Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 10 January 2019

Afternoon (Time: 2 hours)

Paper Reference **4PH0/1P 4SC0/1P**

Physics

Unit: 4PH0

Science (Double Award) 4SC0

Paper: 1P

You must have:
Ruler, calculator, protractor

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 120.
- 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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P 6 1 9 3 6 A 0 1 3 2

Pearson

EQUATIONS

You may find the following equations useful.

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

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

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

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

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

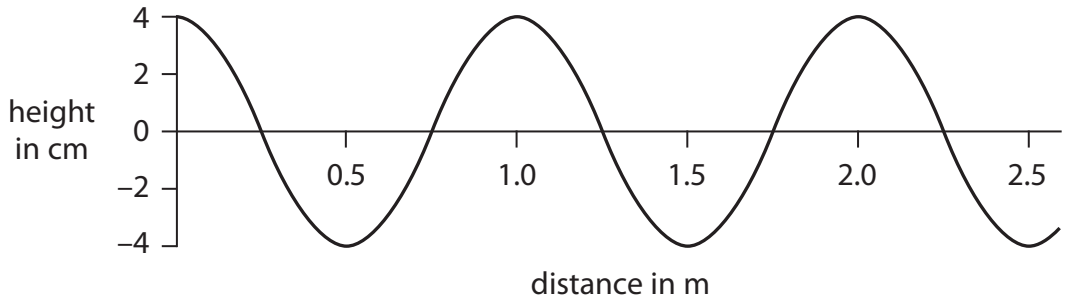
$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2 \times \pi \times r}{T}$$

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

Answer ALL questions.

1 This question is about waves.

(a) The diagram represents a water wave at an instant in time.



(i) What is the wavelength of the water wave?

(1)

☒ **A** 0.5 m

☒ **B** 1.0 m

☒ **C** 1.5 m

☒ **D** 2.0 m

(ii) What is the amplitude of the water wave?

(1)

☒ **A** 1 cm

☒ **B** 2 cm

☒ **C** 4 cm

☒ **D** 8 cm

(b) Describe the differences between transverse and longitudinal waves.

You may draw a diagram to help your answer.

(3)

(c) All electromagnetic waves are transverse.

State two other properties that are the same for all electromagnetic waves.

(2)

1

2

(d) Some types of wave are used in hospitals.

(i) Which type of wave is used in radiotherapy to treat cancer?

(1)

☒ **A** gamma rays

☒ **B** infrared

☒ **C** microwave

☒ **D** radio waves

(ii) Endoscopes use optical fibres to see inside the body.

Which type of wave should be used in the optical fibres?

(1)

☒ **A** microwave

☒ **B** radio waves

☒ **C** ultraviolet

☒ **D** visible light

(iii) X-rays are used to obtain images of broken bones.

Explain why technicians leave the room before taking an x-ray of a patient.

(2)

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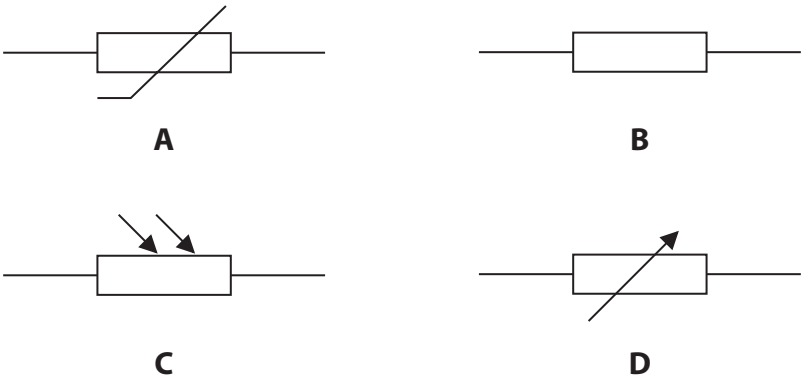
(Total for Question 1 = 11 marks)

2 This question is about electricity.

(a) The diagram shows some electrical circuit symbols.



(i) Which symbol represents a light dependent resistor (LDR)?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(ii) Which symbol represents a fixed resistor?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(b) An electric heater connected to the mains supply has a power of 2200 W.

