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PHYSICS

Formulae

1. Work done $= \vec{F}.\vec{S}$

$= |\vec{F}||\vec{S}|\cos\theta$

$\vec{F} \longrightarrow$ Force

$\vec{S} \longrightarrow$ Displacement

$\theta \longrightarrow$ Angle between $\vec{F}$ and $\vec{S}$

2. Mirror Formula

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

$v \longrightarrow$ image distance from pole

$u \longrightarrow$ object distance from pole

$f \longrightarrow$ focal length

3. Snell's Law

$$\mu_1 \sin i = \mu_2 \sin r$$

$i \longrightarrow$ angle of incidence

$r \longrightarrow$ angle of refraction

$\mu_1, \mu_2 \longrightarrow$ Refractive indices of two media

4. Time Period of simple Pendulum

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$\ell \longrightarrow$ length of Pendulum

$g \longrightarrow$ acceleration due to gravity

5. Newton's Law of universal gravitation:

$$F = \frac{G\ m_1 m_2}{r^2}$$

$m_1, m_2 \longrightarrow$ masses of bodies

$r \longrightarrow$ distance between them

$G \longrightarrow$ Universal gravitational constant

$F \longrightarrow$ Gravitational force of attraction between two bodies

6. Maximum height reached by a body thrown up:

$$H_{max} = \frac{u^2}{2g}$$

$u \longrightarrow$ initial vertical velocity

$g \longrightarrow$ acceleration due to gravity

7. Combination of Resistances

$$\text{Series} \longrightarrow R_{eq} = R_1 + R_2$$

$$\text{Parallel} \longrightarrow R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

$R_{eq} \longrightarrow$ Equivalent Resistance

$R_1, R_2 \longrightarrow$ Resistance of different Resistors in the circuit

8. Resistance

$$R = \frac{\rho\ell}{A}$$

$\ell \longrightarrow$ Length of wire

$A \longrightarrow$ Cross sectional Area of wire

$\rho \longrightarrow$ Resistivity (Material Property)

9. Heat energy developed due to flow of current through a wire

$$Q = I^2Rt$$

$I \longrightarrow$ Current flowing in circuit
$t \longrightarrow$ Time duration of flow of current
$R \longrightarrow$ Resistance
$Q \longrightarrow$ Heat developed

10. Resultant Vector

$$R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

$\vec{A}, \vec{B} \longrightarrow$ Vectors
$\theta \longrightarrow$ Angle between $\vec{A}$ and $\vec{B}$

11. Force on moving charge in Uniform Magnetic field.

$$\vec{F} = q\left(\vec{V} \times \vec{B}\right)$$

$$\left|\vec{F}\right| = qVB\sin\theta$$

$V \longrightarrow$ Speed of charged particle
$B \longrightarrow$ Magnetic field
$q \longrightarrow$ Charge
$\theta \longrightarrow$ Angle between $\vec{V}$ & $\vec{B}$

12. Ohm's Law

$$V = IR$$

$V \longrightarrow$ Potential difference across resistor
$I \longrightarrow$ Current flowing through resistor
$R \longrightarrow$ Resistance of resistor

13. Centripetal acceleration

$$a = \frac{V^2}{R}$$

$V \longrightarrow$ Speed of particle performing circular motion
$R \longrightarrow$ Radius of Circle

14. Quantity of heat

$$Q = ms\,\Delta T$$

$m \longrightarrow$ Mass
$s \longrightarrow$ Specific heat capcacity
$\Delta T \longrightarrow$ Change in Temperature

CHEMISTRY

Properties of solutions, colloids and suspensions :

Property	System		
	Solution	Colloid	Suspension
Particle type	Ions, atoms, small molecules	Large molecules or particles	Large particles or aggregates
Particle size	0.1-1 nm	1-1000 nm	1000 nm and large
Effect of light	No scattering	Exhibits Tyndall effect	Exhibits Tyndall effect
Effect of gravity	Stable, does not separate	Stable, does not separate	Unstable, sediment forms
Filtration	Particles not retained on filter	Particles not retained on filter	Particles retained on filter
Uniformity	Homogeneous	Heterogeneous	Heterogeneous

Types of colloids :

Dispersed phase (Solute)	Dispersing medium (Solvent)	Type	Example
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Foam, rubber, sponge, pumice
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid Sol	Coloured gemstone, milky glass

Mole concept :

1. $\text{No. of mol} = \dfrac{\text{Given mass of entities (atom/molecule/ion)}}{\text{Molar mass}} = \dfrac{\text{Given no. of particles}}{N_A\left(=6.022\times10^{23}\right)} = \dfrac{\text{Given volume at STP}}{\text{Molar volume (22.4L)}}$

2. $\text{Weight of one atom/molecule } = \dfrac{\text{Molar mass}}{N_A}$

3. Total no. of atoms in one mole of compound =Atomicity $\times N_A$

4. $\text{Solubility } = \dfrac{\text{wt. of solute}}{\text{wt. of solvent}}\times100$

