Ace Your Exams
with

Last Minute HACKS

INSIDE YOU'LL FIND

* ALL DIAGRAMS
* COMPLETE FORMULAS & CHEMICAL REACTIONS
* SOCIAL SCIENCE MAPS

CONTENTS

Theorems and Formulas

REAL NUMBERS

Theorem: Every composite number can be expressed (factorized) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

NOTE: Fundamental theorem of arithmetic is called a Unique Factorisation Theorem.

Composite number = Product of prime numbers.

Important Formulas

- For any two positive integers a and b we have,

  H.C.F (a, b) × L.C.M (a, b) = a × b.

POLYNOMIALS

Theorem: If α and β are the zeroes of a quadratic polynomial f(x), then the polynomial f(x) is given by

$f(x) = k\{x^2 - (\alpha + \beta)x + \alpha\beta\}$

OR

$f(x) = k\{x^2 - (\text{Sum of the zeroes})\, x + \text{Product of the zeroes}\}$

where k is any non-zero real number.

Important Formulas

Relationship between Zeroes and Coefficients of a Polynomial: In general,

If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, then

$$\alpha + \beta = -\frac{b}{a} = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2} \text{ and}$$

$$\alpha\beta = \frac{c}{a} = \frac{\text{constant term}}{\text{coefficient of } x^2}.$$

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Important Formulas

Algebraic condition for nature of lines and the number of solutions:

Pair of linear equations $a_1x + b_1y + c_1 = 0$, $a_2x + b_2y + c_2 = 0$	Algebraic conditions	Graphical representation	Algebraic interpretation
Consistent (Independent)	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Exactly one solution (unique solution)
Consistent (Dependent)	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines	Infinitely many solutions – dependent
In-consistent	$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Pair of parallel lines	No solution

QUADRATIC EQUATIONS

Let the given equation be $ax^2 + bx + c = 0$, where $a \neq 0$. Then, the discriminant is given by $D = b^2 - 4ac$, and the roots of the given equation are

$$\alpha = \frac{-b + \sqrt{D}}{2a} \text{ and } \beta = \frac{-b - \sqrt{D}}{2a}.$$

Case 1: When $D > 0$

In this case, the roots are real and distinct. These roots are given by

$$\alpha = \frac{-b + \sqrt{D}}{2a} \text{ and } \beta = \frac{-b - \sqrt{D}}{2a}.$$

Case 2: When $D = 0$

In this case, the roots are real and equal.

$$\text{Each root} = \frac{(-b)}{2a}.$$

Case 3: When $D < 0$

In this case, the roots are imaginary, and we say that the given equation has no real roots.

Note:

In this case $D > 0$, if D is a perfect square then roots are rational and if D is a non-perfect square then roots are irrational.

Important Formulas

- **Quadratic Formula (Shridharacharya Formula):** The roots of a quadratic equation $ax^2 + bx + c = 0$ are given by $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

ARITHMETIC PROGRESSIONS

Important Formulas

- Common difference $d = a_2 - a_1 = a_3 - a_2 = \ldots\ldots = a_n - a_{n-1}$
- In an AP with first term a and common difference d, the n^{th} term (or the general term) is given by $a_n = a + (n - 1)d$.
- The n^{th} term of an AP from the end with first term a, common difference d and last term ℓ is given by $a_n = \ell - (n - 1)\,d$.
- The sum of first n-terms of an AP is given by

  $S_n = \frac{n}{2}[2a + (n-1)d]$

  Here a = first term, n = number of terms and d = common difference.
- If ℓ is the last term of an AP., then sum of all terms is given by

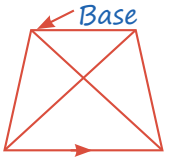
  $S_n = \frac{n}{2}[a + \ell]$

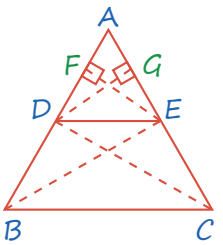
- The n^{th} term of an AP is the difference of the sum to first n terms and the sum to first $(n-1)$ terms of it, i.e., $an = S_n - S_{n-1}$.

TRIANGLES

Theorem 1: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Proof:





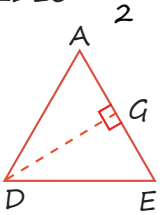
Given: $DE \| BC$

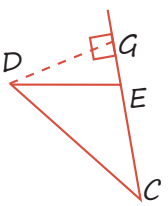
To Prove: $\frac{AD}{BD} = \frac{AE}{EC}$

Construction: Draw $DG \perp AE$ and $EF \perp AD$
Also, Join DC and BE.

Proof: Area of $\Delta ADE = \frac{1}{2} \times AE \times DG$ ...(1)

Area of $\Delta DEC = \frac{1}{2} \times EC \times DG$ ...(2)

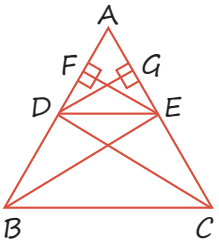




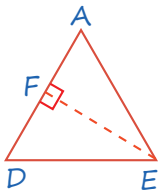
(1) ÷ (2)

$$\frac{Ar(ADE)}{Ar(DEC)} = \frac{\frac{1}{2} \times AE \times DG}{\frac{1}{2} \times EC \times DG}$$

$$\frac{Ar(ADE)}{Ar(DEC)} = \frac{AE}{EC}$$



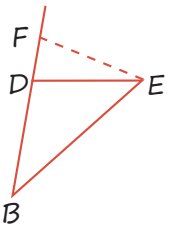
$$Ar\,(ADE) = \frac{1}{2} \times AD \times EF \qquad ...(3)$$



$$Ar\,(DBE) = \frac{1}{2} \times DB \times EF \qquad ...(4)$$

(3) ÷ (4)

$$\frac{Ar(ADE)}{Ar(DBE)} = \frac{\frac{1}{2} \times AD \times EF}{\frac{1}{2} \times DB \times EF}$$



$$\rightarrow \frac{Ar(ADE)}{Ar(DBE)} = \frac{AD}{DB}$$

$Ar\,(DEC) = Ar\,(DBE)$

Since, Δ's on the same base and between same parallel

$$\frac{Ar(ADE)}{Ar(DEC)} = \frac{Ar(ADE)}{Ar(DBE)}$$

$\frac{AE}{EC} = \frac{AD}{DB}$ Hence Proved

Theorem 2: (Converse of Basic Proportionality theorem (BPT)). If a line divides any two sides of a triangle in the same ratio, then the line must be paralled to the third side.