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

(1)

(ii) Show that the current in the electric heater is approximately 10 A.
[mains supply voltage = 230 V]

(2)

(iii) Which of these fuses should be used with the electric heater?

(1)

- ☒ **A** 3 A
- ☒ **B** 5 A
- ☒ **C** 7 A
- ☒ **D** 13 A

(iv) Explain how the fuse protects the electric heater when the current in the electric heater is too high.

(2)

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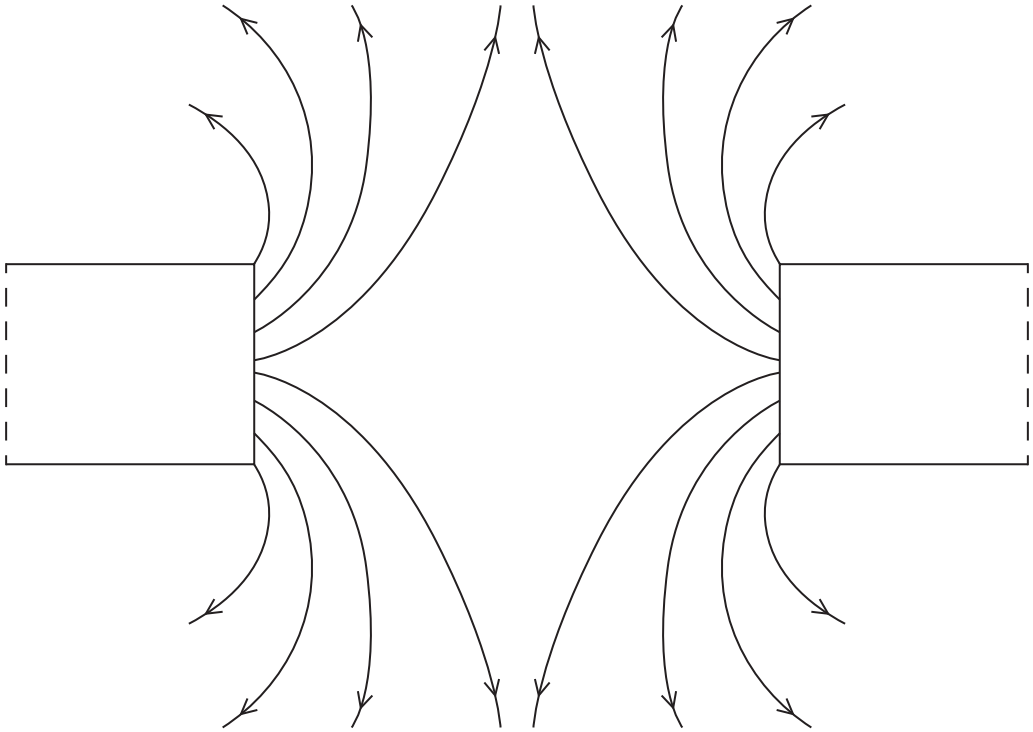
(Total for Question 2 = 8 marks)

3 The diagram shows the magnetic field between the poles of two bar magnets.

Only one end of each bar magnet is shown.



(a) Complete the diagram by labelling the poles on the bar magnets.

(2)

(b) A student investigates the magnetic field between the poles of the two bar magnets.

Describe an experiment that he could do to determine the shape and direction of this magnetic field.

You may draw a diagram to help your answer.

(3)

(Total for Question 3 = 5 marks)

4 This question is about pressure and density.

(a) Photograph A shows a pile of identical metal squares on a table.

Photograph A

There are 6 metal squares in the pile.

The weight of each metal square is 0.072 N.

The pressure exerted on the table by the pile of metal squares is 820 Pa.

(i) State the equation linking pressure, force and area.

(1)

(ii) Calculate the area of the table in contact with the metal squares.

(3)

area = ... m^2

(b) Photograph B shows the 6 metal squares spread out on the table.

Photograph B

(i) Explain how spreading out the metal squares affects the pressure they exert on the table.

(2)

(ii) Explain whether spreading out the metal squares affects the density of the material they are made from.

(2)

(Total for Question 4 = 8 marks)

5 This question is about electric motors.

(a) Diagram A shows a motor lifting a 780 g mass.

