

Important Formulas ScienceRs-1 Laws of motion:Like parallel forces $F_{net} = F_1 + F_2$ Unlike parallel forces $F_{net} = F_1 - F_2$ Torque $\tau = F \times S$ Principle of moments $F_1 \times d_1 = F_2 \times d_2$ Force $F = ma$ $m = \text{mass}$ $a = \text{acceleration}$ $1 \text{ N} = 1 \text{ kg ms}^{-2} = 1 \text{ kgf} = 1 \text{ kg} \times 9.8 \text{ ms}^{-2}$ $1 \text{ dyne} = 1 \text{ g cm s}^{-2}$; $1 \text{ N} = 10^5 \text{ dyne}$ Impulse $J = F \times t = \text{Force} \times \text{time}$

Law of conservation of momentum

$$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2$$

By Newton's law of gravitation

$$\text{Force } F = \frac{G M m}{r^2} \quad G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$$

Acceleration due to gravity

$$g = \frac{GM}{R^2} \quad \begin{array}{l} M - \text{Mass} \\ R - \text{Radius} \end{array}$$

Weight $w = mg$

Apparent weight

(i) when lift is moving upwards

$$[R \rightarrow \text{apparent wt of the person}] \quad R = m(g+a) \quad a = \text{acceleration}$$

(ii) when lift is moving downwards

$$R = m(g-a) \quad m \rightarrow \text{mass of the person}$$

(iii) when lift is at rest

$$R = mg \quad g \rightarrow \text{acceleration}$$

(iv) when lift is falling down freely

$$R = 0$$

Lesson-2 Optics:

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1} \quad \boxed{\mu = \frac{c_a}{c_m}}$$

 c_a - speed of light in air or vacuum c_m - speed of light in mediumAmount of scattering $\propto \frac{1}{\lambda^4}$

This is also called

Rayleigh scattering law

Lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $v \rightarrow$ distance of image $u \rightarrow$ distance of object

$$m = \frac{h'}{h} = \frac{h_i}{h_o} = \frac{\text{height of the image}}{\text{height of the object}}$$

$$\text{Magnification } (m) = \frac{v}{u} = \frac{\text{distance of the image}}{\text{distance of the object}}$$

$$\text{Power of a lens } \boxed{P = \frac{1}{f}}$$

Lens Maker's formula:

$$\frac{1}{f} = (\mu - 1) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

 μ - refractive index R_1, R_2 - Radii of curvature of two faces of the lens.Focal length of required concave lens for myopia $f = \frac{xy}{x-y}$ Focal length of required convex lens for hypermetropia $f = \frac{dD}{d-D}$ Magnification for simple microscope $M = 1 + \frac{D}{f}$ $D \rightarrow$ least distance of distinct vision from the lens of the eye.

Magnification for Compound microscope

$$M = \left[\frac{u}{v} \left(1 - \frac{D}{f_e} \right) \right] \quad (\text{or}) \quad M = \left(\frac{v}{f_o} - 1 \right) \left(1 + \frac{D}{f_e} \right)$$

Astronomical telescope:

$$M = \frac{f_o}{f_e} \quad \begin{array}{l} f_o \rightarrow \text{focal length of} \\ \text{objective lens} \\ f_e \rightarrow \text{focal length of} \\ \text{eye lens} \end{array}$$

Lesson-3 Thermal Physics:

Relation between Celsius and Kelvin

$$K = C + 273$$

Fahrenheit to Kelvin

$$K = (F - 32) \frac{5}{9} + 273$$

Coefficient of linear expansion

$$\alpha_L = \frac{\Delta L}{L_0 \Delta T}$$

ΔL - change in length (Final length - original length)
 L_0 - original length
 ΔT - change in temperature (Final temperature - Initial temperature)

Co-efficient of areal expansion (or) superficial expansion $\alpha_A = \frac{\Delta A}{A_0 \Delta T}$

$\Delta A \rightarrow$ change in area (Final area - Initial area)

