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)

Wednesday 19 November 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

FORMULAE

You may find the following formulae useful.

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

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

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

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

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

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

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

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

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

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

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

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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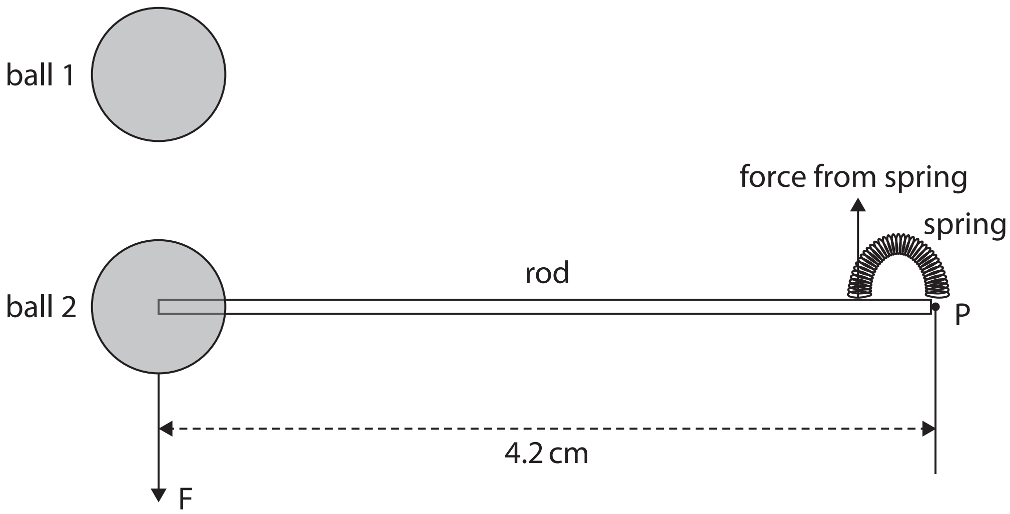
Answer ALL questions. Write your answers in the spaces provided.

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 The diagram shows the apparatus used to investigate electric charge.

The equipment is viewed from above.

- ball 1 and ball 2 have a positive charge
- ball 1 is fixed in place
- ball 2 is attached to a rod that can rotate about point P
- ball 2 does not move



(a) State, in terms of charged particles, how the balls have become positively charged.

(1)

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(b) Ball 1 exerts a force, F, of 0.57 N on ball 2.

(i) State the value of the force exerted on ball 1 from ball 2.

(1)

force = ... N

(ii) Calculate the moment on the rod from force F about point P.

(2)

moment = ... N cm

(iii) State the magnitude of the moment about point P due to the force from the spring.

(1)

magnitude of moment = ... N cm

(iv) Draw an arrow on the diagram to show the direction of the force that the rod exerts on the spring.

(1)

(Total for Question 1 = 6 marks)

2 This question is about gravitational field strength.

(a) (i) The table shows gravitational field strengths at the surfaces of four different planets.

The planets have the same mass but different diameters.

Diameter in km	Gravitational field strength in N/kg
13 000	9.8
18 000	5.1
21 000	3.8
24 000	2.9

Give a reason why a scatter graph is the correct way to display this data, rather than a bar chart.

(1)

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(ii) A student claims that the relationship between the gravitational field strength and the diameter of a planet is given by this formula.

$$\text{gravitational field strength} \times (\text{diameter})^2 = \text{constant}$$

Using data from the table, evaluate the student's claim.

(4)

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(b) The diameter of a planet affects the gravitational field strength at the surface of the planet.

Which of these is also a factor that affects gravitational field strength?

(1)