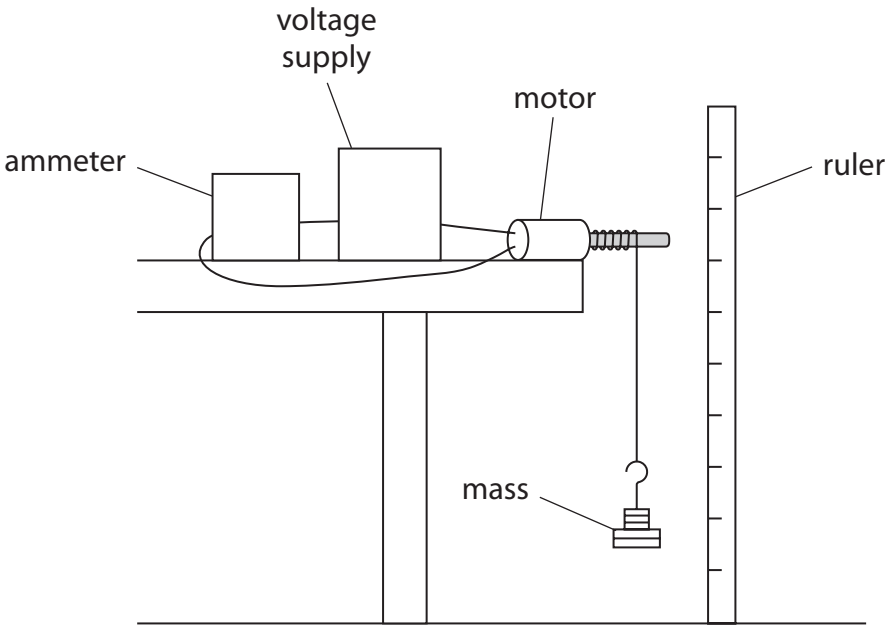


Diagram A

The current in the motor is 0.65 A and the voltage across it is 4.5 V.

The electrical energy transferred to the motor is 25 J.

(i) Calculate the time taken for the motor to lift the mass.

Give your answer to two significant figures.

(3)

time = ... s

(ii) State the equation linking gravitational potential energy (GPE), mass, *g* and height.

(1)

(iii) The mass gains 5.0 J of gravitational potential energy when it is lifted.

Calculate the height the mass is lifted.

(3)

height = ... m

(iv) Explain why the amount of electrical energy transferred to the motor is greater than the amount of GPE gained by the mass.

(2)

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(b) Diagram B shows a different electric motor.

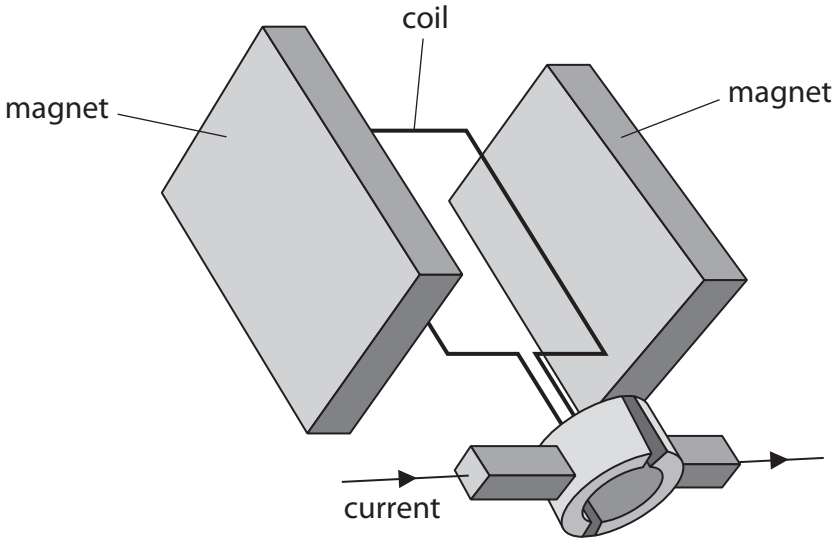


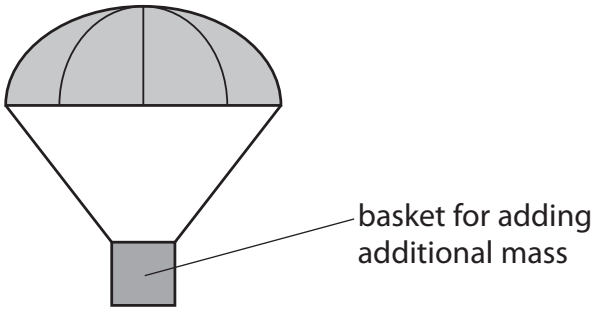
Diagram B

Explain how the current in the motor causes the coil to rotate.