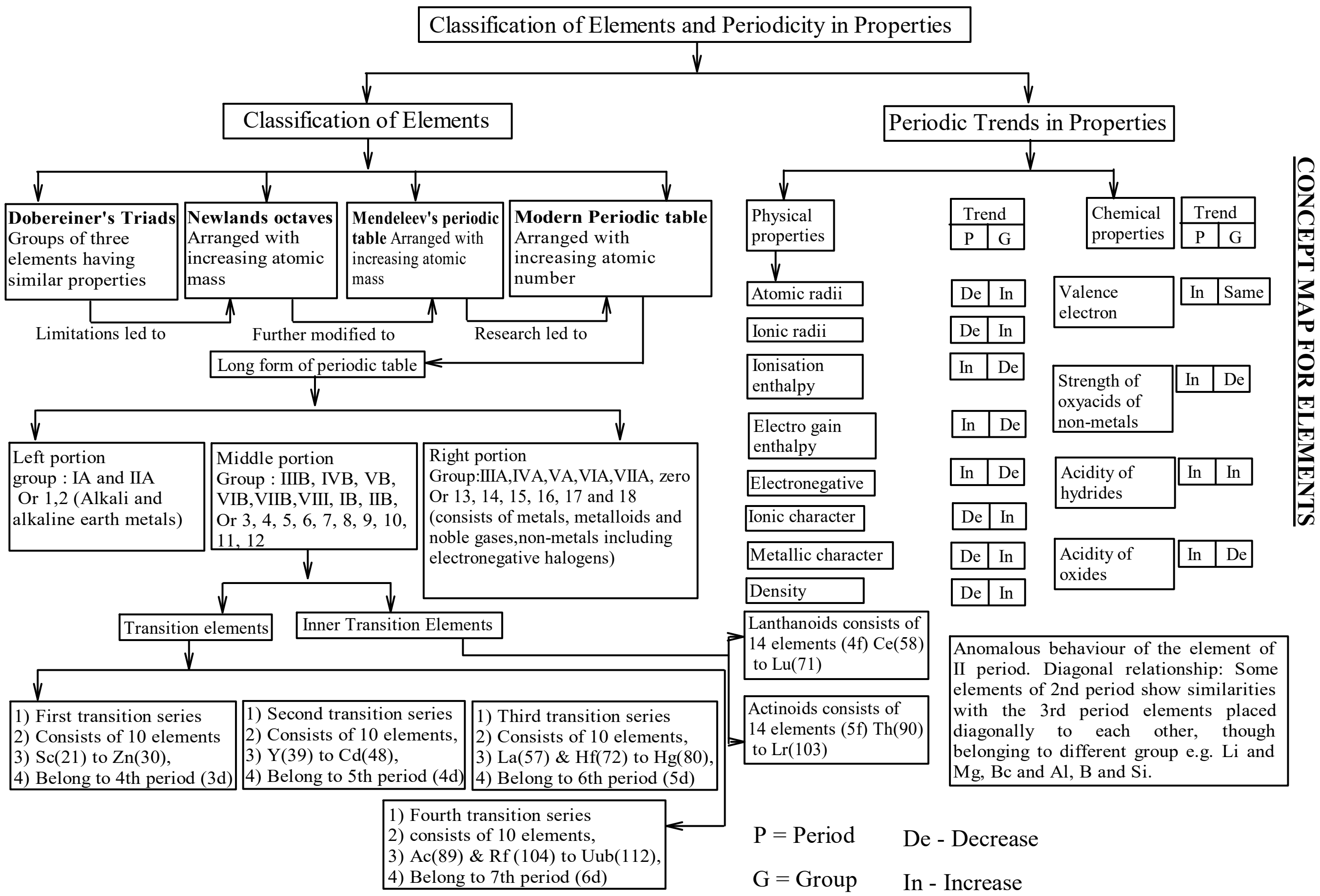
5. $w/w = \dfrac{\text{mass of solute}}{\text{mass of solution}}\times100$

6. $v/v = \dfrac{\text{vol.of solute}}{\text{vol.of solution}}\times100$

7. $\text{Molarity(M)} = \dfrac{\text{moles of solute}}{\text{volume of solution (in litres)}}$

8. $\text{Molality(m)} = \dfrac{\text{moles of solute}}{\text{mass of solvent (in kg)}}$

Periodic properties and trends :



To find pH of A Solution :

$$\mathrm{pH} = -\log\left[\mathrm{H}^{+}\right] \text{ or } \mathrm{pOH} = -\log\left[\mathrm{OH}^{-}\right] ; \text{ at } 25^{\circ}\mathrm{C},\ \mathrm{pH} + \mathrm{pOH} = 14$$

Salts :

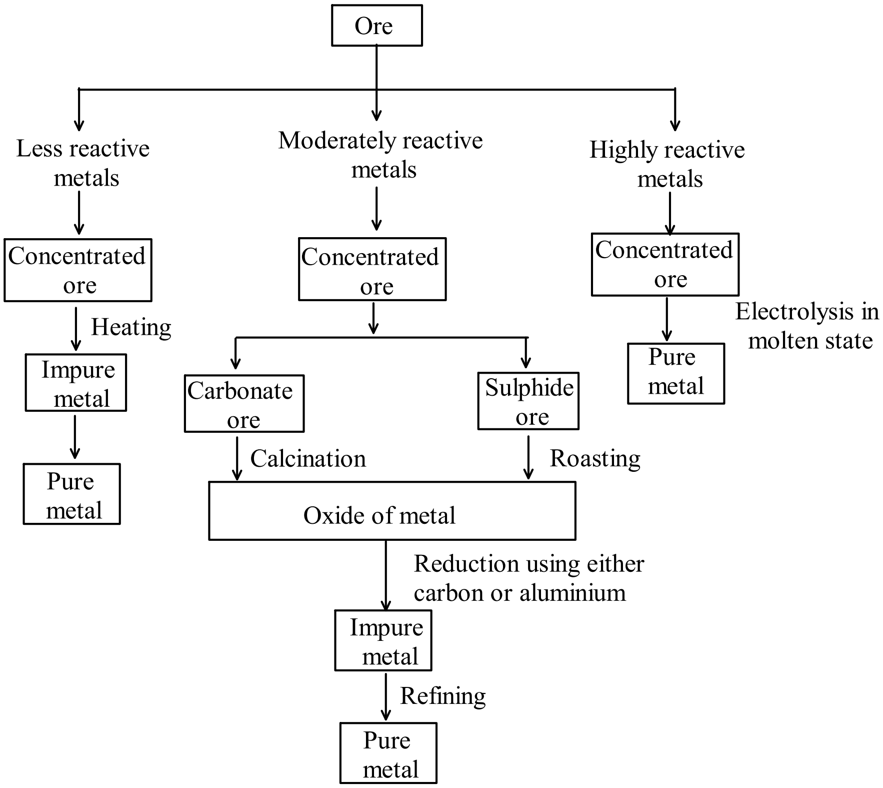
Common Name	Chemical Name	Chemical Formula
Baking soda	Sodium bicarbonate	$NaHCO_3$
Washing soda	Hydrated sodium carbonate	$Na_2CO_3.10H_2O$
Plaster of paris	Calcium sulphate hemihydrates	$CaSO_4 \cdot {}^1\!/_2 H_2O$
Bleaching powder	Calcium oxychloride	$CaOCl_2$
Gypsum	Calcium sulphate dihydrate	$CaSO_4.2H_2O$
Borax	Sodium tetraborate decahydrate	$Na_2B_4O_7.10H_2O$
Epsom salts	Magnesium sulphate heptahydrate	$MgSO_4.7H_2O$
Blue vitriol	Copper sulphate pentahydrate	$CuSO_4.5H_2O$
Green vitriol	Iron(II) sulphate heptahydrate	$FeSO_4.7H_2O$
Hypo	Sodium thiosulphate pentahydrate	$Na_2S_2O_3.5H_2O$