☒ **A** absolute magnitude

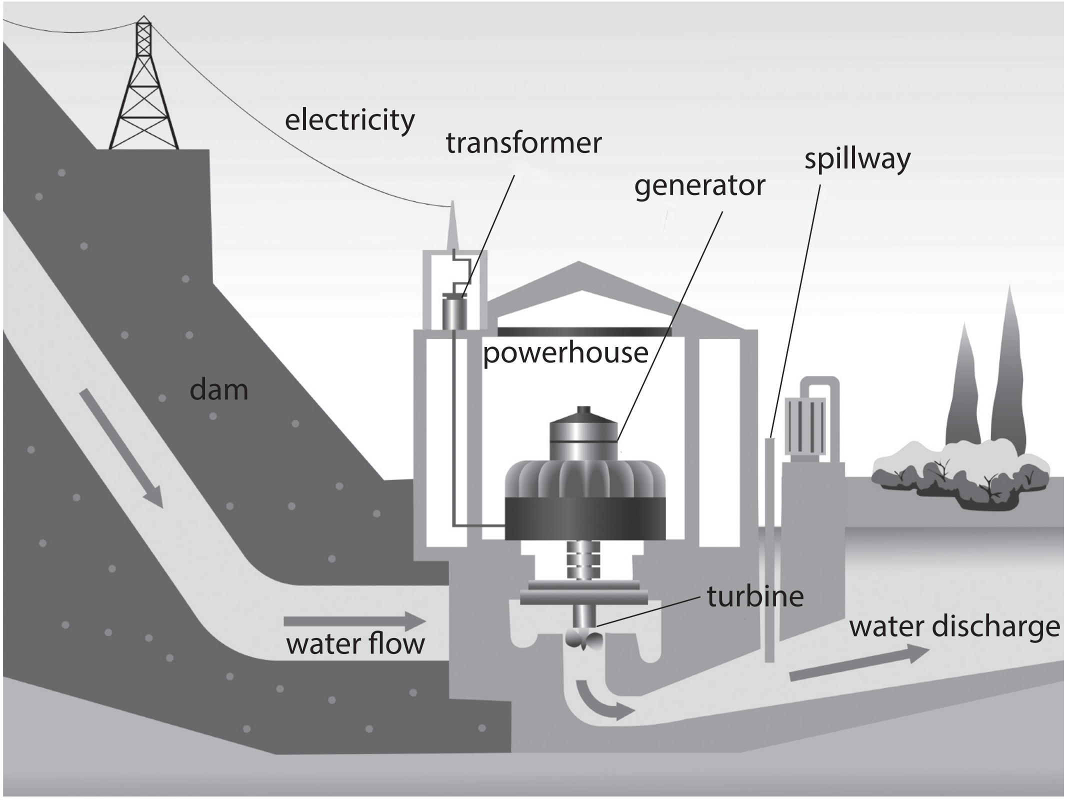
☒ **B** colour

☒ **C** mass

☒ **D** specific heat capacity

(Total for Question 2 = 6 marks)

3 The diagram shows some of the parts of a hydroelectric power station.



(Source: © Radzas2008/Shutterstock)

(a) Water enters the turbine with a momentum of 120 000 kg m/s.

(i) State the formula linking momentum, mass and velocity.

(1)

(ii) A mass of 14 000 kg of water enters the turbine.

Calculate the velocity of the water as it enters the turbine.

(2)

velocity = ... m/s

(iii) The 14 000 kg of water leaves the turbine.

This water has a momentum of 63 000 kg m/s after it leaves the turbine.

The turbine exerts a force of 6100 N on the water.

Calculate the time taken for the water to pass through the turbine.

(3)

time = ... s

(b) As the water passes through the turbine, energy is lost from the water's kinetic energy store.

Explain what happens to the energy lost from the water's kinetic energy store.

(3)

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(c) Hydroelectric power is an example of a renewable resource for the generation of electricity.

Give two examples of **non-renewable** resources for the generation of electricity.

(2)

1 ....

2 ....

(Total for Question 3 = 11 marks)

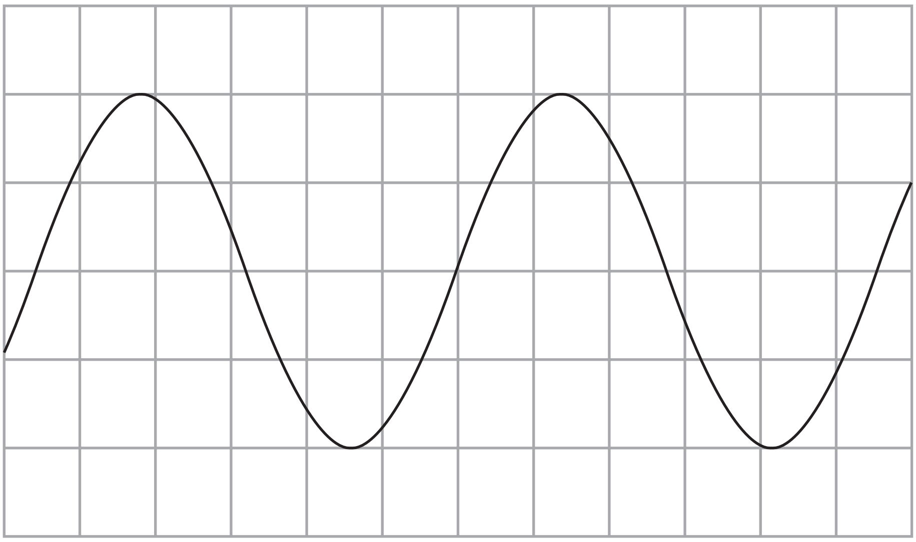
4 This question is about sound waves.

