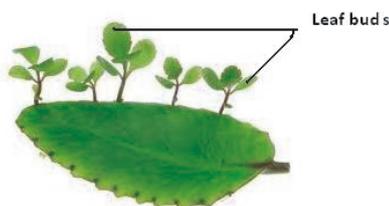


Fig.1.27 Leaf

(iii) **Flower** : A flower may be defined as a modified shoot in which nodes and internodes are highly condensed. It develops from the floral bud. The Flower is the site of sexual reproduction in plants.

(A) **Parts of a Flower** : Flowers vary in size, shape and colour but all flowers have the same basic parts.

23
11 Pedicel and Thalamus

23
11 Calyx

23
11 Corolla

23
11 Androecium / stamen / Male Reproductive organ

23
11 Gynoecium / Pistils/ Female Reproductive organ.

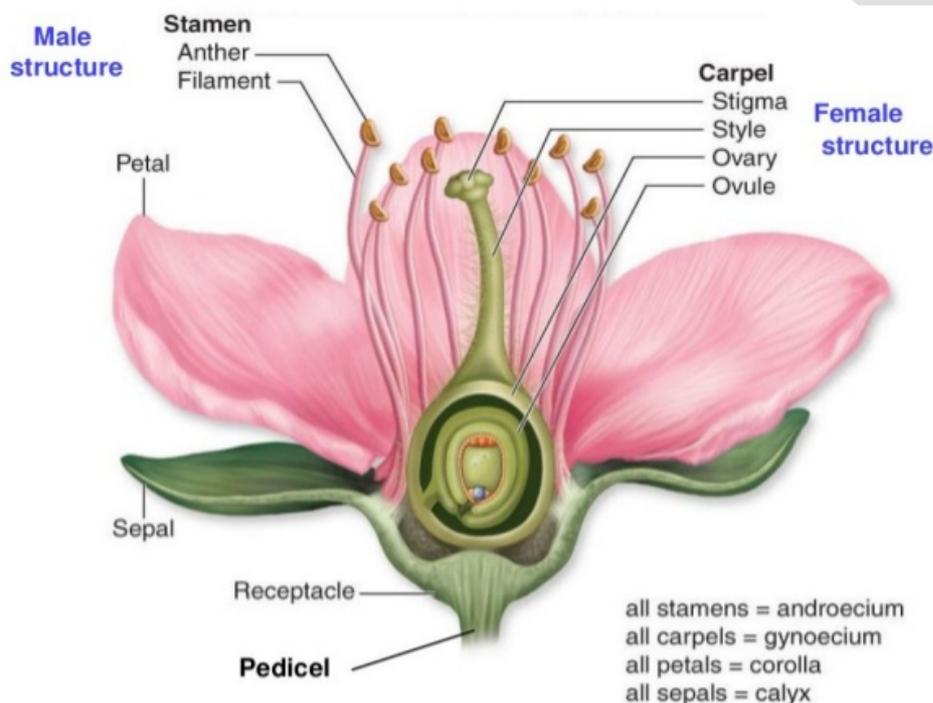


Fig.1.28 Flower structure

(I) **Pedicel and Thalamus** : The Flower is borne on a stalk called pedicel. The upper most end of the pedicel is some what swollen. This swollen part of the pedicel is known as the Thalamus. It bears all the four whorls of a flower.

(II) **Calyx** :

23
11 It is the First outermost whorl of a Flower.

23
11 It consist of leaf like structures called sepals.

23
11 Sepals are generally green in colour and manufacture food.

23
11 They also protect the new delicate inner parts of the flower during the bud stage.

(III) **Corolla** :

23
11 It is the second whorl of a flower.

23
11 Each segment of the corolla is known as a petals.

23
11 Petals are usually brightly coloured due to the presence of pigments.

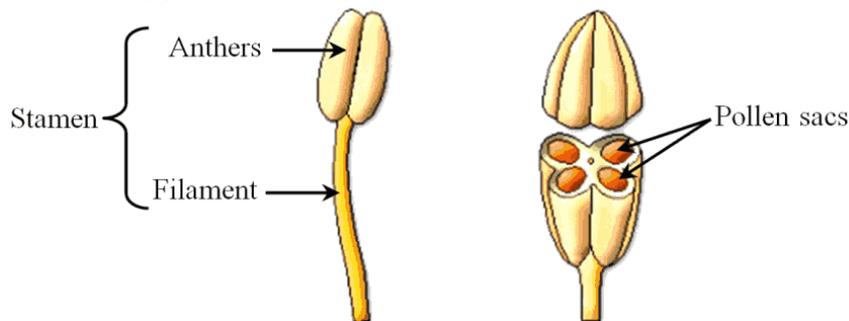
23
11 The bright colour, sweet smell and nectar attract the insect which in turn, help in pollination.

(IV) **Androecium / stamen / male Reproductive organ** : It is the third floral whorl which is composed of one or more male reproductive organs called stamen
 A typical stamen is differentiated into three parts:

²³₁₁ **Filament** : It forms the stalk that bears more or less cylindrical or ovoid anther.

²³₁₁ **Connective** : It connects anther to filament.

²³₁₁ **Anther** : It is present on the top of filament. Each anther consist of two lobes that is why it is called as bilobed.Each anther lobe has two pollen sac which contain millions of tiny microscopic pollen grain, called as microspores.The pollen grains are like yellow dusty powder in appearance.



Structure of stamen

Fig.1.29 Stamen

(V) **Gynoecium / pistil / Female Reproductive organ** : It is located in the centre of flower.The gynoecium is the fourth whorl which is composed of one or more carpels.The freely occuring units of the carpels in a flower are called pistils.

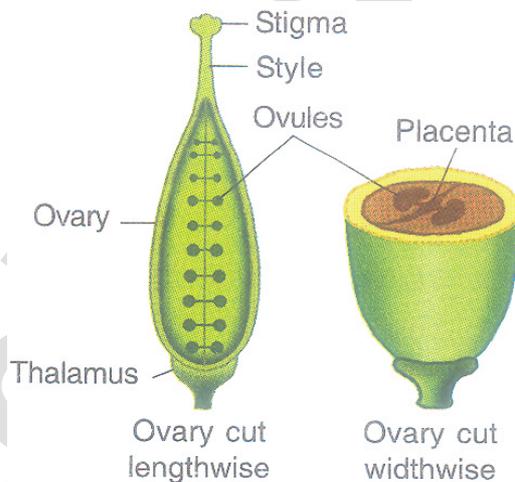


Fig.1.30 Pistil

Each pistil usually consist of three distinct parts :

²³₁₁ **Ovary**

²³₁₁ **Style**

²³₁₁ **Stigma**

²³₁₁ **Ovary** : It is a basal swollen part of the pistil. The ovary bears the ovules on a raised tissue called the placenta.Each ovule contains the female reproductive cell.

²³₁₁ **Style** : From the top of the ovary arise a long elongated structure which connects the stigma with ovary. It is meant for raising the level of the stigma.

²³₁₁ **Stigma** : The terminal end of style is called as stigma. The stigma is normally rough, hairy and sticky.It is meant for receiving pollen grains during pollination.

(B) Types of flowers:

²³/₁₁ **Complete Flowers:** Flower with all the four whorls are called complete flowers, e.g., China rose, Mustard, Rose, Pea etc.

²³/₁₁ **Incomplete Flowers:** Flowers having one of the four whorls missing are called incomplete flowers, e.g., Pumpkin, Water melon, Wheat, Grass etc.

(C) Functions of flower :

²³/₁₁ Flowers are reproductive organs of the plant.

²³/₁₁ The ovary of a flower develops into fruit and its ovules form the seeds.

²³/₁₁ The nectar of flowers is collected by honey bees to prepare honey.

²³/₁₁ Perfumes are prepared from flowers.

²³/₁₁ Cloves are dried flower buds. These are used for adding flavour to the food and for preparing several ayurvedic medicines.

Ask yourself

**Roots**

1. Why desert plant have relatively longer roots.
2. Can bamboo grow over 60 cm. in just one day.
3. What are Halophytes ?
4. Do you know what are adventitious roots ?
5. What is the white part seen coming out of sprouts.

Stems

6. Do stems have pore ?
7. Is the stem of shrubs and trees dead or living ?
8. Is sweet potato a stem or a root ?
9. Can you name a type of edible cactus ?
10. What are stolons ?

Leaves

11. What can you tell about venation by looking at the seed ?
12. Which surface of leaf has more no. of stomata ?
13. Can plants carnivorous ?
14. Can you name one plant whose no part goes waste.
15. Can mushroom be called as plant.

Flowers

16. Do birds also transfer pollens ?
17. What are unisexual and bisexual flowers ?
18. Can a flower contain more than one carpel.
19. Which part of plant is dried and used as saffron ?
20. Study different types of flowers in your neighbourhood. Record your observations in the format given below. (NOTE: When choosing flowers to study, avoid using Marigold, chrysanthemum and sunflower.)

Name of the flower	Does the flower have a smell?	Colour of the petals	Number of		
			Petals	Sepals	Stamens



Add to Your Knowledge

23

11

Oxygen and water are produced as a result of photosynthesis in plants

23

11

Monocots have fibrous roots whereas **Dicots** have tap roots

23

11

Essential and Nonessential Whorls : Stamens and pistil form the essential whorls of the flower. These are the male and female reproductive organs of the flower and are directly involved in reproduction. On the other hand, calyx and corolla are accessory or nonessential whorls of the flower because these are not associated directly with the reproduction.

