Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 16 June 2025

Morning (Time: 1 hour 15 minutes)

Paper reference **4PH1/2P**

Physics

UNIT: 4PH1

PAPER: 2P

You must have:
Ruler, calculator, Equation Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time $\qquad E = I \times V \times t$

$$\text{frequency} = \frac{1}{\text{time period}} \qquad f = \frac{1}{T}$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}} \qquad P = \frac{E}{t}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2 \times \pi \times r}{T}$$

(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)

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

pressure × volume = constant $\qquad p_1 \times V_1 = p_2 \times V_2$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant} \qquad \frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time taken}} \qquad F = \frac{(mv - mu)}{t}$$

$$\frac{\text{change of wavelength}}{\text{wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}} \qquad \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

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

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

Where necessary, assume the acceleration of free fall, $g = 10\ \text{m/s}^2$.

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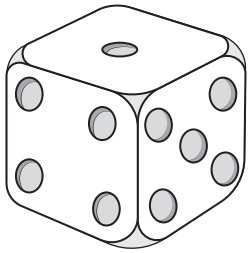
Answer ALL questions.

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 A student plays a game using a single dice.

The student decides to determine the density of the dice by measuring its mass and volume.



(a) Describe how the student could accurately measure the mass of the dice.

(2)

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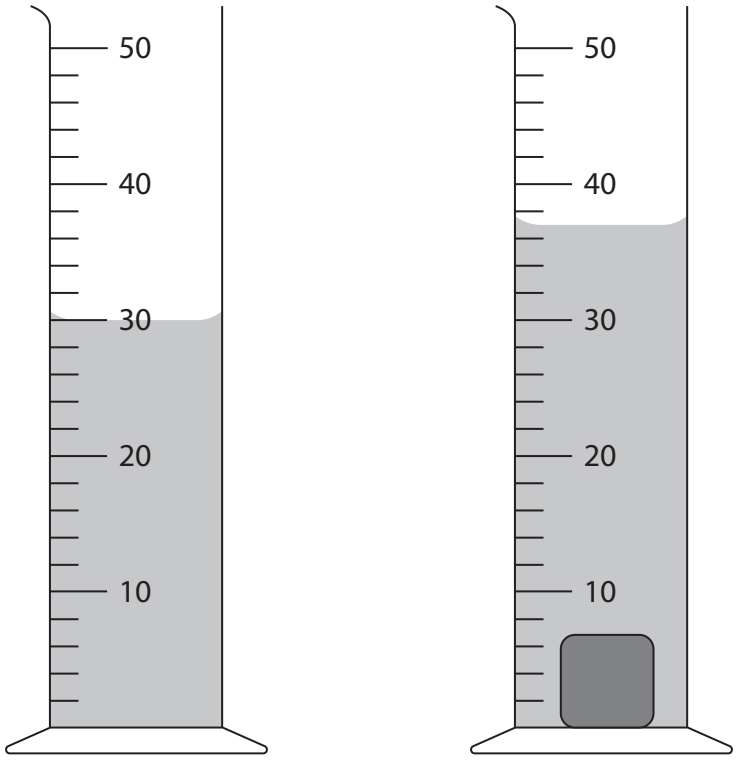
(b) The dice is not a regular shape.

The student decides to measure the volume of the dice using a displacement method.

The student places the dice into a measuring cylinder containing water.

The diagram shows the water in the measuring cylinder before and after the dice is fully submerged.



before after

(i) The measuring cylinder gives volume in units of cm^3.

Using the diagram, determine the volume of the dice.

(2)

volume = ... cm^3

(ii) The dice has a mass of 9.2 g.

Calculate the density of the dice using the formula

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

Give a suitable unit.

(3)

density = ... unit .....

(Total for Question 1 = 7 marks)

2 This question is about sound waves.

(a) Which range of frequencies of sound waves can be heard by humans?

(1)

- ☒ **A** 2 Hz to 20 000 Hz
- ☒ **B** 2 Hz to 200 000 Hz
- ☒ **C** 20 Hz to 20 000 Hz
- ☒ **D** 20 Hz to 200 000 Hz

(b) The table gives some statements about sound waves.

Complete the table by placing a tick (✓) next to each correct statement.

