Oxford Cambridge and RSA

June 2023 only

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.

INFORMATION
- This Equation Sheet is for the June 2023 examination series only.
- This Equation Sheet has **4** pages.

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	$Q = It$
	potential difference = current × resistance	$V = IR$
	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	$E = QV$
	power = potential difference × current	$P = VI$
	power = (current)^2 × resistance	$P = I^2 R$
HT	force = magnetic flux density × current × length of conductor	$F = BIl$
	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	$\frac{\text{potential difference across primary coil}}{\text{potential difference across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$

	P4 Explaining motion	
	weight = mass × gravitational field strength	$W = mg$
	average speed = $\frac{\text{distance}}{\text{time}}$	$v = \frac{s}{t}$
	acceleration = $\frac{\text{change in speed}}{\text{time taken}}$	$a = \frac{v - u}{t}$
	$(\text{final speed})^2 - (\text{initial speed})^2 = 2 \times \text{acceleration} \times \text{distance}$	$v^2 - u^2 = 2as$
HT	momentum = mass × velocity	$p = mv$
HT	change in momentum = resultant force × time for which it acts	$\Delta p = Ft$
	moment of a force = force × distance (normal to direction of the force)	$M = Fd$
	force = mass × acceleration	$F = ma$
	work done = force × distance (along the line of action of the force)	$W = Fs$
	kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{speed})^2$	$E = \frac{1}{2}mv^2$
	gravitational potential energy = mass × gravitational field strength × height	$E = mgh$
	power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$

Turn over

	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	$\Delta E = mc\Delta\theta$
	energy to cause a change of state = mass × specific latent heat	$E = ml$
	force exerted by a spring = spring constant × extension	$F = kx$
	energy stored in a stretched spring = $\frac{1}{2}$ × spring constant × (extension)^2	$E = \frac{1}{2}kx^2$
	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	pV = constant
HT	pressure = density × gravitational field strength × depth	$p = \rho gh$