Proof:

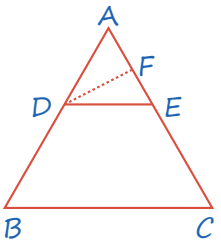
Given: $\frac{AD}{DB} = \frac{AE}{EC}$ ...(1)

To prove: $DE \| BC$

Construction: Draw DF parallel to BC, such that

$$\frac{AD}{DB} = \frac{AF}{FC} \qquad ...(2)$$

Proof: By (1) and (2), $\frac{AE}{EC} = \frac{AF}{FC}$



add 1 to both sides

$$\Rightarrow \frac{AE}{EC} + 1 = \frac{AF}{FC} + 1$$

$$\frac{AE}{EC} + 1 = \frac{AF}{FC} + 1, \quad \frac{AE + EC}{EC} = \frac{AF + FC}{FC}$$

$$\frac{\cancel{AC}}{EC} = \frac{\cancel{AC}}{FC}, \quad \frac{1}{EC} = \frac{1}{FC}$$

$FC = EC$ This means that 'E' & 'F' coincides

$\therefore DE \| BC$ Hence, Proved.

Criteria for similarity of Triangles

(i) AAA similarity criterion

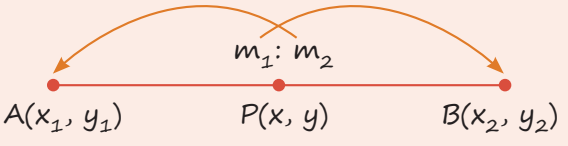
(ii) SSS similarity criterion

(iii) SAS similarity criterion

COORDINATE GEOMETRY

Important Formulas

- **Distance Formula:** The distance between $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.
- **Distance from Origin:** The distance of a point P(x,y) from origin is $\sqrt{x^2 + y^2}$.
- **Section Formula:** The coordinates of the point P(x, y) which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ internally in the ratio $m_1 : m_2$ are $\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$



- **Mid Point Formula:** The mid-point of the line segment joining the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

INTRODUCTION TO TRIGONOMETRY

Important Concepts:

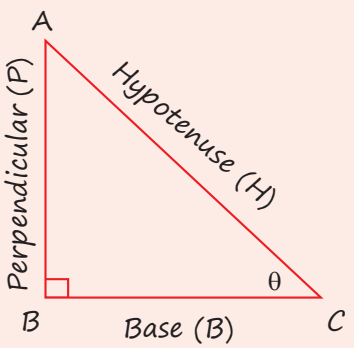
θ	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined
cosec	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined
cot	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Important Formulas

Trigonometric Ratios

The ratio of the sides of a right angle triangle with respect to acute angles are called "Trigonometric ratios of the angle".

In right angled ΔABC



- sine of θ, written as

$$\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{P}{H} = \frac{\text{Pandit}}{\text{Har}}$$

- cosine of θ, written as

$$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{B}{H} = \frac{\text{Badri}}{\text{Har}}$$

- tangent of θ, written as

$$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{P}{B} = \frac{\text{Prasad}}{\text{Bhole}}$$

- cosecant of θ, written as

$$\text{cosec}\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{H}{P}$$

- secant of θ, written as

$$\sec\theta = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{H}{B}$$

- cotangent of θ, written as

$$\cot\theta = \frac{\text{Base}}{\text{Perpendicular}} = \frac{B}{P}$$

Trick to Remember

sin	cos	tan
↓	↓	↓
Pandit / Har	Badri / Har	Prasad / Bhole

Relation Between Trigonometric Ratio

- $\sin\theta = \frac{1}{\text{cosec}\theta} \Rightarrow \text{cosec}\theta = \frac{1}{\sin\theta}$
- $\cos\theta = \frac{1}{\sec\theta} \Rightarrow \sec\theta = \frac{1}{\cos\theta}$
- $\tan\theta = \frac{1}{\cot\theta} \Rightarrow \cot\theta = \frac{1}{\tan\theta}$
- $\tan\theta = \frac{\sin\theta}{\cos\theta} \Rightarrow \cot\theta = \frac{\cos\theta}{\sin\theta}$
- $\sin^2\theta + \cos^2\theta = 1$
- $1 + \tan^2\theta = \sec^2\theta$
- $1 + \cot^2\theta = \text{cosec}^2\theta$

Physics Formulas

Light: Reflection and Refraction

Relation between focal length (f) and radius of curvature (R):

$R = 2f$

Mirror formula:

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

Where,

f ⇒ focal length

u ⇒ object distance

v ⇒ image distance

Magnification:

$$m = \frac{h_i}{h_0} = \frac{-v}{u}$$

h_i ⇒ height of image

h_0 ⇒ height of object

Law of Refraction:

$$\frac{\sin i}{\sin r} = \text{constant}\left({}^1\mu_2\right)$$

i ⇒ angle of incidence

r ⇒ angle of refraction

${}^1\mu_2$ ⇒ refractive index of medium 2 wrt medium 1

Effect on speed (v), frequency (f) and wavelength (r):

$$r = \frac{v}{f}$$

Refractive index:

$${}^1\mu_2 = \frac{\text{Speed of light in medium 1}(v_1)}{\text{Speed of light in medium 2}(v_2)}$$

$$\mu_{21} = \frac{\mu_2}{\mu_1}$$

Absolute Refractive index:

$$\mu = \frac{c}{v}$$

μ ⇒ Refractive index of a medium

c ⇒ speed of light in vacuum

v ⇒ speed of light in medium

Critical angle:

$${}_a\mu_g = \frac{1}{\sin c}$$

${}_a\mu_g$ ⇒ refractive index of glass w.r.t air

c ⇒ critical angle

Lens formula:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

f ⇒ focal length

v ⇒ image distance

u ⇒ object distance

Magnification:

$$m = \frac{h_i}{h_o} = \frac{v}{u}$$

H_i ⇒ height of image

h_o ⇒ height of object

Power of lens:

$$P = \frac{1}{f\,(\text{in meter})}$$

Current Electricity

Quantization of charge:

$Q = n \times e$

Q ⇒ Total charge

n ⇒ no. of electrons

e ⇒ 1.6×10^{-19}C [charge on one electron]

Electric current:

$$I = \frac{Q}{t}$$

I ⇒ current

Q ⇒ charge

t ⇒ time taken

Electric Potential (V):

$$V = \frac{W}{Q}$$

W ⇒ Work done

Q ⇒ charge

Potential difference (ΔV):

$$\Delta V = V_A - V_B = \frac{W}{Q}$$

Ohm's law:

$V = IR$

R ⇒ Resistance

Conductance:

$$\text{Conductance} = \frac{1}{R}$$

Specific Resistance (or Resistivity):

$$R = \frac{\delta l}{A}$$

δ ⇒ Resistivity

l ⇒ length of conductor

a ⇒ area of cross section of conductor

Conductivity (σ):

$$\sigma = \frac{1}{\delta}$$

Resistance in series (Rs):

$R_S = R_1 + R_2 + \text{----------} + R_n$

R_S ⇒ Total resistance of series combination

n ⇒ Total resistors connected in series

Resistance in parallel:

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} - - - - + \frac{1}{R_n}$$

R_P ⇒ total resistance of parallel combination

n ⇒ total resistors in parallel combination

Electrical energy:

$$W = QV = Vit = i^2Rt = \frac{V^2t}{R}$$

Electrical Power:

$$P = \frac{w}{t} = Vi = \frac{v^2}{R} = i^2R$$

2 CHAPTER

Acids, Bases and Salts

Chemical Properties of the Acids

Reaction of Acids with Metals

Metal + Acids ⟶ Salt + Hydrogen gas

$$Mg(s) + H_2SO_4\,(dilute) \longrightarrow MgSO_4(aq) + H_2(g)$$
$$Na(s) + H_2SO_4\,(dilute) \longrightarrow Na_2SO_4(aq) + H_2(g)$$
$$2Na(s) + 2HCl\,(dilute) \longrightarrow 2NaCl(aq) + H_2(g)$$

Reaction of Acids with Metal Oxides

$$CuO(s) + 2HCl(aq) \longrightarrow CuCl_2(aq) + H_2O(l)$$
$$MgO(s) + 2HCl(aq) \longrightarrow MgCl_2(aq) + H_2O(l)$$

Reaction of Acid with Metal Carbonates and Metal Bicarbonates

Metal Carbonate / Bicarbonate + Acid → Salt + Water + Carbon dioxide

$$\underset{\text{Calcium carbonate}}{CaCO_3(s)} + 2HCl(aq) \longrightarrow \underset{\text{Calcium chloride}}{CaCl_2(aq)} + H_2O(l) + CO_2(g)$$

$$\underset{\text{Ferrous carbonate}}{FeCO_3(s)} + H_2SO_4(aq) \longrightarrow \underset{\text{Ferrous sulphate}}{FeSO_4(aq)} + H_2O(l) + CO_2(g)$$

$$\underset{\text{Sodium bicarbonate}}{2NaHCO_3(s)} + H_2SO_4(aq) \longrightarrow \underset{\text{Sodium sulphate}}{Na_2SO_4(aq)} + 2H_2O(l) + 2CO_2(g)$$

Reaction of Acids with Bases

The reaction between an acid and a base to give a salt and water is known as neutralisation reaction.

Acid + Base ⟶ Salt + Water

$$\underset{\text{Hydrochloric acid}}{HCl(aq)} + \underset{\text{Sodium hydroxide}}{NaOH(aq)} \longrightarrow \underset{\text{Sodium chloride}}{NaCl(aq)} + H_2O(l)$$

$$\underset{\text{Nitric acid}}{2HNO_3(aq)} + \underset{\text{Magnesium hydroxide}}{Mg(OH)_2(aq)} \longrightarrow \underset{\text{Magnesium nitrate}}{Mg(NO_3)_2(aq)} + 2H_2O(l)$$

Chemical Properties of Bases

Reaction of Bases with Metals

$$\boxed{\text{Metal + Base} \longrightarrow \text{Salt + Hydrogen gas}}$$

$$Zn(s) + 2NaOH(aq) \rightarrow \underset{\text{Sodium Zincate}}{Na_2ZnO_2(aq)} + H_2(g)$$

$$2Al(s) + 2NaOH(aq) + 2H_2O(l) \rightarrow \underset{\text{Sodium Aluminate}}{2NaAlO_2(aq)} + 3H_2(g)$$

Reaction of Bases with Non-metallic Oxides

$$\boxed{\text{Base + Non-metallic oxide} \longrightarrow \text{Salt + Water}}$$

$$2NaOH(aq) + CO_2(g) \rightarrow Na_2CO_3(aq) + H_2O(l)$$

$$Ca(OH)_2(aq) + SO_3(g) \rightarrow CaSO_4(s) + H_2O(l)$$

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

Strength of Acids and Bases

The pH of an aqueous solution is the negative logarithm of its H^+ ion concentration. That is,

$$pH = -\log [H^+].$$

Just as the $[H^+]$ of a solution can be expressed in terms of pH value, the $[OH^-]$ can be expressed as pOH.

$$pOH = -\log [OH^-]$$

$$\boxed{pH + pOH = 14} \text{ at } 25°C.$$

Salts

A substance formed by neutralisation of an acid with a base is called a salt.