(a) Describe an investigation to measure the frequency of a sound wave with an oscilloscope.

You may draw a diagram to help your answer.

(5)

(b) The diagram shows an oscilloscope screen.



Oscilloscope settings:

x direction: 1 square = 0.5 ms
y direction: 1 square = 0.5 V

(i) Estimate the period, in ms, of the wave.

(3)

period = ... ms

(ii) Calculate the frequency of the wave.

(1)

frequency = ... Hz

(Total for Question 4 = 9 marks)

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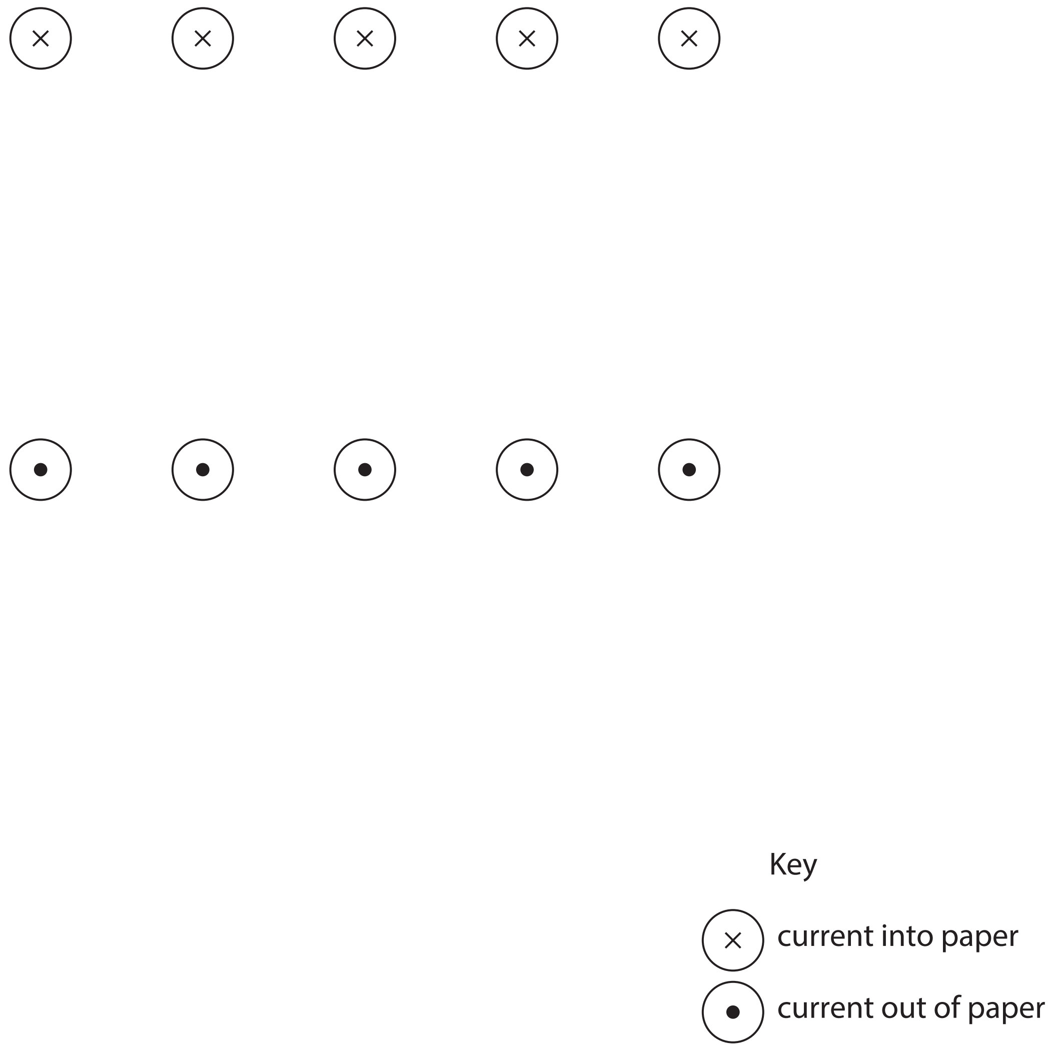
5 (a) The diagram shows a cross-section of a solenoid.



(i) Draw one field line on the diagram to show the direction of the magnetic field.

(2)

(ii) Use the field line to determine which end of the solenoid is the north pole and label this on the diagram.