Reactivity series of metals :

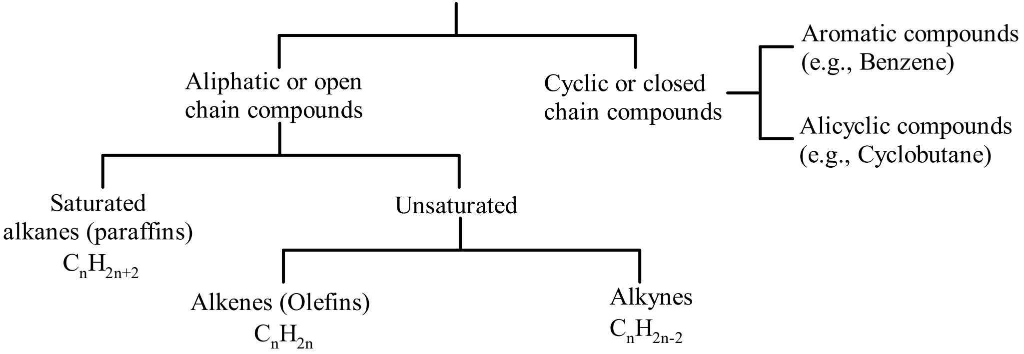
		MINERAL NAME
Highly reactive	K	Feldspar
	Na	Glauber's Salt
	Ca	Limestone, Gypsum
	Mg	Epsom, Magnesite
Moderately reactive	Al	Bauxite
	Zn	Calamine, Zinc Blende
	Fe	Haemetite, Magnetite, Limonite, Siderite, Iron pyrites
	Pb	Gelena
Less reactive	Cu	Copper pyrites
	Hg	Cinnabar
	Ag	Argentite
	Au	Exists in free state

Decreasing order of reactivity

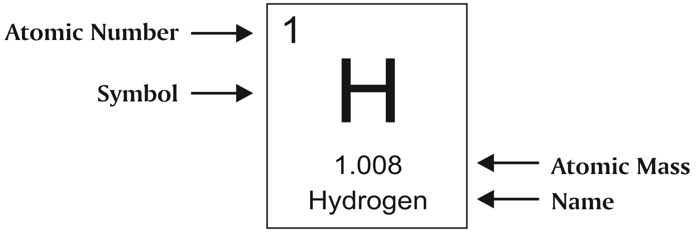
Extraction process of metals :



Organic Chemistry :



Periodic Table



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H 1.008 Hydrogen																	2 He 4.002602 Helium
2	3 Li 6.94 Lithium	4 Be 9.0121831 Beryllium											5 B 10.81 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998403163 Fluorine	10 Ne 20.1797 Neon
3	11 Na 22.98976928 Sodium	12 Mg 24.305 Magnesium											13 Al 26.9815385 Aluminium	14 Si 28.085 Silicon	15 P 30.973761998 Phosphorus	16 S 32.06 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.948 Argon
4	19 K 39.0983 Potassium	20 Ca 40.078 Calcium	21 Sc 44.955908 Scandium	22 Ti 47.867 Titanium	23 V 50.9415 Vanadium	24 Cr 51.9961 Chromium	25 Mn 54.938044 Manganese	26 Fe 55.845 Iron	27 Co 58.933194 Cobalt	28 Ni 58.6934 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.630 Germanium	33 As 74.921595 Arsenic	34 Se 78.971 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton
5	37 Rb 85.4678 Rubidium	38 Sr 87.62 Strontium	39 Y 88.90584 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.90637 Niobium	42 Mo 95.95 Molybdenum	43 Tc 98 Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.90550 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.8682 Silver	48 Cd 112.414 Cadmium	49 In 114.818 Indium	50 Sn 118.710 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.90447 Iodine	54 Xe 131.293 Xenon
6	55 Cs 132.90545196 Caesium	56 Ba 137.327 Barium	57/71	72 Hf 178.49 Hafnium	73 Ta 180.94788 Tantalum	74 W 183.84 Tungsten	75 Re 186.207 Rhenium	76 Os 190.23 Osmium	77 Ir 192.217 Iridium	78 Pt 195.084 Platinum	79 Au 196.966569 Gold	80 Hg 200.592 Mercury	81 Tl 204.38 Thallium	82 Pb 207.2 Lead	83 Bi 208.98040 Bismuth	84 Po 209 Polonium	85 At 210 Astatine	86 Rn 222 Radon
7	87 Fr 223 Francium	88 Ra 226 Radium	89/103	104 Rf 267 Rutherfordium	105 Db 268 Dubnium	106 Sg 269 Seaborgium	107 Bh 270 Bohrium	108 Hs 269 Hassium	109 Mt 278 Meitnerium	110 Ds 281 Darmstadtium	111 Rg 281 Roentgenium	112 Cn 285 Copernicium	113 Uut 286 Ununtrium	114 Fl 289 Flerovium	115 Uup 289 Ununpentium	116 Lv 293 Livermorium	117 Uus 294 Ununseptium	118 Uuo 294 Ununoctium
		Lanthanide Series	57 La 138.90547 Lanthanum	58 Ce 140.116 Cerium	59 Pr 140.90766 Praseodymium	60 Nd 144.242 Neodymium	61 Pm 145 Promethium	62 Sm 150.36 Samarium	63 Eu 151.964 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.92535 Terbium	66 Dy 162.500 Dysprosium	67 Ho 164.93033 Holmium	68 Er 167.259 Erbium	69 Tm 168.93422 Thulium	70 Yb 173.054 Ytterbium	71 Lu 174.9668 Lutetium	
		Actinide Series	89 Ac 227 Actinium	90 Th 232.0377 Thorium	91 Pa 231.03588 Protactinium	92 U 238.02891 Uranium	93 Np 237 Neptunium	94 Pu 244 Plutonium	95 Am 243 Americium	96 Cm 247 Curium	97 Bk 247 Berkelium	98 Cf 251 Californium	99 Es 252 Einsteinium	100 Fm 257 Fermium	101 Md 258 Mendelevium	102 No 259 Nobelium	103 Lr 266 Lawrencium	

