

Paper Reference(s) 4PH1/2P
Pearson Edexcel International GCSE (9–1)

Physics
UNIT: 4PH1
PAPER: 2P

Wednesday 22 November 2023

Equation Booklet

**DO NOT RETURN THIS BOOKLET
WITH THE QUESTION PAPER.**

These equations may be required for both International GCSE Physics (4PH1) and International GCSE Combined Science (4SD0) papers.

1. Forces and Motion
average speed = $\frac{\text{distance moved}}{\text{time taken}}$
acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$ $a = \frac{(v - u)}{t}$
$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$ $v^2 = u^2 + (2 \times a \times s)$
force = mass \times acceleration $F = m \times a$
weight = mass \times gravitational field strength $W = m \times g$
2. Electricity
power = current \times voltage $P = I \times V$

energy transferred = current × voltage × time

$$\mathbf{E = I \times V \times t}$$

voltage = current × resistance

$$\mathbf{V = I \times R}$$

charge = current × time

$$\mathbf{Q = I \times t}$$

energy transferred = charge × voltage

$$\mathbf{E = Q \times V}$$

3. Waves

wave speed = frequency × wavelength

$$\mathbf{v = f \times \lambda}$$

$$\mathbf{frequency = \frac{1}{time\ period}}$$

$$\mathbf{f = \frac{1}{T}}$$

$$\mathbf{refractive\ index = \frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}}$$

$$\mathbf{n = \frac{\sin i}{\sin r}}$$

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Turn over

$$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$$

$$\sin c = \frac{1}{n}$$

4. Energy resources and energy transfers

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$$

$$\text{work done} = \text{force} \times \text{distance moved}$$

$$W = F \times d$$

$$\text{gravitational potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{height}$$

$$\text{GPE} = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2$$

$$\text{KE} = \frac{1}{2} \times m \times v^2$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

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Turn over

5. Solids, liquids and gases

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\rho = \frac{m}{V}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$p = \frac{F}{A}$$

$$\text{pressure difference} = \text{height} \times \text{density} \times \text{gravitational field strength}$$

$$p = h \times \rho \times g$$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant}$$

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{pressure} \times \text{volume} = \text{constant}$$

$$p_1 \times V_1 = p_2 \times V_2$$

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8. Astrophysics

$$\text{orbital speed} = \frac{2 \times \pi \times \text{orbital radius}}{\text{time period}}$$

$$v = \frac{2 \times \pi \times r}{T}$$

The equations on the following pages will only be required for International GCSE Physics.

These additional equations may be required in International GCSE Physics papers 2P and 2PR.

1. Forces and Motion

momentum = mass \times velocity

$$p = m \times v$$

force = $\frac{\text{change in momentum}}{\text{time taken}}$

$$F = \frac{(mv - mu)}{t}$$

moment = force \times perpendicular distance from the pivot

5. Solids, liquids and gases

change in thermal energy = mass \times specific heat capacity \times change in temperature

$$\Delta Q = m \times c \times \Delta T$$

6. Magnetism and electromagnetism

relationship between input and output voltages for a transformer

$$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$$

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Turn over

input power = output power

$$\mathbf{V_p \ I_p = V_s \ I_s}$$

for 100% efficiency

8. Astrophysics

$$\frac{\text{change in wavelength}}{\text{reference wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}}$$

$$\frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

END OF EQUATION LIST