

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

Physics

UNIT: 4PH1

PAPER: 2PR

May–June 2022 Assessment Window

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

$$\text{average speed} = \frac{\text{distance moved}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

$$a = \frac{(v - u)}{t}$$

$$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$

$$v^2 = u^2 + (2 \times a \times s)$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$F = m \times a$$

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$W = m \times g$$

2. Electricity

$$\text{power} = \text{current} \times \text{voltage}$$

$$P = I \times V$$

energy transferred = current \times voltage \times time

$$E = I \times V \times t$$

voltage = current \times resistance

$$V = I \times R$$

charge = current \times time

$$Q = I \times t$$

energy transferred = charge \times voltage

$$E = Q \times V$$

3. Waves

wave speed = frequency \times wavelength

$$v = f \times \lambda$$

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

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

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

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

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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

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

work done = force \times distance moved

$$W = F \times d$$

gravitational potential energy =
mass \times gravitational field strength \times height

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

kinetic energy = $\frac{1}{2} \times$ mass \times speed²

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

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

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

(continued on the next page)

Turn over

5. Solids, liquids and gases

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

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

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

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

pressure difference =
height \times density \times gravitational field strength

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

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

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

pressure \times volume = 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

$$V_p I_p = V_s I_s$$

for 100% efficiency

8. Astrophysics

change in wavelength = velocity of a galaxy
reference wavelength speed of light

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

END OF EQUATION LIST