



A Level

Data and Formulae v1.0 June 2021



$$a^2 + b^2 = c^2 \quad \text{SOH CAH TOA} \quad A_{\text{sphere}} = 4\pi r^2 \quad V_{\text{sphere}} = \frac{4}{3}\pi r^3$$

$$g = 9.81 \text{ N kg}^{-1} \text{ or } \text{m s}^{-2}$$

$$k = 1.38 \times 10^{-23} \text{ J K}^{-1}$$

$$k = 8.99 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$$

($1/4\pi\epsilon_0$)

$$e = -1.60 \times 10^{-19} \text{ C}$$

$$m_e = 9.11 \times 10^{-31} \text{ kg}$$

$$1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$$

$$G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ F m}^{-1}$$

$$h = 6.63 \times 10^{-34} \text{ J s}$$

$$m_p = 1.67 \times 10^{-27} \text{ kg}$$

$$c = 3.00 \times 10^8 \text{ m s}^{-1}$$

$$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$$

$$1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$$

$$s = \frac{(u+v)t}{2}$$

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$\Sigma F = ma$$

$$g = F/m$$

$$W = mg$$

$$M = Fx$$

$$p = mv$$

$$\Delta W = F\Delta s$$

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

$$\Delta E_{\text{grav}} = mg\Delta h$$

$$P = E/t$$

$$P = W/t$$

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

$$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$$

$$V = W/Q \quad R = V/I$$

$$P = VI = I^2R = V^2/R$$

$$W = VIt \quad R = \rho l/A$$

$$I = \Delta Q/\Delta t \quad I = nqvA$$

$$\rho = m/V \quad F = 6\pi\eta rv$$

$$\Delta F = k\Delta x \quad \sigma = F/A$$

$$\epsilon = \Delta x/x \quad E = \sigma/\epsilon$$

$$\Delta E_{\text{el}} = \frac{1}{2}F\Delta x$$

$$v = f\lambda$$

$$I = P/A$$

$$P = 1/f$$

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

$$n\lambda = d\sin\theta$$

$$n = c/v$$

$$v = \sqrt{\frac{T}{\mu}}$$

$$P = P_1 + P_2 + P_3 + \dots$$

$$m = v/\omega$$

$$n_1\sin\theta_1 = n_2\sin\theta_2$$

$$\sin C = 1/n$$

$$E = hf \quad \lambda = h/p$$

$$hf = \phi + \frac{1}{2}mv_{\text{max}}^2$$

$$F\Delta t = \Delta p \quad E_k = p^2/2m$$

$$v = \omega r \quad T = 2\pi/\omega$$

$$F = ma = mv^2/r \quad a = v^2/r$$

$$F = mr\omega^2 \quad a = r\omega^2$$

$$\Delta E = mc\Delta\theta \quad \Delta E = L\Delta m$$

$$\frac{1}{2}m(c^2) = \frac{3}{2}kT \quad pV = \frac{1}{3}Nm(c^2)$$

$$pV = NkT \quad L = \sigma AT^4$$

$$L = \sigma 4\pi r^2 T^4 \quad \lambda_{\text{max}} T = 2.898 \times 10^{-3} \text{ m K}$$

$$F = kQ_1Q_2/r^2 \quad k = 1/4\pi\epsilon_0$$

$$E = F/Q \quad E = kQ/r^2$$

$$E = V/d \quad V = kQ/r$$

$$C = Q/V \quad W = \frac{1}{2}QV$$

$$Q = Q_0 e^{-t/RC} \quad I = I_0 e^{-t/RC}$$

$$V = V_0 e^{-t/RC} \quad F = BIl\sin\theta$$

$$F = Bqv\sin\theta \quad \epsilon = -d(N\phi)/dt$$

$$V_{\text{rms}} = V_0/\sqrt{2} \quad I_{\text{rms}} = I_0/\sqrt{2}$$

$$r = p/BQ$$

$$I = L/4\pi d^2 \quad v = H_0 d$$

$$z = \Delta\lambda/\lambda \approx \Delta f/f \approx v/c$$

$$\Delta E = c^2\Delta m \quad A = \lambda N$$

$$dN/dt = -\lambda N \quad \lambda = \ln 2/t_{1/2}$$

$$N = N_0 e^{-\lambda t} \quad A = A_0 e^{-\lambda t}$$

$$F = Gm_1m_2/r^2 \quad g = Gm/r^2$$

$$V_g = -Gm/r$$

$$F = -kx \quad a = -\omega^2 x$$

$$T = 1/f \quad x = A\cos\omega t$$

$$T = 2\pi/\omega \quad v = -A\omega\sin\omega t$$

$$\omega = 2\pi f \quad a = -A\omega^2\cos\omega t$$

$$T = 2\pi\sqrt{\frac{m}{k}} \quad T = 2\pi\sqrt{\frac{l}{g}}$$