23

11

Pollination: Process of transfer of pollen grains from anther to stigma is called Pollination. There are two types of pollination.

- ◆ **Self pollination**: When pollengrain is transferred from anther to stigma of the same flower.

- ◆ **Cross pollination**: When pollengrain is transferred from anther to stigma of the different flower.

23

11

Fertilization: Fertilization is a process of fusion of male gamete with the female gamete.

23

11

Pollen grain contain two male gametes.

23

11

After Fertilization ovule changes into seed and ovary wall change into fruit wall.

23

11

At maturity wall of ovules changes into seed coat of which outer one is hard and is known as testa, while inner one is called as tegmen.

23

11

Seed has two parts cotyledon (Store food), and embryo which forms Radicle (future root) and plumule (future shoot).

23

11

Seed dispersal is movement or transport of seeds away from the parent plant. There are five modes of seed dispersal : Wind, water, animal, explosion and gravity.

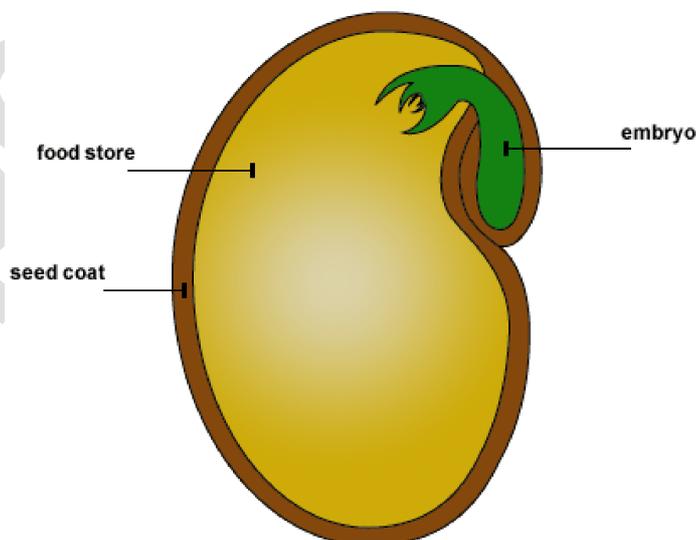
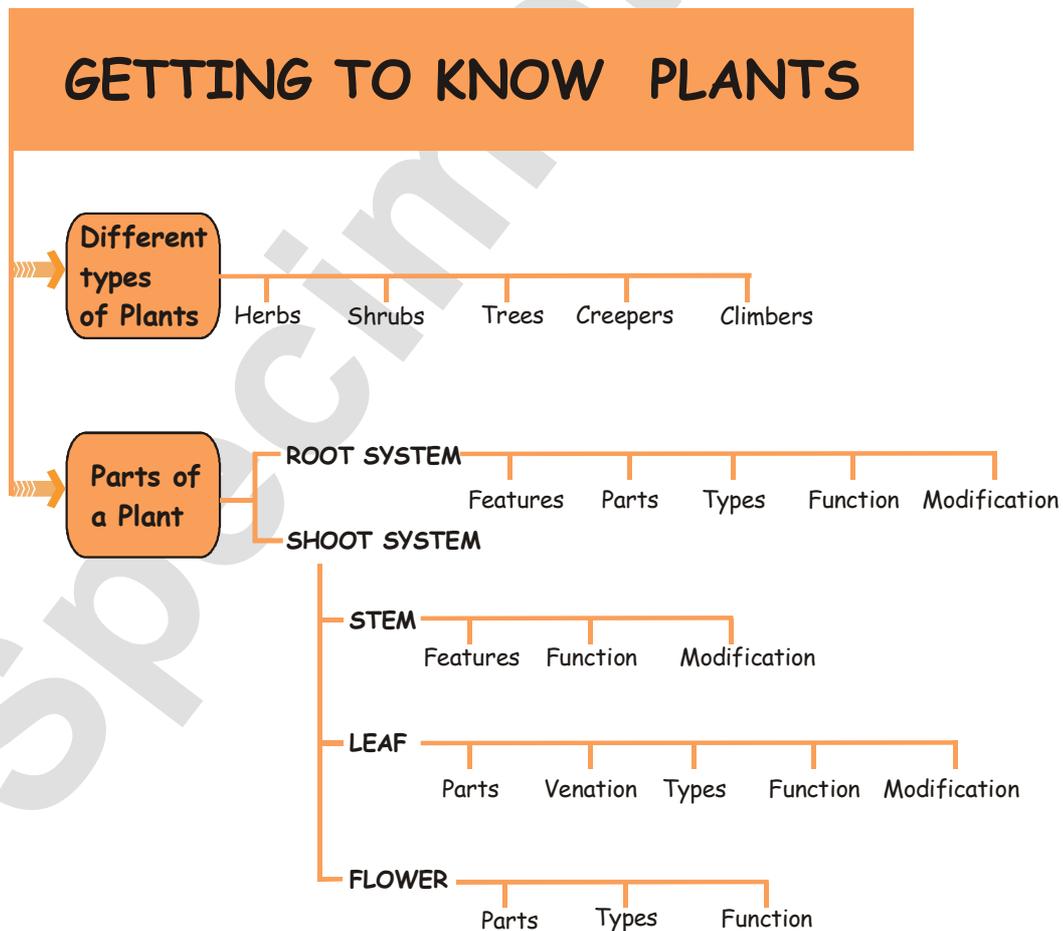


Fig.1.31 Seed

Summary

- ◆ Plants are generally classified into herbs, shrubs, trees, creepers, and climbers based on their height, types of stems and level of branches.
- ◆ Roots are made of one primary root and it's branches called secondary roots and it's branches called tertiary roots.
- ◆ Each branch of root has root hairs which absorb water and minerals from the soil and bind the plant firmly in the soil.
- ◆ Roots are mainly of two types: tap root and fibrous roots.
- ◆ The shoot consists of stem, leaves, flowers and fruits.
- ◆ A stem connects and conducts water and minerals from roots to all parts of a plant.
- ◆ A leaf has a petiole, a lamina with central midrib and veins.
- ◆ The pattern of veins on the leaf can be reticulate or parallel.
- ◆ Plants having leaves with parallel venation have fibrous roots while plants having leaves with reticulate venation have tap roots.
- ◆ Green plants make their own food by the process of photosynthesis using carbon dioxide and water, with the help of chlorophyll, in the presence of sunlight.
- ◆ Excess of water is given out in the form of vapour through the process of transpiration.
- ◆ The parts of a flower are pedicel and thalamus. Latter bears the 4 whorls calyx(sepals), corolla(petals), androecium(stamens), and gynoecium(pistils)

CONCEPT MAP



EXERCISE >> 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS :

1.1 DIFFERENT TYPES OF PLANTS

1. The thick, woody stem of trees : (E)
 (A) Node (B) Trunk (C) Scale (D) Internode
2. Which of these trees do not contain branches : (E)
 (A*) Coconut (B) Apple (C) Papaya (D) Mango

1.2 PARTS OF FLOWERING PLANTS

3. Which of these plants store food in their roots ? (M)
 (A) Balsam (B) onion (C) Carrot (D) Zinnia
4. Which part of plant conducts food ? (E)
 (A*) Stems (B) Roots (C) Leaves (D) Flowers
5. Which one of the following has tap root ? (M)
 (A) Wheat (B) Rice (C) Maize (D) Pea
6. The part of the plant that take part in photosynthesis is : (E)
 (A) Stem (B) Leaf (C) Flower (D) Root
7. The leaves of which of the following plants have reticulate venation ? (M)
 (A) Wheat (B) Maize (C) Rose (D) Rice
8. Green, leaf-like structures at the base of the flower : (E)
 (A) Petals (B) Sepals (C) Stamens (D) Anthers
9. The male reproductive organ of a flower is the : (E)
 (A) Pistil (B) Stamen (C) Pollen grain (D) Ovule
10. Female reproductive parts of a flower : (M)
 (A) Stamens (B) Pistils (C) Petals (D) Sepals

FILL IN THE BLANKS

- (i) _____ is the male reproductive part of the flower.
- (ii) Zimikand is a type of _____.
- (iii) Leaves are green as they contain _____ pigment.
- (iv) Plants with fibrous roots have _____ venation.
- (v) Ovule grows in the _____.

TRUE / FALSE

- (i) Root cap is present on tip of each branch of root.
- (ii) Fibrous roots are found in most of the Dicot.
- (iii) Rice plant has fibrous root system.
- (iv) Bamboo has prop roots.
- (v) Stem grows from the plumule of the embryo of a seed.
- (vi) The broad green part of the leaf is called lamina .
- (vii) The leaf is called "the food factory " of a plant.