(2)

Statement	Correct (✓)
sound waves are longitudinal	
sound waves can travel through a vacuum	
sound waves are part of the electromagnetic spectrum	
sound waves can be reflected and refracted	

(c) An oscilloscope can be used to display a sound wave.

(i) Give the name of the variable that is measured on the x-axis of the oscilloscope screen.

(1)

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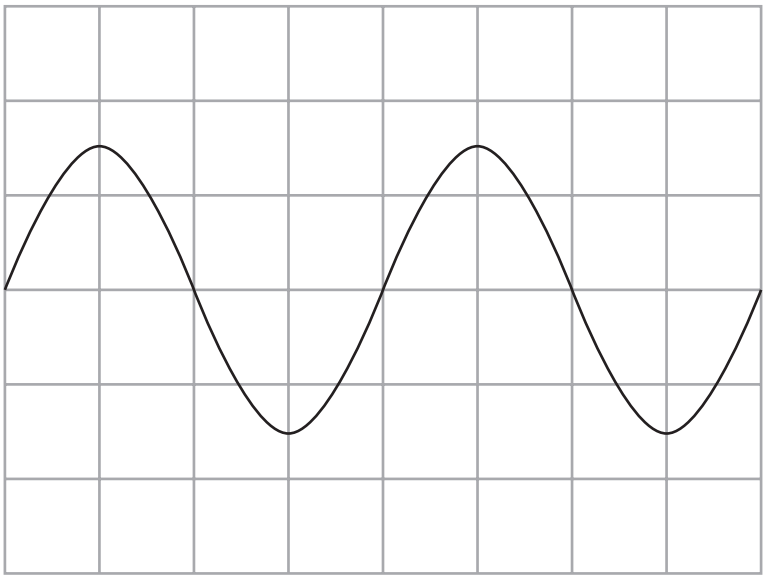
(ii) The diagram shows the trace on an oscilloscope screen when a sound wave is detected.



On the screen, draw the trace for a quieter sound wave with a lower frequency.

(2)

(Total for Question 2 = 6 marks)

3 The photograph shows a camper van with a solar panel on its roof. The solar panel is made from lots of solar cells connected together.

(Source: © kostasgr / Shutterstock)

The solar panel is connected to a battery. The solar panel receives energy from the Sun to charge the battery.

(a) Describe how energy is transferred from the Sun's energy store to the battery's energy store.

(3)

(b) The petrol engine can also be used to charge the battery of the camper van.

Give an advantage of using the solar panel instead of the petrol engine to charge the battery.

Do not refer to cost in your answer.

(1)

(c) The surface of the solar panel is black.

Explain why black is a suitable colour for the solar panel.

(2)

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(d) The solar panel can charge the battery in the camper van with a maximum current of 15 A.

Calculate the minimum time to transfer 360 000 C of charge through the battery.

Use the formula

charge transferred = current × time

(3)

minimum time = ... s

(Total for Question 3 = 9 marks)

