GradeMax

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)

Thursday 22 May 2025

Morning (Time: 2 hours)

Paper reference 4PH1/1PR 4SD0/1PR

Physics

UNIT: 4PH1
Science (Double Award) 4SD0
PAPER: 1PR

You must have:
Ruler, calculator, protractor, 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 110.
- 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.

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FORMULAE

You may find the following formulae useful.

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

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

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

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

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

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

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

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

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

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

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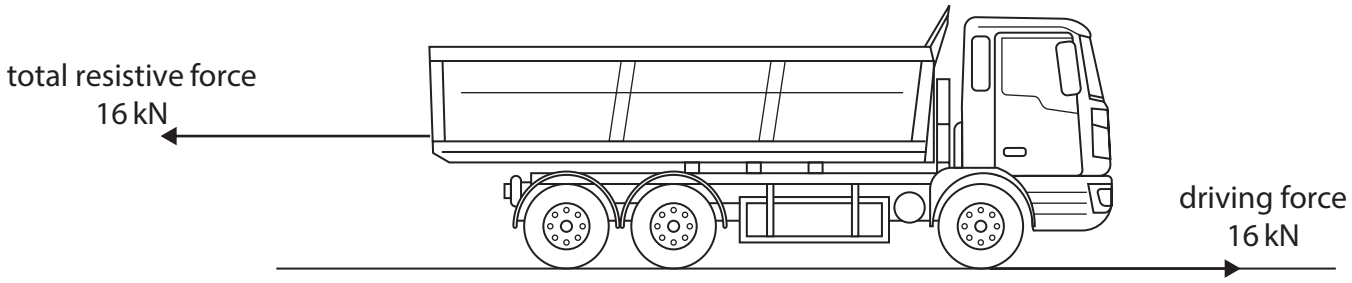
Answer ALL questions.

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 The diagram shows a truck travelling along a horizontal road.



(a) The diagram shows the horizontal forces acting on the truck.

Give the resultant horizontal force acting on the truck.

(1)

resultant horizontal force = ... kN

(b) The driver of the truck has to stop because a tree has fallen on the road.

(i) The thinking distance of the driver is 7 m.

The braking distance of the truck is 20 m.

Calculate the stopping distance of the truck.

(1)

stopping distance = ... m

(ii) Give two factors that would affect the braking distance of the truck.

(2)

1 .....

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2 .....

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(iii) Which of these factors would **decrease** the driver's thinking distance?

(1)

- ☒ **A** the road is dry, rather than wet
- ☒ **B** the truck has old, worn tyres, rather than new tyres
- ☒ **C** the driver is tired
- ☒ **D** the truck is travelling at a lower speed

(Total for Question 1 = 5 marks)

2 This question is about magnetic fields.

(a) Diagram 1 shows the poles of two strong bar magnets being held close together.

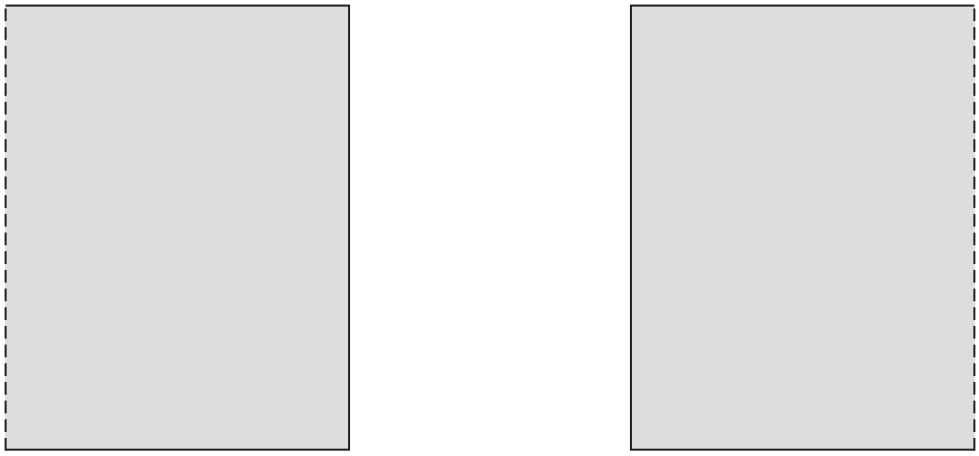

Diagram 1

There is a uniform magnetic field between the poles of the bar magnets.

Complete diagram 1 by drawing magnetic field lines to show the uniform magnetic field.

You should label the poles of the bar magnets.

(4)

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(b) Diagram 2 shows a strong magnet attracting an iron block.