MATCH THE COLUMN (M)**Column-A**

- (i) Fibrous root
- (ii) Pistil
- (iii) Tap root
- (iv)_ Future Shoot

Column-B

- a) Female reproductive part
- b) Dicot
- c)_ Plumule
- d) Monocot

SECTION -B (FREE RESPONSE TYPE)**VERY SHORT ANSWER TYPE**

1. Name the two main organ systems in plants. (E)
2. Name any two functions of roots. (E)
3. Name any two modifications of roots along with their functions and examples. (E)

SHORT ANSWER TYPE

4. With the help of diagrams, describe the two basic root systems found in plants. (M)
5. Write any two functions of the stem. (M)
6. What are the main parts of the shoot system ? (M)
- 7._ What is leaf venation? Name its types. (M)

LONG ANSWER TYPE

- 8._ Describe the structure of a root with the help of a labelled diagram. (T)
- 9._ Describe the functions of a leaf with the help of a labelled diagram. (T)
10. Describe the parts of a typical flower with the help of a diagram. (T)

EXERCISE >> 02**SECTION -A (COMPETITIVE EXAMINATION QUESTION)****MULTIPLE CHOICE QUESTIONS**

1. Which part of a flower turns into a fruit ? (M)
(A) Sepals (B) petals (C) Ovary (D) None
- 2._ Prop roots are present in: (M)
(A) Rice (B) Sugarcane (C) Maize (D) Rubber
- 3._ Breathing roots are present in (D)
(A) Pea (B) Mango (C) Sugarcane (D) Mangroves
4. A plant having parasitic roots : (M)
(A) Radish (B) Dodder (C) Rice (D) Banyan
- 5._ Which of these does not have nodes and internodes: (D)
(A) Ginger (B) Turnip (C) Rose (D) Palm tree
- 6._ Tiny pores on the surface of leaves are: (D)
(A) Lenticels (B) Stomata (C) Cuticle (D) Buds
- 7._ In which plant does the stem perform the function of a leaf ? (D)
(A) Boganvillea (B) Onion (C) Cacti (D) Potato
- 8._ Anthers contain (D)
(A) pollen grains (B) ovules (C) ovary (D) petals
- 9._ When pollen is transferred from anther to stigma of flower the process is called. (D)
(A) Fertilizaton (B) Fusion (C) Pollination (D) germination
- 10._ A type of stem : (M)
(A) Potato (B) Carrot (C) Beetroot (D) Turnip

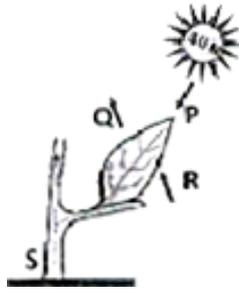
SECTION -B (TECHIE STUFF)

11. Which of the following plants would have a root structure similar to one shown in the figure given below ?



- (A) Marigold (B) Mango (C) Paddy (D) Balsam

12. Study the diagram given below.



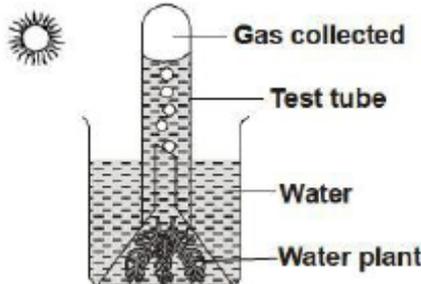
Which labelled arrow represents the movement of oxygen ?

- (A) P (B) Q (C) R (D) S

EXERCISE >> 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. Smita set up an apparatus as shown in the given figure. After keeping the apparatus for some time in the Sun, she found that some gas has collected in the top part of the test tube. Which gas could it be ? **(NSO, 2010)**



- (A) Oxygen (B) Hydrogen (C) Carbon dioxide (D) Nitrogen

2. Given below are three statements (a-c) each with one or two blanks. Select the option which correctly fills up the blanks in two statements. **(NSO-2010)**

(a) In cacti, the (i) is thick, fleshy and green. It carries out photosynthesis.

(b) The male reproductive part of a flower is (i).

(c) The coloured (i) of a flower attract insects for (ii)

- (A) (a) - (i) Root, (b) - (i) Pistil
 (B) (b) - (i) Stamen, (c) - (i) Petals, (ii) Pollination
 (C) (a) - (i) Root, (c) - (i) Sepals, (ii) Food
 (D) (a) - (i) Root, (b) - (i) Stamen

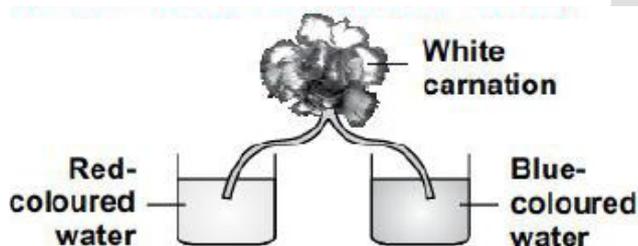
3. Which of the following is incorrect regarding herbs, shrubs and trees ?

(NSO-2011)

Herbs	Shrubs	Trees
(A) Tomato	Lemon	Mango, guava
(B) Usually short	Medium sized	Tall in size
(C) Plants with hard stem, not very thick	Plants with green and tender stems	Plants with thick brown stem
(D) Branches are few	Stem branches out near base	Stem branches out in the upper part

4. Shruti took a white carnation flower and split its stalk halfway along the length and arranged a setup as shown in the given figure. After some time, she observed that half of the petals turned blue and half turned red. A section through stem also showed blue and red coloured areas.

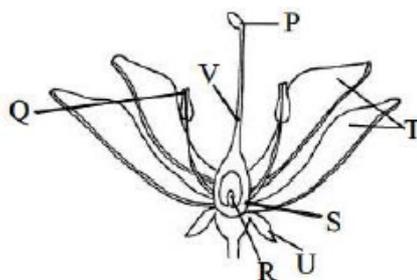
(NSO-2012)



What can she infer from this experiment ?

- (A) Stem conducts water to all plant parts.
 - (B) Stem has localized structures for conduction of water.
 - (C) Stem conducts solutes along with water.
 - (D) All of these
5. Refer the given figure of different parts of a typical flower and select the correct statements regarding it.

(NSO-2013)



- (i) After pollination, 'S' swells up and changes into a fruit and 'R' changes into a seed.
 - (ii) 'P' contains pollen grains.
 - (iii) The pollen grains are transferred from 'Q' to 'P' in self-pollination.
 - (iv) 'U' is brightly coloured and scented to attract insects that help in reproduction.
 - (v) Different flowers have 'T' of different colours.
 - (vi) 'P', 'V' and 'S' form the innermost part of a flower called pistil.
- (A) (i), (ii), (iv) and (vi) (B) (i), (iii), (v) and (vi)
 (C) (ii) and (v) (D) (iii), (iv) and (vi)

6. Refer the given three plants P, Q and R.

(NSO-2013)



- Which of the following is a suitable statement for the given plants?
- (A) P and R produce food, while Q does not
 (B) P and Q produce oxygen, while R does not
 (C) P is a shrub, Q is a herb, while R is a tree
 (D) Leaves of P and Q show parallel venation, while that of R shows reticulate venation
7. He is known as 'Father of Green Revolution.' He produced a high yielding, disease resistant wheat variety and was awarded Nobel Peace Prize in 1970 because of his contributions to world peace by helping to reduce scarcity of food. Who is he ? (NSO-2013)
- (A) Dr. Verghese Kurien (B) Hilaire de Chardonnet
 (C) Norman de Kazimodke (D) Norman Ernest Borlaug

DIRECTION (Q.8 & 9): Refer the given passage and answer the following questions.

(NSO-2013)

In some plants, leaves get modified to perform different functions. For example, in insectivorous plants such as pitcher plant, the leaf is modified to form a pitcher for capturing insects. These plants have green leaves as well. They grow in regions where the soil is deficient in nitrogen.

8. Which of the following statements is incorrect regarding this ?
- (A) Photosynthesis that occurs in the green leaves of these plants, produces carbohydrates as their food source.
 (B) Photosynthesis does not occur in these plants as they depend only upon insects for their food
 (C) To harvest nitrogen necessary for their growth and development, these plants trap insects and digest them.
 (D) Insectivorous plants prepare their food by the following reaction:
- $$\text{CO}_2 + \text{Water} \rightarrow \text{Glucose} + \text{O}_2$$
- (From air) (From soil)
9. Which of these sets of two different pots (P and Q) should one select to carry out a starch test in order to prove that insectivorous plants are photosynthetic ?

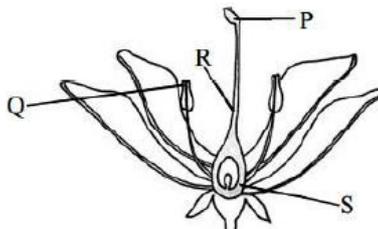
Pot P

- (A) Plant covered within netted container without insects
 (B) Plant in sealed wooden container
 (C) Plant watered everyday
 (D) Plant with fertilizer

Pot Q

- Plant covered with in netted container with insects
 Plant in sealed glass container
 Plant watered every 3rd day
 Plant without fertilizer

10. Identify the parts labelled in the given figure. Match them with their respective functions and select the correct option. **(NSO-2013)**



- (A) P - Anther - Transfer of pollen grains (B) Q - Stigma - Receives pollen grains
 (C) R - Style - Transfer of ovule (D) S - Ovary - Involved in fertilization
11. Which of the following features are useful for desert plants ? **(NSO-2015)**
 (A) Leaf hairs (B) Large flat leaves (C) Needle like leaves (D) All of these
12. X is a stem modified to store food, while Y is a stem modified to make food. X and Y are respectively **(NSO-2016)**
 (A) Cactus and sweet potato (B) Onion and potato
 (C) Ginger and cactus (D) Dahlia and ginger.
13. Phyllotaxy is the arrangement of leaves on the stem. Identify the three types of phyllotaxy shown in the given figures, X, Y and Z. **(NSO, 2016)**



- | | | |
|--------------|-----------|-----------|
| X | Y | Z |
| A. Alternate | Opposite | Whorled |
| B. Opposite | Whorled | Alternate |
| C. Whorled | Alternate | Opposite |
| D. Opposite | Alternate | Whorled |

ANSWER KEY >>

1.GETTING TO KNOW PLANTS
EXERCISE-1
MULTIPLE CHOICE QUESTIONS

Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	C	A	D	B	C	B	B	B

FILL IN THE BLANKS

- (i) Androecium (ii) Corm (iii) Chlorophyll (iv) Parallel (v) Ovary

TRUE / FALSE

- (i) True (ii) False (iii) True (iv) False (v) True
 (vi) True (vii) True

MATCH THE COLUMN

I. (i)-(d),(ii)-(a),(iii)-(b),(iv)-(c)

EXERCISE-2

(COMPETITIVE EXAMINATION QUESTION)

Q	1	2	3	4	5	6	7	8	9	10	11	12
A	C	D	D	B	B	B	C	A	C	A	C	B

EXERCISE-3

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13
A.	A	B	C	D	B	D	D	B	C	D	C	C	C



INTRODUCTION

Human society has evolved over a period of time to what it is today. It is natural tendency of human beings to explore how the world and the human society has grown from times immemorial. All the knowledge on these aspects has been explored is endorsed in books of history.