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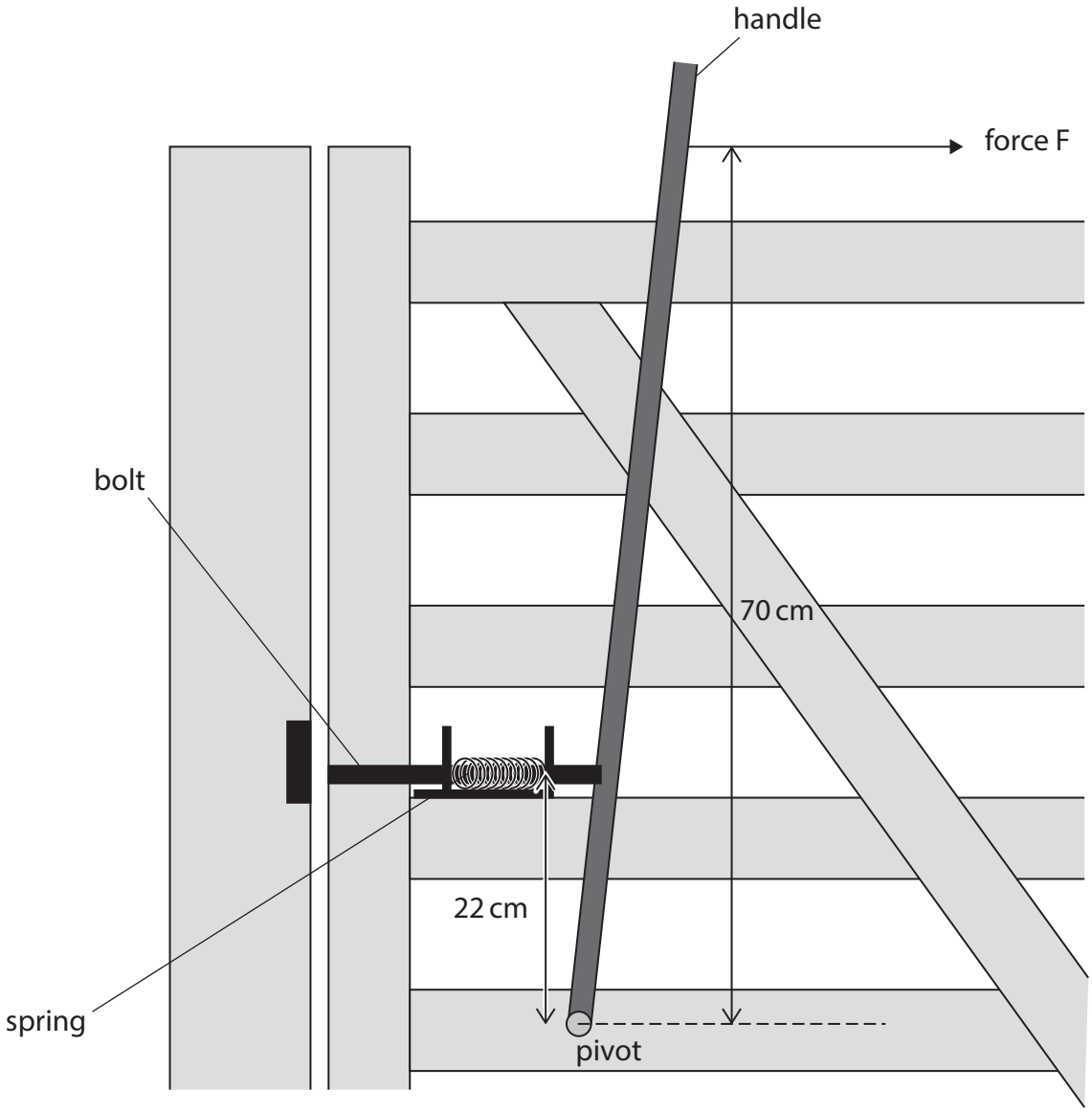
4 The photograph shows a mechanism that can be used to open a gate.

(Source: © Photimageon / Alamy Stock Photo)

The diagram shows the gate mechanism when the handle is being pulled to the right.



The bolt is connected to the handle. When the handle is pulled to the right, the bolt also moves to the right and the gate can be opened.

The spring is compressed when the bolt moves to the right. When the handle is released, the spring pushes the bolt back to its original position.

(a) When the handle is pulled to the right, the spring applies a force on the handle to the left.

The vertical distance between the spring and the pivot point of the handle is 22 cm.

The force from the spring is 5.2 N.

(i) Show that the force from the spring produces a moment of approximately 1 Nm.

(3)

(ii) State what is meant by the term **principle of moments**.

(1)

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(iii) Force F acts on the handle to keep the handle stationary so that the gate can be opened.

Force F acts at a vertical distance of 70 cm from the pivot point of the handle.

Calculate the magnitude of force F.

(3)

magnitude of force F = ... N

(b) Give two changes to this gate mechanism that would make it easier to open the gate.

(2)

1 .....

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2 .....

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(Total for Question 4 = 9 marks)

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5 A student uses this apparatus to investigate static electricity.

The positively charged ball is suspended vertically on a long length of string.

