OCR A

A Level

Data and Formulae v1.0 Jun 2021

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

$v = u + at$ $s = \frac{1}{2}(u + v)t$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$

$F = \Delta p / \Delta t$ $p = mv$ $M = Fx$ $T = Fd$

$\rho = m / V$ $p = F / A$ $p = h\rho g$ $W = Fx\cos\theta$

$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100\%$ $P = W / t$

$P = Fv$ $F = kx$ $E = \frac{1}{2}Fx$ $E = \frac{1}{2}kx^2$

$\sigma = F / A$ $\varepsilon = x / L$ $E = \sigma / \varepsilon$

$\omega = 2\pi / T$ $\omega = 2\pi f$

$v = \omega r$ $a = v^2 / r = \omega^2 r$

$F = mv^2 / r = m\omega^2 r$ $a = -\omega^2 x$

$x = A\cos\omega t$ $x = A\sin\omega t$

$v = \pm\omega\sqrt{A^2 - x^2}$ $g = F / m$

$F = -GMm / r^2$ $g = -GM / r^2$

$T^2 = (\frac{4\pi^2}{GM})r^3$ $V_g = -GM / r$

energy $= -GMm / r$

$g = 9.81\ m\ s^{-2}$

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

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

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

$N_A = 6.02 \times 10^{23}\ mol^{-1}$

$R = 8.31\ J\ mol^{-1}\ K^{-1}$

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

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

$\varepsilon_0 = 8.85 \times 10^{-12}\ F\ m^{-1}$

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

$m_p = 1.673 \times 10^{-27}\ kg$

$m_n = 1.675 \times 10^{-27}\ kg$

$m_\alpha = 6.646 \times 10^{-27}\ kg$

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

u_{quark} (Q) +2/3 e

d_{quark} (Q) -1/3 e

s_{quark} (Q) -1/3 e

$1\ u = 1.661 \times 10^{-27}\ kg$

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

$1\ day = 8.64 \times 10^{4}\ s$

$1\ year = 3.16 \times 10^{7}\ s$

$1\ ly \approx 9.5 \times 10^{15}\ m$

$1\ pc \approx 3.1 \times 10^{16}\ m$

$\Delta Q = I\Delta t$ $I = Anev$

$W = VQ$ $W = \varepsilon Q$

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

$R_{(series)} = R_1 + R_2 + \ldots$ $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$

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

$\varepsilon = I(R + r)$ $\varepsilon = V + Ir$

$V_{out} = \frac{R_2}{R_1 + R_2} \times V_{in}$ $\frac{V_1}{V_2} = \frac{R_1}{R_2}$

$v = f\lambda$ $f = 1 / T$

$I = P / A$ $\lambda = ax / D$

$n = c / v$ $n\sin\theta = \text{constant}$

$\sin C = 1 / n$

$E = hf$ $E = hc / \lambda$

$hf = \phi + KE_{(max)}$ $\lambda = h / p$

$E = mc\Delta\theta$ $E = mL$

$pV = NkT$ $E = \frac{3}{2}kT$

$pV = nRT$ $\frac{1}{2}m\overline{c^2} = \frac{3}{2}kT$

$pV = \frac{1}{3}Nm\overline{c^2}$

$hf = \Delta E$ $hc / \lambda = \Delta E$

$d\sin\theta = n\lambda$ $\lambda_{max} \propto 1 / T$

$L = 4\pi r^2\sigma T^4$ $\Delta\lambda / \lambda \approx \Delta f / f \approx v / c$

$p = 1 / d$ $v = H_0 d$ $t = H_0^{-1}$

$C = Q / V$ $C = \varepsilon_0 A / d$

$C = 4\pi\varepsilon_0 R$ $\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \ldots$

$C_{(parallel)} = C_1 + C_2 + \ldots$

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

$\tau = RC$ $x = x_0 e^{-t/RC}$

$x = x_0(1 - e^{-t/RC})$ $E = F / Q$

$F = Qq / 4\pi\varepsilon_0 r^2$ $E = Q / 4\pi\varepsilon_0 r^2$

$E = V / d$ $V = Q / 4\pi\varepsilon_0 r$

energy $= Qq / 4\pi\varepsilon_0 r$

$F = BIl\sin\theta$ $F = BQv$

$\phi = BA\cos\theta$ $\varepsilon = -\Delta(N\phi) / \Delta t$

$n_s / n_p = V_s / V_p = I_p / I_s$

$R = r_0 A^{1/3}$ $A = \lambda N$

$A = A_0 e^{-\lambda t}$ $\Delta N / \Delta t = -\lambda N$

$N = N_0 e^{-\lambda t}$ $\lambda t_{1/2} = \ln 2$ $\Delta E = \Delta mc^2$

$I = I_0 e^{-\mu x}$ $\Delta f / f = 2v\cos\theta / c$

$Z = \rho c$ $I_r / I_0 = (Z_2 - Z_1)^2 / (Z_2 + Z_1)^2$