Write your name here

Surname	Other names

Pearson Edexcel Certificate
Pearson Edexcel
International GCSE

Centre Number	Candidate Number

Physics

Unit: KPH0/4PH0
Paper: 2P

Tuesday 14 January 2014 – Afternoon
Time: 1 hour

Paper Reference
KPH0/2P
4PH0/2P

You must have:
Ruler, calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **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.
- 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 ☒.

Information

- The total mark for this paper is 60.
- 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.
- Keep an eye on the time.
- 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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P 4 2 8 7 7 A 0 1 2 0

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EQUATIONS

You may find the following equations useful.

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

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

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

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

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

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

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

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

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

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Answer ALL questions.

1 Iodine-131 is a radioactive isotope that emits beta particles.

(a) The equation for this decay is

$$^{131}_{53}\mathrm{I} \rightarrow {}^{A}_{Z}\mathrm{Xe} + {}^{0}_{-1}\mathrm{e}$$

(i) The atomic (proton) number for iodine-131 is

(1)

☒ **A** 0

☒ **B** 53

☒ **C** 78

☒ **D** 131

(ii) The mass (nucleon) number for Xe is

(1)

☒ **A** –1

☒ **B** 0

☒ **C** 53

☒ **D** 131

(b) Iodine-131 is used to treat thyroid cancer.

This radioactive isotope is allowed to enter the tumour.

Explain why iodine-131 is suitable for this treatment.

(2)

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(Total for Question 1 = 4 marks)

2 (a) State the similarity and the difference between scalars and vectors.

(2)

similarity .....

.....

difference .....

.....

(b) Complete the table by ticking (✓) the correct boxes to show whether each quantity is a scalar or a vector.

The first one has been done for you.

(3)

Quantity	Scalar	Vector
density	✓	
energy		
force		
momentum		
speed		
velocity		

(Total for Question 2 = 5 marks)

3 The properties of materials can be explained using particle theory.

Brownian motion provides evidence to support particle theory.

(a) (i) Give an example of Brownian motion.

(1)

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(ii) Explain how Brownian motion supports the idea that matter is made from tiny particles in continuous motion.

(2)

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(b) These are some observations about samples of ice, water and steam.

	Shape	**Size**
ice	keeps a fixed shape	keeps a fixed size
water	takes the shape of the container	keeps a fixed size
steam	takes the shape of the container	fills the container

Explain each of the observations in terms of the arrangement and motion of the particles.

You may use diagrams to help your answer.

(6)

particles in ice .....

particles in water .....

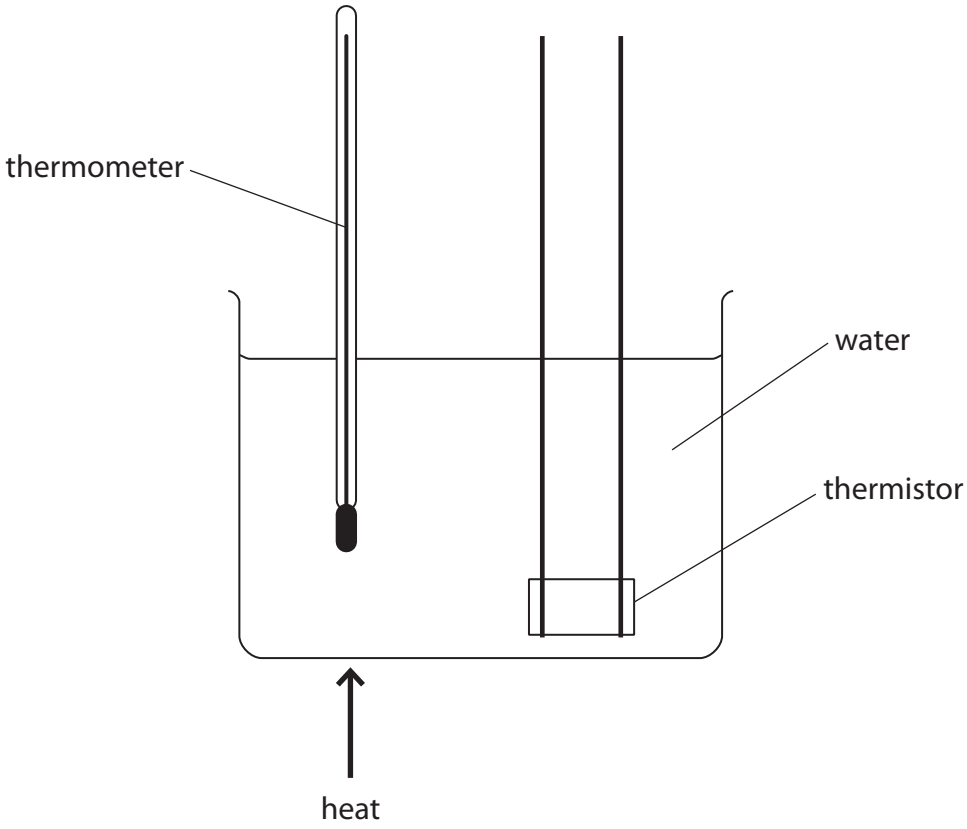
particles in steam .....