(4)

(Total for Question 5 = 13 marks)

6 A student investigates the motion of different falling masses by measuring the time taken for a toy parachute to fall from a window.



This is the student's method.

- measure the mass of the toy parachute
- drop the toy parachute from the window
- repeat the experiment with additional mass added to the toy parachute
- continue to add mass up to a maximum of six different masses

(a) Describe how the student should measure the time taken for the toy parachute to fall from the window.

(2)

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(b) State the independent and dependent variables in this investigation.

(2)

independent variable .....

dependent variable .....

(c) State one factor that the student should keep constant in order to make his investigation valid (a fair test).

(1)

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

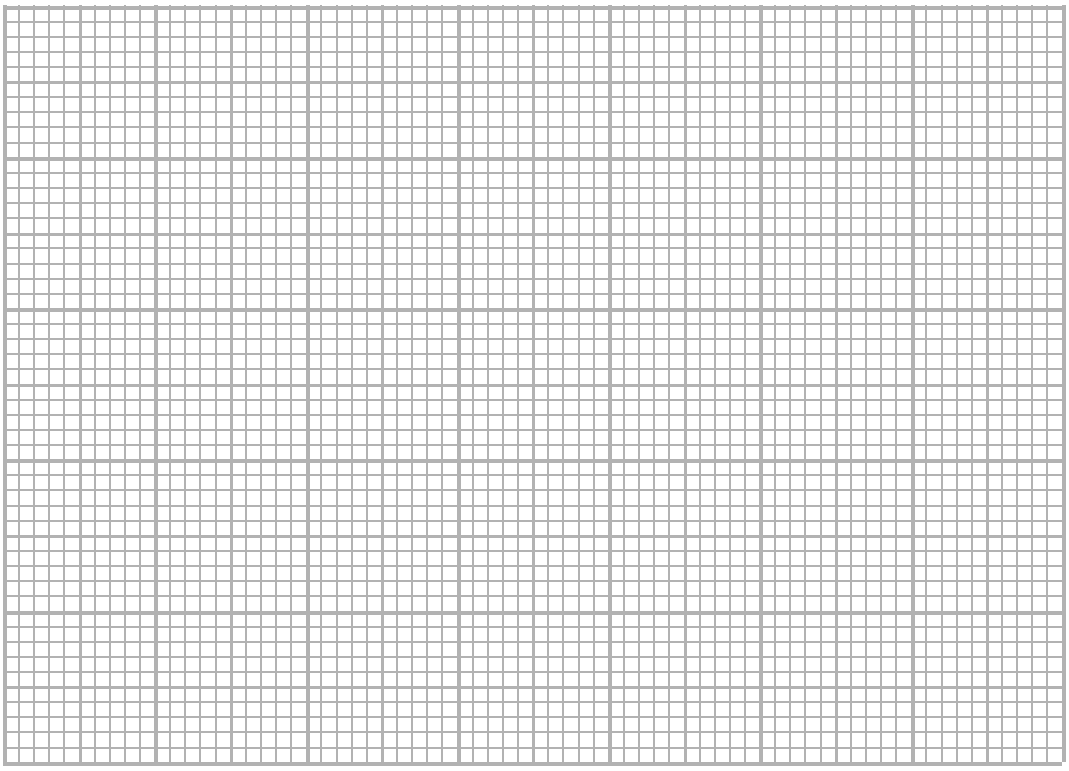
Mass in g	Time taken in s			
	Trial 1	Trial 2	Trial 3	Average (mean)
20	1.72	1.67	1.65	1.68
40	1.23	1.30	1.25	1.26
60	1.11	1.16	1.06	1.11
80	0.99	0.97	1.01	0.99
100	0.95	0.92	0.92	0.93
120	0.90	0.88	0.85	

(i) Complete the table by calculating the average time for a mass of 120 g.