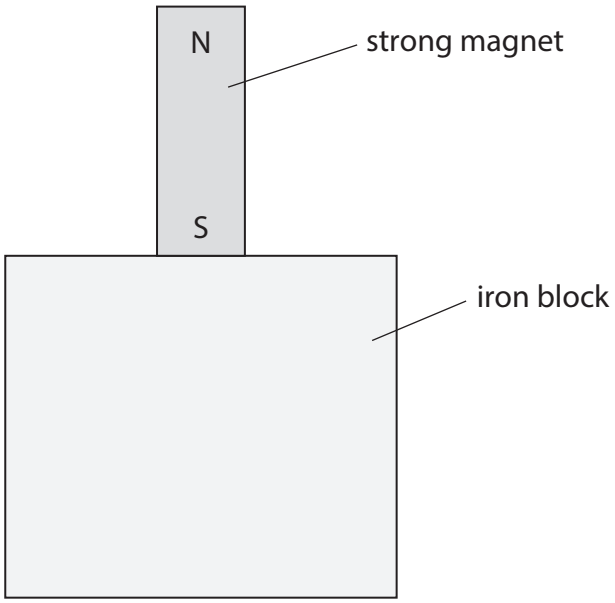

Diagram 2

(i) The iron block becomes magnetised when it is in the magnetic field of the strong magnet.

Label the magnetic poles on the magnetised iron block in diagram 2.

(1)

(ii) A student takes the strong magnet away from the iron block.

The student suggests they can permanently use the iron block to attract small pieces of iron.

Explain whether the student's suggestion is correct.

(2)

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(Total for Question 2 = 7 marks)

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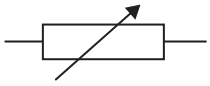
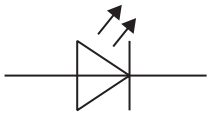
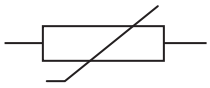
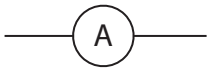
3 This question is about electrical circuits.

(a) The table shows the circuit symbols for some electrical components.

Complete the table by placing ticks (✓) to show whether each component can visibly indicate the presence of a current in a circuit.

(3)

Electrical component	Can visibly indicate the presence of a current
	
	
	
	
	
	

(b) Diagram 1 shows an electrical circuit containing a cell and component X.

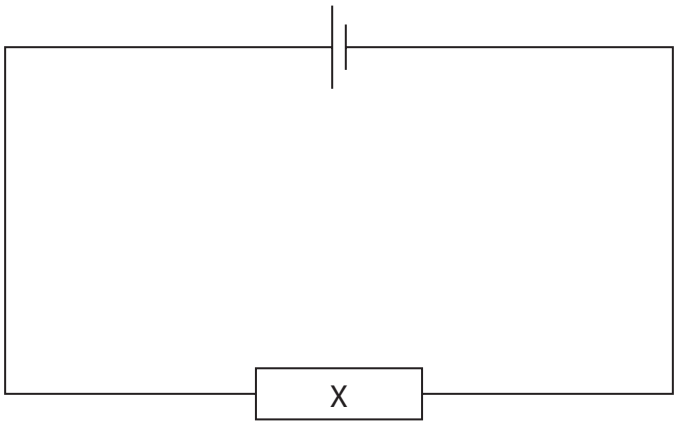
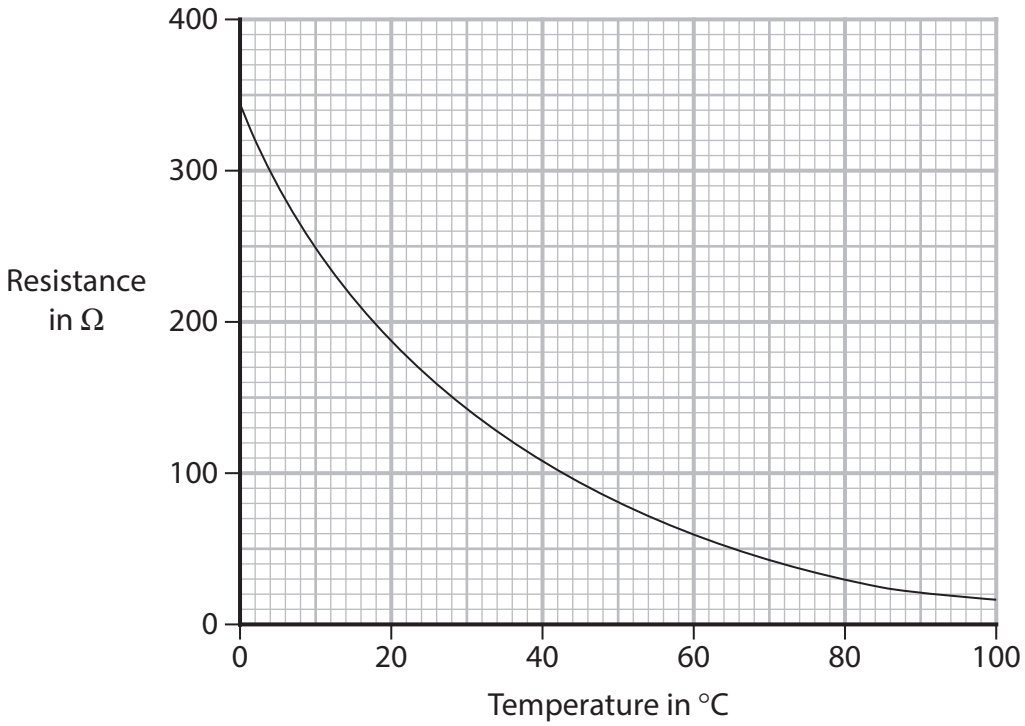


