

# Physics Equations Sheet

GCSE Physics (8463)

**HT = Higher Tier only equations**

kinetic energy = $0.5 \times \text{mass} \times (\text{speed})^2$	$E_k = \frac{1}{2} m v^2$
elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$	$E_e = \frac{1}{2} k e^2$
gravitational potential energy = $\text{mass} \times \text{gravitational field strength} \times \text{height}$	$E_p = m g h$
change in thermal energy = $\text{mass} \times \text{specific heat capacity} \times \text{temperature change}$	$\Delta E = m c \Delta \theta$
power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$
efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
efficiency = $\frac{\text{useful power output}}{\text{total power input}}$	
charge flow = $\text{current} \times \text{time}$	$Q = I t$
potential difference = $\text{current} \times \text{resistance}$	$V = I R$
power = $\text{potential difference} \times \text{current}$	$P = V I$
power = $(\text{current})^2 \times \text{resistance}$	$P = I^2 R$
energy transferred = $\text{power} \times \text{time}$	$E = P t$
energy transferred = $\text{charge flow} \times \text{potential difference}$	$E = Q V$
density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$

	thermal energy for a change of state = mass × specific latent heat	$E = m L$
	For gases: pressure × volume = constant	$p V = \text{constant}$
	weight = mass × gravitational field strength	$W = m g$
	work done = force × distance (along the line of action of the force)	$W = F s$
	force = spring constant × extension	$F = k e$
	moment of a force = force × distance (normal to direction of force)	$M = F d$
	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
HT	<b>pressure due to a column of liquid = height of column × density of liquid × gravitational field strength</b>	<b><math>p = h \rho g</math></b>
	distance travelled = speed × time	$s = v t$
	acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$
	(final velocity) <sup>2</sup> – (initial velocity) <sup>2</sup> = 2 × acceleration × distance	$v^2 - u^2 = 2 a s$
	resultant force = mass × acceleration	$F = m a$
HT	<b>momentum = mass × velocity</b>	<b><math>p = m v</math></b>
HT	<b>force = <math>\frac{\text{change in momentum}}{\text{time taken}}</math></b>	<b><math>F = \frac{m \Delta v}{\Delta t}</math></b>
	period = $\frac{1}{\text{frequency}}$	$T = \frac{1}{f}$
	wave speed = frequency × wavelength	$v = f \lambda$
	magnification = $\frac{\text{image height}}{\text{object height}}$	
HT	<b>force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length</b>	<b><math>F = B I l</math></b>
HT	<b><math>\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}</math></b>	<b><math>\frac{V_p}{V_s} = \frac{n_p}{n_s}</math></b>
HT	<b>potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil</b>	<b><math>V_p I_p = V_s I_s</math></b>