Ved Educational Services
Private Limited, Kota

Chaandmari
Balaji Ki Kripa

SAMPLE MODULE
Class VI, VII & VIII

School Excellence + Competition Nurturing

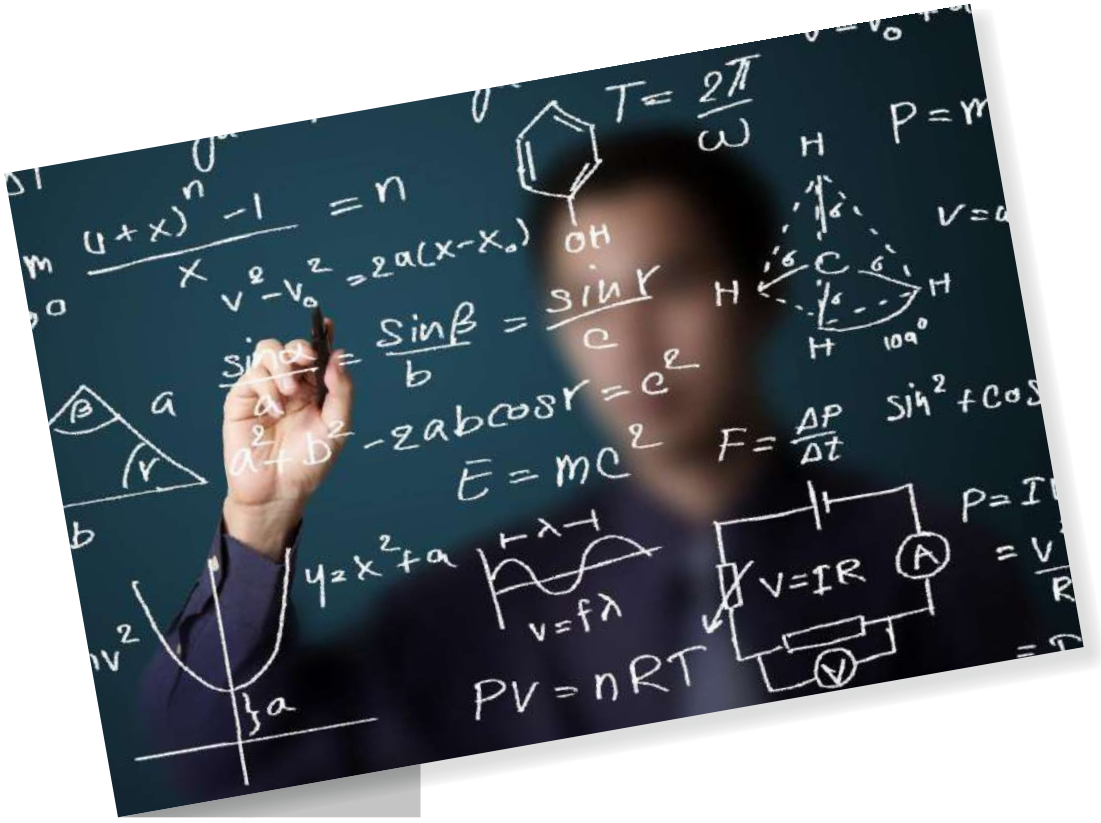
911, Subhash Nagar II, Near Bombay Yojna, Rangbari Mukti Dham, KOTA
website : www.vededucational.in 7891105056 | 7665780536

PRE-FOUNDATION

CLASS VI

SAMPLE

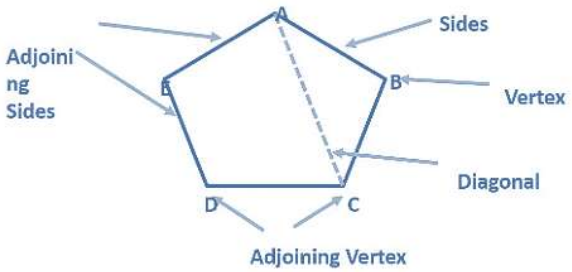
MATHEMATICS



CLASS 6 - MATHEMATICS

CHAPTER-4

Basic Geometrical Ideas



Chapter Flow

1. Introduction
2. Points
3. Line
4. Line Segment
5. Ray
6. Curves
7. Position In A Figure
8. Polygons
9. Angles
10. Triangles
11. Quadrilaterals
12. Circle

DPP-1
DPP-2
DPP-3
Exercise-1 NCERT Basics
Exercise-2 Concept Mastery
Exercise-3 Accuracy Booster

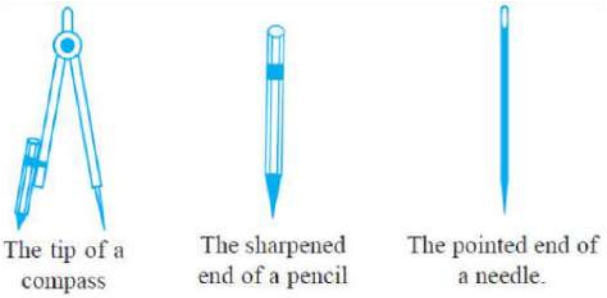
Basic Geometrical Ideas

1. Introduction

The term 'Geometry' is the English equivalent of the Greek word 'Geometron'. 'Geo' means Earth and 'metron' means Measurement. Here, we will discuss some basic concepts in geometry.

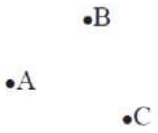
2. Points

A point determines a location. If we mark three points on a paper, we would be required to distinguish them. For this they are denoted by a single capital letter like A, B, C.
These are some models for a point :



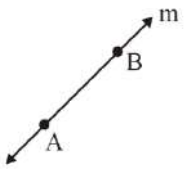
The tip of a compass | The sharpened end of a pencil | The pointed end of a needle.

These pointswill be read as point A, point B and point C.
Of course, the dots have to be invisibly thin.
Apoint has no length and no breadth.



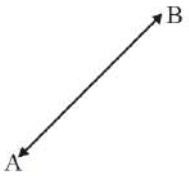
3. Line

A line through two points A and B is written as $\overleftrightarrow{AB}$. It extends indefinitely in both directions. So it contains a countless number of points. (Think about this). Two points are enough to fix a line. We say 'two points determine a line'. The adjacent diagram(figure) is that of a line AB written as $\overleftrightarrow{AB}$. Sometimes a line is denoted by a letter like *l*, m.



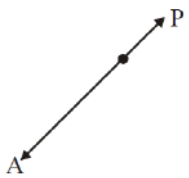
4. Line Segment

A line segment is part of a line. It has two endpoints and has fixed length.
We name the segment by its endpoints.
Point A and Bare the two endpoints of the line segment A Bas shows here.
We write it $\overline{AB}$ and $\overline{BA}$.

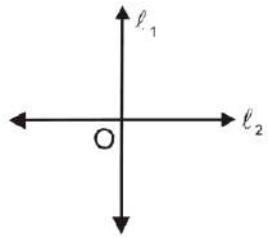


5. Ray

A ray is a portion of a line. It starts at one point (called starting point) and goes endlessly in a direction.
Look at the diagram of ray shown here. Two points are shown on the ray. A is the starting point, P is a point on the path of the ray.
We denote it by $\overrightarrow{AP}$.

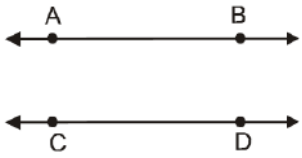


(a) Intersecting Lines : If two or more lines meet each other at one point then they are called intersecting lines. Two intersecting lines have one common point.



l_1 and l_2 intersecting at point O.

(b) Parallel Lines : If two or more lines do not meet each other however far they are extended, then they are called parallel lines.



line AB and CD are parallel to each other

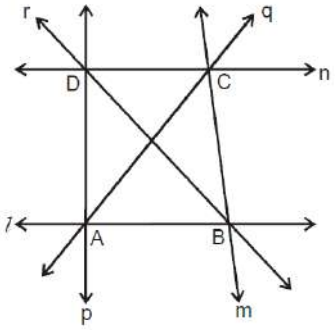
(c) Collinear Points : Three or more points in a plane are said to be collinear if they all lie on the same line.

In Fig, points A,B, C and D are collinear because only one line l passes through all of them.

If the points do not lie on a line, they are called non-collinear points.

Ex In Fig. name :

(i) Four non-collinear points.
(ii) Point of intersection of the lines l and m.
(iii) Point of intersection of the lines r and n.
(iv) Point of intersection of the lines q and n.
(v) Point of intersection of the lines p and q.
(vi) Four line segments.
(vii) Two points on the line q.



Sol. (i) A, B, C, D (ii) B (iii) D (iv) C (v) A
(vi) $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{AD}$ (vii) A,C

6. Curves

When we draw lines on a piece of paper without lifting the pencil and without using a scale, the shapes that we get are called **curves**.

Simple Curve : A curve that does not cross itself is called a **simple curve**. The figures shown below are simple curves.

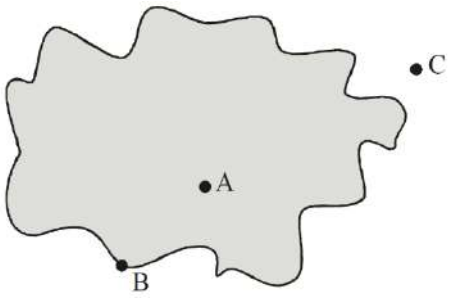
(a) (b)

Open Curves : The figures that do not begin and end at the same point are called open curves.

Closed Curves : The figures that begin and end at the same point are called closed curves.
For example : triangle, circle, rectangle, square, etc. are all closed figures.

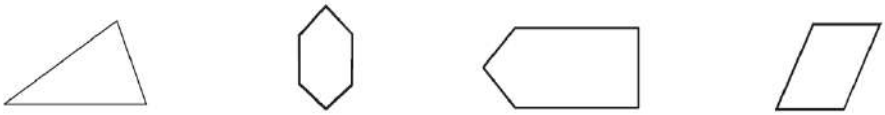
7. Position In A Figure

In a closed curve, thus, there are three parts.
(i) interior ('inside') of the curve
(ii) boundary ('on') of the curve and
(iii) exterior ('outside') of the curve.
In the figure, A is in the interior, C is in the exterior and B is on the curve.
The interior of a curve together with its boundary is called its "**region**".



8. Polygons

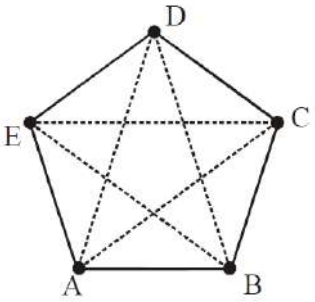
A figure is a polygon if it is a simple closed figure made up entirely of line segments.
For example, triangle, quadrilateral, pentagon, etc., are all examples of polygon.



If all sides of a polygon are equal and all angles are also equal , then it is called a **regular polygon**.

Sides, Vertices and Diagonals

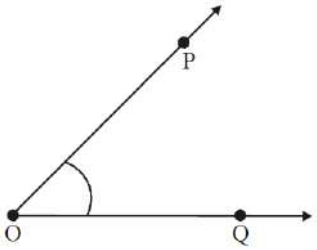
The line segments forming a polygon are called its sides.
The sides of polygon ABCDE, $\overline{AB}$, $\overline{BC}$, $\overline{CD}$, $\overline{DE}$ and $\overline{EA}$.
The meeting point of a pair of sides is called its **vertex**.
Sides $\overline{AE}$ and $\overline{ED}$ meet at E, so E is a vertex of the polygon ABCDE. Points B and C are its other vertices. Any two sides with a common end point are called the **adjacent sides** of the polygon. Sides $\overline{AB}$ and $\overline{BC}$ are adjacent sides.



The end points of the same side of a polygon are called the **adjacent vertices**. Vertices E and D are adjacent, whereas vertices A and D are not adjacent vertices.
The line joining two non-adjacent vertices of a polygon is called a **diagonal**. Since A and C are non-adjacent vertices, so $\overline{AC}$ is a diagonal.

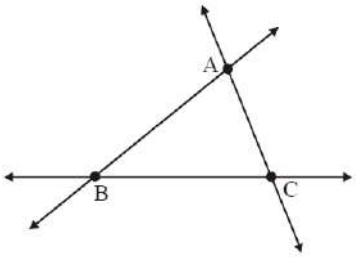
9. Angles

An angle is made up of two rays starting from a common end point. The two rays forming the angle are called the arms or sides of the angle. The common end point is the vertex of the angle.
This is an angle formed by rays $\overline{OP}$ and $\overline{OQ}$. Angle POQ is thus a better way of naming the angle. We denote this by $\angle$POQ.
In specifying the angle, the vertex is always written as the middle letter.

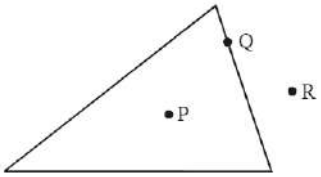


10. Triangles

A triangle is a three-sided polygon. In fact, it is the polygon with the least number of sides. We write ΔABC instead of writing Triangle ABC. The three sides of the triangle are AB, BC and CA. The three angles are $\angle BAC$, $\angle BCA$ and $\angle ABC$ .The points A, B and C are called the vertices of the triangle.



(i)



(ii)

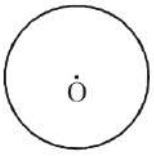
Being a polygon, a triangle has an exterior and an interior. In the figure (ii), P is in the interior of the triangle, R is in the exterior and Q on the triangle.

11. Quadrilaterals

A four sided polygon is a quadrilateral. It has 4 sides and 4 angles.
We named the vertices in a cyclic manner.
This quadrilateral ABCD figure has four sides AB, BC, CD and DA. It has four angles $\angle A$, $\angle B$, $\angle C$ and $\angle D$.
Quadrilateral ABCD, AB and B Care adjacent sides.
AB and DC are opposite sides. $\angle A$ and $\angle C$ are said to be opposite angles; similarly, $\angle D$ and $\angle B$ are opposite angles.
Naturally $\angle A$ and $\angle B$ are adjacent angles.

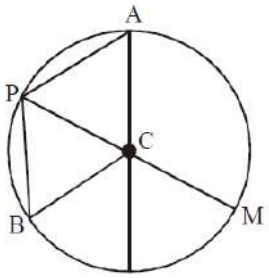
12. Circle

A circle is a simple closed curve all of whose points are at the same distance from a given point O in the same plane . The given point O is called the centre of the circle.
It has some very special properties.

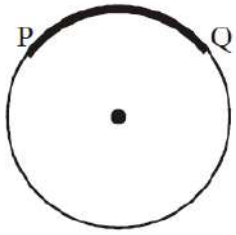


Parts of a circle

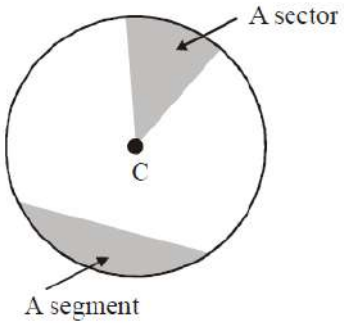
Here is a circle with centre C (Fig) A, P, B, M are points on the circle. We will see that CA = CP = CB = CM.



Each of the segments CA , CP , CB, CM is **radius** of the circle. The radius is a line segment that connects the centre to a point on the circle. CP and CM are radii (plural of 'radius') such that C, P, M are in a line. PM is known as **diameter** of the circle. Diameter is a double the size of a radius.
PB is a **chord** connecting two points on a circle.
An **arc** is a portion of circle.



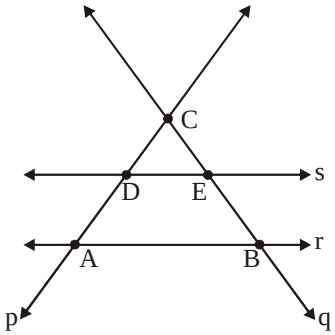
If P and Q are two points we get the arc PQ. We write as $\overset{\frown}{PQ}$.
As in the case of any simple closed curve we can think of the interior and exterior of a circle. A region in the interior of a circle enclosed by an arc on one side and a pair of radii on the other two sides is called **a sector**.



A region in the interior of a circle enclosed by a chord and an arc is called a **segment of the circle**. The distance around a circle is called its **circumference**.

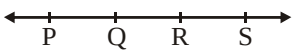
DPP-1

1. In the given figure



(i) Non-collinear points are?
(ii) Collinear points are ?
(iii) Point of intersection of the lines p and q is?
(iv) point of intersection of the lines s and p is?
(v) 8 line segments?
(vi) parallel lines?

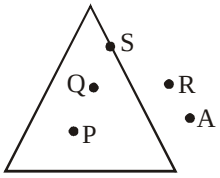
2. Name the line given in all possible ways, choosing only two letters at a time from the four given.



3. Draw a rough figure and label in each of the following cases.

(a) $\overrightarrow{AB}$ and $\overrightarrow{AC}$ meet at A.
(b) Line 'L' contain P, Q but not R.
(c) Lines $\overrightarrow{AB}$ and $\overrightarrow{CD}$ parallel to each other.
(d) $\overrightarrow{AB}$ and $\overrightarrow{CD}$ intersect at a point.

4. Mention the points which are inside, on, outside of the give triangle.

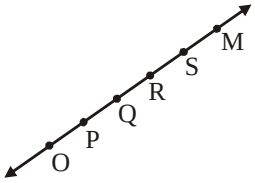


Fill in the blanks (5 & 6):

5. A region in the interior of a circle enclosed by a chord and an arc is called a _____.

6. A portion of circle is _____.

7. Consider the following figure of line $\overleftrightarrow{PQ}$. Say whether following statements are true or false in contest of the given figure.



(i) Q and S are end points of the line segment $\overline{OP}$.

(ii) Ray $\overrightarrow{RS}$ is different from ray $\overrightarrow{PM}$.

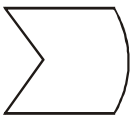
(iii) Ray $\overrightarrow{QR}$ is not different from $\overrightarrow{MP}$.

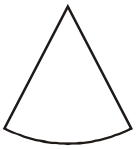
(iv) Points Q, R, S are on line segment $\overline{PM}$.

(v) S is the initial point of $\overrightarrow{SM}$.

DPP-2

1. Which of the following is polygon?

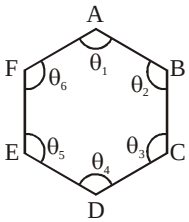
(a) 

(b) 

(c) 

(d) 

2. Name the angles in the given figure



3. From the figure, identify

(a) the centre of the circle

(b) three radii

(c) a diameter

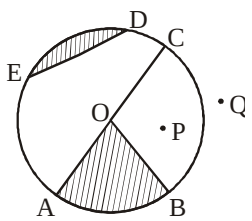
(d) a chord

(e) two points in the interior

(f) a point in the exterior

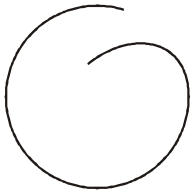
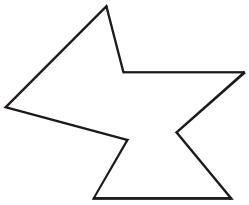
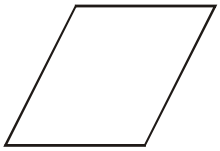
(g) a sector

(h) a segment



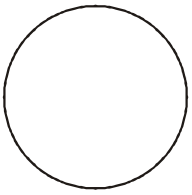
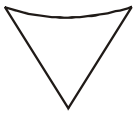
True or False (4 to 7)

4. The centre of a circle is always in its interior.
5. Every chord of circle also a diameter.
6. Two diameters of a circle will necessarily intersect.
7. Every diameter of a circle also a chord.
8. Select (i) closed or (ii) open curve

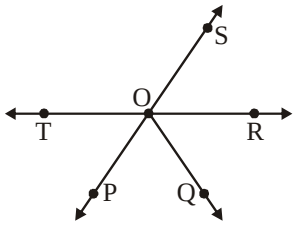
(a) 
(b) 
(c) 
(d) 
(e) 

DPP-3

1. Which of the following figures is made of both curve part and line segment?

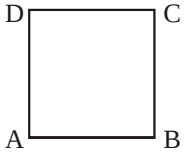
(a) 
(b) 
(c) 
(d) None of these

2. Which of the following are the arms of $\angle POQ$?



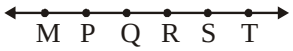
(a) OR, OP (b) OQ, OS (c) OT, OQ (d) OP, OQ

3. Half part of circle is known as a
(a) Quadrant (b) Sector (c) Major segment (d) Semi-circle
4. Which of the following has no end points?
(a) $\overline{PQ}$ (b) $\overrightarrow{PR}$ (c) $\overleftrightarrow{MN}$ (d) All of these
5. Which of the following statement is true, if ABCD is a square?



(a) AB || DC (b) AB $\perp$ BC (c) $\angle A + \angle C = 180°$ (d) All of these

6. The number of line segments in the shown figure is



(a) 30 (b) 20 (c) 15 (d) 24

Fill in the blanks (7 & 8)

7. An arc is a continuous part of the _____ of the circle.

8. One fourth part of circle is _____.

True or False (9 & 10)

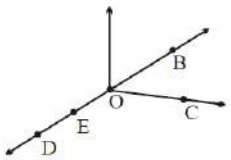
9. A triangle has 3 sides and 4 angles.

10. A ray has finite length.

NCERT Basics Exercise-1

Exercise 4.1

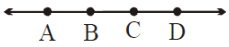
1. Use the figure to name :



(a) Five points (b) Aline

(c) Four rays (d) Five line segments

2. Name the line given in all possible (twelve)ways, choosing onlytwo letters at a time fromthe four given.



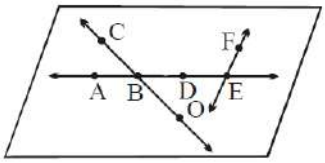
3. Use the figure to name :

(a) Line containing point E.

(b) Line passing through A.

(c) Line on which O lies

(d) Two pairs of intersecting lines.



4. How many lines can pass through (a) one given point? (b) two given points?

5. Draw a rough figure and label suitably in each of the following cases:

(a) Point P lies on $\overrightarrow{AB}$.

(b) $\overrightarrow{XY}$ and $\overrightarrow{PQ}$ intersect at M.

(c) Line *l* contains E and F but not D.

(d) $\overrightarrow{OP}$ and $\overrightarrow{OQ}$ meet at O.

6. Consider the following figure of line $\overrightarrow{MN}$. Say whether following statements are true or false in context of the given figure.

(a) Q, M, O, N, P are points on the line $\overrightarrow{MN}$.

(b) M, O, N are points on a line segment $\overrightarrow{MN}$.

(c) M and N are end points of line segment $\overrightarrow{MN}$.

(d) O and N are end points of line segment $\overrightarrow{OP}$.

(e) M is one of the end points of line segment $\overrightarrow{QO}$.

(f) M is point on ray $\overrightarrow{OP}$.

(g) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{QP}$.

(h) Ray $\overrightarrow{OP}$ is same as ray $\overrightarrow{OM}$.

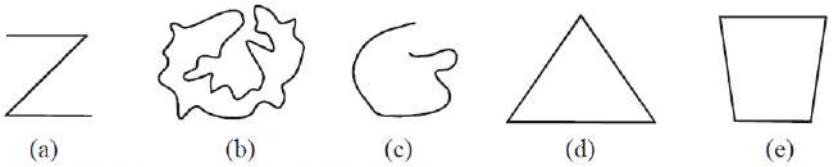
(i) Ray $\overrightarrow{OM}$ is not opposite to ray $\overrightarrow{OP}$.

(j) O is not an initial point of $\overrightarrow{OP}$

(k) N is the initial point of $\overrightarrow{NP}$ and $\overrightarrow{NM}$.

Exercise 4.2

1. Classify the following curves as (i)Open or (ii)Closed.



2. Draw rough diagrams to illustrate the following :

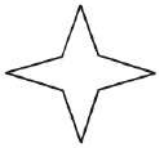
(a) Open curve (b) Closed curve.

3. Draw any polygon and shade its interior.

4. Consider the given figure and answer the questions :

(a) Is it a curve?

(b) Is it closed?



5. Illustrate, if possible, each one of the following with a rough diagram:

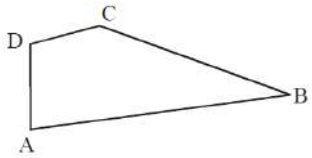
(a) A closed curve that is not a polygon.

(b) An open curve made up entirely of line segments.

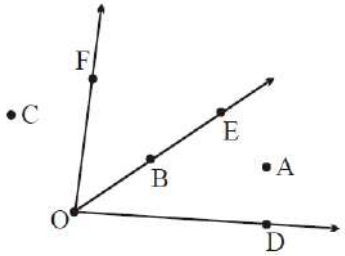
(c) A polygon with two sides.

Exercise 4.3

1. Name the angles in the given figure.



2. In the given diagram, name the point(s)



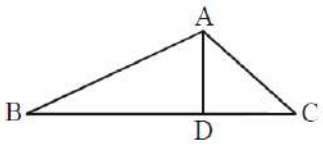
(a) In the interior of $\angle DOE$ (b) In the exterior of $\angle EOF$

(c) On $\angle EOF$

3. Draw rough diagrams of two angles such that they have
   (a) One point in common.
   (b) Two points in common.
   (c) Three points in common.
   (d) Four points in common.
   (e) One ray in common.

Exercise 4.4

1. Draw a rough sketch of a triangle ABC. Mark a point Pin its interior and a point Q in its exterior. Is the point A in its exterior or in its interior?
2. (a) Identify three triangles in the figure.
   (b) Write the names of seven angles.
   (c) Write the names of six line segments.
   (d) Which two triangles have $\angle B$ as common?

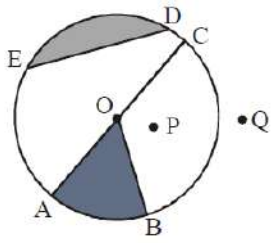


Exercise 4.5

1. Draw a rough sketch of a quadrilateral PQRS. Draw its diagonals. Name them. Is the meeting point of the diagonals in the interior or exterior of the quadrilateral?
2. Draw a rough sketch of a quadrilateral KLMN. State,
   (a) two pairs of opposite sides,
   (b) two pairs of opposite angles,
   (c) two pairs of adjacent sides,
   (d) two pairs of adjacent angles.
3. **Investigate :**
   Use strips and fasteners to make a triangle and a quadrilateral. Try to push inward at any one vertex of the triangle. Do the same to the quadrilateral. Is the triangle distorted? Is the quadrilateral distorted? Is the triangle rigid? Why is it that structures like electric towers make use of triangular shapes and not quadrilaterals?

Exercise 4.6

1. From the figure, identify:
   (a) the centre of circle
   (b) three radii
   (c) a diameter
   (d) a chord
   (e) two points in the interior
   (f) a point in the exterior
   (g) a sector
   (h) a segment



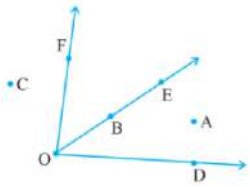
2. (a) Is every diameter of a circle also a chord?
   (b) Is every chord of a circle also a diameter?
3. Draw any circle and mark
   (a) its centre
   (b) a radius
   (c) a diameter
   (d) a sector
   (e) a segment
   (f) a point in its interior
   (g) a point in its exterior
   (h) an arc

4. Say true or false :
   (a) Two diameters of a circle will necessarily intersect.
   (b) The centre of a circle is always in its interior.

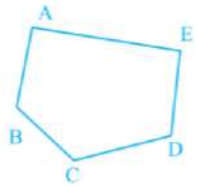
Concept Mastery Exercise-2

A. Very Short Answer Type Questions

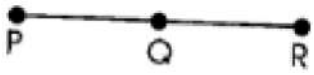
1. In the given diagram, name the point on ∠EOF



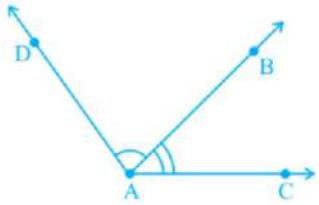
2. Name the line segments shown in the given figure.



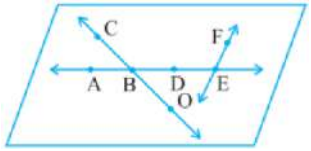
3. Name the mid point.



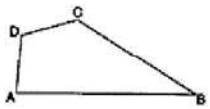
4. Fill in the blank: The common part between the two angles BAC and DAB in the figure is _____.



5. Use the figure to name: Line containing point E



6. Name the angles in the given figure.



7. Draw any polygon and shade it's interior.
8. Draw a rough figure and label suitably in each of the following cases :
   a. Point P lies on $\overline{AB}$.
   b. $\overleftrightarrow{xy}$ and $\overleftrightarrow{PQ}$ intersect at M.
   c. Line l contain E and F but not D.
9. Draw a rough diagram of two angles such that they have one point in common.
10. Draw a rough diagram of two angles such that they have four points in common.

B. Short Answer Type Questions

11. How many end points a line segment have?

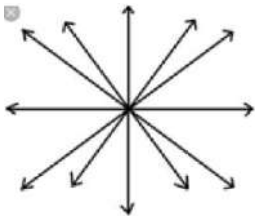
12. How many lines can be drawn through a two given point?

13. How many end points a ray have?

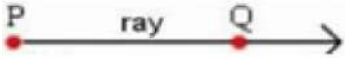
14. An 'angle' is made up of _____ rays having a common endpoint.

15. a. How many points does the line given below contain?

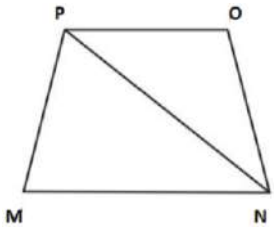
b. How many lines can be drawn through a given point?



c. What is the starting point of a ray PQ?



16. How many angles are formed in the given figure? Name them.



17. Give three examples from your environment of:

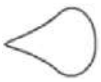
i. Points

ii. A portion of a line

iii. Plane surfaces

C. Long Answer Type Questions

18. Identify the open curve from the following

(a) 

(b) 

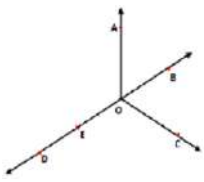
(c) 

(d)

19. Draw rough diagrams of two angles such that they have

i. One point in common. ii. Two points in common. iii. Three points in common.

20. Using the figure: Write

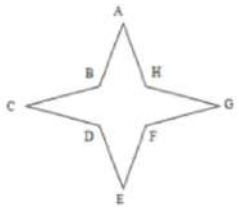


a. five line segments

b. Three rays

21. Define polygon and its components.

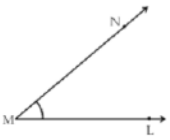
22. **Write:**

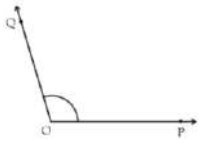


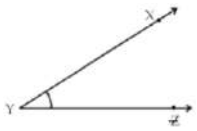
a. 8 pairs of adjacent side - _____.

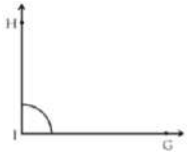
b. 8 pairs of adjacent vertices - _____.

23. Write arms and vertices of the angles given below:

i. 

ii. 

iii. 

iv. 

24. Draw rough diagrams of two angles such that they have

a. One point in common

b. Two points in common

c. Three points in common

d. Four points in common

e. One ray in common.

D. True & False

25. (a) Point can be denoted by double small letter of the English alphabet.

(b) A line segment is a part of a plane.

E. Fill in the Blanks

26. (a) The endpoints of the same side of a polygon are called the adjacent _____.

(b) An angle greater than 180° and less than a complete angle is called _____.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

1. Which one of the following figures is an example of open curve?

(a) 

(b) 

(c) 

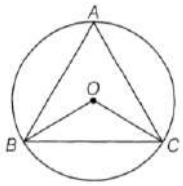
(d) 

2. Which one among the following is incorrect pair of the angle and its complement?

(a) $45^o \Leftrightarrow 45^o$ b) $67^o \Leftrightarrow 23o$

(c) $42^o \Leftrightarrow 48^o$ d) $34^o \Leftrightarrow 46^o$

3. An equilateral Δ ABC is inscribed in a circle with centre O. Then, $\angle$ BOC is equal to



(a) 180^o (b) 160^o

(c) 75^o (d) 120^o

4. A _____ contains a countless number of points.

(a) point (b) line segment

(c) ray (d) line

5. The line segments forming a polygon are called its _____.

(a) sides (b) edges

(c) angles (d) vertices

6. When two lines are parallel, the distance between them is _____.

(a) not equal (b) always equal

(c) increases (d) decreases

7. In a regular polygon of n sides (where n < 10). How many such polygons are possible if each of its interior angles is obtuse angle?

(a) 7 (b) 4

(c) 6 (d) 5

8. A line segment joining any two points on the circle is _____.

(a) area (b) circumference

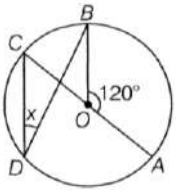
(c) radius (d) chord

9. An angle divides the plane into how many regions?

(a) 3 (b) 2

(c) 5 (d) 4

10. In the figure, O is the centre and AOC is the diameter of the circle. BD is chord and OB and CD are joined D is joined to A . If $\angle$ AOB = 120^o, then the value of x is



(a) 30^o (b) 50^o

(c) 40^o (d) 60^o

11. How many diagonals are there in a 60 sided convex plane?

(a) 1680 (b) 1810

(c) 1710 (d) 1580

12. The number of diagonals in a septagon is

(a) 7 (b) 42

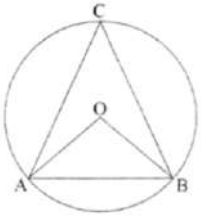
(c) 21 (d) 14

13. How many vertices are there in a hexagon?

(a) 6 (b) 8

(c) 4 (d) 2

14. In the figure O is the centre of circle, chord AB = 4 cm and radius OA = 4 cm. C is the point on circle, then the value of ∠ ACB is



(a) 45º (b) 30º

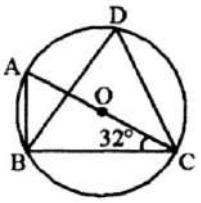
(c) 60º (d) 90º

15. How many segments can be drawn using three non-collinear points?

(a) 5 (b) 3

(c) 2 (d) 1

16. In the given figure, AOC is the diameter of circle, if ∠ACB is 32º, then the measurement of ∠BDC is:



(a) 32º (b) 58º

(c) 68º (d) 52º

17. When two lines lie in the same plane and do not intersect, they are called _____.

(a) intersecting lines (b) perpendicular lines

(c) concurrent lines (d) parallel lines

18. Find the number of sides of the regular polygon whose each interior angle is $128\frac{4}{7}$?

(a) 9 (b) 7

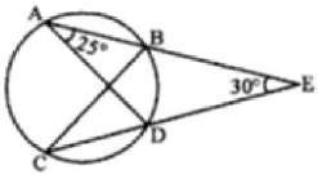
(c) 11 (d) 12

19. Which among the following is the angle which is triple of its supplement?

(a) 110º (b) 135º

(c) 120º (d) 150º

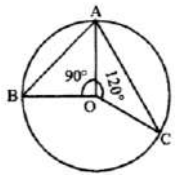
20. Two chords of a circle intersects each other at point E out of the circle. If ∠ E = 30° and ∠ A = 25°, then the value of ∠ CBA is-



(a) 30º (b) 55º

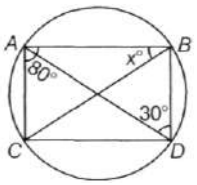
(c) 18º (d) 60º

21. In the figure, O is the centre of circle, the measurement of $\angle BAC$ is:



(a) 105°
(b) 95°
(c) 110°
(d) 75°

22. In the following figure, the value of x^o is

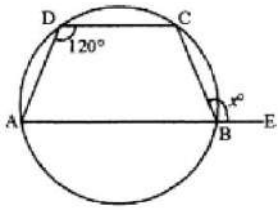


(a) 90°
(b) 40°
(c) 60°
(d) 70°

23. How many sets of collinear points are given below?

(a) 3
(b) 1
(c) 2
(d) 4

24. The value of x in the given diagram is-



(a) 130°
(b) 90°
(c) 120°
(d) 60°

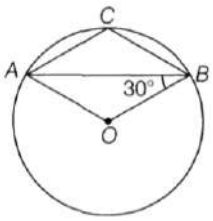
25. One of the acute angle of a right triangle is 75°. Find the other acute angle.

(a) 25°
(b) 15°
(c) 35°
(d) 45°

26. How many line segments can be drawn using four non-collinear points?

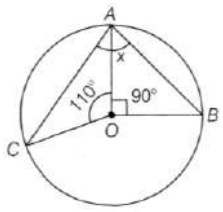
a) 5
(b) 8
c) 6
(d) 4

27. In the given figure, O is centre, then $\angle ACB$ is



(a) 75°
(b) 60°
(c) 90°
(d) 120°

28. If O is the centre of the circle, the value of x in the adjoining figure, is



(a) 80°
(b) 50°
(c) 60°
(d) 70°

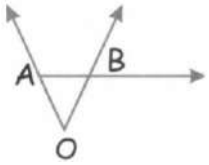
29. PQ is a line segment with a length of 16 units. R is a point on PQ such that PR is $\frac{3}{4}$ of PQ. Find the measures of PR and RQ.

(a) 14 units and 2 units
(b) 12 units and 4 units
(c) 10 units and 6 units
(d) 13 units and 3 units

30. The number of diagonals of a pentagon is

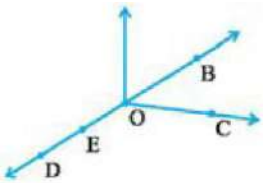
(a) 10
(b) 5
(c) 3
(d) 4

31. Which one of the following does not represent a ray in the given figure?



(a) OB
(b) None of these
(c) AB
(d) OA

32. How many points does the given figure has?



(a) 3
(b) 4
(c) 5
(d) 6

33. The edge of a ruler draws _____.

(a) line segment
(b) curve
(c) ray
(d) line

B. Assertion & Reason Questions

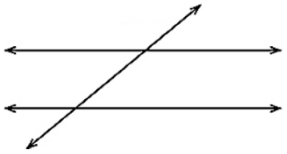
34. **Assertion (A):**  is a curve.

Reason (R): A curve is a shape or a line which is smoothly drawn in a plane having a bent or turns in it.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false. d) A is false but R is true.

35. **Assertion (A):** A line contains a countless number of points.
Reason (R): Line extends indefinitely in both directions.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false. d) A is false but R is true.

36. **Assertion (A):**  is a closed polygon.
Reason (R): A plane figure that is described by a finite number of straight line segments connected to form a closed polygon.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

37. **Assertion (A):** Given lines are parallel lines.
Reason (R): Two or more lines that lie in the same plane and never intersect each other are known as parallel lines

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

38. **Assertion (A):** This is Ray.
Reason (R): A ray is a portion of a line. It starts at one point (called starting point or initial point) and goes endlessly in a direction.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

C. Match the Column

39. Match the following:-

Column A	Column B
1. •	(a) Line
2. 	(b) Point
3. 	(c) line segment
4. 	(d) Ray

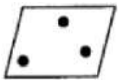
40. Match the following:-

Column A	Column B
1. A curve which does not cross itself	(a) Polygon
2. A curve can have two end points	(b) simple curve
3. A curve can have no end point	(c) open curve
4. A closed curve formed of line segments	(d) closed curve

41. Match the following:-

Column A	Column B
1. Every circle has a point at	(a) Diameter
2. Line segment passing through the centre of a circle	(b) Centre
3. Half of the diameter	(c) Arc
4. The path in the circle formed from two points on the circle	(d) Radius

42. Match the following:-

Column A	Column B
1. 	(a) Intersecting lines
2. 	(b) Coplanar points
3. 	(c) Collinear points
4. 	(d) Parallel lines

D. Case Study or Paragraph

Question No. 43 to 47 are based on the given text. Read the text carefully and answer the questions:

Let us look at Deepak's study table. The top ABCD is flat. He asks his sister Geeta, is she able to see some points and line segments on the table top. She says "yes" then he asks her some questions related to points, parallel lines and line segments.

43. $\overline{AB}$ and $\overline{BC}$ intersect at the point _____.

44. Write one set of parallel lines

(a) Parallel lines do not exist
(b) $\overline{AB}$ and $\overline{AD}$
(c) $\overline{AC}$ and $\overline{BC}$
(d) $\overline{AB}$ and $\overline{CD}$

45. $\overline{AC}$ and $\overline{BC}$ are

(a) Parallel lines
(b) Perpendicular lines
(c) Adjacent lines
(d) Intersecting lines

46. Write a pair of intersecting lines at a point A

(a) $\overline{BC}$ and $\overline{BD}$
(b) $\overline{AB}$ and $\overline{CD}$
(c) $\overline{AC}$ and $\overline{BD}$
(d) $\overline{AD}$ and $\overline{CD}$

47. Parallel lines do not meet.

(a) True
(b) False

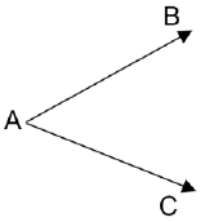
Answer Key

DPP-1

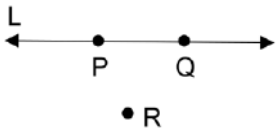
1. (i) E & A, D & B
(ii) ADC, CEB, DE, AB
(iii) C
(iv) D
(v) CD, CE, DA, EB, DE, AB, AC, BC
(vi) DE || AB

2. $\overrightarrow{PQ}$, $\overrightarrow{PR}$, $\overrightarrow{PS}$, $\overrightarrow{QR}$, $\overrightarrow{QS}$, $\overrightarrow{RS}$

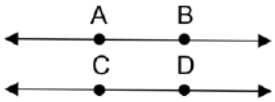
3. (a)



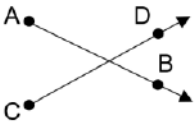
(b)



(c)



(d)



4. Inside Q, P
On S
Outside R, A

5. Segment

6. Arc

7. (i) False (ii) False (iii) False (iv) True (v) True

DPP-2

1. (d)

2. θ_1 ∠BAF or ∠FAB
θ_2 ∠CBA
θ_3 ∠DCB
θ_4 ∠EDC
θ_5 ∠FED
θ_6 ∠AFE

3. (a) O (b) OA, OB, OC (c) AC (d) ED
(e) O, P (f) Q (g) AOC shaded region
(h) ED shaded region

4. True **5.** False **6.** True **7.** True

8. Closed – b, c, e
Open – a, d

DPP-3

1. (c) **2.** (d) **3.** (d) **4.** (c) **5.** (d) **6.** (c)

7. Circumference

8. Quater Circle

9. False

10. False

NCERT Basics Exercise-1

Exercise 4.1

1. (a) O, B, C, D, E.

(b) Many answers are possible. Some are: $\overleftrightarrow{DE}$, $\overleftrightarrow{DO}$, $\overleftrightarrow{DB}$, $\overleftrightarrow{EO}$ etc.

(c) Many answers are possible. Some are: $\overleftrightarrow{DB}$, $\overleftrightarrow{DE}$, $\overleftrightarrow{OB}$, $\overleftrightarrow{OE}$, $\overleftrightarrow{EB}$ etc.

(d) Many answers are possible. Some are: $\overleftrightarrow{DE}$, $\overleftrightarrow{DO}$, $\overleftrightarrow{EO}$, $\overleftrightarrow{OB}$, $\overleftrightarrow{EB}$ etc.

2. $\overrightarrow{AB}$, $\overrightarrow{AC}$, $\overrightarrow{AD}$, $\overrightarrow{BA}$, $\overrightarrow{BC}$, $\overrightarrow{BD}$, $\overrightarrow{CA}$, $\overrightarrow{CB}$, $\overrightarrow{CD}$, $\overrightarrow{DA}$, $\overrightarrow{DB}$, $\overrightarrow{DC}$.

3. (a) Many answers. One answer is $\overrightarrow{AE}$.; (b)Many answers. One answer is $\overrightarrow{AE}$. ; (c) $\overrightarrow{CO}$ or $\overrightarrow{OC}$;
(d) Many answers are possible. Some are, $\overrightarrow{CO}$, $\overrightarrow{AE}$ and $\overrightarrow{AE}$, $\overrightarrow{EF}$.

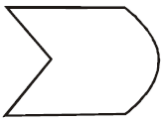
4. (a) Countless ; (b) Only one.

6. (a) True ; (b) True ; (c) True ; (d) False ; (e) False ; (f) False ; (g) True ; (h) False ; (i) False ;
(j) False; (k) True.

Exercise 4.2

1. Open : (a), (c); Closed : (b), (d), (e).

4. (a) Yes ; (b) Yes

5. (a)  (b)  (c)Not possible.

Exercise 4.3

1. $\angle A$ or $\angle DAB$; $\angle B$ or $\angle ABC$; $\angle C$ or $\angle BCD$; $\angle D$ or $\angle CDA$

2. (a) A (b) A, C, D. (c) E, B, O, F.

EXERCISE 4.4

2. (a) ΔABC, ΔABD, ΔADC. ; (b) Angles: $\angle B$, $\angle C$, $\angle BAC$, $\angle BAD$, $\angle CAD$, $\angle ADB$, $\angle ADC$;
(c) Line segments: $\overrightarrow{AB}$, $\overrightarrow{AC}$, $\overrightarrow{BC}$, $\overrightarrow{AD}$, $\overrightarrow{BD}$, $\overrightarrow{DC}$, ; (d) ΔABC, ΔABD

Exercise 4.5

1. The diagonals will meet in the interior of the quadrilateral.

2. (a) $\overrightarrow{KL}$, $\overrightarrow{NM}$ and $\overrightarrow{KN}$, $\overrightarrow{ML}$;

(b) $\angle K$, $\angle M$ and $\angle N$, $\angle L$

(c) $\overrightarrow{KL}$, $\overrightarrow{KN}$ and $\overrightarrow{NM}$, $\overrightarrow{ML}$ or $\overrightarrow{KL}$, $\overrightarrow{LM}$ and $\overrightarrow{NM}$, $\overrightarrow{NK}$

(d) $\angle K$, $\angle L$ and $\angle M$, $\angle N$ or $\angle K$, $\angle L$ and $\angle L$, $\angle M$ etc.

Exercise 4.6

1. (a) O ; (b) $\overrightarrow{OA}$, $\overrightarrow{OB}$, $\overrightarrow{OC}$ (c) $\overrightarrow{AC}$; (d) $\overrightarrow{ED}$; (e) O, P ; (f) Q ; (g) OAB (Shaded portion) ;
(h) Segment ED(Shaded portion)

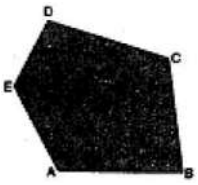
2. (a) Yes ; (b) No

4. (a)True ; (b) True

Concept Mastery Exercise-2

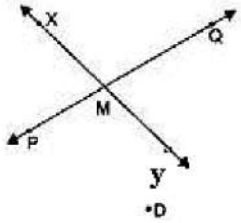
1. Point B lies on $\angle EOF$.
2. The line segments are AB, BC, CD, DE and EA
3. Q
4. Ray $\overline{AB}$
5. The Line containing point E is AE.
6. $\angle A$ or $\angle DAB$; $\angle B$ or $\angle ABC$; $\angle C$ or $\angle BCD$; $\angle D$ or $\angle CDA$.

7.



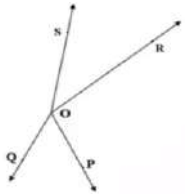
8. (a)

(b)



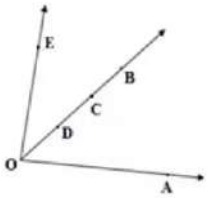
(c)

9. Following figure shows angles with one point in common-



$\angle POQ$ and $\angle ROS$ has one point in common i.e., O.

10. Following figure shows angles with four points in common:



∠EOB and AOB have four points in common i.e. B, C, D and O

11. 2

Explanation: 2

12. 1

Explanation: 1

13. 1

Explanation: 1

14. 2

Explanation: 2

15. a. two

b. Infinite

c. P

16. Six angles are form in the given figure.

∠PMN, ∠NOP, ∠OPN, ∠PNO, ∠MPN, ∠PNM

17. i. The three examples of points are:

a. Pinhole on the map

b. Two walls and floor meeting at the corner

c. The Period at the end of the sentence

ii. The three examples of the portion of a line are:

a. Thin curtain rods

b. Laser beams

c. Stretched power cables

iii. The three examples of plane surfaces are:

a. The surface of a whiteboard

b. Top of a table

c. The Surface of a wall.

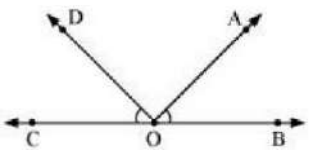
18. Closed curve

b. Closed curve

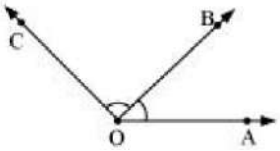
c. Closed curve

d. open curve

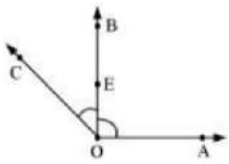
19. i.



ii.



iii.



20. In the given figure

a. Line segments: $\overrightarrow{OB}, \overrightarrow{OE}, \overrightarrow{OD}, \overrightarrow{DE}, \overrightarrow{BE}$

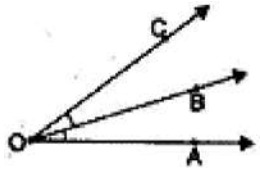
b. Rays: $\overrightarrow{OA}, \overrightarrow{OB}, \overrightarrow{OC}$

21. A closed curve formed of line segments is called a polygon.
i. These line segments forming the polygon are called its sides.
ii. The meeting point of a pair of sides is called the vertex.
iii. Any two vertices which are the endpoints of the same line segment are called adjacent vertices.
iv. Any two sides with a common end point are called adjacent sides.
v. The line segment joining any two non adjacent vertices is called a diagonal.

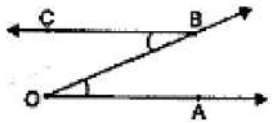
22. a. Adjacent side: (i) AB, AH (ii) GH, GF (iii) EF, ED (iv) CB, CD (v) BA, BC (vi) HA, HG (vii) FG, FE (viii) DE, DC
b. Adjacent vertices: (i) A, H (ii) H,G (iii) G,F (iv) F,E (v) E,D (vi) D, C(vii) C,B (viii) B, A

23. For angle (i): arms are ML and MN. Vertex is M.
For angle (ii): arms are OP and OQ. Vertex is O.
For angle (iii): arms are YX and YZ. Vertex is Y.
For angle (iv): arms are IH and IG. Vertex is I.

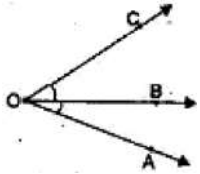
24.



a. $\angle AOB$ and $\angle BOC$ have one point O in common.
b. $\angle AOB$ and $\angle OBC$ have two points O and B in common.



c. Not possible
d. Not possible

e. 

$\angle AOB$ and $\angle BOC$ have one ray $\overrightarrow{OB}$ in common.

