

CAMBRIDGE OCR

June 2027

**GCSE (9–1) Physics B
(Twenty First Century Science)**

J259 01/02/03/04

Equation Sheet

INSTRUCTIONS

Do NOT send this Equation Sheet for marking. Keep it in the centre or recycle it.

EQUATIONS IN PHYSICS

Key: HT = Higher Tier only

	P1 RADIATION AND WAVES	
	wave speed = frequency × wavelength	$v = f\lambda$

	P2 SUSTAINABLE ENERGY	
	energy transferred = power × time	$E = Pt$
	efficiency = $\frac{\text{useful energy transferred}}{\text{total energy transferred}}$	

	P3 ELECTRIC CIRCUITS	
	charge = current × time	$Q = I t$
	potential difference = current × resistance	$V = I R$
	potential difference = $\frac{\text{work done (energy transferred)}}{\text{charge}}$	$V = \frac{W}{Q}$
	power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
	energy transferred (work done) = charge × potential difference	$E = Q V$
	power = potential difference × current	$P = V I$
	power = (current) ² × resistance	$P = I^2 R$
HT	force = magnetic flux density × current × length of conductor	$F = B I l$
	potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_p I_p = V_s I_s$
HT	potential difference across primary coil = potential difference across secondary coil number of turns in primary coil number of turns in secondary coil	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$

	P4 EXPLAINING MOTION	
	weight = mass × gravitational field strength	$W = m g$
	average speed = $\frac{\text{distance}}{\text{time}}$	$v = \frac{s}{t}$
	acceleration = $\frac{\text{change in speed}}{\text{time taken}}$	$a = \frac{v - u}{t}$
	$(\text{final speed})^2 - (\text{initial speed})^2 = 2 \times \text{acceleration} \times \text{distance}$	$v^2 - u^2 = 2 a s$
HT	momentum = mass × velocity	$p = m v$
HT	change in momentum = resultant force × time for which it acts	$\Delta p = F t$
	moment of a force = force × distance (normal to direction of the force)	$M = F d$
	force = mass × acceleration	$F = m a$
	work done = force × distance (along the line of action of the force)	$W = F s$
	kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{speed})^2$	$E = \frac{1}{2} m v^2$
	gravitational potential energy = mass × gravitational field strength × height	$E = m g h$

	$\text{power} = \frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
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	P6 MATTER – MODELS AND EXPLANATIONS		
	density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$	
	change in internal energy = mass × specific heat capacity × change in temperature	$\Delta E = m c \Delta \theta$	
	energy to cause a change of state = mass × specific latent heat	$E = m l$	
	force exerted by a spring = spring constant × extension	$F = k x$	
	energy stored in a stretched spring = $\frac{1}{2} \times$ spring constant × (extension) ²	$E = \frac{1}{2} k x^2$	
	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$	
	for a given mass of gas at a constant temperature: pressure × volume = constant	$p V = \text{constant}$	
HT	pressure = density × gravitational field strength × depth	$p = \rho g h$	

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