

CHAPTER – 1

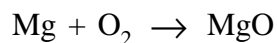
Chemical Reactions and Equations

Chemical Reaction : – Whenever a chemical change occurs we can say that a chemical reaction has taken place

- eg – Food gets digested in our body
 – Rusting of iron.

Chemical Equation :– A chemical reaction can be expressed symbolically by using chemical equation

eg magnesium is burnt into air to form magnesium oxide can be represented as

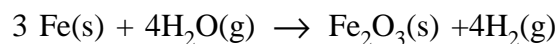


- We can observe or recognise a chemical reaction by observing change in state, colour, by evolution of gas or by change in temperature.

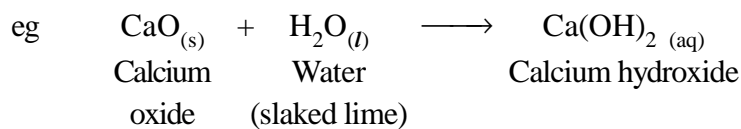
Physical state of the reactant and products are mentioned to make chemical reaction more informative. eg we use (g) for gas, (l) for liquid, (s) for solid and (aq) for aqueous.

Balancing Equation :– We balance the chemical equation so that no. of atoms of each element involved in the reaction remain same at the reactant and product side.

eg $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_2\text{O}_3 + \text{H}_2$ can be written as

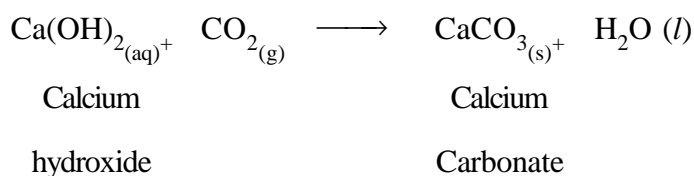


Combination Reaction :– The reaction in which two or more substances combine to form a new single substance



Quick lime

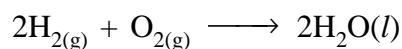
- Ca(OH)_2 slaked lime is used for white washing walls. It reacts with CO_2 to form CaCO_3 and gives a shiny finish to the walls.



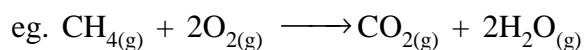
- Burning of Coal



- Formation of water



Exothermic Reactions :- Reaction in which heat is released along with the formation of products.



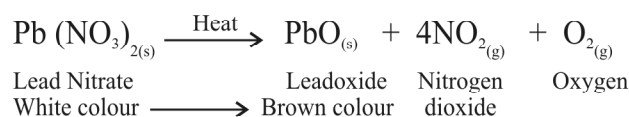
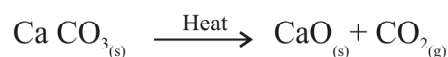
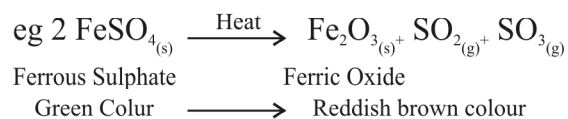
- Respiration is also exothermic reaction.
- Decomposition of vegetable matter into compost.

Decomposition Reactions :- The reaction in which a single substance decomposes to give two or more substances. Decomposition reactions can be of three types

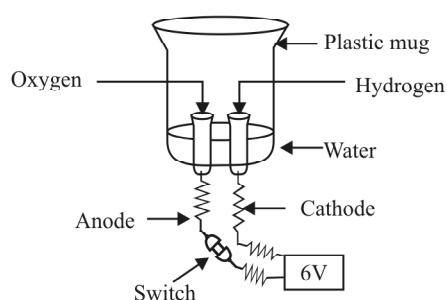
Thermal Decomposition :- When a decomposition reaction is carried out by heating

Decomposition Reactions

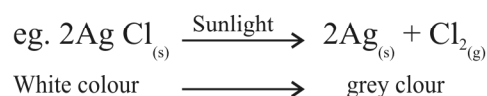
→ **Thermal Decomposition :-** When a decomposition reaction is carried out by heating



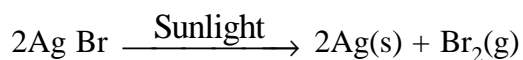
→ **Electrolytic Decomposition :-** When a decomposition reaction is carried out by electric current,



→ **Photolytic decomposition :-** When a decomposition reaction is carried out by light