25. State True or False:
(i) (b) False
(ii) (b) False

26. Fill in the blanks:
(i) 1. Vertices
(ii) 1. Reflex angle
2. reflex

Accuracy Booster Exercise-3

1.	(d)	**2.**	(d)	**3.**	(d)	**4.**	(d)	**5.**	(a)	**6.**	(b)	**7.**	(d)
8.	(d)	**9.**	(b)	**10.**	(a)	**11.**	(c)	**12.**	(d)	**13.**	(a)	**14.**	(b)
15.	(b)	**16.**	(b)	**17.**	(d)	**18.**	(b)	**19.**	(b)	**20.**	(b)	**21.**	(d)
22.	(d)	**23.**	(c)	**24.**	(c)	**25.**	(b)	**26.**	(c)	**27.**	(d)	**28.**	(a)
29.	(b)	**30.**	(b)	**31.**	(b)	**32.**	(c)	**33.**	(a)	**34.**	(a)	**35.**	(b)
36.	(a)	**37.**	(d)	**38.**	(d)								

39. 1. → (b), 2. → (a), 3. → (d), 4. → (c)
40. 1. → (b), 2. → (c), 3. → (d), 4. → (a)
41. 1. → (b), 2. → (a), 3. → (d), 4. → (c)
42. 1. → (d), 2. → (c), 3. → (b), 4. → (a)

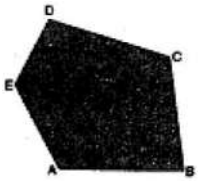
43.	1.B	**44.**	(d)	**45.**	(a)	**46.**	(d)	**47.**	(a)

CLASS 6 - MATHEMATICS

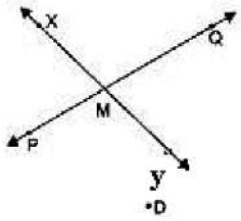
Chapter-4 Basic Geometrical Ideas

Solutions

Concept Mastery Exercise-2

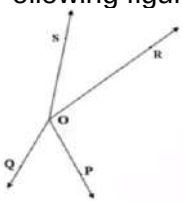
1. Point B lies on ∠EOF.
2. The line segments are AB, BC, CD, DE and EA
3. Q
4. Ray $\overline{AB}$
5. The Line containing point E is AE.
6. ∠A or ∠DAB; ∠B or ∠ABC; ∠C or ∠BCD; ∠D or ∠CDA.
7. 

8. (a) 

(b) 

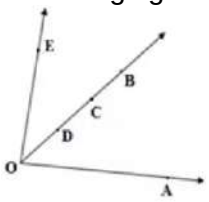
(c) 

9. Following figure shows angles with one point in common-



∠POQ and ∠ROS has one point in common i.e., O.

10. Following figure shows angles with four points in common:



∠EOB and AOB have four points in common i.e. B, C, D and O

11. 2Explanation:
    2
12. 1
    Explanation:
    1
13. 1
    Explanation:
    1

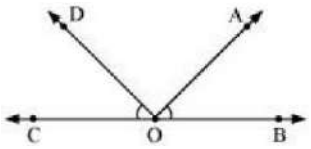
14. 2
Explanation:
2

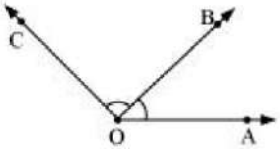
15. a. two
b. Infinite
c. P

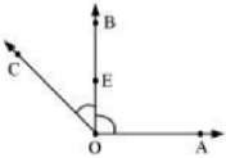
16. Six angles are form in the given figure.
$\angle PMN$, $\angle NOP$, $\angle OPN$, $\angle PNO$, $\angle MPN$, $\angle PNM$

17. i. The three examples of points are:
a. Pinhole on the map
b. Two walls and floor meeting at the corner
c. The Period at the end of the sentence
ii. The three examples of the portion of a line are:
a. Thin curtain rods
b. Laser beams
c. Stretched power cables
iii. The three examples of plane surfaces are:
a. The surface of a whiteboard
b. Top of a table
c. The Surface of a wall.

18. Closed curve
b. Closed curve
c. Closed curve
d. open curve

19. i. 

ii. 

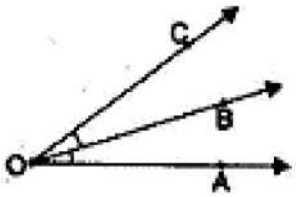
iii. 

20. In the given figure
a. Line segments: $\overrightarrow{OB}$, $\overrightarrow{OE}$, $\overrightarrow{OD}$, $\overrightarrow{DE}$, $\overrightarrow{BE}$
b. Rays: $\overrightarrow{OA}, \overrightarrow{OB}, \overrightarrow{OC}$

21. A closed curve formed of line segments is called a polygon.
i. These line segments forming the polygon are called its sides.
ii. The meeting point of a pair of sides is called the vertex.
iii. Any two vertices which are the endpoints of the same line segment are called adjacent vertices.
iv. Any two sides with a common end point are called adjacent sides.
v. The line segment joining any two non adjacent vertices is called a diagonal.

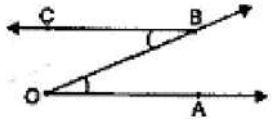
22. a. Adjacent side: (i) AB, AH (ii) GH, GF (iii) EF, ED (iv) CB, CD (v) BA, BC (vi) HA, HG (vii) FG, FE (viii) DE, DC
b. Adjacent vertices: (i) A, H (ii) H,G (iii) G,F (iv) F,E (v) E,D (vi) D, C(vii) C,B (viii) B, A

23. For angle (i): arms are ML and MN. Vertex is M.
For angle (ii): arms are OP and OQ. Vertex is O.
For angle (iii): arms are YX and YZ. Vertex is Y.
For angle (iv): arms are IH and IG. Vertex is I.

24. 

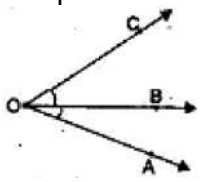
a. $\angle AOB$ and $\angle BOC$ have one point O in common.

b. $\angle AOB$ and $\angle OBC$ have two points O and B in common.



c. Not possible

d. Not possible



e. $\angle AOB$ and $\angle BOC$ have one ray $\overrightarrow{OB}$ in common.

25. State True or False:

(i) **(b)** False

Explanation: False

(ii) **(b)** False

Explanation: False

26. Fill in the blanks:

(i) 1. Vertices

(ii) 1. Reflex angle

2. reflex

Accuracy Booster Exercise-3

1. (d) 

Explanation: 

2. (d) $34^o \Leftrightarrow 46^o$

Explanation: $34^o \Leftrightarrow 46^o$

3. **(d)** 120^o

Explanation: We know that, the angle subtended by an arc at the centre of a circle is double the angle subtended by it any point on the remaning part of the circle.

$\angle BOC = 2\angle A = 2 \times 60^o$

$\therefore \angle BOC = 120^o$

4. **(d)** line

Explanation: A line is called the set of infinite (countless) number of points.

5. **(a)** sides

Explanation: The line segments are joined together and form a polygon. These line segments are called the sides of that polygon.

6. **(b)** always equal

Explanation: always equal

7. **(d)** 5

Explanation: 5

8. **(d)** chord

Explanation: chord

9. **(b)** 2

Explanation: An angle divides a plane into two regions, one inside the angle and the other outside the angle.

10. **(a)** 30^o
Explanation: In a given figure,
$\angle COB = 180^o - 120^o = 60^o$ [$\because$ COA is a line]
$\therefore x = \frac{1}{2} \angle COB$
[angle subtended in the arc is half of that subtended at the centre.]
$= 60^o = 30^o$

11. **(c)** 1710
Explanation: 1710

12. **(d)** 14
Explanation: since, the number of diagonals in n (n - 3) a polygon = $\frac{n(n-3)}{2}$
$\because$ Septagon has 7 sides, i.e., n = 7
$\therefore$ The number of diagonals in a septagon
$\frac{7(7-3)}{2} = \frac{7x4}{2} = 7 \times 2 = 14$

13. **(a)** 6
Explanation: Vertices are the meeting point of two sides of any polygon. In a hexagon, there are 6 sides and they form 6 vertices.

14. **(b)** 30^o
Explanation: Chord AB = OB = BA = OA = 4 cm
Δ AOB equilateral triangle
$\angle AOB = 60°$
$\angle AOB = 2 \angle ACB$
$60° = 2 \angle ACB$
$\angle ACB = 30°$

15. **(b)** 3
Explanation: 3 non-collinear points can make a triangle so 3 line segments can be formed using 3 non collinear points

16. **(b)** 58^o
Explanation: AOC is a diameter
$\angle ABC = 90^o$
$\angle ACB = 32^o$
$\angle BAC = 180^o - (90^o + 32^o)$
$= 180^o - 122^o$
$= 58^o$
$\angle BAC = \angle BDC$
$\angle BDC = 58^o$

17. **(d)** parallel lines
Explanation: Two lines lying in the same plane can be either parallel or intersecting, but if they are not intersecting then the other option is that they are parallel lines.

18. **(b)** 7
Explanation: 7

19. **(b)** 135^o
Explanation: 135^o

20. **(b)** 55^o
Explanation: $\angle DAB$ & $\angle BCD$ are inscribed angles on the arc BC only
$\angle BCD = 25°$
$\angle CBE = 180° - (25° + 30°)$
$= 125°$
$\angle CBA = 180° - 125°$
$= 55°$

21. **(d)** 75^o
Explanation: $\angle BOC + 90^o + 120^o = 360^o$
$\angle BOC = 360^o - 210^o$
$= 150^o$
$\angle BAC = \frac{1}{2} \angle BOC$
$= \frac{1}{2} 150°$
$= 75°$

22. **(d)** 70°
Explanation: In a given figure,
$\angle ADB = \angle ACB = 30^o$
[angle subtended in the same segment]
In ΔABC, $\angle x^o = 180^o - (\angle ACB + \angle CAB)$
= 180o - (30o + 80o) = 70o

23. **(c)** 2
Explanation: 2

24. **(c)** 120^o
Explanation: CBE - 120°
(exterior angle equals to opposite interior angle).

25. **(b)** 15^o
Explanation: 15o

26. **(c)** 6
Explanation: 4 non-collinear points can make a square and the other two points will make its diagonals.

27. **(d)** 120^o
Explanation: In the given figure, OA = OB (radius of circle)
$\Rightarrow \angle OAB = \angle OBA = 30^o$
$\therefore \angle AOB = 180^o - 60^o = 120^o$

$\therefore$ Major $\angle AOB$ = 360o - 120o = 240o
$\Rightarrow \angle ACB = \frac{1}{2} \times 240^o = 120^o$
[angle subtended in the arc is half of that subtended at the centre.]

28. **(a)** 80^o
Explanation: $\angle COB = 360^o - (\angle COA + \angle BOA)$
$= 360^o - (110^o + 90^o)$
$= 160^o$
$\therefore$ x = 12 $\angle COB$ [by theorem]
$= \frac{1}{2} 160^o = 80^o$

29. **(b)** 12 units and 4 units
Explanation: PR = $\frac{3}{4}$ of PQ
PR = $\frac{3}{4} \times 16 = 12$ cm
RQ = 16 - 12 = 4 cm

30. **(b)** 5

Explanation: The diagonals of any polygon can be calculated by the formula $\frac{n \times (n-3)}{2}$ where "n" is the number of sides. for a pentagon n = 5

$\frac{5 \times (5-3)}{2}$

$\frac{5 \times (2)}{2}$

5

Therefore a pentagon has 5 diagonals.

31. **(b)** None of these

Explanation: None of these

32. **(c)** 5

Explanation: according to this figure 5 points are point D, point B, point C, point E and point O.

33. **(a)** line segment

Explanation: A ruler is of definite length and so it draws a line segment only. A line is of infinite length and so cannot be drawn from a ruler.

34. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: A curve which does not cross itself is called a simple curve. This is a simple curve. So, Both (A) and (R) are true and (R) is the correct explanation of (A).

35. **(b)** Both A and R are true but R is not the correct explanation of A.

Explanation: Several points together form a line. Therefore, a line contains infinite points. A line is an idea that it should be straight and that it should extend indefinitely in both directions. Here both (A) and (R) is a correct statements but (R) is not a correct reason for (A).

36. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: A plane figure is described by a finite number of straight line segments connected to form a closed polygon.
And closed polygon is a plane figure that is described by a finite number of straight-line segments connect. So, the given figure is a closed polygon.
So, Both (A) and (R) are true and (R) is the correct explanation of (A).

37. **(d)** A is false but R is true.

Explanation: Lines that do not meet each other at any point are called parallel lines. But Given lines are not parallel lines because one line intersects given two lines. So, (A) is a false statement but (R) is a true statement.

38. **(d)** A is false but R is true. **Explanation:** Given image is not a line it is a segment because it is not go endlessly in a direction. So, (A) is a false statement. A ray is a portion of a line. It starts at one point and goes endlessly in a direction. This is true.

39. 1. → (b)
    2. → (a)
    3. → (d)
    4. → (c)

40. 1. → (b)
    2. → (c)
    3. → (d)
    4. → (a)

41. 1. → (b)
    2. → (a)
    3. → (d)
    4. → (c)

42. 1. → (d)
    2. → (c)
    3. → (b)
    4. → (a)

43. 1.B

44. **(d)** $\overline{AB}$ and $\overline{CD}$

Explanation: $\overline{AB}$ and $\overline{CD}$

45. **(a)** Parallel lines

Explanation: Parallel lines

46. **(d)** $\overline{AB}$ and $\overline{AD}$

Explanation: $\overline{AB}$ and $\overline{AD}$

47. **(a)** True

Explanation: True

PRE-FOUNDATION

CLASS VI

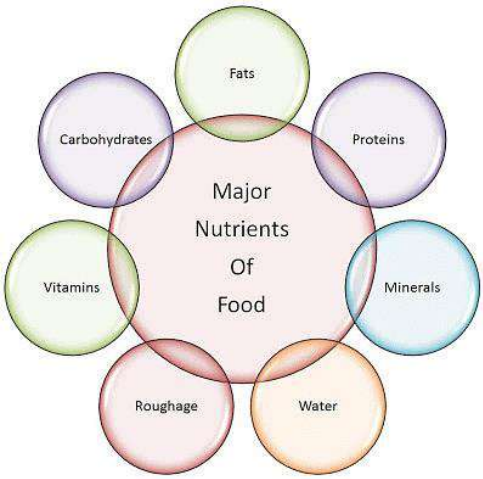
SAMPLE

BIOLOGY

CLASS 6 - BIOLOGY

CHAPTER-2

Components of Food



Chapter Flow

1. Introduction
2. Components of Food
3. Balanced Diet
4. Classification of Food
5. Basic Constituents of Food
6. Test For Carbohydrates, Fats & Proteins
7. Deficiency Diseases

DPP-1
DPP-2
Exercise-1 NCERT Basics
Exercise-2 Concept Mastery
Exercise-3 Accuracy Booster

Components of Food

1. Introduction

Food is one of the most basic requirements of life. Food supplies us with energy. It is also required for growth and maintenance of the body. It also protects us from diseases.

2. Components of Food

Food contain various chemical substances required by our body. These chemical substances are called nutrients. Our body needs some of these nutrients in larger quantities ad some in only very small quantity.

These nutrients can be broadly grouped into the following seven classes.

1. Carbohydrates 2. Fats 3. Proteins 4.Vitamins
5. Minerals 6.Water 7. Roughage

3. Balanced Diet

- A balanced diet is one which provides proper amount and proportion of fats, carbohydrates, proteins, vitamins and minerals, needed for the growth and maintenance of the body. A balanced diet should have three main qualities :
  1. It should be rich in essential nutrients like minerals and vitamins.
  2. It should provide the exact amount of raw materials needed for growth, development, repair and replacement of body tissues.
  3. It should provide the right amount of energy required by the body.

4. Classification of Food

- Food can be classified under three different categories on the basis of its functions:
  (i) Energy giving food : Carbohydrates and fats, e.g. cereals, sugars, oils, etc.
  (ii) Body building food : Proteins, minerals and fats, e.g. pulses, beans, milk, fish, etc.
  (iii) Protective food : Vitamins& minerals, e.g. vegetables, fruits, milk, etc.

5. Basic Constituents of Food

(a) Carbohydrates :

Carbohydrates are organic compounds of carbon, hydrogen and oxygen.

- They are the main source of energy in our body.
- One gram of carbohydrate yields about 4 kilocalories of heat energy.
- A major portion of our food consists of carbohydrates, e.g., rice, chapatis.
- If excess amount of carbohydrates are present in the body, they are converted into fats and stored under the skin and around various organs of the body.
- The carbohydrates in our food are obtained mainly from the plant sources like wheat, rice, maize, potato etc.
- Starch and sugars are the two carbohydrates which provide most of the energy to our body.

(b) Fats :

- Fats are composed of carbon, hydrogen and oxygen.
- They have a lower oxygen content than carbohydrates.
- They are very important sources of energy.
- One gram of fat yields 9 kilocalories of energy.
- A layer of fat under the skin helps to reduce the amount of heat loss from the body in cold weather conditions.

- Every fat molecule consists of three molecules of fatty acids and one molecule of glycerol.
- Fats are insoluble in water but soluble in organic solvents like alcohol, ether, benzene, etc.
- Fats are supplied to our body by different foods like butter, ghee, cheese, ground-nut etc. All the cooking oils (like ground-nut oil, coconut oil) provide us fats.
- Fats also help in forming of cell membranes and other organelles.
- They help in transportation of fat-soluble vitamins in our body

(c) Proteins :

The name protein was coined by Berzelius in 1838.

- Chemically proteins are polymers of molecular units called as amino acids.
- The amino acids are linked together by a peptide bonds. There are about 20 amino acids that take part in the formation of proteins. The 20 amino acids are further divided into two groups :
- Essential amino acids : They are 10 in number. They are not synthesized in a human body and are obtained from food so they are called as essential amino acids. e.g., Methionine, Leucine and tryptophan.
- Non – essential amino acids : They are also 10 in number. They are synthesized in a human body& are thus termed as non – essential amino acids. e.g., Alanine, Asparagine, Aspartic acid and cystine.
- Pulses, peas, beans, nuts, cheese, milk are the important sources of proteins.
- They act as a structural components of cell. They are essential for growth and repair of the body.
- They help to catalyse various reactions occuring in our body.
- They play important roles as hormones, antibodies, etc.
- All the enzymes are made up of proteins.
- Haemoglobin, the respiratory pigment of animals is a conjugated protein composed of globin and haem(pigment).

(d) Vitamins :

Vitamins are organic compounds essential for the growth of the body. They are required by the body in very small quantities. Vitamins are classified into two types.

(A) Fat soluble Vitamins A, D, E,K. (B) Water soluble Vitamins B and C.

- These are obtained from fruits, cod liver etc.
- They keep the body healthy and prevent it from diseases. If the diet does not contain the required amount of vitamins, it results in vitamin deficiency diseases.

(e) Minerals :

- Human body requires about fifteen different kinds of minerals, e.g.-
  - Calcium and phosphorus are needed for the growth of bones and teeth.
  - Iron is needed for the formation of haemoglobin in blood.
  - Iodine, sodium, potassium and zinc are necessary for a good healthy body.
- Meat, eggs, milk, green vegetables and fruits are rich in minerals.
- Minerals are required by the body in trace amounts and are essential for growth, repair and replacement processes. They form a major part of many body chemicals and tissues.

(f) Roughage :

Cellulose forms the fibre content in food and that fibre content is called roughage. Roughage keeps the digestive systemin good working condition.

- It is a plant fibre found in vegetables, fruits, peas, beans, maize and in the barn which surrounds wheat grains.
- It absorbs water and poisonous waste from food during digestion. Food without roughage forms hard dry lumps of waste which get stuck in the gut causing constipation.

(g) Water :

The human body contains 70% of water. It has no food value but it is still one of the essential components of living matter.

- Water performs the following functions in our body:
  - It transports food materials within the body.
  - It helps in the formation of urine and faeces.
  - It regulates the body temperature.
  - It is an essential part of blood and digestive juices.

6. Test For Carbohydrates, Fats & Proteins

(a) Test for carbohydrates :

Take few drops of iodine solution & add it into boiled rice or potato. The formation of blue-black colour confirms the presence of starch (carbohydrate).

(b) Test for fats :

When ghee / butter rubbed on white paper, that portion of paper turns translucent indicating the presence of fats.

(c) Test for proteins :

Take the few drops of egg albumin in a test tube and add a few drops of concentrated nitric acid to it.

- The white colour of the albumin changes to yellow. Now, pour the acid out of the test tube but keep the white of the egg in the test tube.
- Add a few drops of ammonium hydroxide to it.
- The colour changes to violet which shows the presence of proteins.

7. Deficiency Diseases

The main cause of deficiency diseases in our country is poverty. Avast majority of our people are not able to buy quality food items in desired quantities. In the long run they become weak and sick. Its effect on children is more serious.

Diseases due to Deficiency of Carbohydrates:

Carbohydrates are the chief sources of energy for the body. This energy is used by the body for performing various functions.

Deficiency of sufficient carbohydrates in the diet leads to (i) body weakness, and (ii) loss of stamina, as sufficient quantity of energy is not available to the body for performing various functions.

Diseases due to deficiency of Protein :

Proteins are body-building food and causes serious diseases, like kwashiorkor and marasmus develop in case of children if the proteins are not sufficient in their diet. It is for this reason that the children are often advised to take a protein-rich diet – enough milk, pulses, eggs, meat and fish.

- **Symptoms of Kwashiorkor**

  (i) Protruding belly
  (ii) Dark and scaly skin, brownish hair
  (iii) Stunted growth ; usually underweight
  (iv) Swollen legs due to accoumulation of water
  (v) Loss of appetite
  (vi) Anaemia
  (vii) Mental retardation
  (viii) Reduced resistance to diseases

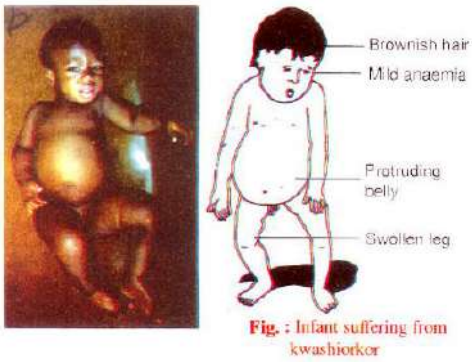


Fig. : Infant suffering from kwashiorkor

- **Symptoms of Marasmus**

(i) Poor muscle development
(ii) Bones showing through the skin ; no fat
(iii) Weak legs
(iv) Loss of appetite
(v) Anaemia
(vi) Grossly underweight
(vii) Mental retardation
(viii) Reduced resistance to diseases


Fig.: Marasmic child

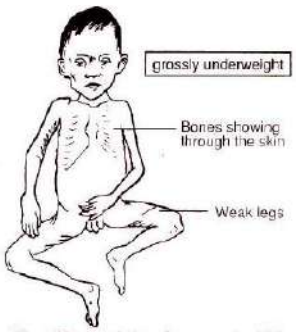


Fig.: Characteristics of a marasmic child

Protein Energy Malnutrition (PEM) is a term used to describe diets which lack proteins and energy - giving carbohydreates. Diseases caused by PEM are common among children.

- Kwashiorkor and marasmus are diseases which result from PEM.

Vitamin / Mineral	Deficiency disease / disorder	Symptoms
Vitamin - A (Retinol)	Night blindness	Poor vision in dark
Vitamin - B1 (Thiamine)	Beri-Beri	Weak muscles & very little energy to work.
Vitamin - C (Ascorbic acid)	Scurvy	Bleeding gums.
Vitamin -D (Calciferol)	Rickets	Bones become soft & bent.
Vitamin - E (Tocoferol)	Infertility	Low production of sperm or ova.
Vitamin - K (Phylloquinone)	Clotting time delayed	Bleeding time exceed.
Calcium	Bone and tooth decay	Weak bones & tooth decay
Iodine	Goitre	Glands in the neck appear swollen, mental disability in children.
Iron	Anaemia	Weakness.

DPP-1

1. One gram of fat yields
(a) 9 Kcal (b) 90 Kcal (c) 0.9 Kcal (d) 0.09 Kcal

2. One gram of carbohydrate yields
(a) 0.4 Kcal (b) 4 Kcal (c) 40 Kcal (d) 0.04 Kcal

3. Which of the following is the main source of energy?
(a) Fats (b) Proteins (c) Carbohydrates (d) Minerals

4. Which of the following mineral is needed for the formation of haemoglobin in blood?
(a) Iron (b) Cobalt (c) Magnesium (d) Zinc

5. Which of the following is a non-essential amino acid?
(a) Methionine (b) Leucine (c) Tryptophane (d) Alanine

6. All enzymes are made up of
(a) minerals (b) fats (c) roughage (d) proteins

7. Which of the following is a water soluble vitamin?
(a) Vitamin A (b) Vitamin K (c) Vitamin B (d) Vitamin E

8. Which of the following are needed for the growth of bones and teeth?
(a) Calcium (b) Phosphorous (c) Zinc (d) Both (a) and (b)

DPP-2

1. Bleeding gums in due to deficiency of
   (a) Vitamin A (b) Vitamin C (c) Vitamin B (d) Vitamin D
2. Retinol is the other name for
   (a) Vitamin A (b) Vitamin C (c) Vitamin B (d) Vitamin D
3. Deficiency of iron causes
   (a) Anaemia (b) Rickets (c) Scurvy (d) Infertility
4. Which of the following is a protein deficiency disease?
   (a) Beri–Beri (b) Rickets (c) Marasmus (d) Goitre
5. Protruding belly, Dark and scaly skin, stumted growth, swollen legs, Anaemia re symptoms of
   (a) Goitre (b) Marasmus (c) Kwashiorkor (d) Beri–Beri
6. Which of the following is not a rich source of fat?
   (a) Butter (b) Groundnut (c) Meat (d) Cheese
7. Fat molecule consists of
   (a) 1 molecule of fatty acids + 1 molecule of glycerol
   (b) 3 molecules of fatty acids + 1 molecule of glycerol
   (c) 3 molecules of glycerol + 1 molecule of fatty acids
   (d) 3 molecules of glycerol + 3 molecules of fatty acids
8. What type of bond present between amino acids?
   (a) peptide bond (b) H-bond (c) glucosidic bond (d) ester bond

NCERT Basics Exercise-1

1. Name the major nutrients in our food.
2. Name the following:
   (a) The nutrients which mainly give energy to our body.
   (b) The nutrients that are needed for the growth and maintenance of our body.
   (c) A vitamin required for maintaining good eyesight.
   (d) A mineral that is required for keeping our bones healthy.
3. Name two food each rich in:
   (a) Fats (b) Starch (c) Dietary fibre (d) Protein
4. Write true and false for the following statements :
   (a) By eating rice alone, we can fulfill nutritional requirement of our body.
   (b) Deficiency diseases can be prevented by eating a balanced diet.
   (c) Balanced diet for the body should contain a variety of food items.
   (d) Meat alone is sufficient to provide all nutrients to the body.
5. Fill in the blanks:
   (a) _____ is caused by deficiency of vitamin D.
   (b) Deficiency of _____ causes a disease known as beri-beri.
   (c) Deficiency of vitamin C causes a disease known as _____ .
   (d) Night blindness is caused due to deficiency of _____ in our food.

Concept Mastery Exercise-2

A. Very Short Answer Type Questions

1. Name two food items which provide fats.
2. Name the major nutrients in our food.
3. Name two energy-providing nutrients.
4. Do all foods contain all the required nutrients?
5. If any food item gives blue-black colour with iodine then which nutrient is present in the food?
6. Name four substances which provide carbohydrates.
7. Name the food nutrient indicated by an oily patch on paper.

B. Short Answer Type Questions

8. Write the functions of water in our body.
9. What is malnutrition? Name two disease caused by it.
10. What is obesity?
11. What are junk foods? Why we should avoid it?
12. Minerals and vitamins are needed in very small quantities by our body as compared to other components, yet, they are an important part of a balanced diet. Explain the statement.
13. Explain why you should eat less cakes and ice-cream.

C. Long Answer Type Questions

14. What are the roles of
    (a) Carbohydrates (b) Fats (c) Proteins
15. Why does our body need nutritious food?
16. Explain why you should : Remove most of the fat from meat.
17. Paheli avoids eating vegetables but likes to eat biscuits, noodles, and white bread. She frequently complains of stomachache and constipation. What are the food items that she should include in her diet to get rid of the problem? Give the reason for your answer
18. What are various functions of protein?
19. Write the sources and deficiency diseases of the vitamins 'A', 'B' complex, C, D, E and K.
20. List various types of nutrients and write the functions of each.

D. True & False

21. (a) By eating rice alone, we can fulfill nutritional requirements of our body.
    (b) Meat alone is sufficient to provide all nutrients to the body.
    (c) Deficiency diseases can be prevented by eating a balanced diet.

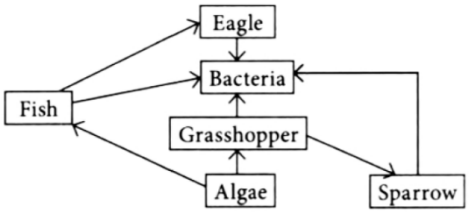
E. Fill in the Blanks

22. (a) Over eating of fried food and fatty food items causes _____.
    (b) Night blindness is caused due to deficiency of _____ in our food.
    (c) _____ gives blue colour with iodine.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

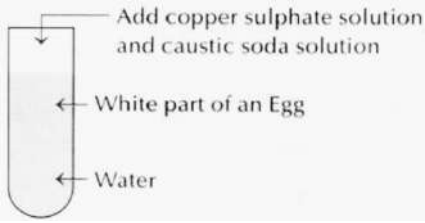
1. Diseases occuring due to the deficiency of one or other nutrients is called
   (a) chronic disease (b) dietary disease
   (c) transmitted disease (d) deficiency disease
2. Which one of the following roots does not modify to store food?
   (a) Turnip (b) Radish
   (c) Carrot (d) Maize
3. Which of the following options contains foods obtained from stem of the plant?
   (a) Garlic, Potato, Turmeric (b) Turnip, Carrot, Onion
   (c) Broccoli, Sugarcane, Colocasia (d) Ginger, Radish, Potato
4. Leech and lice are classified as parasites because they-
   (a) cannot make their own food.
   (b) feed on blood.
   (c) obtain food from their host.
   (d) feed on dead and decaying organic matter.
5. Which vitamins help our body to absorb calcium?
   (a) Vitamin K (b) Vitamin C
   (c) Vitamin D (d) Vitamin A
6. Proper food keeps us in
   (a) Good health (b) Fat body
   (c) Poor vision (d) Proper height
7. Human being is hungry when
   (a) Food can meet energy requirement (b) Food cannot meet energy requirement
   (c) Food has been digested (d) Stomach is empty
8. To test the presence of protein in food
   (a) Copper sulphate and caustic soda is used (b) Iodine solution and caustic soda is used
   (c) Washing soda and nitric acid is used (d) Iron sulphate and iodine is used
9. Washing of cut or peeled fruits and vegetables may lose some
   (a) Minerals (b) Proteins
   (c) Lipids (d) Vitamins
10. Which of the following organisms are secondary consumers in the given food web?
    (a) Sparrow, eagle and bacteria
    (b) Sparrow, snake, eagle and bacteria
    (c) Fish, grasshopper and sparrow
    (d) Sparrow and eagle



11. Which foods item contains phosphorus?
    (a) Rice and sugar (b) Grapes and rice
    (c) Wheat and maize (d) Banana and milk
12. A hard working labourer, who does lot of physical work, needs more of
    (a) Carbohydrates and minerals (b) Protein and Vitamins
    (c) Materials and vitamins (d) Carbohydrates and fats
13. The leaves of _____ plant have paralleled venation.
    (a) banyan (b) mango
    (c) peepal (d) paddy

14. Aaditya wants to make a salad using vegetables from different plant parts. If he chooses to use four different parts of plant, his salad will contain
(a) Broccoli, cauliflower, cucumber and carrot.
(b) Lettuce, carrot, tomato and lemon
(c) Lettuce, broccoli, cucumber and carrot
(d) Cauliflower, carrot, cucumber and radish

15. After shaking, the formation of violet colour confirms the presence of _____.
Observe the diagram and select the CORRECT option.



(a) protein
(b) starch
(c) Mineral
(d) fats

16. We can obtain roughage by adding
(a) Seasonal salad and vegetable
(b) Milk and potato
(c) Butter and fruits
(d) Soyabeans and polka

17. Which vitamin is called sunshine vitamin?
(a) Vitamin D
(b) Vitamin C
(c) Vitamin A
(d) Vitamin B

18. A person with bleeding gums should add to his daily diet
(a) Vitamin K
(b) Vitamin D
(c) Vitamin E
(d) Vitamin C

19. The food rich in carbohydrates are
(a) Meat, fish, egg and pulse
(b) Mango, papaya. Orange and banana
(c) Potato, wheat, maize and sugarcane
(d) Spinach, onion, ginger and tomato

20. The nutrients that protect our body includes
(a) Vitamins and minerals
(b) Protein and carbohydrates
(c) Roughage and vitamins
(d) Carbohydrates and fats

21. Minerals and vitamins present in food are
(a) energy giving
(b) roughage
(c) protective
(d) body building

22. A food sample is taken in a test-tube and a few drops of iodine solution were added to it. It was observed that the solution turned blue black. It shows the presence of which one of the following component in the food sample?
(a) Carbohydrate
(b) Proteins
(c) Fat
(d) Vitamins

23. Vitamins A keeps our
(a) Lung and heart
(b) Eyes and skin healthy
(c) Skin and heart healthy
(d) Eyes and bones

24. A survey found that people living in the mountains have enlarged neck and slow physical development. This is because
(a) Their diet is deficient in vitamin.
(b) Their diet is deficient in phosphorus, hence underdeveloped bones.
(c) Their diet is deficient in iodine required for proper growth.
(d) Their diet is deficient in iron and hence has less blood in the body.

25. An experiment was performed by a student in which the colour of the tested food item turned violet on adding certain chemicals. The food item is perhaps _____.
(a) Groundnut
(b) Rice
(c) Chapati
(d) Pulses

26. Which one is an example of junk food?
(a) Fruit juice
(b) Bread
(c) Pizza
(d) Glucose

27. Which one of the following food items does not provide dietary fiber?
(a) Fruits and vegetables (b) Milk
(c) Whole grains (d) Whole pulses

28. Which mineral is required for the formation of hemoglobin?
(a) Magnesium (b) Iron
(c) Calcium (d) Iodine

29. Which of the following nutrients is not present in milk?
(a) Protein (b) Calcium
(c) Vitamin D (d) Vitamin C

30. PEM stands for
(a) Protein enzyme malnutrition (b) Protein efficiency malnutrition
(c) Protein energy malnutrition (d) Proper energy malnutrition

31. Marasmus is common in infants below _____.
(a) 1 years (b) 10 years
(c) 5 years (d) 3 years

32. We get instant energy from glucose because _____
(a) Glucose is insoluble in water (b) Glucose is high energy food
(c) Glucose is highly soluble in water (d) Glucose does not need to be digested

B. Assertion & Reason Questions

33. **Assertion (A):** Goiter is caused due to deficiency of iron.
Reason (R): Iodine is essential for the production of thyroxine.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

34. **Assertion (A):** Vitamin C is called as a sunshine vitamin.
Reason (R): Fruits are good sources of vitamins and minerals.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

35. **Assertion (A):** A balanced diet makes us healthy.
Reason (R): A balanced diet contains all the components of food in the right proportion.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

36. **Assertion (A):** Scurvy is caused due to a deficiency of vitamin C.
Reason (R): The disease sets in when the diet does not include fresh vegetables and fruits for a long time.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

37. **Assertion (A):** The growing child needs more minerals.
Reason (R): The calcium and phosphorus required for the formation of bones.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

C. Statement Type Questions

38. Given below are the steps to test the presence of proteins in a food item:
i. Take a small quantity of the food item in a test tube, add 10 drops of water to it and shake it.
ii. Make a paste or powder of food to be tested.
iii. Add 10 drops of caustic soda solution to the test tube and shake well.
iv. Add 2 drops of copper sulphate solution to it.
Which of the following is the correct sequence of the steps?
(a) i, ii, iv, iii (b) ii, i, iv, iii
(c) iv, ii, i, iii (d) ii, i, iii, iv

39. Read the following statements about diseases.
i. They are caused by germs.
ii. They are caused due to a lack of nutrients in our diet.
iii. They can be passed on to another person through contact.
iv. They can be prevented by taking a balanced diet.
Which pair of statements best describe a deficiency disease?
(a) (i) and (iii) (b) (ii) and (iv)
(c) (ii) and (iii) (d) (i) and (ii)

40. Which pair is not correct?
(a) Niacin - Pellagra (b) Thiamine – Beriberi
(c) Vitamin D – rickets (d) Vitamin K- Sterility

41. Which one is a correct statement?
A. Labourers require more fat than office workers.
B. Labourers require less food than office workers.
C. Labourers require more vitamins than office workers.
D. Labourers needs more milk than office workers.
(a) B (b) C
(c) D (d) A

D. Match The Column

42. Match the following:

Column A	Column B
a. Energy giving food	i. Vitamins and minerals
b. Body building food	ii. Carbohydrates
c. Protective food	iii. Proteins
d. Plant fibre	iv. Pizzas
e. Junk food	v. Roughage

43. Match the followings:

Column A	Column B
a. Vitamin A	i. Beri-Beri
b. Vitamin C	ii. Rickets
c. Vitamin D	iii. Scurvy
d. Vitamin B1	iv. meat, egg, fish
e. Rich in proteins	v. Night blindness

44. Match the following:

Column A	Column B
a. Anemia	i. Iodine
b. Scurvy	ii. Vitamin D
c. Goitre	iii. Vitamin A
d. Night blindness	iv. Vitamin C
e. Rickets	v. Iron

E. Case Study or Paragraph

Question No. 45 to 49 are based on the given text. Read the text carefully and answer the questions:

Nita is studying deficiency diseases. He is reading the following passage. If a person does not get enough proteins in his/her food for a long time, he/she is likely to have stunted growth, swelling of the face, discoloration of hair, skin diseases and diarrhea. If the diet is deficient in both carbohydrates and proteins for a long period of time, the growth may stop completely. Such a person becomes very lean and thin and so weak that he/she may not even be able to move.

The deficiency of different vitamins and minerals may also result in certain diseases or disorders.

45. Scurvy is caused due to deficiency of

(a) Vitamin C (b) Vitamin B

(c) Vitamin D (d) Vitamin A

46. Deficiency of iodine leads to

(a) goiter (b) scurvy

(c) rickets (d) balanced diet

47. Rickets is a disease of the

(a) skin (b) blood

(c) hair (d) bones

48. The deficiency of calcium in the diet of an adult person causes a disease called _____.

49. Vitamins and minerals protects our body from diseases.

(a) True (b) False

Answer Key

DPP-1

1. (a) **2.** (b) **3.** (c) **4.** (a) **5.** (d) **6.** (d) **7.** (c)
8. (d)

DPP-2

1. (b) **2.** (a) **3.** (a) **4.** (c) **5.** (c) **6.** (c) **7.** (b)
8. (a)

Concept Mastery Exercise-2

1. i. Oils
ii. Ghee
2. Carbohydrates, fats, proteins, vitamins, roughage and water are essential nutrients for our body.
3. i. Carbohydrates
ii. Fats
4. No, all foods do not contain all the nutrients required by our body.
5. It shows the presence of Starch in the food item.
6. i. Potato
ii. Rice
iii. Wheat
iv. Sugar
7. An oily patch on paper shows the presence of fat.
8. Water helps our body to absorb nutrients from the food. It also helps in removing the waste from the body in the form of urine and sweat. We get water from various types of liquids, fruits and vegetables.
9. The condition of nutrition in which the food is either in inadequate quantity or in express, or it lacks some essential nutrients is called malnutrition. In simple terms the condition arising out of inadequate or unbalanced food is called malnutrition.. Two disease caused by malnutrition includes Kwashiorkor and Marasmus.
10. When a person eats too much fat-containing foods, then the fat gets deposited in his body and he may end up suffering from a condition called obesity.
11. Deep fried articles having preservatives etc. like samosa, burger, pizzas etc. are called junk food. We should avoid them because they contain high fat and sugar content and poor nutritional value
12. Vitamins and minerals play the vital role in the functioning of various metabolic processes. We need minerals and vitamins, however, in very less amount because:
i. They help in protecting our bodies from catching diseases.
ii. They help in the growth of our body.
iii. They also help in maintaining good health.
iv. They protect our immune system and helps them function properly.
13. Eat less cakes and ice-cream : Cakes and ice-cream contains lots of sugar and fat. Sugar and fats are energy giving food. But the amount of energy a person needs depends on a person's age, sex and daily activities. If a person takes in more calories than are used up, the excess energy gets stored in the body as fat which leads to obesity, atheroma and diabetes.

14. (a) Role of carbohydrates : Carbohydrates provide us energy.
(b) Role of fats : Fat also provide energy.
(c) Role of proteins :
1) Proteins help in digestion.
2) Proteins help in repairing the damaged cells and building of the muscles.
3) Proteins help in growth of muscles and whole body.
4) Proteins also give energy.

15. We know that food is needed for growth of our body. Food gives us energy to work and play. It gives us resistance against diseases. The main components of food are carbohydrates, proteins, fats, vitamins, minerals, fibre and water. Nutrients are the components of food that the body needs in adequate amounts for growth, to reproduce and lead a normal healthy life. All types of nutrients have their own functions to perform, but the different nutrients must act together. So nutritious food provide energy for all the activity of body.

16. Animal fat contain saturated fat, Our diet should contain less of saturated fat because saturated fat easily changes into cholesterol which causes arteriosclerosis (thickening of walls of arteries) high blood pressure and heart disorder. Hence, we should try to remove most of the fat from meat.

17. Paheli should avoid eating biscuits and other such junk food as they contain media that has a minimum quantity of fibre or roughage. Paheli must include whole grains, whole pulses, fresh fruits, and vegetables in her diet as she seems to lack roughage.

18. Functions of protein are :
1) Proteins are the building materials of our body.
2) Proteins are the constituents of enzymes.
3) Proteins make our muscles skin, hair and nails.
4) Protein forms a red pigment in blood which acts as oxygen carrier.
5) Protein like fibrin help in clotting of blood.
6) Protein help in repairing damaged, replacing wornout on dead cells and tissues.
7) Proteins help to develop resistance of the body against various infections.

19.

Vitamins	**Sources**	**Deficiency diseases**
1) Vitamin A	Milk, butter, yellow fruits and vegetables, egg yolk, liver oils of fish.	Xerophthalmia, Night blindness.
2) Vitamin B complex	Milk, egg, green, vegetables, cheese, meat, germinating seeds, yeast and unpolished rice.	Beri-beri
3) Vitamin C	Citrus fruits, green and red peppers.	Scurvy
4) Vitamin D	Milk, egg, fish, liver oil, sun light.	Rickets
5) Vitamin E	Vegetable seeds, eggs, sweet potato, oils, meat, sprouted grains.	Sterility
6) Vitamin K	Egg yolk, liver, cheese tomato, cabbage, soyabean, cauliflower.	Improper coagulation of blood.

20. The various types of nutrients are:
i. Carbohydrates: They are mainly energy-providing nutrients.
ii. Fats: They provide energy for the body. They give much more energy than carbohydrates if consumed in the same amount.
iii. Proteins: They are called body-building foods. Proteins help in the formation and repairing of body parts. Skin, hair, muscles, enzymes are made up of proteins.
iv. Vitamins: Vitamins help in protecting our body against disease. They also protect eyes, bones, teeth and gums.
v. Minerals: Minerals are essential for the proper growth of the body and to maintain good health.

21. State True or False:
(i) (b) False
Explanation: False
(ii) (b) False
Explanation: False
(iii) (a) True
Explanation: True

22. Fill in the blanks:
(i) 1. Obesity
(ii) 1. Vitamin A
(iii) 1. Starch

Accuracy Booster Exercise-3

1.	(d)	**2.**	(d)	**3.**	(a)	**4.**	(c)	**5.**	(c)	**6.**	(a)	**7.**	(d)
8.	(a)	**9.**	(d)	**10.**	(d)	**11.**	(d)	**12.**	(d)	**13.**	(b)	**14.**	(c)
15.	(a)	**16.**	(a)	**17.**	(a)	**18.**	(d)	**19.**	(c)	**20.**	(a)	**21.**	(c)
22.	(a)	**23.**	(b)	**24.**	(c)	**25.**	(c)	**26.**	(c)	**27.**	(b)	**28.**	(b)
29.	(d)	**30.**	(c)	**31.**	(c)	**32.**	(d)	**33.**	(d)	**34.**	(d)	**35.**	(b)
36.	(a)	**37.**	(a)	**38.**	(b)	**39.**	(b)	**40.**	(d)	**41.**	(d)		

42. Column A Column B
a. Energy giving food ii. Carbohydrates
b. Body building food iii. Protiens
c. Protective food i. Vitamins and minerals
d. Plant fibre v. Roughage
e. Junk food iv. Pizzas

43.

Column A	Column B
a. Vitamin A	v. Night blindness
b. Vitamin C	iii. Scurvy
c. Vitamin D	ii. Rickets
d. Vitamin B1	i. Beri-Beri
e. Rich in proteins	iv. meat, egg, fish

44.

Column A	Column B
a. Anemia	v. Iron
b. Scurvy	iv. Vitamin C
c. Goitre	i. Iodine
d. Night blindness	iii. Vitamin A
e. Rickets	ii. Vitamin D

45. (a) **46.** (a) **47.** (d)
48. 1. Osteomalacia
49. (a)

CLASS 6 - BIOLOGY

Chapter-2 Components of Food

Solutions

Concept Mastery Exercise-2

1. i. Oils
   ii. Ghee
2. Carbohydrates, fats, proteins, vitamins, roughage and water are essential nutrients for our body.
3. i. Carbohydrates
   ii. Fats
4. No, all foods do not contain all the nutrients required by our body.
5. It shows the presence of Starch in the food item.
6. i. Potato
   ii. Rice
   iii. Wheat
   iv. Sugar
7. An oily patch on paper shows the presence of fat.
8. Water helps our body to absorb nutrients from the food. It also helps in removing the waste from the body in the form of urine and sweat. We get water from various types of liquids, fruits and vegetables.
9. The condition of nutrition in which the food is either in inadequate quantity or in express, or it lacks some essential nutrients is called malnutrition. In simple terms the condition arising out of inadequate or unbalanced food is called malnutrition.. Two disease caused by malnutrition includes Kwashiorkor and Marasmus.
10. When a person eats too much fat-containing foods, then the fat gets deposited in his body and he may end up suffering from a condition called obesity.
11. Deep fried articles having preservatives etc. like samosa, burger, pizzas etc. are called junk food. We should avoid them because they contain high fat and sugar content and poor nutritional value
12. Vitamins and minerals play the vital role in the functioning of various metabolic processes. We need minerals and vitamins, however, in very less amount because:
    i. They help in protecting our bodies from catching diseases.
    ii. They help in the growth of our body.
    iii. They also help in maintaining good health.
    iv. They protect our immune system and helps them function properly.
13. Eat less cakes and ice-cream : Cakes and ice-cream contains lots of sugar and fat. Sugar and fats are energy giving food. But the amount of energy a person needs depends on a person's age, sex and daily activities. If a person takes in more calories than are used up, the excess energy gets stored in the body as fat which leads to obesity, atheroma and diabetes.
14. (a) Role of carbohydrates : Carbohydrates provide us energy.
    (b) Role of fats : Fat also provide energy.
    (c) Role of proteins :
    1) Proteins help in digestion.
    2) Proteins help in repairing the damaged cells and building of the muscles.
    3) Proteins help in growth of muscles and whole body.
    4) Proteins also give energy.
15. We know that food is needed for growth of our body. Food gives us energy to work and play. It gives us resistance against diseases. The main components of food are carbohydrates, proteins, fats, vitamins, minerals, fibre and water. Nutrients are the components of food that the body needs in adequate amounts for growth, to reproduce and lead a normal healthy life. All types of nutrients have their own functions to perform, but the different nutrients must act together. So nutritious food provide energy for all the activity of body.
16. Animal fat contain saturated fat, Our diet should contain less of saturated fat because saturated fat easily changes into cholesterol which causes arteriosclerosis (thickening of walls of arteries) high blood pressure and heart disorder. Hence, we should try to remove most of the fat from meat.

17. Paheli should avoid eating biscuits and other such junk food as they contain media that has a minimum quantity of fibre or roughage. Paheli must include whole grains, whole pulses, fresh fruits, and vegetables in her diet as she seems to lack roughage.

18. Functions of protein are :
1) Proteins are the building materials of our body.
2) Proteins are the constituents of enzymes.
3) Proteins make our muscles skin, hair and nails.
4) Protein forms a red pigment in blood which acts as oxygen carrier.
5) Protein like fibrin help in clotting of blood.
6) Protein help in repairing damaged, replacing wornout on dead cells and tissues.
7) Proteins help to develop resistance of the body against various infections.

19.

Vitamins	Sources	Deficiency diseases
1) Vitamin A	Milk, butter, yellow fruits and vegetables, egg yolk, liver oils of fish.	Xerophthalmia, Night blindness.
2) Vitamin B complex	Milk, egg, green, vegetables, cheese, meat, germinating seeds, yeast and unpolished rice.	Beri-beri
3) Vitamin C	Citrus fruits, green and red peppers.	Scurvy
4) Vitamin D	Milk, egg, fish, liver oil, sun light.	Rickets
5) Vitamin E	Vegetable seeds, eggs, sweet potato, oils, meat, sprouted grains.	Sterility
6) Vitamin K	Egg yolk, liver, cheese tomato, cabbage, soyabean, cauliflower.	Improper coagulation of blood.

20. The various types of nutrients are:
i. Carbohydrates: They are mainly energy-providing nutrients.
ii. Fats: They provide energy for the body. They give much more energy than carbohydrates if consumed in the same amount.
iii. Proteins: They are called body-building foods. Proteins help in the formation and repairing of body parts. Skin, hair, muscles, enzymes are made up of proteins.
iv. Vitamins: Vitamins help in protecting our body against disease. They also protect eyes, bones, teeth and gums.
v. Minerals: Minerals are essential for the proper growth of the body and to maintain good health.

21. State True or False:
(i) (b) False
Explanation: False
(ii) (b) False
Explanation: False
(iii) (a) True
Explanation: True

22. Fill in the blanks:
(i) 1. Obesity
(ii) 1. Vitamin A
(iii) 1. Starch

Accuracy Booster Exercise-3

1. (d) deficiency disease
   Explanation: deficiency disease
2. (d) Maize
   Explanation: Carrot, Turnip and Radish roots are modified to store food.
3. (a) Garlic, Potato, Turmeric
   Explanation: We eat stems of garlic, potato, turmeric, onion, sugarcane, ginger and Colocasia. We eat roots of turnip, carrot and radish. We eat flower of broccoli.
4. (c) obtain food from their host.
   Explanation: obtain food from their host.
5. (c) Vitamin D
   Explanation: Vitamin D helps in absorbing calcium in our body from food like milk.
6. (a) Good health
   Explanation: Proper balanced food keeps us in good health as it contains the entire nutrient in appropriate quantity.
7. (d) Stomach is empty
   Explanation: Human beings feel hungry when stomach is empty and enzymes form gastric glands.
8. (a) Copper sulphate and caustic soda is used
   Explanation: A paste of food item was taken in a test-tube and to it was added a few drops of copper sulphate solution followed by caustic soda solution. A violet colour was observed in the test-tube after a few minutes. It had shown the presence of proteins in the food sample.
9. (d) Vitamins
   Explanation: Fruits and vegetables must be washed properly before cutting as washing of cut or peeled fruits and vegetables may lose some vitamins. Maximum vitamins and minerals are present in the skin of the fruits.
10. (d) Sparrow and eagle
    Explanation: In the given food web, sparrow and eagle are the secondary consumers as they are feeding on the primary consumers grasshopper and fish respectively. Bacteria is acting as a decomposer and algae is the producer.
11. (d) Banana and milk
    Explanation: Banana and milk are rich source of phosphorous in our body which are essential for bone density.
12. (d) Carbohydrates and fats
    Explanation: Foods containing fats and carbohydrates are called ‘Energy Giving Foods’. So, a hard working labourer, who does lot of physical work, needs more of fats and carbohydrates.
13. (b) mango
    Explanation: mango
14. (c) Lettuce, broccoli, cucumber and carrot
    Explanation: The four different parts of the plant used in the salad are:
    Leaf - Lettuce
    Flower - Broccoli
    Fruit - Cucumber
    Root - Carrot
15. (a) protein
    Explanation: protein
16. (a) Seasonal salad and vegetable
    Explanation: Seasonal salad and vegetables contains lot of roughage that helps in easy movement of food in digestive tract.
17. (a) Vitamin D
    Explanation: Vitamin D is called as sunshine vitamin because it can be easily absorbed from sun on exposure.
18. (d) Vitamin C
    Explanation: Bleeding gums is the characteristic symptoms of scurvy disease that occurs due to deficiency of vitamin C.