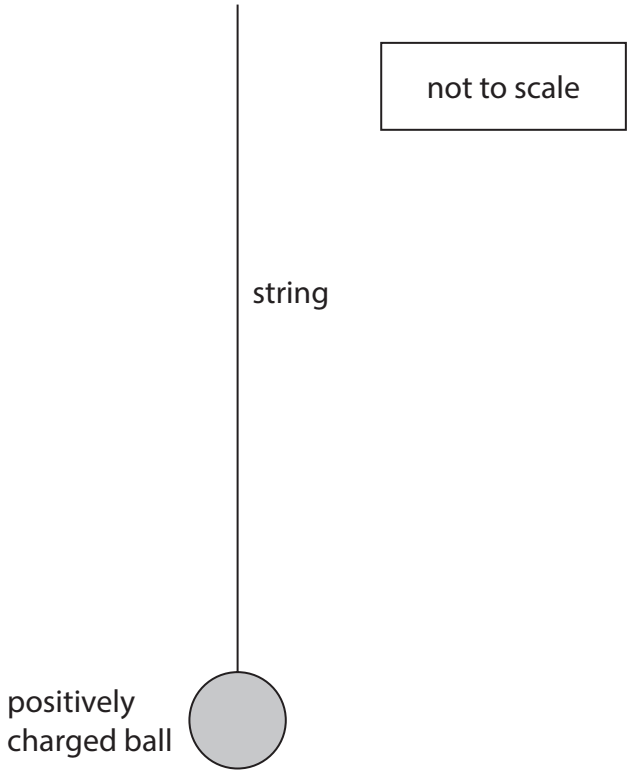

Diagram 1

(a) The ball is made of a material that is a good electrical conductor.

Name a material that is a good electrical conductor.

(1)

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(b) Explain, in terms of the movement of charged particles, how the ball has become positively charged.

(2)

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(c) The student places a centimetre scale behind the length of string.

The string lines up with the 5.0 cm mark on the scale when the ball is in its resting position, as shown in diagram 2.

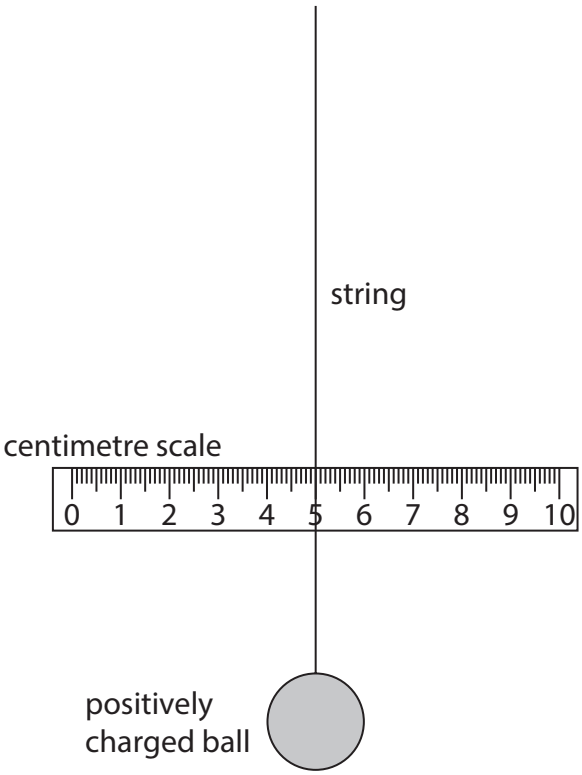

Diagram 2

The student brings a negatively charged polythene rod near to the right side of the ball.

The ball moves, as shown in diagram 3.