(2)

(ii) On the grid, plot a graph of the average time taken for each mass.

(4)



(iii) Draw the curve of best fit.

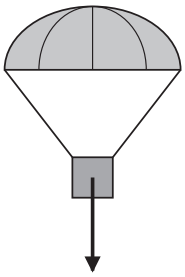
(1)

(e) The student notices that the toy parachute accelerates and then falls at constant speed.

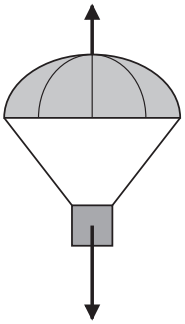
(i) The arrows in the diagrams show the size and direction of the forces acting on the toy parachute at different points during its fall.

Label the forces on the last diagram.

(2)



at the start



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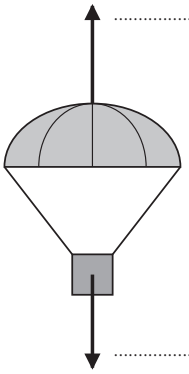


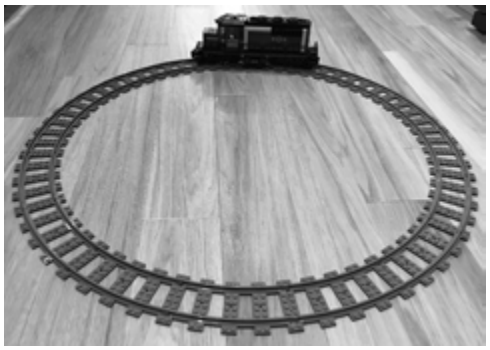
near the bottom

(ii) Explain why the toy parachute accelerates and then falls at a constant speed.

(3)

(Total for Question 6 = 17 marks)

7 The photograph shows a toy train as it moves around a circular track.



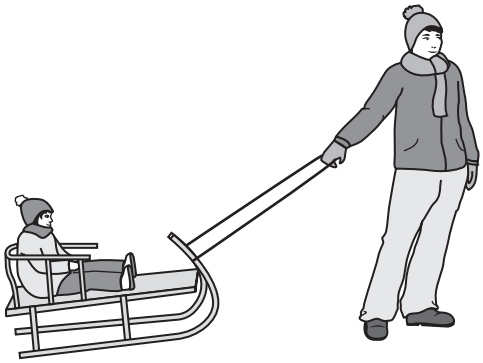
A student wants to find the average speed of the toy train.

Describe a method that the student could use to find the average speed.

(5)

(Total for Question 7 = 5 marks)

8 (a) The diagram shows a man pulling a child on a sledge.



The mass of the child and sledge is 45 kg.

The unbalanced force acting on the sledge is 49 N.

(i) State the equation linking unbalanced force, mass and acceleration.

(1)

(ii) Calculate the acceleration of the child and sledge.

(2)

acceleration = ... m/s^2

(iii) Suggest a reason why the man must pull the sledge with a force that is greater than 49 N.

(1)

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(b) The sledge is then placed at the top of a hill.

When it slides down the hill, it accelerates at 1.3 m/s^2.

The sledge accelerates from rest for 2.4 s.