19. (c) Potato, wheat, maize and sugrcane
Explanation: The food rich in carbohydrates are potato, wheat, maize and sugarcane.
20. (a) Vitamins and minerals
Explanation: Vitamins and minerals are protective food that protects us from disease.
21. (c) protective
Explanation: protective
22. (a) Carbohydrate
Explanation: It is a test for starch and starch is a carbohydrate.
23. (b) Eyes and skin healthy
Explanation: Vitamin A keep our eyes and skin healthy and deficiency may leads to night blindness.
24. (c) Their diet is deficient in iodine required for proper growth.
Explanation: Their diet is deficient in iodine required for proper growth.
25. (c) Chapati
Explanation: Carbohydrates change colour on adding certain chemicals due to the presence of starch.
26. (c) Pizza
Explanation: Junk foods are artificial food prepared using fats, refined flour and other ingredients like pizza, sandwich etc.
27. (b) Milk
Explanation: Milk
28. (b) Iron
Explanation: Chemiron provides iron. Chemiron is required daily to balance iron content of body and to produce required hemoglobin. Iron is very essential for the formation of hemoglobin as iron is an integral part of hemoglobin.
29. (d) Vitamin C
Explanation: Protein, Calcium and Vitamin D are present in milk whereas vitamin C is not present in milk.
30. (c) Protein energy malnutrition
Explanation: PEM stands for protein energy malnutrition, a group of nutritional deficiency in infants.
31. (c) 5 years
Explanation: Marasmus is a nutritional deficiency of infants which occurs commonly in infant below 5 years of age.
32. (d) Glucose does not need to be digested
Explanation: We get instant energy from glucose because glucose does not need to be digested as it gets mix with blood and release energy on oxidation.
33. (d) A is false but R is true.
Explanation: Iodine deficiency is the most common cause of goiter. The body needs iodine to produce thyroid hormone. So, (A) is a false statement.
iodine is required for the synthesis of thyroxine by the thyroid gland. A deficiency of iodine in the diet causes hypothyroidism. So, (R) is true statement.
34. (d) A is false but R true.
Explanation: Vitamin D is known as 'Sunshine Vitamin'. So, (A) is a false statement.
Fruits and vegetables contain many vitamins and minerals that are good for your health. So, (R) is a true statement.
35. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: We should eat a balanced diet because it contains all the vital components of food such as carbohydrates, proteins, fats, vitamins, and minerals, also dietary fibers, and water in the right proportion that keeps our body healthy.
So, Both (A) and (R) are true and (R) is not the explanation of (A).
36. (a) Both A and R are true and R is the correct explanation of A.
Explanation: A severe lack of vitamin C in your diet for at least three months can cause scurvy. Reasons for this deficiency include not eating enough fresh fruits and vegetables. Also, cooking destroys some of the vitamin C found in food.
So, Both (A) and (R) are true and (R) is the correct explanation of (A).

37. (a) Both A and R are true and R is the correct explanation of A.
Explanation: A growing child needs more minerals like calcium and phosphorus for the formation of bones.
So, Both (A) and (R) are true and (R) is the correct explanation of (A).

38. (b) ii, i, iv, iii
Explanation: ii, i, iv, iii

39. (b) (ii) and (iv)
Explanation: Deficiency diseases are not caused by germs. These diseases are caused due to lack of nutrients in our diet.
These are non-infectious as they do not spread from person to person. Lack of nutrients can be fulfilled by taking a balanced diet.

40. (d) Vitamin K- Sterility
Explanation: Deficiency of Vitamin D leads to rickets. Thiamine deficiency may cause Beriberi. Niacin deficiency causes
Pellagra but deficiency of vitamin K do not cause sterility. Sterility is due to deficiancy of Vitamin E.

41. (d) A
Explanation: Labourer requires more fat containing food than office worker who does mental work more than the physical work done by labourer.

42. Column A Column B
a. Energy giving food ii. Carbohydrates
b. Body building food iii. Protiens
c. Protective food i. Vitamins and minerals
d. Plant fibre v. Roughage
e. Junk food iv. Pizzas

43.

Column A	Column B
a. Vitamin A	v. Night blindness
b. Vitamin C	iii. Scurvy
c. Vitamin D	ii. Rickets
d. Vitamin B1	i. Beri-Beri
e. Rich in proteins	iv. meat, egg, fish

44.

Column A	Column B
a. Anemia	v. Iron
b. Scurvy	iv. Vitamin C
c. Goitre	i. Iodine
d. Night blindness	iii. Vitamin A
e. Rickets	ii. Vitamin D

45. (a) Vitamin C
Explanation: Vitamin C

46. (a) goiter
Explanation: goiter

47. (d) bones
Explanation: bones

48. 1. Osteomalacia

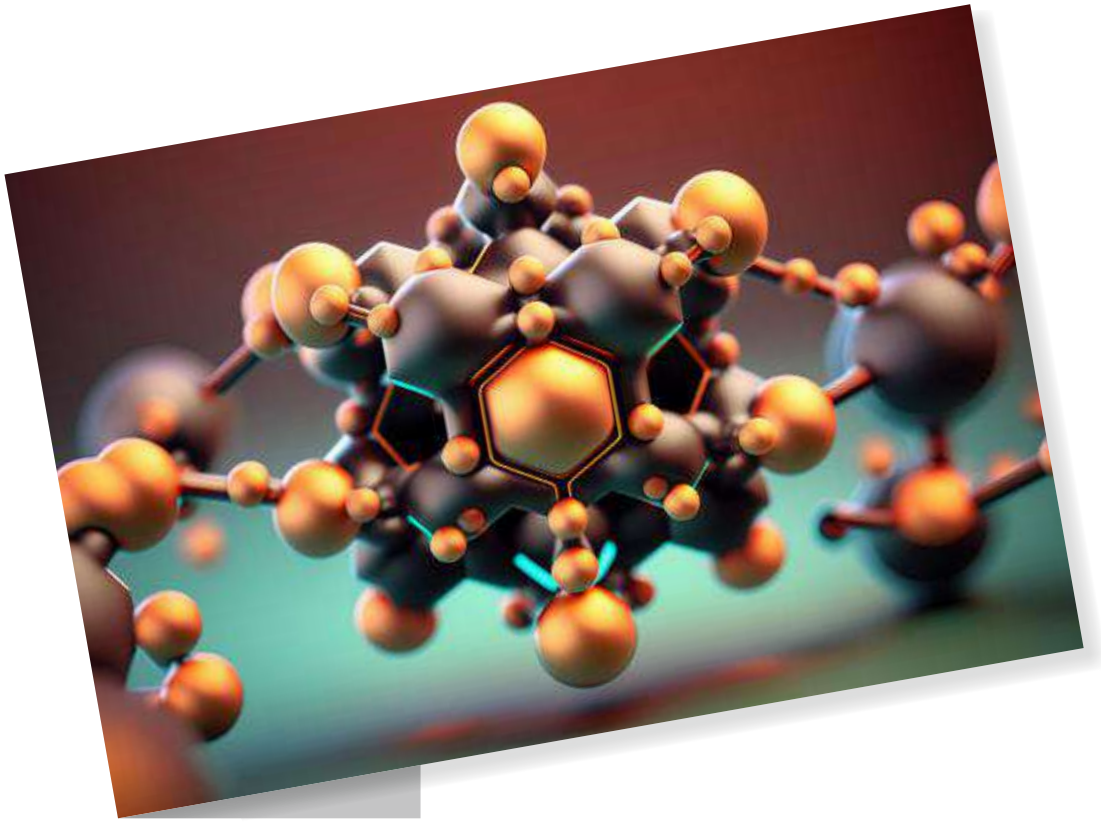
49. (a) True
Explanation: True

PRE-FOUNDATION

CLASS VII

SAMPLE

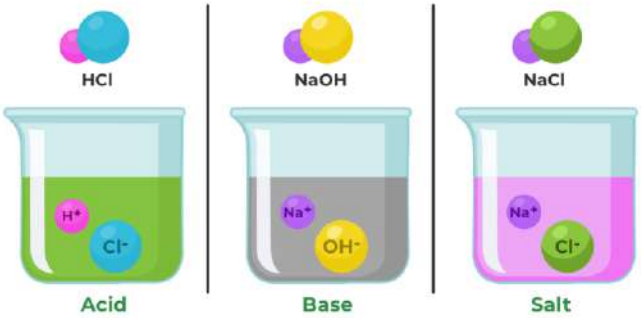
CHEMISTRY



CLASS 7 - CHEMISTRY

CHAPTER-4

Acids, Bases and Salts



Chapter Flow

Acids, Bases and Salts

1. Introduction

Everyday you use various kinds of substances such aswater, food, medicines, fuel and clothes. All these are chemical substances, i.e., made up of atoms of one or more elements.

A number of substances you consume such as lemon, curd, tamarind, fruit juice, common salt, sugar and vinegar have different tastes. You must have noticed that they may taste sour, bitter, sweet or salty. You must be wondering why different substances have different tastes. This is because the chemical nature of these substances is not the same. It differs from substance to substance.

On the basis of chemical nature, chemical substances can be broadly classified as acidic, basic and neutral substances.

vinegar lemon juice

curd

Some acidic substances

milk of magnesia

cleaning solution

soap

Some basic substances

- **Atom**

The smallest particle of an element that takes part in a chemical reaction is an atom.

- **Element**

Element is the basic constituent of all matter.

- **Chemical Compound**

A substance whose each molecule contains two or more atoms of different elements in a fixed ratio is a chemical compound.

2. Acids

The term acid is derived from the Latin word acid us meaning sour. Lemons, oranges and grapes taste sour because they contain citric acid. Tamarind and vinegar contain tartaric acid and acetic acid respectively.

Definition :

"An acid is defined as a substance which gives H^+ ions on dissolution in water."

e.g.

$$\underset{\text{Hydrochloric acid}}{HCl} \xrightarrow{\text{Water}} H^+ + Cl^-$$

$$\underset{\text{acetic acid}}{CH_3COOH} \xrightarrow{\text{Water}} CH_3COO^- + H^+$$

Nitric acid (HNO_3), Phosphoric acid (H_3PO_4), formic acid (HCOOH) etc. have one and sulphuric acid

(H_2SO_4) has two replaceable hydrogen atom, thus they are acids.

Remember
- **Vitamin C which is very important for our body is also an organic acid known as ascorbic acid.**

Examples of some important acids and their sources :

S. No.	Name acid	Substances in which its is found
1.	Acetic acid	Vinegar
2.	Ascorbic acid (Vitamin C)	Amla, citrus fruits
3.	Citric acid	Citrus fruits such as lemon and orange
4.	Formic acid	Ant's sting or Bee's sting
5.	Lactic acid	Sour milk, curd
6.	Hydrochloric acid	Gastric juice (present in the stomach)
7.	Malic acid	Apple
8.	Oxalic acid	Spinach
9.	Tannic acid	Tea
10.	Tartaric acid	Tamarind (imli), grapes, raw mango

Classification of Acids:

(a) On the basis of occurrence:

(i) Mineral acids : Acids which are obtained from the minerals present in earth's crust are called mineral acids.

e.g. HCl, H_2SO_4, HNO_3 etc.

(ii) Organic acids : Acids that are found in animals and plants are known as organic acids.

e.g. Lactic acid , citric acid, tartaric acid, acetic acid and formic acid.

(b) On the basis of strength:

(i) Strong Acids :

Acids, which almost completely ionise (break up into ions) in water, are called strong acids.

e.g. Hydrochloric acid (HCl), sulphuric acid (H_2SO_4), nitric acid (HNO_3) etc.

$HCl + Water \longrightarrow H^+(aq) + Cl^-(aq)$

$H_2SO_4 + Water \longrightarrow 2H^+(aq) + SO_4^{2-}(aq)$

(ii) Weak Acids:

Acids, which partially ionise in water, are called weak acids.

e.g. Carbonic acid (H_2CO_3), phosphoric acid (H_3PO_4), formic acid (HCOOH), acetic acid (CH_3COOH).

$CH_3COOH + Water \longrightarrow CH_3COO^-(aq) + H^+(aq)$ (Partially ionised)

Remember
- The sharp pain caused by the sting of ants and bees is due to formic acid, which they push into the body or spray on the skin.
- Acids like conc. H_2SO_4 and conc. HNO_3 are corrosive in nature. They destroy organic matter like clothes, paper, wood and cause burn to human skin.
- In general mineral acids are strong while organic acids are weak.

(c) On the basis of concentration :

(i) Concentrated acid :

The acid containing very less amount of water is called concentrated acid. HCl is prepared by dissolving HCl gas in water. The solution of this acid is called conc. HCl.

(ii) Dilute acid :

The acid containing excess amount of water is called dilute acid. Strength can be decreased by dissolving the acid in more water. In a laboratory, we generally use either concentrated acid or it's solution diluted to a definite strength.

Dilution of acids :

It is always desirable to add acid to water, keeping the solution continuously stirred, while preparing dilute solutions of acids, specially mineral acids. We should always slowly add acid to water; otherwise, so much heat is produced during the dilution process that the container, specially that of glass, may break. The hot contents may also cause an explosion and spill on our clothes and body. This may result into serious acid burns.

(d) On the basis of basicity :

(i) Mono basic Acids :

When one molecule of an acid on complete ionisation produces one hydronium ion (H_3O^+) in aqueous solution, the acid is said to be a monobasic acid.

Examples of Monobasic Acids.

Some examples ofmonobasic acids are :

(i) Hydrochloric acid (HCl) **(ii)** Hydrobromic acid (HBr)

(iii) Nitric acid (HNO_3) **(iv)** Acetic acid (CH_3COOH)

(v) Formic acid (HCOOH)

(ii) Dibasic Acids :

When onemolecule of an acid on complete ionisation produces two hydroniumions (H3O+) in aqueous solution, the acid is said to be a dibasic acid.

Examples of Dibasic Acids :

Some examples of dibasic acids are :

(i) Sulphuric acid (H_2SO_4) **(ii)** Sulphurous acid (H_2SO_3)

(iii) Carbonic acid (H_2CO_3) **(iv)**Oxalic acid [$(COOH)_2$]

(v) Hydrofluoric acid (HF)

(iii) Tribasic Acids :

When one molecule of an acid on complete ionisation produces three hydronium ions (H_3O^+) in aqueous solution, the acid is said to be a tribasic acid.

An example of tribasic acids is Phosphoric acid (H_3PO_4).

(iv) Tetrabasic Acids :

When one molecule of an acid on complete ionisation produces four hydronium ions (H_3O^+) in aqueous solution, the acid is said to be a tetrabasic acid.

An example of tetrabasic acids is silicic acid (H_4SiO_4)

Remember

The atmosphere of Venus is made up of thick white and yellow clouds of Oil of Vitriol (H_2SO_4).

3. Bases

These chemical substances are bitter in taste and soapy to touch .The chemical nature of such substances is basic.

Definition :

A base is a compound which gives hydroxyl group (OH^-) on dissolution in water are known as bases.

e.g.

Sodium hydroxide NaOH

Calcium hydroxide $Ca(OH)_2$

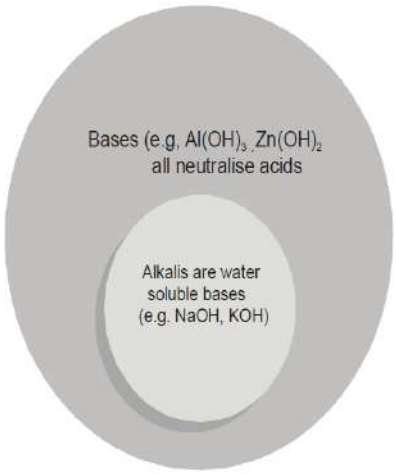
Aluminium hydroxide $Al(OH)_3$

Remember

• Alkalis :

Bases which dissolves in water are called alkalis. e.g. KOH, NaOH.

All alkalis are bases but all bases are not alkalis. e.g. $Al(OH)_3$ is a base, but not an alkali.



Examples of some important bases and their uses :

S.N.	Chemical Name	Commercial Name	Chemical Formula	Uses
1.	Sodium hydroxide	Caustic soda	NaOH	In manufacturing of soap, paper pulp, rayon, refining of petroleum etc.
2.	Potassium hydroxide	Caustic potash	KOH	In alkaline storage batteries, manufacture of soap, absorbing CO_2 gas etc.
3.	Calcium hydroxide	Slaked lime	$Ca(OH)_2$	In manufacture of bleaching powder, softening of hard water etc.
4.	Magnesium hydroxide	Milk of magnesia	$Mg(OH)_2$	As an antacid to remove Acidity from stomach.
5.	Aluminium hydroxide	–	$Al(OH)_3$	As foaming agent in Fire extinguishers.
6.	Ammonium hydroxide	–	NH_4OH	In removing grease stains From clothes and in Cleaning window panes.

Remember

- Sodium carbonate (Na_2CO_3) is commonly called Washing soda.
- Sodium bicarbonate($NaHCO_3$) is commonly called baking soda.
- CaO is used to neutralize acidic nature of soil.
- $Ca(OH)_2$ is used to prepare mortar, bleaching powder and to neutralize acid in water supplies.
- KOH(caustic potash) is used to conduct electricity between two electrodes.

- Both NaOH and KOH are deliquescent in nature which means that they absorb moisture from air.

Classification of Bases :

(i) On the basis of strength :

(1) Strong Bases : Bases which are almost completely dissociated in water are known as strong bases.

e.g. Sodium hydroxide (NaOH), potassium hydroxide (KOH), barium hydroxide $Ba(OH)_2$ etc.

$NaOH(s) + Water \longrightarrow Na^+(aq) + OH^-(aq)$

$KOH(s) + Water \longrightarrow K^+(aq) + OH^-(aq)$

(2) Weak Bases : Bases which dissolve in water only slightly and produce a low concentration of hydroxide ions are called weak bases.

e.g. Ammonium hydroxide (NH_4OH), silver hydroxide (AgOH) etc.

(ii) On the Basis of their Concentration :

By the term concentration, we mean the amount of water present in the given sample of alkali solution in water. On the basis of concentration, the alkalis can be classified as under :

(1) Concentrated alkali :

A solution of alkali having a relatively high percentage of alkali in its aqueous solution is known as concentrated alkali.

(2) Dilute alkali :

A solution of alkali having a relatively low percentage of alkali in its aqueous solution is known as a dilute alkali.

If the concentration of alkali in the solution is less than 1mole per litre, then it is considered to be a dilute alkali.

(iii) On the Basis of their Acidity :

The number of hydroxide (OH^-) ions produced by one molecule of an alkali on complete dissociation in water or the number of hydrogen ions (of an acid) with which a molecule of that alkali reacts to produce salt and water only is known as acidity of an alkali.

For water insoluble hydroxides, acidity of the base is equal to the number of OH^- ions present in one molecule of that base.

On the basis of acidity, the bases can be classified as under :

(1) Monoacidic Bases (or alkalis) :

When one molecule of the base on complete ionisation produces one hydroxide (OH^-) ion in aqueous solution, the base or alkali is said to be monoacidic base.

OR

A monoacidic base (or alkali) may be defined as one whose one molecule reacts with one hydrogen (H^+) ion completely to form salt and water as the only products.

Examples of Monoacidic Bases (or alkalis) :

Sodium hydroxide (NaOH), Potassium hydroxide (KOH), Ammonium hydroxide (NH_4OH). All these substances produce only one hydroxyl ion on complete ionisation in aqueous solution.

$NaOH(aq.) \longrightarrow Na^+(aq) + OH^-(aq)$

$KOH(aq.) \longrightarrow K^+(aq) + OH^-(aq)$

The dissociation of monoacidic bases or alkalis takes place in a single step.

(2) Diacidic Bases (or alkalis) :

When one molecule of a base or alkali on complete ionisation produces two hydroxide (OH^-) ions in aqueous solution, the base or alkali is said to be diacidic.

Examples of Diacidic Bases

$\underset{\text{Calcium hydroxide}}{Ca(OH)_2(aq)} \longrightarrow Ca^{2+}(aq) + 2OH^-(aq)$

$\underset{\text{Magnesium hydroxide}}{Mg(OH)_2(aq)} \longrightarrow Mg^{2+}(aq) + 2OH^-(aq)$

One molecule of both the bases are producing $2OH^-$ ions in aqueous solution, therefore, these are termed as diacidic bases .

(3) Triacidic Bases :

When one molecule of a base or alkali on complete ionisation produces three hydroxide (OH^-) ions in aqueous solution, the base or alkali is said to be triacidic base.

Examples of Triacidic Bases :

$$\underset{\text{Aluminium hydroxide}}{Al(OH)_3(aq)} \longrightarrow Al^{3+}(aq) + 3OH^-(aq)$$

$$Al(OH)_3 + 3HCl(aq) \longrightarrow AlCl_3 + 3H_2O$$

In the above equations, one molecule of Al $(OH)_3$ is producing three OH^- ions and one molecule of Al $(OH)_3$ is reacting with three hydrogen (H^+) ions to form salt and water only, therefore, it is termed as a triacidic base.

4. Indicators

It is not possible to taste each and every substance to identify its chemical nature and also, it may be dangerous to touch each and every substance.

To overcome this problem, special types of substances called indicators are used to get to know the chemical nature of substances.

An indicator is a substance which indicates the nature of particular solution whether acidic, basic or neutral. Hence they indicate the change in nature of the solution from acidic to basic and vice versa. Indicators are basically coloured organic substances.

(a) Different types of indicators :

(i) Litmus : Litmus is a purple dye which is extracted from a plant 'lichen'. It can also be applied on paper in the form of strips and is available as blue and red strips. A blue litmus strip, when dipped in an acid solution acquires red colour. Similarly a red strip when dipped in a base solution becomes blue.

Lichen (a plant)

Red and blue litmus papers

Activity - 1

To test the chemical nature of a few substances.

- Collect lemon juice, limewater, tap water, washing soda solution, milk of magnesia, and sugar solution in separate test tubes.
- With the help of dropper, one by one, put a drop of each solution on separate red and blue litmus papers.
- Record your observations in Table.

S.N.	Solution	Effect on red litmus paper	Effect on blue litmus paper	Chemical nature
1.	Lemon juice	Red	Red	Acidic
2.	Lime water	Blue	Blue	Basic
3.	Tap water	No change	No change	Neutral
4.	Washing soda solution	Blue	Blue	Basic
5.	Milk of magnesia	Blue	Blue	Basic
6.	Sugar solution	No change	No change	Neutral

(ii) Phenolphthalein : It is also an organic dye. In neutral or acidic solution, it remains colourlesswhile in the basic solution, the colour of indicator changes to pink.
(iii) Methyl Orange : Methyl orange is an orange coloured dye and keeps this colour in the neutral or basic medium. In the acidic medium the colour of indicator becomes red.
(iv) Red Cabbage Juice : It is purple in colour in neutral medium and turns red or pink in the acidic medium. In the basic or alkaline medium, its colour changes to green.
(v) Turmeric juice : It is yellow in colour and remains as such in the neutral and acidic medium. In the Basic medium its colour becomes reddish or deep brown.
(vi) China Rose : Extract of china rose (Gudhal) petals is of pink colour. It will change into dark pink (magenta) in acidic solution and green in basic solution.

Activity - 2

To test the nature of different sbstances using temeric as an indicator.

- Make turmeric paste in a bowl
- Nowleave it to dry for 15-20minutes.
- cut thin strips of yellowturmeric paper
- Collect lemon juice, limewater, tap water, washing soda solution, milk of magnesia and sugar solution in separate test tubes
- With the help of dropper, one by one, put a drop of each solution on the thin strip of yellow turmeric paper.
- Record your observation inTable

S.N.	Solution	Effect on Yellow turmeric paper	Chemical nature
1.	Lemon juice	Yellow	Acidic
2.	Lime water	Reddish brown	Basic
3.	Tap water	Yellow	Neutral
4.	Washing soda solution	Reddish brown	Basic
5.	Milk of magnesia	Reddish brown	Basic
6.	Sugar solution	Yellow	Neutral

Colour of indicators in acidic and basic medium

S.N.	Indicator	Colour in acidic medium	Colour in basic medium
1.	Blue litmus	Red	Blue
2.	Red litmus	Red	Blue
3.	Turmeric	Yellow	Raddish-brown
4.	China rose	Dark pink (magenta)	Green
5.	Methyl orange	Red	Orange
6.	Phenolphthalein	Colourless	Pink

Activity - 3

To observer the effect of various indicators on acidic and basic solution

- Collect 5mLeach of dilute sulphuric acid, dilute sodium hydroxide, dilute hydrochloric acid, dilute potassium hydroxide, dilute nitric acid, dilute ammonium hydroxide and dilute calcium hydroxide in separate test tubes.
- One by one test the acidic or basic nature of each of the sample solutions with blue litmus paper, red litmus paper, phenol phthalein, methyl orange, China rose and turmeric indicators.
- Record your observation in Table

S.N.	Sample	Effect on blue litmus paper	Effect on red litmus paper	Effect on Phenol-phthalein	Effect on methyl orange	Effect on China rose	Effect on Turmeric
1.	Dilute sulphuric acid	red	red	colourless	red	dark pink	yellow
2.	Dilute sodium hydroxide	blue	blue	pink	orange	green	reddish brown
3.	Dilute hydrochloric acid	red	red	colourless	red	dark pink	yellow
4.	Dilute potassium hydroxide	blue	blue	pink	orange	green	reddish brown
5.	Dilute nitric acid	red	red	colourless	orange	dark pink	yellow
6.	Dilute ammonium hydroxide	blue	blue	pink	orange	green	reddish brown
7.	Dilute calcium hydroxide	blue	blue	pink	orange	green	brown reddish brown

5. Neutralisation

The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process with the evolution of heat. Evolved heat is known as heat of neutralisation .

Acid + Base $\longrightarrow$ Salt +Water

e.g.

$$\underset{\text{Hydrochloric acid}}{HCl} + \underset{\text{Sodium hydroxide}}{NaOH} \longrightarrow \underset{\text{Sodium chloride}}{NaCl} + \underset{\text{water}}{H_2O} + 57.1kJ$$

Where 57.1kJ energy is the heat of neutralisation for above reaction. This value remains same if both acid and base are strong. If one out of these is weak then amount of energy released will be lesser than 57.1 kJ

Activity - 4

Aim: To observe the neutralization reaction.

Procedure :

- Take a test tube and fill it one-fourth with dilute hydrochloric acid (HCl).
- With the help of a dropper, add 2–3 drops of phenolphthalein indicator (colourless) to it.
- Gently shake the test tube.
- Note down its colour.

You will observe that the solution is colourless.

- Now put a drop of dilute sodium hydroxide with the help of a dropper and shake it gently.
- Continue adding dilute sodium hydroxide and shaking it till the pink colour just appears.
- At this point, the solution is just neutral.
- Add a drop of dilute hydrochloric acid to it
- What do you observe now ?

You will notice that the pink colour disappears.

- Again add a drop of dilute sodium hydroxide.

You will notice that the pink colour reappears.
This happens because phenolphthalein is colourless in an acidic medium and pink in a basic medium.
Inference : Drop by drop addition of dilute sodium hydroxide neutralizes dilute hydrochloric acid.

(a) Neutralisation in everyday life :

(i) Indigestion : People particularly of old age suffer from acidity problems in the stomach which is caused mainly due to release of excessive gastric juices containing HCl. The acidity is neutralised by antacid tablets which contain sodium hydrogen carbonate (baking soda, $NaHCO_3$), magnesium hydroxide (milk of magnesia, $Mg(OH)_2$) etc.

(ii) Ant and bee sting : The stings of bees and ants contain formic acid. Its corrosive and poisonous effect can be neutralised by rubbing soap which contains NaOH(an alkali) or by rubbing baking soda ($NaHCO_3$) or by calamine solution ($ZnCO_3$). The stings of wasps contain an alkali and its poisonous effect can be neutralised by an acid like acetic acid (present in vinegar).


Ant sting


Bee sting

(iii) Soil treatment : Farmers generally neutralize the effect of acidity in the soil caused by acid rain by adding slaked lime (Calcium hydroxide, $Ca(OH)_2$) to the soil.

(iv) Factory wastes : The wastes of many factories contain acids. If they are allowed to flow into the water bodies, the acids will kill fish and other organisms. The factory wastes are, therefore, neutralised by adding basic substances.

DPP-1

1. The acid present in apples is -
(a) oxalic acid (b) tartaric acid (c) malic acid (d) formic acid

2. H^+ ions exist in aqueous solutions as –
(a) H^+ ions (b) OH^- ions (c) H_3O^+ ions (d) All of these

3. Acid used in anti-rust paints is –
(a) sulphuric acid (b) carbonic acid (c) phosphoric acid (d) hydrochloric acid

4. Souring of milk occurs due to –
(a) lactic acid (b) tartaric acid (c) formic acid (d) acetic acid

5. The gas released when an acid reacts with metal carbonate or bicarbonate is –
(a) H_2 (b) CO_2 (c) O_2 (d) None of these

6. Caustic soda and caustic potash are the common name for _____ and ____ respectively.
(a) NaOH, KOH (b) KOH, NaOH (c) NaCl, KCl (d) KCl,NaCl

7. _____ and _____ acid are present in vinegar and lemon
(a) citric acid, acetic acid (b) acetic acid, oxalic acid
(c) tartaric acid, cirtic acid (d) acetic acid, citric acid

8. Aqua regia is a mixture of –

(a) H_2SO_4 and HCl (b) HNO_3 and H_2SO_4

(c) HCl and HNO_3 (d) HCl, HNO_3 and H_2SO_4

DPP-2

1. A solution reacts with crushed egg-shells to give a gas that turns lime-water milky, the solution contains

(a) NaCl (b) HCl (c) LiCl (d) KCl

2. Mixing of acid in water is -

(a) exothermic process (b) endothermic process

(c) neither exothermic nor endothermic (d) depends upon the nature of ac

3. Both H_2CO_3 and H_2SO_4 are

(a) weak acid (b) monoprotic acid (c) diprotic acid (d) triprotic acid

4. Soda-acid fire extinguisher contains –

(a) Na_2SO_4 and HCl (b) NaOH and HCl

(c) $NaHCO_3$ solution and dil.H_2 SO_4 (d) None of these

5. Acids are those substances which :

(a) liberate hydrogen ions in solution (b) liberate hydroxyl ions in solution

(c) accept hydrogen ions in solution (d) accept hydroxyl ions in solution

6. Common name ofH2SO4 is -

(a) oil of vitriol (b) muriatic acid (c) blue vitriol (d) green vitriol

7. Which of the following is not a characteristic of acid ?

(a) Sour in taste

(b) They have replaceable hydrogen.

(c) When they react with base, salt is formed.

(d) They do not react with active metals to give hydrogen

8. Molecular formula of nitric acid is

(a) HNO_3 (b) H_2SO_4 (c) KCl (d) NaOH

DPP-3

1. Which of the following is an example ofmineral acid ?

(a) Formic acid (b) Acetic acid (c) Hydrochloric acid (d) Citric acid

2. Which of the following is the strongest acid ?

(a) H_2SO_4 (b) $HClO_4$ (c) HNO_2 (d) HBr

3. Vinegar is a dilute solution of –

(a) Carbonic acid (b) Acetic acid (c) Lactic acid (d) Sulphuric acid

4. Neutralisation reaction is an example of

(a) Exothermic reaction (b) Endothermic reaction

(c) Oxidation (d) None of these

5. While diluting an acid –

(a) Always water is added to acid (b) Always acid is added to water

(c) Both are mixed simultaneously (d) None of these

6. The acid which is formed when CO_2 gas is dissolved in water is –
(a) Acetic acid (b) Phosphoric acid (c) Carbonic acid (d) Tartaric acid

7. Baking powder contains baking soda and –
(a) tartaric acid (b) calcium bicarbonate
(c) sodium carbonate (d) vinegar

8. Carbon dioxide reacts with metal hydroxide to form-
(a) Carbonates (b) Bicarbonates (c) Carbonic acid (d) None of these

DPP-4

1. Formalin is a dilute solution of
(a) phenolphthalein (b) phosphoric acid (c) formaldehyde (d) none of these

2. People often feel stiffness and pain in their muscles after excerise, due to the formation of –
(a) acetic acid (b) formic acid (c) citric acid (d) lactic acid

3. The anhydride of nitric acid is –
(a) NO (b) N_2O_5 (c) NO_2 (d) N_2O_4

4. The acid which is used in manufacture of explosives like TNT (trinitrotoleune) and TGT (trinitroglycerine)-
(a) HNO_3 (b) H_2SO_4 (c) HCl (d) CH_3COOH

5. Acid present in stings of nettle leaves is –
(a) citric acid (b) formic acid (c) lactic acid (d) mallic acid

6. Aqueous solution of baking soda ($NaHCO_3$) is –
(a) acidic (b) basic (c) neutral (d) amphoteric

7. Which one of the following types of medicines is used for treating indigestion ?
(a) Antibiotic (b) Analgesic (c) Antacid (d) Antiseptic

8. Milk of magnesia is the common name of –
(a) $Al(OH)_3$ (b) NaOH (c) $Mg(OH)_2$ (d) None of these

DPP-5

1. Base have an
(a) soapy touch and bitter taste (b) capability to neutralize acids
(c) tendency to turn red litmus blue (d) all of the above

2. Bases are the substances which on dissolving in water give -
(a) H^+ ions (b) OH^- ions (c) Ca^{2+} ions (d) Na^+ ions

3. Barium hydroxide is a –
(a) monoacidic base (b) triacidic base (c) diacidic base (d) None of these

4. Cu_2O is a/an :
(a) acid (b) salt (c) base (d) none of these

5. Solution of alkali metals in water are -
(a) acidic (b) basic (c) amphoteric (d) neutral

6. A gas is highly soluble in water and the solution so obtained turns red litmus blue. This gas may be-
(a) NH_3 (b) CO_2 (c) SO_2 (d) None of these

7. A weak base is dissolved in water then the solution must be containing

(i) OH^- ions (ii) cation (iii) undissociated base

(a) (i) and (iii) both (b) only(iii) (c) (ii) and (iii) both (d) (i), (ii) and (iii)

8. For the reaction : $Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$, acidity of the base is

(a) 2 (b) 3 (c) 1 (d) Zero

NCERT Basics Exercise-1

1. State differences between acids and bases.

2. Ammonia is found in many household products, such as window cleaners. It turns red litmus blue. What is its nature?

3. Name the source from which litmus solution is obtained. What is the use of this solution?

4. Is the distilled water acidic/basic/neutral? How would you verify it?

5. Describe the process of neutralisation with the help of an example.

6. Mark 'T' if the statement is true and 'F' if it is false:

(i) Nitric acid turn red litmus blue. (T/F)

(ii) Sodium hydroxide turns blue litmus red. (T/F)

(iii) Sodium hydroxide and hydrochloric acid neutralise each other and form salt and water. (T/F)

(iv) Indicator is a substance which shows different colours in acidic and basic solutions. (T/F)

(v) Tooth decay is caused by the presence of a base. (T/F)

7. Dorji has a few bottles of soft drink in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom?

8. Explain why:

(a) An antacid tablet is taken when you suffer from acidity.

(b) Calamine solution is applied on the skin when an ant bites.

(c) Factory waste is neutralised before disposing it into the water bodies.

9. Three liquids are given to you. One is hydrochloric acid, another is sodium hydroxide and third is a sugar solution. How will you identify them? You have only turmeric indicator.

10. Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution? Explain.

11. Consider the following statements:

(a) Both acids and bases change colour of all indicators.

(b) If an indicator gives a colour change with an acid, it does not give a change with a base.

(c) If an indicator changes colour with a base, it does not change colour with an acid.

(d) Change of colour in an acid and a base depends on the type of the indicator.

Which of these statements are correct?

(i) All four (ii) a and d (iii) b, c and d (iv) only d

Concept Mastery Exercise-2

A. Very Short Answer Type Questions

1. What is acid rain?
2. Why do vessels of copper and brass need "kalai"?
3. Name the acid present in lemon juice.
4. Which gas is used in fire extinguishers?
5. What is an oxide?
6. What happens when a non-metal oxide is dissolved in water?
7. Why are mineral acids dangerous?
8. Calamine solution is applied on the skin when an ant bites. Explain why?
9. What are organic acids? Give two examples.
10. Is the distilled water acidic/basic/neutral? How would you verify it?

B. Short Answer Type Questions

11. State differences between acids and bases.
12. You are provided with four test tubes containing sugar solution, baking soda solution, tamarind solution, salt solution. Write down the activity to find the nature (acidic/basic/neutral) of each solution.
13. Describe the process of neutralization with the help of an example.
14. How can you test the presence of acid in a substance?
15. A farmer was unhappy because of his low crop yield. He discussed the problem with an agricultural scientist and realized that the soil of his field was either too acidic or too basic. What remedy would you suggest to the farmer to neutralize the soil?

C. Long Answer Type Questions

16. Write the effect of lemon juice, orange juice, vinegar, milk of magnesia, boking soda, lime water, sugar and common salt on turmeric solution.

17. Explain the action of antacids.

18. Explain the uses of hydrochloric acid and sulphuric acid in daily life.
19. You are given some acids like acetic acid, formic acid, citric acid, lactic acid, oxalic acid, ascorbic acid (vitamin C), tartaric acid and some bases like calcium hydroxide, sodium hydroxide, ammonium hydroxide, potassium hydroxide and magnesium hydroxide. Name the substances in which these acids and bases are found.
20. Dorji has a few bottles of soft drink in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom?

D. True & False

21. (a) Indicator is a substance which shows different colours in acidic and basic solutions.
    (b) Sodium hydroxide and hydrochloric acid neutralize each other and form salt and water.
    (c) Lime water turns red litmus blue.

E. Fill in the Blanks

22. (a) Acid + Base ⟶ _____ + Water
    (b) Neutralisation is the reaction between an acid and a base to form _____ and _____.
    (c) The acidic or basic nature of a substance is tested by using an _____.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

1. Which of the following statements is correct about salts?
   (a) Salt solutions in water are good conductors of electricity.
   (b) Most of the salts have high melting and boiling points.
   (c) All of these
   (d) Most salts are solids.
2. Which of the following is a base?
   (a) CH_3COOH (b) KCl
   (c) CH_3OH (d) KOH
3. A synthetic indicator used to test an acid or base is:
   (a) China rose (b) Litmus
   (c) Methyl orange (d) Turmeric
4. Products of a neutralization reaction are always
   (a) a salt and a base (b) a salt and water
   (c) an acid and a base (d) an acid and a salt
5. When the soil is too basic, plant do not grow well in it. To improve its quality what must be added to the soil?
   (a) Calamine solution (b) Quick lime
   (c) Organic matter (d) Slaked lime
6. Salt formed by strong acid and weak base is:
   (a) Acidic (b) Volatile
   (c) Basic (d) Neutral
7. The colour of blue litmus in distilled water is _____.
   (a) purple (b) red
   (c) yellow (d) blue
8. An indicator which is obtained from the association of fungus and algae:
   (a) Phenolphthalein (b) Turmeric
   (c) China rose (d) Litmus
9. Sodium hydroxide combines with hydrochloric acid to form:
   (a) Sodium chloride (b) Sodium hydrogen chloride
   (c) Water only (d) Sodium hydrogen carbonate
10. Sodium carbonate is a basic salt because it is salt of:
    (a) Strong acid and weak base (b) Strong acid and strong base
    (c) Weak acid and weak base (d) Weak acid and strong base
11. Taj Mahal marble is affected by
    (a) O_3 (b) CO
    (c) SO_2 (d) O_2
12. A mixture of sodium hydrogen carbonate and tartaric acid used for making a cake is called:
    (a) Washing soda (b) Washing powder
    (c) Baking soda (d) Baking powder
13. _____ salt is used in developing films in photography.
    (a) $Ag\ NO_3$ (b) Na Cl
    (c) $Na\ HCO_3$ (d) $Cu\ SO_4$
14. Which of the following acids is used to prepare explosives such as TNT?
    (a) Sulphuric acid (b) Oxalic acid
    (c) Ammonium hydroxide (d) lactic acid
15. Organic matter is added to soil to neutralise the excess of the base in the soil as organic matter.
    (a) Release salt on decomposition (b) Absorbs the acid from the soil
    (c) Absorbs the base from the soil (d) Release acid on decomposition
16. Borax turns litmus paper
    (a) Blue (b) Red
    (c) Purple (d) Pink
17. Vinegar contains _____.
    (a) acetic acid (b) citric acid

(c) lactic acid (d) tartaric acid

18. Curd should be stored in:
(a) Glass vessels (b) Copper vessels
(c) Bronze vessels (d) Steel vessels

19. The colour of litmus in basic solution is _____.
(a) blue b) red
(c) purple d) pink

20. Blue litmus paper is dipped in a solution. It remains blue. The nature of the solution is:
(a) Either basic or neutral b) Either basic or acidic
(c) Neither acidic nor basic d) Neither basic nor neutral

21. Which of the following statements is correct?
(a) Distilled water in which common salt is dissolved turns blue litmus red.
(b) A basic compound will turn all indicators blue.
(c) Calamine solution can be used to treat ant's sting.
(d) All substances are either acidic or basic.

22. Rainwater becomes acidic because of:
(a) Lead oxide (b) Tin oxide
(c) Nitrogen dioxide and sulphur dioxide (d) Potassium hydroxide

23. Ammonium hydroxide and magnesium hydroxide tastes _____ because they are _____ in nature.
(a) Sour, acidic (b) Bitter, acidic
(c) Salty, salty (d) Bitter, basic

24. Eggshell is made up of:
(a) Calcium carbonate (b) Calcium hydroxide
(c) Calcium oxide (d) Calcium chloride

25. Which of the following is a weak acid?
(a) HNO_3 (b) CH_3COOH
(c) HC_1 (d) H_2SO_4

26. Distilled water is neutral, it can be verified by using:
(a) Methyl orange (b) Vanilla
(c) Litmus (d) Universal indictor

27. The oil of virtriol is called-
(a) Acetic acid (b) Sulphuric acid
(c) Nitric acid (d) Hydrochloric acid

28. The water solution having pH = 0, is
(a) Common (b) Acidic
(c) Alkaline (d) Neutral

29. Raman took a turmeric paper and tried to draw flowers on it with the help of cotton dipped in solutions P and Q.
The flower drawn with solution P was not visible while one drawn with solution Q turned red.
Solution P and Q could be respectively.
(a) Both Vinegar and soap solution and Common salt solution and baking soda
(b) Vinegar and soap solution
(c) Lime water and lemon juice
(d) Common salt solution and baking soda

30. The field of a farmer has become acidic due to the accumulation of water. He should use _____ to remove acidity from the soil.
(a) Any one of these (b) Manure and fertiliser
(c) Lime or chalk (d) Cow dung and household wastes

31. All acids produce _____ ions in the presence of water.
(a) OH^- (b) Na^+
(c) Cl^- (d) H^+

32. Oxalic acid is present in _____.
(a) Spinach (b) Orange
(c) Apple (d) Tomato

33. When an ant bites, it eject _____ into the skin.
(a) Lactic acid (b) Citric acid

(c) Formic acid (d) Methonoic acid

34. Which of the following statement is true about the acid?
(a) Sour in taste and turns red litmus blue
(b) Sour in taste and turns blue litmus red
(c) Bitter in taste and turns blue litmus red
(d) Bitter in taste and turns red litmus blue

35. Select the correct pair.
A. Sodium hydroxide – Alkaline|
B. Sodium chloride- Base
C. Magnesium sulphate- Acid
D. Sulphuric acid – salt
(a) (A) (b) (C)
(c) (B) (d) (D)

36. The correct way of making a solution of acid in water is to
(a) add water to acid in a shallow container (b) add acid to water
(c) add water to acid (d) mix acid and water simultaneously

B. Assertion & Reason Questions

37. **Assertion (A):** Formic acid formed by ant is harmful to humans.
Reason (R): It can burn skin and eyes.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

38. **Assertion (A):** Tooth decay is caused by the presence of base in mouth.
Reason (R): Consuming a lot of sugar can cause tooth cavity.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

39. **Assertion (A):** Factories waste are hazardous to environment.
Reason (R): It contain acids.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

40. **Assertion (A):** Damage to Taj Mahal is caused by acid rain.
Reason (R): Acid rain consist of harmful components like sulphur dioxide, nitric oxides.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

C. Statement Type Questions

41. Which of the following is a correct statement?
A. Acids turn blue litmus red
B. The base turns blue litmus red
C. Salts are always neutral
D. Indicators always give colour change with acid
(a) (C) (b) (D)
(c) (B) (d) (A)

D. Match the Column

42. Match the following:

Column A	Column B
(i) Oxalic acid	(a) Curd
(ii) Acetic acid	(b) Tamarind
(iii) Tartaric acid	(c) Spinach
(iv) Lactic acid	(d) Vinegar

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

43. Match the substances on the left side with the appropriate properties on the right side.

Vinegar	changes red litmus blue
Sodium	Chloride is sour to taste
Milk of magnesia	major salt of sea
Potassium nitrate	used in fertilizer industry

44. Match the following:

Column A	Column B
(i) Vinegar	(i) Major salt of sea
(ii) Fertilizer	(ii) Basic
(iii) Sodium chloride	(iii) Magnesium hydroxide
(iv) Lime water	(iv) Acetic acid
(v) Milk of magnesia	(v) Potassium nitrate

E. Case Study or Paragraph

Question No. 45 to 49 are based on the given text. Read the text carefully and answer the questions:
The acids are sour in taste while bases are bitter in taste. Tasting a substance is not a good way of finding out if it is an acid or a base. Acids and bases can be better distinguished with the help of indicators. Indicators are substances that undergo a change of colour with a change of acidic, neutral or basic medium. Many of these indicators are derived from natural substances such as extracts from flower petals and barrier. Some indicators are prepared artificially. For example, methyl orange and phenolphthalein.

45. When a few drops of phenolphthalein is added to a solution having pH 8.5, then the colour
(a) does not change
(b) changes to red
(c) changes to pink
(d) changes to blue

46. The colour observed when methyl orange is added to an acid is
(a) blue
(b) orange
(c) pinkish red
(d) yellow

47. Which of the following statement(s) is incorrect about the litmus paper?
(a) In acidic solution, blue litmus paper turns red.
(b) It is a most commonly used indicator.
(c) Litmus solution is a yellow dye, which is extracted from the lichen plant.
(d) In neutral solution, no colour change is observed.

48. Which solution will change blue litmus to red?
(a) NH_4OH (aq)
(b) NaOH(aq)
(c) KCl(aq)
(d) H_2SO_4 (aq)

49. Which of the following compound consist of hydroxide ions-
(a) HNO_3
(b) H_2SO_4
(c) NaOH
(d) HCl

Answer Key

DPP-1

1.	(c)	**2.**	(c)	**3.**	(c)	**4.**	(a)	**5.**	(b)	**6.**	(a)	**7.**	(d)
8.	(c)												

DPP-2

1.	(b)	**2.**	(a)	**3.**	(c)	**4.**	(c)	**5.**	(a)	**6.**	(a)	**7.**	(d)
8.	(a)												

DPP-3

1.	(c)	**2.**	(b)	**3.**	(b)	**4.**	(a)	**5.**	(b)	**6.**	(c)	**7.**	(a)
8.	(a)												

DPP-4

1.	(c)	**2.**	(d)	**3.**	(b)	**4.**	(a)	**5.**	(b)	**6.**	(b)	**7.**	(c)
8.	(c)												

DPP-5

1.	(d)	**2.**	(b)	**3.**	(c)	**4.**	(c)	**5.**	(b)	**6.**	(a)	**7.**	(d)
8.	(b)												

Concept Mastery Exercise-2

1. The rain containing excess of acid is called acid rain. The rain becomes acidic because carbon dioxide, Sulphur dioxide and nitrogen dioxide which are released into air as pollutants dissolve in rain drops to form acids. Acid rain can cause damage to buildings, historical monuments, plants and animals.

2. Acids react with brass and copper and corrode them. Hence "Kalai" is needed to prevent them from corrosion.

3. Citric acid is present in lemon juice..

4. Carbon dioxide gas is used in fire extinguishers.

5. An oxide is the compound of an element with oxygen. Oxides are binary compounds formed by the reaction of oxygen with other elements. Oxygen is highly reactive in nature. They react with metals and non-metal to form oxides.
e.g. (a) Water is an oxide of hydrogen.
(b) CO_2 is the oxide of carbon.
(c) Rust is the oxide of iron.

6. Most of the non-metal oxides when dissolved in water give acidic solution. These solutions turn blue litmus red. e.g. Sulphur dioxide when dissolved in water forms sulphurous acid.

$$SO_2 + H_2O \rightarrow \underset{\text{Sulphurous acid}}{H_2SO_3}$$

But some metal oxides are neutral. e.g. Nitrous oxide (N_2O). Carbon monoxide (CO) etc. These oxides do not have any effect on litmus paper.

7. HCl, H_2SO_4 and HNO_3 are mineral acids. These acids are very strong and corrosive. They corrode skin, clothes, metals, etc.
Hence, they are dangerous and should be handled very carefully. They are used in the laboratory and industries only.

8. When an ant bites, it injects an acidic liquid into the skin. Liquid formic acid causes inflammation to the skin. The effect of the sting can be neutralised by rubbing calamine solution. It contains zinc carbonate, which is a very weak base and causes no harm to the skin.

9. Acids obtained from living beings (plants and animals) are called organic acid. Organic acids contain the COOH group. These acids are present in animal and plant materials. e.g. Ethanoic acid (CH_3COOH), methanoic acid (HCOOH), citric acid $C_6H_8O_7$.

10. Distilled water is neutral. We can verify it by showing that neither blue nor red litmus paper changes its colour when dipped in distilled water.

11.

Acids	**Bases**
Acids are sour to taste.	Bases are bitter to taste.
Acids turn blue litmus to red.	Bases turn red litmus to blue.
Acid is defined as a substance which contains hydrogen ion.	A base is defined as a substance which contains hydroxyl ion.
An acid is an substance which donates a proton.	A base is any substance which accepts a proton.
An acid is any chemical compound which when dissolved in water gives a solution with a hydrogen ion activity greater than in pure water.	A base is an aqueous substance that can accept hydrogen ions.

12. Add blue litmus solution and then red litmus solution and note down the change in colour.
i. Sugar solution - No change in colour of blue or red litmus solution.
ii. Baking soda solution - Turns red litmus blue.
iii. Tamarind solution - Turns blue litmus red.
iv. Salt solution - No change in colour of blue or red litmus solution.
Hence, Sugar solution, salt solution - neutral, Baking soda solution - basic, Tamarind solution - acidic.