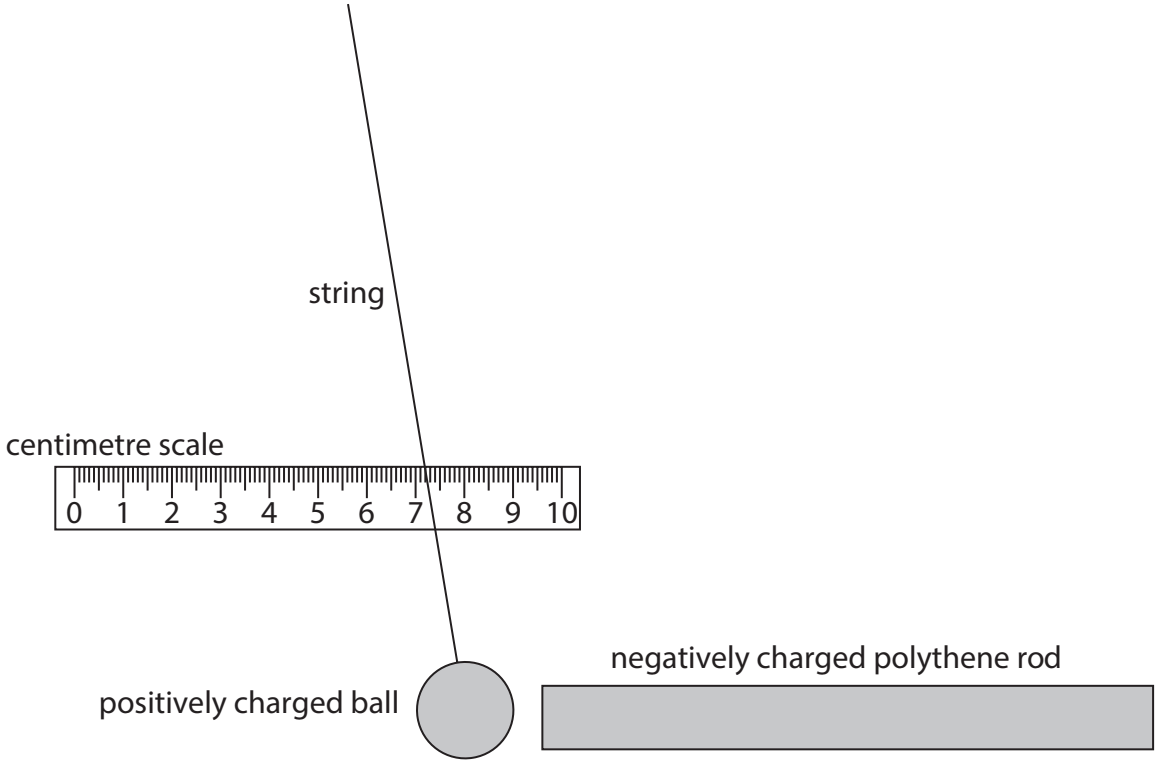

Diagram 3

(i) Explain how the movement of the ball shows that the charge on the polythene rod is negative.

(2)

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(ii) In diagram 3, the string lines up with the 7.2 cm mark on the scale.

The student moves the polythene rod slightly further away from the ball.

Predict a possible reading on the scale.

(1)

reading = ... cm

(d) The student extends the investigation by measuring the reading on the scale for rods made from different materials.

As a control variable, the student charges each rod by rubbing it with a cloth the same number of times.

Give two other control variables for the student's investigation.

(2)

1 .....

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2 .....

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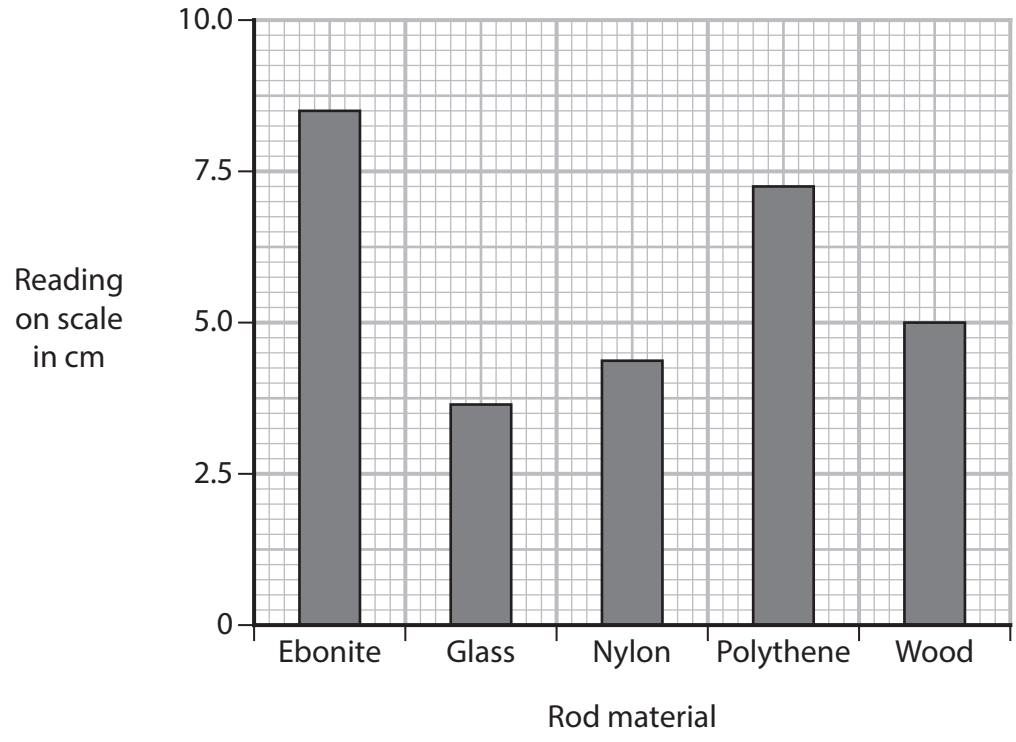
(e) The bar chart shows the results of the student's investigation.