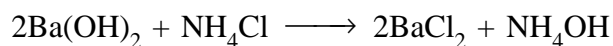


- Silver bromide behaves similarly

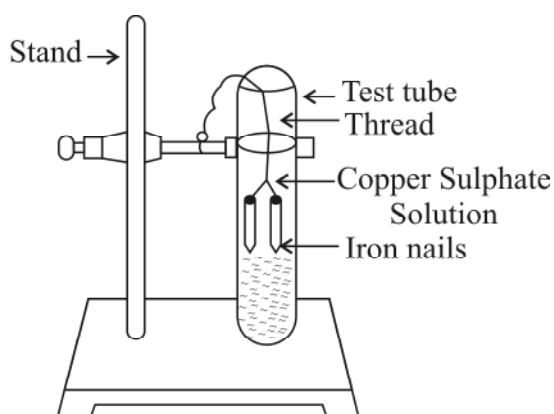
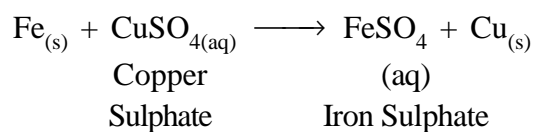


- The above two reactions are used in black and white photography.

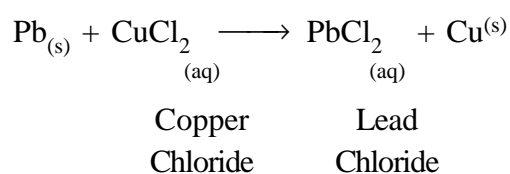
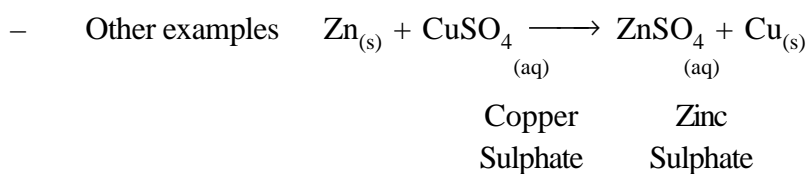
- **Endothermic Reactions** – The reactions which require energy in the form of heat, light or electricity are called Endothermic Reactions.



- **Displacement Reaction** : The chemical Reaction in which an element displaces another element from its solution



- The nail becomes brownish in colour and the blue colour of Copper Sulphate solution fade.



- Zinc and lead are more reactive elements than copper. They displace copper from its compounds.

- **Corrosion** : When a metal is attacked by substances around it such as moisture, acids etc.
eg. Reddish brown coating on iron.
(ii) Black coating on Silver.
- **Rancidity** : When fats and oils are oxidised they become rancid and their smell and taste change.
- Antioxidants are added to foods containing fats and oil.

EXERCISE (Question Bank)

(1 Mark)

Answer the following questions very briefly

1. What happens when the milk is left at room temperature during summer?
2. Write a chemical equation when magnesium is burnt in air to give magnesium oxide.
3. A substance under goes chemical reactions to produce simpler products, what type of reaction is this?
4. Why do copper vessels lose their shine when exposed to air?
5. Which gas is produced by the action of dilute hydrochloric acid on zinc granules?
6. $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$
The above reaction is an example of which type of reaction.
7. Name the type of reaction in which energy is absorbed.
8. Why does the colour of copper sulphate solution change when an iron nail is dipped into it?
9. Give an example of decomposition reaction which proceeds by absorbing electric energy.
10. Why do we balance the chemical equation?

Answer the following questions briefly

(2 mark)

1. Write down the observations which indicate the occurrence of a chemical reaction.
2. Why is respiration considered as an exothermic reaction? Explain.
3. Transfer the following statements into Chemical equations and then balance them.
 - a) Hydrogen gas combines with nitrogen to form ammonia.
 - b) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.
4. Identify the substances that are oxidised and the substances that are reduced to the following reactions.
 1.
$$\begin{array}{ccccccc} \text{Na} & + & \text{O}_2 & \longrightarrow & \text{Na}_2\text{O} \\ \text{(s)} & & \text{(g)} & & \text{(s)} \end{array}$$
$$\begin{array}{ccccccc} \text{CuO} & + & \text{H}_2 & \longrightarrow & \text{Cu} & + & \text{H}_2\text{O} \\ \text{(s)} & & \text{(g)} & & \text{(s)} & & \text{(l)} \end{array}$$
5. What happens when silver chloride is exposed to sunlight? Give one practical application of this reaction. Write the equation also.
6. Why is the bag used for potato chips flushed with nitrogen gas?