13. When a solution of acid is mixed with the solution of base, both of them neutralize each other and a third substance called salt is formed. Such phenomenon is called neutralization or neutralization reaction. The solution formed because of mixing of solution of acid and base is neither acidic nor basic in nature. Such solution is known as neutral solution.
Acid + Base → Salt + Water
For example,
$HCl + NaOH \rightarrow NaCl + H_2O$
Antacids like milk of magnesia (magnesium hydroxide), baking soda (sodium bicarbonate) etc. which contain a base are used for reducing the acidity in stomach. It neutralizes the excess acid present in the stomach.

14. Place a drop of the given liquid (or a crystal of the solid) on a moist blue litmus paper. If the colour changes to red, acid is present.
Another method: Acids react with many metals to produce hydrogen and a salt of metal.
e.g. $2Na + 2HCl \rightarrow 2NaCl + H_2$

15. If the soil is too acidic it should be treated with bases such as quick lime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is too basic, organic matter is added to it. Organic matter releases acids which neutralize the basic nature of the soil.

16.

S.No.	Test solution	Effect on turmeric solution	Remarks
1.	Lemon juice	Blue	Acidic
2.	Orange juice	Blue	Acidic
3.	Vinegar	Blue	Acidic
4.	Milk of magnesia	Red	Basic
5.	Baking soda	Red	Basic
6.	Lime water	Red	Basic
7.	Sugar	No change	Neutral
8.	Common salt	No change	Neutral

17. Some antacids, which we use in everyday life for getting relief from acidity and indigestion, contain sodium hydrogen carbonate. When taken orally, they react with the hydrochloric acid present in the stomach and reduce its strength by consuming some of it.
This gives relief from acidity, indigestion and sometimes, even headache.
e.g. Milk of Magnesia is an antacid.

18. Uses of hydrochloric acid
(1) We know that we use dilute hydrochloric acid in our homes for cleaning tiles, toilet seats, wash basins and kitchen sinks.
(2) Hydrochloric acid is used in the process of oil production.
(3) Hydrochloric acid is used in the production of chlorides, dyes, fertilizers and in various industries such as photography, textiles and rubber.
Uses of sulphuric acid
(1) The sulphuric acid (also known as battery acid), used in car batteries, has a definite strength. When the strength of this acid decreases due to constant use, we say that the battery has run down. The battery needs charging. It means that the strength of sulphuric acid present in the battery needs to be increased upto the desired strength. This is achieved by charging the battery.
(2) The sulphuric acid is used in making Detergents.
(3) The sulphuric acid is used in making Fertiliser, Paints and dyes.

19.

Name of acid	Found in
Acetic acid →	Vinegar
Formic acid →	Ant's sting
Citric acid →	Citrus fruits such as oranges, lemons, etc.
Lactic acid →	Curd
Oxalic acid →	Spinach
Ascorbic acid (Vitamin C) →	Amla, Citrus fruits
Tartaric acid →	Tamarind, grapes, unripe mangoes, etc.
All the acids mentioned above occur in nature	
Name of base →	**Found in**
Calcium hydroxide →	Lime water
Sodium hydroxide →	Soap
Ammonium hydroxide →	Window cleaner
Potassium hydroxide →	Liquid Soap
Magnesium hydroxide →	Milk of magnesia

20. Since the drinks are edible, Dorji can take decisions by testing the drinks. Acidic drinks will be sour in taste whereas basic drinks will be bitter in taste and neutral drinks will have no taste.
Dorji can decide which drink is acidic by taking the litmus test:
i. If the drink turns blue litmus paper to red, then it is acidic in nature and hence it will be served to the first customer who wants an acidic drink.
ii. If the drink turns red litmus paper to blue, then the drink is basic and hence it will be served to another customer who wants a basic drink.
iii. If the drink does not show the change in the colour, then it will be a neutral drink and hence it will be served to the third customer who wants a neutral drink.

21. (i) (a) True Explanation: True
(ii) (a) True Explanation: True
(iii) (a) True Explanation: True

22. (i) 1. Salt
(ii) 1. Salt, Water
(iii) 1. Indicator

Accuracy Booster Exercise-3

1.	(c)	**2.**	(d)	**3.**	(c)	**4.**	(b)	**5.**	(c)	**6.**	(a)	**7.**	(d)
8.	(d)	**9.**	(a)	**10.**	(d)	**11.**	(c)	**12.**	(d)	**13.**	(a)	**14.**	(a)
15.	(d)	**16.**	(a)	**17.**	(a)	**18.**	(a)	**19.**	(a)	**20.**	(a)	**21.**	(c)
22.	(c)	**23.**	(d)	**24.**	(a)	**25.**	(b)	**26.**	(d)	**27.**	(b)	**28.**	(b)
29.	(a)	**30.**	(c)	**31.**	(d)	**32.**	(a)	**33.**	(c)	**34.**	(b)	**35.**	(a)
36.	(b)	**37.**	(a)	**38.**	(d)	**39.**	(b)	**40.**	(b)	**41.**	(d)	**42.**	(a)

43.

Vinegar	is sour to taste
Sodium Chloride	major salt of sea
Milk of magnesia	changes red litmus blue
Potassium nitrate	used in fertilizer industry

44.

Column A	**Column B**
(i) Vinegar	(iv) Acetic acid
(ii) Fertilizer	(v) Potassium nitrate
(iii) Sodium chloride	(i) Major salt of sea
(iv) Lime water	(ii) Basic
(v) Milk of magnesia	(iii) Magnesium hydroxide

45.	(c)	**46.**	(c)	**47.**	(c)	**48.**	(d)	**49.**	(c)

Quick Exam Revision

- **Atom :** The smallest particle of an element that takes part in a chemical reaction is an atom.
- **Element :**Element is the basic constituent of all matter.
- **Chemical Compound :** A substance whose each molecule contains two or more atoms of different elements in a fixed ratio is a chemical compound.
- **Acid :** The substance which contains hydrogen and produces H^+ ions in aquesous solution is called Acid. Acids are sour in taste.
- **Base:** The substance which produces OH^- ions in aqueous solution is called the chemical substances which are bitter in taste and soapy base touch.
- **Alkalis :** Bases which dissolves in water are called alkalis.
- **Neutralisation :** The reaction between an acid and a base is known as neutralisation.
- **Antacid :** It is a medicine that neutralize acid formed in the stomach.
- Litmus, turmeric and china rose petal are naturally occurring indicators, while methyl orange and phenolphthalein are prepared in laboratories.
- On the basis of chemical nature, all chemical substances are broadly classified as acidic, basic and neutral substances.
- **Acid Rain :** When pollutent like sulphur dioxide and nitrogen oxides dissolve in rainwater, it forms an acid. The rain of that acid is called acid rain.

CLASS 7 – CHEMISTRY

Chapter-4 Acids, Bases and Salts

Solutions

Concept Mastery Exercise-2

1. The rain containing excess of acid is called acid rain. The rain becomes acidic because carbon dioxide, Sulphur dioxide and nitrogen dioxide which are released into air as pollutants dissolve in rain drops to form acids. Acid rain can cause damage to buildings, historical monuments, plants and animals.
2. Acids react with brass and copper and corrode them. Hence "Kalai" is needed to prevent them from corrosion.
3. Citric acid is present in lemon juice..
4. Carbon dioxide gas is used in fire extinguishers.
5. An oxide is the compound of an element with oxygen. Oxides are binary compounds formed by the reaction of oxygen with other elements. Oxygen is highly reactive in nature. They react with metals and non-metal to form oxides.
   e.g. (a) Water is an oxide of hydrogen.
   (b) CO_2 is the oxide of carbon.
   (c) Rust is the oxide of iron.
6. Most of the non-metal oxides when dissolved in water give acidic solution. These solutions turn blue litmus red. e.g. Sulphur dioxide when dissolved in water forms sulphurous acid.
   $SO_2 + H_2O \rightarrow \underset{\text{Sulphurous acid}}{H_2SO_3}$
   But some metal oxides are neutral. e.g. Nitrous oxide (N_2O). Carbon monoxide (CO) etc. These oxides do not have any effect on litmus paper.
7. HCl, H_2SO_4 and HNO_3 are mineral acids. These acids are very strong and corrosive. They corrode skin, clothes, metals, etc.
   Hence, they are dangerous and should be handled very carefully. They are used in the laboratory and industries only.
8. When an ant bites, it injects an acidic liquid into the skin. Liquid formic acid causes inflammation to the skin. The effect of the sting can be neutralised by rubbing calamine solution. It contains zinc carbonate, which is a very weak base and causes no harm to the skin.
9. Acids obtained from living beings (plants and animals) are called organic acid. Organic acids contain the COOH group. These acids are present in animal and plant materials. e.g. Ethanoic acid (CH_3COOH), methanoic acid (HCOOH), citric acid $C_6H_8O_7$.
10. Distilled water is neutral. We can verify it by showing that neither blue nor red litmus paper changes its colour when dipped in distilled water.

11.

Acids	Bases
Acids are sour to taste.	Bases are bitter to taste.
Acids turn blue litmus to red.	Bases turn red litmus to blue.
Acid is defined as a substance which contains hydrogen ion.	A base is defined as a substance which contains hydroxyl ion.
An acid is an substance which donates a proton.	A base is any substance which accepts a proton.
An acid is any chemical compound which when dissolved in water gives a solution with a hydrogen ion activity greater than in pure water.	A base is an aqueous substance that can accept hydrogen ions.

12. Add blue litmus solution and then red litmus solution and note down the change in colour.
i. Sugar solution - No change in colour of blue or red litmus solution.
ii. Baking soda solution - Turns red litmus blue.
iii. Tamarind solution - Turns blue litmus red.
iv. Salt solution - No change in colour of blue or red litmus solution.
Hence, Sugar solution, salt solution - neutral, Baking soda solution - basic, Tamarind solution - acidic.

13. When a solution of acid is mixed with the solution of base, both of them neutralize each other and a third substance called salt is formed. Such phenomenon is called neutralization or neutralization reaction. The solution formed because of mixing of solution of acid and base is neither acidic nor basic in nature. Such solution is known as neutral solution.
Acid + Base → Salt + Water
For example,
$HCl + NaOH \rightarrow NaCl + H_2O$
Antacids like milk of magnesia (magnesium hydroxide), baking soda (sodium bicarbonate) etc. which contain a base are used for reducing the acidity in stomach. It neutralizes the excess acid present in the stomach.

14. Place a drop of the given liquid (or a crystal of the solid) on a moist blue litmus paper. If the colour changes to red, acid is present.
Another method: Acids react with many metals to produce hydrogen and a salt of metal.
e.g. $2Na + 2HCl \rightarrow 2NaCl + H_2$

15. If the soil is too acidic it should be treated with bases such as quick lime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is too basic, organic matter is added to it. Organic matter releases acids which neutralize the basic nature of the soil.

16.

S.No.	Test solution	Effect on turmeric solution	Remarks
1.	Lemon juice	Blue	Acidic
2.	Orange juice	Blue	Acidic
3.	Vinegar	Blue	Acidic
4.	Milk of magnesia	Red	Basic
5.	Baking soda	Red	Basic
6.	Lime water	Red	Basic
7.	Sugar	No change	Neutral
8.	Common salt	No change	Neutral

17. Some antacids, which we use in everyday life for getting relief from acidity and indigestion, contain sodium hydrogen carbonate. When taken orally, they react with the hydrochloric acid present in the stomach and reduce its strength by consuming some of it.
This gives relief from acidity, indigestion and sometimes, even headache.
e.g. Milk of Magnesia is an antacid.

18. Uses of hydrochloric acid
(1) We know that we use dilute hydrochloric acid in our homes for cleaning tiles, toilet seats, wash basins and kitchen sinks.
(2) Hydrochloric acid is used in the process of oil production.
(3) Hydrochloric acid is used in the production of chlorides, dyes, fertilizers and in various industries such as photography, textiles and rubber.
Uses of sulphuric acid
(1) The sulphuric acid (also known as battery acid), used in car batteries, has a definite strength. When the strength of this acid decreases due to constant use, we say that the battery has run down. The battery needs charging. It means that the strength of sulphuric acid present in the battery needs to be increased upto the desired strength. This is achieved by charging the battery.
(2) The sulphuric acid is used in making Detergents.
(3) The sulphuric acid is used in making Fertiliser, Paints and dyes.

19.

Name of acid	Found in
Acetic acid →	Vinegar
Formic acid →	Ant's sting
Citric acid →	Citrus fruits such as oranges, lemons, etc.
Lactic acid →	Curd
Oxalic acid →	Spinach
Ascorbic acid (Vitamin C) →	Amla, Citrus fruits
Tartaric acid →	Tamarind, grapes, unripe mangoes, etc.
All the acids mentioned above occur in nature	
Name of base →	**Found in**
Calcium hydroxide →	Lime water
Sodium hydroxide →	Soap
Ammonium hydroxide →	Window cleaner
Potassium hydroxide →	Liquid Soap
Magnesium hydroxide →	Milk of magnesia

20. Since the drinks are edible, Dorji can take decisions by testing the drinks. Acidic drinks will be sour in taste whereas basic drinks will be bitter in taste and neutral drinks will have no taste.
Dorji can decide which drink is acidic by taking the litmus test:
i. If the drink turns blue litmus paper to red, then it is acidic in nature and hence it will be served to the first customer who wants an acidic drink.
ii. If the drink turns red litmus paper to blue, then the drink is basic and hence it will be served to another customer who wants a basic drink.
iii. If the drink does not show the change in the colour, then it will be a neutral drink and hence it will be served to the third customer who wants a neutral drink.

21. State True or False:
(i) (a) True Explanation: True
(ii) (a) True Explanation: True
(iii) (a) True Explanation: True

22. Fill in the blanks:
(i) 1. Salt
(ii) 1. Salt, Water
(iii) 1. Indicator

Accuracy Booster Exercise-3

1. (c) All of these
Explanation: All of these

2. (d) KOH
Explanation: Potassium hydroxide (KOH) is a base as it produces OH^- ions in the presence of water.

3. (c) Methyl orange
Explanation: Methyl orange

4. (b) a salt and water
Explanation: Salt and water are produced as a result of neutralisation reaction, e.g.
$NaOH + HCl \rightarrow NaCl + H_2O$

5. (c) Organic matter
Explanation: Organic matter

6. (a) Acidic
Explanation: Acidic

7. (d) blue
Explanation: blue

8. (d) Litmus
Explanation: Litmus

9. (a) Sodium chloride
Explanation: Sodium chloride

10. (d) Weak acid and strong base
Explanation: Sodium carbonate is a basic salt because it is salt formed by the reaction between a weak acid and a strong base.

11. (c) SO_2
Explanation: SO_2

12. (d) Baking powder
Explanation: The mixture of sodium hydrogen carbonate (baking soda) and tartaric acid used for making a cake is called baking powder. When baking powder mixes with water then sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas which gets trapped in the wet dough and bubbles out slowly making the cake rise and hence soft and spongy.

13. (a) Ag NO_3
Explanation: Ag NO_3

14. (a) Sulphuric acid
Explanation: Sulphuric acid

15. (d) Release acid on decomposition
Explanation: Excess of the base in the soil can be neutralised by adding organic matter in the soil as organic matter releases acid on decomposition in the soil to neutralise the soil. Organic matters also supply nutrients to soil thereby increasing soil fertility. It also helps in holding water in sandy soils and prevents water lodging in clayey soils.

16. (a) Blue
Explanation: Blue

17. (a) acetic acid
Explanation: acetic acid

18. (a) Glass vessels
Explanation: Curd should be stored in glass vessels because acids present in curd react with the metal containers to form salts which may be toxic for human beings.

19. (a) blue
Explanation: blue

20. (a) Either basic or neutral
Explanation: When blue litmus paper is dipped in a solution, it remains blue. This shows that solution is either basic or neutral. Since the paper did not change the colour to red it is not acidic.

21. (c) Calamine solution can be used to treat ant's sting.
Explanation: Calamine solution can be used to treat ant's sting.

22. (c) Nitrogen dioxide and sulphur dioxide
Explanation: Due to an increase in air pollution, some oxides of nitrogen and sulphur are released in the air. When these oxides react with rainwater it forms nitric acid and sulphuric acid. These acids fall with the rainwater in the form of acid rain.

23. (d) Bitter, basic
Explanation: Bitter, basic

24. (a) Calcium carbonate
Explanation: Eggshells are made up of calcium carbonate It is a semipermeable membrane which means air and moisture can pass through its pores. The shell also has a thin outermost coating called the bloom or cuticle that helps to keep out bacteria and dust.

25. (b) CH_3COOH
Explanation: CH_3COOH

26. (d) Universal indictor
Explanation: Distilled water is neither acidic nor basic; it can be verified by using a universal indicator that gives green colour to the neutral substance. On the pH scale, the distilled water has a pH value of 7. A substance that has a pH value of 7 is neutral.

27. (b) Sulphuric acid
Explanation: Sulfuric acid was called 'oil of vitriol' by medieval European alchemists because it was prepared by roasting 'green vitriol' (iron (II) sulfate) in an iron retort

28. (b) Acidic
Explanation: Pure water is neutral. When an acid is dissolved in water, the pH will be less than 7 (25 °C). When a base, or alkali, is dissolved in water, the pH will be greater than 7. A solution of a strong acid, such as hydrochloric acid, at concentration of 1 mol dm-3 has a pH of 0.

29. (a) Both Vinegar and soap solution and Common salt solution and baking soda
Explanation: Both Vinegar and soap solution and Common salt solution and baking soda

30. (c) Lime or chalk
Explanation: Farmers use lime or chalk to neutralise the soil as chalk and lime contain base that neutralise the acids present in soil due to the accumulation of water. Another way is by adding limestone consists of calcium carbonate which acts as a neutraliser on the soil.

31. (d) H^+
Explanation: All acids produce hydrogen ions (H^+) in the presence of water and all bases produce (OH^-) ions.

32. (a) Spinach
Explanation: Oxalic acid is present in Spinach along with vitamin A. Oxalic acid is colourless crystalline solid that forms a colourless solution in water.

33. (c) Formic acid
Explanation: When an ant bites, it ejects formic acid in skin which causes burning sensation and irritation. Formic acid is a colourless liquid having high pungent, penetrating odour at room temperature. In miscible with water and most polar organic solvents and somewhat soluble in hydrocarbons.

34. (b) Sour in taste and turns blue litmus red
Explanation: Acids are sour in taste and turn blue litmus red. Acids react with the metal to give metal salt and hydrogen gas is evolved.

35. (a) (A)
Explanation: Sodium hydroxide is a water-soluble base called alkalis. Sodium chloride is a salt. Magnesium sulphate is salt and sulphuric acid is acid. Sodium hydroxide also is known as caustic soda is an inorganic compound with a formula NaOH. Sodium hydroxide is a highly caustic base and alkali that decomposes protein at ordinary ambient temperature and may cause severe chemical burns.

36. (b) add acid to water
Explanation: The correct way of making a solution of acid in water is to add acid to water. It is an exothermic reaction and a large amount of heat is produced if water is added to acid.

37. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Formic acid is found in ant's sting. They can spray the acid on their prey or in order to prevent their nest.

38. (d) A is false but R is true.
Explanation: When bacteria in your mouth make acid, that acids attack the enamel and leads to cavities in teeth .

39. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: Factory waste contain acids, if they are allowed to flow in water bodies then the acids can kill fishes and other organisms. Therefore, these wastes are neutralise by adding bases.

40. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: The nitric acid and sulphuric acid react with calcium carbonate present in white marble of Taj Mahal and turns the white marble into yellow.

41. (d) (A)
Explanation: Acids turn blue litmus red in the presence of water. Salts may be neutral, acidic or basic in nature. Litmus is a water-soluble mixture of different dyes extracted from lichens. It is used t find a solution that is acidic, basic, or neutral. If a blue litmus paper turns into red then the solution is red, If a red litmus paper turns blue then it is base and if no change in colour happens then the solution is neutral.

42. (a) (i - c), (ii - d), (iii - b), (iv - a)
Explanation: (i - c), (ii - d), (iii - b), (iv - a)

43.

Vinegar	is sour to taste
Sodium Chloride	major salt of sea
Milk of magnesia	changes red litmus blue
Potassium nitrate	used in fertilizer industry

44.

Column A	**Column B**
(i) Vinegar	(iv) Acetic acid
(ii) Fertilizer	(v) Potassium nitrate
(iii) Sodium chloride	(i) Major salt of sea
(iv) Lime water	(ii) Basic
(v) Milk of magnesia	(iii) Magnesium hydroxide

45. (c) changes to pink
Explanation: changes to pink

46. (c) pinkish red
Explanation: pinkish red

47. (c) Litmus solution is a yellow dye, which is extracted from the lichen plant.
Explanation: Litmus solution is a yellow dye, which is extracted from the lichen plant.

48. (d) H_2SO_4 (aq)
Explanation: H_2SO_4 (aq)

49. (c) NaOH
Explanation: NaOH

PRE-FOUNDATION

CLASS VII

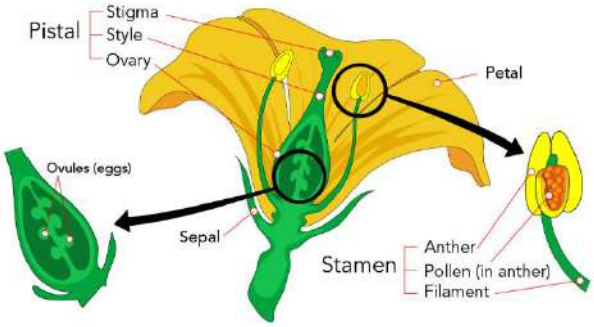
SAMPLE

BIOLOGY

CLASS 7 - BIOLOGY

CHAPTER-8

Reproduction in Plants



Chapter Flow

1. Introduction
2. Modes of Reproduction
3. Asexual Reproduction
   1. Vegetative Propagation
   2. Budding
   3. Fragmentation
   4. Spore Formation
4. Sexual Reprodcution
   1. Pollination
   2. Fertilisation
   3. Fruits and Seed Formation
   4. Seed Dispersal

DPP-1
DPP-2
DPP-3
Exercise-1 NCERT Basics
Exercise-2 Concept Mastery
Exercise-3 Accuracy Booster

Reproduction in Plants

1. Introduction

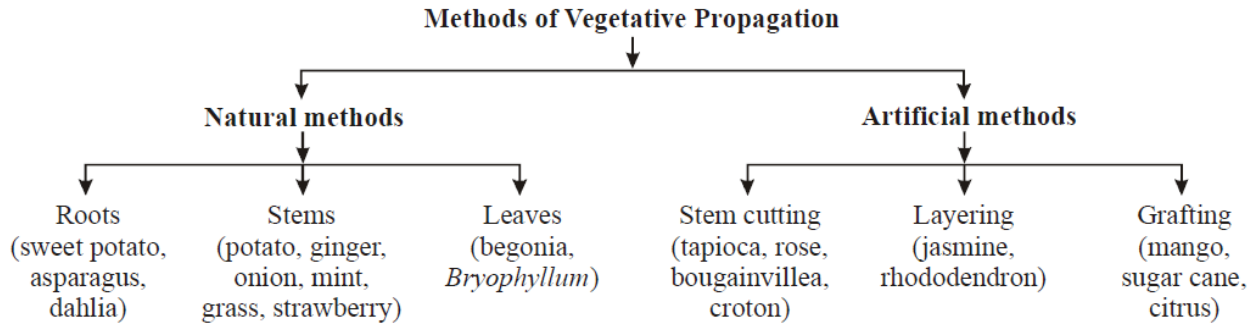
The production of new individuals from the parents is known as reproduction. Reproduction thus, ensures that organisms of a species continue to live, even after the death of the parent organisms.
There are different methods by which new individual are produced by their parents.

2. Modes of Reproduction

Plants reproduce by various methods. These methods can be divided into two types:
(i) asexual reproduction and (ii) sexual reproduction.
In asexual reproduction, the new individual is produced by a single parent. Seeds are not produced and there is no union of gametes (sex cells). The new individual is identical to the parent.
In sexual reproduction, fusion of two types of gametes takes place. Two parents take part in the formation of gametes and new individuars are produced from these. The new individual is not identical to either of the parents. It has features of both the parents.

3. Asexual Reproduction

- In asexual reproduction new plants are obtained without production of seeds or spores. A single parent can produce off springs, which are genetically and morphologically similar to their parent and called as clone. It occurs by different methods :



1. Vegetative Propagation

(i) **It is a type of asexual reproduction in which new plants are produced from roots, stems and leaves.** For eg. by stem in potato and ginger, by roots in sweet potato, rad dish and by leaves in bryophyllum. Since reproduction is through the vegetative parts of the plant, it is known as vegetative propagation.
(ii) Plants produced by vegetative propagation take less time to grow and bear flowers and fruits earlier than those produced from seeds. The new plants are exact copies of the parent plant, as they are produced from a single parent.
(iii) Cut branch of rose or champa with node called as cutting. When these cuttings are buried in the soil than from node new leaves arises and from buried part roots arises.

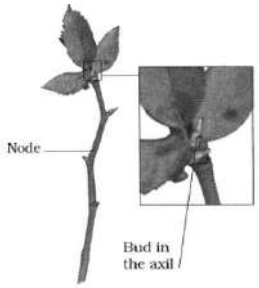


Figure: Stem-Cutting of Rose

(iv) **Over the stem, multicellular out growths appear called buds.** Buds, which develops into flower called **floral buds.** Some buds are present in axil of leaves, which develop into shoots. These buds are called **vegetative buds.** Abud consists of a short stem around which immature overlapping leaves are folded. Such vegetative buds can give rise to new plants.

(v) Over a fresh potato, some scars are found having buds. These scars are called **"eyes"**. A piece of potato having eye when buried in soil can produce a new plant.

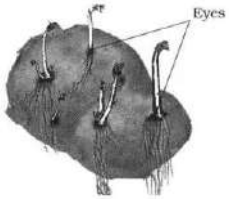


Figure: Potato Plant Sprouting from an 'eye'

Similarly ginger and turmeric can be grown.

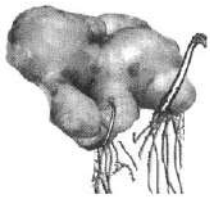


Figure: Ginger with new plants sprouting from it

(vi) Bryophyllum (Sprout leaf plant) has fleshy leaves with serrated margin. Over margins buds are present, when leaf falls on a moist soil, each bud can give rise to a new plant.

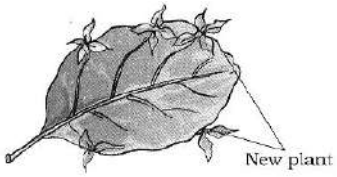


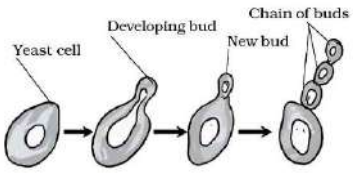
Figure: Leaf of Bryophyllum with buds in the margin

(vii) The roots of some plants can also produce new plants. For e.g. sweet potato, Dahlia, raddish, carrot etc. The pairs of cacti plant, when get detached from the main plant body can produce in plants.

Advantages of Vegetative fropagation

- Plants produced by this method take less time to grow and bear flowers and fruit faster than those produced from seeds.
- Seedless plants can be obtained.
- Plants produced are exact copies of the parent plant. No variations are present.

2. Budding



Reproduction in yeast by budding

(i) Yeast is a single-celled microscopic organism.

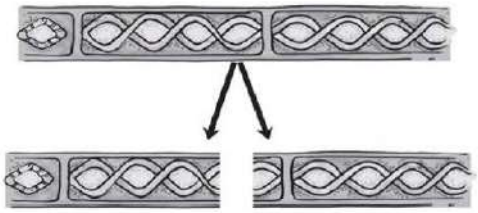
(ii) In yeast small bulb-like projection coming out from the yeast cell is called a bud.

(iii) The bud gradually grows and gets detached from the parent cell and forms a new yeast cell.

(iv) The new yeast cell grows, matures and produces more yeast cells. Sometimes, chain of bud arises from single yeast cell.

(v) If this process continues, a large number of yeast cells are produced in a short time. Yeast can be easily grown in sugar solution. Yeast is commercially used in bakery etc.

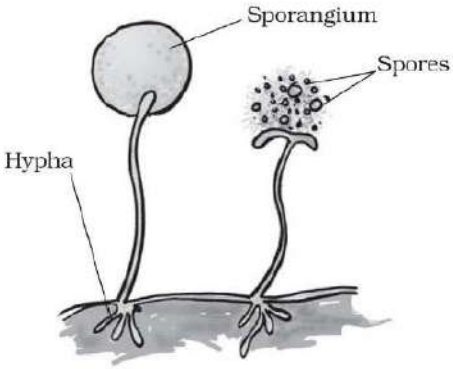
3. Fragmentation



Fragmentation in spirogyra (an alga)

(i) Slimy green patches in ponds, or in other stagnant water bodies can be easily seen.
(ii) These are the algae i.e. spirogyra or pond silk.
(iii) When water and nutrients are available algae grow and multiply rapidly by fragmentation.
(iv) An alga breaks up into two or more fragments.
(v) These fragments or pieces grow into new individuals. This process continues and they cover a large area in a short period of time. e.g. Spirogyra.

4. Spore formation



Reproduction through spore formation in fungus

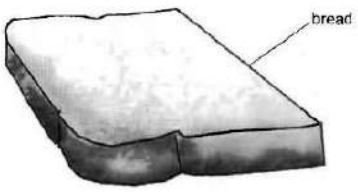
(i) The fungi on a bread piece grow and forms pores which are present in the air. When spores are released they keep floating in the air. As they are very light they can cover long distances.
(ii) **The spores are asexual reproductive bodies.**
(iii) Each spore is covered by a hard protective coat to with stand unfavourable conditions such as high temperature and low humidity. So, **they can survive for a longer time.**

(iv) Under favourable conditions, a spore germinates and develops into a new individual. Plants such as mosses and ferns also reproduce by means of spores

Activity : To observe spore formation in bread mould.

- Take a slice of bread and slightly moisten it.
- Leave it in air for 3 days.
- Observe after 3 days with a magnifying glass. You will notice fine thread-like structures (hyphae) and small spherical structures (sporangia) on long stalks are seen in Fig:
- Now, take a spherical structure on a slide in a drop of water and put a cover slip on it.

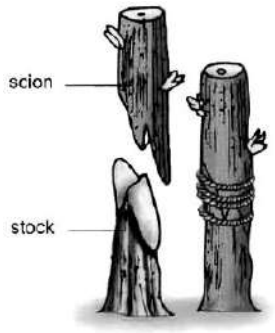
On observed under the microscope.
You will see very small rounded bodies called the spores.



Artificial Methods of Vegetative Propagation

Vegetative propagation carried out by human beings is called artificial propagation. There are several methods of artificial propagation. Two of the methods are stem cutting and grafting.

- **Stem cutting** is generally used in plants like rose, champa, sugar cane and bougainvillea. A stem cutting is a short piece of a branch of a plant having a node. This cutting when placed in the soil under suitable conditions develops roots and leaves. Finally the complete plant develops.



Grafting

- **Layering** is done when the other propagation methods are unsuccessful and only a few plants are needed. It is a method in which roots develop on a shoot or branch that is still attached to the parent plant. The stem is cut off from the parent plant only after it has rooted. Layering is generally used in plants like honeysuckle, rhododendron and forsythia.
- **Grafting** is a very common method of artificial vegetative propagation in fruit plants like mango. New varieties can be developed by this method. In this method, the root portion is taken from one plant. This is called the **stock**. The stem portion, with several buds, is taken from another plant called the **scion**.

  The scion is taken from a plant which has the desired features that are intended to be introduced in the root portion. The ends of the stock and the scion are obliquely cut and firmly tied together. In this manner, a new plant variety is developed.

4. Sexual Reproduction

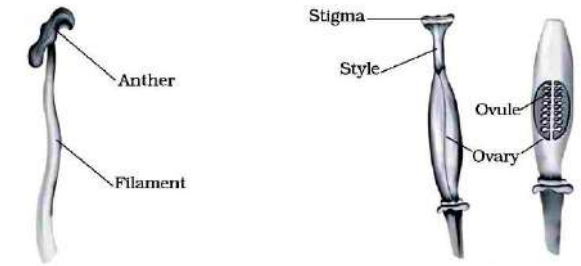
(i) In this kind of reproduction two opposite sexes i.e. male and female are required.

(ii) The flowers are the reproductive parts of a plant. The **stamens** are the **male reproductive part** and the **carpel or pistil** is the **female reproductive part.**

(iii) The flowers which contain either only the pistil or only the stamens are called **unisexual flowers.**

(iv) The flowers which contain both stamens and pistil are called **bisexual flowers.**

(v) Corn, papaya and cucumber produce unisexual flowers, where as mustard, rose and petunia have bisexual flowers. Both the male and the female unisexual flowers may be present in the same plant or in different plants.



Reproductive parts

(vi) **Anther contains pollen grains which produce male gametes.**

(vii) A pistil consists of stigma, style and ovary. The ovary contains one or more ovules. The female gamete or the egg is formed in an ovule. In sexual reproduction, a male and a female gamete fuse to forma **zygote.**

1. Pollination

The transfer of pollen from the anther to the stigma of a flower is called pollination.

Types of pollination:

(a) Self pollination

(b) Cross-pollination

(a) If the pollen lands on the stigma of the same flower it is called **self-pollination.**

(b) When the pollen of a flower lands on the stigma of another flower of the same plant, or that of a different plant of the same kind, it is called **cross-pollination.** In plants pollination is followed by fertilization.

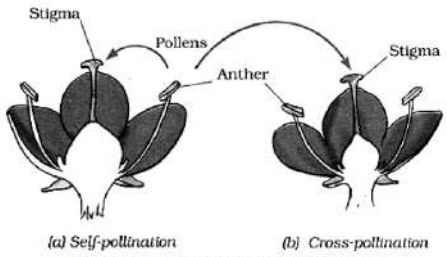


Figure: Pollination in Flower

2. Fertilisation

The process of fusion of male and female gametes (to forma zygote) is called fertilisation. The zygote develops into an embryo.

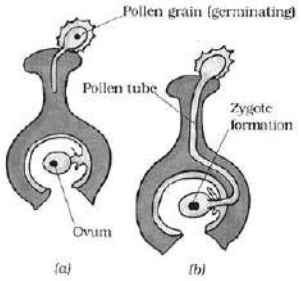


Figure: Fertilization (Zygote formation)

3. Fruits and Seed Formation

(i) After fertilisation, the ovary grows into a fruit and other parts of the flower fall off.

(ii) **The fruit is the ripened ovary.**

(iii) The seeds develop from the ovules.

(iv) The seed contains an embryo enclosed in a protective seed coat. Seed contain cotyledon, which store food materials. Some fruits are fleshy and juicy such as mango, apple and orange. Some fruits are hard like almonds and walnuts.

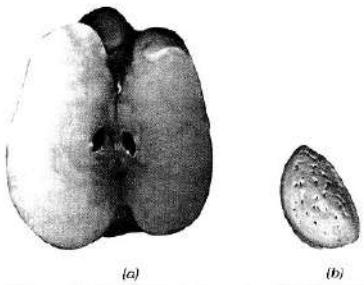
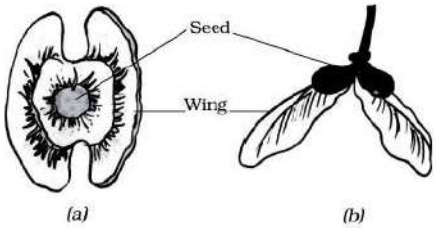


Figure: (a) Section of an apple (b) Almond

4. Seed Dispersal

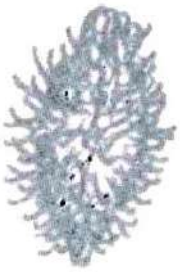
(i) Seeds are dispersed to different places by means of some special structure through wind, water, animals etc.

(ii) Dispersal of seeds is very essential, if all seeds fall at the same place and grow than it will cause competition between germinating seeds for space, nutrients, water, sunlight, minerals etc. and seed would not grow into healthy plants.



Seeds of (a) drumstick and (b) maple

(a) The hairy fruit of sunflower and (b) hairy seed of madar (aak)


Xanthium

(iii) Thus, seed dispersal prevents overcrowding and competition between the plant and its own seedlings for sunlight, water and minerals.
(iv) It also enables the plants to invade new habitats for wider distribution.
(v) Winged seeds such as those of drumstick and maple. (a) and (b)], light seeds of grasses or hairy seeds of aak (Madar) and hairy fruit of sunflower. (a), (b)], get blown off with the wind to far away places.
(vi) Some seeds are dispersed by water. These fruits or seeds usually develop floating ability in the form of spongy or fibrous outer coat as in coconut.
(vii) Some seeds are dispersed by animals, especially spiny seeds with hooks which get attached to the bodies of animals and are carried to distant places. Examples are Xanthium and Urena.
(viii) Some seeds are dispersed when the fruits burst with sudden jerks. The seeds are scattered far from the parent plant. This happens in the case of castor and balsam.

DPP-1

1. In which of the following plants vegetative reproduction takes place with the help of bulbils?
(a) Colocasia (b) Zingiber (c) Agave (d) Vallisneria

2. Scion is a term in relation to
(a) layering (b) cutting (c) grafting (d) micropropagation

3. Which of the following is propagated by means of cutting?
(a) Sugarcane (b) Coffee (c) Citrus (d) All of these

4. Stem cuttings are commonly used for propagation in
(a) rubber (b) mangoes (c) sugarcane (d) jasmine

5. A method in which roots are induced on the stem while it is still attached to the parent plant is called
(a) layering (b) cutting (c) grafting (d) vivipary

6. During grafting root stock is generally derived from a plant
(a) efficient in water and mineral absorption (b) resistant to diseases
(c) that grows strong and healthy branches (d) all of the above

7. What is parthenogenesis?
(a) Development of fruit without hormones (b) Development of fruit without fertilisation
(c) Development of egg without fertilisation (d) Development of embryo without fertilisation

8. What is micropropagation?
(a) Germination of seed with cotyledons above the soil
(b) A technique to obtain new plants by cultivating the cells or tissues in culture medium
(c) The mature stage of endosperm
(d) To manufacture hormones

DPP-2

1. Pollination is best defined as
   (a) the transference of pollens from anthers to stigma
   (b) the germination of pollen grains
   (c) visiting of flowers by ants
   (d) the growth of pollen tube in the ovule
2. Pollination is a characteristic of
   (a) angiosperms (b) pteridophytes (c) bryophytes (d) all of the above
3. Self-pollination means
   (a) germination of pollens within the anther
   (b) transference of pollens from anthers to the stigma within the same flower
   (c) transference of pollens from one flower to another on the same plant
   (d) presence of male and female sex organs in the same flower
4. When pollen of a flower is transferred to the stigma of another flower of the same plant the pollination is referred to as
   (a) autogamy (b) allogamy (c) xenogamy (d) geitonogamy
5. Cross-pollination is advantageous because it results in
   (a) formation of weaker progeny (b) formation of better progeny
   (c) formation of male offspring (d) formation of female offspring
6. Fertilisation means
   (a) transfer of male gamete to female gamete
   (b) adhesion of male and female reproduction organs
   (c) fusion of nuclei of male and female gametes
   (d) the shedding of gametes from a reproductive organ
7. Which of the following event is NOT directly affected by light in a vegetable garden?
   (a) Seed germination (b) Food manufacture
   (c) Fertilisation (d) Flowering
8. Fertilisation in which male gametes are carried through pollen tube is known as
   (a) chalazogamy (b) siphonogamy
   (c) syngamy (d) porogamy

DPP-3

1. Double fertilisation is characteristic of
   (a) angiosperms (b) algae (c) gymnosperms (d) bryophytes
2. Double fertilisation means
   (a) fusion of eggs and pollen nucleus of two pollen nuclei
   (b) fusion of one male gamete with the egg and other with the secondary nucleus
   (c) fusion of two eggs
   (d) fusion of one male gamete with the egg and other two synergids
3. Syngamy refers to
   (a) fusion of one of the sperms with secondary nucleus
   (b) fusion of one of the sperms with the egg

(c) fusion of one of the sperms with the egg and other with the secondary nucleus
(d) fusion of one of the sperms with synergid

4. Milky water of green coconut is
(a) liquid of female gametophyte
(b) liquid endosperm
(c) liquid chalaza
(d) liquid nucellus

5. Seeds are called products of sexual reproduction because they
(a) give rise to new plants
(b) are formed by fusion of gametes
(c) are formed by fusion of pollen tubes
(d) can survive for longer periods

6. Spirogyra reproduces by
(a) budding (b) tubers (c) bulbs (d) fragmentation

7. When the explant in tissue culture divides, it results in a mass of loosely arranged cells called
(a) buds (b) ovules (c) callus (d) corm

8. The part of the pistil which receives the pollen is the
(a) ovary (b) stalk (c) stigma (d) anther

NCERT Basics Exercise-1

1. Fill in the blanks:
(a) Production of new individuals from the vegetative part of parent is called_____.
(b) A flower may have either male or female reproductive parts. Such a flower is called_____.
(c) The transfer of pollen grains from the anther to the stigma of the same or of another flower of the same kind is known as _____.
(d) The fusion of male and female gametes is termed as _____.
(e) Seed dispersal takes place by means of _____,_____ and _____.

2. Describe the different methods of asexual reproduction. Give examples.

3. Explain what you understand by sexual reproduction.

4. State the main difference between asexual and sexual reproduction.

5. Sketch the reproductive parts of a flower.

6. Explain the difference between self-pollination and cross-pollination.

7. How does the process of fertilisation take place in flowers?

8. Describe the various ways by which seeds are dispersed.

9. Match items in Column I with those in Column II:

Column I	Column II
(a) Bud	(i) Maple
(b) Eyes	(ii) Spirogyra
(c) Fragmentation	(iii) Yeast
(d) Wings	(iv) Bread mould
(e) Spores	(v) Potato
	(vi) Rose

10. Tick (✓) the correct answer:

(a) The reproductive part of a plant is the

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

(b) The process of fusion of the male and the female gametes is called

(i) fertilisation (ii) pollination

(iii) reproduction (iv) seed formation

(c) Mature ovary forms the

(i) seed (ii) stamen (iii) pistil (iv) fruit

(d) A spore producing organism is

(i) rose (ii) bread mould (iii) potato (iv) ginger

(e) Bryophyllum can reproduce by its

(i) stem (ii) leaves (iii) roots (iv) flower

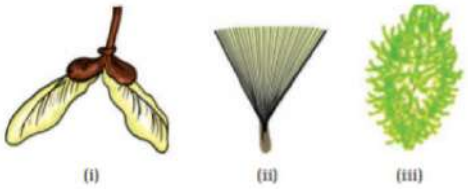
Concept Mastery Exercise-2

A. Very Short Answer Type Questions

1. What is vegetative propagation?
2. Name the process by which parents produce new individuals.
3. Give one example each of the plants reproducing by roots, stems and leaves.
4. Define fruit.
5. What is a zygote?
6. Sketch the reproductive parts of a flower.
7. How does new plants grow the leaves?
8. Draw a sketch of a flower and label its reproductive parts in detail.

B. Short Answer Type Questions

9. Explain fragmentation with example.
10. What are fruits? What are fleshy and dry fruits?
11. Group the seeds given in Figure (i) to (iii) according to their means of dispersion.



a. Seed dispersed by wind
b. Seed dispersed by water
c. Seed dispersed by animal

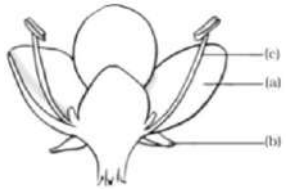
12. What is the difference between a cutting and a graft?

13. Describe the various ways by which seeds are dispersed.
14. When you keep food items like bread and fruits outside for a long time especially during the rainy season, you will observe a cottony growth on them.
a. What is this growth called?
b. How does the growth take place?

C. Long Answer Type Questions

15. Describe the structure of a typical flower.
16. What are the benefits of seed dispersal and how the seeds are dispersed?

17. In the diagram of a bisexual flower given as figure draw the missing part and label the parts marked



(a), (b) and,
(c). Also, label the missing part that you draw.

18. Describe the different methods of asexual reproduction. Give examples.

19. In the figure of a flower given below, label the parts whose functions are given below and give their names.

a. The part which contains pollen grains.
b. The part where the female gamete is formed.
c. The female reproductive part, where pollen grains germinate.
d. The colourful part of flower which attracts insects.

20. One morning as Paheli strolled in her garden she noticed many small plants which were not there a week ago.
She wondered where they had come from as nobody had planted them there. Explain the reason for the growth of these plants.

D. True & False

21. (a) Two individuals are needed for the sexual reproduction.
(b) Fruits are developed from the ripened ovary.
(c) Hibiscus or China rose is a bisexual flower.

E. Fill in the Blanks

22. (a) The small bulb-like projection coming out from the yeast cell is called a _____.
(b) Seed dispersal takes place by means of _____ and _____.
(c) The process of _____ ensures continuity of life on earth.
(d) The process of _____ ensures continuity of life on earth.
(e) Budding is a type of _____ reproduction.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

1. Which part of a plant is not involved in vegetative propagation?
(a) Stem (b) Root
(c) seeds (d) Leaves

2. Which process of asexual reproduction is involved in fern?
(a) Vegetative propagation (b) Budding
(c) Fragmentation (d) Spore formation

3. The cell which results after fusion of male gamete and female gamete is called:
(a) Egg (b) Zygote
(c) Pistil (d) Ovule

4. The eye of the potato plant is what
(a) the anther is to stamen (b) the root is to any plant
(c) the bud is to Bryophyllum leaf (d) the bud is to a flower

5. The stamens are male reproductive parts and pistil is
(a) Insect attracting part (b) Female reproductive part
(c) Nectar storing part (d) Smell producing part
6. Part of plant used for culturing is called _____.
(a) Scion (b) Explant
(c) Stock (d) Callus
7. Pistil, the female reproductive part of the flower includes:
(a) Stigma, filament, and ovary (b) Stigma, style and ovary
(c) Anther, style, and ovary (d) Style, filament and ovary
8. Fleshy and juicy fruits are found in:
(a) Walnuts and almond (b) Orange and almond
(c) Mango and orange (d) Mango and almond
9. Pollination refers to be
(a) transfer fo pollen from anther to ovule.
(b) transfer of pollen from anther to ovary.
(c) transfer to pollen from anther to ovule.
(d) transfer of pollen from anther to stigma.
10. Which one is a dicotyledonous plant?
(a) Gram (b) Sugar cane
(c) Wheat (d) Banana
11. Bread mold reproduces by
(a) Regeneration (b) Spore formation
(c) Fragmentation (d) Budding
12. In which of the following plants, buds are present on the margins of leaves?
(a) Coriander (b) Bryophyllum
(c) Touch me not (d) Chandan
13. The plant with dry (Xerophytic) characteristics is-
(a) Mango (b) Cactus
(c) Rose (d) Garlic
14. Vegetative propagation is used to:
(a) Grow plants in a short time (b) Plants are better in feature
(c) Plants grows slower (d) Grow plants in same time
15. The plants produced by vegetative production are:
(a) Exact copies of the parent (b) Same features but different colour
(c) Same in size but different in taste (d) Different from the parent
16. The main function of coloured petals of flowers is to:
(a) To store nectar (b) Produce anther
(c) Attract insects for pollination (d) To attract human
17. The female reproductive part of plant is _____.
(a) bud (b) spore
(c) pistil (d) stamen
18. The ovaries of different flowers may contain
(a) only two ovules (b) one to many ovules
(c) many ovules (d) only one ovule
19. Cross-pollination help in creating variation as:
(a) Pollen is not carried by the wind (b) Two different genome fuse together
(c) Pollen is heavy (d) Pollen gets changed during the transfer
20. Self-pollinated plants:
(a) Change features and purity (b) Better adopted in any habitat
(c) Cause variation and evolution (d) Maintains purity and superiority of variety
21. The male parts of the flower are called
(a) styles (b) pistils
(c) stamens (d) carpels
22. Mature ovary forms the
(a) Pistil (b) Seed
(c) Fruit (d) Stamen

23. A spore:
(a) Is covered by a hard protective coat
(b) Is a sexual reproductive body
(c) All of these
(d) Germinates and develops into a new individual

24. The flowers which contain either the pistil or the stamens are called _____.
(a) asexual flowers (b) bisexual flowers
(c) unisexual flowers (d) budding

25. Seeds of drumstick and maple are carried to long distance by wind because they possess
(a) large and hairy seeds (b) long and ridged fruits
(c) spiny seeds (d) Winged seeds

26. The process by which plants give rise to new plants without seeds is called _____.
(a) sexual reproduction (b) budding
(c) vegetative propagation (d) asexual reproduction

27. The reproductive part of a plant is the
(a) Stem (b) Flower
(c) Root (d) Leaf

28. Which of the following parts of a plant take part in sexual reproduction?
i. Flower ii. Seed
iii. Fruit iv. Branch
(a) (i), (ii) and (iii) (b) (i) and (ii)
(c) (ii), (iii) and (iv) (d) (iii) and (iv)

29. The two nuclei at the end of the pollen tube are called _____.
(a) tube nucleus and a generative nucleus (b) tube nucleus and sperm
(c) generative nucleus and stigma (d) sperm and ovum

30. The figure shown below is

(a) Fruit of sunflower
(b) Seed of oak
(c) Seed of xanthium
(d) Flower of cactus

31. Maize shows cross-pollination by _____.
(a) Rains (b) Human
(c) Insects (d) Winds

32. Banana is a _____ plant.
(a) Endospermic (b) Dicots
(c) Monocots (d) Hybrid

33. Mature ovule forms _____.
(a) Seed (b) Endosperm
(c) Buds (d) Leaves

34. Which of the following statement is/are true for sexual reproduction in plants?
i. Plants are obtained from seeds. ii. Two plants are always essential.
iii. Fertilisation can occur only after pollination. iv. Only insects are agents of pollination.
(a) (i) only (b) (ii) and (iii)
(c) (i) and (iii) (d) (i) and (iv)

35. Lila observed that a pond with clear water was covered up with green algae within a week. By which method of reproduction did the algae spread so rapidly?
(a) Pollination (b) Budding
(c) Sexual Reproduction (d) Fragmentation

B. Assertion & Reason Questions

36. **Assertion (A):** A bisexual flowers has both the male and the female reproductive parts.
Reason (R): The male gametes are found in side the ovule and females gametes are found inside the pollen grains.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

37. **Assertion (A):** After fertilization, the ovule present in the ovary grows to become a seed.
Reason (R): The ovary of a flower may give rise to the number of seeds.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

38. **Assertion (A):** There is no fusion of gametes, no seeds are formed in asexual reproduction mode of reproduction.
Reason (R): In sexual reproduction only single parent are involved.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

39. **Assertion (A):** Fungus, moss and fern reproduce by the common method of spore formation.
Reason (R): After fertilization the ovary becomes fruit and ovule becomes seed.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

C. Statement Type Questions

40. Which one of the following statements is CORRECT?
A. Sporogenous tissue is haploid.
B. The hard outer layer of pollen is called intine.
C. Tapetum nourishes the developing pollen.
D. Micropores are produced by endothelium.
(a) Statement C is correct.
(b) Statement B is correct.
(c) Statement A is correct.
(d) Statement D is correct.