$$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$$

$$2KOH(aq) + H_2SO_4(aq) \longrightarrow K_2SO_4(aq) + 2H_2O(l)$$

Sodium Hydroxide (NaOH)

Preparation (chlor-alkali process)

$$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{Electric current}} 2NaOH(aq) + Cl_2(g) + H_2(g)$$

Washing Soda ($Na_2CO_3 \cdot 10H_2O$)

First step:

$$\underset{\text{Common Salt}}{NaCl(aq)} + H_2O(l) + CO_2(g) + NH_3(g) \longrightarrow \underset{\text{Ammonium Chloride}}{NH_4Cl(aq)} + \underset{\text{Sodium Hydrogen Carbonate}}{NaHCO_3(aq)}$$

$$\underset{\text{Limestone}}{CaCO_3(s)} \xrightarrow{\text{Heat}} \underset{\text{Quick lime}}{CaO(s)} + CO_2(g)$$

Second step: Dry sodium hydrogen carbonate is heated strongly to give sodium carbonate

$$2NaHCO_3(s) \xrightarrow{\text{Heat}} \underset{\substack{\text{Anhydrous Sodium} \\ \text{Carbonate (Soda Ash)}}}{Na_2CO_3(s)} + H_2O(l) + CO_2(g)$$

Third step: Sodium carbonate is recrystallized by dissolving in water to get washing soda. It is a basic salt.

$$\underset{\text{Sodium carbonate}}{Na_2CO_3(s)} + 10H_2O(l) \longrightarrow \underset{\text{Washing soda}}{Na_2CO_3.10H_2O(s)}$$

Baking Soda ($NaHCO_3$)

Preparation (Solvay Process)

$$NaCl + H_2O + NH_3 + CO_2 \rightarrow \underset{\substack{\text{Ammonium}\\\text{Chloride}}}{NH_4Cl} + \underset{\substack{\text{Sodium}\\\text{Bicarbonate}}}{NaHCO_3}$$

Properties of $NaHCO_3$

$$\underset{\text{Baking soda}}{2NaHCO_3} \xrightarrow{\Delta} \underset{\substack{\text{Sodium}\\\text{carbonate}}}{Na_2CO_3} + CO_2 + H_2O$$

Uses of Baking Soda

During the bread preparation, the release of CO_2 causes the bread to rise (swell).

$$\underset{\substack{\text{Sodium}\\\text{Bicarbonate}}}{2NaHCO_3} + \underset{\text{Tartaric Acid}}{\begin{matrix}CH(OH)COOH\\|\\CH(OH)COOH\end{matrix}} \xrightarrow{\Delta} \underset{\text{Sodium Tartrate}}{\begin{matrix}CH(OH)COONa\\|\\CH(OH)COONa\end{matrix}} + 2CO_2 + 2H_2O$$

Bleaching Powder ($CaOCl_2$)

Bleaching powder is commercially called 'chloride of lime or chlorinated lime'.

Preparation

Bleaching powder is prepared by passing chlorine gas over dry slaked lime.

$$\underset{\text{Slaked lime}}{Ca(OH)_2} + Cl_2 \xrightarrow{\Delta} \underset{\text{Bleaching powder}}{Ca(OCl)Cl} + H_2O$$

Plaster of Paris ($CaSO_4.1/2H_2O$)

Preparation

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \xrightarrow{373\,K} \underset{\text{Plaster of paris}}{CaSO_4.\frac{1}{2}H_2O} + \frac{3}{2}H_2O$$

$$CaSO_4.2H_2O \xrightarrow[373K]{\text{More than}} \underset{\text{Dead burnt plaster}}{CaSO_4} + 2H_2O$$