Answer the following questions in detail

(3 marks)

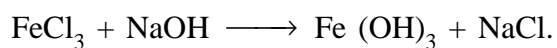
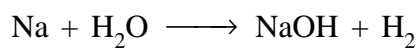
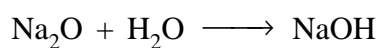
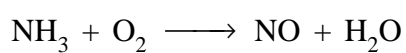
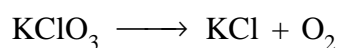
1. Write down the balanced chemical equations for the following reactions.
 - a) Zinc Carbonate_(s) \longrightarrow Zinc Oxide + Carbon Dioxide_(g)
 - b) Aluminium_(s) + Chlorine_(g) \longrightarrow Aluminium Chloride_(s)
 - c) Magnesium_(s) + Water_(l) $\xrightarrow{\text{Heat}}$ Magnesium Hydroxide_(l) + Hydrogen_(g)
2. Choose combination, displacement and double displacement reactions out of the given reactions.
 - i)
$$\text{MnO}_{2(s)} + 4\text{HCl}_{(l)} \longrightarrow \text{MnCl}_{2(s)} + \text{Cl}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$$
 - ii)
$$\text{CaO}_{(s)} + \text{CO}_{2(g)} \longrightarrow \text{CaCO}_{3(s)}$$
 - iii)
$$2\text{AgCl}_{(s)} \longrightarrow 2\text{Ag}_{(s)} + \text{Cl}_{2(g)}$$

3. What happens when $\text{CO}_2^{(g)}$ is passed through slaked lime? Write the balanced chemical equation. Write the type of reaction that has occurred.

Explain the following questions detail

(5 marks)

1. Balance the following chemical equation and identify the type of reaction they represent



2. Define various types of chemical reactions. Write one chemical equation for each type.

Key Notes

Chapter-02

Polynomials

- An algebraic expression of the form $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_{n-1}x + a_n$, where $a_0, a_1, a_2, \dots, a_n$ are real numbers, n is a non-negative integer and $a_0 \neq 0$ is called a polynomial of degree n .
- **Degree:** The highest power of x in a polynomial $p(x)$ is called the degree of polynomial.
- Polynomials of degrees 1, 2 and 3 are called linear, quadratic and cubic polynomials respectively.
- **Types of Polynomial:**
 - (i) **Constant Polynomial:** A polynomial of degree zero is called a constant polynomial and it is of the form $p(x) = k$.
 - (ii) **Linear Polynomial:** A polynomial of degree one is called linear polynomial and it is of the form $p(x) = ax + b$ where a, b are real numbers and $a_0 \neq 0$.
 - (iii) **Quadratic Polynomial:** A quadratic polynomial in x with real coefficient is of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.
 - (iv) **Cubical Polynomial:** A polynomial of degree three is called cubical polynomial and is of the form $p(x) = ax^3 + bx^2 + cx + d$ where a, b, c, d are real numbers and $a \neq 0$.
 - (v) **Bi-quadratic Polynomial:** A polynomial of degree four is called bi-quadratic polynomial and it is of the form $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, where a, b, c, d, e are real numbers and $a \neq 0$.
- The zeroes of a polynomial $p(x)$ are precisely the x -coordinates of the points where the graph of $y = p(x)$ intersects the x -axis i.e. $x = a$ is a zero of polynomial $p(x)$ if $p(a) = 0$.
- A polynomial can have at most the same number of zeros as the degree of polynomial.
- For quadratic polynomial $ax^2 + bx + c \neq 0$ Sum of zeros = $-\frac{b}{a}$ Product of zeros = $\frac{c}{a}$
- The division algorithm states that given any polynomial $p(x)$ and polynomial $g(x)$, there are polynomials $q(x)$ and $r(x)$ such that: $p(x) = g(x).q(x) + r(x)$, $g(x) \neq 0$ where $r(x) = 0$ or degree of $r(x) < \text{degree of } g(x)$
- The division algorithm states that given any polynomial $p(x)$ and polynomial $g(x)$, there are polynomials $q(x)$ and $r(x)$ such that: $p(x) = g(x).q(x) + r(x)$, $g(x) \neq 0$ where $r(x) = 0$ or degree of $r(x) < \text{degree of } g(x)$.