D. Match The Column

41. Match items in Column I with those in Column II:

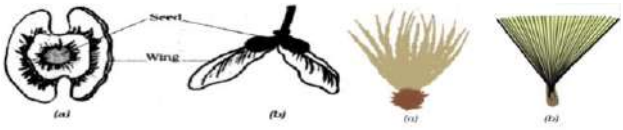
Column I	**Column II**
(a) Bud	(i) Maple
(b) Eyes	(ii) Spirogyra
(c) Fragmentation	(iii) Yeast
(d) Wings	(iv) Bread mould
(e) Spores	(v) Potato
	(vi) Rose

42. Match the following:

Column I	**Column II**
(i) Bread mould	(a) cutting
(ii) Yeast	(b) leaves
(iii) Potato	(c) fragmentation
(iv) Rose	(d) detached body part
(v) Sweet potato	(e) spores
(vi) Bryophyllum	(f) eye
(vii) Cactus	(g) roots
(viii) Spirogyra	(h) budding

E. Case Study or Paragraph

Question No. 43 to 47 are based on the given text. Read the text carefully and answer the questions:
In nature same kinds of plants grow in different places. This happens because seeds are dispersed to different places.
Seeds and fruits of plants are carried away by the wind, water and animals. It depend on the characteristics of seeds
shown below:



43. Winged seeds is a characteristic of seeds dispersed by
(a) Insects (b) Animals
(c) Wind (d) Water

44. Seeds which are dispersed by animals are
(a) Both Drumstick and Xanthium (b) Xanthium
(c) Drumstick (d) Urena

45. Which of the following seeds are dispersed when the fruits burst with sudden jerks.
(a) Xanthium (b) Balsam
(c) Drumstick (d) Urena

46. Some seeds are dispersed by animals, especially spiny seeds with hooks that get attached to the bodies of animals.
(a) True (b) False

47. Seeds are dispersed by water. These fruits or seeds usually develop floating ability in the form of _____ outer coat as in coconut.

Answer Key

DPP-1

1.	(c)	**2.**	(c)	**3.**	(d)	**4.**	(c)	**5.**	(a)	**6.**	(d)	**7.**	(c)
8.	(b)												

DPP-2

1.	(a)	**2.**	(a)	**3.**	(b)	**4.**	(d)	**5.**	(b)	**6.**	(c)	**7.**	(c)
8.	(b)												

DPP-3

1.	(a)	**2.**	(b)	**3.**	(b)	**4.**	(b)	**5.**	(b)	**6.**	(d)	**7.**	(c)
8.	(c)												

Concept Mastery Exercise-2

1. Vegetative propagation is a type of asexual reproduction in which a new plant is developed from the vegetative parts such as stem, leaf and root. It can be done by both natural and artificial methods.

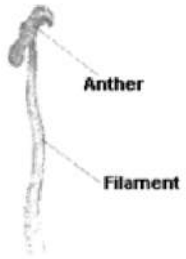
2. Reproduction.

3. (i) Roots : Sweet Potato
(ii) Stem : Rose
(iii) Leaves : Bryophyllum.

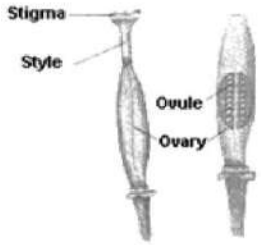
4. The ripened ovary after fertillisation is called fruit.

5. The cell which results after fusion of the gametes is called a zygote. Zygote is formed after fertilization. The zygote develops into an embryo and finally into a new individual.

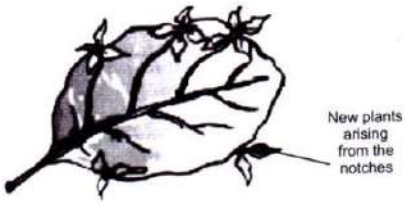
6. a. Stamen



b. Pistil

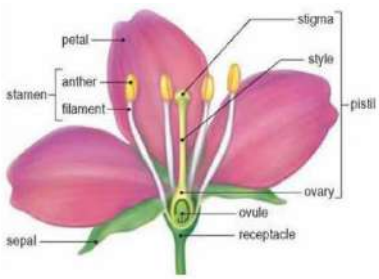


7. Leaves of some plants grow into a new plant when they are detached from the parent plant. Some other plants exhibit growth of small plants, called plantlets, on the edge of their leaves. Example: Bryophyllum.



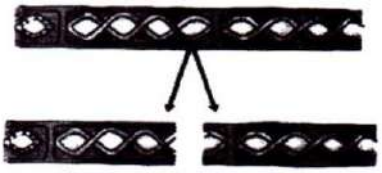
Leaf of *Bryophyllum*.

8.



Sketch of a flower.

9. It is a mode of asexual reproduction. When water and nutrients are available, an alga, like Spirogyra grow and multiply rapidly by the process of fragmentation. An alga breaks up into two or more fragments. These fragments or pieces grow into new individuals.
This process continues and they cover a large area in a short period of time.



Fragmentation in *Spirogyra* (an alga).

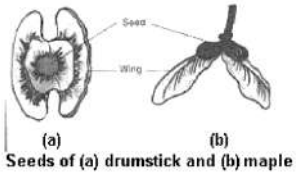
10. Ripened ovary after fertilization is called fruit. There are two types of fruits:
(i) Fleshy fruits: The fruits which are fleshy and juicy like mango, apple and orange are called fleshy fruits.
(ii) Dry fruits: The hard fruits like almonds and walnut are called dry fruits.

11. a. Seed dispersed by wind – (i) Maple seed, (ii) seed of madar Seeds of maple and madar have wing-like structure and hence are dispersed by wind.
b. Seed dispersed by water – given seeds do not support seed dispersal by water
c. Seed dispersed by animal – (iii) Xanthium
Xanthium is a spiny seed with hooks that sticks or get attached to the bodies of animals. Hence it is dispersed by animals.

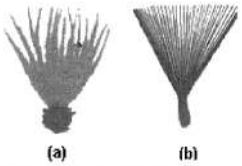
12. Stem cutting and grafting are the types of vegetative reproduction in plants.
Grafting: Grafting is a technique in which tissues from one plant are inserted into those of another plant. The joining of the vascular tissues of both the plants results in the formation of new plant under suitable conditions. Usually the vascular joining is done between two plants where one plant is selected for its roots and the other plant is selected for its stems, leaves, flowers or fruits.
Stem cutting : Stem cutting is a technique in which the stem of a plant is removed from the parent plant and is used to grow into a whole new plant. The stem when placed in a rooting medium, and provided with favorable conditions like high humidity, indirect light and soil temperature of 20°C to 25°C result in the formation of a new plant. As the new plant formed will be the exact copy of the parent plant, it may also be termed as cloning.

13. Seeds are dispersed to different places in following way:
i. By wind : Seeds dispersed by wind are either winged (e.g. drumstick and maple) or light (e.g. grasses) or hairy (e.g. aak and sunflower).
ii. By water : Seeds dispersed by water develop floating ability (e.g. coconut)
iii. By insects and other animals : Seeds which are spiny and sticky disperse by sticking on the body of animals (e.g. xanthium and urena)

iv. Some seeds are dispersed when the fruit bursts with sudden jerks (e.g. castor and balsam).



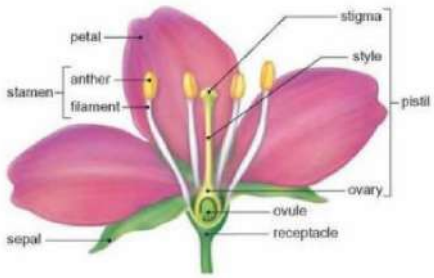
Seeds of (a) drumstick and (b) maple



(a) The hairy fruit of Sunflower and
(b) hairy seed of madar (aak)

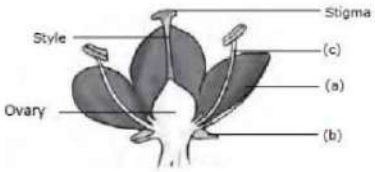
14. a. The growth is called a mould. It is formed by fungus.
b. The growth takes place through spore formation. The parent produces hundreds of spores that are released into the air. The spores have a protective coat that protects them from unfavorable conditions. These are randomly scattered to various places by wind, water, etc. Under suitable conditions, the spores would fall into places like moist bread pieces. The spores germinate to form new individuals. This process continues.

15. Flowers are the reproductive parts of the plant. A typical flower consists of the following parts:
i. Sepals: These are green leaf like structures which help in the preparation of food.
ii. Petals: These are coloured big leaf like structure in the flower which help in the pollination.
iii. Stamens: Stamens are the male reproductive parts of the flowers.
There are two parts of stamen (i) anther and (ii) filament. Anther contains pollen grains which have male gametes.
iv. Pistil: Pistil is the female reproductive part of the flowers. There are three main parts of a pistil (i) stigma (ii) style and (iii) ovary. The ovary contains one or more ovules. The female gametes or the eggs are formed in an ovule.



16. The benefits of seed dispersal are:
i. It enables the plants to invade new habitats for wider distribution.
ii. It prevents competition between the plant and its own seedlings for sunlight, water and minerals.
iii. It also prevents such competition between the seedlings.
Methods of dispersal of seeds: The seeds are dispersed by various ways:
i. By winds: The light and hairy seeds of some plants are dispersed by winds. For example: grasses, seeds of aak (madar) and sunflower.
ii. By water: Some seeds are dispersed by water. These seeds and fruits have floating ability in the form of spongy or fibrous outer coat as in coconut.
iii. By animals: Some seeds are dispersed by animals. Specially spiny seeds with hooks which get attached to the body of animals and area carried to distant places. For example: xanthium and urena.
iv. By human: Human beings also help in the dispersal of seeds. They carry fruits to the long distances and throw their seeds there.
v. Some seeds are dispersed when fruits burst with sudden jerks. The seeds are scattered far from parental plant. For example: balsam and castor.

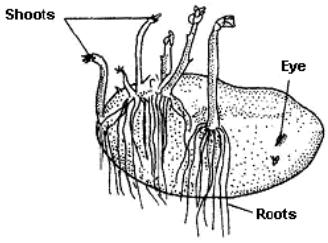
17. The completed diagram of a bisexual flower looks like



The missing parts have been labeled in the diagram itself.
The parts marked (a), (b), (c) are:
(a) – petal (b) – sepal (c) – filament of stamen
Additional info:
Sepal is a part of flower which protects the flower bud. It also helps in giving support to the petals of the flower.

18. Various methods of asexual reproduction are:
i. Vegetative propagation: When new plants are obtained from leaves, stems and roots, it is called vegetative reproduction, e.g. rose, sugarcane, potato, ginger (stem), bryophyllum (leaf), sweet potato, dahelia (roots) and any detached body part of cacti.
ii. Budding: Reproduction in yeast is by budding. The small bulb like projection called bud comes out from the parent cell. The nucleus then divides into two, one of which goes into the bud. The bud gradually grows and get detached from the parent cell and forms a new yeast cell.
iii. Fragmentation: Some organisms like spirogyra break up into two or more fragments and each fragment develops into a new

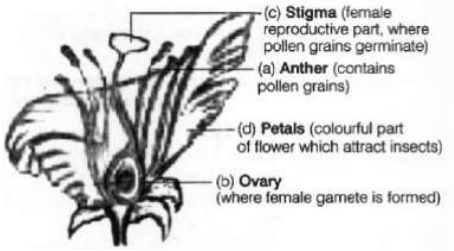
Bryophyllum
(a)



New Plants arising from the Buds
(b)

iv. Spore formation: The spores are asexual reproductive bodies which are covered by a protective covering to withstand unfavourable conditions. Under favourable conditions, a spore germinates and develops into a new individual.

19. The parts of a flower and its functions :
a. The part which contains pollen grains is anther.
b. The part where the female gamete is formed is ovary.
c. The female reproductive part, where pollen grains germinate is stigma.
d. The colourful part of flower which attracts insects is petals.



20. Sometimes, plants grow without human support. New plants are produced from seeds or from vegetative parts. The seeds developed in the parent plant are dispersed to different locations by various agents, like wind, water, animals, or insects. When these seeds get sufficient resources, they start to germinate to form new plants.
Moreover, new plants can grow through vegetative propagation also. In the case of the Bryophyllum plant, the leaves contain 'buds' which can grow into new Bryophyllum plants. These leaves could fall from the parent plant, into the soil. In a suitable environment, the buds develop into new plants. This explains the presence of many small plants in Paheli's garden.

21. State True or False:
(i) (a) True Explanation: True
(ii) (a) True Explanation: True
(iii) (a) True Explanation: True

22. Fill in the blanks:
(i) 1. Bud
(ii) 1. Water, Animals
(iii) 1. Reproduction
(iv) 1. Reproduction
(v) 1. Asexual

Accuracy Booster Exercise-3

1.	(c)	**2.**	(d)	**3.**	(b)	**4.**	(c)	**5.**	(b)	**6.**	(b)	**7.**	(b)
8.	(c)	**9.**	(d)	**10.**	(a)	**11.**	(b)	**12.**	(b)	**13.**	(b)	**14.**	(a)
15.	(a)	**16.**	(c)	**17.**	(c)	**18.**	(b)	**19.**	(b)	**20.**	(d)	**21.**	(c)
22.	(c)	**23.**	(c)	**24.**	(c)	**25.**	(d)	**26.**	(d)	**27.**	(b)	**28.**	(a)
29.	(a)	**30.**	(a)	**31.**	(d)	**32.**	(c)	**33.**	(a)	**34.**	(c)	**35.**	(d)
36.	(c)	**37.**	(b)	**38.**	(c)	**39.**	(b)	**40.**	(a)				

41. (a) - (iii), (b) - (v), (c) - (ii), (d) - (i), (e) - (iv)

42.

Column I	Column II
(i) Bread mould	(e) spores
(ii) Yeast	(h) budding
(iii) Potato	(f) eye
(iv) Rose	(a) cutting
(v) Sweet potato	(g) roots
(vi) Bryophyllum	(b) leaves
(vii) Cactus	(d) detached body part
(viii) Spirogyra	(c) fragmentation

43.	(c)	**44.**	(a)	**45.**	(b)	**46.**	(a)	**47.** 1. spongy

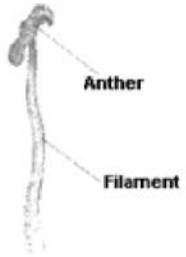
CLASS 7 – BIOLOGY

Chapter-8 Reproduction in Plants

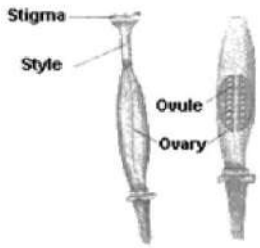
Solutions

Concept Mastery Exercise-2

1. Vegetative propagation is a type of asexual reproduction in which a new plant is developed from the vegetative parts such as stem, leaf and root. It can be done by both natural and artificial methods.
2. Reproduction.
3. (i) Roots : Sweet Potato
   (ii) Stem : Rose
   (iii) Leaves : Bryophyllum.
4. The ripened ovary after fertillisation is called fruit.
5. The cell which results after fusion of the gametes is called a zygote. Zygote is formed after fertilization. The zygote develops into an embryo and finally into a new individual.
6. a. Stamen

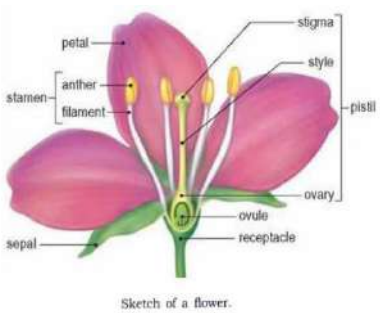


b. Pistil



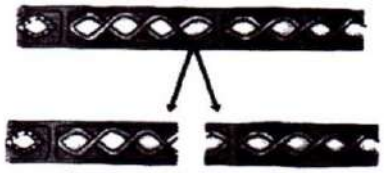
7. Leaves of some plants grow into a new plant when they are detached from the parent plant. Some other plants exhibit growth of small plants, called plantlets, on the edge of their leaves. Example: Bryophyllum.

Leaf of *Bryophyllum*.

8. 

Sketch of a flower.

9. It is a mode of asexual reproduction. When water and nutrients are available, an alga, like Spirogyra grow and multiply rapidly by the process of fragmentation. An alga breaks up into two or more fragments. These fragments or pieces grow into new individuals.
This process continues and they cover a large area in a short period of time.



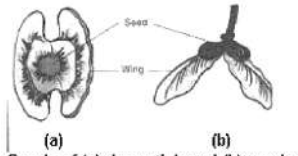
Fragmentation in *Spirogyra* (an alga).

10. Ripened ovary after fertilization is called fruit. There are two types of fruits:
(i) Fleshy fruits: The fruits which are fleshy and juicy like mango, apple and orange are called fleshy fruits.
(ii) Dry fruits: The hard fruits like almonds and walnut are called dry fruits.

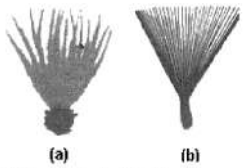
11. a. Seed dispersed by wind – (i) Maple seed, (ii) seed of madar Seeds of maple and madar have wing-like structure and hence are dispersed by wind.
b. Seed dispersed by water – given seeds do not support seed dispersal by water
c. Seed dispersed by animal – (iii) Xanthium
Xanthium is a spiny seed with hooks that sticks or get attached to the bodies of animals. Hence it is dispersed by animals.

12. Stem cutting and grafting are the types of vegetative reproduction in plants.
Grafting: Grafting is a technique in which tissues from one plant are inserted into those of another plant. The joining of the vascular tissues of both the plants results in the formation of new plant under suitable conditions. Usually the vascular joining is done between two plants where one plant is selected for its roots and the other plant is selected for its stems, leaves, flowers or fruits.
Stem cutting : Stem cutting is a technique in which the stem of a plant is removed from the parent plant and is used to grow into a whole new plant. The stem when placed in a rooting medium, and provided with favorable conditions like high humidity, indirect light and soil temperature of 20°C to 25°C result in the formation of a new plant. As the new plant formed will be the exact copy of the parent plant, it may also be termed as cloning.

13. Seeds are dispersed to different places in following way:
i. By wind : Seeds dispersed by wind are either winged (e.g. drumstick and maple) or light (e.g. grasses) or hairy (e.g. aak and sunflower).
ii. By water : Seeds dispersed by water develop floating ability (e.g. coconut)
iii. By insects and other animals : Seeds which are spiny and sticky disperse by sticking on the body of animals (e.g. xanthium and urena)
iv. Some seeds are dispersed when the fruit bursts with sudden jerks (e.g. castor and balsam).



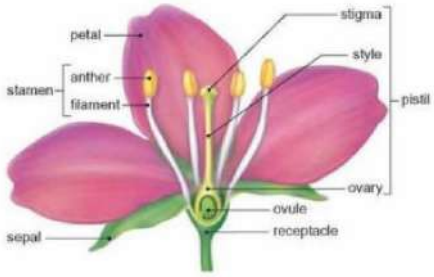
Seeds of (a) drumstick and (b) maple



(a) The hairy fruit of Sunflower and
(b) hairy seed of madar (aak)

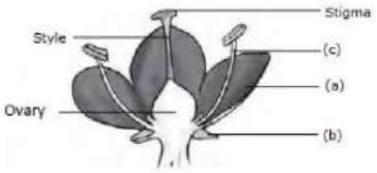
14. a. The growth is called a mould. It is formed by fungus.
b. The growth takes place through spore formation. The parent produces hundreds of spores that are released into the air. The spores have a protective coat that protects them from unfavorable conditions. These are randomly scattered to various places by wind, water, etc. Under suitable conditions, the spores would fall into places like moist bread pieces. The spores germinate to form new individuals. This process continues.

15. Flowers are the reproductive parts of the plant. A typical flower consists of the following parts:
i. Sepals: These are green leaf like structures which help in the preparation of food.
ii. Petals: These are coloured big leaf like structure in the flower which help in the pollination.
iii. Stamens: Stamens are the male reproductive parts of the flowers.
There are two parts of stamen (i) anther and (ii) filament. Anther contains pollen grains which have male gametes.
iv. Pistil: Pistil is the female reproductive part of the flowers. There are three main parts of a pistil (i) stigma (ii) style and (iii) ovary. The ovary contains one or more ovules. The female gametes or the eggs are formed in an ovule.



16. The benefits of seed dispersal are:
i. It enables the plants to invade new habitats for wider distribution.
ii. It prevents competition between the plant and its own seedlings for sunlight, water and minerals.
iii. It also prevents such competition between the seedlings.
Methods of dispersal of seeds: The seeds are dispersed by various ways:
i. By winds: The light and hairy seeds of some plants are dispersed by winds. For example: grasses, seeds of aak (madar) and sunflower.
ii. By water: Some seeds are dispersed by water. These seeds and fruits have floating ability in the form of spongy or fibrous outer coat as in coconut.
iii. By animals: Some seeds are dispersed by animals. Specially spiny seeds with hooks which get attached to the body of animals and area carried to distant places. For example: xanthium and urena.
iv. By human: Human beings also help in the dispersal of seeds. They carry fruits to the long distances and throw their seeds there.
v. Some seeds are dispersed when fruits burst with sudden jerks. The seeds are scattered far from parental plant. For example: balsam and castor.

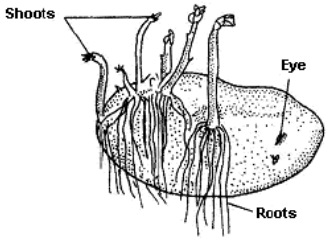
17. The completed diagram of a bisexual flower looks like



The missing parts have been labeled in the diagram itself.
The parts marked (a), (b), (c) are:
(a) – petal (b) – sepal (c) – filament of stamen
Additional info:
Sepal is a part of flower which protects the flower bud. It also helps in giving support to the petals of the flower.

18. Various methods of asexual reproduction are:
i. Vegetative propagation: When new plants are obtained from leaves, stems and roots, it is called vegetative reproduction, e.g. rose, sugarcane, potato, ginger (stem), bryophyllum (leaf), sweet potato, dahelia (roots) and any detached body part of cacti.
ii. Budding: Reproduction in yeast is by budding. The small bulb like projection called bud comes out from the parent cell. The nucleus then divides into two, one of which goes into the bud. The bud gradually grows and get detached from the parent cell and forms a new yeast cell.
iii. Fragmentation: Some organisms like spirogyra break up into two or more fragments and each fragment develops into a new

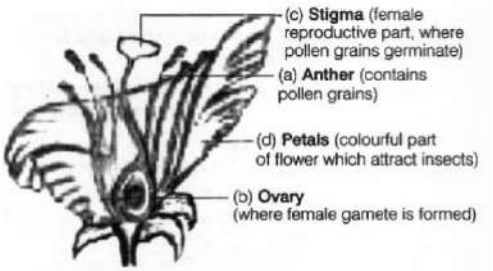
Bryophyllum
(a)



New Plants arising from the Buds
(b)

iv. Spore formation: The spores are asexual reproductive bodies which are covered by a protective covering to withstand unfavourable conditions. Under favourable conditions, a spore germinates and develops into a new individual.

19. The parts of a flower and its functions :
a. The part which contains pollen grains is anther.
b. The part where the female gamete is formed is ovary.
c. The female reproductive part, where pollen grains germinate is stigma.
d. The colourful part of flower which attracts insects is petals.



20. Sometimes, plants grow without human support. New plants are produced from seeds or from vegetative parts. The seeds developed in the parent plant are dispersed to different locations by various agents, like wind, water, animals, or insects. When these seeds get sufficient resources, they start to germinate to form new plants.
Moreover, new plants can grow through vegetative propagation also. In the case of the Bryophyllum plant, the leaves contain 'buds' which can grow into new Bryophyllum plants. These leaves could fall from the parent plant, into the soil. In a suitable environment, the buds develop into new plants. This explains the presence of many small plants in Paheli's garden.

21. State True or False:
(i) (a) True Explanation: True
(ii) (a) True Explanation: True
(iii) (a) True Explanation: True

22. Fill in the blanks:
(i) 1. Bud
(ii) 1. Water, Animals
(iii) 1. Reproduction
(iv) 1. Reproduction
(v) 1. Asexual

Accuracy Booster Exercise-3

1. (c) seeds
Explanation: The seeds contain only the genetic material of the parent plant. Therefore, propagation via asexual seeds is asexual reproduction but not vegetative propagation.
2. (d) Spore formation
Explanation: A spore is an asexual reproductive body, surrounded by a hard protective cover to withstand unfavourable conditions such as high temperature and low humidity. Under favourable conditions, the spores germinate and grow into new plants. Plants like moss and ferns use this mode of reproduction.
3. (b) Zygote
Explanation: The cells from each parent that combine to form the zygote are called gametes. In humans, the male gamete is called sperm, and the female gamete is called an egg. When the gametes join they form a cell called a zygote.
4. (c) the bud is to Bryophyllum leaf
Explanation: the bud is to Bryophyllum leaf
5. (b) Female reproductive part
Explanation: The male gametes are found inside the pollen grains and female gametes are found in the ovule. The stamens are the male reproductive part and the pistil is the female reproductive part. Anther contains pollen grains which produce male gametes. A pistil consists of stigma, style and ovary. The ovary contains one or more ovules. The female gamete or the egg is formed in an ovule. In sexual reproduction a male and a female gamete fuse to form a zygote.
6. (b) Explant
Explanation: The artificial medium is a suitable culture medium that has all the nutrients required for the desired growth and development of the explants. The plant parts that are detached and used for the plant culture are called explants.
7. (b) Stigma, style and ovary
Explanation: A pistil consists of stigma, style and ovary. The ovary contains one or more ovules. The female gamete or the egg is formed in an ovule.
8. (c) Mango and orange
Explanation: Fleshy fruits are made of living cells and are often juicy and. So Fleshy and juicy fruits are found in mango and orange.
9. (d) transfer of pollen from anther to stigma.
Explanation: transfer of pollen from anther to stigma.
10. (a) Gram
Explanation: Dicotyledonae consists of plants having seeds with two cotyledons and the plants are called dicotyledonous plants. Gram, mango, neem, sunflower all are dicotyledonous plant.
11. (b) Spore formation
Explanation: Bread mould reproduce by spore formation. Spores are small structures containing a nucleus. They are produced in large numbers and are very light, being easily dispersed by air and other agents. Rhizopus stolonifer which is a fungi is also known as bread mould.
12. (b) Bryophyllum
Explanation: The leaf in the Bryophyllum plant is broad and has notched at its margins. Buds arise from the notches. When the buds drop off from the leaf and placed in soil, they develop into a new plant with roots and small leaves.
13. (b) Cactus
Explanation: A xerophyte is a species of plant that his adaptations to survive in an environment with little liquid water, such as a desert or an ice or snow-covered region in the Alps or the Arctic. Popular examples of xerophyte
14. (a) Grow plants in a short time
Explanation: When a new plant is developed by a vegetative part; such as root, stem or leaf; it is known as vegetative propagation. Vegetative propagation is used to Grow plants in a short time.
15. (a) Exact copies of the parent
Explanation: The plants can grow in less time by vegetative propagation. They bear flowers and fruits earlier than those produced by sexual reproduction or from the seeds. The new plants produced by vegetative propagation are exact copies of the parent plant, as they are produced from

a single parent, while the plants produced by sexual reproduction are not a true copy of any parent but have the characters of both parents.

16. (c) Attract insects for pollination
Explanation: Petals are modified leaves that surround the reproductive parts of flowers. They are often brightly colored or unusually shaped to attract pollinators.

17. (c) pistil
Explanation: Pistil is the female reproductive part of a plant.

18. (b) one to many ovules
Explanation: one to many ovules

19. (b) Two different genome fuse together Explanation: Cross-pollination is the transfer of Pollen grains to the stigma of a flower of another plant of the same species and as in palm. Cross-pollination help in creating variation as two different genome fuse together.

20. (d) Maintains purity and superiority of variety
Explanation: Advantages of Self-pollination
i. the purity of race is maintained.
ii. No wastage of pollen grains.
iii. Fewer chances of failure of pollination.
iv. Scent and nectar need not be produced by flowers.

21. (c) stamens
Explanation: stamens

22. (c) Fruit
Explanation: Fruit is the mature ovary whereas ovule develops into a seed, which contains the developing embryo.

23. (c) All of these
Explanation: A spore is an asexual reproductive body, surrounded by a hard protective cover to withstand unfavourable conditions such as high temperature and low humidity. Under favourable conditions, the spores germinate and grow into new plants.

24. (c) unisexual flowers
Explanation: A Unisexual flower contains either stamen or pistil but not both.

25. (d) Winged seeds Explanation: Winged seeds

26. (d) asexual reproduction
Explanation: asexual reproduction

27. (b) Flower
Explanation: The flower is the reproductive unit of some plants (angiosperms). Parts of the flower include petals, sepals, one or more carpels (the female reproductive organs), and stamens (the male reproductive organs).

28. (a) (i), (ii) and (iii)
Explanation: (i), (ii) and (iii)

29. (a) tube nucleus and a generative nucleus
Explanation: tube nucleus and a generative nucleus

30. (a) Fruit of sunflower
Explanation: The figure shown below show hairy fruit of sunflower of sunflower.

31. (d) Winds Explanation: The transfer of pollen from another to the stigma of a flower is called pollination. Plants need help from various agents of pollination to carry out cross-pollination. Wind, insects, birds, and other animals play the role of agents of pollination.
Maize shows cross-pollination by the wind.

32. (c) Monocots
Explanation: the banana plant is actually a monocot and is closely related to the grass family. As is typical with monocots, banana plants do not have secondary growth; they die down regularly after the banana plant has produced its fruits.

33. (a) Seed
Explanation: The fruit is the mature ovary whereas the ovule develops into a seed, which contains the developing embryo.

34. (c) (i) and (iii)
Explanation: (i) and (iii)

35. (d) Fragmentation
Explanation: Fragmentation

36. (c) A is true but R is false.
Explanation: The flowers which contain both reproductive organs are called bisexual flowers like hibiscus and petunia. So,
(A) is a true statement. In flowering plants, male and female gametes are produced in the anther and ovule, respectively. Male gametes are contained within pollen grains, which are released from the anthers at anthesis. So, (R) is false statement.

37. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: After fertilization, the ovule present in the ovary grows to become a seed. The seeds contain embryos and food for developing new plants. The ovary of a flower may give rise to the number of seeds. The ovary of a flower develops and becomes a fruit. Fruit is the ripened ovary of a flower. So. amongst these correct options is both assertion and reason are correct but the reason is not the correct explanation for assertion.

38. (c) A is true but R is false.
Explanation: Asexual reproduction requires only one parental animal (either male or female), this process does not include the production and union of gametes.
So, (A) is true and (R) is false.

39. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: Fungus, moss and fern reproduce by the common method of spore formation which is a type of asexual reproduction.
In flowering plants after fertilisation, the zygote develops into the embryo, the ovules develop into the seed and the ovary develops into the fruit.
So. amongst these correct option is (B) both assertion and reason are correct but reason is not the correct explanation for assertion.

40. (a) Statement C is correct.
Explanation: Tapetum nourishes the developing pollen.

41. The correct order of match is (a) - (iii), (b) - (v), (c) - (ii), (d) - (i), (e) - (iv)

42.

Column I	**Column II**
(i) Bread mould	(e) spores
(ii) Yeast	(h) budding
(iii) Potato	(f) eye
(iv) Rose	(a) cutting
(v) Sweet potato	(g) roots
(vi) Bryophyllum	(b) leaves
(vii) Cactus	(d) detached body part
(viii) Spirogyra	(c) fragmentation

43. (c) Wind
Explanation: Wind

44. (a) Both Drumstick and Xanthium
Explanation: Both Drumstick and Xanthium

45. (b) Balsam
Explanation: Balsam

46. (a) True
Explanation: True

47. 1. spongy

PRE-FOUNDATION

CLASS VIII

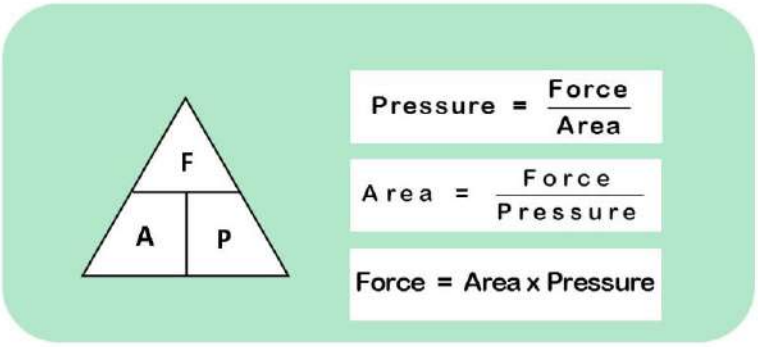
SAMPLE

PHYSICS

CLASS 8 - PHYSICS

CHAPTER-8

Force and Pressure



Chapter Flow

1. Introduction
2. Force
3. Effects of Force
4. Balanced and Unbalanced Forces
5. Force Can Be Classified Into Two Classes
6. Introduction (Pressure)
7. Other Applications of Pressure
8. Combination of Resistances (or Resistors)
9. Kirchhoff's Law
10. Heating Effect of Electric Current
11. Joule's Law
12. Practical Applications of Heating effect of Electric Current
13. Electric Power
14. Electric Energy

DPP-1

DPP-2

DPP-3

DPP-4

Exercise-1 NCERT Basics

Exercise-2 Concept Mastery

Exercise-3 Accuracy Booster

Force and Pressure

1. Introduction

1.1 Introduction (Force)

We use force all the time. We use force to open a door. We use force to pick up the school bag. We use force to brush our teeth. We use force to squeeze out toothpaste from a tube and so on.

Force is not an object which can be seen, force can be experienced or measured. We can experience the force of pull of earth on us and can measure it by a weight machine.

Now we are in position to define the force

"Force is a push or pull acting on an object"

2. Force

"Force is a push or pull which changes or tends to change the state of rest or of uniform motion, direction of motion, or the shape and size of a body".

Unit : Aunit of force on SI is **Newton** (represented by N).

It is a vector quantity.

One Newton force is that much force which produces an acceleration of $1ms^{-2}$ in a body of mass 1 kg.

Unit of force on **c.g.s.** system is **dyne**.

One dyne force is that much force which produces an acceleration of 1 cms^{-2} in a body of mass one gram.

Relation between newton and dyne

$1\ N = 10^5$ dyne

> **Remember**
> **A force produces or tries to produce motion in a body at rest, stops or tries to stop a moving body, changes or tries to change the direction of motion of a body and produces and tries to produce a change in the shape of a body.**

3. Effects of Force

(A) Force Acting on A Body can Change Its State of Motion or of Rest

- A force can make a stationary body move. When you kick a stationary football it moves.
- A force can stop a moving body. A fielder catches a moving cricket ball to stop its motion.
- A force can increase the speed of a moving object when a force is applied on a moving object in the direction of motion, its speed increases.
- A force can decrease the speed of a moving object when a force is applied on a moving object in the direction opposite to the direction of motion its speed decreases.

Fig.: A force can make a body move

(B) Force can Change the Direction of Motion of A Moving Object

There are many activities that show that a force can change the direction of motion of a moving object. During the game of cricket, the batsman changes the direction of the moving ball by touching or striking it with the bat at a suitable angle.

When you pass alongside a bus or truck emitting smoke, you wave the smoke away by moving your hand. Your moving hand exerts force on the smoke and pushes it away.

Fig.: Force can change the direction of a moving body

(C) Force can Change the Shape and Size of an Object

When a force is applied on a soft object, it changes the size and shape of the object. For example,

(a) When a inflated balloon is pressed between the two hands, its shape and size change.

(b) When a ball of wheat flour is pressed its shape changes. In fact, it can be given any shape.

(c) When a spring is pulled, its shape and size change.

(d) Foamor sponge can be compressed by applying force on it.

(e) The shape of tooth paste tube changes on squeezing.

Thus we see that force acting on a body is push, pull or a squeeze.

Fig.: Force can change the shape and size of object

4. Balanced and Unbalanced Forces

A number of forces acting on an object may either be balanced or unbalanced.

(A) Balanced Forces : If a number of forces acting on an object does not produce any change in its state of rest or uniform motion or direction of motion then, they are called as balanced forces.

For example

(i) A person holding a briefcase in hand.

(ii) A book resting on table.

(iii) Squeezing a lemon etc.

(B) Unbalanced Forces : If a number of forces acting on an object produce a change in its state of rest or uniform motion or direction of motion, then they are termed as unbalanced forces.

For example

(i) A brief case released from a persons hand.

(ii) Astone dropped etc.

5. Force Can Be Classified Into Two Classes

Type of Forces :

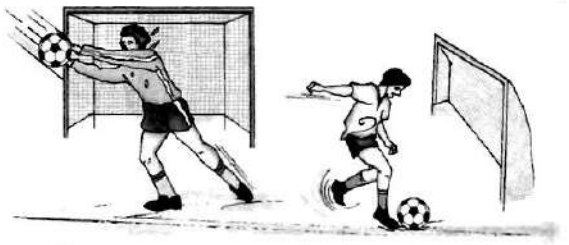
(A) Contact forces **(B) Non-contact forces**

(A) Contact Force

- In all the above cases we observed that force acts on an object only when the force is in contact with the object. Such forces are called Contact force

- Contact forces represent the result of physical contact between two objects, one by which force is exerted and the other on which force is exerted.
- Pulling (stretching) of a coiled spring, pulling of a cart/and kicking of a football are some examples of contact forces. The force exerted on us by the wind is also a contact force.
- Contact forces are the following types :

  (i) Muscular Force : If a school bag is lifted or a football is kicked, force is applied. Whatever you do, you do it with the force of your muscles. Your body has to be in contact with the object to apply a force. **This force exerted by the muscles is called a muscular force.** All animals and human beings use their muscles to do work. The muscles exert a force on the object that brings it in motion. Muscular force can also change the speed of moving bodies [fig. (a)&(b)].



(a) To slow down or stop a moving object (b) To make a moving object move faster

Fig.: Muscular Force

  (ii) Mechanical Force : The force exerted by a machine is called **mechanical force**. Machine do not produce force by themselves. In order to produce force they need energy from other sources. Mechanical force produced by a car engine, and mechanical force produced by the turbines in a hydroelectric power station (figure) are examples of contact forces. A crane lifting heavy objects with the help of a mechanical force is also an example of contact force. Here the heavy object and the crane come in contact with each other. Therefore the mechanical force that makes the crane lift the object is a **contact force**.

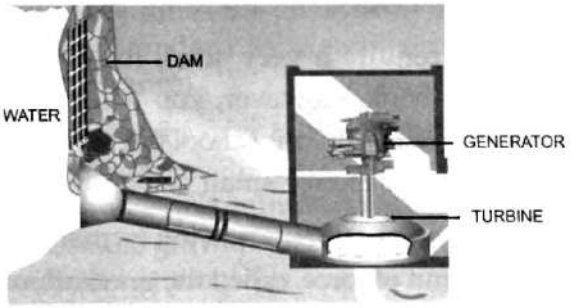


Fig.: Muscular Force

(iii) Applied Forces : The forces that we use with our hands, leg, figures, etc. are collectively called **applied forces**. When we tie a stone to a string and suspend it, the tension in the string opposes the force of gravity of the Earth and keeps the stone from falling down. When we do work with our hands, like lifting a weight, or pulling an object, the force required is provided by the tension of our muscles. When we need to apply a force, the brain sends a signal to the muscle (in the form of electrical signals via the nerve cells), which makes the muscle contract. This is how we can apply a force with our hands, legs, etc.

(iv) Frictional Force : The resistance into the motion experienced when two surfaces in on tact move with respect to each other is called **friction**. When ever the surface of one body slides over that of another, each exerts a force on the other which opposes the motion of the body. This is called frictional force. Frictional force comes into play only when two surfaces are in physical contact and is, therefore, a contact force.

Friction is a very complex phenomenon, and there is a lot about it that still needs to be explained. Two simple explanations for why friction is caused are as follows:

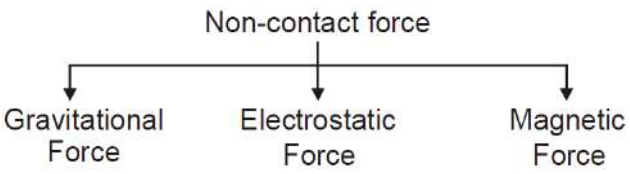
- Any surface, however smooth, has a lot of irregularities when seen under a microscope. These irregularities are like hills and valleys. When two such surface slide over each other, there will be a resistance to motion (friction).
- Another theory that explains friction says that when two surfaces come in contact, their atoms and molecules pull each other due to electrostatic forces. They 'stick' to each other at a microscopic level. When we try to slide the surfaces with respect to each other, these offer a resistance to motion. Frictional force depends on two main factors : the nature of the surfaces in contact and the mass of the object.

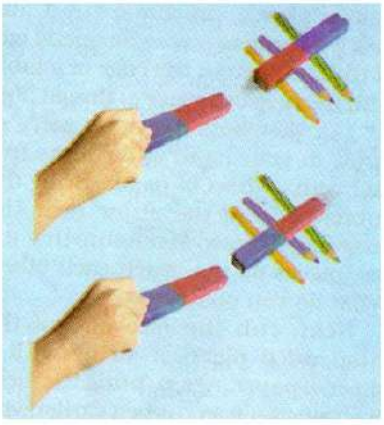
(v) Tension Force : Tension is a force exerted by string, ropes, fibres and cables when they are pulled.

(vi) Normal Force : The force perpendicular to the surfaces of the objects in contact is called normal force.

(B) Non Contact Force or (Action at A Distance Forces)

- These forces do not need any physical contact with the object on which they are acting and they can also act through empty space.
- The action at a distance force are the forces which do not involve physical contact between the two objects but act through the space between the two.
- There are three types of non-contact force





- The gravitational force, electrical force, and magnetic force are very common property that they act from a distance.

(i) **Gravitational Force :** *The force with which objects pull each other is called* ***gravitational force****.* This force is very small and we can feel it only if an object is very massive, like the Earth. It is the gravitational force of the Earth that keeps us bound to the Earth. Gravitational force makes the Earth move around the sun and also makes the moon go around the Earth. In fact, our weight is the gravitational force of the Earth acting on us. Different objects exert different magnitudes of gravitational force. For example, the gravitational force of the moon is about one-sixth that of the Earth. This means that the weight of any object on the moon will be one-sixth of its weight on the Earth.

(ii) **Electrostatic Force :** The force between electric charges is called electrostatic force. If we rub a plastic object like a pen, comb, or CD with hair and bring it close to tiny bits of paper, the bits of paper get attracted to the plastic object (Fig.). This is due to electrostatic force. Tiny particles of dust and smoke can also be attracted by electrostatic force. This method is used in electric air purifiers and in factories to purify air in chimneys before letting it escape into the atmosphere.

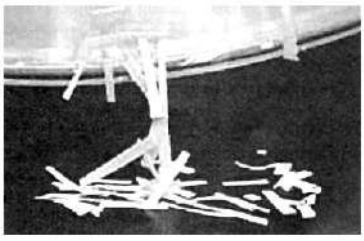


Fig.: A charged CD attracting pieces of paper

(iii) **Magnetic Force :** The force exerted by magnets on each other and on metals like iron and nickel is called magnetic force. Since magnets attract iron (Fig.), they are used to separate waste iron objects from garbage dumps so that they can be recycled.

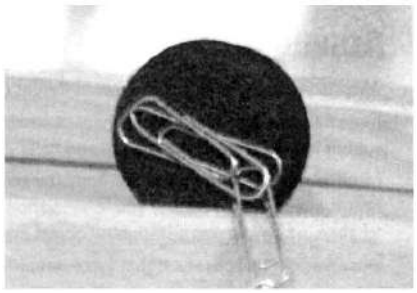


Fig.: A magnet attracting iron pins

Remember

Gravitational force : Objects or things fall towards the earth because it pulls them. This force is called force of gravity.

Note: Gravity is not a property of earth alone. In fact, every object in the universe, whether small or large exerts a force on every other object. This force is known as the gravity force.

Electrostatic force: Force exerted by any charged body on another charged or uncharged body is known as electrostatic force.

Illustration 1 : What is force?

Solution : Force acting on a body is push, pull or squeeze. It can not be seen, we can feel the force through its effects.

Illustration 2 : Write True or False for the statements given below.

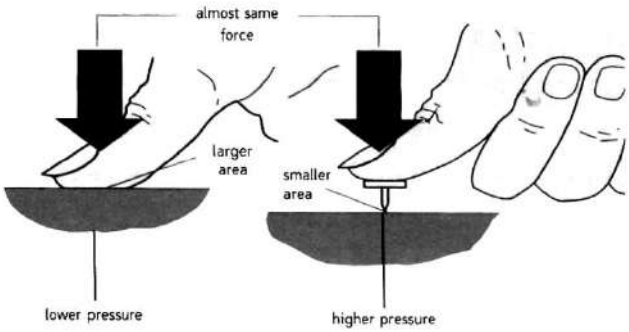
1. A force can make a moving object move faster. **[True]**

2. A moving object can be slowed down by applying a force. **[True]**
3. Forces that do not need physical contact with the object on which they are acting are called contact forces. **[False]**
4. An electrostatic force is a contact force. **[False]**
5. Amagnetic force is a non-contact force. **[True]**

6. Introduction (Pressure)

Press your thumb against a piece of paper without using your nails. What do you see? Now take a needle or a drawing pin and push its pointed end against the paper. What do you see this time? You will see that if you use a needle or a drawing pin, you will be able to make a hole in the paper, while you can't do the same with your thumb. Can you explain why this happens?

Although the force applied on the paper is almost the same in both the cases, the needle has a much smaller area of contact as compared to our thumb. This means that in the case of the needle the area over which the force acts is smaller, and therefore, its effect on the paper is much greater (it makes a hole in the paper). This is because of a physical quantity called **pressure**.



Pressure is defined as the force per unit area. The SI unit of pressure is **pascal** (Pa), which is newton per square metre.

$$\text{Pressure (in Pa)} = \frac{\text{Force (in newton)}}{\text{Area (in m)}}$$

The effect of force on a body depends on the pressure produced. Some very important and useful devices such as syringes, dropper, straw, etc. work on the principles of pressure. The normal force acting on a unit area of a surface is called pressure.

So porters place a round piece of cloth on their heads, when they have to carry heavy loads. By doing this they increase the area of contact of the load with their head.

So, the pressure on their head is reduced and they find it easier to carry the load. In mathematical form.

$$\text{Pressure} = \frac{\text{Normal Force (Thrust)}}{\text{Area on which it acts}}$$

Remember

Blaise Pascal (1623-1662)

Have you ever wondered why the unit of pressure is called pascal? It is named after the French mathematician and physicist Blaise Pascal. He was a child prodigy. He has made important contributions to the study of fluids and pressure, among many others.

Remember

Factors on which applied Pressure depends = $P \propto F$,

i.e. Pressure directly proportional to force and $P \propto \frac{1}{A}$ i.e. Pressure is inversely proportional to Area.

A camel has flat, broad feet that reduce the pressure exerted on the sand. As a result, the camel's feet sink very little in the sand, allowing it to move fast.

Illustration 3 : **If a force of 2 N is applied over an area of 2 cm^2, calculate the pressure produced. Note: To get the pressure in Pa, we have to make sure that the force is in newton and the area in m^2.**

Solution : Here, the area is in cm^2. To convert this to m^2, we have to divide the given area by 10,000.

$$\text{Thus, Area} = \frac{2}{10,000} = 0.0002\,\text{m}^2$$

$$\text{Now, Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$= \frac{2\text{N}}{0.0002\,\text{m}^2} = 10,000\,\text{Pa}$$

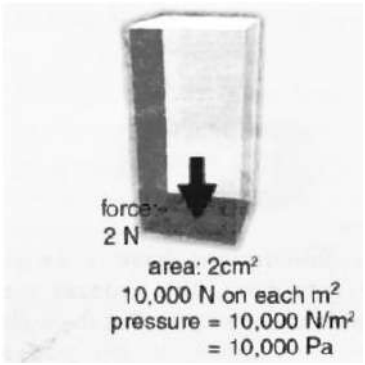


Illustration 3 : **Calculate the pressure if a force of 2 N is applied on an area of 2 mm^2.**

Solution : Here, again the area is not in m^2. To change it into m^2, we divide the area by 1,000,000. Thus,

$$\text{Area} = \frac{2}{1,000,000} = 0.000002\,\text{m}^2$$

$$\text{Now, Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$= \frac{2\text{N}}{0.000002\,\text{m}^2} = 1,000,000\,\text{Pa}$$

Have you noticed that in the above two examples we have taken the same force and calculated the pressure when this force acts over two different areas? You will see that the same force, when acts on a smaller area produces a greater pressure.

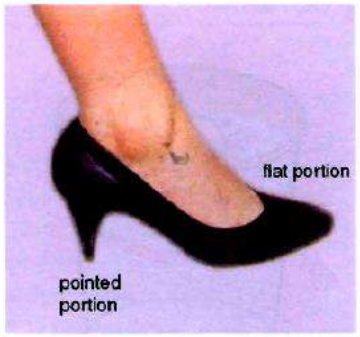
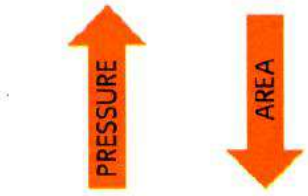


Fig. *The pointed end of a high-heeled shoe exerts a greater pressure than the flat end*



This picture is conveying a message. Can you figure out what it is? .....

1.6.1 Examples of Pressure in Everyday Life

1. The drawing pin is broad-based towards the thumb side and pointed towards the other end. This decreases the area of contact and the pressure exerted by the thumb increases. Thus, piercing becomes easier.

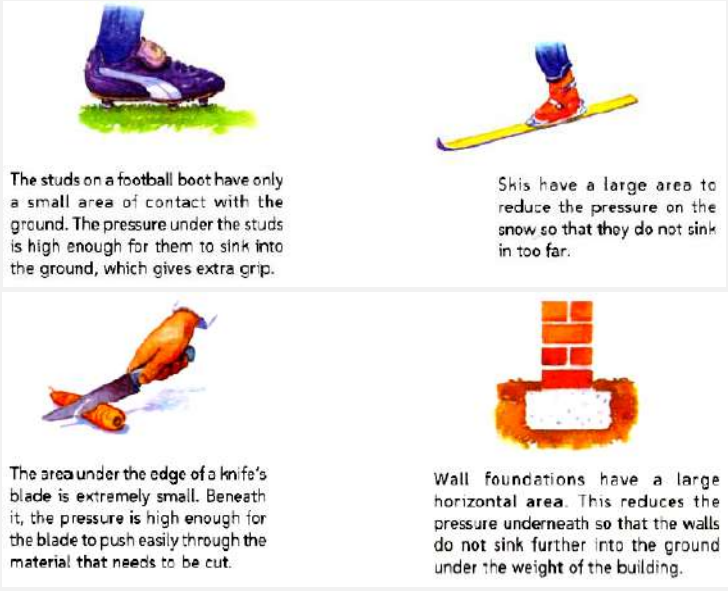
2. Desert animals like camels can walk easily on sand as compared to other animals because they have broad feet which exert less pressure on the ground.
3. Foundations of high-rise buildings are kept broad and wide so that they exert less pressure on the ground and do not sink in due to extremely high pressure of the building.
4. Porters wear turbans when they have to carry heavy loads on their heads, to increase the area of contact. This reduces pressure on their heads.
5. School bags and shopping bags have broad straps or belts so that the area of contact increases and pressure on the hand or shoulder is reduced.

6. A heavy truck or a lorry carrying heavy loads has eight tyres instead of four and the tyres are broader. This increases the area of contact with the ground, thus reducing the pressure exerted on the ground.
7. Have you ever noticed that the rails on a railway track are fixed to large wide wooden or steel sleepers? The heavy thrust of the train on the rail is spread over the large surface area of the sleepers. It reduces the pressure on the ground and prevents the rails from sinking into the Earth under heavy pressure

Remember

Variation of pressure with area

We have learnt just now that, for the same force, increasing the area over which it acts decreases the pressure applied. The converse is also true: decreasing the area of application increases the pressure produced, for the same force. This property is made use of many appliances that we use, to increase or decrease pressure.