(i) Justify the use of a bar chart to present the student's results.

(1)

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(ii) Deduce what can be concluded about the charge on each of the rods used in the investigation.

Use information from the bar chart to help your answer.

(3)

(Total for Question 5 = 12 marks)

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6 This question is about gamma radiation.

(a) Which of these statements is correct for gamma radiation?

(1)

- ☒ **A** gamma radiation has a weaker penetrating ability than alpha radiation
- ☒ **B** gamma radiation is emitted by electrons in atoms
- ☒ **C** gamma radiation is positively charged
- ☒ **D** gamma radiation is less ionising than alpha radiation

(b) A student uses a simulation to investigate gamma radiation.

This is the student's method.

- place a Geiger-Muller (GM) tube a distance of 6 cm from a source of gamma radiation
- measure the count for a time of 10 seconds
- move the GM tube further away from the source and measure the count again.

The student measures the count three times for each distance.

(i) Give a reason why the student takes repeat readings.

(1)

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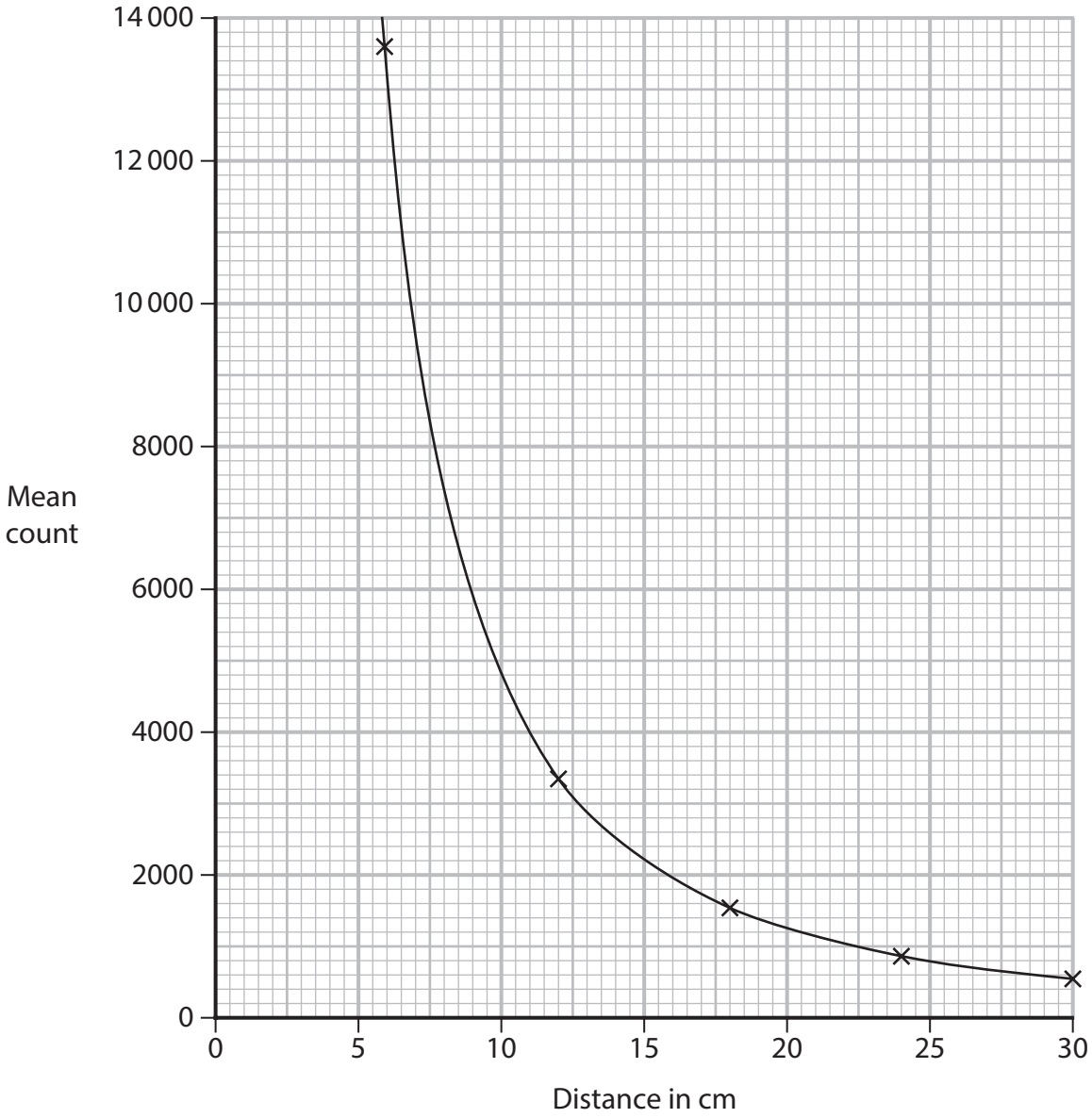
(ii) The graph shows the student's results.