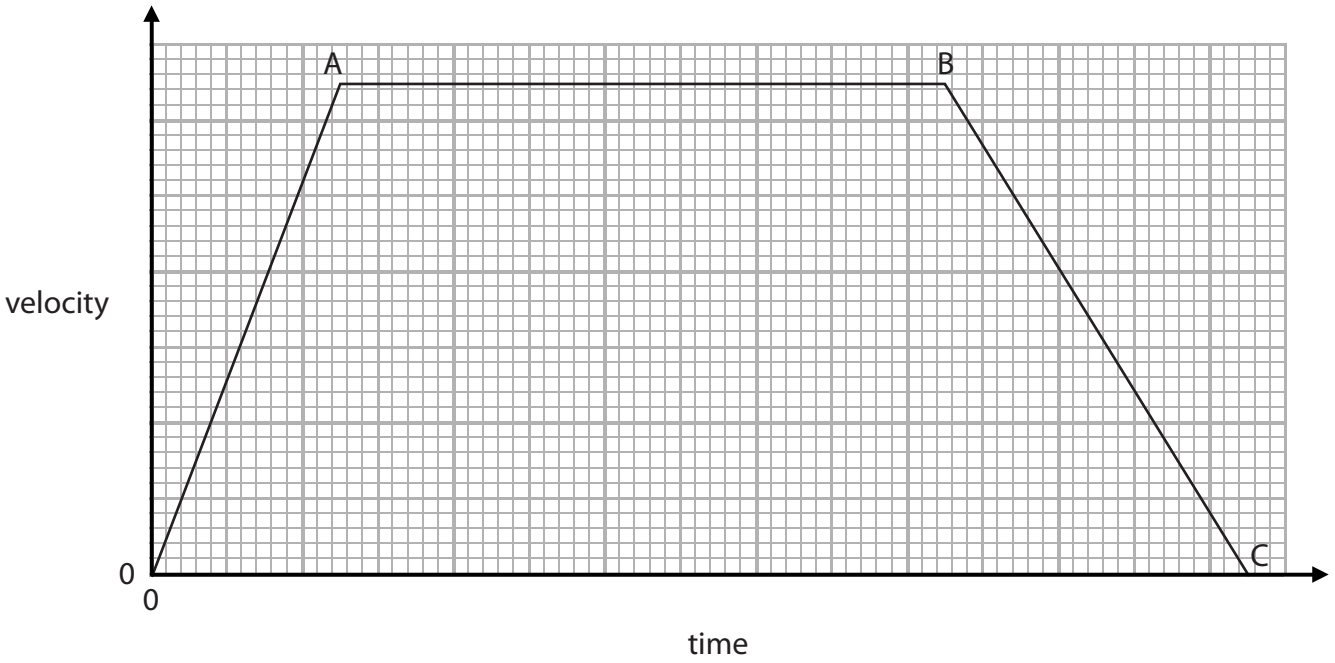
(i) State the equation linking acceleration, velocity and time.

(1)

(ii) Show that the sledge reaches a speed of approximately 3 m/s after it has accelerated for 2.4 s.

(2)

(c) This velocity-time graph shows the motion of another sledge.



(i) Which feature of the velocity-time graph shows the distance travelled by the sledge?

(1)

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(ii) Describe the motion of the sledge during the journey shown by the velocity-time graph.

(3)

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(Total for Question 8 = 11 marks)

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9 A teacher measures the count from a radioactive source over a 20 minute period.

(a) Name an instrument the teacher should use to detect the radiation emitted from the source.

(1)

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(b) (i) State two sources of background radiation.

(2)

1 .....

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2 .....

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(ii) Describe the procedure the teacher should follow to measure the background radiation and correct the count measurement.

(3)

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(c) The radioactive source used by the teacher emits beta radiation.

Describe how the nucleus of an atom is changed by the emission of a beta particle.

(2)

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(d) State two ways that the teacher can reduce the risks when working with radioactive sources.

(2)

1 .....

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2 .....

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(Total for Question 9 = 10 marks)

10 The photograph shows a cylinder of compressed air used to breathe underwater.

© serg_dibrova/Shutterstock

(a) Explain how the air causes a pressure on the inside of the cylinder.

Refer to particles in your answer.

(3)

(b) Explain what happens to the pressure of the air inside the cylinder as its temperature increases.

(3)

(c) A fixed mass of air has a volume of 43 000 cm^3 when its pressure is 100 kPa.

Calculate the pressure of this fixed mass of air when it is inside the cylinder.

[volume of air in cylinder = 8500 cm^3]

(3)

pressure = ... kPa

(Total for Question 10 = 9 marks)

11 A light ray can undergo total internal reflection.

(a) (i) State two uses of total internal reflection.

(2)

1 .....

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2 .....

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(ii) Describe the conditions required for total internal reflection to occur.