1.1 WHAT IS HISTORY ALL ABOUT ?

History is the systematically structured study of the events that happened in the past chronologically or in the sequence to time. It tells us the details of how the ancestors of humans lived and progressed over the thousand of years. History is a part of Social Science.

Herodotus, the Greek historian, is regarded as the father of History. It was he who invented the word "history". He said history means 'study' or 'investigation of past time'.

According to Leo Tolstoy, "The subject of history is the life of the people and of humanity." History is not just a record of kings and queens. It comprises the study of human culture and civilization of all ages.

And the scholars who describe the past are often called historians.

Archaeology is that branch of knowledge that examines the physical remains of the past and gathers evidence.



Fig. : Herodotus

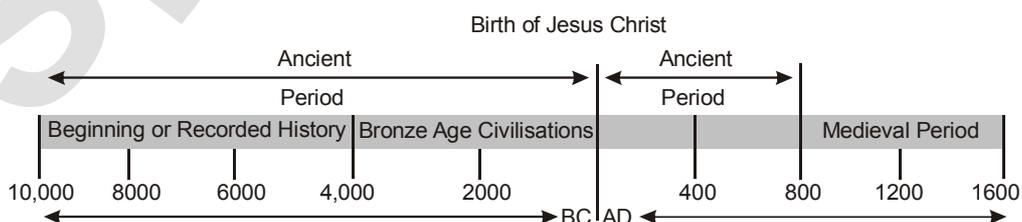
1.2 TIME FRAME

What is Meant by B.C. and A.D.?

History deals with the complete story of man, his past, present and future. How to measure this long period is a problem. But historians have solved this problem too by introducing the concepts of B.C and A.D.

The birth of the Christ is the focal point from which we count the dates. If an event happened 100 years before the birth of Christ we say that event happened in 100 B.C and if, on the other hand, any thing happened 100 years after the birth of Christ we say that it happened in 100 A.D.

The letters B.C stand for Before Christ and A.D. stand for 'Anno Domini' which in simple language means 'the year of the Lord'.



A timeline tells us what happened and when it happened

Thus, while dealing with any date before Christ we add B.C. to that year and likewise if we deal with any date after Christ we add A.D. to that date. If we say Alexander invaded India in 326 B.C. and the Guptas ruled over India between 320 A.D. to 540 A.D., it simply means that Alexander's invasion took place 326 years before Christ and the Guptas ruled some 320-540 years after Christ.

If we add Circa with any date, it means that such a date is not the right or exact one but quite close to that. It is an approximate date.

Do You Know

Another set of abbreviations that is used with the dates, is that of BCE and CE. 'BCE' stands for 'Before Common Era' and the 'CE' for Common Era

How is the History of the Past Relevant to an Understanding of the Present ?

What we are today is the product of the past.

If we want to understand anything, we will have to go to its roots or foundation. If we want to know about any country or a nation we will have to go to its past history. Many of our beliefs and traditions are deep-rooted in the past. If we want to understand India today, we will have to study its past history.

There is no denying the fact that we have inherited many good things from the past. Many ethnic groups like the pre-Aryans, the Indo-Aryans, the Greeks, the Turks, the Scythians, the Hunas, the Turks etc. mingled and intermingled, and this ultimately resulted in the making of the present Indian race.

The study of ancient Indian History helps us in imbibing the spirit of religious tolerance. The Hindus, the Buddhists and the Jains lived in complete religious harmony, so should we.

The ancient people strove for unity and gave one name to the whole country, i.e. the Bharata which extended from the Himalayas to Cape Comorin and from the Valley of the Brahmaputra in the east to the land beyond the Indus. We should also imbibe this spirit of unity.

The caste system proved the undoing of social unity over and over again, so the ancient experience warns us to be careful of it.

1.3 NAMES OF OUR COUNTRY

Our country was known by different names from time to time. But two of them, i.e. Bharat and India, are the most well known. The name Bharata is mentioned in Rigveda the earliest work in Sanskrit dated about 3500 years ago. Initially the name Bharata was used for those people who lived in the north-west part of the country but later on it began to be used for the whole country. The name India comes from the Indus, called Sindhu in the Sanskrit language. Both the Iranians and the Greeks who came to this country from the northwestern side of the country about 2500 years ago were familiar with the Indus which was sometimes called the Hindos or the Indos. The land to the east of the Indus came to be called as India. These two names Bharat and India still exist in our literature and history.

1.4 THE GEOGRAPHICAL FRAMEWORK

How is Geography Helpful in Shaping the Life and History of the People

People of any country of the world are greatly influenced by their country's geographical features. Their style of living, wearing clothes, food habits are all influenced by it. People living in cold regions, like Siberia, would naturally wear woolen clothes while those living in hot countries would wear loose clothes, like in Arabia.

The following physical or geographical divisions of India have affected Indian people and their history in their own way :

1. The Great Himalayas
2. The Great Northern Plains
3. The Deccan Plateau
4. The Eastern and Western Coastal Regions.
5. Deserts
6. Islands

The Great Himalayas have always been a barrier for invaders from the north. Hence very few invasions have taken place from this side.

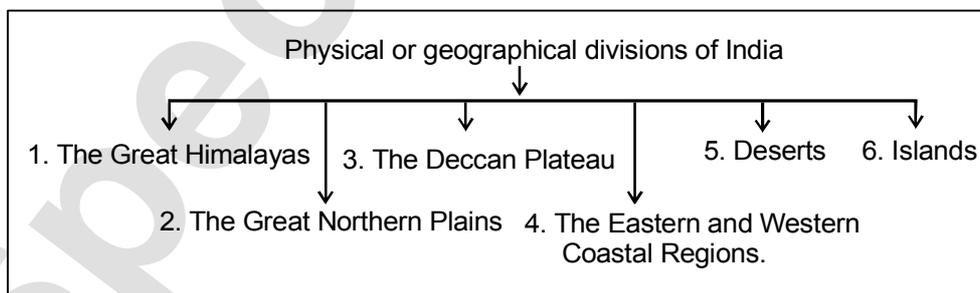
India was invaded again and again from the north-western side simply because of the presence of so many low-lying passes such as the Khyber, the Kunlun, the Gomal, Trichi and the Bolan, etc. in the north-west.

The vast and fertile plains of north India formed a base for the establishment of the vast empires like that of the Mauryas, the Guptas and the Mughals.

Have you ever thought why Pataliputra was the capital of the two great empires of the Mauryas and the Guptas though the gap between the existence of these two empires was more than six centuries? This was because Bihar (including Jharkhand) was and it still is the storehouse of iron-ore. It was with the help of this iron that weapons of war could be manufactured in abundance which facilitated the establishment of two great empires, both with their capital at Pataliputra.

The Deccan provided a good military base, so even the mighty empires of the north could not easily win and keep those areas under their control for a long time. This was the main reason why the Marathas with their scanty military power could successfully challenge the mighty Mughal empire.

A very long coastline along the western and eastern coastal plains enabled the Indians, especially the southern powers, to establish strong commercial relations both with the South-East Asian states as well as with the African and European countries.