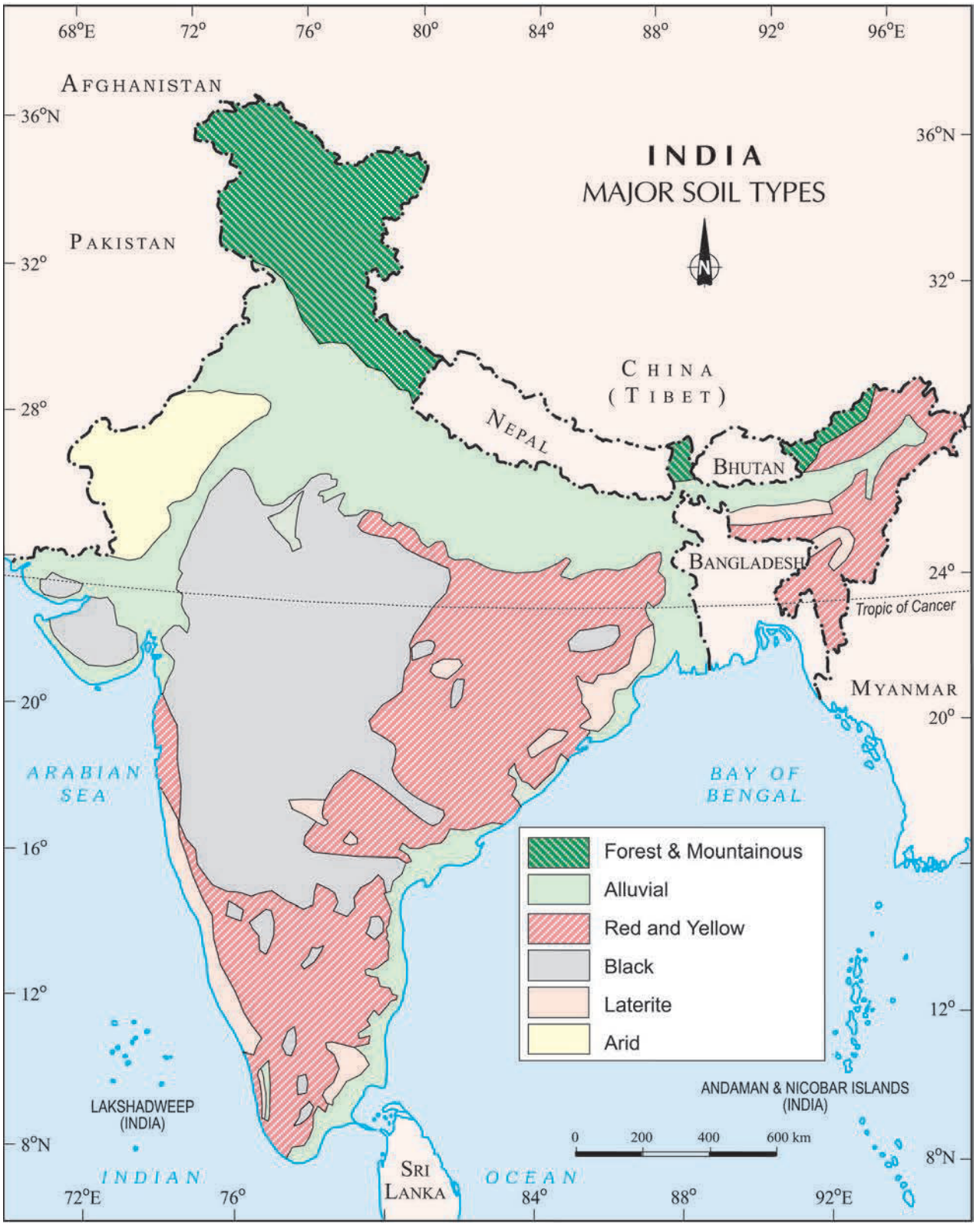
Properties of POP

$$\underset{\text{Plaster of Paris}}{CaSO_4.\frac{1}{2}H_2O} + \underset{\text{Water}}{\frac{3}{2}H_2O} \longrightarrow \underset{\text{Gypsum (hard mass)}}{CaSO_4.2H_2O}$$

Water of Crystallisation

$$\underset{\substack{\text{Copper sulphate}\\\text{(Hydrated)}\\\text{Blue}}}{CuSO_4.5H_2O} \xrightarrow{\Delta} \underset{\substack{\text{Copper sulphate}\\\text{(Anhydrous)}\\\text{White}}}{CuSO_4} + 5H_2O$$

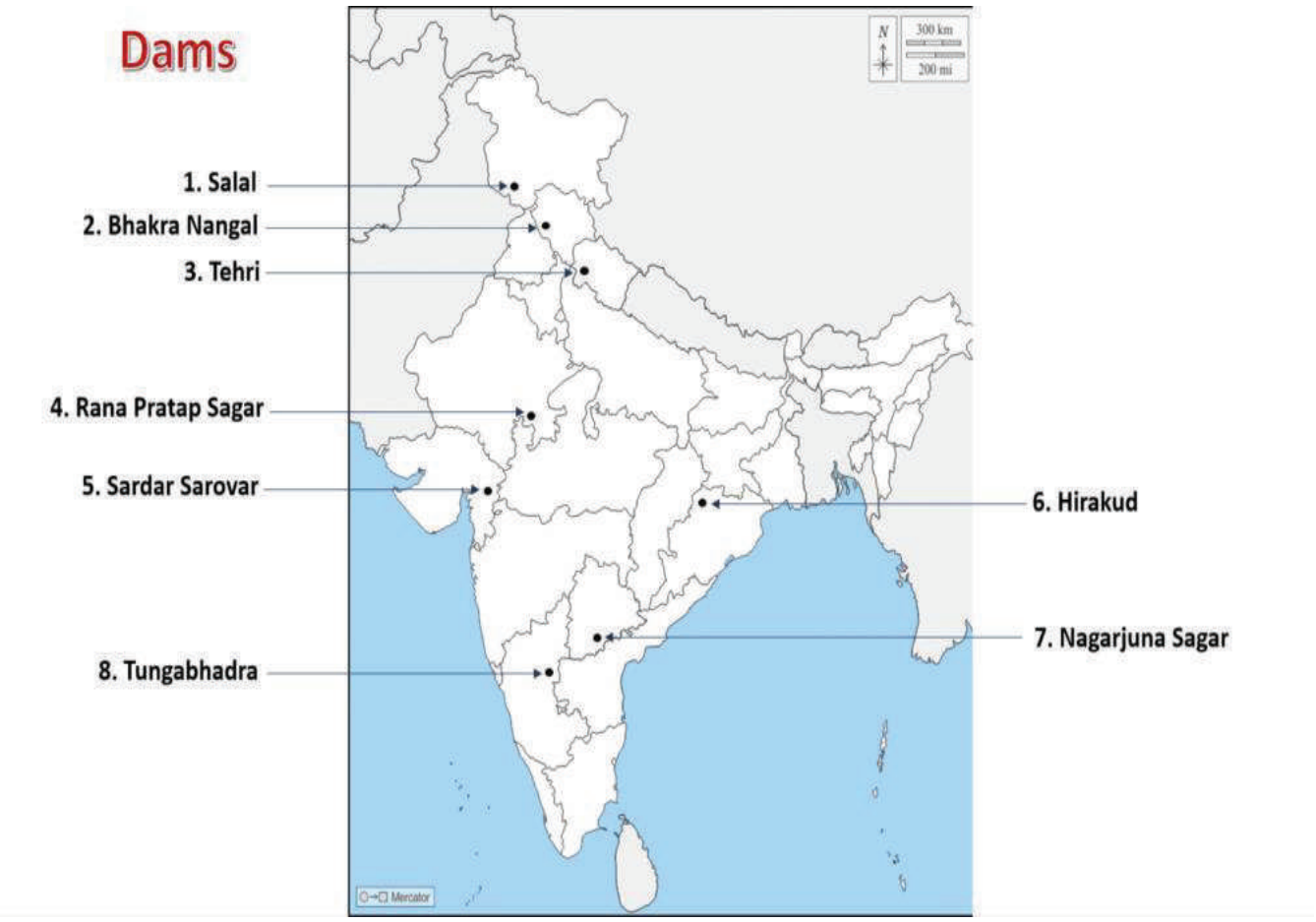
Chapter 1: Resources and Development (Identification only)