MATHEMATICS

Algebra

1. $\left(a+b\right)^2 = a^2 + 2ab + b^2;\ a^2 + b^2 = \left(a+b\right)^2 - 2ab$

2. $\left(a-b\right)^2 = a^2 - 2ab + b^2;\ a^2 + b^2 = \left(a-b\right)^2 + 2ab$

3. $\left(a+b+c\right)^2 = a^2 + b^2 + c^2 + 2\left(ab+bc+ca\right)$

4. $\left(a+b\right)^3 = a^3 + b^3 + 3ab\left(a+b\right)$

5. $\left(a-b\right)^3 = a^3 - b^3 - 3ab\left(a-b\right)$

6. $a^2 - b^2 = \left(a+b\right)\left(a-b\right)$

7. $a^3 - b^3 = \left(a-b\right)\left(a^2+ab+b^2\right)$

8. $a^3 + b^3 = \left(a+b\right)\left(a^2-ab+b^2\right)$

9. $a^n - b^n = \left(a-b\right)\left(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \ldots + b^{n-1}\right)$

Def : $a^1 = a$ and $a^n = a \times a \times a \times a$........n times. a is called the base, n is called the index or exponents and a^n is the n^{th} power of a.

10. $a^n = a.a.a.....n$ times

11. $a^m . a^n = a^{m+n}$

12. $\frac{a^m}{a^n} = a^{m-n},\ a \neq 0$

13. $\left(a^m\right)^n = a^{mn} = \left(a^n\right)^m$

14. $\left(ab\right)^n = a^n .\ b^n$

15. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n},\ b \neq 0$

16. $a^0 = 1$ where $a \in R,\ a \neq 0$

17. $a^{-n} = \frac{1}{a^n}, a^n = \frac{1}{a^{-n}},\ a \neq 0$

18. $a^{p/q} = \sqrt[q]{a^p}$

19. If $a^m = a^n$ and $a \neq \pm 1,\ a \neq 0$ then $m = n$

20. If $a^n = b^n$ where $n \neq 0$; n is even, then $a = \pm b$

21. If $\sqrt{x}, \sqrt{y}$ are quadratic surds and if $a+\sqrt{x}=\sqrt{y}$, then a = 0 and x = y

22. If $\sqrt{x}, \sqrt{y}$ are quadratic surds and if $a+\sqrt{x}=b+\sqrt{y}$ then a = b and x = y

❖ **Logarithm**

If a and n are positive real numbers, $a \neq 1$ and x is a real number such that $a^x = n$, then x is called the logarithm of n to the base a and we write this as $\log_a n = x$

If $a^x = n$, then $\log_a n = x$; $n > 0$, $a > 0$, $a \neq 1$

i) $\log_a (mn) = \log_a m + \log_a n$

ii) $\log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$

iii) $\log_a m^n = n \log_a m$

iv) $\log_b a = \frac{\log_k a}{\log_k b}$ where $b \neq 1$, $k \neq 1$,

v) $\log_b a = \frac{1}{\log_a b}$ where a, b are positive real numbers, $a \neq 1, b \neq 1$

vi) If a, m, n are positive real numbers, $a \neq 1$ and if $\log_a m = \log_a n$, then $m = n$

(vii) $\log_a 1 = 0$

(viii) $\log_a a = 1$

(ix) $a^{\log_a b} = b$

(x) $a^{\log_c b} = b^{\log_c a}$

Note- 1) Standard logarithm $\log_{10} a$

2) Natural logarithm $\log_e a = \ln a$

23. The roots of the quadratic equation $ax^2 + bx + c = 0;\ a \neq 0$ are $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

The solution set of the equation is $\left\{\frac{-b+\sqrt{\Delta}}{2a}, \frac{-b-\sqrt{\Delta}}{2a}\right\}$

Where Δ = discriminant $= b^2 - 4ac$

24. The roots are real and distinct if $\Delta > 0$

25. The roots are real and equal if $\Delta = 0$

26. The roots are non-real if $\Delta < 0$

27. If α and β are the roots of the equation $ax^2 + bx + c = 0,\ a \neq 0$ then

(i) $\alpha + \beta = \frac{-b}{a} = -\frac{\text{coeff. of } x}{\text{coeff. of } x^2}$ (ii) $\alpha \cdot \beta = \frac{c}{a} = \frac{\text{Constant term}}{\text{coeff. of } x^2}$

28. The quadratic equation whose roots are α and β is $(x-\alpha)(x-\beta) = 0$

(i) i.e., $x^2 - (\alpha+\beta)x + \alpha\beta = 0$

(ii) i.e., $x^2 - Sx + P = 0$ where S = Sum of the roots and P = Product of the roots.

29. For an arithmetic progression (A.P.) whose first term is ‘a’ and common difference is ‘d’.

(i) n^{th} term $= t_n = a + (n-1)d$

(ii) The sum of the first ‘n’ terms $= S_n = \frac{n}{2}(a+\ell) = \frac{n}{2}\{2a + (n-1)d\}$

Where ℓ = last term $= a + (n-1)d$.