The student claims that the data obeys the formula

$$\text{count} \times \text{distance}^2 = \text{constant}$$

Evaluate the student's claim.

(3)

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(Total for Question 6 = 5 marks)

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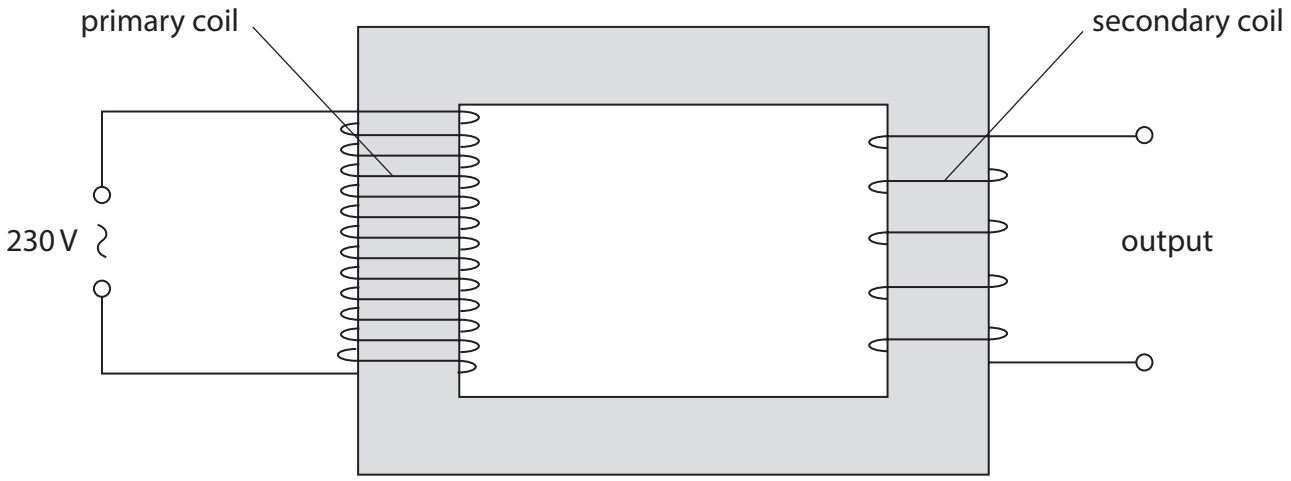
7 This question is about transformers.

(a) The diagram shows a step-down transformer.



