

**Paper Reference(s) 4PH1/1PR 4SD0/1PR**  
**Pearson Edexcel International GCSE (9–1)**

**Physics**

**UNIT: 4PH1**

**Science (Double Award) 4SD0**

**PAPER: 1PR**

**Wednesday 22 May 2024 – Morning**

**Time: 2 hours**

**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

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

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

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

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

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

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

$$F = m \times a$$

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

$$W = m \times g$$

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Turn over

## 2. Electricity

**power = current × voltage**

$$P = I \times V$$

**energy transferred = current × voltage  
× time**

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

**voltage = current × resistance**

$$V = I \times R$$

**charge = current × time**

$$Q = I \times t$$

**energy transferred = charge × voltage**

$$E = Q \times V$$

## 3. Waves

**wave speed = frequency × wavelength**

$$v = f \times \lambda$$

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

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

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

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

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

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

#### 4. Energy resources and energy transfers

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

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Turn over

**work done = force × distance moved**

$$W = F \times d$$

**gravitational potential energy = mass × gravitational field strength × height**

$$GPE = m \times g \times h$$

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

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

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

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

**(continued on the next page)**

**Turn over**

## 5. Solids, liquids and gases

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

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

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

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

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

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

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

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

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Turn over

**pressure  $\times$  volume = constant**

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

## **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 × velocity**

$$p = m \times v$$

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

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

**moment = force ×  
perpendicular distance from the pivot**

## 5. Solids, liquids and gases

**change in thermal energy = mass ×  
specific heat capacity ×  
change in temperature**

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

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**Turn over**



## 6. Magnetism and electromagnetism

relationship between input and output voltages for a transformer

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

input power = output power

$$V_p I_p = V_s I_s$$

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