30. For a geometric progression (G.P.) whose first term is ‘a’ and common ratio is ‘r’ .

(i) n^{th} term $= t_n = ar^{n-1}$

(ii) The sum of the first ‘n’ terms:

$$S_n = \frac{a(1-r^n)}{1-r} \quad \text{if } r<1$$

$$= \frac{a(r^n-1)}{r-1} \quad \text{if } r>1$$

$$= na \quad \text{if } r=1$$

(iii) $S_\infty = \frac{a}{1-r}, \ |r|<1$

31. For any sequence $\{t_n\}, S_n - S_{n-1} = t_n$ where $S_n =$ Sum of the first ‘n’ terms.

32. $\sum_{r=1}^{n} r = 1+2+3+...+n = \frac{n}{2}(n+1)$.

33. $\sum_{r=1}^{n} r^2 = 1^2+2^2+3^2+...+n^2 = \frac{n}{6}(n+1)(2n+1)$

34. $\sum_{r=1}^{n} r^3 = 1^3+2^3+3^3+4^3+...+n^3 = \frac{n^2}{4}(n+1)^2 = \left\{\frac{n(n+1)}{2}\right\}^2$

35. $n! = 1.2.3.4........(n-1).n$

36. $n! = n(n-1)! = n(n-1)(n-2)! = ...$

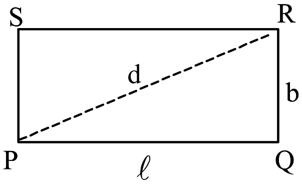
37. $0! = 1$

38. $(a+b)^n = a^n + na^{n-1}b + \frac{n(n-1)}{2!}a^{n-2}b^2 + \frac{n(n-1)(n-2)}{3!}a^{n-3}b^3 + ...+ b^n, n>1$

39. Area of rectangle = $\ell \times b$

Perimeter of rectangle = $2(\ell + b)$

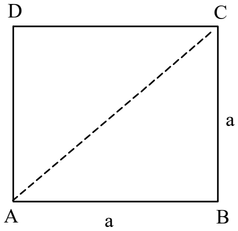
Diagonal $(d) = \sqrt{\ell^2 + b^2}$



40. Area of square = $(\text{side})^2$

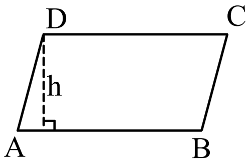
Perimeter of square = $4 \times \text{side}$

Diagonal of square = $\sqrt{2} \times \text{side}$



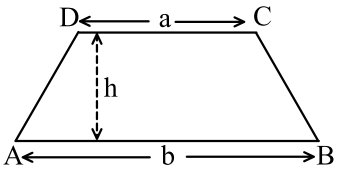
41. Area of parallelogram = Base × height

Perimeter of parallelogram = 2(sum of two adjacent sides)



42. Trapezium:

Area of trapezium = $\frac{1}{2}$(sum of parallel sides) × height

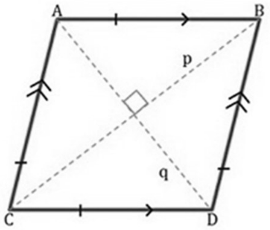


43. Area of rhombus = $\frac{1}{2}\times$product of its diagonals

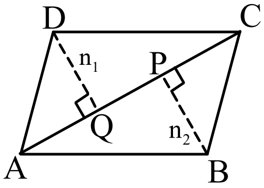
$$=\frac{1}{2}\times d_1\times d_2$$

Note : side of rhombus = $\frac{\sqrt{{d_1}^2+{d_2}^2}}{2}$

Where d_1 is p and d_2 is q.



44. Area of quadrilateral ABCD



$=\frac{1}{2}\times(n_1+n_2)AC$

$=\frac{1}{2}\times$sum of perpendiculars on the diagonal from the opposite vertices × Diagonal

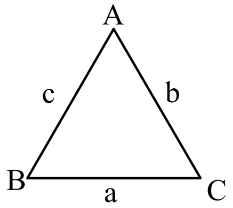
45. Area of triangle:

Perimeter = $a+b+c$

Area of triangle = $\frac{1}{2}\sqrt{s(s-a)(s-b)(s-c)}$

where $s=\frac{a+b+c}{2}$

This formula is called heron's formula

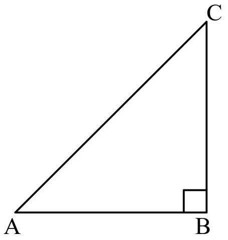


46. Area of right angled triangle

$=\frac{1}{2}AB\times BC$

$A=\frac{1}{2}\times Base\times Height$

Perimeter of right angled
Triangle = Base + height + hypotenuse



47. The Pythagorean equation:

(length of base)^2 + (length of height)^2 = (length of hypotenuse)^2

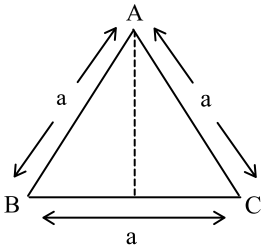
$\therefore AB^2+BC^2=AC^2$

48. Equilateral triangle

Area of equilateral triangle

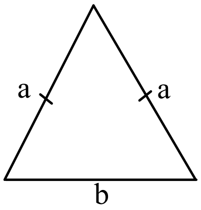
$=\frac{\sqrt{3}}{4}\times(side)^2$

Perimeter = 3×side



49. Area of isosceles triangle

$=\frac{b}{4}\sqrt{4a^2-b^2}$

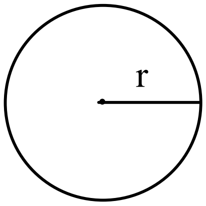


50. Area (of circle with radius r) $= \pi r^2$

Perimeter (circumference) of circle = $2\pi r$

Where $\pi = \frac{22}{7}$ or 3.14

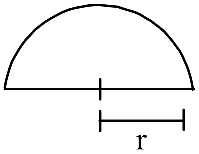
Note : π is an irrational number



Area of semi-circle = $\frac{\pi r^2}{2}$

Circumference of semi-circle = $\pi r + d$

Where d = diameter of circle



Cuboid :