1.6.2 Pressure exerted by Liquids and Gases

If a liquid is filled in a container then it exerts a pressure on the walls of the container, similarly gases too exerts pressure on the walls of their container.

(i) Pressure in fluids

Have you tried to push an inflated balloon into a bucket of water? Try it. You will find that as you try to push down the balloon, the water seems to be pushing it right back, upward!

In fact, if you stop pushing the balloon, the balloon will be pushed back to the surface. This is because the water in the bucket exerts a pressure on the balloon (Fig).

Fluids exert pressure

Liquids and gases are together called fluids. Fluids exert pressure on all bodies immersed in them and on the walls of the container that holds them. This is why a balloon expands when we blow air into it. The air inside the balloon exerts a pressure on the inner wall of the balloon. If we blow in too much air, and the material of the balloon is not capable of expanding further, increasing the pressure inside can cause the wall of the balloon to break at one or more points. This is why a balloon bursts when too much air is blown into it.

Did you know that all of us are immersed in a sea of air and are experiencing its pressure all the time? This is called atmospheric pressure. We will learn about atmospheric pressure in the following section) In case of solids the force can be applied in any direction with respect to the surface but in liquids, the force must be applied at right angles to the liquid surface. This is because fluids (liquids and gases) at rest cannot sustain a tangential force. Therefore, we state the pressure acting on the fluid instead of force.

The pressure (P) is defined as the magnitude of the normal force acting on a unit surface area of the fluid.

If a constant force of magnitudes Facts normally on a surface area A, then pressure acting on the surface is given by P = F/A.

The pressure is a scalar quantity this is because hydro static pressure is transmitted equally in all directions when force is applied which shows that a definite direction is not associated with pressure.

(ii) Units of pressure

(a) CGS and SI unit: In CGS, system unit of pressure is dyne cm^{-2}. In SI unit of pressure is Nm^{-2} or Pascal (Pa)

1 Pa = 1 N m^{-2}

Scientists discovered atmospheric pressure in the seventeenth century. This discovery uncovered an interesting fact-that air actually has weight! The weight of the atmosphere presses down on the earth's surface and creates a pressure on it. The pressure at any point exerted by the weight of the air above it is cal led atmospheric pressure.


The pressure of the air inside makes the balloon expand

Atmospheric pressure is defined as the pressure exerted on an object by the weight of the air above it.

The atmospheric pressure on the earth's surface at sea level is about one hundred thousand pascal, i.e., 100 kPa. If such an enormous amount of pressure is acting on us, why do we not feel it? This is because the pressure of the blood in the blood vessels and the other fluids present in the body balances out the atmospheric pressure.

Fact: The weight of the atmosphere on the top of your head is 250 kg wt, which is equivalent to the weight of about two baby elephants.

(iii) Variation of atmospheric pressure with altitude

The altitude of a place is its height above sea level. The atmospheric pressure at a place depends on its altitude. The atmospheric pressure decreases as we go up. Can you tell why this happens? We know that atmospheric pressure at a place is the force exerted by the weight of the air column above that place. As we go up, the length of the air column above us decreases. This means its weight, and therefore the atmospheric pressure is smaller at higher places (than at sea level).

What do you think will happen if air pressure is suddenly taken away? If the pressure of atmosphere is removed suddenly, our blood vessels and tissues will rupture due to the pressure of the blood and other fluids inside. This is why spacemen have to wear special pressurized suits as in space there is no air and hence, no air pressure.

(iv) Pressure in Liquids

As we mentioned earlier, both liquids and gases exert pressure. We just now learnt about the pressure exerted by air. Let us now learn about the pressure exerted by liquids.

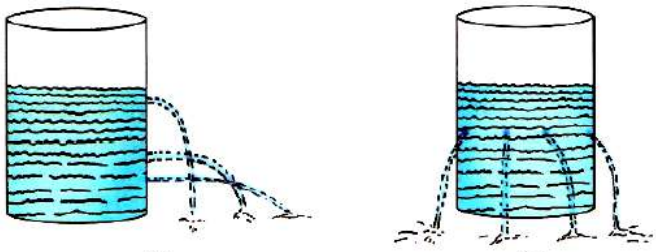
Try pushing down an inverted glass bottle into a bucket full of water. You will notice that the bottle resists being pushed down into water. This happens because of the force exerted by water on the bottle. Just like in the case of atmospheric pressure, the pressure at any point under a liquid is due to the weight of the liquid column above the point.

When an object is immersed in a liquid, the liquid exerts a net upward force on the object.

This upward force determines whether an object will float or sink in a liquid. If the upward force exceeds the weight of the object, the object floats; if the weight of the object exceeds the upward force, the object sinks.

(v) Variation of pressure with depth

As we go deeper beneath the surface of a liquid, the pressure increases. Pressure increases with depth. Deep under the sea the pressure exerted by water is much greater than at the sea level. See Figure.



Pressure exerted by liquids varies with depth

The pressure experienced by deep-sea divers is so great that they have to wear specially designed suits to protect themselves. They use special suits called diving suits and buoyancy compensators to combat the weight of their diving equipment and the water pressure at great depths [Fig. (a)].

Dams are made stronger and thicker at the bottom than at the top to withstand the high pressures at greater depths [Fig. (b)].

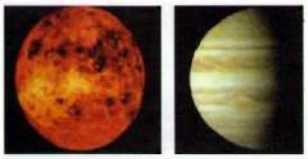
Fig.: (a) Special suits of divers and (b) dams are made to withstand high pressures at greater depths

Remember

- **Decompression sickness :**Decompression sickness, one of the dangers of diving, is a common symptom noticed inmost deep-sea divers. Because deep sea divers have to breathe air at high pressure under water, more air dissolves in their blood and tissues than at atmospheric pressure. Now if the diver were to swim to the surface quickly, it's like uncorking a soda bottle-the air is released. This leads to a painful condition called decompression sickness, also called bends, which is characterized by severe pains in joints and chest, skin irritation, cramps, and paralysis. In severe cases, the condition may prove to be fatal too. To avoid the effects of quick decompression, it is advisable that the diver rises slowly and/or makes intermittent stops on the way up (called "decompression stops") so that the air can escape slowly.
- **Reason behind the release of nitrogen gas :** Deep underwater the solubility of gases increases because a greater amount of gas dissolves under high pressure. When the diver rises to the surface suddenly, there is a sudden drop in the surrounding pressure, which causes the air (containing mainly nitrogen gas) to escape or decompress This results in the formation of nitrogen bubbles in the blood and tissues, consequently causing severe pains to the diver.

Remember

Atmospheric Pressures on Other Planets :



Have you ever wondered if there is an atmospheric pressure on other planets? Well, if a planet has an atmosphere, it will have an atmospheric pressure too! For example, the atmospheric pressure on Jupiter is so high that scientists believe that on Jupiter, hydrogen exists as a super hot liquid metal. The planet Venus too has a thick atmosphere and has an atmospheric pressure of about 90 times that on the surface of the earth.

Atmospheric pressure :

The envelope of gases surrounding the earth is called atmosphere. At the earth's surface the composition of dry air is 78% nitrogen, 21% oxygen, 0.94% argon, 0.03% carbon-dioxide, 0.01% hydrogen and the remainder includes small amounts of neon and helium. As we go higher, the density of atmospheric air goes on decreasing. Thus it becomes difficult to breath at high altitude above sea level. The ocean of air (i.e. atmosphere) exerts pressure on the earth's surface. The pressure is called atmospheric pressure.

Standard or normal atmospheric pressure is equal to the pressure due to a column of 76 cm (= 0.76m) of mercury at 0°C at sea level, density of mercury = 13.6 × 103 kg ×m^{-3} and at sea level, g = 9.8 ms^{-2}.

Now, $P = h\rho g$

$\therefore$ 1 atmospheric pressure = $76 \times 13.6 \times 10^3 \times 9.8$ N m^{-2}

= 1.013×10^5 N m^{-2} (or Pa)

Practical units of atmospheric pressure:

1 Atmosphere (atm) = 76 cm of mercury column at 0°C and at sea level

= 1.013×10^6 dyne cm^{-2}

= 1.013×10^5 Nm^{-2}

= 1.013×10^5 Pa

1 bar = 10^6 dyne cm^{-2}

= 10^5 Nm^{-2}

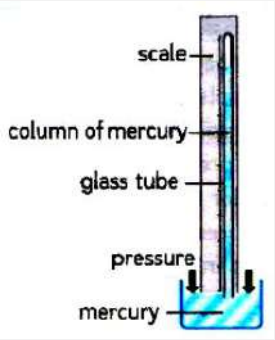
$= 10^5$ Pa

1 millibar $= 10^{-3}$ bar
$= 10^{-3} \times 10^6$ dyne cm^{-2}
$= 10^3$ dyne cm^{-2}
$= 10^2$ Nm^{-2}
$= 10^2$ Pa

1 torr = 1 mm of mercury column
= 133.3 Pa

Remember

Barometer : An instrument used to measure atmospheric pressure is a barometer. It consists of a long glass tube, which is sealed at one end. It is filled with mercury, a silvery liquid metal. The open end of the tube (filled with mercury) is placed in a small trough full of mercury. The air exerts pressure on the mercury in the trough and is able to hold certain h eight of mercury column. When the air pressure reduces, the column of the mercury moves down, and when the air pressure increases, the height of the mercury column increases. This way, the pressure is measured by the height of the mercury column, in mm of Hg, i.e., the height of the mercury column in millimeters. At sea level it is 760 mm of Hg.



Water Barometer

Let us suppose water is used in the barometer instead of mercury

We know, atmospheric pressure = 1.013×10^5 N m^{-2}. Let h be the height of the water column supported by earth's atmosphere.

Therefore, pressure corresponding to height h of water column = $h\rho g$

Now $h\rho g = 1.013 \times 10^5$ or $h = \dfrac{1.013 \times 10^5}{\rho g}$

For water, $\rho = 10^3 kgm^{-2}$ $\therefore h = \dfrac{1.013 \times 10^5}{10^3 \times 9.8} = 10.3m$

Thus, the height of the water column in the tube of a barometer will be 10.3m. Such a long tube cannot be managed easily and hence water can not be the replacement of the mercury in the barometer. In other words, water barometer is not feasible.

7. Other Applications of Pressure

(a) Drinking straw

You must have used a drinking straw to suck up fruit juice. When air is sucked in, it causes a decrease in air pressure inside the straw. The atmospheric pressure on the outside forces the liquid inside the straw. This is called suction mechanism. The dropper also works on the same principle.

(b) Syringe

In the case of a syringe, the pressure of the liquid (blood) forces the liquid to move into the syringe when its plunger is withdrawn.

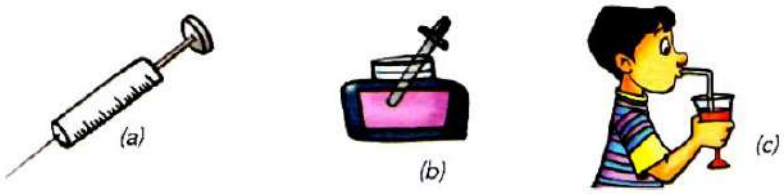
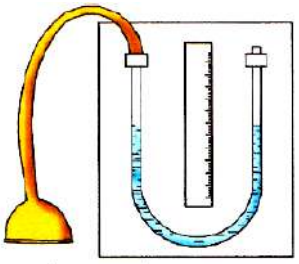


Fig.:(a) Syringe, (b)Dropper and (c)Drinking straw work on the principle of pressure

(c) Vacuum Cleaner

A vacuum cleaner, as you might be aware, helps clean up the debris from carpets and the remotest corners of a house. Have you ever wondered how it works? A vacuum cleaner is an electrical appliance that cleans surfaces by suction. Afan inside the vacuum cleaner lowers the air pressure and creates a low pressure inside the device. Consequently, the air and dirt particles on and near the surface are sucked into the device. This is what helps in cleaning the surface.

(d) Measuring Pressure

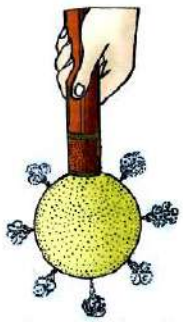


An open-tube manometer

The instrument used to measure pressure is called a pressure gauge. The simplest type of pressure gauge is the open-tube manometer which measures pressure difference. A manometer consists of a U-shaped tube containing a liquid (sometimes water). One arm of the tube is open to air and the other arm is connected to the vessel in which we want to measure the pressure (Figure).

The difference in liquid level represents the applied pressure.

(e) Pascal's Law :



Transmission of pressure in a liquid

The pressure applied to an enclosed liquid gets transmitted equally to every part of the liquid. This property was first demonstrated by Pascal and is called Pascal's law. According to Pascal's law, when some pressure is applied to any part of the enclosed liquid, an equal and uniform pressure gets transmitted over the whole liquid.

Hydraulic devices like hydraulic press and car brakes work on the above principle.

The pressure applied to an enclosed liquid gets transmitted equally to every part of the liquid. It can be demonstrated using a glass vessel with holes at different places as shown in Figure. When a force is applied to the piston, the pressure exerted on the water is transmitted equally throughout the water so that water comes out of all the holes with equal force.

Illustration 4 : **Define Pressure.**

Solution : The force per unit area of a surface and normal to it is called pressure.

Illustration 5 : **A man of weight 500 N (i.e. 50 kg) is standing on a plat form of area 1/10 m^2. Find pressure on the ground due to the plat form assume plat form as massless.**

Solution : $$P = \frac{\text{Force}}{\text{Area}} = \frac{500\,\text{N}}{1/10\,\text{m}^2} = 5000\ \text{N/m}^2 = 5000\,\text{Pa}$$

Note that force is taken in newton and area is taken in m^2 to get the pressure in N/m^2 or Pa.

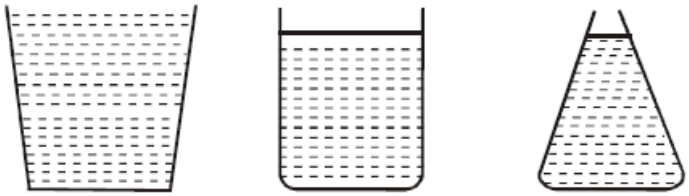
Illustration 6 : **Find pressure due to water at a depth 2m inside it (Given density of water = 1 g/cm^3 = 1000 kg/m^3)**

Solution : $P = \rho\ g\ h$

Here to find pressure in N/m^2 (SI unit)
We have to take density (ρ) in kg/m^3
g in m/s^2 which is $10m/s^2$
h in metre which is 2m
So, $P = 1000 \times 10 \times 2 = 20000\ N/m^2$

Hydrostatic Paradox

Consider three vessels A, B and C of different shapes as shown in figure.



All these vessels have the same area of base and all of them are filled with water to the same depth. The pressure at the base of each vessel is same, regardless of the shapes of the vessels. Pressure is directly proportional to the depth and by applying Pascals law it can be seen that pressure is independent of the size and shape of the containing vessel.

Let Us Recapitulate

- Force is a push or pull or squeeze that can change the speed, direction or shape of a body. It may also be defined as an external agency that displaces or tends to displace a body from its position of rest.
- Contact forces are those forces which act only when objects are in physical contact with each other and bring about necessary changes.
- The effect of a contact force depends on the magnitude of the force and the area over which it acts. The smaller the area of contact, the greater is the effect of the force.
- The force exerted by the muscles is called muscular force. It can also change the shape of the bodies.
- Some forces do not involve physical contact between the bodies on which they act. These forces are called 'Non-contact Forces.'
- The force which a magnet exerts on the iron nails is called magnetic force.
- The force which results due to repulsion of similar charges or attraction of opposite charges is called electrostatic force.
- When two surfaces slide over each other, the force which opposes their relative motion is called friction or force of friction.
- Mass is the quantity of matter contained in a body. Weight is the force with which the Earth pulls a body towards its centre.
- The force acting per unit area of a surface is called pressure.
- SI unit of pressure is Nm^{-2}. Pascal is another unit of pressure 1 Pa = $1Nm^{-2}$
- The total force acting perpendicularly on a surface is known as thrust. Pressure = $\frac{\text{Thrust}}{\text{Area}}$
- According to Pascal's law, when pressure is applied to any part of the liquid, an equal and uniform pressure gets transmitted over the whole liquid.
- The atmosphere is the layer of air around the Earth. It extends up to 1000 km above the surface of the Earth and has a total weight of about 4.5×10^{18} kg. This weight exerts a pressure on the surface of the Earth which is called atmospheric pressure.
- At high altitudes the air pressure is less, therefore, breathing is difficult and nose bleeding may occur.
- The single force which acts on the body to produce the same effect in it as done by all the forces

collectively is called resultant force. When two forces act in the same direction along the same line, the resultant force is equal to the sum of the two forces.

- When two forces act along the same line but in opposite directions, the resultant force is equal to the difference of the two forces.
- In case the resultant of all the forces acting on an object is zero, the forces are said to be balanced forces. For a given force, smaller the area of contact, higher is the pressure exerted by it.
- For a given force, larger is the area of contact, lesser is the pressure exerted by it.
- For a fixed area of contact, the pressure exerted increases with an increase in force or other way round.
- A pressure exerted by a liquid increases with depth, pressure at the bottom of the sea is much greater than its surface. At a depth of 1000 m, pressure due to water is about 100 times greater than the atmospheric pressure.
- Pressure exerted by a liquid does not depend on shape or size of the container.

DPP-1

1. A box is pulled by two forces but in opposite direction as shown in below figure (in which direction of you the box will move)

(a) Left Side (b) Right side (c) don't move (d) can't says

2. When two forces applied on an object are equal and opposite, then these forces

(a) may move the object.

(b) may stop a moving object.

(c) may move the object and also cause a change in its shape.

(d) do not move the object but may cause a change in its shape.

3. When two unbalanced forces act on a body, in opposite directions, the net force is equal to

(a) the sum of the individual unbalanced forces.

(b) zero.

(c) difference between the two unbalanced forces and is in the direction of the larger force.

(d) difference between the two unbalanced forces and is in the direction of smaller force.

4. 1 kilogram weight is

(a) 98 N (b) 9.8 N (c) 0.98 N (d) 0.098 N

5. A batsman hits a cricket ball which then rolls on the level ground. After covering a short distance the ball comes to rest. The ball stops due to

(a) magnetic force (b) frictional force (c) gravitational force (d) muscular force

6. Fruits falling from trees is an example of

(a) Gravitational force (b) Muscular force (c) Frictional force (d) Electric force

7. Which physical quantity of a body always remains constant ?

(a) mass (b) weight (c) speed (d) force

8. Which of the following types of forces is not a contact force ?

(a) muscular force (b) frictional force (c) magnetic force (d) none of these

DPP-2

1. Magnetic force is
(a) Contact force (b) Non-contact force (c) both (a) and (b) (d) None.
2. The force exerted by animal body is called
(a) muscular force (b) mechanical force (c) gravitational force (d) magnetic force
3. Which among the following will exert maximum pressure when pushed with the same amount of force?
(a) An eraser of area 2 cm^2 (b) A sharpened pencil tip
(c) The blunt end of a pencil (d) The rear portion of a closed safety pin
4. When a force is applied over a larger area, the pressure produced will .
(a) increase (b) decrease (c) both (a) and (b) (d) none of these
5. Pressure is also measured in .
(a) joule (b) mm of Hg (c) mm of Ag (d) meter
6. Force per unit area is called
(a) Energy (b) work (c) pressure (d) trust
7. When a force is applied to a body of mass 2kg, its velocity changes from 20 m/s to 30 m/s in 2 sec. the rate of change of momentum of the body is
(a) 10 kg ms^{-1} (b) 10 N (c) 0.1 N (d) 10 kgm
8. The momentum of a body of given mass is proportional to
(a) its colour (b) its velocity (c) its volume (d) its shape

DPP-3

1. SI unit of thrust is
(a) N (b) kgm^{-3} (c) Nm^{-2} (d) $kgNm^{-3}$
2. When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb, water gets filled in dropper. The rise of water in the dropper is due to
(a) Pressure of water (b) gravity of the earth
(c) shape of rubber bulb (d) atmospheric pressure.
3. Atmospheric pressure is measured by :
(a) Barometer (b) manometer (c) screw gauge (d) none of these
4. A force of 50 N is applied on a nail of area 0.001 sq. cm. then the thrust is
(a) 50 N (b) 100 N (c) 0.05 N (d) 10 N
5. How does pressure vary as we come from mountain top to sea level?
(a) increases (b) decreases (c) remains same (d) depends on weather
6. As we go deeper beneath the surface of a liquid, the pressure:
(a) remains same (b) increases (c) decreases (d) depends on weather
7. A vacuum cleaner works on the principle of :
(a) Electro Magnetic Induction (b) Suction
(c) Mutual Induction (d) Energy conservation

8. A wooden piece 5 N in weight and 5 cm × 3 cm × 2 cm in size lies on 5 cm × 2 cm face. The pressure exerted by it in N per cm^2 is
(a) 150 (b) 50 (c) 0.5 (d) 15

DPP-4

1. Rockets work on the principle of conservation of
(a) mass (b) momentum (c) energy (d) Impulse
2. The law of conservation of momentum holds for
(a) individual particles (b) only for two particles
(c) A system of particles (d) only for three particles
3. The law of conservation of momentum states that the sum of momentum of two objects before collision is equal to the sum of momenta after collision provided that
(a) No internal unbalanced force acts on them (b) No external unbalanced force acts on them
(c) No external balanced force acts on them (d) No internal balanced force acts on them
4. The momentum of an isolated system remains conserved provided
(a) Net final momentum of the system is zero (b) Net external force of the system is non-zero
(c) Net initial momentum of the system is zero (d) Net external force on the system is zero
5. Find the impulse and force which make 12 m/s change in the velocity of object having 16 kg mass in 4 sec
(a) F = 48 N, I = 12 $kgms^{-1}$ (b) F = 48 N, I = 192 $kgms^{-1}$
(c) F = 160 N, I = 640 $kgms^{-1}$ (d) F = 160 N, I = 40 kg ms^{-1}
6. Two objects each of mass 1.5 kg are moving in the same straight line but in opposite directions. The velocity of each object is 2.5 m/s before the collision during which they stick together. What will be the velocity of the combined object after the collision ?
(a) 2.5 m/s (b) 5 m/s (c) zero (d) 3 m/s
7. A ball of mass 5 kg moving at 3 m/s collides with another ball of mass 3 kg moving at 5 m/s in the same direction. If the balls move together after the collision in the same direction, find their common velocity
(a) 5 m/s (b) 3.75 m/s (c) 6.25 m/s (d) 7.5 m/s
8. A man pushes a moving ball on a frictionless floor. If the man pushes with force 11 N for 5 seconds, what is the change of momentum of ball.
(a) 5 N-S (b) 55 N-S (c) 11 N-S (d) 137 N-S

NCERT Basics Exercise-1

1. Give two examples each of situations in which you push or pull to change the state of motion of objects.
2. Give two examples of situations in which applied force causes a change in the shape of an object.
3. Fill in the blanks in the following statements.
(a) To draw water from a well we have to _____ at the rope.
(b) A charged body _____ an uncharged body towards it.
(c) To move a loaded trolley we have to _____ it.
(d) The north pole of a magnet _____the north pole of another magnet.

4. An archer stretches her bow while taking aim at the target. She then releases the arrow, which begins to move towards the target. Based on this information fill up the gaps in the following statements using the following terms.

   muscular, contact, non-contact, gravity, friction, shape, attraction

   (a) To stretch the bow, the archer applies a force that causes a change in its _____.

   (b) The force applied by the archer to stretch the bow is an example of _____ force.

   (c) The type of force responsible for a change in the state of motion of the arrow is an example of a _____ force.

   (d) While the arrow moves towards its target, the forces acting on it are due to _____ and that due to _____ of air.

5. In the following situations identify the agent exerting the force and the object on which it acts. State the effect of the force in each case.

   (a) Squeezing a piece of lemon between the fingers to extract its juice.

   (b) Taking out paste from a toothpaste tube.

   (c) A load suspended from a spring while its other end is on a hook fixed to a wall.

   (d) An athlete making a high jump to clear the bar at a certain height.

6. A blacksmith hammers a hot piece of iron while making a tool. How does the force due to hammering affect the piece of iron?

7. An inflated balloon was pressed against a wall after it has been rubbed with a piece of synthetic cloth. It was found that the balloon sticks to the wall. What force might be responsible for the attraction between the balloon and the wall?

8. Name the forces acting on a plastic bucket containing water held above ground level in your hand. Discuss why the forces acting on the bucket do not bring a change in its state of motion.

9. A rocket has been fired upwards to launch a satellite in its orbit. Name the two forces acting on the rocket immediately after leaving the launching pad.

10. When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to

    (a) pressure of water.

    (b) gravity of the earth.

    (c) shape of rubber bulb.

    (d) atmospheric pressure.

Concept Mastery Exercise-2

A. Very Short Answer Type Questions

1. Name some non-contact forces.
2. How do we feel force in our daily life?
3. A rocket has been fired upwards to launch a satellite in its orbit. Name the two forces acting on the rocket immediately after leaving the launching pad.
4. Can you separate two hemispheres, if all the air is suck out from them?
5. What is gravitational force?
6. How does an applied force changes the speed of an object?
7. What may be the consequences when a force is applied on an object?
8. Explain that liquids exert equal pressure at the same depth.
9. Explain that forces are due to an interaction between objects.
10. A chapati maker is a machine that converts balls of dough into chapati's. What effect of force comes into play in this process?

B. Short Answer Type Questions

11. A man is pushing a cart down a slope. Suddenly the cart starts moving faster and he wants to slow it down. What should he do?
12. Show that a liquid exerts pressure on the walls of the container.
13. What are non-contact forces? Explain different types of non-contact forces with examples.
14. Write the effects of the force applied on an object.
15. Define the following:
    a. Muscular force
    b. Frictional force

C. Long Answer Type Questions

16. Explain why, atmospheric pressure decreases as we go higher up above the earth's surface?
17. When a person stands on a cushion, the depression is much more than when he lies down on it. Explain with a reason.
18. Explain the working of a dropper and its principle.
19. a. What is meant by contact force? Explain with the help of an example.
    b. What is meant by non contact force? Explain with the help of an example.
20. a. How does the pressure of a liquid depend on its depth?
    b. Explain why, the walls of a dam are thicker near the bottom than at the top?

D. True & False

21. (a) Frictional force is a non contact force.
    (b) Liquids exert pressure upwards too.
    (c) SI derived unit of pressure is pascal.
    (d) Force can change the direction of the moving body.
    (e) Magnetic force is an example of non contact force.

E. Fill in the Blanks

22. (a) To draw water from a well we have to _____ at the rope.
    (b) The force exerted per unit area is called _____.
    (c) Force acting on per unit area is called _____.
    (d) The force applied by the archer to stretch the bow is an example of _____ force.
    (e) To stretch the bow, the archer applies a force that cause a change in its _____.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

1. 1N/ sq m is equal to
   (a) 1 Pa (b) 1.5 Pa (c) 0.1 Pa (d) 10 Pa
2. How much force is applied on a body of mass 10 kg to increase its acceleration by 2m/s sq?
   (a) 20 N (b) 10 N (c) 5 N (d) 12 N
3. Two objects repel each other. This repulsion could be due to
   (a) magnetic force only
   (b) electrostatic force only
   (c) either a magnetic or an electrostatic force
   (d) frictional force only
4. A brick is kept in three different ways on a table as shown below. The pressure exerted by the brick on the table will be _____ .
   (a) maximum in position A
   (b) maximum in position B
   (c) equal in all case
   (d) maximum in position C
5. Which of the following statements is/are correct about friction between the two bodies?
   I. Limiting friction is always greater than the kinetic friction
   II. Static friction is always greater than the kinetic friction
   III. Limiting friction is never less than the static friction
   IV. Both I and III
   (a) Only II
   (b) Only III
   (c) Only I
   (d) Only IV

6. A boy having area of 70 cm sq. exerts a pressure of 7N/cm sq. on the ground. The Force acting on the ground will be
(a) 77 N (b) 10 N
(c) 490 N (d) 100 N
7. With increase in the altitude, the pressure of the atmosphere
(a) Increases (b) Both Increases and Decreases
(c) remains constant (d) decreases
8. Two forces each of 20 N act simultaneously on a body, the maximum net force and minimum net force are
(a) 40 N and 0 (b) 20 N and 10 N
(c) 20 N and 0 (d) 40 N and 20 N
9. A ball is moving on a floor (surface) along a straight path with a uniform speed State the conclusion you can draw from this statement
(a) No gravitational force is acting on the bail. (b) The force acting on the bail is zero.
(c) No frictional force acts on the rolling objects. (d) A non-contact force is acting on the hall against frictional force.
10. The lateral pressure exerted by liquid at same height is
(a) Less in right direction (b) Equal in all direction
(c) More in left direction (d) Not equal in all direction
11. Brakes of vehicle is stopped by using brake that works on property of
(a) Retardation (b) Friction
(c) Acceleration (d) Pressure
12. A body moving on leveled grounds need to apply constant force to
(a) Contact force (b) Gravitational force
(c) Overcome frictional force (d) Magnetic force of earth
13. Three forces start acting simultaneously on an object moving with velocity v. These forces are represented in magnitude and direction by three sides of a triangle taken in the same order. The object will now move with a velocity
(a) Less than v (b) More than v
(c) Same as v (d) Object will not move
14. The fluid friction depends on
(a) Shape of object (b) All of these
(c) Speed of object with respect to fluid (d) Size of object
15. A sharp knife enables us to cut through things more easily as compare to a blunt knife because:
(a) The pressure exerted is greater when the same force is used.
(b) The pressure exerted is lesser when the same force is used.
(c) The sharp edge is not felt when cutting through the material.
(d) The sharp edge can pass through the materials slowly.
16. While walking on the ground we apply force on
(a) friction (b) ground
(c) gravitational (d) shoes
17. Identify the correct statements.
i. The speed of an object is zero in the state of rest.
ii. A change in the state of motion of an object is described by its speed only.
iii. A change in the state of motion of an object is described either by its speed, or by the direction of motion, or both.
(a) (iii) Only (b) (i), (ii) and (iii)
(c) (i) and (iii) Only (d) (i) and (ii)
18. S.I. unit of pressure is
(a) Kelvin (b) Celsius
(c) Newton (d) Pascal
19. When we press the bulb of a dropper, with its nozzle kept under water, air in the dropper is seen to escape in the form of bubbles. If we then release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to _____ .
(a) gravity of the earth (b) liquid pressure
(c) atmospheric pressure (d) weight of the bulbs

20. Ball bearings are used in bicycles, cars, etc. because
(a) the effective area of contact between the wheel and axle is reduced
(b) the effective area of contact between the wheel and axle is increased
(c) the actual area of contact between the wheel and axle is Decreased
(d) the actual area of contact between the wheel and axle is increased

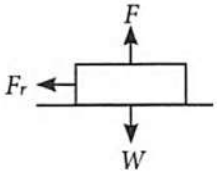
21. S.I. unit of force is
(a) Newton (b) Pascal
(c) Watt (d) Joule

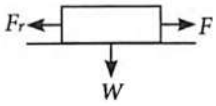
22. Pressure is
(a) Inversely proportional to force (b) Directly proportional to mass
(c) Inversely proportion to area of contact (d) Directly proportional to area of contact

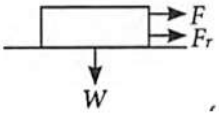
23. Rate of change in velocity is called
(a) Momentum (b) Conservation
(c) Acceleration (d) Gravitation

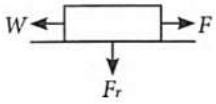
24. The force of gravitation acts
(a) only between the earth and the bodies on it
(b) only between the sun and the planets moving around it
(c) between all bodies in the universe
(d) only between the sun and the earth

25. An object of weight W is pulled along a rough horizontal surface by a force F. The force of friction is Fr. Which diagram correctly shows the direction of these forces on the object?

(a) 

(b) 

(c) 

(d) 

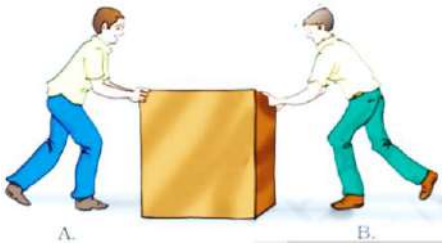
26. The pressure exerted by liquids _____ .
(a) depends on the upper direction (b) is at same depth in all directions
(c) depends on the depth (d) is downwards and sideways

27. In rolling the ball of dough into chapati, we use_____ .
(a) gravitational force (b) frictional force
(c) Both B and C (d) muscular force

28. A force creates acceleration of 10 m/s2 in a body of 0.5 kg. The value of force will be:
(a) 5 N (b) 6 N
(c) 20 N (d) 50 N

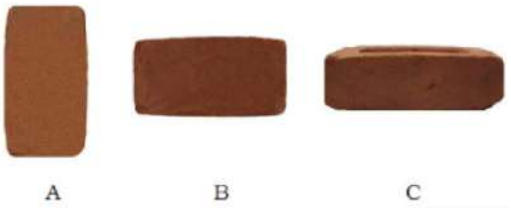
29. Magnetic needle always aligns itself in north south direction due to _____.
(a) Magnetic force (b) Electrostatic force
(c) Frictional force (d) Gravitational force

30. In Fig. two boys A and B are shown applying force on a block. If the block moves towards the right, which one of the following statements is correct?



(a) Magnitude of force applied by A is smaller than that of B.
(b) Magnitude of force applied by A is greater than that of B.
(c) Magnitude of force applied by A is equal to that of B.
(d) Net force on the block is towards A.

31. A brick is kept in three different ways on a table as shown in Fig. The pressure exerted by the brick on the table will be



(a) equal in all cases
(b) maximum in position A
(c) maximum in position C
(d) maximum in position B

32. The north pole of magnet _____ the north pole of another magnet.
(a) Attracts
(b) Repels
(c) Push
(d) Pull

33. To draw water from a well we have to _____ the rope.
(a) Contract
(b) Stretch
(c) Pull
(d) Push

34. When we press the bulb of a dropper with its nozzle kept in water, air in the dropper is seen to escape in the form of bubbles. Once we release the pressure on the bulb, water gets filled in the dropper. The rise of water in the dropper is due to –
(a) gravity of the earth
(b) atmospheric pressure
(c) shape of rubber bulb
(d) pressure of water

B. Assertion & Reason Questions

35. **Assertion (A):** When a stone is thrown vertically upward, after getting a certain height' it comes back to the earth.
Reason (R): Stone has to work against the force of friction of air.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

36. **Assertion (A):** The motion imparted to objects was due to the action of a speed.
Reason (R): In science, a push or a pull on an object is called a force.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

37. **Assertion (A):** Steel nails are pointed at one end to have the least area of contact with the surface.
Reason (R): Least area exerts high pressure.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

38. **Assertion (A):** While taking a penalty kick in football, the player applies a force on the ball and ball move toward the goal.
Reason (R): The goalkeeper try to save the goal and therefore he apply force to stop the ball.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

D. Match The Column

39. Match the items given in Column A with those in Column B suitably:

Column A	Column B
(i) Magnet	(a) Unit area
(ii) Gravity	(b) Non-contact force
(iii) Pressure	(c) Earth
(iv) Friction force	(d) Pull or push
(v) Force	(e) Contact force

40. Match column I with column II and select the correct option from given codes.

Column A	Column B
(i) Small grain pieces fall down while sieving grains	(a) Magnetic force
(ii) A gas filled balloon moving up in air.	(b) Electrostatic force
(iii) During dry weather we see hair flying apart while combing it.	(c) Gravitational force
(iv) The doorbell chimes when we press the button.	(d) Buoyant force
(v) Meteor burns in air after it enters atmosphere.	(e) Frictional force
(vi) During dry weather, synthetic clothes often stick to our skin.	

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

E. Case Study or Paragraph

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:

Teacher of class 8 performed the following activity in the class.
Step 1 - Take a plastic bottle. Fix a cylindrical glass tube, a few cm long near its bottom
Step 2 - Cover the mouth of the glass with a thin rubber sheet.
Step 3 - Now fill the bottle up to half with water.
Step 4 - Some changes occur. Pour some more water in the bottle.

41. The above activity demonstrates
(a) Weight exerts pressure
(b) Water exert pressure
(c) Air and Weight exert pressure
(d) Air exert pressure

42. Pressure exerted by liquid decreases by
(a) Decrease width depth
(b) Increases with depth
(c) Is different in different direction at the same depth
(d) Doesn't change with depth

43. The rubber sheet has been fixed on the side of the container and not at the bottom indicate
(a) container does not exert pressure
(b) Container exert pressure on the side of wall
(c) Container exert pressure on the bottom
(d) container does exert pressure

44. The force acting on a unit area of a surface is called

45. Gases, too, exert pressure on the walls of their container.
(a) True
(b) False

Answer Key

DPP-1

1.	(a)	2.	(d)	3.	(c)	4.	(b)	5.	(b)	6.	(a)	7.	(a)
8.	(c)												

DPP-2

1.	(b)	2.	(a)	3.	(b)	4.	(b)	5.	(b)	6.	(c)	7.	(b)
8.	(b)												

DPP-3

1.	(a)	2.	(d)	3.	(a)	4.	(a)	5.	(a)	6.	(b)	7.	(b)
8.	(c)												

DPP-4

1.	(b)	2.	(c)	3.	(b)	4.	(d)	5.	(b)	6.	(c)	7.	(b)
8.	(b)												

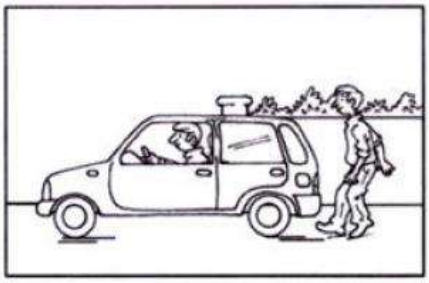
Concept Mastery Exercise-2

1. (i) Electrostatic forces
   (ii) Magnetic force
   (iii) Force due to gravity.
2. Various big or small actions make us feel the force. We hit or catch many objects in our daily life. We see that a moving ball stops on its own. The ball changes the direction of its motion when it is hit with a bat. We make lassi etc. by churning of curd. These are many actions which help us to feel that a force is exerted.
3. The two forces acting on rocket are :
   (i) Force due to gravity acts vertically downward.
   (ii) Force of push acting upward.
4. There is no air inside the two hemispheres, so only outer surface is in contact of atmospheric pressure. This is because we cannot separate them.
5. The force by which earth or any other object attracts objects towards itself is called the gravitational force.
6. When a force is applied on an object, it may change its speed. If the applied force is in the direction of motion, the speed of the object increases. If the force is applied in the direction opposite to the motion, then it results in a decrease in the speed of the object.
7. When a force is applied on an object it can.
   (i) Change the shape of the object.
   (ii) Change in the state of motion of the object.

8. Take an empty plastic bottle. Drill four holes all around near the bottom of the bottle. Make sure that all the holes are at the same height from the bottom. Now fill the bottle with water. We observe that different streams of water coming out of the holes fall at the same distance from the bottle. This observation indicates that liquids exert equal pressure at the same depth.

Liquid exerts equal pressure at the same depth.

9. Imagine, a man is standing behind a stationary car. The car does not move due to his presence. Now allow the man to push the car, it means he applies a force on the car. The car may begin to move in the direction of the applied force. Note that the man to push car to make it move. This example shows that at least two objects must interact with each other for a force to come into play.



(*a*) A man standing behind a stationary car.

(*b*) A car being pushed by a man.

10. Pressure is defined as the force acting per unit area.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Note that the pressure is inversely proportional to the area. So smaller the area, larger the pressure on a surface.

Chapatti maker works on this principal. This large pressure converts balls of dough into chapattis

11. Men should follow the steps given below:

i. If the force is applied in the direction of opposite to the direction of motion, then it results in a decrease in the speed of the object.

ii. Hence, to slow down the cart, he should apply an opposite force to the moving cart.

iii. To balance the downward motion of the cart which is due to the force of gravity, he can start pulling the cart instead of pushing the cart.

12. Take a plastic bottle. Fix a small glass tube above the bottom of the plastic bottle. We should seal the joint of glass tube with plastic bottle by using molten wax so that water does not leak from the joint. Tie a thin sheet of rubber tightly on the open end of glass tube. Now fill half of plastic bottle with water. On filling water, the rubber sheet tied to the mouth of glass tube gets stretched and bulges out. The bulging out of rubber sheet tied to the glass tube fixed in the wall of plastic bottle demonstrates that water present in plastic b ottle exerts pressure on the walls of the bottle. It is the sideways pressure exerted by water which inflates the thin rubber sheet forming a buldge. If we pour more water in the plastic bottle to increase depth, we will see that the bulge in the rubber sheet increases. This indicates that the pressure exerted by water increases with increasing depth.

Liquid exerts pressure on the walls of the container.

i. The pressure exerted by a liquid on the walls of container increases with increasing depth.

ii. A liquid exerts pressure on the walls of its container.

13. The forces which can be exerted from a distance, without establishing a contact non-contact forces. Some non-contact forces are:
(i) Magnetic force: The force exerted by a magnet on other magnet or some magnetic substance like iron is called magnetic force.
Like poles of a each other and unlike poles of a magnet attract each other without contact. called non-contact force.
(ii) Electrostatic force: The force exerted by a charged body on other char* uncharged body is called electrostatic force.
Electrostatic force also acts making a direct contact with other charged or uncharged body. So it is also a non-contact force.
(iii) Force of gravity: Earth pulls every thing or body towards it. The force of attraction exerted by earth on any object is called force of gravity. This is also a non-contact force as it acts from a distance.
14. The effects of force applied on an object are as follows:
a. A force can move a stationary body.
b. A force can stop a moving body.
c. A force can change the speed of the moving body.
d. A force can change the direction of the moving body.
e. A force can change the shape and size of the body.
15. i. Muscular force- The force exerted by the muscles of our body is called the muscular force. Both human beings and animals can exert force with their muscles. For example, we push a cart with our muscles, child riding a bicycle is using his legs muscles to ride a cycle, and a person drawing water from the well is using his muscular force.
ii. Frictional force- A force that opposes the motion of an object is called a frictional force. It acts between the surface of the two objects. For example, a ball rolling on the ground slows down and then stops after some time. It is due to the frictional force acting between the ground and the surface of the ball.
16. The atmospheric pressure above the surface of the earth is maximum at the sea level. It is because air column above us is the highest at the sea level. As we go up in the atmosphere from the surface of the earth, the atmospheric pressure goes on decreasing.
It is because the weight of air goes on decreasing due to which the pressure also decreases. Hence the pressure at the top of the mountain will be much less than at the base.
17. When a man stands on a cushion then his two feet are in contact with the cushion. Due to this his body weight falls on a small area. On the other hand when a man lies on the cushion, his whole body comes in contact with the cushion. His weight falls over the large area because of which the depression in the cushion is less than when he stands on it.
18. A dropper is a short glass tube with a rubber bulb at one end and a nozzle at the other end. It is used for measuring the drops of liquids as in the case of medicines. It works on the principle of atmospheric pressure.
When we press the rubber bulb, the air present in the glass tube escapes from the nozzle in the form of bubbles. The air pressure inside the rubber bulb and the nozzle is reduced and a greater atmospheric pressure is acting on the surface of the liquid which pushes the liquid inside the glass tube. This is how it works on the principle of the atmospheric pressure.
19. a. A force which can be exerted by an object on another object only through some contact is called a contact force. The examples of contact forces are: muscular force and frictional force.
Since muscular force is applied on an object with our muscles, hence it is a contact force. For example, a boy pulling a cart.
Frictional force is also applied between the two surfaces in contact with each other, for example, a car moving on the road is stopped by applying friction.
b. A force which can be exerted by an object on another object even from a distance without touching each other is called a non contact force.
Magnetic force and gravitational force are examples of non contact forces. A magnet can attract an iron object even at a distance, so it is a non contact force.
Gravitational force is also applied on all objects even at a distance, so it is a non contact force. For example, an apple falls from a tree comes to the earth in the downward direction.

20. a. The pressure of the liquids is not same at all depths. It changes with the depth.
The pressure exerted by a liquid increases with increasing depth inside the liquid. As the depth increases, the weight of liquid column pushing down from above increases and hence the pressure increases too.
b. The walls of a dam are thicker at the bottom because the pressure exerted at the bottom is more than the top, so to bear the pressure and the weight of the liquid, the walls are made thicker.

21. (i) (b) False (ii) (a) True (iii) (a) True (iv) (a) True (v) (a) True

22. (i) 1. Apply force (lift) (ii) 1. Pressure (iii) 1. Pressure (iv) 1. Muscular
(v) 1. Shape

Accuracy Booster Exercise-3

1.	(a)	**2.**	(a)	**3.**	(c)	**4.**	(a)	**5.**	(d)	**6.**	(c)	**7.**	(d)
8.	(a)	**9.**	(d)	**10.**	(b)	**11.**	(b)	**12.**	(c)	**13.**	(c)	**14.**	(b)
15.	(a)	**16.**	(b)	**17.**	(c)	**18.**	(d)	**19.**	(b)	**20.**	(a)	**21.**	(a)
22.	(c)	**23.**	(c)	**24.**	(c)	**25.**	(b)	**26.**	(c)	**27.**	(d)	**28.**	(a)
29.	(a)	**30.**	(b)	**31.**	(b)	**32.**	(b)	**33.**	(c)	**34.**	(b)	**35.**	(b)
36.	(c)	**37.**	(a)	**38.**	(a)								

39.

Column A	Column B
(i) Magnet	(a) Non-contact force
(ii) Gravity	(b) Earth
(iii) Pressure	(a) Unit area
(iv) Friction force	(e) Contact force
(v) Force	(d) Pull or push

40. (c) (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a), (v)-(e), (vi)-(b)
Explanation: (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a), (v)-(e), (vi)-(b)

41. (b) **42.** (b) **43.** (b) **44.** 1. Pressure **45.** (a) True

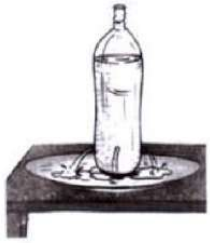
CLASS 8 – PHYSICS

Chapter-8 Force and Pressure

Solutions

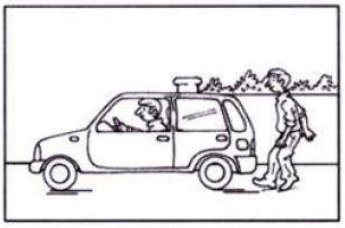
Concept Mastery Exercise-2

1. (i) Electrostatic forces
   (ii) Magnetic force
   (iii) Force due to gravity.
2. Various big or small actions make us feel the force. We hit or catch many objects in our daily life. We see that a moving ball stops on its own. The ball changes the direction of its motion when it is hit with a bat. We make lassi etc. by churning of curd. These are many actions which help us to feel that a force is exerted.
3. The two forces acting on rocket are :
   (i) Force due to gravity acts vertically downward.
   (ii) Force of push acting upward.
4. There is no air inside the two hemispheres, so only outer surface is in contact of atmospheric pressure. This is because we cannot separate them.
5. The force by which earth or any other object attracts objects towards itself is called the gravitational force.
6. When a force is applied on an object, it may change its speed. If the applied force is in the direction of motion, the speed of the object increases. If the force is applied in the direction opposite to the motion, then it results in a decrease in the speed of the object.
7. When a force is applied on an object it can.
   (i) Change the shape of the object.
   (ii) Change in the state of motion of the object.
8. Take an empty plastic bottle. Drill four holes all around near the bottom of the bottle. Make sure that all the holes are at the same height from the bottom. Now fill the bottle with water. We observe that different streams of water coming out of the holes fall at the same distance from the bottle. This observation indicates that liquids exert equal pressure at the same depth.



Liquid exerts equal pressure at the same depth.

9. Imagine, a man is standing behind a stationary car. The car does not move due to his presence. Now allow the man to push the car, it means he applies a force on the car. The car may begin to move in the direction of the applied force. Note that the man to push car to make it move. This example shows that at least two objects must interact with each other for a force to come into play.



(a) A man standing behind a stationary car.

(b) A car being pushed by a man.

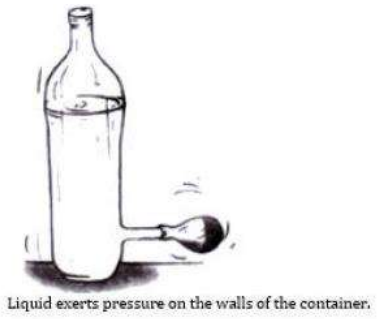
10. Pressure is defined as the force acting per unit area.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Note that the pressure is inversely proportional to the area. So smaller the area, larger the pressure on a surface.
Chapatti maker works on this principal. This large pressure converts balls of dough into chapattis

11. Men should follow the steps given below:
i. If the force is applied in the direction of opposite to the direction of motion, then it results in a decrease in the speed of the object.
ii. Hence, to slow down the cart, he should apply an opposite force to the moving cart.
iii. To balance the downward motion of the cart which is due to the force of gravity, he can start pulling the cart instead of pushing the cart.

12. Take a plastic bottle. Fix a small glass tube above the bottom of the plastic bottle. We should seal the joint of glass tube with plastic bottle by using molten wax so that water does not leak from the joint. Tie a thin sheet of rubber tightly on the open end of glass tube. Now fill half of plastic bottle with water. On filling water, the rubber sheet tied to the mouth of glass tube gets stretched and bulges out. The bulging out of rubber sheet tied to the glass tube fixed in the wall of plastic bottle demonstrates that water present in plastic b ottle exerts pressure on the walls of the bottle. It is the sideways pressure exerted by water which inflates the thin rubber sheet forming a buldge. If we pour more water in the plastic bottle to increase depth, we will see that the bulge in the rubber sheet increases. This indicates that the pressure exerted by water increases with increasing depth.


Liquid exerts pressure on the walls of the container.

i. The pressure exerted by a liquid on the walls of container increases with increasing depth.
ii. A liquid exerts pressure on the walls of its container.

13. The forces which can be exerted from a distance, without establishing a contact non-contact forces. Some non-contact forces are:
(i) Magnetic force: The force exerted by a magnet on other magnet or some magnetic substance like iron is called magnetic force.
Like poles of a each other and unlike poles of a magnet attract each other without contact. called non-contact force.
(ii) Electrostatic force: The force exerted by a charged body on other char* uncharged body is called electrostatic force.
Electrostatic force also acts making a direct contact with other charged or uncharged body. So it is also a non-contact force.
(iii) Force of gravity: Earth pulls every thing or body towards it. The force of attraction exerted by earth on any object is called force of gravity. This is also a non-contact force as it acts from a distance.

14. The effects of force applied on an object are as follows:
a. A force can move a stationary body.
b. A force can stop a moving body.
c. A force can change the speed of the moving body.
d. A force can change the direction of the moving body.
e. A force can change the shape and size of the body.

15. i. Muscular force- The force exerted by the muscles of our body is called the muscular force. Both human beings and animals can exert force with their muscles. For example, we push a cart with our muscles, child riding a bicycle is using his legs muscles to ride a cycle, and a person drawing water from the well is using his muscular force.
ii. Frictional force- A force that opposes the motion of an object is called a frictional force. It acts between the surface of the two objects. For example, a ball rolling on the ground slows down and then stops after some time. It is due to the frictional force acting between the ground and the surface of the ball.