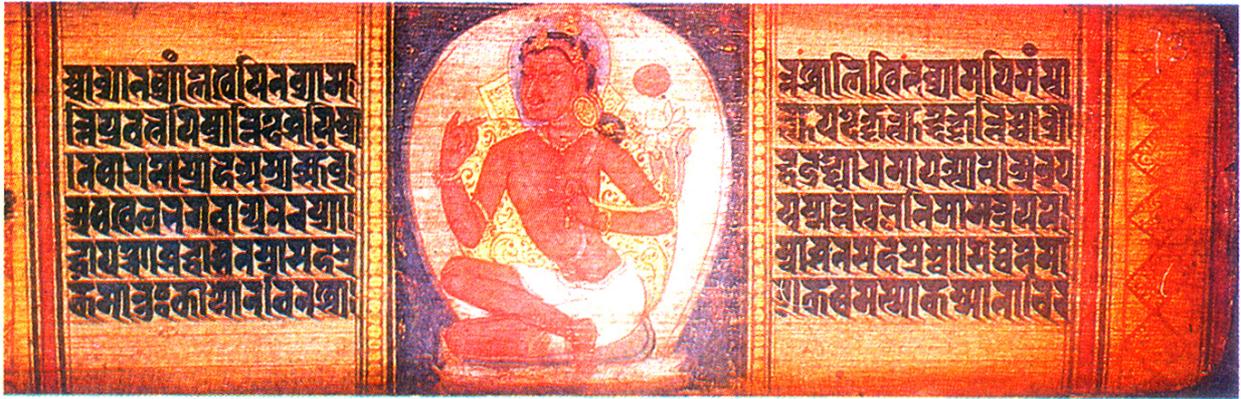


Fig. : An old manuscript

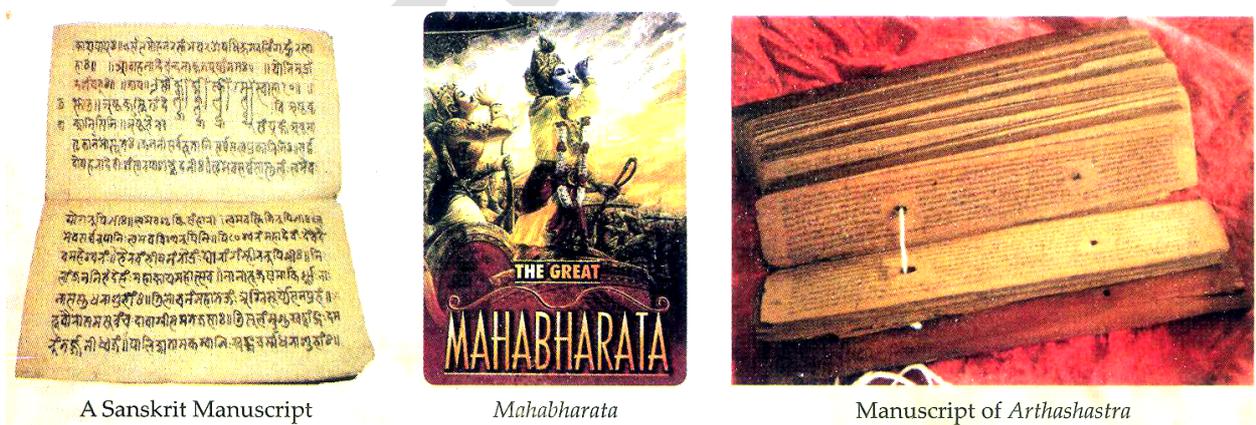
Secular or Historical Literature :

- (i) The Arthashastra by Kautilya gives us information about Mauryan administration and the contemporary society.
- (ii) The Mudra Rakshasa by Vishakhadatta yields valuable information regarding the Nandas and the Mauryas, particularly the overthrow of the Nandas by the Mauryas.
- (iii) Bana's Harsha Charita, which has been compared by Dr. V.A. Smith with Abul Fazal's Akbarnama, gives accurate and valuable information regarding Harsha, his conquests and administration.
- (iv) Rajtarangini by Kalhan traces the history of Kashmir from the earliest times to the 12th century A.D.
- (v) The dramas of Kalidasa - Shakuntala/ Meghaduta and Malvikagnimitra - shed light on the social life of his age and also on the early Sungas.



Fig. : Hieun Tsang

Historians have also derived important historical information from such literary works as Panini's Ashtadhyayi and Patanjali's Mahabhashya.



A Sanskrit Manuscript

Mahabharata

Manuscript of Arthashastra

Fig. Religious Literature

Travellers' Accounts :

A number of foreign travellers - Greeks, Romans, Chinese, Tibetans, Muslims, etc. - visited this country from time to time and have left valuable political and social accounts. Herodotus

in his book Histories supply much information regarding the Perso-Greek War and the political connection of north-west India with Persia in the fifth century B.C. Megasthenese in his book Indica throws a good deal of light on the Mauryan administration and society, and also the geography and products of India.

Why did Some Travellers Go to Distant Lands?

Some people travelled to distant lands in search of livelihood and better service opportunities, while others travelled to avoid natural calamities like earthquakes and floods. Merchants travelled with caravans to sell their valuable articles at high prices while religious leaders travelled for preaching their own faith and bettering humanity. Certainly some conquerors marched to other lands to conquer them and win military laurels. Last but not the least, there were certain persons who went to distant lands driven by the spirit of adventure.

Similarly, the Chinese pilgrims, especially Fahein (A.D. 399-414), Hieun Tsang (A.D. 629-45) and Itsing (A.D. 673-95), who visited this country in search of knowledge and Buddhist literature, have left valuable accounts about the religious, social and political conditions of India. Fahein's description of Pataliputra and Gupta administration, and Hieun Tsang's account of the political, religious and social conditions of India towards the middle of the 7th century A.D. have proved very useful to us in reconstructing the history of India from A.D. 400-700.

Do you Know

According to historians, cities began to develop in the Indian subcontinent by 2500 BC. Around the same time, human settlements started coming up in the Nile Valley in Egypt. In Sumer (present day Iraq), cities were already flourishing. The Sumerians invented the wheel and created the first script.

(b) Archaeological Sources

The archaeological sources like inscriptions, coins, monuments and artefacts have a significant effect on the writing of ancient history.

- Inscriptions :** The inscriptions engraved on stone, copper plates etc. provide us information about important events of ancient rulers. The rock edicts of Ashoka, the Sanchi inscriptions, the Allahabad Pillar Inscription, the Iron Pillar Inscription at Mehrauli in Delhi tell us about important events, administration, the personal qualities of the rulers, important dates, specimens of art and the mutual relations of different rulers.

- Coins :**



Coins of the Gupta Period



Fig. :
Ashokan Pillar

A large number of coins belonging to ancient times have also been found. These coins are made of gold, silver, copper and other metals. They help us in fixing the dates of several dynasties. They also help us in many other ways in the study of Indo-Bactrian and Indo-Greek periods in India. Similarly, the coins issued by Samudragupta tell us that he was a devotee of Vishnu. Samudragupta is depicted on his coins playing Veena. This proves he was a great musician. Coins also tell us about the economic condition of the period and the extent of the empire of the kings concerned.

3. Monuments :

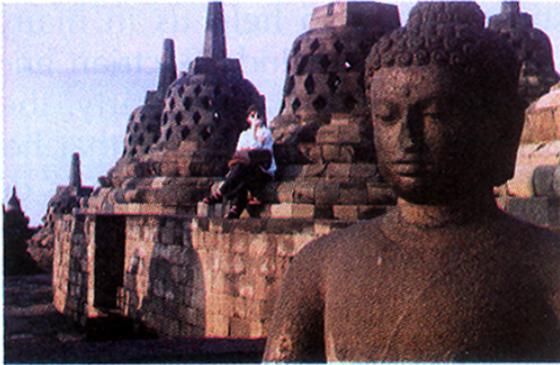


Fig. : Borobudur temple of Java



Fig. : Angkorvat Temple, Cambodia

The ruins of old buildings, temples, palaces, stupas, caves, old towns, etc., provide important information regarding our past heritage.

The excavations at Mohen-jo-Daro, Harappa, Sanghol and several other sites have proved that a great civilization existed in the Indus Valley about 5,000 years ago. The excavations at Taxila have yielded valuable information about the Kushan dynasty and excavations at Pataliputra have helped us a lot in our knowledge about the Mauryas.

They throw light not only on the development of architecture but also on the social and religious life of the people. In this respect, the stupas built by Ashoka at Sanchi and Bharhut and the temples at Bhitrigaon and Deogaon belonging to the Gupta period are also important. The ruins of Nalanda and Vikramshila enlighten us about the ancient (contemporary) system of education.

Things such as bones and wood found during excavations can be dated by a method called Carbon Dating. All living things absorb carbon -12 and carbon-14. Carbon 14 decays after death. The ratio between Carbon 12 and Carbon 14 decreases. The lower the ratio, the older the object is.

4. Artefacts : Artefacts or works of art comprising sculptures and paintings also help us in forming an idea of the cultural life of the people of the past.

The specimens found at Taxila that belonged to the period of Kanishka throw light on the beauty of the Gandhara Art and the Greek influence on the Indian sculpture as well as on the religious beliefs of the Kushan kings. Similarly, the images and paintings of Shiva, Vishnu, Buddha and Mahavira, and sculptures of the Gupta period (which are still found in the Ellora Caves) not only tell us about exquisiteness of the contemporary sculpture but also the religious tolerance of the Gupta rulers.

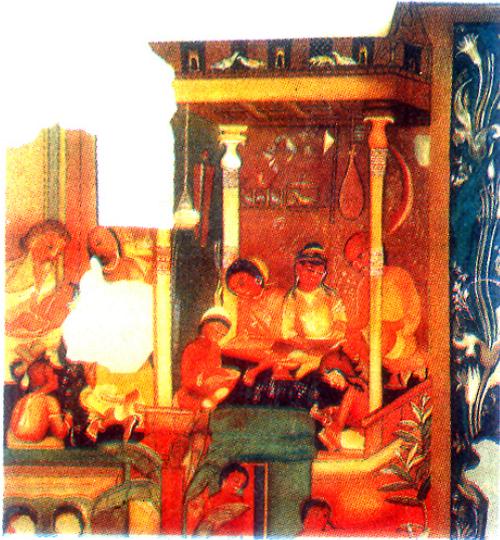


Fig. : A wall painting from one of the caves at Ajanta



Besides sculptures, the paintings and frescos found at Ajanta, Ellora and other places give valuable information regarding contemporary religious and social customs as well as clothing, food habits and means of entertainment of the people.