Key Notes

Chapter-03

Pair of Linear Equation in Two Variables

- **Algebraic Expression:** A combination of constants and variables, connected by four fundamental arithmetical operations of $+$, $-$, \times and \div is called an algebraic expression. For example, $3x^2 + 4xy - 5y^2$ is an algebraic expression.
- **Equation:** An algebraic expression with equal to sign ($=$) is called the equation. Without an equal to sign, it is an expression only. For example, $3x + 9 = 0$ is an equation, but $3x + 9$ is an expression.
- **Linear Equation:** If the greatest exponent of the variable(s) in a equation is one, then equation is said to be a linear equation.
- The most general form of a pair of linear equations is:

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0 \text{ Where } a_1, a_2, b_1, b_2, c_1, c_2 \text{ are real numbers and}$$

$$a_1^2 + b_1^2 \neq 0, a_2^2 + b_2^2 \neq 0.$$

$$2 + b_1$$

$$a_1^2 + b_1^2 \neq 0, a_2^2 + b_2^2 \neq 0.$$

- The graph of a pair of linear equations in two variables is represented by two lines;
 - (i) If the lines intersect at a point, the pair of equations is consistent. The point of intersection gives the unique solution of the equation.
 - (ii) If the lines coincide, then there are infinitely many solutions. The pair of equations is consistent. Each point on the line will be a solution.
 - (iii) If the lines are parallel, the pair of the linear equations has no solution. The pair of linear equations is inconsistent.
- If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$
 - (i) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ the pair of linear equations is consistent. (Unique solution).
 - (ii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is inconsistent (No solution).
 - (iii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is dependent and consistent (infinitely many solutions).

Key Notes

Chapter-04

Quadratic Equation

- **Quadratic Polynomial:** A polynomial of the form $ax^2 + bx + c$ is called a quadratic expression in the variable x . This is a polynomial of the second degree. In quadratic expression $ax^2 + bx + c$, a is the coefficient of x^2 , b is the coefficient of x and c is the constant term (or coefficient of x^0).
- **Quadratic Equation:** An equation of the form $ax^2 + bx + c = 0$, $a \neq 0$, is called a quadratic equation in one variable x , where a , b , c are constants.
- The equation $x^2 + bx + c = 0$, $a \neq 0$ is the standard form of a quadratic equation, where a , b and c are real numbers.
- A real number α is said to be a root of the quadratic equation $x^2 + bx + c = 0$, $a \neq 0$. If $a\alpha^2 + b\alpha + c = 0$, the zeroes of quadratic polynomial $x^2 + bx + c$ and the roots of the quadratic equation $x^2 + bx + c = 0$ are the same.
- If we can factorise $x^2 + bx + c = 0$, $a \neq 0$ into product of two linear factors, then the roots of the quadratic equation can be found by equating each factors to zero.
- The roots of a quadratic equation $x^2 + bx + c = 0$, $a \neq 0$ are given by $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, provided that $b^2 - 4ac \geq 0$.
- A quadratic equation $x^2 + bx + c = 0$, $a \neq 0$ has _____
 - (a) Two distinct and real roots, if $b^2 - 4ac > 0$.
 - (b) Two equal and real roots, if $b^2 - 4ac = 0$.
 - (c) Two roots are not real, if $b^2 - 4ac < 0$.
- A quadratic equation can also be solved by the method of completing the square.
 - (i) $a^2 + 2ab + b^2 = (a + b)^2$
 - (ii) $a^2 - 2ab + b^2 = (a - b)^2$
- Discriminant of the quadratic equation $x^2 + bx + c = 0$, $a \neq 0$ is given by $D = b^2 - 4ac$.

Key Notes

Chapter-05

Arithmetic Progression

- **Sequence:** A set of numbers arranged in some definite order and formed according to some rules is called a sequence.
- **Progression:** The sequence that follows a certain pattern is called progression.
- **Arithmetic Progression:** A sequence in which the difference obtained by subtracting any term from its preceding term is constant throughout, is called an arithmetic sequence or arithmetic progression (A.P.). The general form of an A.P. is $a, a + d, a + 2d, \dots$ (a : first term common difference).
- **General Term:** If ' a ' is the first term and ' d ' is common difference in an A.P., then n^{th} term (general term) is given by $a_n = a + (n - 1) d$.
- The formula $a_n = a + (n - 1)d$ contains four quantities a_n , a , n and d . Three quantities being given, the fourth can be find out by using the above relation.
- If only two quantities are given, two conditions (equations) in the problem should be given. Therefore, to determine these two unknowns, we have to solve both the conditions (equations) linearly.
- **Sum of n Terms of an A.P.:** If ' a ' is the first term and ' d ' is the common difference of an A.P., then sum of first n terms is given by $S_n = \frac{n}{2} (2a + (n - 1)d)$ or $S_n = \frac{n}{2} (a + l)$ If ' l ' is the last term of a finite A.P. then the sum is given by $S_n = \frac{n}{2} \{a + l\}$
- (i) If a_n is given, then common difference $d = a_n - a_{n-1}$.
(ii) If S_n is given, then n^{th} term is given by $a_n = s_n - s_{n-1}$
(iii) If a, b, c is in A.P., then $2b = a + c$.
(iv) If a sequence has n terms, its r^{th} term from the end $= (n - r + 1)^{\text{th}}$ term from the beginning.