(2)

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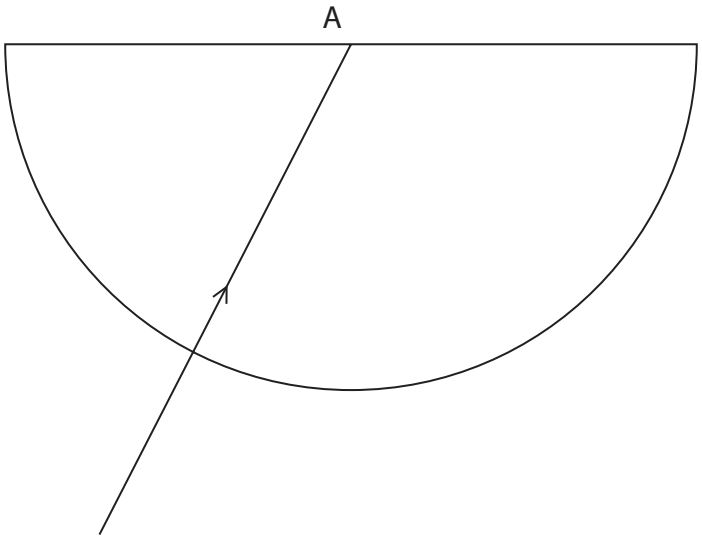
(b) The diagram shows a light ray entering a glass block from air and then incident on the flat side of the block at position A.



(i) Draw the normal line where the light ray is incident on the flat side of the block.

(1)

(ii) Measure the angle of incidence.

(1)

angle of incidence = ...

(iii) The critical angle of the glass block is 40°

Continue the path of the light ray after it reaches position A.

(2)

(iv) State the equation linking critical angle and refractive index.

(1)

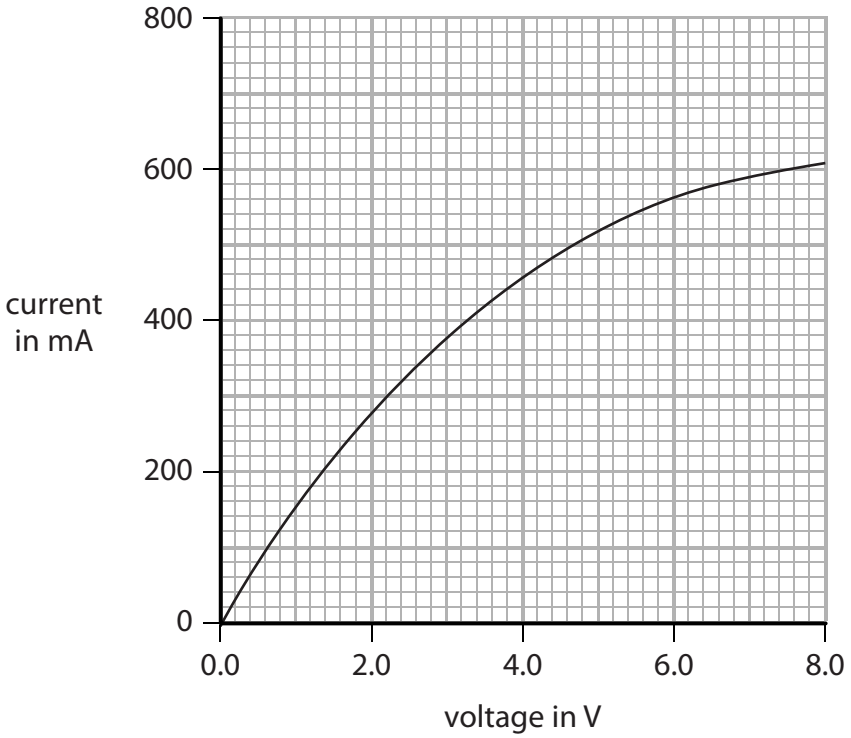
(v) Calculate the refractive index of the glass block.

(2)

refractive index = ...

(Total for Question 11 = 11 marks)

12 The graph shows how the current in a filament lamp varies as the voltage across it is changed.



(a) Draw a circuit diagram to show a circuit that could be used to make the measurements required to plot this graph.

(4)

(b) The resistance of the filament lamp changes as the voltage is increased.

(i) Determine how the resistance of the filament lamp changes as the voltage is increased.

You should use data from the graph in your answer.

(4)

(ii) Explain why the resistance changes as the voltage is increased.

(3)

(c) Draw a line on the graph to show how the current varies with voltage for a different filament lamp with a higher power rating.

(1)

(Total for Question 12 = 12 marks)

TOTAL FOR PAPER = 120 MARKS

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