Lateral surface area

= Base perimeter × Height

$= 2(\ell + b) \times h$ sq. unit

Total surface area = $2(\ell b + bh + h\ell)$

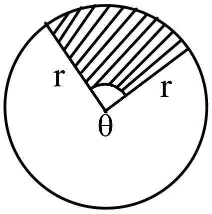
Volume = Base area × Height

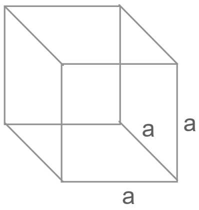
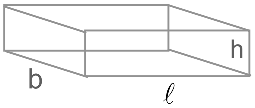
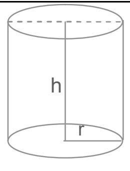
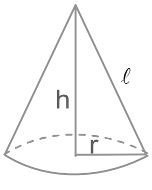
$= \ell \times b \times h$

51. Length of arc (ℓ) with angle $\theta = \frac{\theta}{360^o} \times 2\pi r$

52. Area of sector with angle $\theta = \frac{\theta}{360^o} \times \pi r^2$

53. Perimeter of sector $= \frac{\theta}{360^o} \times 2\pi r + 2r$



Name of the Solid	**Figure**	**Lateral/ Curved Surface Area**	**Total Surface Area**	**Volume**
Cube		$4a^2$	$6a^2$	a^3
Cuboid		$2(\ell + b)h$	$2(\ell b+bh+h\ell)$	ℓbh
Right circular cylinder		$2\pi rh$	$2\pi r(r + h)$	πr^2h
Right circular cone		$\pi r\ell$	$\pi r(\ell + r)$	$\frac{1}{3}\pi r^2h$

54. Total surface area of sphere $=4\pi r^2$

Volume = $\frac{4}{3}\pi r^3$

Curved surface area of Hemi-sphere = $2\pi r^2$

Total surface area = $3\pi r^2$

Volume of Hemi-sphere = $\frac{2}{3}\pi r^3$

55. i) Volume of the frustum of the cone = $\frac{1}{3}\pi h\left(r_1^2+r_2^2+r_1r_2\right)$

ii) The curved surface area of the frustum of the cone = $\pi\left(r_1+r_2\right)\ell$

where $\ell=\sqrt{h^2+\left(r_1-r_2\right)^2}$

iii) Total surface area of the frustum of the cone = $\pi\ell\left(r_1+r_2\right)+\pi r_1^2+\pi r_2^2$,

where $\ell=\sqrt{h^2+\left(r_1-r_2\right)^2}$

FORMULAS/EQUATIONS

Distance between two points $d=\sqrt{\left(x_2-x_1\right)^2+\left(y_2-y_1\right)^2}$ where $\left(x_1,y_1\right)$ and $\left(x_2,\ y_2\right)$ are two points in a coordinate plane

Slope of a line : $m=\frac{y_2-y_1}{x_2-x_1}$ where $\left(x_1,y_1\right)$ and $\left(x_2,\ y_2\right)$ are two points on a coordinate plane

Point-Slope Equation of a line : $y-y_1=m\left(x-x_1\right)$ where m is the slope and the point $\left(x_1,\ y_1\right)$

Slope-Intercept Equation of a line : $y=mx+c$ where m is the slope and c is the y-intercept

Standard Equation of a circle : $\left(x-h\right)^2+\left(y-k\right)^2=r^2$ where r is the radius and center at (h, k)

Trigonometric Formula Sheet & Definition of the Trig Functions

Right Angled Triangle Definition

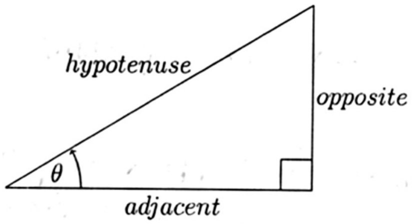
Assume that :

$0<\theta<\frac{\pi}{2}$ or $0^0<\theta<90^\circ$

$\sin\theta=\frac{opp}{hyp}$ $\quad$ $\cos ec\,\theta=\frac{hyp}{opp}$

$\cos\theta=\frac{adj}{hyp}$ $\quad$ $\sec\theta=\frac{hyp}{adj}$

$\tan\theta=\frac{opp}{adj}$ $\quad$ $\cot\theta=\frac{adj}{opp}$



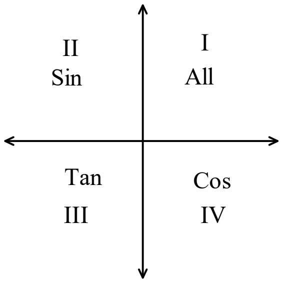
Remarks :

(i) In the first quadrant all trigonometric ratios are positive

(ii) In the 2nd quadrant, sin x and its reciprocal (cosec x) are positive and rest are negative.

(iii) In the 3rd quadrant, tan x and its reciprocal (cot x) are positive and rest are negative.

(iv) In the 4th quadrant. cos x and sec x are positive and rest are negative.