$A_0 \rightarrow$ original area

$\Delta T \rightarrow$ change in temperature (Final temperature - initial temperature)

Co-efficient of cubical expansion

$$\alpha_V = \frac{\Delta V}{V_0 \Delta T}$$

$\Delta V \rightarrow$ change in volume (Final volume - initial volume)

$V_0 \rightarrow$ original volume

$\Delta T \rightarrow$ change in temperature (Final temperature - initial temperature)

Boyle's law = $P \propto \frac{1}{V}$ $PV = \text{constant}$

Charles's law = $V \propto T$ (or) $\frac{V}{T} = \text{constant}$

Avagadro's law = $V \propto n$ (or) $\frac{V}{n} = \text{constant}$

$n \Rightarrow$ no. of atoms or molecules

Ideal gas equation: $PV = RT$

Lesson - 4 Electricity

Ohm's law $V = IR$ $R = \frac{V}{I}$ Unit = ohm (Ω)

Resistivity $\rho = \frac{RA}{L}$ Unit: ohm-metre (Ωm)

Conductance = $\frac{1}{R}$ Unit: ohm⁻¹ (mho)

Conductivity: $\sigma = \frac{1}{\rho} = \frac{1}{\text{resistivity}}$
 Unit: $\Omega^{-1} m^{-1}$ (or) $m\text{ohm}^{-1}$

Resistance $R_s = R_1 + R_2$

If 'n' resistors connected in series
 $R_s = nR$

Resistance in Parallel:

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Joule's law: $H = I^2 R t$ (or) $H = V I t$

Electric power: $P = VI$ $P = \frac{V I t}{t}$

Unit: (W) (or) volt ampere

$$1 \text{ kWh} = 36 \times 10^5 \text{ J (or)} 3.6 \times 10^6 \text{ J}$$

Electrical energy $E = P \times t$

$$\text{Unit} = \text{Joule} = V I t = V Q$$

If 'n' resistors connected in parallel $R_p = \frac{R}{n}$

Electric current $I = \frac{Q}{t}$ Unit: Ampere (or) $C s^{-1}$

specific resistance (or)

Electrical resistivity

$$\rho = \frac{RA}{L}$$

Unit = ohm metre

Electrical Potential difference

$$V = \frac{W}{Q} \text{ (or) } W = V Q$$

Unit: volt

Electrical Resistance $R = \frac{V}{I}$ Unit (Ω)

L-5 Acoustics

Time period $T = \frac{1}{n}$ $n \rightarrow$ Frequency

Frequency $n = \frac{1}{T}$ $T \rightarrow$ Time period

$c = v \lambda$ $v = \frac{c}{\lambda}$ $\lambda \rightarrow$ wavelength
 $v \rightarrow$ Frequency

$I \propto A^2$ $I \rightarrow$ Intensity
 $A \rightarrow$ Amplitude

$V_T = (V_0 + 0.61 T)$
 $V_0 \rightarrow$ velocity of sound in the gas at 0°C

$v_T \rightarrow$ velocity of sound at temperature T

$$\frac{v_2}{v_1} = \sqrt{\frac{T_2}{T_1}}$$

Acoustic Impedance = Density of the medium \times speed of sound

Unit: $\text{kg m}^{-2} \text{s}^{-1}$

$$\text{Velocity} = \frac{2d}{t} = \frac{\text{distance travelled by sound}}{\text{time taken}}$$

Source and listener move towards each other (n') = $\left(\frac{v+v_L}{v-v_S}\right)n$

Source and listener move away from each other (n') = $\left(\frac{v-v_L}{v+v_S}\right)n$

Listener move towards the stationary source (n') = $\left(\frac{v+v_L}{v}\right)n$

Listener move away from the stationary source (n') = $\left(\frac{v-v_L}{v}\right)n$