Chapter 3: Water Resources (Locating and Labelling)

Dams:

1. Salal
2. Bhakra Nangal
3. Tehri
4. Rana Pratap Sagar
5. Sardar Sarovar
6. Hirakud
7. Nagarjuna Sagar
8. Tungabhadra



Chapter 4: Agriculture (Identification only)

a. Major areas of Rice and Wheat

b. Largest / Major producer states of Sugarcane, Tea, Coffee, Rubber, Cotton, and Jute

Rice - The main rice-producing states are Tamil Nadu, ***West Bengal*** (largest producer), Andhra Pradesh, Bihar, Odisha, Uttar Pradesh, etc.

India: Distribution of Rice

1 CHAPTER

BIOLOGY

Life Process

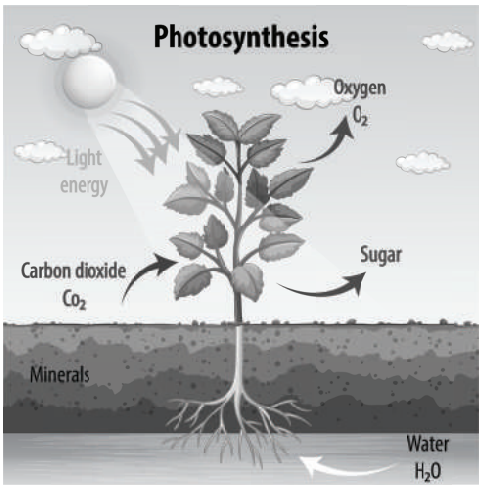


Fig. 1: Green plants make their own food by photosynthesis

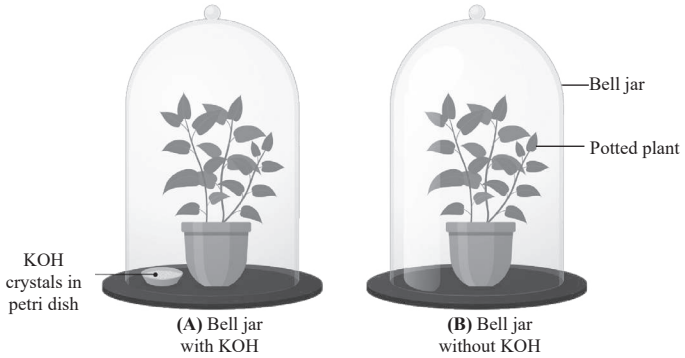


Fig. 2: Experimental Set-up (A) with potassium hydroxide (B) without potassium hydroxide

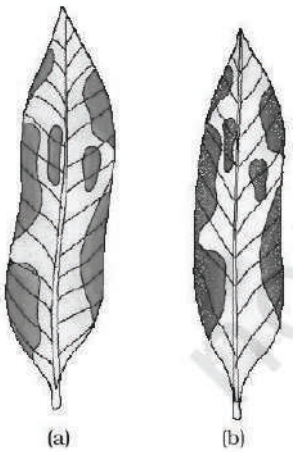


Fig. 3: Variegated leaves

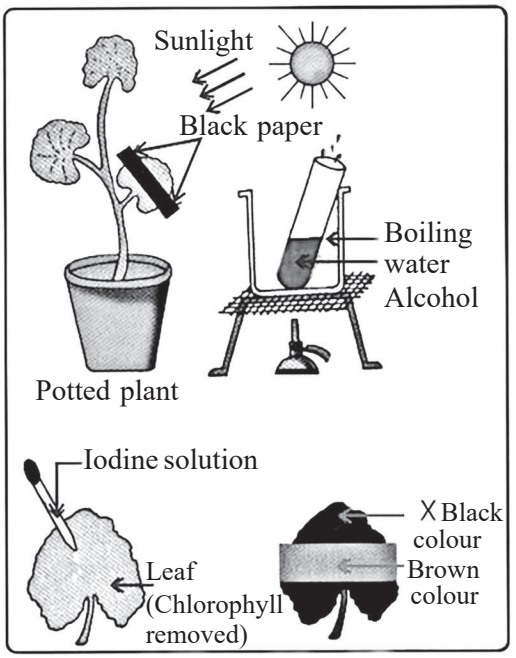


Fig. 4: Demonstration to show the presence of sunlight is necessary for photosynthesis