Trigonometric Identities and Formulas

Tangent and cotangent identities

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

Reciprocal identities

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

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

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

Trigonometric identities

$\sin^2\theta + \cos^2\theta = 1$

$\tan^2\theta + 1 = \sec^2\theta$

$1 + \cot^2\theta = \operatorname{cosec}^2\theta$

Degrees to Radians Formulae

If x is an angle in degrees and t is an angle in radians then:

$$\frac{\pi}{180^\circ} = \frac{t}{x} \Rightarrow t = \frac{\pi x}{180^\circ} \text{ and } x = \frac{180^\circ t}{\pi}$$

Sum and Difference Formulas

$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$

$\tan(\alpha \pm \beta) = \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$

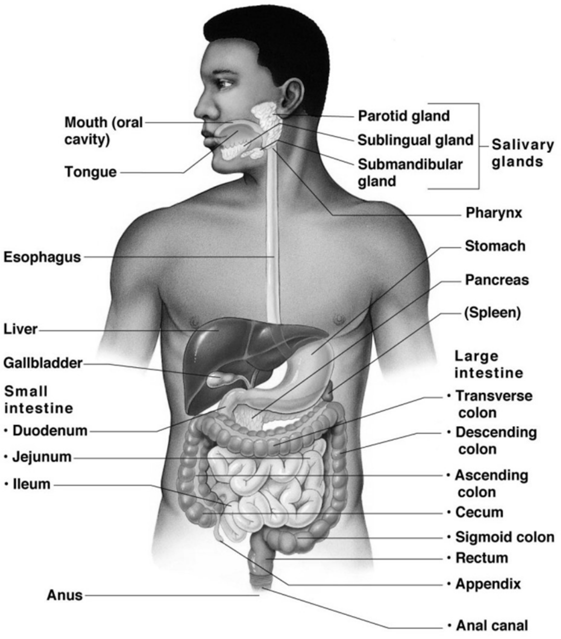
Double Angle formulae

$\sin 2\theta = 2\sin\theta\cos\theta = \frac{2\tan\theta}{1+\tan^2\theta}$

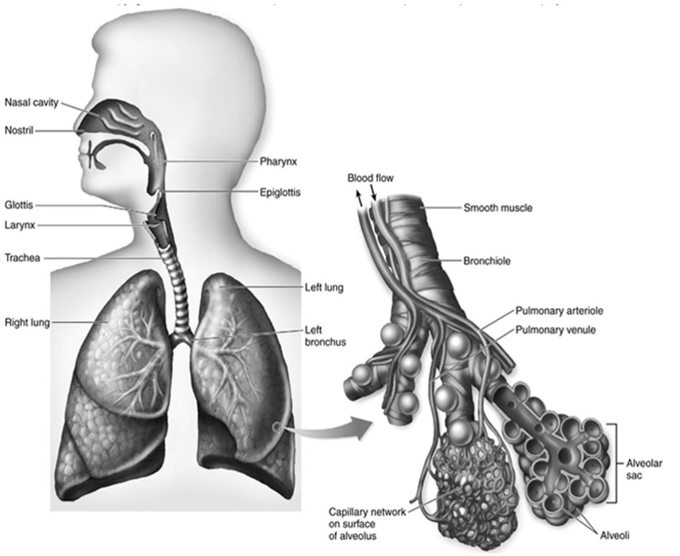
$\cos 2\theta = \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