(Total for Question 3 = 9 marks)

4 A student investigates how the voltage across a thermistor varies with temperature.

The student keeps the current in the thermistor constant, but varies the temperatures between 20 °C and 100 °C.

(a) The diagram shows how the student sets up his apparatus.



Suggest three changes to this set up that would improve the accuracy of the measurement of the thermistor temperature.

(3)

1 .....

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2 .....

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3 .....

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(b) What instrument should the student use to measure the current in the thermistor?

(1)

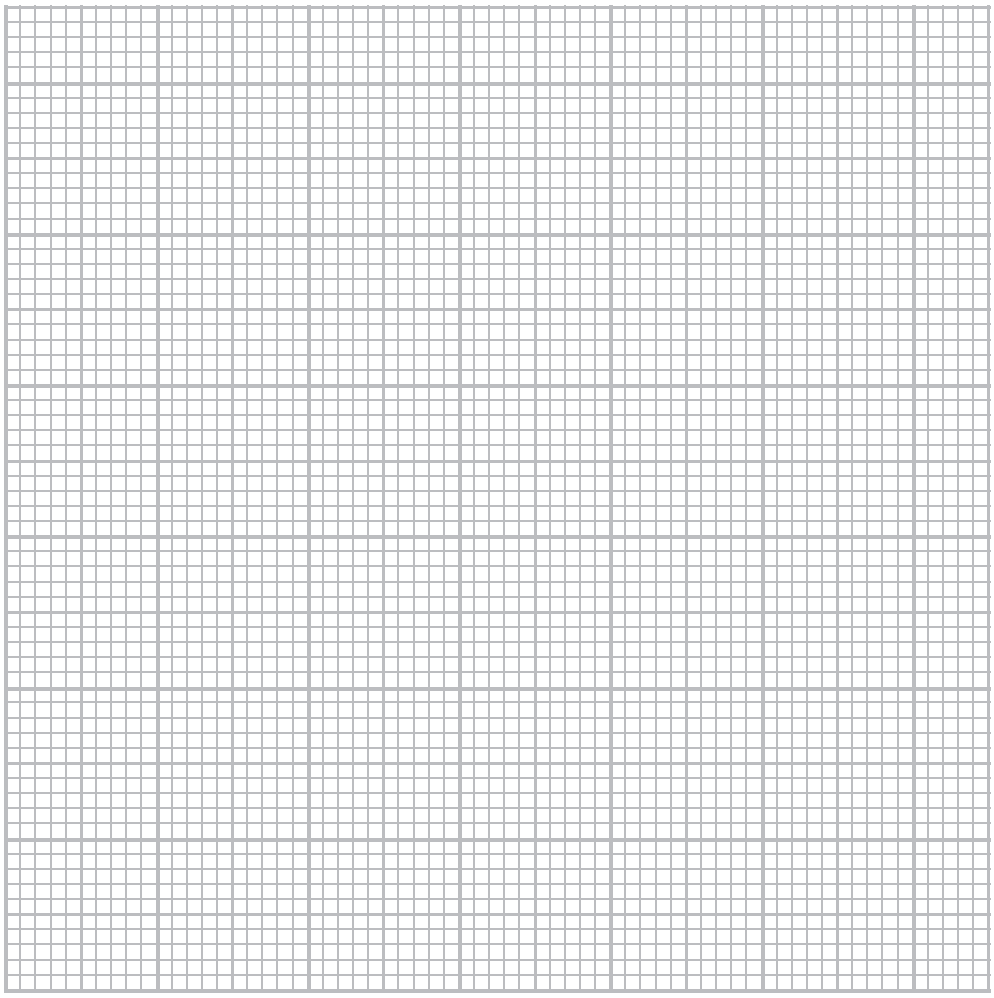
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(c) The table shows the student's results.