Chapter-06

Triangles

- **Similar Triangles:** Two triangles are said to be similar if their corresponding angles are equal and their corresponding sides are proportional.
- All congruent figures are similar but the converse is not true.
- Two polygons with same number of sides are similar, if
 - (i) Their corresponding angles are equal and
 - (ii) Their corresponding sides are in the same ratio (i.e., proportion).
- Criteria for Similarity: in $\triangle ABC$ and $\triangle DEF$
 - (i) **AAA Similarity:** $\triangle ABC \sim \triangle DEF$ When $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$
 - (ii) **SAS Similarity:** $\triangle ABC \sim \triangle DEF$ when $\frac{AB}{DE} = \frac{AC}{EF}$ and $\angle B = \angle E$
 - (iii) **SSS Similarity:** $\triangle ABC \sim \triangle DEF$, $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$
- The proof of the following theorems can be asked in the examination:
 - (i) **Basic Proportionality Theorem:** If a line is drawn parallel to one side of a triangle to intersect the other sides in distinct points, the other two sides are divided in the same ratio.
 - (ii) The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
 - (iii) **Pythagoras Theorem:** In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
 - (iv) **Converse of Pythagoras Theorem:** In a triangle, if the square of one side is equal to the sum of the squares of the other two sides then the angle opposite to the first side is a right angle.
- **Right Angled Triangle:**

Key Notes

- (i) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the Whole triangle and also to each other.
- (ii) In the right triangle, the square of the hypotenuse is equal to the sum of the square of the other two sides (Pythagoras Theorem).
- (iii) If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.
- **Thales Theorem:** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio (Basic Proportionality Theorem or Thales Theorem).
- If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

Key Notes

Chapter-07

Coordinate Geometry

- The length of a line segment joining A and B is the distance between two points

$$A(x_1, y_1) \text{ and } (x_2, y_2) \text{ is } \sqrt{\{(x_2 - x_1)^2 + (y_2 - y_1)^2\}}$$

- The distance of a point (x, y) from the origin is $\sqrt{(x^2 + y^2)}$. The distance of P from x-axis is y units and from y-axis is x-units.
- The co-ordinates of the points p (x, y) which divides the line segment joining the points

$$A(x_1, y_1) \text{ and } B(x_2, y_2) \text{ in the ratio } m_1 : m_2 \text{ are } \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right) \text{ we can take ratio}$$

$$\text{as } k : 1, k = \frac{m_1}{m_2}$$

- The mid-points of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

- The area of the triangle formed by the points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) is the numeric value of the expressions $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + (y_1 - y_2)]$.
- If three points are collinear then we cannot draw a triangle, so the area will be zero i.e.

$$|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)| = 0$$

- Centroid of a triangle and its coordinates:** The medians of a triangle are concurrent. Their point of concurrence is called the centroid. It divides each median in the ratio 2:1. The coordinates of centroid of a triangle with vertices $A(x_1, y_1)$, and $B(x_2, y_2)$ and $C(x_3, y_3)$ are given by $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$

Chapter-08

Introduction to Trigonometry

- Trigonometry is the branch of Mathematics which deals with the measurement of sides and angles of the triangles.