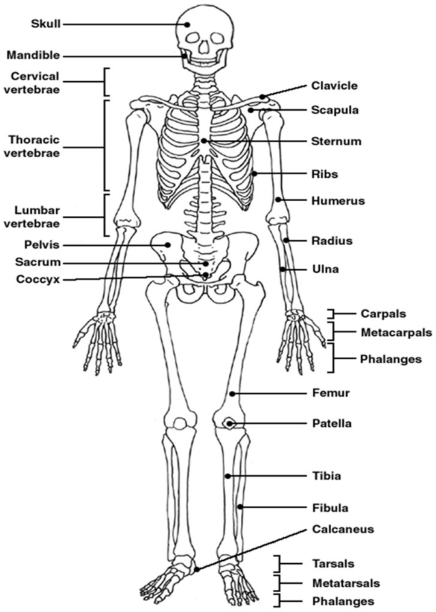
BIOLOGY



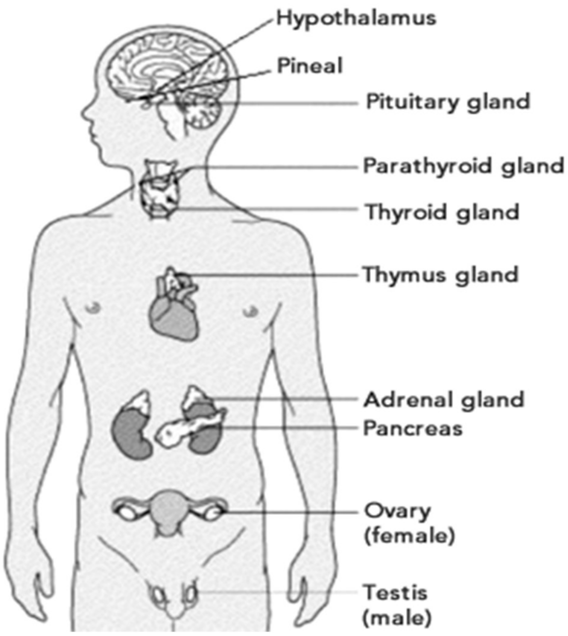
DIGESTIVE SYSTEM



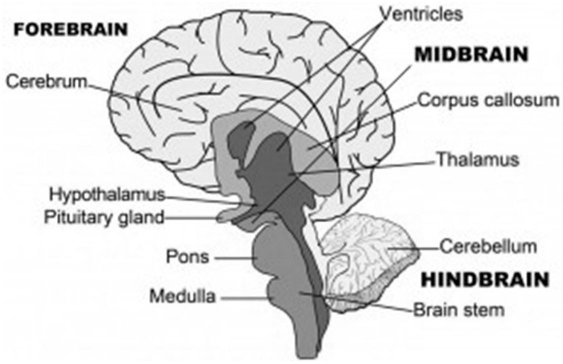
RESPIRATORY SYSTEM



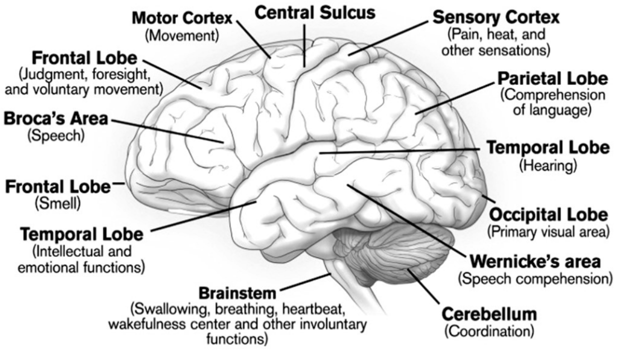
SKELETAL SYSTEM



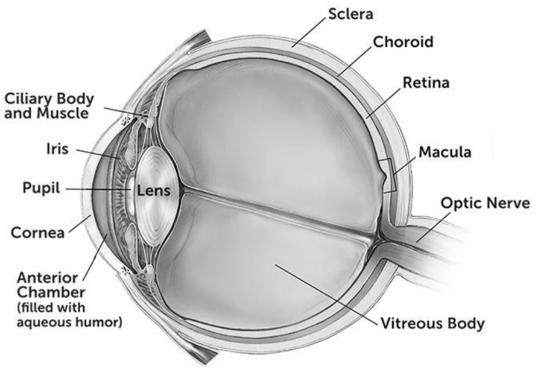
ENDOCRINE SYSTEM



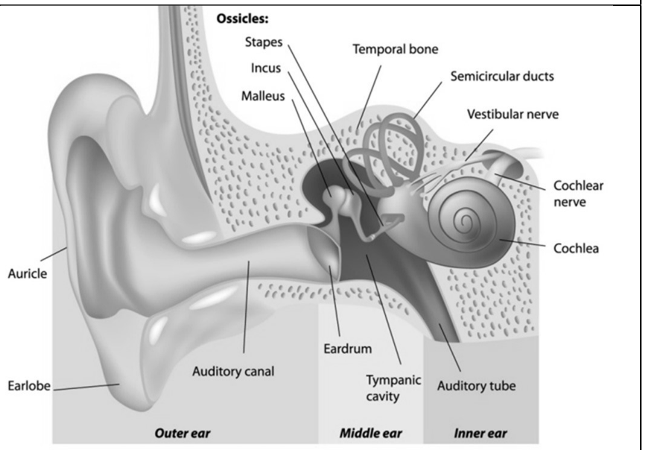
STRUCTURE OF THE BRAIN



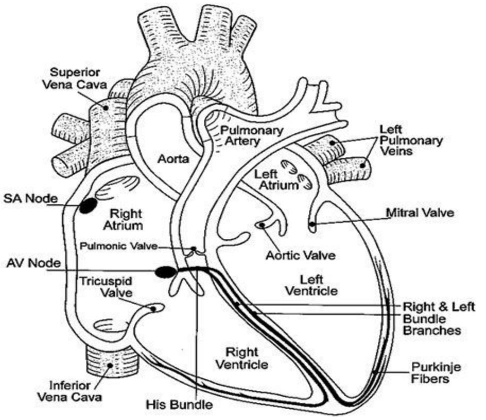
BRAIN PARTS & ITS FUNCTIONS



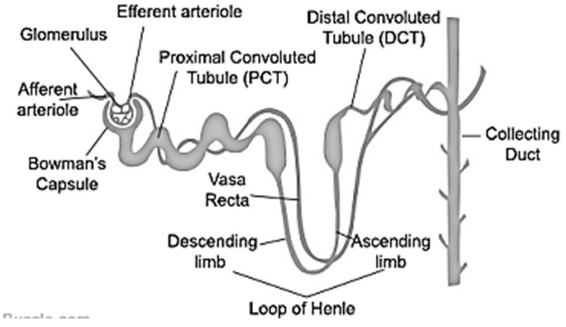
STRUCTURE OF THE EYE



STRUCTURE OF THE EAR



STRUCTURE OF THE HEART



STRUCTURE OF THE NEPHRON

SCHOLARSHIP CUM ENTRANCE TEST SAMPLE QUESTIONS

1. The least perfect square, which is divisible by each of 21, 36 and 66 is:
(A) 213444 (B) 214344 (C) 214434 (D) 231444

2. Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was. What is the difference between the ages of her parents?
(A) 2 years (B) 4 years (C) 6 years (D) 8 years

3. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is:
(A) 250 (B) 276 (C) 280 (D) 285

4. If $\sqrt{x-1}-\sqrt{x+1}+1=0$, then $4x$ equals:
(A) 5 (B) $4\sqrt{-1}$ (C) 0 (D) no real value

5. When simplified, $\left(x^{-1}+y^{-1}\right)^{-1}$ is equal to:
(A) $x+y$ (B) $\frac{xy}{x+y}$ (C) xy (D) $\frac{1}{xy}$

6. The fraction $\frac{a^{-4}-b^{-4}}{a^{-2}-b^{-2}}$ is equal to:
(A) $a^{-6}-b^{-6}$ (B) $a^{-2}-b^{-2}$ (C) $a^{-2}+b^{-2}$ (D) $a^{2}+b^{2}$

7. If $8.2^{x}=5^{y+8}$, then , when $y=-8, x=$
(A) -4 (B) -3 (C) 0 (D) 4

8. The value of $x-y^{x-y}$ when $x=2$ and $y=-2$ is:
(A) -18 (B) -14 (C) 14 (D) 18

9. Of the following expressions the one equal to $\frac{a^{-1}b^{-1}}{a^{-3}-b^{-3}}$ is:
(A) $\frac{a^{2}b^{2}}{b^{2}-a^{2}}$ (B) $\frac{a^{2}b^{2}}{b^{3}-a^{3}}$ (C) $\frac{ab}{b^{3}-a^{3}}$ (D) $\frac{a^{3}-b^{3}}{ab}$

10. If $\left(r+\frac{1}{r}\right)^{2}=3$ then $r^{3}+\frac{1}{r^{3}}$ equals
(A) 1 (B) 2 (C) 0 (D) 6

CUT HERE TO USE IT AS A POSTER

"YOU HAVE TO
DREAM
BEFORE YOUR
DREAMS CAN COME
TRUE"

Dr. A. P. J. Abdul Kalam

PACE
IIT & MEDICAL