



Oxford Cambridge and RSA

June 2024 only

GCSE (9–1) Physics A (Gateway Science)

J249 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 2024 examination series only.
- This Equation Sheet has **4** pages.

Equations in physics

Key: HT = Higher Tier only

	P1 Matter	
	density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$
	change in thermal energy = mass \times specific heat capacity \times change in temperature	$\Delta E = mc\Delta\theta$
	thermal energy for a change in state = mass \times specific latent heat	$E = ml$
	for a given mass of gas at a constant temperature: pressure \times volume = constant	$pV = \text{constant}$
HT	pressure due to a column of liquid = height of column \times density of liquid \times gravitational field strength	$p = h\rho g$

	P2 Forces	
	distance travelled = speed \times time	$s = vt$
	acceleration = $\frac{\text{change in velocity}}{\text{time}}$	$a = \frac{v-u}{t}$
	(final velocity) ² – (initial velocity) ² = 2 \times acceleration \times distance	$v^2 - u^2 = 2as$
	kinetic energy = $\frac{1}{2} \times$ mass \times (speed) ²	$E = \frac{1}{2}mv^2$
	force = mass \times acceleration	$F = ma$
HT	momentum = mass \times velocity	$p = mv$
	work done = force \times distance (along the line of action of the force)	$W = Fs$
	power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$

	P2 Forces	
	force exerted by a spring = spring constant \times extension	$F = kx$
	energy transferred in stretching = $\frac{1}{2} \times$ spring constant \times (extension) ²	$E = \frac{1}{2} kx^2$
	gravitational force = mass \times gravitational field strength	$W = mg$
	gravitational potential energy = mass \times gravitational field strength \times height	$E = mgh$
	pressure = $\frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
	moment of a force = force \times distance (normal to direction of the force)	$M = Fd$

	P3 Electricity	
	charge flow = current \times time	$Q = It$
	potential difference = current \times resistance	$V = IR$
	energy transferred = charge \times potential difference	$E = QV$
	power = potential difference \times current	$P = VI$
	power = (current) ² \times resistance	$P = I^2R$
	energy transferred = power \times time	$E = Pt$

	P4 Magnetism and magnetic fields	
HT	force on a conductor (at right angles to a magnetic field) carrying a current: force = magnetic flux density \times current \times length	$F = BIl$
HT	potential difference across primary coil = $\frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$ \times potential difference across secondary coil	$\frac{V_p}{V_s} = \frac{N_p}{N_s}$

P5 Waves in matter		
wave speed = frequency \times wavelength		$v = f\lambda$
P7 Energy		
efficiency = $\frac{\text{useful output energy transfer}}{\text{input energy transfer}}$		
P8 Global challenges		
potential difference across primary coil \times current in primary coil = potential difference across secondary coil \times current in secondary coil		$V_p I_p = V_s I_s$