(1)

(b) A transformer consists of two solenoids and an iron core.

This is the label on the transformer.

Number of turns on primary coil: 180
Number of turns on secondary coil: 345
Output voltage: 230 V
Output power = 320 W

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

(1)

(ii) Calculate the input voltage of this transformer.

(3)

input voltage = ... V

(iii) Give the name of this type of transformer.

(1)

....

(iv) When the transformer is in use, there is a current in the primary coil and in the secondary coil.

State the type of current in the coils of the transformer.

(1)

....

(Total for Question 5 = 9 marks)

6 Galaxies A, B and C are different distances from the Earth.

Galaxy A is moving away from the Earth with a velocity of 1.7×10^4 km/s.

(a) The reference wavelength for light arriving at the Earth from galaxy A is 506 nm.

Calculate the observed wavelength for the light arriving from galaxy A.

[speed of light = 3.0×10^5 km/s]

(3)

wavelength = ... nm

(b) Galaxy B is twice as far away from the Earth as galaxy A is from the Earth.

Galaxy C is four times as far away from the Earth as galaxy A is from the Earth.

Explain how the velocities of galaxies B and C are different.

(2)

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(c) The universe started with an event called the Big Bang.

Explain how evidence from cosmic microwave background radiation shows how the temperature of the universe has changed since the Big Bang.

(2)

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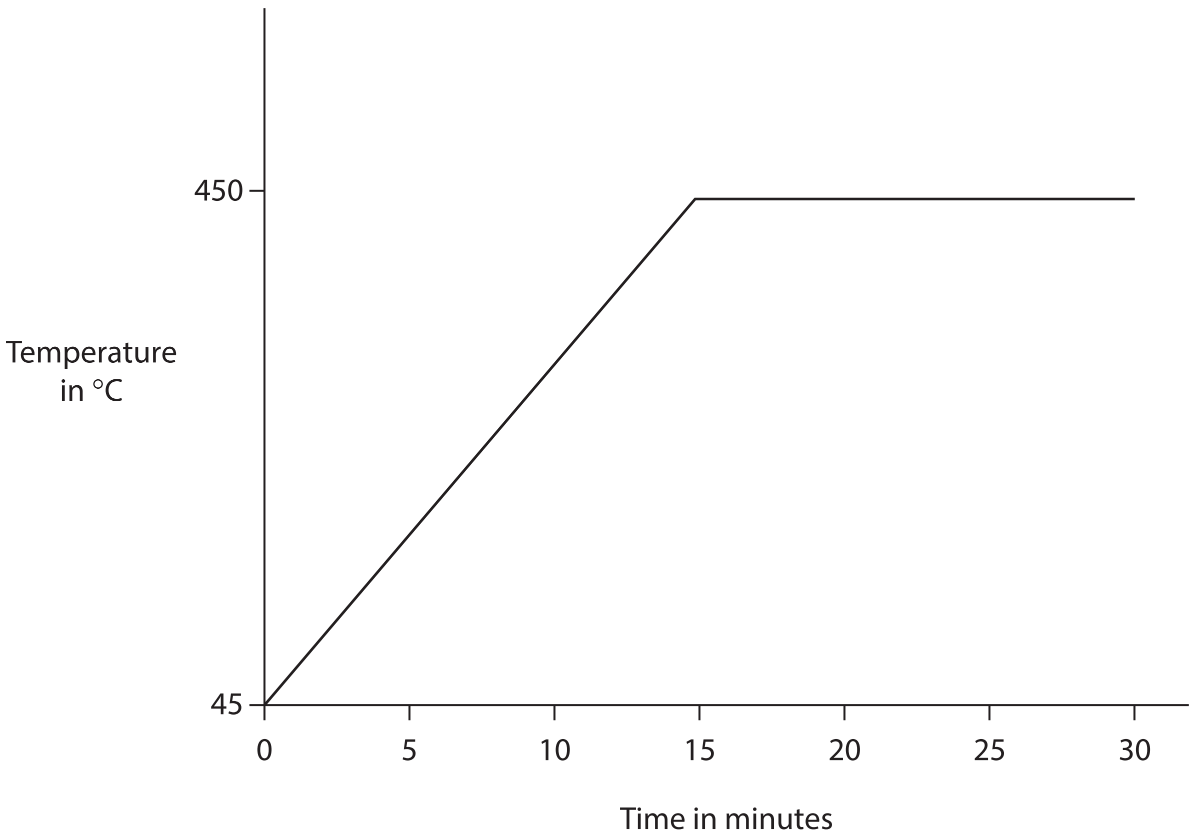
(Total for Question 6 = 7 marks)

7 A student investigates how the temperature of a metal block varies with time as it is heated.

The student measures the temperature of the block at 5-minute intervals for a total of 30 minutes.