- In a right triangle ABC, right-angled at B,

$$\sin A = \frac{\text{side opposite to angle } A}{\text{hypotenuse}}, \cos A = \frac{\text{side adjacent to angle } A}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{side opposite to angle } A}{\text{side adjacent to angle } A}$$

$$\operatorname{cosec} A = \frac{1}{\sin A}; \sec A = \frac{1}{\cos A}$$

$$\cot A = \frac{1}{\tan A}, \tan A = \frac{\sin A}{\cos A}$$

- If one of the trigonometric ratios of an acute angle is known, the remaining trigonometric ratios of the angle can be easily determined.
- The values of trigonometric ratios for angles 0° , 30° , 45° , 60° and 90° .
- The value of $\sin A$ or $\cos A$ never exceeds 1, whereas the value of $\sec A$ or $\operatorname{cosec} A$ is always greater than or equal to 1.
- $\sin (90^\circ - A) = \cos A$, $\cos (90^\circ - A) = \sin A$;
- $\tan (90^\circ - A) = \cot A$, $\cot (90^\circ - A) = \tan A$;
- $\sec (90^\circ - A) = \operatorname{cosec} A$, $\operatorname{cosec} (90^\circ - A) = \sec A$.
- $\sin^2 A + \cos^2 A = 1$,
- $\sec^2 A - \tan^2 A = 1$ for $0^\circ \leq A < 90^\circ$,
- $\operatorname{cosec}^2 A = 1 + \cot^2 A$ for $0^\circ < A \leq 90^\circ$.

Key Notes

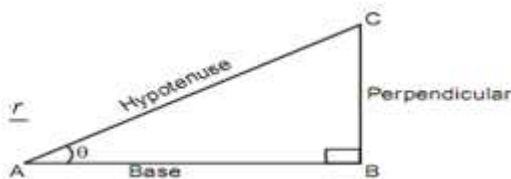
Chapter-09

Some Application to Trigonometry

- The height or length of an object or the distance between two distant objects can be determined with the help of trigonometric ratio.
- The line of sight is the line drawn from the eye of an observer to the point of the object viewed by the observer.
- Trigonometric Ratios: In $\triangle ABC$, $\angle B = 90^\circ$, for angle 'A'

$$\sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}}, \cos A = \frac{\text{Base}}{\text{Hypotenuse}}, \tan A = \frac{\text{Perpendicular}}{\text{Base}}$$

$$\cot A = \frac{\text{Base}}{\text{Perpendicular}}, \sec A = \frac{\text{Hypotenuse}}{\text{Base}}, \operatorname{cosec} A = \frac{\text{Hypotenuse}}{\text{Perpendicular}}$$



- **Reciprocal Relations:**

$$\sin \theta = \frac{1}{\operatorname{cosec} \theta}, \operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\cos \theta = \frac{1}{\sec \theta}, \sec \theta = \frac{1}{\cos \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}, \cot \theta = \frac{1}{\tan \theta}$$

- **Quotient Relations:**

$$\tan \theta = \frac{\sin \theta}{\cos \theta}, \cot \theta = \frac{\cos \theta}{\sin \theta}$$

- **Identities:** $\sin^2 + \cos^2 = 1 \Rightarrow \sin^2 \theta = 1 - \cos^2 \theta$ and $\cos^2 \theta = 1 - \sin^2 \theta$

Key Notes

$$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta \Rightarrow \cot^2 \theta = \operatorname{cosec}^2 \theta - 1 \text{ and } \operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta \Rightarrow \tan^2 \theta = \sec^2 \theta - 1 \text{ and } \sec^2 \theta - \tan^2 \theta = 1$$

- Trigonometric Ratios of Some Specific Angles:**

$\angle A$	0°	30°	45°	60°	90°
$\sin A$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos A$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan A$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
$\operatorname{cosec} A$	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec A$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
$\cot A$	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

- Trigonometric Ratios of Complementary Angles:**

$$\sin (90^\circ - \theta) = \cos \theta, \cos (90^\circ - \theta) = \sin \theta, \tan (90^\circ - \theta) = \cot \theta$$

$$\cot (90^\circ - \theta) = \tan \theta, \sec (90^\circ - \theta) = \operatorname{cosec} \theta, \operatorname{cosec} (90^\circ - \theta) = \sec \theta$$

- Line of Sight:** The line of sight is the line drawn from the eyes of an observer to a point in the object viewed by the observer.
- Angle of Elevation:** The angle of elevation is the angle formed by the line of sight with the horizontal, when it is above the horizontal level i.e. the case when we raise our head to look at the object.
- Angle of Depression:** The angle of depression is the angle formed by the line of sight with the horizontal when it is below the horizontal i.e. case when we lower our head to look at the object.