Many caves which date back to early stone age (Paleolithic caves) have been discovered in Andhra Pradesh. Bones of stone age mammals have been discovered on the ground in some caves. These give valuable information to archaeologists.

Do you Know

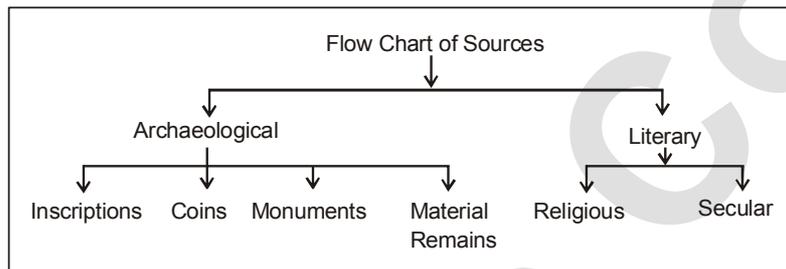
In 1822, the French scholar Jean-Francois Champollion deciphered the hieroglyphic script, by successfully reading the inscription of the Rosetta Stone. It was a piece of rock that had been inscribed with tiny writings. When scholars examined it, they found that it contained the same passage in three ancient scripts : Egyptian hieroglyphics, a simple Egyptian script and Greek. Since scholars could read the Greek and Egyptian writings, they were finally able to decode the hieroglyphics.

1.6 IMPORTANCE OF HISTORICAL SOURCES : ONE PAST OR MANY

In fact historical sources have a great importance of their own for every country. From them we form an idea of our ancient culture and about the people who lived in this land from time to time. From them we learn how the different groups of people like herders, farmers, merchants, craftsmen etc. whom we can call ordinary people lived a different life from the rulers and the kings. The kings, for instance, led a luxurious life in great palaces while farmers lived in ordinary houses and found it difficult to make the both ends meet. Again, where the kings kept a record of their battles, courts, leisure and pleasures the ordinary people like the farmers did not keep a record of what they did. The lives of the ordinary people and the ruling class were so different that some historians even believe that we have not one past but many pasts.

Key Words :

- SECULAR LITERATURE** : Literature concerned with worldly subjects, other than religion and philosophy.
- MONUMENTS** : Old buildings, whether excavated or standing.
- MANUSCRIPTS** : Handwritten accounts.
- INSCRIPTIONS** : Writings engraved on stones, metals, rocks, pillars, etc.
- ARCHAEOLOGICAL** : Ancient remains of buildings, pottery, tools, images, seats, tablets, coins, etc.
- EVIDENCES** : Proofs
- SCRIPT** : The form in which a language is written.
- ARTEFACTS** : Works of art which are produced by human skill.



Let's Recall :

About History

- ✘ What is history and why is the past important?
- ✘ History is a systematic record of past events; to understand the present, we need to study and understand the past
- ✘ There are two periods in history
 - prehistory: the period when man had no knowledge of reading and writing
 - history: the period for which written records are available

Influence of Geography on history

- ✘ Humans first settled around the fertile Indo-Gangetic plains
- ✘ The passes in the mountains served as pathways through which ideas, traditions and cultures were exchanged
- ✘ These routes were used by the traders, religious leaders; while some traders just traded and returned home, few settled down in India

Study of History

- ✘ History is studied in a chronological order
- ✘ The dates of years before Christ's birth are referred to as BC
- ✘ The years after Christ's birth are referred to as AD
- ✘ The historical events are arranged in a chronological order into a timeline

Sources of History

- ✘ Literary sources
 - Religious literature - Vedas, Upanishads, Ramayana, Mahabharata
 - Secular literature - accounts of foreign travellers, biographies, etc.
- ✘ Archaeological sources – Coins, monuments, inscriptions, artefacts

EXERCISE >> 01

FIXED RESPONSE TYPE

MULTIPLE CHOICE QUESTIONS :

- The full form of CE is
(A) Common Era (B) Christian Era (C) Command Era (D) Christ era
- AD stands for
(A) After Date (B) Anti Domini (C) Anno Domini (D) After Domini
- An inscription is a method of
(A) Writing on hard surfaces (B) Study of religious epics
(C) Study of old culture (D) Reading out special texts.
- The language which was not used in the Ancient Period
(A) Sanskrit (B) Prakrit (C) Tamil (D) Hindi
- The name 'Bharata' was used for a group of people who lived in the north-western region and are mentioned in
(A) The Rigveda (B) The Ramayan
(C) The Mahabharata (D) The Samveda
- The Iranians and the Greeks who came 2500 years ago and were familiar with the Indus called it
(A) Hindos and Indos (B) Panchal (C) Beas (D) Ravi
- The word 'India' comes from the word 'Indus' and the meaning of Indus in Sanskrit is
(A) Ganga (B) Yamuna (C) Saraswati (D) Sindhu
- Most of the manuscripts were written in
(A) Prakrit. (B) Hindi. (C) Tamil. (D) Sanskrit.
- The Rigveda are written in
(A) Sanskrit. (B) Prakrit. (C) Awadhi. (D) Hindi.
- The powerful kingdom that emerged on the bank of river Ganga was
(A) Vaishali. (B) Kamboja. (C) Champa. (D) Magadha.

FILL IN THE BLANKS

- We can know about pre-history through _____.
- The period for which writing records are available is called _____.
- Archaeological sources are _____ evidences.
- Writings that are not religious are known as _____ literature.
- Before paper, books were written on _____ leaves.

TRUE / FALSE

1. Coins are valuable source of information.
2. 'Indica' was written by Kautilya.
3. History is studied in chronological order.
4. Monuments provide important information regarding our heritage.
5. Religions literature is a archaeological source.

MATCH THE COLUMN**Column-I**

- (i) Meghadootam
- (ii) Sumerians
- (iii) Indica
- (iv) Archaeology

Column-II

- (a) Pictographic script
- (b) Kalidasa
- (c) digging
- (d) Megasthenese

(A) i-b, ii-a, iii-c, iv-d (B) i-a, ii-b, iii-d, iv-c (C) i-b, ii-a, iii-d, iv-c (D) i-b, ii-d, iii-a, iv-c

EXERCISE 02**FREE RESPONSE TYPE****SUBJECTIVE QUESTIONS****SHORT ANSWER TYPE**

1. Write down the importance of Himalayas for us ?
2. Discuss why it is important to study our past?
3. How did India get its name?
4. What are the sources of History ?
5. State the importance of historical sources.

LONG ANSWER TYPE

6. Briefly mention the geographical features of India.
7. Write a short note on Inscriptions ?
8. Why did the people travel from one part of the subcontinent to another?
9. Briefly explain the Secular or Historical literature ?
10. How is the history of the past relevant to an understanding of the present ?

ANSWER KEY >>

Ques.	1	2	3	4	5	6	7	8	9	10
Ans.	A	C	A	D	A	A	D	D	A	D

Fill in the Blanks :

1. archeology. 2. history. 3. direct 4. secular 5. palm

True and False :

1. True 2. False 3. True 4. True 5. False

Match the Column :

(C) i-b, ii-a, iii-d, iv-c





Terminologies

Noun, Pronoun, Verb, Adjective, Adverb, Preposition, Conjunction, Interjection

INTRODUCTION

Words are divided into different kinds or classes according to the purpose for which they are used. Different kinds of words are called Parts of speech

1.1 DEFINITION OF PARTS OF SPEECH

THE EIGHT PARTS OF SPEECH

There are eight parts of speech in the English language: noun, pronoun, verb, adjective, adverb, preposition, conjunction, and interjection. The part of speech indicates how the word functions in meaning as well as grammatically within the sentence. An individual word can function as more than one part of speech when used in different circumstances.

(a) Noun

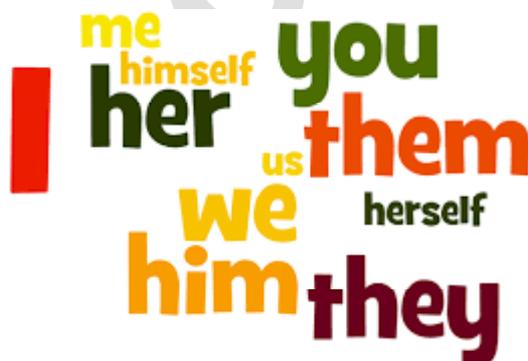
WHAT ARE NOUNS?

- Nouns are naming words.
- They name people, places and objects.
- They can also name ideas, emotions, qualities and activities.
- Here are some examples of nouns:
- Peter, Elizabeth, driver, sister, friend.
- Bristol, Severn, Brazil, pen, dog, money.
- Love, beauty, industry, nature, greed, pain.

A noun is the name of a person, place, thing, or idea.

Example: man, college, John, happiness

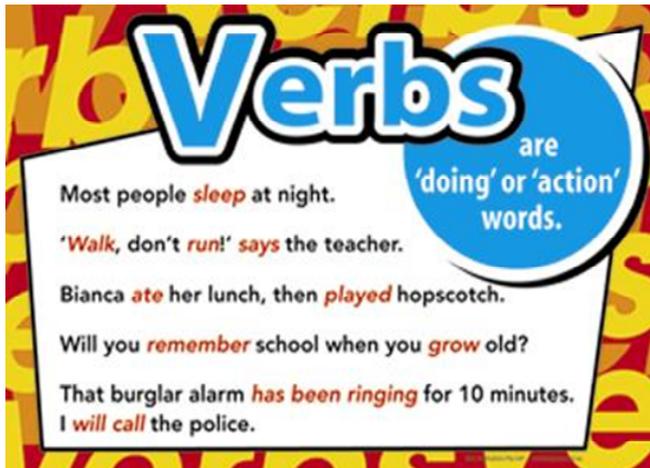
(b) Pronoun



A pronoun is a word used in place of a noun.