Temperature in °C	Voltage in V
20	6.0
40	2.2
60	1.1
80	0.2
100	0.4

(i) Plot a graph of voltage against temperature and draw the line of best fit.

(5)



(ii) Circle the anomalous point on your graph.

(1)

(d) (i) State the equation linking voltage, current and resistance.

(1)

(ii) At room temperature the thermistor has a resistance of 680 Ω.

The voltage across it is 5.9 V.

Show that the current in the thermistor is about 8.5 mA.

(3)

(Total for Question 4 = 14 marks)

5 Some cars have a pedestrian airbag for safety.

If a pedestrian is hit and lands on the front of the car, the airbag inflates.



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Use ideas about momentum to explain how this airbag can reduce injuries to pedestrians.

(4)

(Total for Question 5 = 4 marks)

6 (a) A student wants to find the refractive index of a glass block.

(i) Draw a diagram to show how the student should set up the apparatus needed to find the refractive index of a glass block.

Label your diagram.

(2)

(ii) What measurements should the student take to find the refractive index of the glass block?

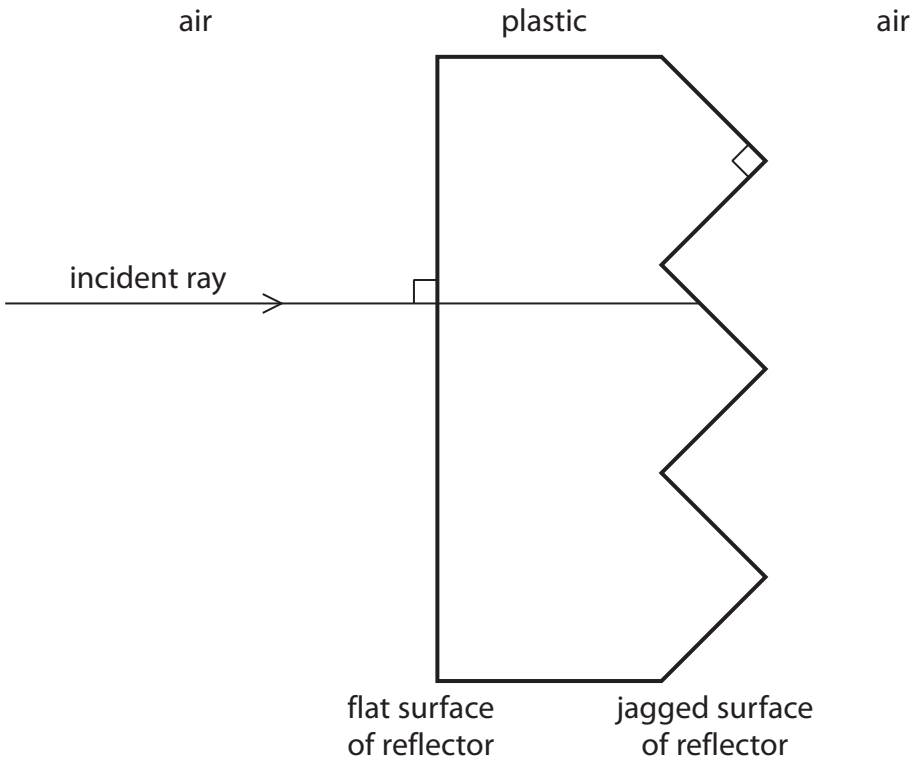
(2)

(iii) Describe how the student should use these measurements to find the refractive index of the glass block.

(2)

(b) The diagram shows a section through a bicycle reflector.

A ray of light is incident on the flat surface of the reflector.



(i) The critical angle for the plastic of the reflector is less than 45°.

Continue the incident ray on the diagram to show the path of the ray until it emerges from the plastic.

(2)

(ii) What happens to the incident ray as it enters the plastic?