Chapter-10

Circles

- **Circles:** A circle is a collection of all those points in a plane which are at a constant distance (radius) from a fixed point (center).
- **Secant:** A line which intersects a circle in two distinct points is called a secant of the circle.
- **Tangent to a Circle:** The tangent to a circle is a special case of secant, when the two end points of its corresponding chord coincide.
 - (i) There is no tangent to a circle passing through a point lying inside the circle.
 - (ii) There is one and only one tangent to a circle passing through a point lying on the circle.
 - (iii) There are exactly two tangents to a circle through a point outside the circle.
- **Length of the Tangent:**
 - (i) The length of the segment of the tangent from the external point and the point of contact with the circle is called the length of the tangent from the external point to the circle.
 - (ii) The length of two tangents drawn from the same external point are equal.

Key Notes

Chapter-11

Constructions

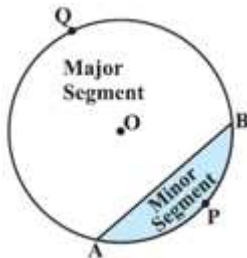
- **"Construction"** in Geometry means to draw shapes, angles or lines accurately. These constructions use only compass, straightedge (i.e. ruler) and a pencil. This is the "pure" form of geometric construction: no numbers involved.
- Construction should be neat and clean and as per scale given in question.
- Steps of construction should be provided only to those questions where it is mentioned.
- **Used of Construction:**
 - (i) The perpendicular bisector of a chord of a circle passes through its center.
 - (ii) Tangents drawn from an external point to a circle are equal.
 - (iii) The angle which tangent makes with a chord of a circle is equal to the angle in its alternate segment.
 - (iv) Angles in the same segment are equal.
 - (v) The tangent to a circle is perpendicular to the line joining the center and the point of contact.

Key Notes

Chapter-12

Area Related to Circles

- **Circle:** A circle is the locus of a point which moves in a plane in such a way that its distance from a fixed point always remains the same. The fixed point is called the center and given constant distance is known as the radius of the circle.
- **Segment of a Circle:** The portion (or part) of a circular region enclosed between a chord and the corresponding arc is called a segment of the circle. In adjacent fig. APB is minor segment and AQB is major segment.



- **Sector of a Circle:** The portion (or part) of the circular region enclosed by the two radii and the corresponding arc is called a sector of the circle. In adjacent figure OAPB is minor sector and OAQB is the major sector.



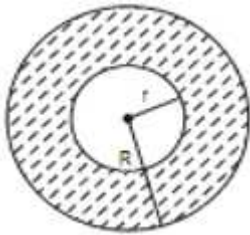
- Area of circle = πr^2 where 'r' is the radius of the circle.
- Area of Semi circle = $\frac{\pi r^2}{2}$
- Area enclosed by two concentric circles

$$= \pi(R^2 - r^2)$$

$$= \pi(R + r)(R - r); R > r$$

Key Notes

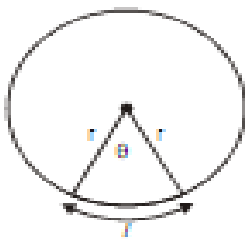
where 'R' and 'r' are radii of two concentric circles.



- The arc length 'l' of a sector of angle θ in a circle of radius 'r' is given by

$$l = \frac{\theta}{360^\circ} \times 2\pi r$$

$$l = \frac{\theta}{180^\circ} \times \pi r$$



- If the arc subtends an angle θ , then area of the corresponding sector is $\frac{\theta}{360^\circ} \times \pi r^2$



- Angle described by minute hand in 60 minutes = 360° . Angle described by minute hand in 1

$$\text{minute} = \left(\frac{360^\circ}{60} \right) = 6^\circ$$

Key Notes

Chapter-13

Surface Areas and Volumes

- **Cylinder:** A solid obtained by revolving a rectangular lamina about one of its sides is called a right circular cylinder.
- **Right Circular Cone:** A solid obtained by revolving a right-angled triangular lamina about any side (other than the hypotenuse) is called a right circular cone.
- **Sphere:** A sphere is a solid obtained on revolving a circle about any of its diameters.
- **Hemisphere:** When a sphere is cut by a plane through its center into two equal parts, then each part is called a hemisphere.
- **Spherical Shell:** The solid enclosed between two concentric sphere is called a spherical shell.
- **Hemisphere Shell:** The solid enclosed between two concentric hemispheres is called a hemispherical shell.
- **Frustum of a Cone:** If a cone is cut by a plane parallel to the base of the cone, then the portion between this plane and the base is called the frustum of the cone.
- Curved surface area of cylinder of radius r and height $h = 2\pi rh$ square units.
- Total surface area of cylinder of radius r and height $h = 2\pi r (r + h)$ square units.
- Volume of cylinder of radius r and height $h = \pi rh$ cubic units.
- Curved surface area of cone of radius r , height h and slant height $l = \pi rl$ square units where $l = \sqrt{r^2 + h^2}$
- Total surface area of cone $= \pi r (l + r)$ sq.units.
- Volume of cone $= \frac{1}{3} \pi r^2 h$ cubic units.
- Total surface area of sphere of radius r units $= 4\pi r^2$ sq.units.
- Curved surface area of hemisphere of radius r units $= 2\pi r^2$ sq.units.
- Total surface area of a solid hemisphere of radius r units $= 3\pi r^2$ sq.units.