Source move towards stationary listener $n' = \left(\frac{v}{v-v_S}\right)n$

Source move away from stationary listener (n') = $\left(\frac{v}{v+v_S}\right)n$

n' = apparent frequency

n = actual frequency

v_S = velocity of listener

v_S = Velocity of source

Intensity of sound

$$I = \frac{W}{A \times t} = \frac{\text{work}}{\text{Area} \times \text{time}}$$

$$\text{Unit} = \frac{\text{work}}{\text{time} \times \text{Area}} = \frac{\text{J s}^{-1}}{\text{m}^2} = \text{W m}^{-2}$$

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$$I = \frac{\text{Power (or)} \frac{E}{t}}{\text{Area}} = \frac{E}{t \cdot A}$$

$$\text{Wavelength } \lambda = \frac{v}{n} \quad v = \text{velocity} \quad n = \text{frequency}$$

Lesson-6 Nuclear Physics

U^{235} , Pu^{239} , P^{241} = fissusable material

U^{238} , Pu^{240} , Th^{232} : fertile material

He^4 = α particle

I^{131} = Cure goiter

Fe^{59} = treat anaemia

P^{32} = Cure skin disease

Co^{60} , Au^{197} - Treatment of skin Cancer

Cl^{252} = Detect explosives

Am^{241} = smoke detector

C^{14} = Archaeological research

Control rod = Boron & cadmium

coolant = water, air and liquid sodium

Fuel = uranium

Moderator = graphite, heavy water

Fuel = Uranium

Values:

1 Rd (Rutherford) = 10^6 disintegrations/sec.

1 curie = 3.7×10^{10} disintegration/sec

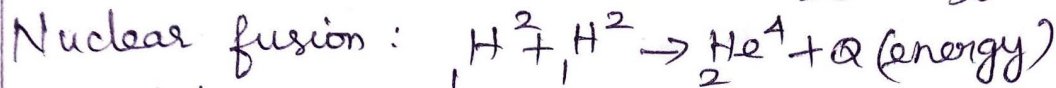
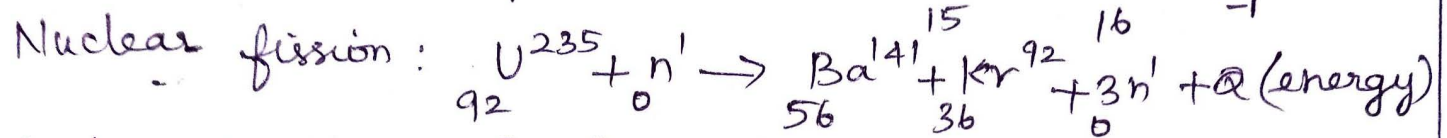
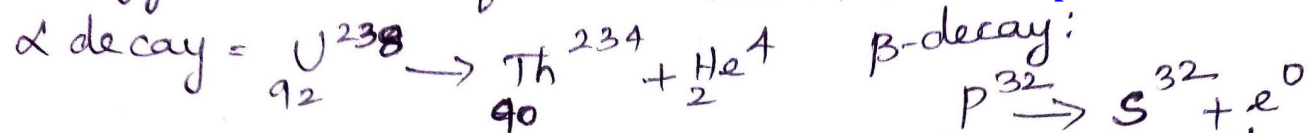
1 Roentgen = 2.58×10^{-4} C in kg

speed of light $c = 3 \times 10^8 \text{ ms}^{-1}$

Temperature required for fusion 10^7 to 10^9 K

Energy radiated by sun = 3.8×10^{26} J/s

Energy released in fusion = 200 Mev www.Padasalai.Net www.Trb TnpSC.com



Inventions & Discoveries:-

Radioactivity = Henri Becquerel

Radium and Polonium = Marie Curie & F. Joliot

Artificial Radioactivity = Irene Curie & F. Joliot

Radioactive displacement law = Soddy & Fajan

Nuclear fission = Otto Hahn & F. Strassman

X-rays = Roentgen

Nucleus (protons) = Rutherford

Uranium = Martin Klaproth

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