16. The atmospheric pressure above the surface of the earth is maximum at the sea level. It is because air column above us is the highest at the sea level. As we go up in the atmosphere from the surface of the earth, the atmospheric pressure goes on decreasing.
It is because the weight of air goes on decreasing due to which the pressure also decreases. Hence the pressure at the top of the mountain will be much less than at the base.

17. When a man stands on a cushion then his two feet are in contact with the cushion. Due to this his body weight falls on a small area. On the other hand when a man lies on the cushion, his whole body comes in contact with the cushion. His weight falls over the large area because of which the depression in the cushion is less than when he stands on it.

18. A dropper is a short glass tube with a rubber bulb at one end and a nozzle at the other end. It is used for measuring the drops of liquids as in the case of medicines. It works on the principle of atmospheric pressure.
When we press the rubber bulb, the air present in the glass tube escapes from the nozzle in the form of bubbles. The air pressure inside the rubber bulb and the nozzle is reduced and a greater atmospheric pressure is acting on the surface of the liquid which pushes the liquid inside the glass tube. This is how it works on the principle of the atmospheric pressure.
19. a. A force which can be exerted by an object on another object only through some contact is called a contact force. The examples of contact forces are: muscular force and frictional force.
Since muscular force is applied on an object with our muscles, hence it is a contact force. For example, a boy pulling a cart.
Frictional force is also applied between the two surfaces in contact with each other, for example, a car moving on the road is stopped by applying friction.
b. A force which can be exerted by an object on another object even from a distance without touching each other is called a non contact force.
Magnetic force and gravitational force are examples of non contact forces. A magnet can attract an iron object even at a distance, so it is a non contact force.
Gravitational force is also applied on all objects even at a distance, so it is a non contact force. For example, an apple falls from a tree comes to the earth in the downward direction.
20. a. The pressure of the liquids is not same at all depths. It changes with the depth.
The pressure exerted by a liquid increases with increasing depth inside the liquid. As the depth increases, the weight of liquid column pushing down from above increases and hence the pressure increases too.
b. The walls of a dam are thicker at the bottom because the pressure exerted at the bottom is more than the top, so to bear the pressure and the weight of the liquid, the walls are made thicker.
21. State True or False:
(i) (b) False
Explanation: False
(ii) (a) True
Explanation: True
(iii) (a) True
Explanation: True
(iv) (a) True
Explanation: True
(v) (a) True
Explanation: True
22. Fill in the blanks:
(i) 1. Apply force (lift)
(ii) 1. pressure
(iii) 1. Pressure
(iv) 1. Muscular
(v) 1. Shape

Accuracy Booster Exercise-3

1. (a) 1 Pa
Explanation: The S.I. unit of pressure is Pascal. One Pascal is equal to the pressure that results from the action of one Newton of force on one meter square area.
So,1 Pascal = 1 N / 1 sq m.
2. (a) 20 N
Explanation: Here, Mass of the body = 10kg
Acceleration = 2m/s sq
Force = Mass $\times$ Acceleration = 10kg $\times$ 2m/s sq = 20N.
3. (c) either a magnetic or an electrostatic force
Explanation: When two objects repel each other, this repulsion could be due to either magnetic or electrostatic force. In electrostatic force, similar charges may repel each other. In a magnetic force, similar poles may repel each other.

4. (a) maximum in position A
Explanation: maximum in position

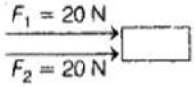
A

5. (d) Only IV
Explanation: Only IV

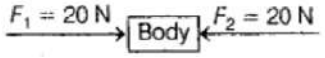
6. (c) 490 N
Explanation: Here, Pressure exerted by the boy on ground = 7N/cm sq
Area on the boy occupied = 70 cm sq
As, Pressure = Force/ Area
The force acting on the ground = Pressure $\times$ Area
= 7 N/ cm sq $\times$ 70 cm sq
= 490 N

7. (d) decreases
Explanation: decreases

8. (a) 40 N and 0
Explanation: When two forces act in the same direction and parallel to each other; then the net force is
F_{net} = 20N + 20 N = 40 N



When two forces act in the opposite direction as shown in the figure.



$F_{net} = F_1 + F_2$
Here, F_1 = 20 N
F_2 = - 20N (opposite direction) = 20 - 20 = 0

9. (d) A non-contact force is acting on the hall against frictional force.
Explanation: A non-contact force is acting on the ball against frictional force due to which ball is moving on a floor along a straight path with a uniform speed.

10. (b) Equal in all direction
Explanation: The lateral pressure exerted by liquid at same height is equal in all direction and pressure increases with depth.

11. (b) Friction
Explanation: Wheels of vehicle is stopped by using brake that works on property of friction. We deliberately increase friction by using brake pads in the brake system and arrest the motion of the rim and finally the wheel, which helps in slowing and stopping the vehicle.

12. (c) Overcome frictional force
Explanation: Frictional force always works in opposite direction of motion. A body moving on leveled grounds need to apply constant force to overcome frictional force provided by ground.

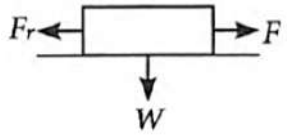
13. (c) Same as v
Explanation: Same as v

14. (b) All of these
Explanation: All of these

15. (a) The pressure exerted is greater when the same force is used.
Explanation: The pressure exerted is greater when the same force is used.

16. (b) ground
Explanation: According to Newton's third law; every action has an equal and opposite reaction. This is relevant to walking because when you put your foot on the ground, you are applying a force to it. In doing this, the ground also actually applies an equal force onto your foot, in the opposite direction, pushing you forward.

17. (c) (i) and (iii) Only
Explanation: Both direction and magnitude of velocity of an object change the state of body.
18. (d) Pascal
Explanation: S.I. unit of pressure is Pascal. One Pascal is equal to one Newton per meter square. Larger the force, larger will be the pressure exerted.
19. (b) liquid pressure
Explanation: liquid pressure
20. (a) the effective area of contact between the wheel and axle is reduced
Explanation: the effective area of contact between the wheel and axle is reduced
21. (a) Newton
Explanation: S.I. unit of force is Newton. When a force pushes a body of mass one kg to a distance of one meter per second, the force is equal to one Newton.
22. (c) Inversely proportion to area of contact
Explanation: Pressure is inversely proportional to area of contact and directly proportional to force acting on per unit area.
Increased area of contact results in applying bigger force which results in lower pressure and less area of contact results in less force which in turn results in high pressure.
23. (c) Acceleration
Explanation: The rate of change in velocity is called acceleration. Acceleration is a vector quantity and has both magnitude and direction. An object's acceleration is the net result of all forces acting on the object.
24. (c) between all bodies in the universe
Explanation: between all bodies in the universe
25. (b)



Explanation: The weight W acts vertically downward and force F_r opposite to applied force F.
26. (c) depends on the depth
Explanation: depends on the depth
27. (d) muscular force
Explanation: muscular force
28. (a) 5 N
Explanation: F = ma
= 0.5 10
= 5 N
29. (a) Magnetic force
Explanation: Magnetic force of earth's magnetic field, forces a magnet to remain aligned in North-South direction.
30. (b) Magnitude of force applied by A is greater than that of B.
Explanation: If the block moves towards the right, the magnitude of force applied by A is greater than that of B.
31. (b) maximum in position A
Explanation: The smaller the area, the larger the pressure on a surface for the same force. Hence, brick A whose area of contact is minimum will exert more pressure on the table.
32. (b) Repels
Explanation: The north pole of magnet repel the north pole of another magnet because like poles of magnet when face each other repel and unlike poles get attracted when each other.
33. (c) Pull
Explanation: To draw water from a well we have to pull the rope in upward direction. The force required to pull the rope depends upon mass of the bucket with water and height in this case it is the depth of the water.
34. (b) atmospheric pressure
Explanation: The rise of water in the dropper is due to atmospheric pressure. When the bulb of a dropper is pressed, the pressure inside the dropper decreases and this causes the water to go inside the dropper.

35. (b) Both A and R are true but R is not the correct explanation of A.
Explanation: When a stone is thrown vertically upward, after getting a certain height' it comes back to the earth because of gravitation force. So, (A) is the correct statement.
When the stone is released, it falls down. Once the stone is released, the forces acting on the stone are the gravitational force and an upward force opposing the gravitational force. If the medium in which the stone is released is air, frictional force due to air also acts on the stone opposing its motion. So, (R) is the correct statement.
So. amongst these correct options is (B) both assertion and reason are correct but reason is not the correct explanation for assertion.

36. (c) A is true but R is false.
Explanation: The motion imparted to objects was due to the action of a force. So, (A) is false.
In science, a push or a pull on an object is called a force. Is the correct definition of force. So, (R) is true.

37. (a) Both A and R are true and R is the correct explanation of A.
Explanation: Pressure $= \frac{\text{force}}{\text{area}}$
A nail has a pointed end so that the surface area is less, when the surface area is less the pressure increases which makes it easy for the nail to be driven into the wall or where ever it may be inserted.
So, Both A and R are true and R is the correct explanation of A.

38. (a) Both A and R are true and R is the correct explanation of A.
Explanation: While kicking a ball, the footballer's leg will experience the same magnitude of force by which it kicked on the ball but, in the opposite direction.
The goalkeeper applies a force on the ball in the opposite direction to that of its motion and thus stops the ball.
So, Both A and R are true and R is the correct explanation of A.

39.

Column A	**Column B**
(i) Magnet	(a) Non-contact force
(ii) Gravity	(b) Earth
(iii) Pressure	(a) Unit area
(iv) Friction force	(e) Contact force
(v) Force	(d) Pull or push

40. (c) (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a), (v)-(e), (vi)-(b)
Explanation: (i)-(c), (ii)-(d), (iii)-(b), (iv)-(a), (v)-(e), (vi)-(b)

41. (b)
Water exert pressure
Explanation: Water exert pressure

42. (b)
Increases with depth
Explanation: Increases with depth

43. (b)
Container exert pressure on the side of wall
Explanation: Container exert pressure on the side of wall

44. 1. pressure

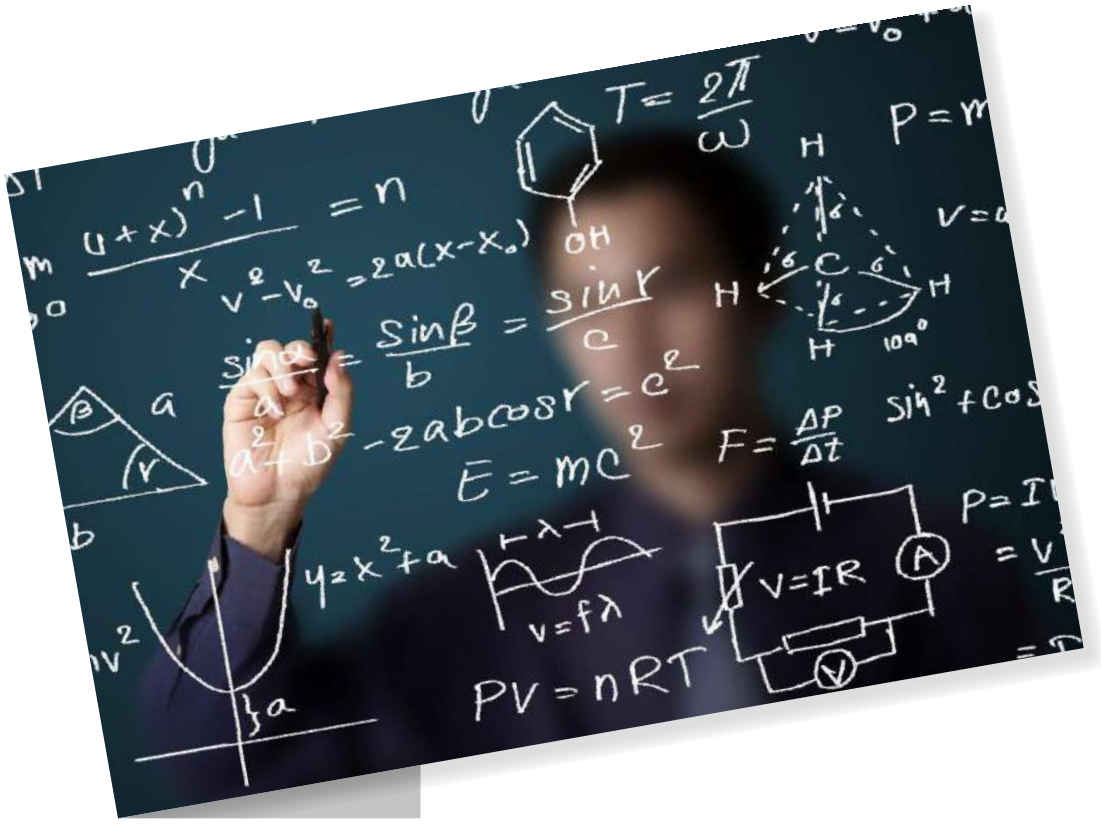
45. (a) True
Explanation: True

PRE-FOUNDATION

CLASS VIII

SAMPLE

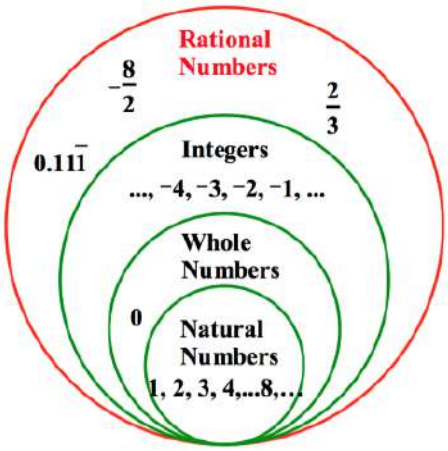
MATHEMATICS



CLASS 8 - MATHEMATICS

CHAPTER-1

Rational Numbers



Chapter Flow

1. Introduction
2. Numbers
   1. Defining Various Types of Numbers
   2. Properties of Rational Number
3. The Role of Zero
4. Negative of A Number
5. Reciprocal or Multiplicative Inverse
6. Distributive Property of Multiplication Over Addition of Rational Numbers
7. Distributive Property of Multiplication Over Subtraction of Rational Numbers
8. Absolute Value of a Rational Number
9. Representation of Rational Numbers on The Number Line
10. Rational Numbers Between Two Rational Numbers
11. Representing The Square Root of A Positive Number on The Number Line

DPP-1

DPP-2

DPP-3

Exercise-1 NCERT Basics

Exercise-2 Concept Mastery

Exercise-3 Accuracy Booster

Quick Exam Revision

Rational Numbers

1. Introduction

We know that for two given integers p and q, their sum p + q, difference p – q and product pq is always integer. But the system of integers suffered from the defect that division is not always possible within the system. For example, to problems such as $3 \div 5$ or $-4 \div 3$ there was no answer. That is to say no integer could be found to fill in the blank 5 × .....= 3 or 3 × .....= –7. Therefore, need was felt to go beyond integers and construct a new number system which include integers and in which all division could be carried out. The numbers that were created were called Rational Numbers.

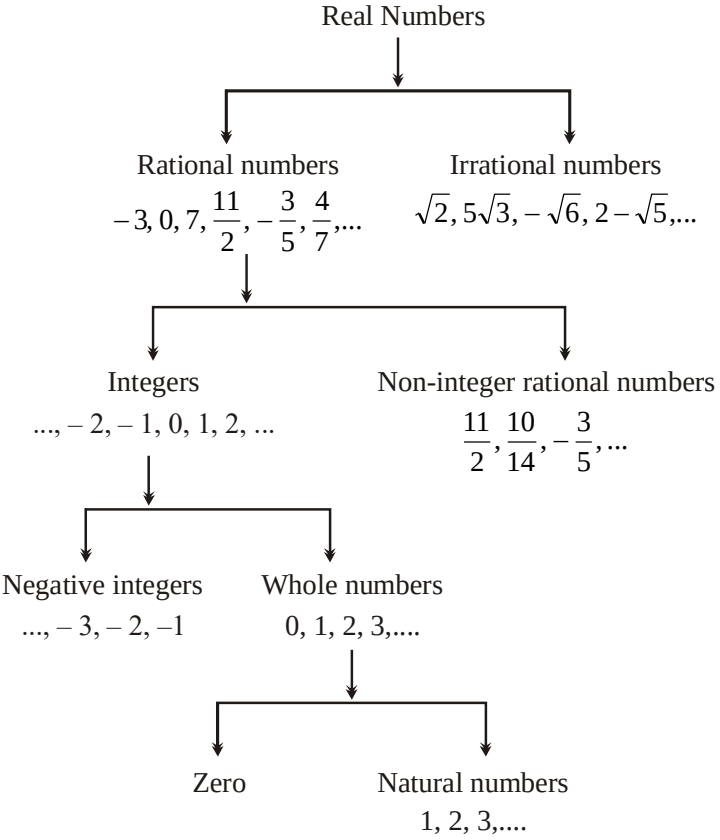
The word 'rational' is derived from the word ratio.

Definition: A rational number is any number that can be written in the form p/q where p and q are integers and $q \neq 0$.

For example, $\frac{5}{6}, -\frac{6}{11}, \frac{8}{-9}$ are rational numbers.

2. Numbers

In Hindu Arabic system we use ten symbols 0,1, 2, 3, 4, 5, 6, 7, 8, 9 called digits to represent any number. A group of figures denoting a number is called a numeral.



1. Defining Various Types of Numbers

(a) Natural numbers: Counting numbers are called natural numbers.
thus N = {1,2,3,... ... ... } is the set of natural numbers.

(b) Whole Numbers : All counting numbers together with zero form the set of whole numbers.
Thus W = {0,1,2,3 ..... } is the set of whole numbers.
Every natural number is a whole number but 0 is a whole number which is not a natural number.

(c) Integers: The set I of all natural numbers 0 and negatives of counting numbers is the set of all integers.

Thus I = {..... –3, –2, –1, 0, 1, 2, 3, ... } is the set of all integers.

(d) Rational Numbers: The numbers of the form p/q where p and q are integers and q 0 are known as rational numbers e.g. $\{\frac{3}{5}, \frac{9}{7}, \frac{-2}{3}, \frac{0}{1}$ etc$\}$

Thus Q = { p/q : p and q are integers & $q \neq 0$} is the set of all rational numbers. Every integer is a rational number.

(e) Terminating and Repeating decimals : Every rational number has a particular characteristic that is, when expressed in the decimal form, it is expressible either in terminating decimals or in repeating decimals.

$\frac{1}{2} = 0.5$ $\frac{1}{3} = 0.333 = 0.\overline{3}$

(f) Irrational Number: All numbers when expressed in decimal form which are in non-terminating and non repeating form are known as irrational numbers e.g. $\sqrt{2}, \sqrt{3}, \sqrt{5}, \pi$ etc.

(g) Real Numbers: The totality of all rational and all irrational numbers forms the set R of all real numbers.

Thus every natural, every whole number, every integer, every rational number and every irrational number is a real number.

(h) Even and odd numbers : Integers divisible by 2 are known as even integers while those which are not divisible by 2 are known as odd integers.

Thus, –6, –4, –2, 0, 2, 4, 6 ..... are even integers.
and : –5, –3, –1, 1, 3, 5 ..... are odd integers.

(i) Prime Numbers *:* A number greater than 1 is called a prime number if it has exactly two factors namely 1 and itself. For example 2, 3, 5, 7, 11 etc.

(j) Composite Numbers *:* Numbers greater than 1 which are not primes are known as composite numbers e.g. 4, 6, 8 ..... are all composite numbers.

Remember

(i) 1 is neither prime nor Composite.
(ii) 2 is the only even number which is prime.
(iii) There are 25 prime numbers between 1 & 100.
(iv) ***The sum (or difference) of a rational number and an irrational number is irrational.***
(v) ***The product of a rational and an irrational number is irrational (Except 0).***

2. Properties of Rational Number

(A) Closure Property :

(i) Addition :

We take an example,

$\frac{1}{4} + \left(-\frac{3}{2}\right) = \frac{1+(-6)}{4} = \frac{-5}{4}$ which is a rational number.

If a & b are two rational number then a + b is also a rational number. This property is known as closure property for addition of rational numbers.

(ii) Subtraction :

Subtraction is inverse of addition. So to subtract a rational number we add its additive inverse.

For example,

$-\frac{2}{5} - \left(-\frac{4}{9}\right) = \frac{-2}{5} + \frac{4}{9}$ {additive inverse of $\frac{-4}{9}$ is $\frac{4}{9}$}

Thus : If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers then :

$$\frac{a}{b} - \frac{c}{d} = \frac{a}{b} + \left(-\frac{c}{d}\right)$$

The difference of any two rational numbers a & b, i.e. a–b, is a rational numbers.
for e.g.

$$\frac{1}{2} - \frac{4}{9} = \frac{1}{2} + \left(-\frac{4}{9}\right) = \frac{9-8}{18} = \frac{1}{18}$$ a rational number.

This property is known as **closure property for subtraction** of rational numbers.

(iii) Multiplication :

If a and b are two rational numbers then a × b is also a rational number :

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then:

$$\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$$

for e.g. $\frac{2}{3} \times \frac{5}{7} = \frac{2\times5}{3\times7} = \frac{10}{21}$ which is a rational number.

Hence this is a closure property for multiplication of rational numbers.

(iv) Division:

If a & b are two rational numbers and b $\neq$ 0 then a ÷ b is always a rational number.

for e.g. $\frac{2}{3} \div -\frac{4}{9} = \frac{2}{3} \times \frac{9}{-4} = -\frac{3}{2}$ is a rational number.

Hence this is a closure property for Division of rational numbers.

For any rational number a, a ÷ 0 is not defined.

So rational numbers are not closed under division.

However if we exclude zero then the collection of all other rational numbers is closed under division.

(B) Commutative Property :

(i) Addition : Addition is commutative for rational numbers.

If a and b are any two rational numbers then a + b = b + a.

This property is known as commutative property for addition of rational numbers.

If a and b are any two rational numbers then a+b is also a rational number.

For example,

$$\frac{1}{2} + \frac{3}{4} = \frac{2+3}{4} = \frac{5}{4}$$ which is a rational number.

$$\frac{-2}{3} + \frac{-1}{5} = \frac{-10+(-3)}{15} = \frac{-13}{15}$$ which is a rational number.

(ii) Subtraction is not commutative

It can be explained as follows:

$$a - b \neq b - a$$

e.g. $\frac{2}{3} - \frac{5}{4} \neq \frac{5}{4} - \frac{2}{3}$

both are not equal hence subtraction is *not* commutative for rational numbers.

(iii) Multiplication is commutative for rational number :

In general :

$a \times b = b \times a$ for any rational numbers.

$$\frac{3}{5} \times \frac{4}{9} = \frac{4}{9} \times \frac{3}{5} = \frac{12}{35}$$

Both are equal hence multiplication is commutative for rational numbers.

(iv) Division is not commutative for rational numbers :

$$\frac{-a}{b} \div \frac{c}{d} \neq \frac{c}{d} \div \left(\frac{-a}{b}\right)$$

The expression on both sides are not equal.

for .e.g. $\frac{-5}{4} \div \frac{3}{7} \neq \frac{3}{7} \div \frac{-5}{4} \quad \Rightarrow \quad \frac{-35}{12} \neq \frac{12}{-35}$

Hence division is not commutative for rational numbers.

(C) Associative Property :

(i) Addition is associative:

e.g. a, b, c are three rational numbers then :

$a + (b + c) = (a + b) + c$

This property is known as **associative property** for addition of rational numbers.

(ii) Subtraction is not associative for rational number :

$a - (b + c) \neq (a - b) + c$

(iii) Multiplication is associative for rational number:

For any three rational numbers a, b, c

$a \times (b \times c) = (a \times b) \times c$

so multiplication is associative for rational numbers.

(iv) Division is not associative :

$$\frac{a}{b} \div \left(\frac{c}{d} \div \frac{e}{f}\right) \neq \left(\frac{a}{b} \div \frac{c}{d}\right) \div \frac{e}{f}$$

Remember

Properties of Rational Number

Closure :

Operation	Whole Numbers	Integers	Rational Numbers
Addition	Closed under addition	Closed under addition	Closed under addition
Subtraction	Not closed under subtraction	Closed under subtraction	Closed under subtraction
Multiplication	Closed under multiplication	Closed under multiplication	Closed under multiplication
Division	Not closed under division	Not closed under division	Not closed under division

Commutativity :

Operation	Whole Numbers	Integers	Rational Numbers
Addition	Commutative	Commutative	Commutative
Subtraction	Not Commutative	Not Commutative	Not Commutative
Multiplication	Commutative	Commutative	Commutative
Division	Not Commutative	Not Commutative	Not Commutative

Associativity :

Operation	Whole Numbers	Integers	Rational Numbers
Addition	Associative	Associative	Associative
Subtraction	Associative	Associative	Associative
Multiplication	Associative	Associative	Associative
Division	Not associative	Not associative	Not associative

3. The Role of Zero (0)

(i) Addition of 0 to a rational number

If C is a rational number then:

C + 0 = 0 + C = C.

Zero is called the identity for the addition of rational number.

If $\frac{p}{q}$ is a rational number then $0 \times \frac{p}{q} = 0 = \frac{p}{q} \times 0$

It follows that the product of a rational number and zero is always zero.

4. Negative of A Number

If *x* be any rational number then -x is also called a rational number such that $x + (-x) = 0 = (-x) + x$. Here $-x$ is called the negative of x or **additive inverse of *x***

5. Reciprocal or Multiplicative Inverse

If a/b be a rational number then b/a is called multiplicative inverse if :

$$\frac{a}{b} \times \frac{b}{a} = 1$$

Illustration 1 : Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? Why or why not?

Solution : $-1\frac{1}{8} = \frac{-9}{8}$ $\quad\therefore\quad \frac{8}{9}\times\left(-1\frac{1}{8}\right) = \frac{8}{9}\times\frac{-9}{8} = 1 \neq 1$

$\therefore$ $\frac{8}{9}$ is not the multiplicate inverse of $-1\frac{1}{8}$

Remember

(i) Zero has no reciprocal.

(ii) Reciprocal of 1 is 1.

(iii) Reciprocal of –1 is –1.

6. Distributive Property of Multiplication Over Addition of Rational Numbers

If a, b, c are any three rational numbers then :

$a \times (b + c) = a \times b + a \times c$

This property is illustrated by the following example:

$$\frac{2}{3} \times \left(\frac{5}{6}+\frac{7}{8}\right) = \left(\frac{2}{3}\times\frac{5}{6}\right) + \left(\frac{2}{3}\times\frac{7}{8}\right)$$

7. Distributive Property of Multiplication Over Subtraction of Rational Numbers

Since $b - c = b + (-c)$

$a \times (b - c) = a \times b - a \times c$

The distributive property of multiplication over subtraction is illustrated by the following example:

$$\frac{2}{3}\left(\frac{5}{6}-\frac{1}{3}\right)=\frac{2}{3}\times\frac{5}{6}-\frac{2}{3}\times\frac{1}{3}$$

8. Absolute Value of A Rational Number

Absolute value of a rational number is its numerical value (value without signs)

For example, $\left|-\frac{3}{5}\right| = \frac{3}{5}$ & $\left|\frac{7}{9}\right| = \frac{7}{9}$

Properties:

The absolute value of the sum of two rational numbers is always less than or equal to the sum of the absolute values of the given numbers.

$$|x+y| \leq |x| + |y|$$

The absolute value of the product of two rational numbers is equal to the product of the absolute values of the given numbers.

$$|x \times y| = |x| \times |y|$$

9. Representation of Rational Numbers on The Number Line

(i) Draw any line. Take a point O on it. Call it 0 (zero) . Set off equal distances on right as well as on the left of 0. Each such distance is of unit length. Clearly points A, B, C, D etc. represents the integers 1, 2, 3, 4 ..... etc. respectively & the points A´, B´, C´, D´ represents the integers –1, –2, –3, –4 respectively.

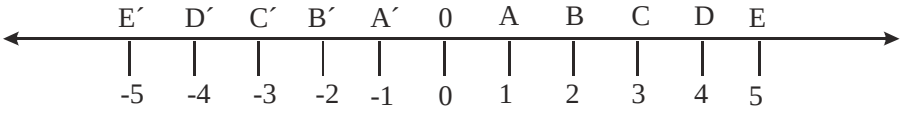


Illustration 2 : Represent 13/5 and –13/5 on number line

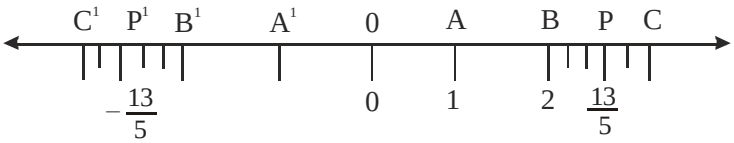
Solution : Draw a line. Take a point O on it. Let it be represented by 0.

$$\text{Now} \quad \frac{13}{5} = 2\frac{3}{5} = 2+\frac{3}{5}$$

$$-\frac{13}{5} = -\left[2+\frac{3}{5}\right]$$

From O set off unit distances OA, AB and BC clearly, the points A, B, C represents, 1, 2, 3 respectively. Now take 2 units OA and AB and divide the third unit BC into 5 equal parts. Take 3 parts out of these 5 parts to reach at point P. Then point P represents rational number $\frac{13}{5}$.

Similarly on left side P´ represents $-\left[2+\frac{3}{5}\right]$



10. Rational Numbers between two Rational Numbers

If x and y are two rational number. Such that x < y then ½(x +y) is a rational number lying between x and y.

Illustration 3 : **Give three rational numbers lying between $\frac{1}{3}$ and $\frac{1}{2}$.**

Solution : The rational number $= \frac{1}{2}\times\left(\frac{1}{3}+\frac{1}{2}\right)$ lies between $\frac{1}{3}$ and $\frac{1}{2}$.

Now, $\frac{1}{2}\times\left(\frac{1}{3}+\frac{1}{2}\right) = \frac{1}{2}\times\left(\frac{2+3}{6}\right) = \frac{1}{2}\times\frac{5}{6} = \frac{5}{12}$

Therefore, $\frac{1}{3}<\frac{5}{12}<\frac{1}{2}$.

Let us now find a rational number between $\frac{1}{3}$ and $\frac{5}{12}$.

We know that $\frac{1}{2}\left(\frac{1}{3}+\frac{5}{12}\right)$ is one such number.

Also , $\frac{1}{2}\left(\frac{1}{3}+\frac{5}{12}\right) = \frac{1}{2}\left(\frac{4}{12}+\frac{5}{12}\right) = \frac{1}{2}\times\frac{9}{12} = \frac{9}{24} = \frac{3}{8}$ $\quad\therefore\ \frac{1}{3}<\frac{3}{8}<\frac{5}{12}<\frac{1}{2}$

Now let us find a rational number between $\frac{5}{12}$ and $\frac{1}{2}$.

One such number is

$$\frac{1}{2}\left(\frac{5}{12}+\frac{1}{2}\right) = \frac{1}{2}\left(\frac{5}{12}+\frac{6}{12}\right) = \frac{1}{2}\times\frac{11}{12} = \frac{11}{24}$$

$\therefore\quad \frac{1}{3}<\frac{3}{8}<\frac{5}{12}<\frac{11}{24}<\frac{1}{2}$

Hence, $\frac{3}{8},\frac{5}{12},\frac{11}{24}$ are the required three rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$.

11. Representing The Square Root of A Positive Number on The Number Line

Let x be a positive real number. We will now locate $\sqrt{x}$ on the number line.

Step. 1 : Mark –x on the number line. Let this point be represented by A. Mark 1 unit on the number line. Let this be represented by B.

Step. 2 : Locate the midpoint M of AB.

Step. 3 : With M as the centre and MA or MB as radius draw a semicircle. Since diameter AB= (x+1) units, MA= MB = ½ (x+1) units.

Step. 4 : Draw OD perpendicular to AB meeting the semicircle in D. Join MD. Note the DMO is a right triangle with MD = ½ (x+1) units and MO = [½ (x+1)-1) units. = ½ (x-1) units.

Step 5 : Using the Pythagorean theorem, we obtain :

$OD^2 = MD^2 - MO^2$

$= \frac{1}{4}(x+1)^2 - \frac{1}{4}(x-1)^2$

$= \frac{1}{4}(4x) = x = OD = \sqrt{x}$

With O as the centre and OD as the radius, draw an arc to meet the number line at C. The point C represents $\sqrt{x}$.

Illustration 4 : Locate $\sqrt{2}$ on the number line.

Solution : **Step 1 :** Draw the number line with O representing the number 0 and A representing the number 1.

Step 2 : Construct a square OABC with each side equal to 1 unit.

By the Pythagorean theorem :

$$OB^2 = OA^2 + AB^2$$
$$= 1^2 + 1^2$$
$$= 1 + 1 = 2$$
$$OB = \sqrt{2}$$

Step 3 : With O as centre and OB as radius, draw an arc to meet the number line at point P.

Since OP = OB = $\sqrt{2}$, the point P represents $\sqrt{2}$ on the number line.

DPP-1

1. Name the properties used in each of the following :

(a) $\frac{3}{7}\times 1 = 1\times\frac{3}{7} = \frac{3}{7}$

(b) $\frac{-11}{8}\times\frac{-7}{9} = \frac{-7}{9}\times\frac{-11}{8}$

(c) $\frac{7}{10}\times\frac{10}{7} = 1$

(d) $\frac{1}{17}+\frac{1}{15} = \frac{1}{15}+\frac{1}{17}$

(e) $5+\left(\frac{1}{3}+\frac{1}{7}\right) = \left(5+\frac{1}{3}\right)+\frac{1}{7}$

(f) $9\times\frac{1}{15} = \frac{1}{15}\times 9$

(g) $2\times\frac{5}{3} + 2\times\frac{7}{6} = 2\left(\frac{5}{3}+\frac{7}{6}\right)$

2. Verify the distributivity of multiplication of rational numbers over their addition by taking

$x = -\frac{3}{5}, y = \frac{2}{3}, z = -\frac{2}{7}$

3. Write the additive inverse of the following rational numbers:

(a) $\frac{1}{2}$

(b) $-\frac{3}{2}$

(c) 0

(d) $\frac{13}{-17}$

4. Find the multiplicative inverse of the following :

(a) –15

(b) $\frac{-2}{9}$

(c) $\frac{7}{2}$

(d) $\frac{5}{-6}$

5. Is $\frac{3}{7}$ the multiplicative inverse of $2\frac{1}{3}$?

6. Represent the following on number line.

(a) $\frac{11}{3}$

(b) $-\frac{11}{3}$

(c) $\frac{3}{7}$

(d) $-\frac{5}{6}$

7. Divide the sum of $\frac{18}{5}$ and $\frac{-7}{15}$ by their difference.

DPP-2

1. The sum of two rational numbers if $\frac{-17}{27}$. If one of them is $\frac{-11}{27}$, find the other.
2. Using appropriate properties to simplify the following

   (a) $\frac{-3}{4}\times\frac{4}{7}+\frac{7}{3}-\frac{4}{7}\times\frac{1}{8}$ (b) $\frac{4}{3}\times\left(\frac{-5}{9}\right)-\frac{1}{4}\times\frac{5}{2}+\frac{1}{8}\times\frac{4}{3}$
3. How many rational numbers are between –1 and 0.
4. Verify that $|x+y|\le|x|+|y|$ for

   (a) $x=\frac{-9}{7}$, $y=\frac{3}{4}$ (b) $x=\frac{8}{-3}$, $y=\frac{-7}{9}$
5. The sides of a triangular field are $14\frac{1}{2}$ m, $13\frac{3}{4}$ m and $9\frac{5}{8}$ m. Find its perimeter.
6. Subtract the sum of $\frac{-8}{7}$ and $\frac{-5}{3}$ from the sum of $\frac{3}{2}$ and $-\frac{31}{28}$.
7. Simplify : $\left(\frac{5}{7}\times\frac{-14}{15}\right)+\left(\frac{-8}{15}\times\frac{3}{-16}\right)-\left(\frac{2}{9}\times\frac{-27}{16}\right)$

DPP-3

1. The product of two numbers is $-17\frac{1}{2}$. If one of them is $1\frac{1}{6}$, find the other.
2. The area of a rectangle is $145\frac{5}{6}$ sq m. If it is $17\frac{1}{2}$ m long, find its width.
3. Find four rational numbers between $\frac{-7}{4}$ and 1.
4. Insert nine rational numbers between x and $|x|$ when x = $\frac{-5}{9}$.
5. Arrange in ascending order

   (i) $\frac{5}{8}$ (ii) $\frac{1}{4}$

   (iii) $\frac{5}{7}$ (iv) $\frac{6}{5}$
6. Find the H.C.F. of 144, 36, 72.
7. Find the L.C.M. of 54, 243, 75.

NCERT Basics Exercise-1

1. Name the property under multiplication used in each of the following.

   (i) $\frac{-4}{5}\times 1 = 1\times\frac{-4}{5} = -\frac{4}{5}$ (ii) $-\frac{13}{17}\times\frac{-2}{7} = \frac{-2}{7}\times\frac{-13}{17}$

   (iii) $\frac{-19}{29}\times\frac{29}{-19} = 1$

2. Tell what property allows you to compute $\frac{1}{3}\times\left(6\times\frac{4}{3}\right)$ as $\left(\frac{1}{3}\times 6\right)\times\frac{4}{3}$.

3. The product of two rational numbers is always a _____.

Concept Mastery Exercise-2

A. Very Short Answer Type Questions

1. Use the distributivity of multiplication of rational number over addition to simplify $\frac{-5}{4}\times\left[\frac{8}{5}+\frac{16}{15}\right]$

2. Name the property used in the expression: $\frac{-2}{7}+0 = 0+\frac{-2}{7} = -\frac{2}{7}$

3. Simplify the expression by using the suitable property. Also, name the property.
   $\left[\frac{1}{5}\times\frac{2}{15}\right]-\left[\frac{1}{5}\times\frac{2}{5}\right]$

4. Verify the property x × y = y × x of rational number by using x = $\frac{-5}{7}$ and y = $\frac{14}{15}$

5. By what number should we multiply $\frac{-15}{20}$ so that the product may be $\frac{-5}{7}$?

6. Find $\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

7. Verify the property x + y = y + x of rational number by taking x = $\frac{-2}{5}$ and y = $\frac{-9}{10}$

8. A train travels $\frac{1445}{2}$ km in $\frac{17}{2}$ h.

9. A $117\frac{1}{3}$ m long rope is cut into equal pieces measuring $7\frac{1}{3}$ each. How many such small pieces are these?

10. Verify the property x (y z) = (x y) z of rational number by using x = 1, y = $\frac{-1}{2}$ and z = $\frac{1}{4}$ and What is the name of this property?

B. Short Answer Type Questions

11. The cost of 2⅓ meters of cloth is ₹ 75¼. Find the cost of cloth per meter.

12. Solve: $-\frac{2}{3}\times\frac{3}{5}+\frac{5}{2}-\frac{3}{5}\times\frac{1}{6}$

13. Verify the property x × (y + z) = x × y + x × z of rational number where $x = \frac{-1}{5}, y = \frac{2}{15}$ and $z = \frac{-3}{10}$

14. Simplify: $\left(-5\times\frac{2}{15}\right)-\left(-6\times\frac{2}{9}\right)$

15. Verify and name the property used
$\left(\frac{-3}{5}\times\frac{12}{13}\right)\times\frac{7}{8}=\frac{-3}{5}\times\left(\frac{12}{13}\times\frac{7}{8}\right)$.

16. Find: $0\div\frac{2}{3}$.

17. $\frac{7}{11}$ of all the money in Hamid's bank account is ₹ 77000. How much money does Hamid have in his bank account?

18. On a winter day the temperature at a place in Himachal Pradesh was -16°C. Convert it in degree Fahrenheit (°F) by using the formula $\frac{c}{5}=\frac{F-32}{9}$.

19. By what numbers should we multiply $\frac{-8}{13}$ so that the product may be 24?

C. Long Answer Type Questions

20. Find $\left(\frac{1}{2}\times\frac{2}{3}\right)+\left(\frac{3}{5}\times\frac{1}{2}\right)+\frac{7}{5}$ using property.

21. Are $\left\{\frac{2}{9}+\left[\frac{5}{9}+\frac{1}{9}\right]\right\}$ and $\left\{\left[\frac{2}{9}+\frac{5}{9}\right]+\frac{1}{9}\right\}$ equal? What do you come to know from the result?

22. a. Solve: $\left[\frac{-14}{9}\right]\times\frac{3}{5}\times\left[\frac{-4}{7}\right]\times\frac{15}{16}$

b. Represent $\frac{-1}{5}$ on the number line.

23. Simplify: $\left(\frac{1}{4}\times\frac{2}{7}\right)-\left(\frac{5}{14}\times\frac{-2}{3}\right)+\left(\frac{3}{7}\times\frac{9}{2}\right)$

24. The overall width in cm of several wide-screen televisions is 97.28 cm, $98\frac{4}{9}$ cm, $98\frac{1}{25}$ cm and 97.94 cm. Express these numbers as rational numbers in the form $\frac{p}{q}$ and arrange the widths in ascending order.

D. True & False

25. (a) Zero is a rational number.
(b) Every whole number is a rational number.
(c) If $\frac{x}{y}$ is a rational number, then y is always a whole number.
(d) Every integer is a rational number.

E. Fill in the Blanks

26. (a) Every whole number can be written in $\frac{a}{b}$ where b = _____.
(b) _____ numbers are closed under addition.

Accuracy Booster Exercise-3

A. Multiple Choice Questions

1. Find $\frac{5}{9}+\left(-\frac{5}{18}\right)+\left(-\frac{7}{18}\right)+\frac{7}{9}$

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$

(c) -3 (d) -2

2. If x is any rational number, then x + 0 is equal to:

(a) x (b) -x

(c) Not defined (d) 0

3. If a = 2 and b = 3, then value of $\left(\frac{1}{a}+\frac{1}{b}\right)^{a}$.

(a) $\frac{75}{26}$ (b) $\frac{24}{26}$

(c) $\frac{25}{36}$ (d) $\frac{25}{26}$

4. Find $\frac{3}{7}+\left(-\frac{5}{14}\right)+\left(-\frac{8}{21}\right)+\frac{5}{21}$

(a) 1 (b) -21

(c) -1 (d) $\frac{-1}{14}$

5. Simplify: $\frac{\left(-18\frac{1}{3}\times 2\frac{8}{11}\right)-\left(4\frac{5}{7}\times 2\frac{1}{3}\right)}{\left|\frac{3}{5}+\left(\frac{-9}{10}\right)\right|+\left|-\left(\frac{-3}{5}\right)\right|}$

(a) $63\frac{4}{81}$ (b) $-23\frac{7}{9}$

(c) $-67\frac{7}{9}$ (d) $12\frac{6}{17}$

6. A number which can be expressed as $\frac{p}{q}$ where p and q are integers and $q \neq 0$ is

(a) rational number (b) natural numbers

(c) whole number (d) irrational number

7. Find $\frac{7}{8}+\left(-\frac{5}{16}\right)+\left(-\frac{3}{16}\right)+\frac{5}{8}$

(a) -16 (b) -21

(c) -1 (d) 1

8. Find the value of $244 - [13 + 25\{15 \div 3 - (13 - \overline{24-12})\}]$

(a) -156 (b) 144

(c) 131 (d) -144

9. The least natural number is _____.

(a) 9 (b) 0

(c) 1 (d) does not exist

10. $\frac{15}{17}+\left(-\frac{15}{17}\right)=$ _____.

(a) 1 (b) 0
(c) 17 (d) 15

11. $\frac{13}{19}+\left(-\frac{13}{19}\right)=$ _____.

(a) $-\frac{13}{19}$ (b) 0
(c) 13 (d) 19

12. The product of two rational numbers is always a _____.

(a) rational number (b) negative number
(c) irrational number (d) None of these

13. A number which cannot be written in the form $\frac{p}{q}$, where p and q are integers and q ≠ 0 is called a _____.

(a) negative number (b) none of these
(c) rational number (d) irrational number

14. Which of the following statement is false?

i. Every fraction is a rational number
ii. Every rational number is a fraction
iii. Every integer is a rational number
iv. All the above

(a) Option (i) (b) Option (ii)
(c) Option (iv) (d) Option (iii)

15. A rational number can be expressed as a terminating decimal if the denominator has factors:

(a) 4 or 5 (b) 3 or 5
(c) 2 or 5 (d) 2, 3 or 5

16. A rational number can be expressed as a terminating decimal if the denominator has factors:

(a) 3 or 5 (b) 2, 4 or 5
(c) 2, 3 or 5 (d) 2 or 5

17. Sum of two rational numbers is a _____.

(a) positive number (b) negative number
(c) irrational number (d) rational number

18. Find $\frac{-4}{5}\times\frac{3}{7}\times\frac{15}{16}\times\left(\frac{-14}{9}\right)$

(a) 2 (b) 0
(c) 1 (d)

19. A number which can be expressed as $\frac{p}{q}$, where p and q are integers and q ≠ 0 is

(a) integer (b) natural number
(c) whole number (d) rational number

20. $\frac{18}{23}+\left(-\frac{18}{23}\right)=$ _____.

(a) 0 (b) 18
(c) 23 (d) $\frac{18}{23}$

21. Which statement is true?

a. $-5 + 3 \neq 3 + (-5)$

b. $\frac{-8}{12} = \frac{10}{-15}$

c. 2 is not natural number

d. 17 is not prime number

(a) Option (c) (b) Option (b)

(c) Option (d) (d) Option (a)

22. Evaluate $| 44 - [1 + 5 \{12 \div 4 - 2 (1 - \overline{4-3})\}] |$

(a) 28 (b) 17

(c) -14 (d) 12

23. Which of the following is an example of the distributive property of multiplication over addition to rational numbers?

(a) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \times \frac{2}{3}\right] + \left[-\frac{1}{4} \times \left(\frac{-4}{7}\right)\right]$

(b) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} - \frac{1}{4}$

(c) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \frac{2}{3} + \left(-\frac{1}{4}\right) \times \frac{-4}{7}$

(d) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[\frac{1}{4} \times \frac{2}{3}\right] - \left(\frac{-4}{7}\right)$

24. Find $\frac{5}{7} + \left(-\frac{6}{7}\right) + \left(-\frac{8}{35}\right) + \frac{5}{21}$

(a) 105 (b) -105

(c) $\frac{-2}{15}$ (d) -11

25. $42(4 + 2) = (42 \times 4) + (42 \times 2)$ is an example of

(a) distributive property (b) associative property

(c) closure property (d) commutative property

26. Find $\frac{3}{4} + \left(-\frac{5}{2}\right) + \left(-\frac{8}{3}\right) + \frac{5}{5}$

(a) -41 (b) -1

(c) $-\frac{41}{12}$ (d) 12

27. Which of the following is false?

i. $\frac{-4}{-5} + 0 = \frac{4}{5}$

ii. $\frac{-5}{6} + \frac{-7}{12} = \frac{-7}{12} + \frac{-5}{6}$

iii. $\frac{8}{9} + \left(\frac{11}{3} + \frac{-2}{3}\right) = \left(\frac{8}{9} + \frac{11}{3}\right) + \frac{-2}{3}$

iv. $\frac{8}{9} - \frac{7}{11} = \frac{7}{11} - \frac{8}{9}$

(a) Option (i) (b) Option (ii)

(c) Option (iii) (d) Option (iv)

28. The property represented by $a \times (b + c) = a \times b + a \times c$ is

(a) closure property (b) distributive property

(c) associative property (d) commutative property

29. If x + 0 = 0 + x = x, which is rational number, then 0 is called
(a) multiplicative inverse of x
(b) additive inverse of x
(c) reciprocal of x
(d) identity for addition of rational numbers

30. Which one of the following is not true?
i. There does not exist any rational number whose square is 4
ii. There does not exist any rational number whose square is 5
iii. There does not exist any rational number whose square is 2
iv. There does not exist any rational number whose square is 3
(a) Option (i)
(b) Option (iv)
(c) Option (iii)
(d) Option (ii)

31. $0 \times \frac{1}{4} =$ _____
(a) 1
(b) 4
(c) $\frac{1}{4}$
(d) 0

32. A number which can be written in the form _____, where p and q are integers and q ≠ 0 is called a rational number.
(a) $\frac{p}{q}$
(b) p – q
(c) p × q
(d) p + q

33. Which of the given is not true?
(a) $\frac{2}{3}-\frac{5}{4}=\frac{5}{4}-\frac{2}{3}$
(b) $\frac{2}{3}\times\frac{5}{4}=\frac{5}{4}\times\frac{2}{3}$
(c) $\frac{2}{3}+\frac{5}{4}=\frac{5}{4}+\frac{2}{3}$
(d) $\frac{2}{3}\div\frac{5}{4}=\frac{2}{3}\times\frac{4}{5}$

34. Which of the following is not true?
a) Rational numbers are closed under multiplication
b) Rational numbers are closed under division
c) Rational numbers are closed under addition
d) Rational numbers are closed under subtraction

35. Which of the following is the identity element?
(a) -1
(b) 1
(c) None of these
(d) 0

B. Assertion & Reason Questions

36. **Assertion (A):** $\frac{1}{3}$ of 3 is a rational number.
Reason (R): A rational number is a type of real numbers, which is in the form of p/q where q is not equal to zero.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

37. **Assertion (A):** Rational numbers are associative for subtraction.
Reason (R): The associative property states that the sum or the product of three or more numbers does not change if they are grouped in a different way.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

38. **Assertion (A):** The reciprocal of is equal to $\left(\frac{2}{5}\right)\times\left(\frac{4}{9}\right)$ is equal to $\frac{45}{8}$.

Reason (R): There are countless rational numbers between any two given rational numbers.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

39. **Assertion (A):** Rational numbers are not closed under multiplication.

Reason (R): A rational number is a number that is in the form of $\frac{p}{q}$, where p and q are integers, and q is not equal to 0.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

C. Match the Column

40. Match the columns

Column A	Column B
i. -(-x) is same as	a. 0
ii. $1\div\frac{7}{2}$	b. negative
iii. Multiplicative inverse of a negative rational number is	c. +x
iv. The identity for addition of rational numbers.	d. $\frac{2}{7}$

D. Case Study or Paragraph

Question No. 41 to 45 are based on the given text. Read the text carefully and answer the questions:
Closure property states that for any two numbers a and b, a $*$ b is also a rational number, then the set of rational numbers is closed under addition.
* represents +, -, or $\div$
Let us study the closure property for all the operations on whole numbers in brief.

Operation	Numbers	Remarks
Addition	0 + 5 = 5, a whole number 4 + 7 = ... Is it a whole numbers. In general, a + b is a whole number for any two whole numbers a and b.	Whole numbers are closed under addition.
Subtraction	5 - 7 = -2, which is not a whole number.	Whole numbers are not closed under subtraction.
Multiplication	0 $\times$ 3 = 0, a whole number 3 $\times$ 7 = ... Is it a whole number? In general, if a and b are any two whole numbers, their product a b is a whole number.	Whole numbers are closed under multiplication.
Division	$5\div 8=\frac{5}{8}$, which is not a whole number.	Whole numbers are not closed under division.

Thus whole numbers are closed under addition, subtraction and multiplication but not closed under division
For the four types of number the closure property is shown in the following table.