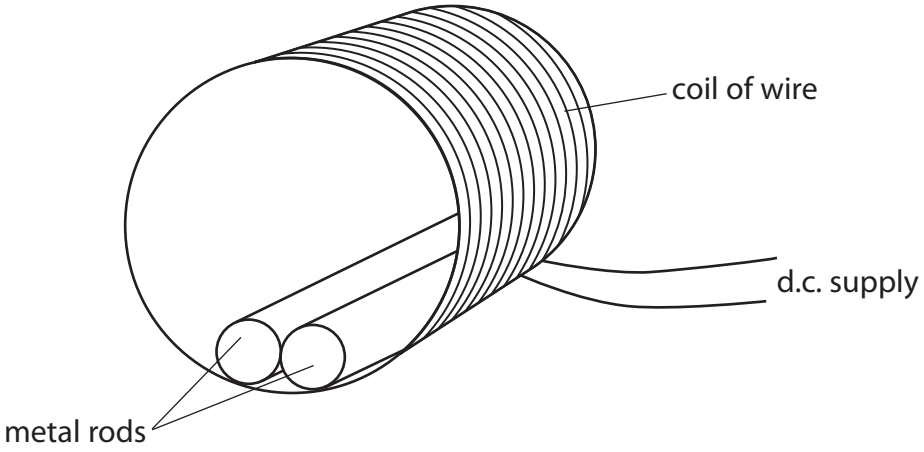
(1)

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(Total for Question 6 = 9 marks)

7 The diagram shows two identical metal rods placed inside a coil of wire.



(a) When a direct current is supplied to the coil, a magnetic field forms and the metal rods move apart.

Explain why the metal rods move apart.

(2)

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(b) When the current is switched off, the metal rods return to their starting places.

Suggest what material the metal rods are made from.

Explain your answer.

(3)

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(c) The direct current in the coil is replaced by an alternating current.

Explain what will happen to the magnetic field.

(2)

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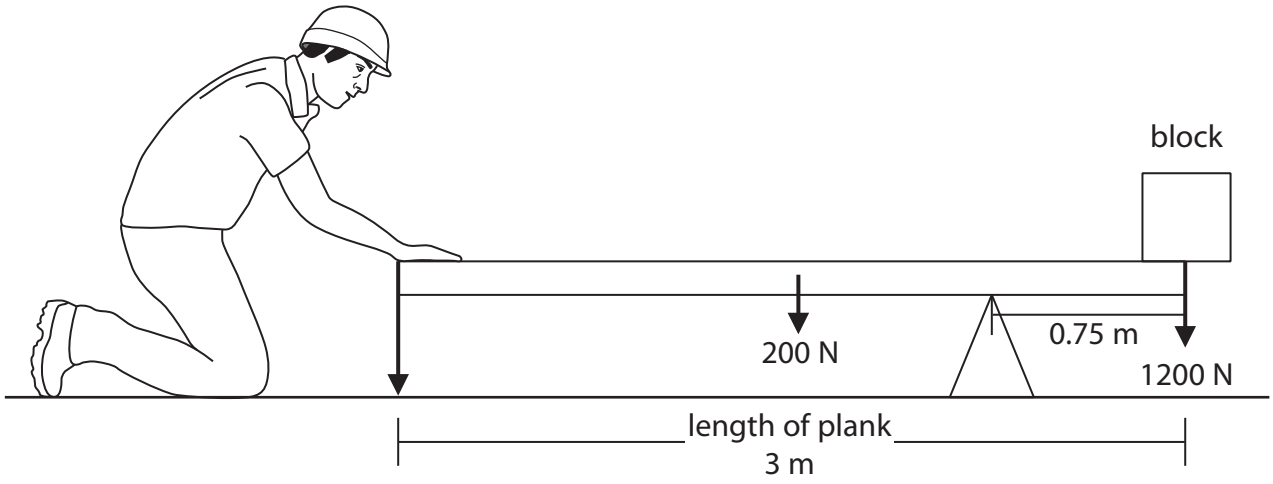
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(Total for Question 7 = 7 marks)

8 A man uses a uniform plank to lift a block.

He holds the plank horizontal.



The arrows on the diagram represent three forces on the plank.

(a) Complete the table to identify the missing force.

(1)

Force	Name of force
F	force of man pushing down on the plank
1200 N	weight of block
200 N	

(b) (i) State the equation linking moment, force and perpendicular distance from the pivot.

(1)

(ii) Calculate the clockwise moment of the block about the pivot.

(2)

moment = ... Nm

(c) Calculate the force of the man pushing down on the plank.

(4)

force = ... N

(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 60 MARKS

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