Example: She, we, they, it

(c) **Verb**



A verb expresses action or being.

Example: jump, play, write, become

There is a main verb and sometimes one or more helping verbs. ("She can sing". 'Sing' is the main verb, 'can' is the helping verb.) A verb must agree with its subject in number (in singular or in plural). Verbs also take different forms to express tense.

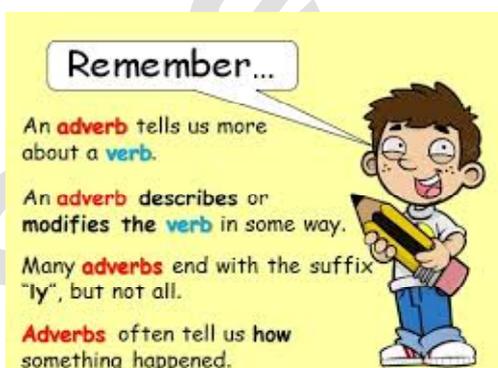
(d) **Adjective**



An adjective modifies or describes a noun or a pronoun. It usually answers the question of which one, what kind, or how many.

Example: pretty , old , blue , smart

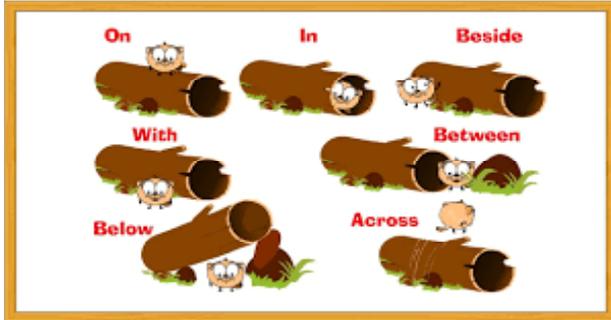
(e) **Adverb**



An adverb modifies or describes a verb, an adjective, or another adverb. It usually answers the questions of when, where, how, why, under what conditions, or to what degree. Adverbs often end in -ly.

Example: gently ,extremely , carefully , well

(f) **Preposition**

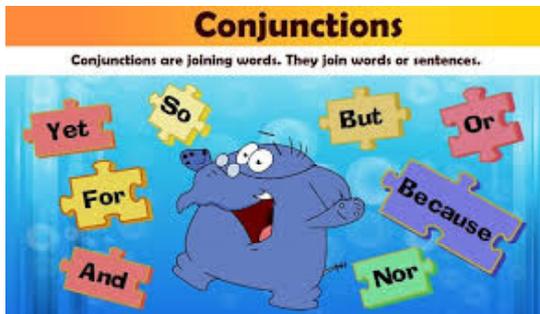


A preposition is a word placed before a noun or pronoun to form a phrase modifying another word in the sentence.

Example:

- by , with , about , until
- by the tree, with our friends, about the book, until tomorrow

(g) **Conjunction**



A conjunction joins words, phrases, clauses or sentences.

Example: and , but , or , while , because

(h) **Interjection**



An interjection is a word used to express emotion. It is often followed by an exclamation mark.

Example: Oh! , Wow! , Oops!



Ask yourself

Tick the correct part of speech of the bold words :

1. I bought a **beautiful** dress at the mall .
 (A) Preposition (B) Adjective (C) Noun (D) Adverb
2. What did **she** ask you to do ?
 (A) Preposition (B) Adjective (C) Pronoun (D) Adverb
3. I left my shoes **under** the kitchen table .
 (A) Preposition (B) Adjective (C) Pronoun (D) Adverb
4. If we finish our work **quickly** we can go to the movie.
 (A) Preposition (B) Adjective (C) Pronoun (D) Adverb
5. On sundays , I **help** my mother in making dinner.
 (A) Preposition (B) Adjective (C) Verb (D) Adverb



Add to Your Knowledge

A word can have various parts of speech.

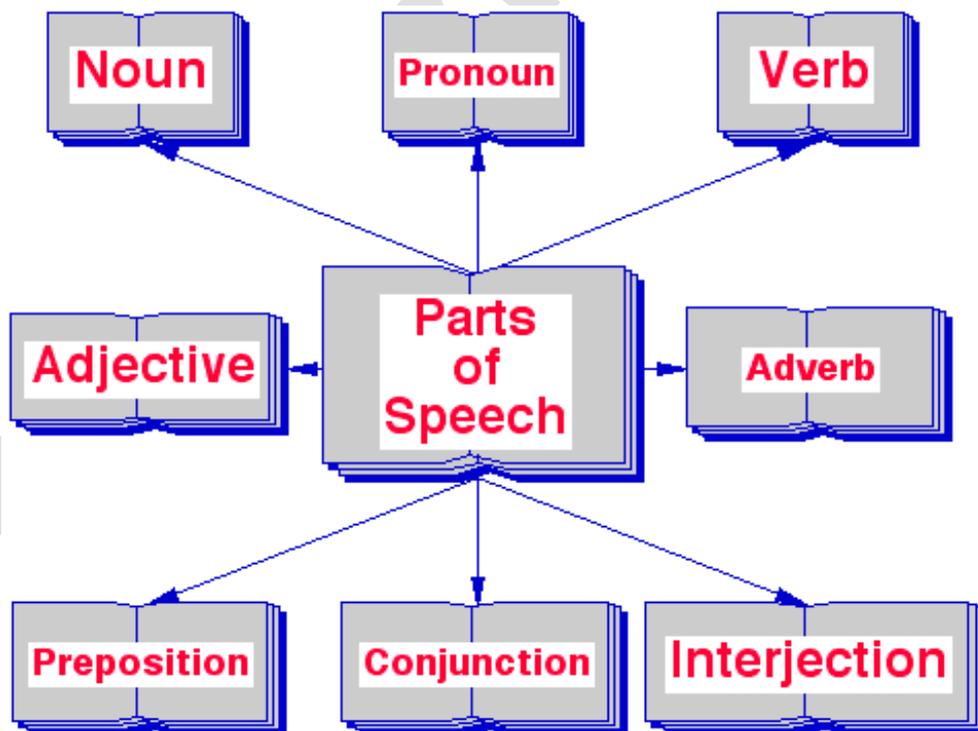
Example : I sat on the **sofa**.

In the above example, 'sofa' is used as a noun(Object of the preposition).

Example : I slept on the **sofa** bed.

But here 'sofa' is used as an adjective to modify the noun 'bed'.

CONCEPT MAP



EXERCISE >> 01

(FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS :

- Read the contract carefully .Identify the underlined part of speech .
(A) Verb (B) Adverb (C) Adjective (D) Noun
- You are learning grammar from your english textbook. Identify the underlined parts of speech.
(A) Adverb (B) Preposition (C) Verb (D) Noun
- Serena will light the candles on her birthday . Identify the underlined parts of speech.
(A) Verb (B) Adverb (C) Adjective (D) Noun
- She and I will complete the work and give it to you by 5 p.m. Identify the underlined parts of speech.
(A) Noun (B) Adverb (C) Pronoun (D) Conjunction

FILL IN THE BLANKS :

- It was John who _____ the window. (Broke , Breaking)
- The _____ intervention of the policeman saved his life. (Time , Timely)
- The meeting _____ for three hours.(Lastily , lasted)
- She is _____ beautiful . (ravishingly , ravishing)

TRUE OR FALSE :

- The word 'and', 'but', 'or' and 'nor' are preposition . [True /False]
- Verbs express an action , an occurrence , or a state of being. [True /False]
- Words such as completely , primarily and slowly are adjectives . [True /False]
- Nouns are important in our language because they name person, places, things, qualities, feelings ,concepts & activities. [True /False]

EXERCISE >> 02

(FIXED / FREE RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS :

- I always go to the **park** on the weekends.
(A) Noun (B) Pronoun (C) Adjective (D) Verb
- On the **cold** winter days, I love to have a cup of hot chocolate.
(A) Noun (B) Adverb (C) Adjective (D) Verb
- Roger Bannister finished the mile race very **quickly** in 1954.
(A) Verb (B) Pronoun (C) Adjective (D) Adverb
- What language do most people **speak** in Brazil?
(A) Noun (B) Adverb (C) Adjective (D) Verb
- Western Australia is the largest state **in** Australia.
(A) Noun (B) Preposition (C) Adjective (D) Verb



INTRODUCTION

How many letters are in the 'LOCOMOTOR'? We have four letters of this word 1st, 3rd, 6th and 8th. Now can you make a meaningful word by arranging these four letters in a particular order.

L C O O
1 2 3 4

We have lots of words in this world but to find them quickly we need to manage them in a order which is alphabetical order. Every word has certain letters so we can make meaningful word by using certain given number of letters in a particular order.

1.1 ALPHABETICAL ORDER

You have to arrange the given words in order in which they are arranged in a dictionary. In a dictionary the words are placed in alphabetical order w.r.t. the first alphabet then the second alphabet of the words and so on (that is third alphabet, fourth alphabet....).

Illustration : 1.1

Arrange the given words in the correct alphabetical order.