Diagram 1

The graph shows how the resistance of component X varies with temperature.



(i) Give the name of component X.

(1)

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(ii) Using the graph, determine the resistance of component X when its temperature is 50 °C.

(1)

resistance = ... Ω

(iii) The cell in diagram 1 has a voltage of 9.0 V.

Calculate the current in component X when its temperature is 50 °C.

Use the formula

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

(3)

current = ... A

(iv) The circuit in diagram 1 is modified by adding a second identical component X in series with the other components.

The temperatures of the first component X and second component X are reduced to 26 °C.

Explain how the resistance of the circuit is affected by these changes.

(4)

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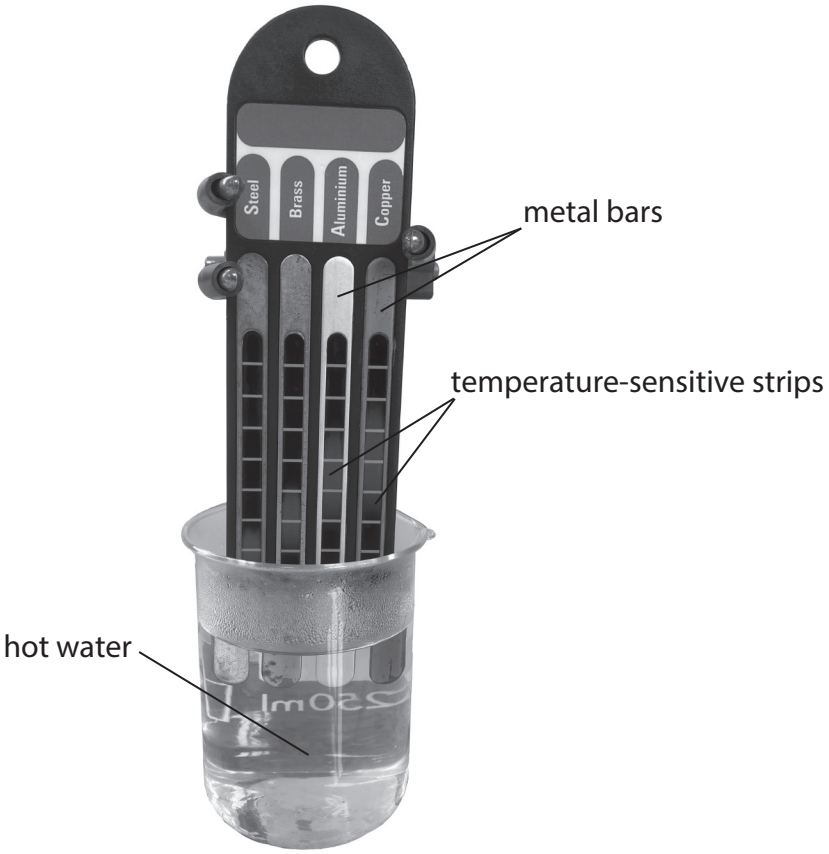
(Total for Question 3 = 12 marks)

4 A student does an experiment to investigate energy transfer by conduction.

(a) The student plans to use the piece of apparatus shown in the photograph.



The apparatus has four bars made from different metals.

When the apparatus is placed in hot water, energy is transferred from the bottom of the bar to the top of the bar. The temperature-sensitive strip on each bar changes colour as the temperature of the bar changes.

The time taken for the colour change to reach the top of the bar can be used to compare how effective each metal is at transferring energy by conduction.

(i) Give three control variables in the student's investigation.