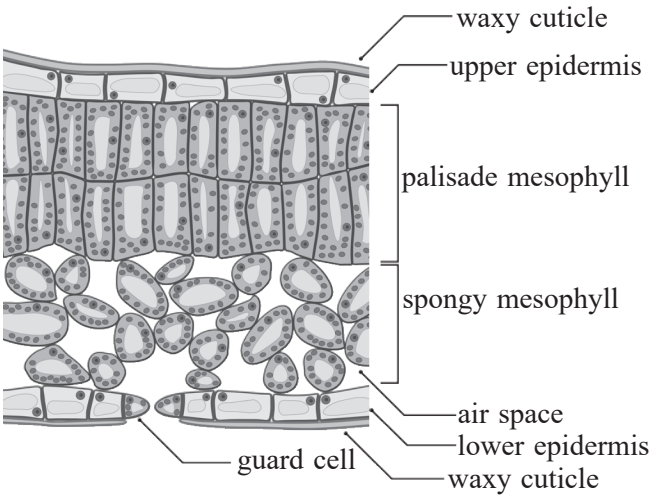


Fig. 5: Cross Section of Leaf

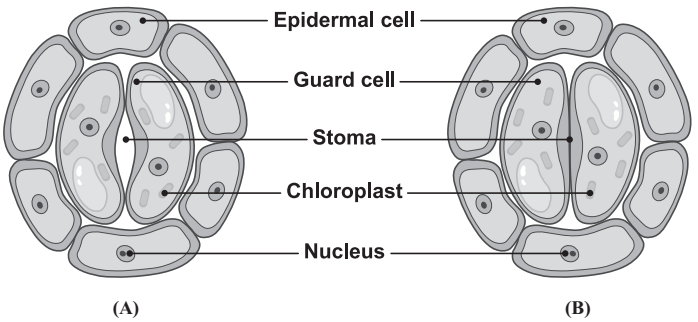


Fig. 6: (A) Open and (B) Closed Stomatal Pore

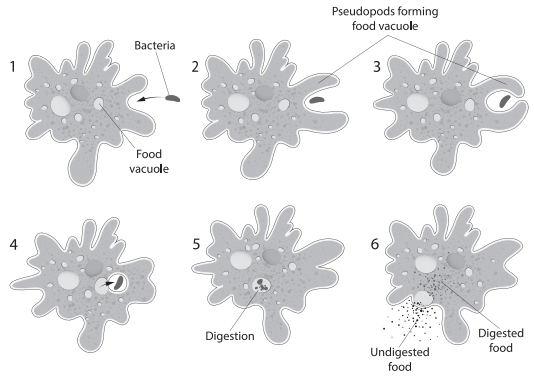


Fig. 7: Nutrition in *Amoeba*

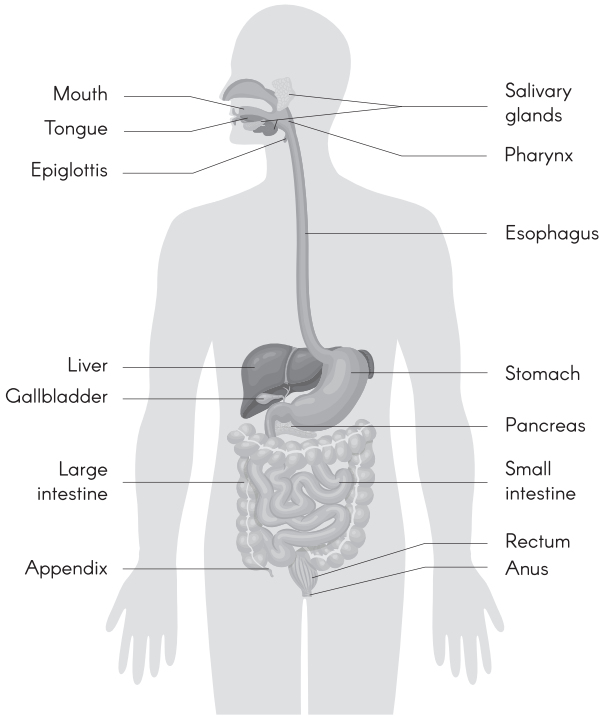


Fig. 8: Human Digestive System

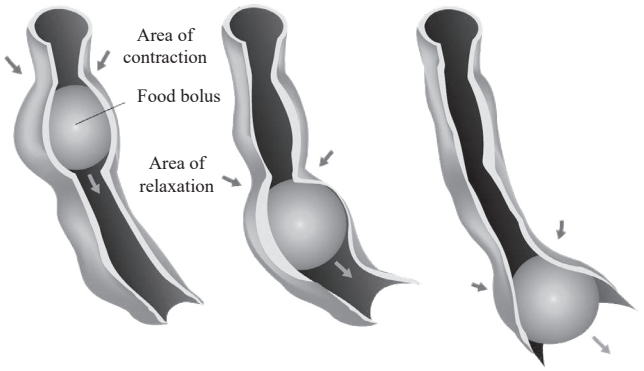


Fig. 9: Peristaltic Movement

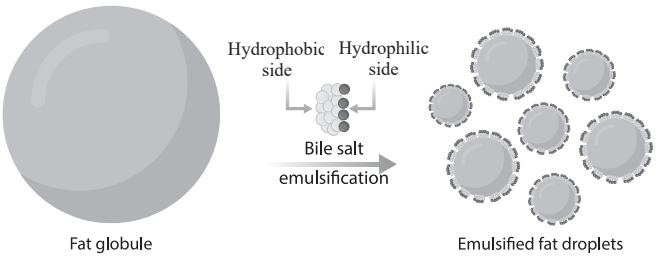


Fig. 10: Emulsification of Lipids

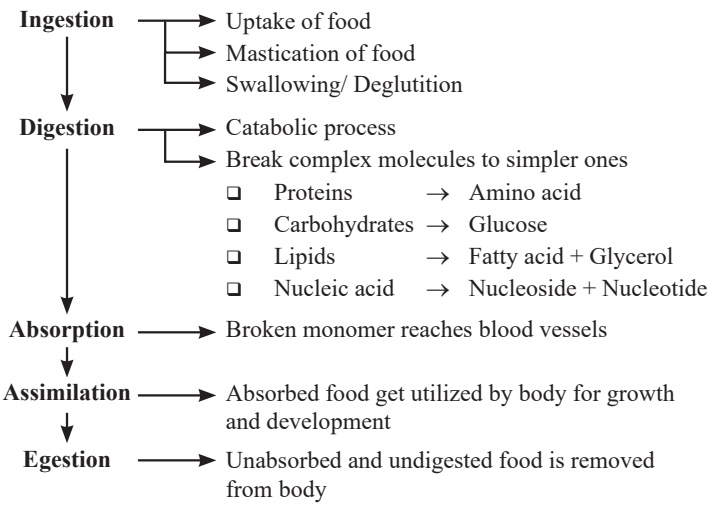


Fig. 11: Steps of Digestion process

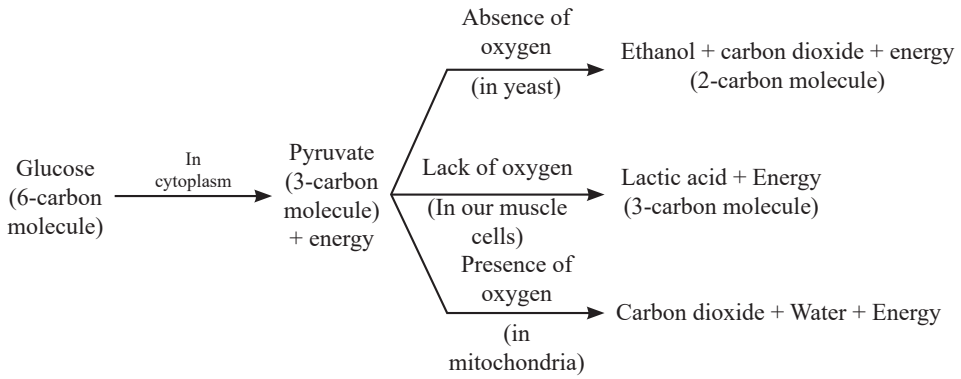


Fig. 12: Break-down of glucose by various pathways

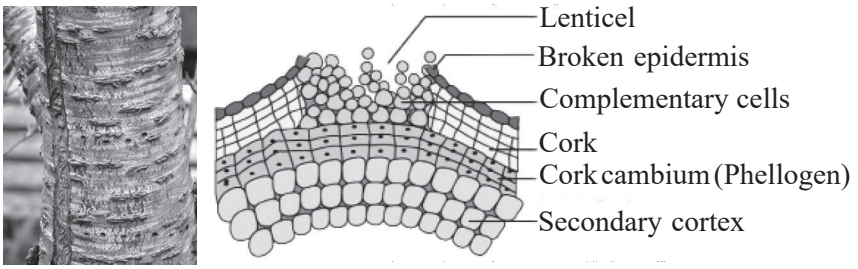


Fig. 13: (a) Lenticels on the Bark of the Tree, (b) Lenticel Inner Structure