The graph shows the student's results.



(a) (i) Give the name of a piece of equipment that the student could use to measure the time during the investigation.

(1)

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(ii) Which of these is the dependent variable in this investigation?

(1)

☒ **A** mass of block

☒ **B** temperature of block

☒ **C** time taken to heat block

☒ **D** volume of block

(b) The energy supplied to the block is 440 000 J.

Calculate the mass of the metal block when the temperature of the block increases from 45 °C to its melting point of 450 °C.

[for the metal, specific heat capacity = 910 J / kg °C]

(3)

mass = ... kg

(c) The metal block melts and then the liquid metal boils to become a gas.

Describe the motion of the particles when the metal is a gas.

(2)

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(d) Suggest two changes to the graph if the student had used a different metal in their investigation.

(2)

1 ....

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2 ....

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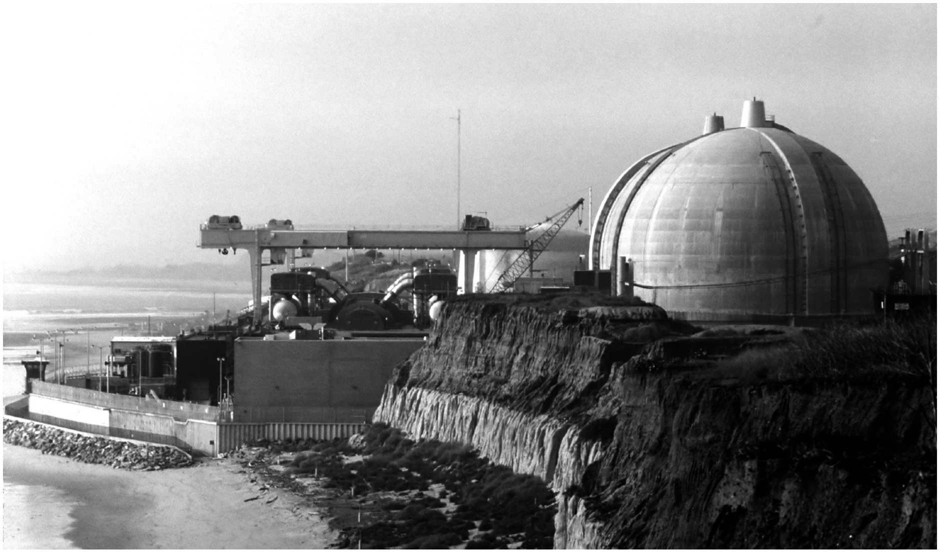
(Total for Question 7 = 9 marks)

8 The photograph shows a nuclear power station.



(Source: © Julius Fekete/Shutterstock)

A chain reaction releases energy inside the power station.

(a) Explain how the fission of U-235 can set up a chain reaction.

(3)

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(b) Explain how nuclear fusion is different from radioactive decay.

(2)

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(c) An isotope of hydrogen is used as a fuel for nuclear fusion.

The nuclear equation shows how this isotope of hydrogen can be manufactured.

Complete the equation by giving the missing information.

(2)

$$^{1}_{\square}\text{n} + ^{6}_{3}\text{Li} \rightarrow ^{\square}_{1}\text{H} + ^{4}_{2}\alpha$$

(d) Explain why nuclear fusion can only happen at high temperatures and pressures.

(2)

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....

(e) (i) Which of these is the time taken for the number of undecayed nuclei in a radioactive isotope to halve?

(1)

☒ **A** activity

☒ **B** becquerels

☒ **C** half-life

☒ **D** proton number

QUESTION 8 CONTINUES ON THE NEXT PAGE.

(ii) This isotope of hydrogen is radioactive and has a half-life of 12 years.

A sample of the isotope has an activity of 72 kBq.

Calculate the activity of the isotope in the sample after 60 years.

(3)

activity = ... kBq

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 70 MARKS

Pearson Edexcel International GCSE (9–1)

Wednesday 19 November 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.

Turn over

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Pearson

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 × 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 = $\frac{\text{change in momentum}}{\text{time taken}}$	$F = \frac{(mv - mu)}{t}$
moment = force × perpendicular distance from the pivot	
5. Solids, liquids and gases	
change in thermal energy = mass × specific heat capacity × change in temperature	$\Delta Q = m \times c \times \Delta T$
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