(3)

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2 .....

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3 .....

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(ii) The student has this equipment.

- beaker
- hot water
- stopclock
- clamp and clamp stand

Design a method the student could use to compare the effectiveness of the metals at transferring energy by conduction.

You may draw a diagram to help your answer.

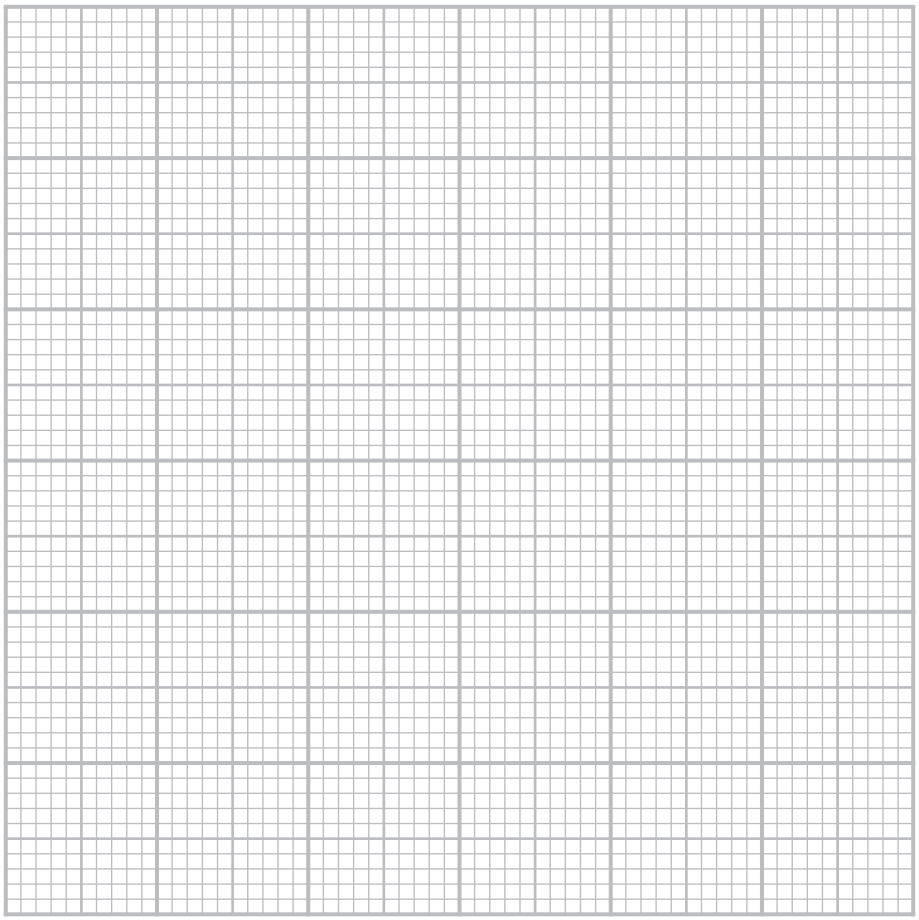
(5)

(b) The table shows the results of the student's investigation.

Metal	Time taken for colour change in seconds
aluminium	29
brass	64
copper	22
steel	115

(i) Plot a bar chart of the student's results.

(3)



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(ii) Deduce which metal is the most effective at transferring energy by conduction.

(2)

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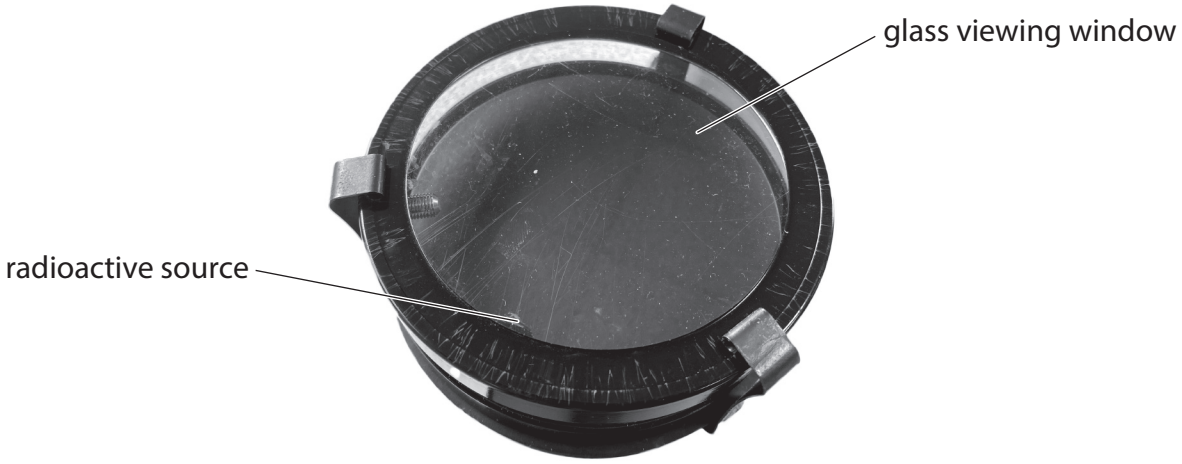
(Total for Question 4 = 13 marks)

