

CAMBRIDGE A LEVEL · 9702

A Level Physics Formula Sheet

The 9702 data and formulae pages, plus every equation to recall.

1 Given in Papers 1, 2 and 4

Printed on page 2 of the paper, with the data constants.

Uniformly accelerated motion	$s = ut + \frac{1}{2}at^2, v^2 = u^2 + 2as$
Hydrostatic pressure	$\Delta p = \rho g \Delta h$
Upthrust	$F = \rho g V$
Doppler effect for sound	$f_o = \frac{f_s v}{v \pm v_s}$
Electric current	$I = Anvq$
Resistors in series	$R = R_1 + R_2 + \dots$
Resistors in parallel	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$

2 Also given in Paper 4

Printed on page 3 of Paper 4.

Gravitational potential	$\phi = -\frac{GM}{r}$
Gravitational potential energy	$E_p = -\frac{GMm}{r}$
Pressure of an ideal gas	$p = \frac{1}{3} \frac{Nm}{V} \langle c^2 \rangle$
Simple harmonic motion	$a = -\omega^2 x$
Velocity in s.h.m.	$v = v_0 \cos \omega t, v = \pm \omega \sqrt{(x_0^2 - x^2)}$
Electric potential	$V = \frac{Q}{4\pi\epsilon_0 r}$
Electrical potential energy	$E_p = \frac{Qq}{4\pi\epsilon_0 r}$
Capacitors in series	$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \dots$
Capacitors in parallel	$C = C_1 + C_2 + \dots$
Discharge of a capacitor	$x = x_0 e^{-t/RC}$
Hall voltage	$V_H = \frac{BI}{ntq}$
Alternating current or voltage	$x = x_0 \sin \omega t$
Radioactive decay	$x = x_0 e^{-\lambda t}$
Decay constant	$\lambda = \frac{0.693}{t_{1/2}}$
Intensity reflection coefficient	$\frac{I_p}{I_0} = \frac{(Z_1 - Z_2)^2}{(Z_1 + Z_2)^2}$
Stefan-Boltzmann law	$L = 4\pi\sigma r^2 T^4$
Doppler redshift	$\frac{\Delta\lambda}{\lambda} \approx \frac{\Delta f}{f} \approx \frac{v}{c}$

3 Not given: recall and use (AS)

The syllabus expects you to recall these.

Work done	$W = \text{force} \times \text{displacement in the direction of the force}$
Energy	$E_p = mgh, E_k = \frac{1}{2}mv^2$
Spring constant and elastic energy	$k = \frac{F}{x}, E_p = \frac{1}{2}Fx = \frac{1}{2}kx^2$

Wave speed and intensity	$v = f\lambda$, intensity = $\frac{\text{power}}{\text{area}}$
Malus's law	$I = I_0 \cos^2\theta$
Double slit and diffraction grating	$\lambda = \frac{ax}{D}$, $d \sin \theta = n\lambda$
Charge and potential difference	$Q = It$, $V = \frac{W}{Q}$
Electrical power	$P = VI$, $P = I^2R$, $P = \frac{V^2}{R}$
Resistance and resistivity	$V = IR$, $R = \frac{\rho L}{A}$

4 Not given: recall and use (A Level)

The A Level content adds these.

Circular motion	$\omega = \frac{2\pi}{T}$, $v = r\omega$
Centripetal acceleration and force	$a = r\omega^2 = \frac{v^2}{r}$, $F = mr\omega^2 = \frac{mv^2}{r}$
Newton's law of gravitation	$F = \frac{Gm_1m_2}{r^2}$, $g = \frac{GM}{r^2}$
Ideal gas	$pV = nRT$, average KE of a molecule = $\frac{3}{2}kT$
First law of thermodynamics	$\Delta U = q + W$, $W = p\Delta V$
Simple harmonic motion	$x = x_0 \sin \omega t$, $E = \frac{1}{2}m\omega^2x_0^2$
Electric fields	$F = qE$, $E = \frac{V}{d}$
Coulomb's law	$F = \frac{Q_1Q_2}{4\pi\epsilon_0r^2}$, $E = \frac{Q}{4\pi\epsilon_0r^2}$
Capacitance	$C = \frac{Q}{V}$, $W = \frac{1}{2}QV = \frac{1}{2}CV^2$, $\tau = RC$
Magnetic force	$F = BIL \sin \theta$, $F = BQv \sin \theta$
Magnetic flux	$\Phi = BA$
Alternating current	$I_{\text{rms}} = \frac{I_0}{\sqrt{2}}$, $V_{\text{rms}} = \frac{V_0}{\sqrt{2}}$
Photons	$E = hf$, $hf = \Phi + \frac{1}{2}mv^2_{\text{max}}$, $hf = E_1 - E_2$
de Broglie wavelength	$\lambda = \frac{h}{p}$
Nuclear physics	$E = mc^2$, $A = \lambda N$
Attenuation of ultrasound and X-rays	$I = I_0e^{-\mu x}$
Radiant flux intensity	$F = \frac{L}{4\pi d^2}$
Wien's law and Hubble's law	$\lambda_{\text{max}} \propto \frac{1}{T}$, $v \approx H_0d$