Numbers	Closed under			
	addition	subtraction	multiplication	division
Rational numbers	Yes	Yes	Yes	Yes
Integers	Yes	Yes	Yes	Yes
Whole numbers	Yes	Yes	Yes	Yes
Natural numbers	Yes	Yes	Yes	Yes

41. Which of the following operation is closed for natural numbers?
(a) 3 + 7 = 10 (b) 32 ÷ 5 = 6.4
(c) 18 - 25 = - 7 (d) 10 - 14 = - 4

42. Which of the following operation is not closed for integers?
(a) 48 ÷ 5 = 9.6 b) 14 - 14 = 0
(c) 18 - 25 = - 7 d) 12 - 17= - 5

43. The rational numbers in the operation $\frac{5}{7}\times\frac{9}{11}=\frac{45}{77}$ are _____.

44. Rational numbers are closed under Division operation.
(a) True (b) False

45. Which of the following operation is not closed for Rational numbers?
(a) $\frac{2}{7}+\frac{3}{7}=\frac{5}{7}$ (b) $\frac{3}{5}\times\frac{7}{11}=\frac{21}{55}$
(c) $\frac{2}{7}\div 0$ (not defined) (d) $\frac{3}{5}+\frac{2}{5}=\frac{5}{5}$

Answer Key

DPP-1

1. (a) Multiplicative identity property
(b) Commutative property
(c) Multiplicative inverse property
(d) Commutative property with respective to addition
(e) Associative property with respect to addition
(f) Commutative property with respect to multiplication
(g) Distributive property

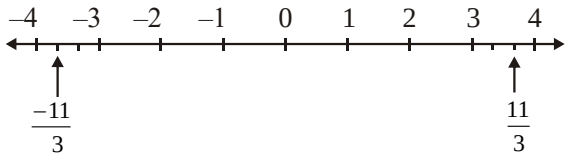
2. $x \times (y + z) = x \times y + x + z$
L.H.S. $= x \times (y + z)$
$= \left(-\frac{3}{5}\right) \times \left[\left(\frac{2}{3}\right) + \left(\frac{-2}{7}\right)\right] = \left(-\frac{3}{5}\right) \times \left(\frac{14-6}{21}\right) = -\frac{3}{5} \times \frac{8}{21} = \frac{-8}{35}$
R.H.S. $= x \times y + x \times z$
$= \left(-\frac{3}{5}\right) \times \left(\frac{2}{3}\right) + \left(\frac{(-3)}{5}\right) \times \left(-\frac{2}{7}\right) = -\frac{2}{5} + \frac{6}{35} = \frac{-14+6}{35} = -\frac{8}{35}$
Since, L.H.S. = R.H.S. Hence verified.

3. (a) $-\frac{1}{2}$ (b) $\frac{3}{2}$ (c) 0 (d) $\frac{13}{17}$

4. (a) $-\frac{1}{15}$ (b) $\frac{9}{-2}$ (c) $\frac{2}{7}$ (d) $\frac{-6}{5}$

5. We have, $2\frac{1}{3} = \frac{6+1}{3} = \frac{7}{3}$
$\frac{-9}{9}\ \frac{-8}{9}\ \frac{-7}{9}$ Now, $\frac{3}{7} \times \frac{7}{3} = 1$
$\therefore$ $\frac{3}{7}$ is the multiplicative inverse of $2\frac{1}{3}$.

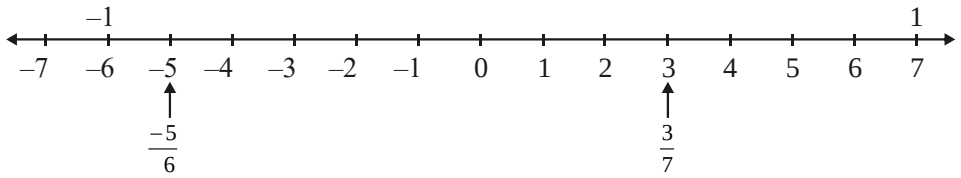
6. (a) Express $+\frac{11}{3}$ in the form of mixed fraction
$\frac{11}{3} = 3\frac{2}{3} = 3 + \frac{2}{3}$
Divide the unit part in between 3 and 4 to 3 in three equal parts on right side of origin. The second part on right side of 3 will represent $\frac{11}{3}$ as shown



(b) Express $-\frac{11}{3}$ in the form of mixed fraction
i.e., $-\frac{11}{3} = -\left(3\frac{2}{3}\right) = -\left(3 + \frac{2}{3}\right)$

Divide the unit part in between –3 and –4 to –3 in three equal parts on the left side of –3. The second part on left of –3 will represent $\frac{-11}{3}$ as shown in the given figure.

(c) Since $\frac{3}{7}$ cannot be expressed as a mixed fraction, divide the part in between 0 and 1 in 7 equal parts, third part from 0 will represent $\frac{3}{7}$ as shown.



(d) Since $-\frac{5}{6}$ cannot be expressed as a mixed fraction. Therefore, divide the unit part in between 0 and –1 in 6 equal parts, where fifth part on the left of origin will represent $-\frac{5}{6}$ as shown above.

7. $\frac{47}{61}$

DPP-2

1. Let other rational number = x

$\therefore\ x+\left(\frac{-11}{27}\right)=\frac{-17}{25}$

2. (a) $\frac{-3}{4}\times\frac{4}{7}+\frac{7}{3}-\frac{4}{7}\times\frac{1}{8}=\frac{3}{4}\left(\frac{-4}{7}\right)-\frac{4}{7}\times\frac{1}{8}+\frac{7}{3}$ (by commutative property)

$=\frac{3}{4}\times\left(\frac{-4}{7}\right)+\left(\frac{-4}{7}\right)\times\frac{-1}{8}+\frac{7}{3}$ (by commutative property)

$\left(\frac{-4}{7}\right)\times\frac{3}{4}+\left(\frac{-4}{7}\right)\times\frac{-1}{8}+\frac{7}{3}$ (By commutative property)

$=\left(\frac{-4}{7}\right)+\left[\frac{3}{4}+\frac{1}{8}\right]+\frac{7}{3}$ (by distributive property)

$=\left(\frac{-4}{7}\right)+\left[\frac{6}{8}+\frac{1}{8}\right]+\frac{7}{3}$

$=\frac{-4\times7}{7\times8}+\frac{7}{3}=\frac{-1}{2}+\frac{7}{3}=\frac{-3+14}{6}=\frac{11}{6}$

(b) $\frac{4}{3}\times\left(\frac{-5}{9}\right)-\frac{1}{4}\times\frac{5}{2}+\frac{1}{8}\times\frac{4}{3}=\frac{4}{3}\times\left(\frac{-5}{9}\right)+\frac{1}{8}\times\frac{4}{3}-\frac{1}{4}\times\frac{5}{2}$ (by commutative property)

$=\frac{4}{3}\left[\frac{-5}{9}+\frac{1}{8}\right]-\frac{1\times5}{4\times2}$ (by distributive property)

$=\frac{4}{3}\left[\frac{-40+9}{72}\right]-\frac{5}{8}=\frac{-4\times31}{3\times72}-\frac{5}{8}$

$=\frac{-31}{54}-\frac{5}{8}$

$$\frac{-124-135}{216} = \frac{-259}{216}$$

3. Infinite 5. $37\frac{7}{8}$ m 6. $3\frac{17}{84}$ 7. $\frac{-23}{120}$

DPP-3

1. -15 2. $8\frac{1}{3}$ m 3. $\frac{-3}{8}, \frac{5}{16}, \frac{-17}{16}, -\frac{23}{32}$

4. $\frac{-4}{9}, \frac{-1}{3}, \frac{-2}{9}, \frac{-1}{9}, 0, \frac{1}{9}, \frac{2}{9}, \frac{1}{3}, \frac{4}{9}$ 5. $\frac{1}{4} < \frac{5}{8} < \frac{5}{7} < \frac{6}{5}$

6. 36 7. 12150

NCERT Basics Exercise-1

1. (i) 1 is the multiplicative identity
   (ii) Commutativity
   (iii) Multiplicative inverse
2. Rational number

Concept Mastery Exercise-2

1. Given, $\frac{-5}{4}\times\left(\frac{8}{5}+\frac{16}{15}\right)=\frac{-5}{4}\times\frac{8}{5}+\left(\frac{-5}{4}\right)$ [by using distributive property over addition]

$=-2-\frac{4}{3}=\frac{-6-4}{3}=\frac{-10}{3}$

2. Existence of additive identity

3. Given, $\left[\frac{1}{5}\times\frac{2}{15}\right]-\left[\frac{1}{5}\times\frac{2}{5}\right]=\frac{1}{5}\left[\frac{2}{15}-\frac{2}{5}\right]$ [using distributive property over addition]

$=\frac{1}{5}\left[\frac{2-6}{15}\right]=\frac{-4}{75}$

4. Given, $x=\frac{-5}{7}$ and $y=\frac{14}{15}$

Then, LHS $=x\times y=\frac{-5}{7}\times\frac{14}{15}=\frac{-2}{3}$

RHS $=y\times x=\frac{14}{15}\times\frac{-5}{7}=\frac{-2}{3}$

$\therefore$ LHS = RHS Hence, $x\times y=y\times x$

5. Let the required number be x.

According to the question $x\times\frac{-15}{20}=\frac{-5}{7}$

$x=\frac{-5}{7}\times\frac{20}{-15}=\frac{20}{21}$ Hence, the required number is $\frac{20}{21}$.

6. We have $\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

$=\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

$=\frac{2}{5}\times\frac{-3}{7}-\frac{3}{7}\times\frac{3}{5}-\frac{1}{14}$ (by commutativity)

$=\frac{-3}{7}\left(\frac{2}{5}+\frac{3}{5}\right)-\frac{1}{14}$ (by distributivity)

$=\frac{-3}{7}\times1-\frac{1}{14}$

$=\frac{-6-1}{14}$

$=\frac{-1}{2}$

7. Given, $x=\frac{-2}{5}$ and $y=\frac{-9}{10}$

Then, LHS $=x+Y=\frac{-2}{5}+\frac{-9}{10}=\frac{-2}{5}-\frac{9}{10}=\frac{-4-9}{10}=\frac{-13}{10}$

RHS $y+x=\frac{-9}{10}+\frac{-2}{5}=\frac{-9}{10}-\frac{2}{5}=\frac{-9-4}{10}=\frac{-13}{10}$

$\therefore$ LHS = RHS

Hence, $x+y=y+x$

8. Here, distance travelled by trian $=\frac{1445}{2}$ km.

Time taken by trian $=\frac{17}{2}$ h

$\because$ Speed of trian $=\frac{\text{distance travelled by train}}{\text{Time taken by train}}=\frac{\frac{1445}{2}}{\frac{17}{2}}=\frac{1445}{2}\times\frac{2}{17}=85$ km/h

Hence, the speed of the train is 85 km/h.

9. We have, length of rope $=117\frac{1}{3}\text{m}=\frac{117\times3+1}{3}=\frac{352}{3}$

Length of each piece = $7\frac{1}{3}=\frac{22}{3}$

So, the number of pieces of the rope $=\frac{\text{Total length of the rope}}{\text{Length of each piece}}=\frac{\frac{352}{3}}{\frac{22}{3}}=\frac{352}{3}\times\frac{3}{22}=16$

Hence, the number of small pieces cut from the $117\frac{1}{3}$ m long rope is 16.

10. Given, $x=1, y=\frac{-1}{2}$ and $z=\frac{1}{4}$

Now, LHS $=x\times(y\times z)=1\times\left(\frac{-1}{2}\times\frac{1}{4}\right)=1\times\frac{-1}{8}=\frac{-1}{8}$

and RHS $=(x\times y)\times z=\left(1\times\frac{-1}{2}\right)\times\frac{1}{4}=\frac{-1}{2}\times\frac{1}{4}=\frac{-1}{8}$

$\therefore$ LHS = RHS Hence, x × (y × z) = (x × y) × z

This property is associative property of multiplication.

11. Let the cost of cloth per meter be x.
According to question
2⅓x = 75¼

$$\frac{7}{3}x = \frac{301}{4}$$

$$x = \frac{(3\times 301)}{(7\times 4)}$$

= ₹ 32.55

12. $-\frac{2}{3}\times\frac{3}{5}+\frac{5}{2}-\frac{3}{5}\times\frac{1}{6}$

$=-\frac{2}{3}\times\frac{3}{5}-\frac{3}{5}\times\frac{1}{6}+\frac{5}{2}$ [Using Associative property]

$=\frac{3}{5}\left(\frac{-2}{3}-\frac{1}{6}\right)+\frac{5}{2}$ [Using distributive property]

$=\frac{3}{5}\left(\frac{-4-1}{6}\right)+\frac{5}{2}$

$=\frac{3}{5}\times\frac{-5}{6}+\frac{5}{2}$

$=-\frac{1}{2}+\frac{5}{2}$

$=\frac{-1+5}{2}=\frac{4}{2}=2$

13. We have given, $x=\frac{-1}{5}, y=\frac{2}{15}$ and $z=\frac{-3}{10}$

Now taking L.H.S. $=x\times(y+z)$

$=\frac{-1}{5}\times\left(\frac{2}{15}+\frac{-3}{10}\right)$

$=\frac{-1}{5}\times\left(\frac{2}{15}-\frac{3}{10}\right)$

$=\frac{-1}{5}\times\left(\frac{4-9}{30}\right)$

$=\frac{-1}{5}\times\frac{-5}{30}$

$=\frac{1}{30}$

Now taking R.H.S. = x × y + x × z

$=\frac{-1}{5}\times\frac{2}{15}+\left(\frac{-1}{5}\right)\times\left(\frac{-3}{10}\right)$

$=\frac{-2}{75}+\frac{3}{50}$

$=\frac{14+9}{150}$

$=\frac{5}{150}$

$=\frac{1}{30}$

$\therefore$ L.H.S. = R.H.S.

Hence, $x\times(y+z)=x\times y+x\times z$

14. $\left(\frac{-10}{15}\right)-\left(\frac{-12}{9}\right)$

$=\frac{[-30-(-60)]}{45}$

$=\frac{[-30+60]}{45}$

$=\frac{30}{45}=\frac{2}{3}$

15. L.H.S.

$\left(\frac{-3}{5}\times\frac{12}{13}\right)\times\frac{7}{8}$

$=\left(\frac{-36}{65}\right)\times\frac{7}{8}$

$=\left(\frac{-63}{130}\right)$

R.H.S.

$\frac{-3}{5}\times\left(\frac{12}{13}\times\frac{7}{8}\right)$

$=\frac{-3}{5}\times\left(\frac{84}{104}\right)=\frac{-3}{5}\times\left(\frac{21}{26}\right)=\left(\frac{-63}{130}\right)$

Therefore, L.H.S = R.H.S.

Hence, verified.

The property is Associative i.e. $(a\times b)\times c=a\times(b\times c)$.

16. 0

Explanation:

$0\div\frac{2}{3}=0\times\frac{3}{2}=0$

17. 121000

Explanation:

Let money in Hamid's bank account be Rs. x.

Given, $\frac{7}{11}$ of all the money in Hamid's bank account = Rs. 77000

$\Rightarrow \frac{7}{11}\times x=77000 \Rightarrow x=\frac{77000\times 11}{7}$

$\Rightarrow x=11000\times 11 \Rightarrow x=121000$

Hence, Hamid has Rs.121000 in his bank account

18. 3.2

Explanation:

Given, temperature of Himachal Pradesh = - 16 °C

$\because \frac{C}{5}=\frac{F-32}{9}$

$\Rightarrow \frac{-16}{5}=\frac{F-32}{9}$

$\Rightarrow F-32=-\frac{144}{5}$

$\Rightarrow F=32-\frac{144}{5}$

$\Rightarrow F=\frac{160-144}{5}=\frac{16}{5}=3.2^{o}F$

19. -39

Explanation:

Let the required number be x.

According to the question,

$\frac{-8x}{13} = 24$

$x = -\frac{13 \times 24}{8}$

x = -13 3 = - 39

Hence, $\frac{-8}{13}$ should be multiplied by -39 to get the product 24.

20. $\left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{3}{5} \times \frac{1}{2}\right) + \frac{7}{5}$

Taking $\frac{1}{2}$ common

$= \frac{1}{2}\left(\frac{2}{3} + \frac{3}{5}\right) + \frac{7}{5}$

$= \frac{1}{2}\left(\frac{10}{15} + \frac{9}{15}\right) + \frac{7}{5}$

$= \frac{1}{2}\left(\frac{19}{15}\right) + \frac{7}{5}$

$= \frac{(19 + 42)}{30}$

$= \frac{61}{30}$

21. $\left\{\frac{2}{9} + \left\lfloor\frac{5}{9} + \frac{1}{9}\right\rfloor\right\}$

$= \left\{\frac{2}{9} + \left\lfloor\frac{6}{9}\right\rfloor\right\}$

$= \frac{8}{9}$

$\left\{\left\lfloor\frac{2}{9} + \frac{5}{9}\right\rfloor + \frac{1}{9}\right\}$

$= \left\{\left\lfloor\frac{7}{9}\right\rfloor + \frac{1}{9}\right\}$

$= \frac{8}{9}$

Yes they are equal.

It is clear that the addition of rational numbers is associative.

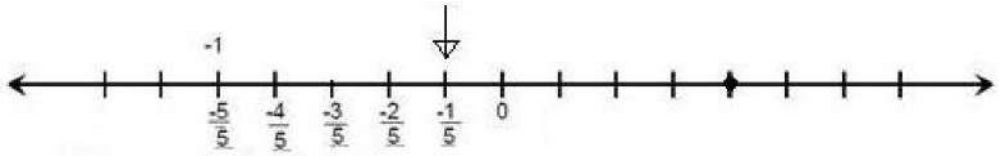
22. a. $\left\lfloor\frac{-14}{9}\right\rfloor \times \frac{3}{5} \times \left\lfloor\frac{-4}{7}\right\rfloor \times \frac{15}{16}$

$= \left[\frac{-\cancel{14}}{\cancel{9}}\right]^{2}_{3} \times \frac{\cancel{3}}{\cancel{5}} \times \left[\frac{-\cancel{4}}{\cancel{7}}\right] \times \frac{\cancel{15}^{3}}{\cancel{16}_{4}}$

$= \frac{1}{2}$

Hence answer is $\frac{1}{2}$.

b. Divide the number line on the left side of zero into 5 equal parts starting from $\frac{0}{5}, \frac{-1}{5}, \ldots\ldots \frac{-5}{5}$. Bold mark $\frac{-1}{5}$ as required in the question and mark it as any alphabet like A,X,P, etc.



23. $\left(\frac{1}{4}\times\frac{2}{7}\right)-\left(\frac{5}{14}\times\frac{-2}{3}\right)+\left(\frac{3}{7}\times\frac{9}{2}\right)$

$=\left(\frac{2}{28}\right)-\left(\frac{-10}{42}\right)+\left(\frac{27}{14}\right)$

$=\left(\frac{1}{14}\right)-\left(\frac{-5}{21}\right)+\left(\frac{27}{14}\right)$

LCM is 42

$=\frac{(3-(-10)+81)}{42}$

$=\frac{(3+10+81)}{42}$

$\frac{94}{42}=\frac{47}{21}$

The answer is $\frac{47}{21}$.

24. We have,

The width of the televisions screen are 97.28 cm, $98\frac{4}{9}$ cm, $98\frac{1}{25}$ cm and 97.94 cm.

Then, at first, we convert all widths in the rational numbers.

i. $97.28\text{cm} = \frac{9728}{100}$ [After removing decimal]

$\therefore \frac{p}{q}=\frac{2432}{25}\text{cm}$ [numerator and denominator both dividing by 4]

ii. $98\frac{4}{9}\text{cm}=\frac{886}{9}\text{cm}$ [convert mixed fraction into simple fraction]

$\therefore \frac{p}{q}=\frac{886}{9}\text{cm}$

iii. $98\frac{1}{25}\text{cm}=\frac{2451}{25}\text{cm}$ [convert mixed fraction into simple fraction]

$\therefore \frac{p}{q}=\frac{2451}{25}\text{cm}$

iv. $97.94\text{cm}=\frac{9794}{100}$ [after removing decimal]

$\therefore \frac{p}{q}=\frac{4897}{50}\text{cm}$ [numerator and denominator both dividing by 2]

To arrange in ascending order, firstly we convert all the denominators same, then we get

2	25, 9, 25, 50
25	25, 9, 25, 25
9	1, 9, 1, 1
	1, 1, 1, 1

$\therefore$ LCM of 25, 9, 25, 50 $= 2 \times 25 \times 9$

= 450

So, $\frac{2432}{25} = \frac{2432 \times 18}{25 \times 18}$

$= \frac{43776}{450}$

Also, $\frac{886}{9} = \frac{886 \times 50}{9 \times 50}$

$= \frac{44300}{450}$

Also, $\frac{2451}{25} = \frac{2451 \times 18}{25 \times 18}$

$= \frac{44118}{450}$

Also, $\frac{4897}{50} = \frac{4897 \times 9}{50 \times 9}$

$= \frac{44073}{450}$

In ascending order, $\frac{43776}{450} > \frac{44073}{450} > \frac{44118}{450} > \frac{44300}{450}$

i.e. 97.28 cm $>$ 97.94 cm $<$ $98\frac{1}{25}$ cm $<$ $98\frac{4}{9}$ cm

25. State True or False:

(i) (a) True

Explanation: True.

Example. Zero can be written as 0/1. We know that a number of the form $\frac{p}{q}$, where p, q are integers and q ≠ 0 is a rational number. Thus, zero is a rational number.

(ii) (a) True

Explanation: True

Every whole number can be written in the form of $\frac{p}{q}$, where p, q are integers and q ≠ 0.

Hence, every whole number is a rational number.

(iii) (b) False

Explanation: False, if $\frac{x}{y}$ is a rational number, then, x and y are integers, where y ≠ 0. Hence, y is always a non-zero integer.

(iv) (a) True

Explanation: True, Every integer is a rational number whose denominator is 1.

26. Fill in the blanks:

(i) 1. 1

(ii) 1. Rational

Accuracy Booster Exercise-3

1.	(a)	**2.**	(a)	**3.**	(c)	**4.**	(d)	**5.**	(c)	**6.**	(a)	**7.**	(d)
8.	(c)	**9.**	(c)	**10.**	(b)	**11.**	(b)	**12.**	(a)	**13.**	(d)	**14.**	(b)
15.	(c)	**16.**	(d)	**17.**	(d)	**18.**	(d)	**19.**	(d)	**20.**	(a)	**21.**	(b)
22.	(a)	**23.**	(a)	**24.**	(c)	**25.**	(a)	**26.**	(c)	**27.**	(d)	**28.**	(b)
29.	(d)	**30.**	(a)	**31.**	(d)	**32.**	(a)	**33.**	(a)	**34.**	(b)	**35.**	(d)
36.	(a)	**37.**	(d)	**38.**	(b)	**39.**	(d)						

40. i. – c
ii. – d
iii. – b
iv. – a

41. (a) **42.** (a) **43.** 1. Closed **44.** (b) False **45.** (c)

Quick Exam Revision

- Rational numbers are **closed** under **addition, subtraction, multiplication** and **division**.
- Rational numbers are **commutative** under **addition** and **multiplication**.
- Rational numbers are **associative** under **addition** and **multiplication**.
- In rational numbers, there exists an **identity element 'zero'** under addition. i.e. a + 0 = 0 + a = a
- In rational numbers, there exists an **identity element 'one'** under multiplication. i.e. a × 1 = 1 × a = a
- Given a rational numbers $\frac{p}{q}$, there exists and additive inverse $-\frac{p}{q}$ such that $\frac{p}{q}+\left(-\frac{p}{q}\right)=0$.
- Given a rational numbers $\frac{p}{q}$, there exists and multiplicative inverse $\frac{q}{p}$ such that $\frac{p}{q}\times\frac{q}{p}=1$.
- In rational numbers, multiplication, distributes over addition and subtraction.
- Every rational numbers can be represented on the number line.
- On the number line, a rational number on the right is always greater than the number on the left.
- Between two rational numbers there lie an infinite number of rational numbers.
- If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then $\frac{a}{b}\times\frac{c}{d}=\frac{a\times c}{b\times d}$.
- If $\frac{a}{b}$ and $\frac{c}{d}$ $(\neq 0)$ are two rational numbers, then $\frac{a}{b}\div\frac{c}{d}=\frac{a}{b}\times\frac{d}{c}$.
- If a and b are two rational numbers, then
  - (i) (a + b) is always a rational number (closure property)
  - (ii) (a – b) is always a rational number (closure property)
  - (iii) (a + b) = (b + a) is always a rational number (commutative property of addition)

CLASS 8 - MATHEMATICS

Chapter-1 Rational Numbers

Solutions

Concept Mastery Exercise-2

1. Given, $\frac{-5}{4}\times\left(\frac{8}{5}+\frac{16}{15}\right)=\frac{-5}{4}\times\frac{8}{5}+\left(\frac{-5}{4}\right)$ [by using distributive property over addition]

$=-2-\frac{4}{3}=\frac{-6-4}{3}=\frac{-10}{3}$

2. Existence of additive identity

3. Given, $\left[\frac{1}{5}\times\frac{2}{15}\right]-\left[\frac{1}{5}\times\frac{2}{5}\right]=\frac{1}{5}\left[\frac{2}{15}-\frac{2}{5}\right]$ [using distributive property over addition]

$=\frac{1}{5}\left[\frac{2-6}{15}\right]=\frac{-4}{75}$

4. Given, $x=\frac{-5}{7}$ and $y=\frac{14}{15}$

Then, LHS $=x\times y=\frac{-5}{7}\times\frac{14}{15}=\frac{-2}{3}$

$RHS=y\times x=\frac{14}{15}\times\frac{-5}{7}=\frac{-2}{3}$

$\therefore$ LHS = RHS

Hence, $x\times y=y\times x$

5. Let the required number be x.

According to the question $x\times\frac{-15}{20}=\frac{-5}{7}$

$x=\frac{-5}{7}\times\frac{20}{-15}=\frac{20}{21}$

Hence, the required number is $\frac{20}{21}$.

6. We have $\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

$=\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

$=\frac{2}{5}\times\frac{-3}{7}-\frac{3}{7}\times\frac{3}{5}-\frac{1}{14}$ (by commutativity)

$=\frac{-3}{7}\left(\frac{2}{5}+\frac{3}{5}\right)-\frac{1}{14}$ (by distributivity)

$=\frac{-3}{7}\times1-\frac{1}{14}$

$=\frac{-6-1}{14}$

$=\frac{-1}{2}$

7. Given, $x=\frac{-2}{5}$ and $y=\frac{-9}{10}$

Then, LHS $=x+Y=\frac{-2}{5}+\frac{-9}{10}=\frac{-2}{5}-\frac{9}{10}=\frac{-4-9}{10}=\frac{-13}{10}$

RHS $y + x = \frac{-9}{10} + \frac{-2}{5} = \frac{-9}{10} - \frac{2}{5} = \frac{-9-4}{10} = \frac{-13}{10}$

$\therefore$ LHS = RHS

Hence, $x + y = y + x$

8. Here, distance travelled by trian $= \frac{1445}{2}$ km.

Time taken by trian $= \frac{17}{2}$ h

$\because$ Speed of trian $= \frac{\text{distance travelled by train}}{\text{Time taken by train}} = \frac{\frac{1445}{2}}{\frac{17}{2}} = \frac{1445}{2} \times \frac{2}{17} = 85$ km/h

Hence, the speed of the train is 85 km/h.

9. We have, length of rope $= 117\frac{1}{3}\text{m} = \frac{117 \times 3 + 1}{3} = \frac{352}{3}$

Length of each piece = $7\frac{1}{3} = \frac{22}{3}$

So, the number of pieces of the rope $= \frac{\text{Total length of the rope}}{\text{Length of each piece}} = \frac{\frac{352}{3}}{\frac{22}{3}} = \frac{352}{3} \times \frac{3}{22} = 16$

Hence, the number of small pieces cut from the $117\frac{1}{3}$ m long rope is 16.

10. Given, $x = 1, y = \frac{-1}{2}$ and $z = \frac{1}{4}$

Now, LHS $= x \times (y \times z) = 1 \times \left(\frac{-1}{2} \times \frac{1}{4}\right) = 1 \times \frac{-1}{8} = \frac{-1}{8}$

and RHS $= (x \times y) \times z = \left(1 \times \frac{-1}{2}\right) \times \frac{1}{4} = \frac{-1}{2} \times \frac{1}{4} = \frac{-1}{8}$

$\therefore$ LHS = RHS

Hence, x × (y × z) = (x × y) × z

This property is associative property of multiplication.

11. Let the cost of cloth per meter be x.

According to question

2⅓x = 75¼

$\frac{7}{3}x = \frac{301}{4}$

$x = \frac{(3 \times 301)}{(7 \times 4)}$

= ₹ 32.55

12. $-\frac{2}{3} \times \frac{3}{5} + \frac{5}{2} - \frac{3}{5} \times \frac{1}{6}$

$= -\frac{2}{3} \times \frac{3}{5} - \frac{3}{5} \times \frac{1}{6} + \frac{5}{2}$ [Using Associative property]

$= \frac{3}{5}\left(\frac{-2}{3} - \frac{1}{6}\right) + \frac{5}{2}$ [Using distributive property]

$= \frac{3}{5}\left(\frac{-4-1}{6}\right) + \frac{5}{2}$

$= \frac{3}{5} \times \frac{-5}{6} + \frac{5}{2}$

$= -\frac{1}{2} + \frac{5}{2}$

$= \frac{-1+5}{2} = \frac{4}{2} = 2$

13. We have given, $x = \frac{-1}{5}, y = \frac{2}{15}$ and $z = \frac{-3}{10}$

Now taking L.H.S. $= x \times (y + z)$

$= \frac{-1}{5} \times \left(\frac{2}{15} + \frac{-3}{10} \right)$

$= \frac{-1}{5} \times \left(\frac{2}{15} - \frac{3}{10} \right)$

$= \frac{-1}{5} \times \left(\frac{4-9}{30} \right)$

$= \frac{-1}{5} \times \frac{-5}{30}$

$= \frac{1}{30}$

Now taking R.H.S. = x × y + x × z

$= \frac{-1}{5} \times \frac{2}{15} + \left(\frac{-1}{5} \right) \times \left(\frac{-3}{10} \right)$

$= \frac{-2}{75} + \frac{3}{50}$

$= \frac{14+9}{150}$

$= \frac{5}{150}$

$= \frac{1}{30}$

$\therefore$ L.H.S. $=$ R.H.S.

Hence, $x \times (y + z) = x \times y + x \times z$

14. $\left(\frac{-10}{15} \right) - \left(\frac{-12}{9} \right)$

$= \frac{[-30 - (-60)]}{45}$

$= \frac{[-30 + 60]}{45}$

$= \frac{30}{45} = \frac{2}{3}$

15. L.H.S.

$\left(\frac{-3}{5} \times \frac{12}{13} \right) \times \frac{7}{8}$

$= \left(\frac{-36}{65} \right) \times \frac{7}{8}$

$= \left(\frac{-63}{130} \right)$

R.H.S.

$\frac{-3}{5} \times \left(\frac{12}{13} \times \frac{7}{8} \right)$

$= \frac{-3}{5} \times \left(\frac{84}{104}\right)$

$= \frac{-3}{5} \times \left(\frac{21}{26}\right)$

$= \left(\frac{-63}{130}\right)$

Therefore, L.H.S = R.H.S.

Hence, verified.

The property is Associative i.e. $(a \times b) \times c = a \times (b \times c)$.

16. 0

Explanation:

$0 \div \frac{2}{3} = 0 \times \frac{3}{2} = 0$

17. 121000

Explanation:

Let money in Hamid's bank account be Rs. x.

Given, $\frac{7}{11}$ of all the money in Hamid's bank account = Rs. 77000

$\Rightarrow \frac{7}{11} \times x = 77000$

$\Rightarrow x = \frac{77000 \times 11}{7}$

$\Rightarrow x = 11000 \times 11$

$\Rightarrow x = 121000$

Hence, Hamid has Rs.121000 in his bank account

18. 3.2

Explanation:

Given, temperature of Himachal Pradesh = - 16 °C

$\because \frac{C}{5} = \frac{F-32}{9}$

$\Rightarrow \frac{-16}{5} = \frac{F-32}{9}$

$\Rightarrow F - 32 = -\frac{144}{5}$

$\Rightarrow F = 32 - \frac{144}{5}$

$\Rightarrow F = \frac{160-144}{5}$

$= \frac{16}{5} = 3.2^{o}F$

19. -39

Explanation:

Let the required number be x.

According to the question,

$\frac{-8x}{13} = 24$

$x = -\frac{13 \times 24}{8}$

x = -13 3 = - 39

Hence, $\frac{-8}{13}$ should be multiplied by -39 to get the product 24.

20. $\left(\frac{1}{2}\times\frac{2}{3}\right)+\left(\frac{3}{5}\times\frac{1}{2}\right)+\frac{7}{5}$

Taking $\frac{1}{2}$ common

$=\frac{1}{2}\left(\frac{2}{3}+\frac{3}{5}\right)+\frac{7}{5}$

$=\frac{1}{2}\left(\frac{10}{15}+\frac{9}{15}\right)+\frac{7}{5}$

$=\frac{1}{2}\left(\frac{19}{15}\right)+\frac{7}{5}$

$=\frac{(19+42)}{30}$

$=\frac{61}{30}$

21. $\left\{\frac{2}{9}+\left\lfloor\frac{5}{9}+\frac{1}{9}\right\rfloor\right\}$

$=\left\{\frac{2}{9}+\left\lfloor\frac{6}{9}\right\rfloor\right\}$

$=\frac{8}{9}$

$\left\{\left\lfloor\frac{2}{9}+\frac{5}{9}\right\rfloor+\frac{1}{9}\right\}$

$=\left\{\left\lfloor\frac{7}{9}\right\rfloor+\frac{1}{9}\right\}$

$=\frac{8}{9}$

Yes they are equal.

It is clear that the addition of rational numbers is associative.

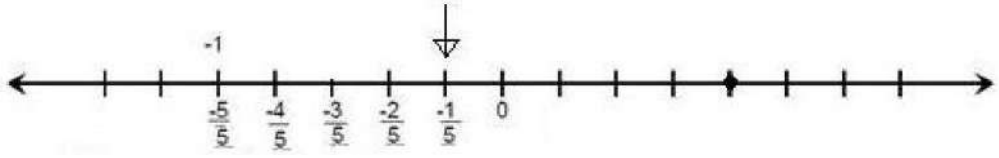
22. a. $\left\lfloor\frac{-14}{9}\right\rfloor\times\frac{3}{5}\times\left\lfloor\frac{-4}{7}\right\rfloor\times\frac{15}{16}$

$=\left[\frac{-\cancel{14}}{\cancel{9}_{3}}\right]\times\frac{\cancel{3}}{\cancel{5}}\times\left[\frac{-\cancel{4}}{\cancel{7}}\right]\times\frac{\cancel{15}^{3}}{\cancel{16}_{4}}$

$=\frac{1}{2}$

Hence answer is $\frac{1}{2}$.

b. Divide the number line on the left side of zero into 5 equal parts starting from $\frac{0}{5},\frac{-1}{5},.....\frac{-5}{5}$. Bold mark $\frac{-1}{5}$ as required in the question and mark it as any alphabet like A,X,P, etc.



23. $\left(\frac{1}{4}\times\frac{2}{7}\right)-\left(\frac{5}{14}\times\frac{-2}{3}\right)+\left(\frac{3}{7}\times\frac{9}{2}\right)$

$=\left(\frac{2}{28}\right)-\left(\frac{-10}{42}\right)+\left(\frac{27}{14}\right)$

$=\left(\frac{1}{14}\right)-\left(\frac{-5}{21}\right)+\left(\frac{27}{14}\right)$

LCM is 42

$=\frac{(3-(-10)+81)}{42}$

$=\frac{(3+10+81)}{42}$

$\frac{94}{42}=\frac{47}{21}$

The answer is $\frac{47}{21}$.

24. We have,

The width of the televisions screen are 97.28 cm, $98\frac{4}{9}$ cm, $98\frac{1}{25}$ cm and 97.94 cm.

Then, at first, we convert all widths in the rational numbers.

i. $97.28\text{cm}=\frac{9728}{100}$ [After removing decimal]

$\therefore \frac{p}{q}=\frac{2432}{25}\text{cm}$ [numerator and denominator both dividing by 4]

ii. $98\frac{4}{9}\text{cm}=\frac{886}{9}\text{cm}$ [convert mixed fraction into simple fraction]

$\therefore \frac{p}{q}=\frac{886}{9}\text{cm}$

iii. $98\frac{1}{25}\text{cm}=\frac{2451}{25}\text{cm}$ [convert mixed fraction into simple fraction]

$\therefore \frac{p}{q}=\frac{2451}{25}\text{cm}$

iv. $97.94\text{cm}=\frac{9794}{100}$ [after removing decimal]

$\therefore \frac{p}{q}=\frac{4897}{50}\text{cm}$ [numerator and denominator both dividing by 2]

To arrange in ascending order, firstly we convert all the denominators same, then we get

2	25, 9, 25, 50
25	25, 9, 25, 25
9	1, 9, 1, 1
	1, 1, 1, 1

$\therefore$ LCM of 25, 9, 25, $50=2\times25\times9$

= 450

So, $\frac{2432}{25}=\frac{2432\times18}{25\times18}$

$=\frac{43776}{450}$

Also, $\frac{886}{9}=\frac{886\times 50}{9\times 50}$

$=\frac{44300}{450}$

Also, $\frac{2451}{25}=\frac{2451\times 18}{25\times 18}$

$=\frac{44118}{450}$

Also, $\frac{4897}{50}=\frac{4897\times 9}{50\times 9}$

$=\frac{44073}{450}$

In ascending order, $\frac{43776}{450}>\frac{44073}{450}>\frac{44118}{450}>\frac{44300}{450}$

i.e. 97.28 cm $>$ 97.94 cm $<98\frac{1}{25}$ cm $<98\frac{4}{9}$ cm

25. State True or False:
(i) (a) True
Explanation: True.

Example. Zero can be written as 0/1. We know that a number of the form $\frac{p}{q}$, where p, q are integers and q ≠ 0 is a rational number. Thus, zero is a rational number.
(ii) (a) True
Explanation: True

Every whole number can be written in the form of $\frac{p}{q}$, where p, q are integers and q ≠ 0.

Hence, every whole number is a rational number.
(iii) (b) False

Explanation: False, if $\frac{x}{y}$ is a rational number, then, x and y are integers, where y ≠ 0. Hence, y is always a non-zero integer.
(iv) (a) True
Explanation: True, Every integer is a rational number whose denominator is 1.

26. Fill in the blanks:
(i) 1. 1
(ii) 1. Rational

Accuracy Booster Exercise-3

1. (a)

Explanation: $\left\lfloor\frac{5}{9}+\left(\frac{-5}{18}\right)\right\rfloor+\left\lfloor\left(\frac{-7}{18}\right)+\frac{7}{9}\right\rfloor$

$=\left\lfloor\frac{5\times 2+(-5)\times 1}{18}\right\rfloor+\left\lfloor\frac{-7\times 1+2\times 7}{18}\right\rfloor$

$=\left\lfloor\frac{10-5}{18}\right\rfloor+\left\lfloor\frac{-7+14}{18}\right\rfloor$

$=\frac{5}{18}+\frac{7}{18}=\frac{12}{18}=\frac{2}{3}$

2. (a) x

Explanation: If x is any rational number,
then x + 0 = x [∵ 0 is the additive identity]

3. (c) $\frac{25}{36}$

Explanation: Given , a = 2 , b = 3 so,

$$\left(\frac{1}{a}+\frac{1}{b}\right)^{a}=\left(\frac{1}{2}+\frac{1}{3}\right)^{2}$$

$$=\left(\frac{3+2}{6}\right)^{2}$$

$$=\left(\frac{5}{6}\right)^{2}$$

$$=\frac{25}{36}$$

4. (d) $\frac{-1}{14}$

Explanation: $\left|\frac{3}{7}+\left(\frac{-5}{14}\right)\right|+\left|\left(\frac{-8}{21}\right)+\frac{5}{21}\right|$

$$=\left|\frac{3\times2+1\times(-5)}{14}\right|+\left|\frac{-8+5}{21}\right|$$

$$=\left|\frac{1}{14}\right|+\left|\frac{-3}{21}\right|$$

$$=\frac{3\times1+(-3)\times2}{42}$$

$$=\frac{3-6}{42}$$

$$=\frac{-3}{42}$$

$$=\frac{-1}{14}$$

5. (c) $-67\frac{7}{9}$

Explanation: We have, $\frac{\left(-18\frac{1}{3}\times2\frac{8}{11}\right)-\left(4\frac{5}{7}\times2\frac{1}{3}\right)}{\left|\frac{3}{5}+\left(\frac{-9}{10}\right)\right|+\left|-\left(\frac{-3}{5}\right)\right|}$

$$=\frac{\left(\frac{-55}{3}\times\frac{30}{11}\right)-\left(\frac{33}{7}\times\frac{7}{3}\right)}{\left|\frac{3}{5}-\frac{9}{10}\right|+\left|\frac{3}{5}\right|}=\frac{-50-11}{\left|\frac{6-9}{10}\right|+\frac{3}{5}}$$

$$=\frac{-61}{\frac{3}{10}+\frac{3}{5}}=\frac{-61}{\frac{3+6}{10}}=\frac{-61\times10}{9}=\frac{-610}{9}=-67\frac{7}{9}$$

6. (a) rational number

Explanation: Rational Numbers - A number which can be written in form of $\frac{p}{q}$ where p and q are integers and q ≠ 0.

7. (d) 1

Explanation: $\left\lfloor \frac{7}{8}+\left(\frac{-5}{16}\right)\right\rfloor+\left\lfloor\left(\frac{-3}{16}\right)+\frac{5}{8}\right\rfloor$

$=\left\lfloor \frac{7\times 2+(-5)\times 1}{16}\right\rfloor+\left\lfloor \frac{-3\times 1+2\times 5}{16}\right\rfloor$

$=\left\lfloor \frac{14-5}{16}\right\rfloor+\left\lfloor \frac{-3+10}{16}\right\rfloor$

$=\frac{9}{16}+\frac{7}{16}$

$=\frac{16}{16}=1$

8. (c) 131

Explanation: 244 - [13 + 25 {15 ÷ 3 - (13 - $\overline{24-12}$)}]

= 244 - [13 + 25 {15 ÷ 3 - (13 - 12)}] = 244 - [13 + 25 {15 × 3 - 1}]

= 244 - [13 + 25 × 4] = 244 - 113 = 131

9. (c) 1

Explanation: Least natural number is 1.

10. (b) 0

Explanation: $\frac{15}{17}+\left(\frac{-15}{17}\right)$

$=\frac{15}{17}-\frac{15}{17}$

= 0

11. (b) 0

Explanation: $\frac{13}{19}+\left(\frac{-13}{19}\right)$

$=\frac{13}{19}-\frac{13}{19}$

$=0$

12. (a) rational number

Explanation: The product of two rational numbers is always a rational number as, if we multiply any two rational numbers the product is a rational number (with the exception of 0)

13. (d) irrational number

Explanation: A number which cannot be written in the form of $\frac{p}{q}$, where p and q are integers and q is not equal to zero is called an irrational number for example $\sqrt{2}$, $\sqrt{3}$,...

14. (b) Option (ii)

Explanation: Every rational is not a If action eg: 4 is not a fraction

15. (c) 2 or 5

Explanation: 2 or 5

16. (d) 2 or 5

Explanation: When the denominator has factors 2 (or) 5, then only a rational number is expressible as a terminating decimal.

17. (d) rational number

Explanation: Sum of two rational numbers is a rational number.

For, exampe, $\frac{2}{3}+\frac{4}{3}=\frac{6}{3}$

18. (d) $\frac{1}{2}$

Explanation: $\frac{-4}{5} \times \frac{3}{7} \times \frac{15}{16} \times \left(\frac{-14}{9}\right)$

$= \frac{-12}{35} \times \frac{-210}{144}$

$= \frac{6}{12}$

$= \frac{1}{2}$

19. (d) rational number

Explanation: A number which can be expressed as $\frac{p}{q}$ where p and q are integers and q ≠ 0 is a rational number.

20. (a) 0

Explanation: $\frac{18}{23} + \left(\frac{-18}{23}\right)$

$= \frac{18}{23} - \frac{18}{23}$

= 0

21. (b) Option (b)

Explanation: By options,

a. -5 + 3 = -2 and 3 + (-5) = -2, whoch are equal.

b. $\frac{-8}{12} = \frac{10}{-15} \Rightarrow \frac{-2}{3} = \frac{-2}{3}$, which are equal.

c. 2 is not natural number.

d. 17 is not prime number.

22. (a) 28

Explanation: | 44 - [1 + 5 {12 ÷ 4 - 2(1 - $\overline{4-3}$)}] |

= | 44 - [1 + 5 {12 4 - 2 (1 - 1)}] |

= | 44 - [1 + 5 {12 4 - 0}] | = | 44 - [1 + 5 × 3] | = | 44 - 16 | = |28| = 28

23. (a) $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \times \frac{2}{3}\right] + \left[-\frac{1}{4} \times \left(\frac{-4}{7}\right)\right]$

Explanation: We know that, the distributive property of multiplication over addition for rational numbers can be expressed as a × (b + c) = ab + ac, where a, b and c are rational numbers.

Here, $-\frac{1}{4} \times \left\{\frac{2}{3} + \left(\frac{-4}{7}\right)\right\} = \left[-\frac{1}{4} \times \frac{2}{3}\right] + \left[-\frac{1}{4} \times \left(\frac{-4}{7}\right)\right]$

24. (c) $\frac{-2}{15}$

Explanation: $\left[\frac{5}{7} + \frac{-6}{7}\right] + \left[\left(\frac{8}{35}\right) + \frac{5}{21}\right]$

$= \left[\frac{5-6}{7}\right] + \left[\frac{-8 \times 3 + 5 \times 5}{105}\right]$

$= \frac{-1}{7} + \frac{1}{105}$

$= \frac{-15+1}{105}$

$= \frac{14}{105} = \frac{-2}{15}$

25. (a) distributive property
Explanation: a(b + c) = (a × b) + (a × c) distributive property

26. (c)

Explanation: $\left\lfloor \frac{3}{4}+\left(\frac{-5}{2}\right)+\left(\frac{-8}{3}\right)\right\rfloor+\frac{5}{5}$

$=\left\lfloor \frac{3\times3+(-5)\times6+(-8)\times4}{12}\right\rfloor=1$

$=\left\lfloor \frac{9-30-32}{12}\right\rfloor+1$

$=\frac{-53}{12}+1$

$=\frac{-53+12}{12}$

$=\frac{-41}{12}$

27. (d) Option (iv)

Explanation: $\frac{8}{9}-\frac{7}{11}=\frac{88-63}{99}=\frac{25}{99}$

$\frac{7}{11}-\frac{8}{9}=\frac{63-88}{99}=\frac{-25}{99}$

$\therefore \frac{8}{9}-\frac{7}{11}\neq\frac{7}{11}-\frac{8}{9}$

28. (b) distributive property
Explanation: Distributive property

29. (d) identity for addition of rational numbers
Explanation: We know that, the sum of any rational number and zero (0) is the rational number itself. Now, x + 0 = 0 + x = x, which is a rational number, then 0 is called identity for addition of rational numbers.

30. (a) Option (i)
Explanation: $2^2 = 4$

31. (d) 0
Explanation: Zero multiplied by any number is 0.

32. (a) $\frac{p}{q}$

Explanation: The answer is $\frac{p}{q}$ as any number which is in this form is a rational number provided $q \neq 0$

33. (a) $\frac{2}{3}-\frac{5}{4}=\frac{5}{4}-\frac{2}{3}$

Explanation: $\frac{2}{3}-\frac{5}{4}=\frac{5}{4}-\frac{2}{3}$

34. (b) Rational numbers are closed under division
Explanation: Rational numbers are not closed under division.

As, 1 and 0 are the rational numbers but $\frac{1}{0}$ is not defined.

35. (d) 0
Explanation: 0

36. (a) Both A and R are true and R is the correct explanation of A.

Explanation: $\frac{1}{3}$ of 3 = 1, 1 is also rational number.

Reason is a definition of rational number.

37. (d) A is false but R is true.

Explanation: When any three rational numbers are subtracted or divided in an order, the result so obtained will change if the order is changed. Therefore, subtraction and division are not associative for rational numbers. So, (A) is false. Rational numbers follow the associative property for addition and multiplication. (R) is true.

38. (b) Both A and R are true but R is not the correct explanation of A.

Explanation: $\left(\frac{2}{5}\right)\times\left(\frac{4}{9}\right)=\frac{8}{45}$

The reciprocal of 8/45 is $\frac{45}{8}$. So, (A) is true.

(R) is also true but not the correct explanation of (A)

39. (d) A is false but R is true.

Explanation: Rational numbers are closed under addition, subtraction, and multiplication. So, (A) false. Reason (R) is a definition of the rational number.

40. i. - c

ii. - d

iii. - b

iv. - a

41. (a) 3 + 7 = 10

Explanation: 3 + 7 = 10

42. (a) 48 ÷ 5 = 9.6

Explanation: 48 ÷ 5 = 9.6

43. 1. Closed

44. (b) False

Explanation: False

45. (c) $\frac{2}{7}\div 0$ (not defined)

Explanation: $\frac{2}{7}\div 0$ (not defined)

6th to 10th Pre-Foundation		
Class	**Subjects**	**No of Booklets**
6th	Physics / Chemistry / Biology / Mathematics	5
	English Grammar	1
	History / Geography / Civics	1
	Mental Ability	1
7th	Physics / Chemistry / Biology / Mathematics	5
	English Grammar	1
	History / Geography / Civics	3
	Mental Ability	1
8th	Physics / Chemistry / Biology / Mathematics	5
	English Grammar	1
	History / Geography / Civics	3
	Mental Ability	1
9th	Physics / Chemistry / Biology / Mathematics	5
	English Grammar / English Text	2
	History / Geography / Political Science / Economics	4
	Mental Ability	1
10th	Physics / Chemistry / Biology / Mathematics	5
	English Grammar / English Text	2
	History / Geography / Political Science / Economics	4
	Mental Ability	1

JEE & NEET Foundation		
Class		**No of Booklets**
11th JEE	Physics / Chemistry / Mathematics	12
11th NEET	Physics / Chemistry / Biology	13
12th JEE	Physics / Chemistry / Mathematics	12
12th NEET	Physics / Chemistry / Biology	13

Other Exam Study Material		
Class		**No of Booklets**
NDA	Mathematics	2
	General Aptitude Test	7
CUET Science	English	1
	General Test	2
	Physics	1
	Chemistry	1
	Biology / Mathematics	1
CUET Commerce	English	1
	General Test	2
	Accountancy	1
	Business Studies	1
	Economics	1
CUET Humanities	English	1
	General Test	2
	History	1
	Geography	1
	Political Science	1

Crash Course with Test Seriesa		
Class		**No of Booklets**
JEE Main	Physics / Chemistry / Mathematics	6
	8 PT + 2SM + 10FT	20
NEET	Physics / Chemistry / Biology	6
	8 PT + 2SM + 10FT	20
MH CET	Physics / Chemistry / Mathematics	6
	8 PT + 2SM + 10FT	20
JEE Advanced	Physics / Chemistry / Mathematics	6
	8 PT + 2SM + 10FT	20

Facilities:

- Customized Authentic Study Material for School & Competitive Exams
- As per New Syllabus & Pattern
- Study Material Prepared by Experienced Subject Experts
- Also Available in Hindi & English Language
- Available for Class 1 to 12For more details and sample kindly contact
- CET Study Material also Available

Payment Gateway

Ved Educational Services
Private Limited, Kota

Chaandmari Balaji Ki Kripa

Address 911, Subhash Nagar II, Near Bombay Yojna, Rangbari Mukti Dham, KOTA - 324005
Contact No. 7891105056
Website www.vededucational.in