5 The photograph shows a cloud chamber, used to observe alpha radiation produced by a radioactive source. The radioactive source is inside the cloud chamber, as shown in the photograph.



(a) Describe the structure of an alpha particle.

(2)

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(b) The source used in the cloud chamber contains the isotope radium-226.

The incomplete nuclear equation shows the decay of radium-226 into an isotope of radon.

Complete the nuclear equation by writing the correct numbers in the boxes.

(3)

$$^{226}_{88}\text{Ra} \rightarrow {}^{\square}_{86}\text{Rn} + {}^{\square}_{\square}\alpha$$

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(c) The tracks in the cloud chamber can be seen through the glass viewing window.

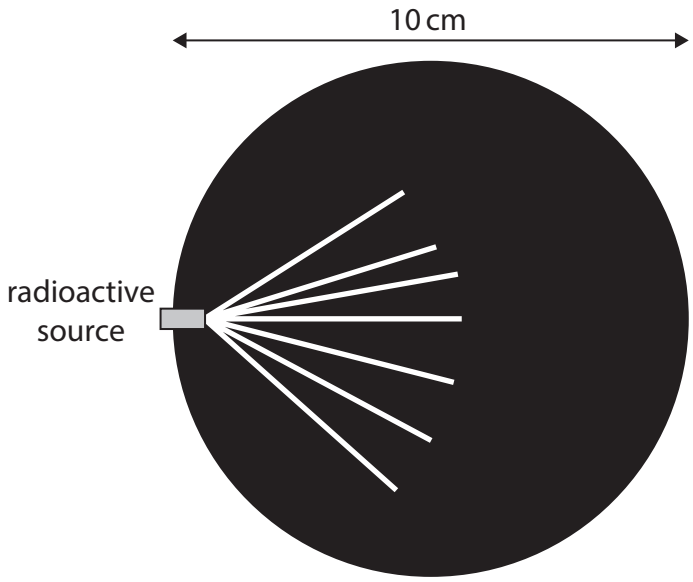
Explain why the radioactive source is not a hazard to the person viewing the cloud chamber.

(2)

(d) When radiation is emitted from the source a white line is produced in the cloud chamber. The white line is known as a track.

The diagram shows the tracks produced by the radiation from the source.

The diameter of the cloud chamber is also shown.



Explain the properties of alpha radiation that can be deduced from the length of the tracks.

(3)

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(Total for Question 5 = 10 marks)

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6 The photograph shows a rocket being launched at Cape Canaveral in the United States of America.

(Source: © Geopix / Alamy Stock Photo)

The table gives some information about the motion of the rocket during the first 5.0 seconds of its launch.

Initial velocity	0.0 m / s
Acceleration	13 m / s^2
Time taken	5.0 s

(a) Calculate the final velocity of the rocket after 5.0 seconds.

Assume that the acceleration remains constant during this time.

(3)

final velocity = ... m / s

(b) Calculate the distance the rocket travels during the 5.0 seconds.

Assume that the acceleration remains constant during this time.

(3)