Fig. 14: Pneumatophores in mangroves for gaseous exchange

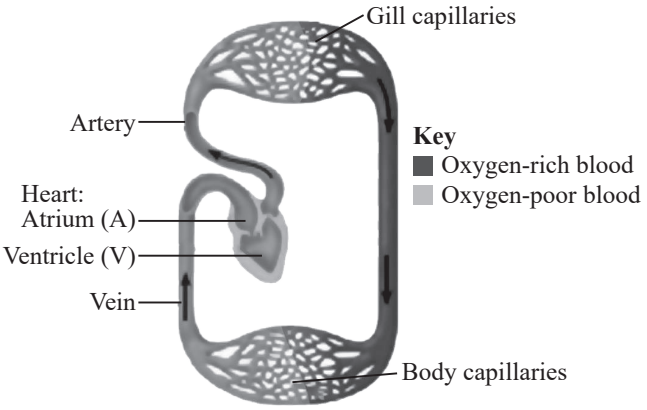


Fig. 15: Single circulation: Fish

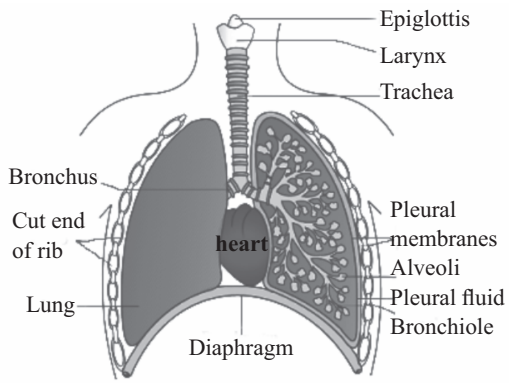
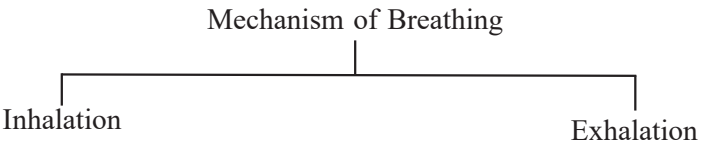


Fig. 16: Diagrammatic view of human respiratory system (sectional view of the left lung is also shown)



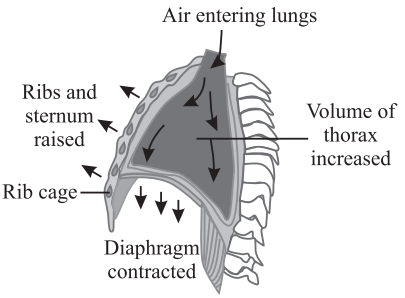


Fig. 17: Mechanism of breathing showing: Inspiration

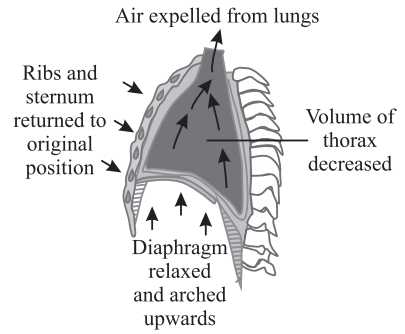


Fig. 18: Mechanism of breathing showing: Exhalation

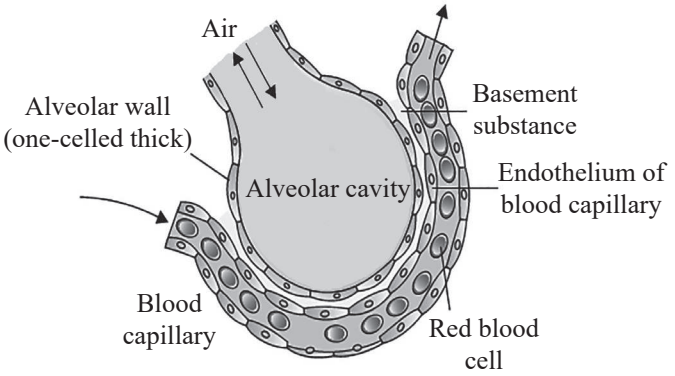


Fig. 19: A diagram of a section an alveolus with a pulmonary capillary

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