The table gives some data for the step-down transformer.

Input (primary) voltage	230 V
Input (primary) current	1.3 A
Output (secondary) current	4.0 A
Number of turns on primary coil	1000
Number of turns on secondary coil	300

(i) State the formula linking input (primary) voltage, output (secondary) voltage and the turns ratio for a transformer.

(1)

(ii) Use data from the table to calculate the output (secondary) voltage of the transformer.

(3)

output (secondary) voltage = ... V

(iii) This transformer is not 100% efficient.

The efficiency of a transformer can be calculated using the formula

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

Calculate the efficiency of the transformer.

(5)

efficiency = ... %

(b) Explain how transformers are used in the efficient, large-scale transmission of electrical energy.

You may draw a diagram to help your answer.

(5)

(Total for Question 7 = 14 marks)

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8 This question is about cosmology.

(a) Give two pieces of evidence that support the Big Bang theory.

(2)

1 .....

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2 .....

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(b) The galaxy NGC 300 is moving away from the Earth at a speed of 1.44×10^5 m/s.

Hydrogen atoms in NGC 300 emit light with a reference wavelength of 4.3405×10^{-7} m.

Calculate the wavelength of this light when it is detected at Earth.

Give your answer to five significant figures.

[speed of light in a vacuum, $c = 3.00 \times 10^8$ m/s]

(4)

wavelength = ... m

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(c) Another galaxy, Centaurus A, is much further away from the Earth than NGC 300.

Explain how the wavelength of light detected from hydrogen atoms in Centaurus A is different from the wavelength of light detected from hydrogen atoms in NGC 300.

(2)

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(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 70 MARKS

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Pearson Edexcel International GCSE (9–1)

Monday 16 June 2025

Morning (Time: 1 hour 15 minutes)

Paper reference **4PH1/2P**

Physics

UNIT: 4PH1

PAPER: 2P

Equation Booklet

Do not return this Booklet with the question paper.

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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 = $\frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{(v-u)}{t}$
(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)	$v^2 = u^2 + (2 \times a \times s)$
force = mass × acceleration	$F = m \times a$
weight = mass × gravitational field strength	$W = m \times g$
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	$v = f \times \lambda$
frequency = $\frac{1}{\text{time period}}$	$f = \frac{1}{T}$
refractive index = $\frac{\sin(\text{angle of incidence})}{\sin(\text{angle of refraction})}$	$n = \frac{\sin i}{\sin r}$
$\sin(\text{critical angle}) = \frac{1}{\text{refractive index}}$	$\sin c = \frac{1}{n}$

4. Energy resources and energy transfers	
efficiency = $\frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$	
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 = $\frac{1}{2}$ × mass × speed^2	$KE = \frac{1}{2} \times m \times v^2$
power = $\frac{\text{work done}}{\text{time taken}}$	$P = \frac{W}{t}$
5. Solids, liquids and gases	
density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$
pressure = $\frac{\text{force}}{\text{area}}$	$p = \frac{F}{A}$
pressure difference = height × density × gravitational field strength	$p = h \times \rho \times g$
$\frac{\text{pressure}}{\text{temperature}}$ = constant	$\frac{p_1}{T_1} = \frac{p_2}{T_2}$
pressure × volume = constant	$p_1 \times V_1 = p_2 \times V_2$
8. Astrophysics	
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 page 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 = $\dfrac{\text{change in momentum}}{\text{time taken}}$	$F = \dfrac{(mv - mu)}{t}$
moment = force × perpendicular distance from the pivot	
5. Solids, liquids and gases	
change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta T$
6. Magnetism and electromagnetism	
relationship between input and output voltages for a transformer	$\dfrac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \dfrac{\text{primary turns}}{\text{secondary turns}}$
input power = output power	$V_p I_p = V_s I_s$ for 100% efficiency
8. Astrophysics	
$\dfrac{\text{change in wavelength}}{\text{reference wavelength}} = \dfrac{\text{velocity of a galaxy}}{\text{speed of light}}$	$\dfrac{\lambda - \lambda_0}{\lambda_0} = \dfrac{\Delta\lambda}{\lambda_0} = \dfrac{v}{c}$

END OF EQUATION LIST