distance travelled = ... m

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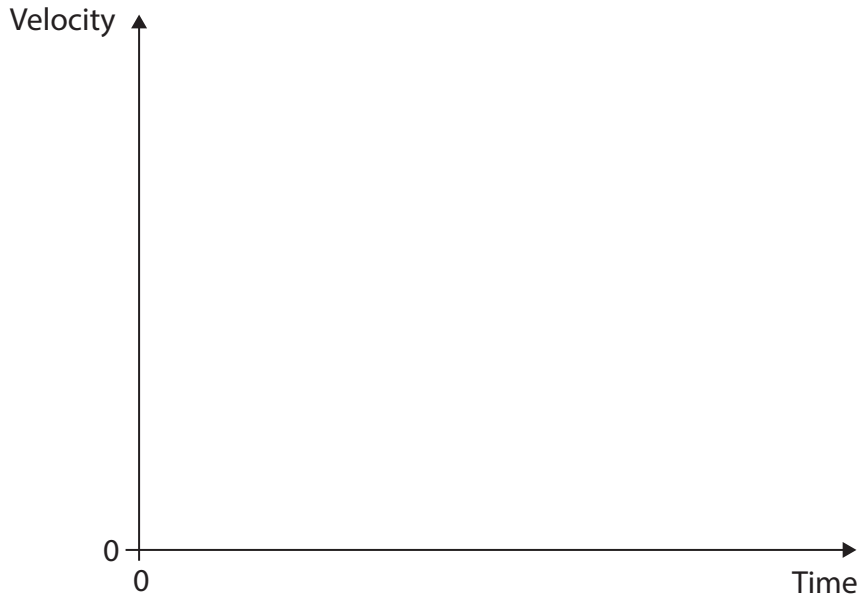
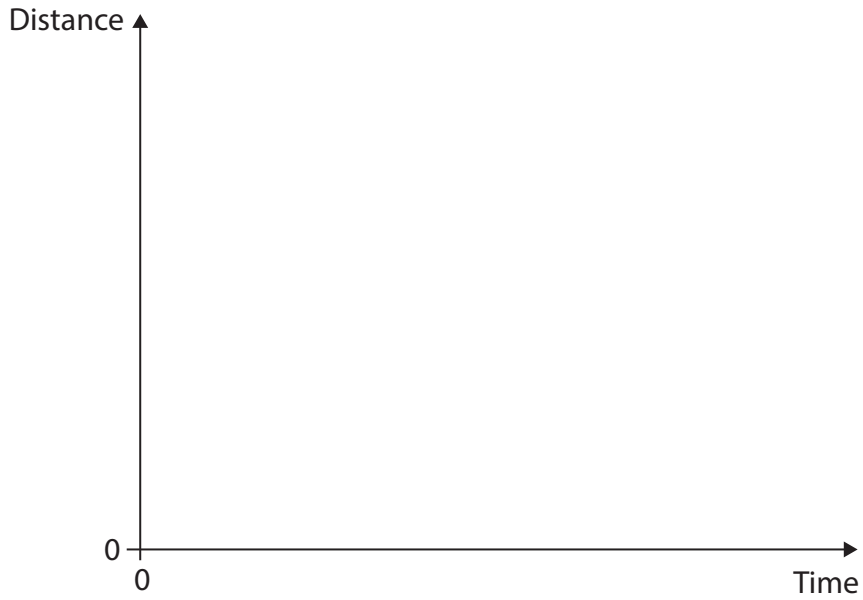
(c) Sketch a velocity-time graph and a distance-time graph showing how the motion of the rocket changes during the first 5.0 seconds of its launch.

You do not need to include values on the axes.

(4)





(Total for Question 6 = 10 marks)

7 This question is about light.

(a) Light is an example of a transverse wave.

Describe a transverse wave.

You may draw a diagram to help your answer.

(2)

(b) Diagram 1 shows a ray of light in a section of optical fibre.

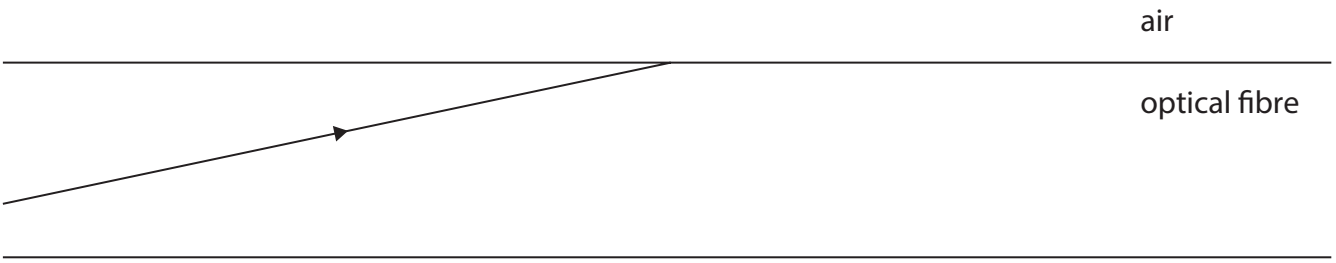


Diagram 1

(i) The ray of light is incident at the boundary between the optical fibre and air.

The ray of light reflects at the boundary.

Complete diagram 1 by drawing the reflected ray of light.

(2)

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(ii) Explain why no light leaves the optical fibre when the light reflects at the boundary between the optical fibre and air.

(3)

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(c) Diagram 2 shows a different ray of light, incident on the boundary between water and air.