Apple, Aeroplane, Air, Airlift, Arrange, Assure, accurate

Sol. The given words can be arranged in the alphabetical order as
Accurate, Aeroplane, Air, Airlift, Apple, Arrange, Assure

Illustration : 1.2

Arrange the given words in alphabetical order and find the one that comes last.

Heavy, Heredity, Hesitate, Hedge, Hero, Haste, History, Hinderance

Sol. The given words can be arranged in the alphabetical order as :
Haste, Heavy, Hedge, Heredity, Hero, Hesitate, Hinderance, History
Clearly, **History** comes last.

Illustration : 1.3

Arrange the given words in the order they occur in dictionary.

1. MATHS 2. ENGLISH 3. SCIENCE 4. HINDI 5. SANSKRIT

(A) 5, 1, 2, 4, 3 (B) 2, 4, 1, 5, 3 (C) 3, 4, 1, 2, 5 (D) 3, 5, 4, 2, 1

Sol. (B) The correct alphabetical order of the given words is : ENGLISH, HINDI, MATHS, SANSKRIT, SCIENCE. Thus, the correct sequence is **2, 4, 1, 5, 3**

1.2 WORD FORMATION BY UNSCRAMBLING THE LETTERS

Illustration : 1.4

A meaningful word is made from the second, fifth, sixth, seventh, eighth and ninth letters of the word **AEROSPACE**, which of the following is the third letter from the right in the word formed?

(A) C (B) A (C) E (D) P

Sol. The letters are E S P A C E
(B) The meaningful word will be ESCAPE and **A** will be the third letter from the right.

Arrange the following group such that when arranged in a specific order, meaningful word is formed.

Illustration : 1.5

R M N B U E

1 2 3 4 5 6

(A) 1,5,4,2,6,3 (B) 2,6,3,4,1,5 (C) 3,5,2,4,6,1 (D) 4,6,3,2,1,5

Sol. (C) The given letter, when arranged in the order 3,5,2,4,6,1. Form the word **NUMBER**.

Illustration : 1.6

D I F E R N

1 2 3 4 5 6

(A) 1,4,3,6,2,5 (B) 6,4,3,5,2,1 (C) 3,5,2,4,6,1 (D) 5,4,3,2,6,1

Sol. (C) The given letter, when arranged in the order 3,5,2,4,6,1. Form the word **FRIEND**.

EXERCISE >> 01

Directions : (1 to 2) Arrange the given words in alphabetical order and tick the one that comes first.

- (A) Dismiss (B) Distinct (C) Doubt (D) Different
- (A) Inkpot (B) Ionize (C) Increase (D) Inspite
- If the following words are arranged in an alphabetical order, which word will appear in the second ?
(A) Preserve (B) Past (C) Prepare (D) Precise
- In a telephone directory, which of the following names will appear in the last ?
(A) Avinash (B) Ankit (C) Anirudh (D) Alankar
- Arrange the given words in the sequence in which they occur in the dictionary and choose the correct sequence.
1. Schime 2. Similar 3. Skip 4. Sequence 5. Sand 6. Stand
(A) 5, 3, 1, 4, 2, 6 (B) 5, 1, 4, 3, 2, 6 (C) 5, 1, 3, 4, 2, 6 (D) 5, 1, 4, 2, 3, 6
- If the following words are arranged as found in the dictionary, then what will be the fourth letter from the left in the last word ?
INTIMATION, INFORMATION, INTEREST, INTERROGATION, INSTIGATION
(A) R (B) O (C) T (D) I
- If the following scrambled letters are rearranged to form the name of a city, the city so formed is famous for its _____.
WILGARO
(A) Locks (B) Steel Plant (C) Temples (D) Pottery
- If the following scrambled letters are rearranged to form the name of a city, the city so formed is the sun city, which letter will appear in the middle?
DHJOPRU
(A) J (B) O (C) H (D) P

Directions : (9 to 10) Arrange the given words in alphabetical order and choose the one that comes first.

9. (A) Miser (B) Money (C) Material (D) Mislead
10. (A) Crown (B) Coffee (C) Chocolate (D) Crunchy
11. Arrange the given words in the sequence in which they occur in the dictionary and then choose the correct sequence.
 1. Planet 2. Pattern 3. Problem 4. Plant 5. Position
 (A) 1, 2, 4, 5, 3 (B) 2, 1, 5, 4, 3 (C) 2, 1, 4, 5, 3 (D) 2, 5, 4, 1, 3

Directions : (12 to 15) Arrange the following group such that when arranged in a specific order, meaningful word is formed.

12. V A H Y E
 1 2 3 4 5
 (A) 2, 3, 4, 5, 1 (B) 3, 2, 5, 1, 4 (C) 3, 5, 2, 1, 4 (D) 1, 5, 2, 3, 4
13. K A T C E L
 1 2 3 4 5 6
 (A) 4, 2, 3, 1, 5, 6 (B) 1, 2, 4, 5, 6, 3 (C) 6, 5, 3, 2, 4, 1 (D) 3, 2, 4, 1, 6, 5
14. T R I F U
 1 2 3 4 5
 (A) 3, 1, 2, 4, 5 (B) 4, 2, 5, 3, 1 (C) 4, 3, 2, 1, 5 (D) 5, 3, 2, 1, 4
15. R U S G A
 1 2 3 4 5
 (A) 1, 5, 4, 2, 3 (B) 5, 3, 4, 1, 2 (C) 3, 2, 4, 5, 1 (D) 4, 5, 3, 2, 1



Add to Your Knowledge

→ If in the word 'DISTURBANCE', the first letter is interchanged with the last letter, the second letter is interchanged with the tenth letter and so on, which letter would come after the letter 'T' in the newly formed word ?

- (A) I (B) N (C) S (D) T

It is an example of alphabetical quibble. According to the given information we have to change D with E, I with C, S with N and so on. So you can see the word after rearrangement

ECNABRUTSID

So here we can see that the letter S comes after letter T.

→ If the alphabets were written in the reverse order, which letter will be the fifth letter to the left of the fourteenth letter from the left.

- (A) R (B) I (C) S (D) H

It is also an example of alphabetical quibble, so first we have to write the alphabets in the reverse order which means Z to A and assign the left and right. now we have to find the letter having the given conditions. First we have to start from last condition 'from the left' than find the 'fourteenth letter from the left' and then decide the left right of the fourteenth letter then find 'fifth letter to the left of the fourteenth letter'

LEFT Z Y X W V U T S R Q P O N M L K J I H G F E D C B A RIGHT

M is the 14th letter from the left , according to the left of M , R is the fifth letter to the left of M.

EXERCISE >> 02

- If all the vowels are removed from the series given below, which is the ninth to right of twelfth letter from right end? **[NSO_SET-A_2013]**
Q E E E F E B U L A M C D I P Q O R R R A P P W I
(A) R (B) W (C) I (D) P
- Some letters are given which are numbered 1, 2, 3, 4 and 5. Find the combination of numbers from the options so that the letters arranged accordingly form a meaningful word. **[IMO_2011]**
E R P I C
1 2 3 4 5
(A) 3, 2, 4, 1, 5 (B) 3, 2, 1, 4, 5 (C) 3, 2, 4, 5, 1 (D) 3, 2, 1, 5, 4
- If the English alphabet is written in reverse order and then every alternate letter starting from Y is deleted, then which letter will be exactly in the middle? **[IMO_SET-A_2012]**
(A) M (B) O (C) N (D) M or O
- Find which one word can be made from the letters of the given word. **[IMO_SET-A_2012]**
CHROMATOGRAPHIC
(A) STORE (B) ROAST (C) MOTOR (D) GRAPHS
- Some letters are given which are numbered 1, 2, 3, 4 and 5. Below are given four options containing combinations of these numbers. Find that combination of numbers so that letters arranged accordingly form a meaningful word. **[IMO_SET-A_2012]**
C H A T W
1 2 3 4 5
(A) 2, 3, 4, 5, 1 (B) 5, 3, 2, 4, 1 (C) 1, 3, 2, 4, 5 (D) 5, 3, 4, 1, 2
- Rearrange the following letters to make a single word and then choose the category to which it belongs. **[IMO_SET-B_2012]**
G F O R
(A) City (B) Animal (C) Vegetable (D) Person
- A meaningful word starting with A is made from the first, the second, the fourth, the fifth and the sixth letters of the word CONTRACT. Which of the following is the middle letter of that word? **[IMO_SET-B_2013]**
(A) C (B) O (C) R (D) T
- In the word MATHEMATICAL, if the first and third letters, the fourth and the sixth letters, the seventh and the ninth letters & the tenth and the twelfth letters were interchanged, then which of the following would be the seventh letter from the left end **[IMO_SET-B_2014]**
(A) M (B) A (C) H (D) I
- If every third letter from the english alphabets is dropped, which letter will be fourth to the right of fourteenth letter from your right? **[IMO_Level-II_2012-13]**
(A) M (B) N (C) E (D) A
- The positions of the first and the ninth letters in the word PRESBYTERIANISMS are interchanged. Similarly, the positions of the second and the tenth letters are interchanged, and so on. Which of the following will be the sixth letter from the right end after rearrangement? **[IMO_Level-II_2013-14]**
(A) A (B) B (C) I (D) E

ANSWER KEY >>**EXERCISE # 1**

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	D	C	D	A	D	D	C	C	C	C	C	C	D	B	C

EXERCISE # 2

Ques.	1	2	3	4	5	6	7	8	9	10
Ans.	D	C	C	C	D	B	D	D	A	D

