Science(Physics) 5086 List of Formulae

1. Measurement

Corrected reading = Observed reading – (Zero error)

2. Kinematics

$$v = \frac{d}{t}$$

v: speed [m/s] or [ms^{-1}] d: distance [m] t: time [s]

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

Average speed [m/s] total distance [m] total time [s]

$$a = \frac{v - u}{t}$$

a: acceleration [m/s^2] or [ms^{-2}] v: final velocity [m/s]
t: time taken [s] u: initial velocity [m/s]

Distance travelled = Area under Speed-Time graph

4. Forces & Pressure

$$W = mg$$

W: weight [N] m: mass [kg]
g: acceleration due to gravity [m/s^2]

$$\rho = \frac{m}{V}$$

ρ : density [kg/m^3] m: mass [kg] V: volume [m^3]

$$\text{Average density} = \frac{\text{total mass}}{\text{total volume}}$$

Average density [kg/m^3] total mass [kg]
total volume [m^3]

$$p = \frac{F}{A}$$

p: pressure [Pa] or [N/m^2] F: force [N] A: area [m^2]

4. Forces and Pressure

$$F_R = ma$$

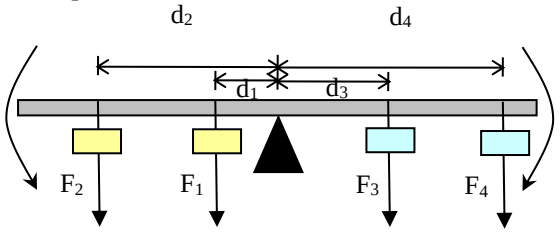
F_R: **resultant** or **net** force [N] m: mass [kg]
a: acceleration [m/s^2]

5. Turning Effect of Forces

$$M = F\,d$$

M: moment of a force about a pivot [Nm] F: force [N]
d: **perpendicular** distance from the line of action of the force to the pivot [m]

Principle of moments:



Sum of Anti-clockwise Moments = Sum of Clockwise Moments

$$F_1 d_1 + F_2 d_2 = F_3 d_3 + F_4 d_4$$

6. Energy, Work and Power

$$GPE = mgh$$

GPE: gravitational potential energy [J]
m: mass [kg] g: acceleration due to gravity [m/s^2]
h: height raised [m]

$$KE = \frac{1}{2}mv^2$$

KE: kinetic energy [J] m: mass [kg] v: speed [m/s]

$$W = F\,s$$

W: Work done [J] F: force [N]
s: distance moved in the **direction of the force** [m]

$$P = \frac{W}{t} \quad \text{or} \quad P = \frac{Fs}{t} \quad \text{or} \quad P = \frac{E}{t}$$

P: power [W] W: work done [J]
E: energy [J] t: time [s]

7. Kinetic Model of Matter

8. Thermal Processes

9. General Wave Properties

$$f = \frac{1}{T}$$

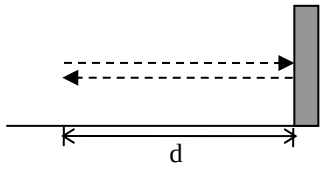
f: frequency [Hz] T: period [s]

Wave velocity equation:

$$v = f\lambda$$

v: speed of wave [m/s] *f*: frequency [Hz]
λ : wavelength [m]

Reflection of Sound:
For determination of speed of sound using **echo** method:



$$v = \frac{2d}{t}$$

v: speed of sound [m/s] d: **one-way** distance [m]
t: time taken for echo to be received [s]

10. Electromagnetic Spectrum
11. Light

Angle of **incidence** = Angle of **reflection**

Snell's Law:

$$\eta = \frac{\sin i}{\sin r} \quad \text{or} \quad \eta_1 \sin\theta_1 = \eta_2 \sin\theta_2$$

η : refractive index of a medium
i: angle of incidence (**in the vacuum or air**) [°]
r: angle of refraction (in the medium) [°]

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

η : refractive index of a medium
c: speed of light in vacuum or air = 3.0×10^8 m/s
v: speed of light in the medium [m/s]

15. Electric Charge & Current Electricity

$$Q = I\,t$$

Q: charge [C] I: current [A] t: time [s]

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

ε : electromotive force, e.m.f. [V]
W: work done [J] Q: charge [C]

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

V: potential difference, p.d., or voltage [V]
W: work done or energy converted [J] Q: charge [C]

Ohm's Law:

$$V = IR$$

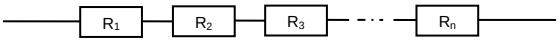
V: potential difference, p.d., or voltage [V]
I: current [A] R: resistance [Ω]

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

R: resistance [Ω] ρ : resistivity [Ωm]
l: length [m] A: cross-sectional area [m^2]

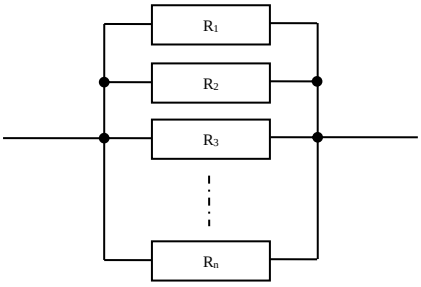
13. D.C. Circuits

Effective resistance, R_{eff} [Ω], for resistors in series:

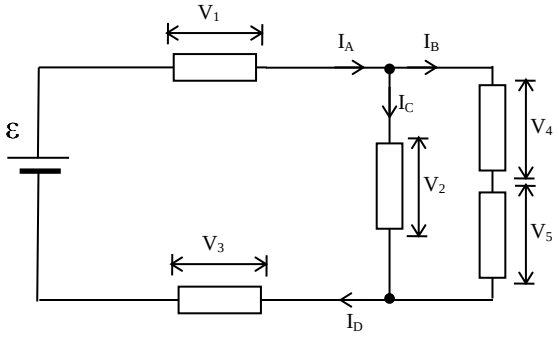


$$R_{eff} = R_1 + R_2 + R_3 + \ldots + R_n$$

Effective resistance, R_{eff} [Ω], for resistors in parallel:



$$R_{eff} = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}\right)^{-1}$$



Applying principle of current in a parallel circuit,

$$I_A = I_B + I_C = I_D$$

Applying principle of p.d. in a series circuit,

$$\varepsilon = V_1 + V_2 + V_3$$

Applying principle of p.d. in a parallel circuit,

$$V_2 = V_4 + V_5$$

14. Practical Electricity

$$P = IV = I^2R = \frac{V^2}{R}$$

P: power [W] I: current [A]
V: voltage [V] R: resistance [Ω]

$$E = Pt$$

E: electrical energy [J] P: power [W] t: time [s]

For calculating cost of using electricity,

$$E = Pt$$

E: electrical energy [in **kWh**] P: power [in **kW**]
t: time [in **hour**]

Cost = Electrical energy x Cost per unit

15. Magnetism and Electromagnetism

16. Radioactivity