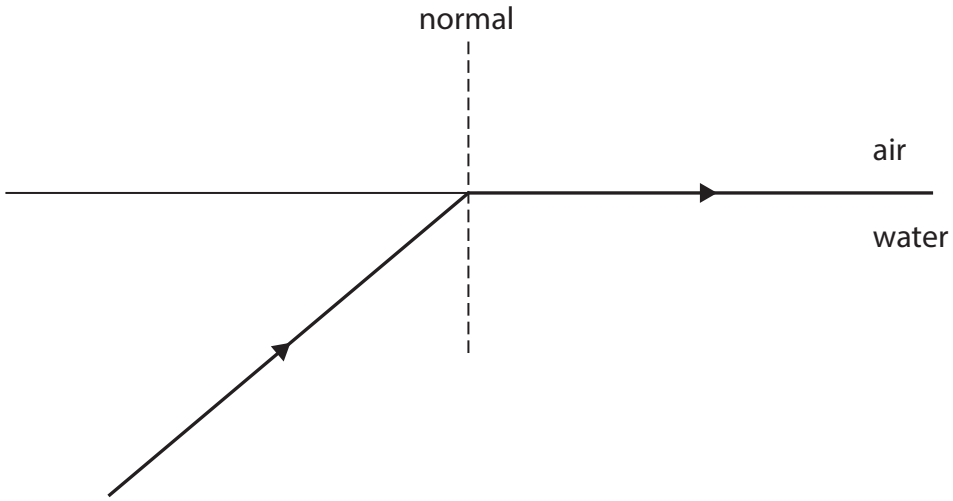

Diagram 2

Using diagram 2, show that the refractive index of water is approximately 1.3

(4)

(Total for Question 7 = 11 marks)

8 This is a question about the Solar System.

(a) Give the name of the galaxy the Solar System is in.

(1)

.....

(b) Neptune is a planet in the Solar System.

(i) Triton is a moon that orbits the planet, Neptune.

Draw a diagram to show the orbit of Neptune and the orbit of Triton in the Solar System.

(2)

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(ii) Neptune orbits in the Solar System at an orbital speed of 5.4×10^3 m / s with an orbital radius of 4.5×10^{12} m.

Pluto is another object in the Solar System. Pluto orbits with a time period of 7.8×10^9 s.

Show that the ratio of the orbital time period of Neptune to the orbital time period of Pluto is 2 : 3

(4)

(Total for Question 8 = 7 marks)

9 (a) The diagrams show a spring hanging from a nail.

- diagram 1 shows the spring with no weight added
- diagram 2 shows the spring stationary, after a weight has been added
- diagram 3 shows the spring after the weight has been pulled down

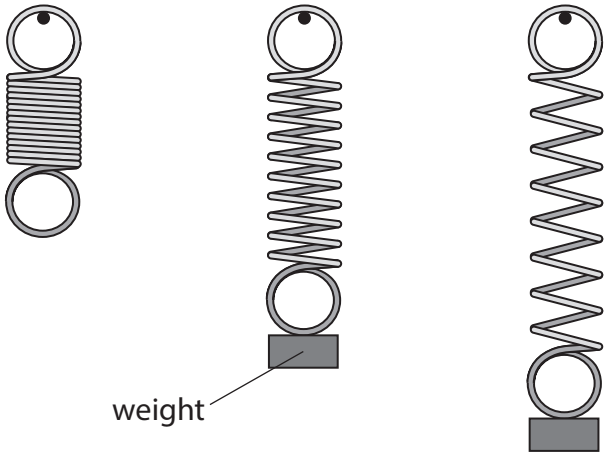

Diagram 1 **Diagram 2** **Diagram 3**

(i) Which energy store has increased for the spring in diagram 2 compared to the spring in diagram 1?

(1)

☒ **A** chemical

☒ **B** elastic

☒ **C** gravitational potential

☒ **D** kinetic

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(ii) The spring is released from the position shown in diagram 3.

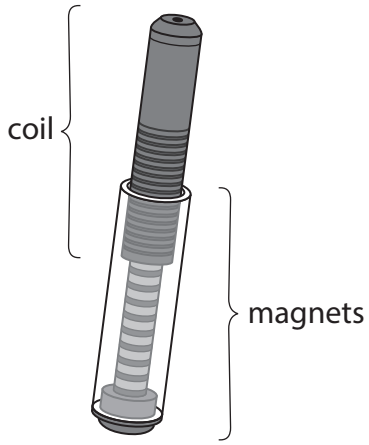
Describe the energy transfers that take place until the spring stops vibrating.

(6)

(b) Shock absorbers containing springs are used on motorcycles.
Shock absorbers are designed to compress and expand as the motorcycle moves across a rough surface.

