PHYSICS - FORMULAS

⇒ GENERAL PHYSICS

1. momentum = Mass x Velocity
2. Force = Mass x Acceleration
3. Conservation of momentum: $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$
4. Elastic collision = $u_1 - u_2 = v_2 - v_1$
5. Force = $\frac{mv - mu}{t}$
6. Impulse = $Ft = mv - mu$
7. Work done = Force x distance
8. Kinetic energy = $\frac{1}{2}mv^2$
9. Gravitational potential energy = mgh
10. power = $\frac{\text{Work done}}{\text{time}}$
11. power = Force x velocity
12. Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}} \times 100$
13. When force is at an angle, work done = $F\cos\theta$ x displacement.
14. Upthrust = $\rho \Delta v g$
15. moment = Force x perpendicular distance from pivot
16. For non-perpendicular forces Moment = $F\sin\theta$ x distance
17. Torque of a couple = magnitude of one of the forces x perpendicular distance between the forces.
18. Density = $\frac{\text{Mass}}{\text{Volume}}$
19. Pressure = $\frac{\text{Force}}{\text{Area}}$
20. Pressure (liquids) = $h\rho g$
21. Force = kx = constant x extension
22. stress (σ) = $\frac{F}{A} = \frac{\text{Force}}{\text{Area}}$, unit: Pa.

Projectile

Range : $\frac{u^2 \times \sin 2\theta}{g}$ $H_{max} = \frac{u^2 \sin^2\theta}{2g}$ time of flight = $\frac{2u \sin\theta}{g}$

23. Strain = $\frac{e}{l_0}$ = $\frac{\text{extension}}{\text{og length}}$

24. Youngs modulus = $\frac{\text{stress}}{\text{Strain}} = \frac{F}{A} \times \frac{l_0}{e}$

25. Elastic potential energy = $\frac{1}{2} k x^2$

26. Projectile motion

1. Time of flight - how long the projectile is in the air
2. Maximum height - height at which the projectile is momentarily at rest
3. Range - The horizontal distance travelled by the projectile.

for horizontal component - $u\cos\theta = u_x$

for vertical component - $u\sin\theta = u_y$

27. motion equations

1. $v = u + at$
2. $s = ut + \frac{1}{2}at^2$
3. $v^2 = u^2 + 2as$
4. $s = \frac{u+v}{2} \times t$

⟹ Electric Physics

1. $I = \frac{Q}{t}$, Current = $\frac{\text{charge}}{\text{time}}$ (Q → symbol; unit (C) coulomb)

2. Smallest possible charge = -1.6×10^{-19} C

3. Charge density = n = $\frac{\text{No. of charge carriers}}{\text{volume}}$

4. $I = nAqv$ (A → area; v → drift velocity; n → charge density)

5. Voltage = $\frac{\text{Work done}}{\text{Charge}}$, unit = volts (V)

6. Energy = $V \times Q$ or $V \times I \times t$

7. Power = $\frac{E}{t} = V \times I$, unit = watts (W), I^2R, V^2/R

8. Voltage = Current x Resistance

$V = IR$

9. Resistance = $\frac{V}{I}$, unit = Ω (ohms)

10. Resistivity = $\frac{\text{Resistance} \times \text{Area}}{\text{length}}$

$\rho = \frac{RA}{l}$, unit = Ωm

if 2 wires are of same material then they have same resistivity.

11. $\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{A_2}{A_1}$, $\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{d_2^2}{d_1^2}$, $\frac{R_1}{R_2} = \frac{l_1}{l_2} \times \frac{r_2^2}{r_1^2}$

12. R_s = effective resistance in series = $R_1 + R_2 + R_3 \ldots$

voltage divides in series, current is same.

effective resistance in series is always greater than individual resistance.

13. R_p = effective resistance in parallel. $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots$

current divides in parallel, V is same.

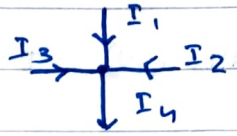
effective resistance in parallel is always less than individual resistance.

14. If internal resistance is present

E.M.F = $IR + Ir$; r = internal resistance.

15. Kirchoff's I^{st} law

→ sum of current entering the junction is always equal to the sum of current leaving the junction.



$$I_1 + I_2 + I_3 = I_4$$

16. Kirchoff's II^{nd} law

→ Sum of E.M.F in the circuit is equal to the sum of potential difference across the components in the circuit.

$$E = V_1 + V_2$$

17. Drift speed $= \frac{I}{Anq}$ or $I = Anvq$

$$\boxed{q = 1.6 \times 10^{-19}}$$

18. $I = \frac{nq}{t}$