Key Notes

- Volume of sphere of radius r units $= \frac{4}{3}\pi r^3$ cubic units.
- Volume of hemisphere of radius r units $= \frac{2}{3}\pi r^3$ cubic units.
- Curved surface area of *frustum* $= \pi l(r + R) + \pi(r^2 + R^2)$ sq. units. where l slant height of frustum and radii of circular ends are r and R .
- Total surface area of frustum $= \pi l(r + R) + \pi(r^2 + R^2)$ sq. units.
- Volume of Frustum $= \frac{1}{3}\pi h(r^2 + R^2 + rR)$ cubic units. Where $l = \sqrt{h^2 + (R - r)^2}$

Chapter-14

Statistics

- **Mean:** The arithmetic mean (or, simply mean) is the sum of the values of all the observations divided by the total number of observation.
- The mean for grouped data can be found by:

(i) The direct method $\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$

(ii) The assumed mean method $\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i}$, Where $d_i = x_i - a$.

(iii) The step deviation method: $\bar{X} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$, where $u_i = \frac{x_i - a}{h}$

- The mode for the grouped data can be found by using the formula:

$$\text{mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h$$

l = lower limit of the modal class.

f_1 = frequency of the modal class.

f_0 = frequency of the preceding class of the modal class.

f_2 = frequency of the succeeding class of the modal class.

h = size of the class interval.

Modal class - class interval with highest frequency.

- The median for the grouped data can be found by using the formula:

$$\text{median} = l + \left[\frac{n/2 - Cf}{f} \right] \times h$$

l = lower limit of the median class.

n = number of observations.

Key Notes

Cf = cumulative frequency of class interval preceding the median class.

f = frequency of median class.

h = class size.

- Empirical Formula: $\text{Mode} = 3 \text{ median} - 2 \text{ mean}$.
- Cumulative frequency curve or an Ogive:
 - (i) Ogive is the graphical representation of the cumulative frequency distribution.
 - (ii) Less than type Ogive:
- Construct a cumulative frequency table.
- Mark the upper class limit on the x = axis.
 - (i) More than type Ogive:
 - (ii) Construct a frequency table.
 - (iii) Mark the lower class limit on the x-axis.
- To obtain the median of frequency distribution from the graph:
 - (i) Locate point of intersection of less than type Ogive and more than type Ogive:
 - (ii) Draw a perpendicular from this point on x-axis.
 - (iii) The point at which it cuts the x-axis gives us the median.

Key Notes

Chapter-15

Probability

- **Probability:** If there are n elementary events associated with a random experiment and m of them are favourable to an event A then the probability of happening of event A is defined as the ratio $\frac{m}{n}$ and is denoted by $P(A)$.

- The Theoretical probability of an event E written as $P(E)$ is

$$P(E) = \frac{\text{Number of outcomes favourable of } E}{\text{Total number of outcomes}}$$

- The sum of the probability of all the elementary events of an experiment is 1.
- The probability of a sure event is 1 and probability of an impossible event is 0.
- If E is an event, in general, it is true that $P(E) + P(\overline{E}) = 1$.
- From the definition of the probability, the numerator is always less than or equal to the denominator therefore $0 \leq P(E) \leq 1$.
- **Elementary Event:** An outcome of a random experiment is called an elementary event.
- **Compound Event:** An event associated to a random experiment is a compound event, if it is obtained by combining two or more elementary events associated to the random experiment.
- **Sure Event:** Those events whose probability is one.
- **Impossible Event:** Those events whose probability is zero.
- **Occurrence of an Event:** An event A associated to a random experiment is said to occur, if any one of the elementary events associated to the event A is an outcome.