A new type of shock absorber has been developed to generate electricity from the movement of the motorcycle.

This new type of shock absorber consists of magnets that slide inside a coil when the motorcycle goes over a bump.



Some of the energy that would normally be wasted can be recovered, so fuel is saved.

(i) Which of these statements best describes the advantage of this new type of shock absorber?

(1)

☒ **A** it increases the energy transferred to a thermal store from the fuel

☒ **B** it increases the efficiency of the motorcycle

☒ **C** it decreases the speed of the motorcycle

☒ **D** it decreases the braking power of the motorcycle

(ii) Explain how this new type of shock absorber can generate electricity.

(3)

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(iii) Road X has a rough surface.

Road Y has a smooth surface.

(Source: © MikhailSh / Shutterstock)

Road X

(Source: © BearFotos / Shutterstock)

Road Y

A motorcycle travels at the same speed along road X and road Y.

Explain why the new type of shock absorber will generate more electricity for this motorcycle on road X than on road Y.

(3)

(Total for Question 9 = 14 marks)

10 The photograph shows a ring made of gold.

(Source: ©Michael Burrell / Alamy Stock Photo)

A student wants to determine the volume of the ring.

(a) The student measures the mass of the ring several times.

(i) Describe how the student should use laboratory equipment to accurately measure the mass of the ring.

(2)

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(ii) The table shows the student's measurements of the mass of the ring.

Mass in g
6.411
6.408
6.410
6.426
6.412

One of the student's measurements is an anomaly.

Draw a circle around the anomalous result in the table.

(1)

(iii) Calculate the mean mass of the gold ring.

(3)

mean mass = ... g

(iv) The student is given a value for the density of gold.

Which of these formulae should be used to calculate the volume of the gold ring?

(1)

☒ **A** volume = density ÷ mass

☒ **B** volume = density ÷ mass^3

☒ **C** volume = mass ÷ density

☒ **D** volume = mass ÷ density^3

(b) The student does not know if the ring is made of pure gold.

The student suggests that they could also measure the volume of the ring using a displacement method.

Discuss which method (calculation method or displacement method) will give the most accurate volume measurement.

(4)

(Total for Question 10 = 11 marks)

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11 A ball is moving through the air with a speed of 54.8 m / s. The ball has a mass of 159 g.

(a) Calculate the energy in the kinetic store of the ball.

Give your answer to 3 significant figures.

(4)

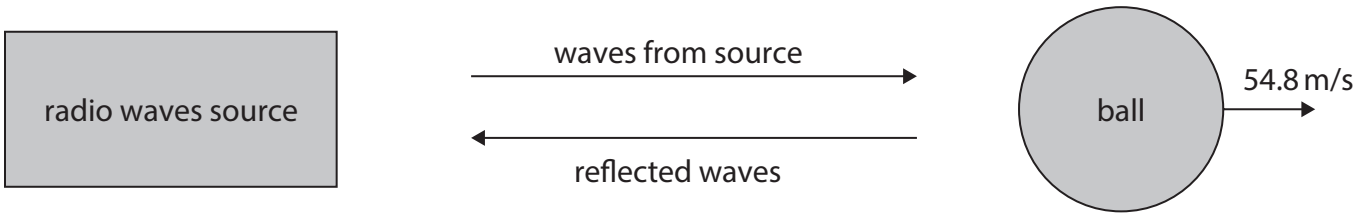
energy in kinetic store = ... J

(b) The speed of the ball is measured using radio waves.

Radio waves of frequency 2.90×10^{10} Hz travel towards the ball from a source.

The radio waves then reflect off the ball.

The reflected radio waves change frequency depending on the speed of the ball.
This change in frequency is due to the Doppler effect.



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(i) The change in frequency can be calculated using this formula.

$$\text{speed of ball} = \frac{\text{change of frequency}}{\text{source frequency}} \times \frac{\text{speed of radio waves}}{2}$$

Show that the change in frequency of the radio waves is approximately 1.1×10^4 Hz.

[speed of radio waves = 3.00×10^8 m / s]

(3)

(ii) The change in frequency of the radio waves happens because the ball acts as a new source of radio waves.

The ball is moving away from the original source of radio waves.

Explain the change in frequency of the radio waves when the radio waves reflect off the ball.

(3)

(Total for Question 11 = 10 marks)

TOTAL FOR PAPER = 110 MARKS

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Pearson Edexcel International GCSE (9–1)

Thursday 22 May 2025

Morning (Time: 2 hours)

Paper reference 4PH1/1P 4SD0/1P

Physics

UNIT: 4PH1
Science (Double Award) 4SD0
PAPER: 1P

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