Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier — Physics Paper 2H

Specimen 2018 (set 2) — Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator
- a protractor
- the Physics Equations Sheet (enclosed).

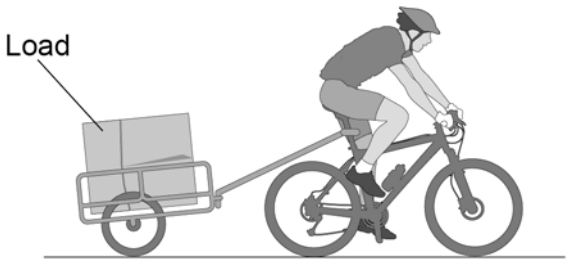
Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

0 1 **Figure 1** shows a cyclist with a trailer attached to his bike.

Figure 1



0 1 . 1 Describe how Newton's Third Law applies to the forces between the bike and the trailer.

[2 marks]

0 1 . 2 A student investigated how the stopping distance of the bike was affected by the mass of the load.

The same person rode the same bike throughout the investigation.

Give **two** other variables which the student should have controlled.

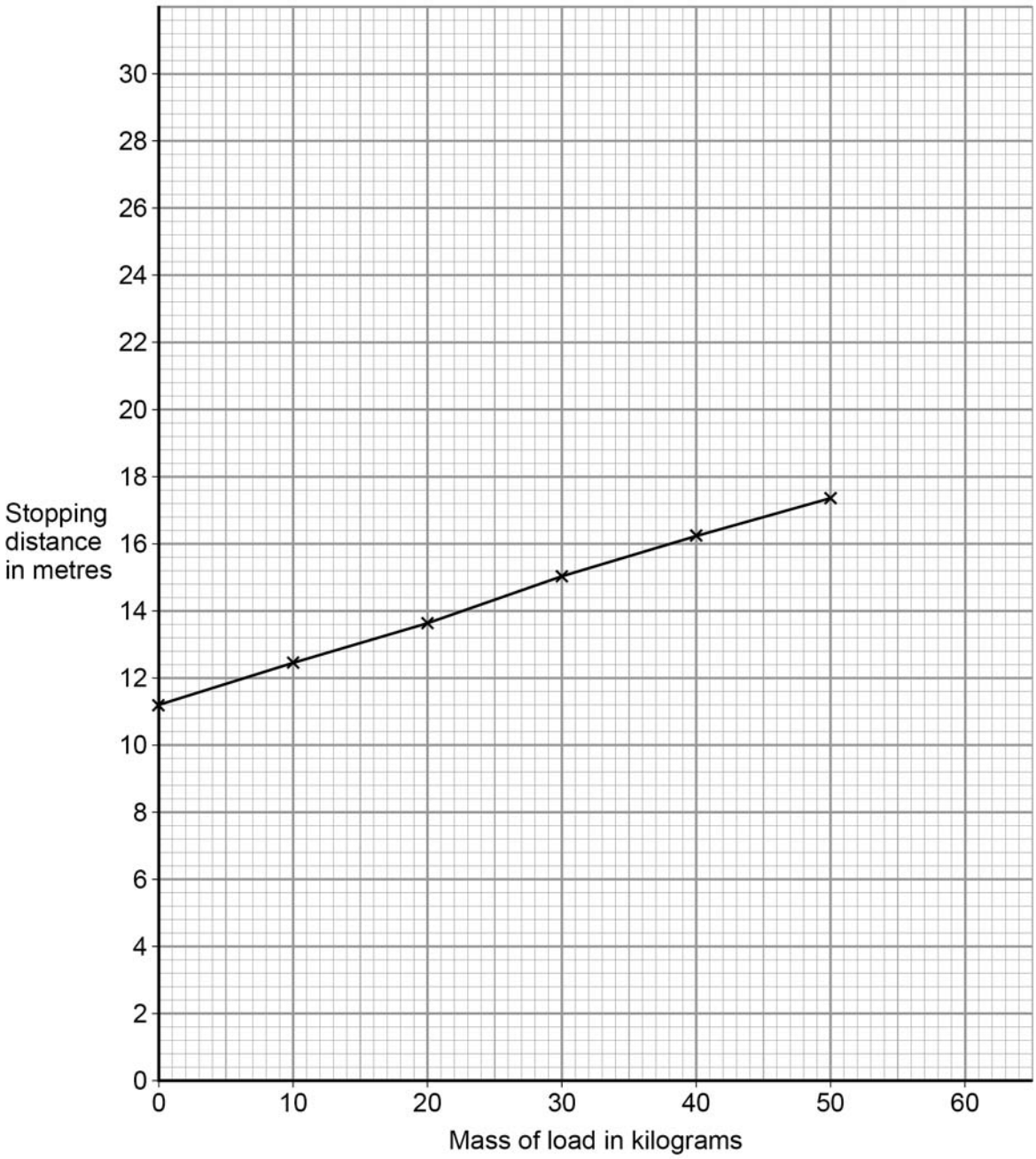
[2 marks]

1 _____

2 _____

0 1 . 3 **Figure 2** shows the results of the investigation.

Figure 2



Draw a line on **Figure 2** to show how the stopping distance would be different if a heavier cyclist rode the bike.

[1 mark]

Question 1 continues on the next page

Turn over ►

0 1 . 4 At one time in the investigation the cyclist was distracted.

The distraction increased the stopping distance of the bike but did **not** affect the braking distance.

Explain why the stopping distance increased.

[3 marks]

_____

_____

_____

_____

_____

_____

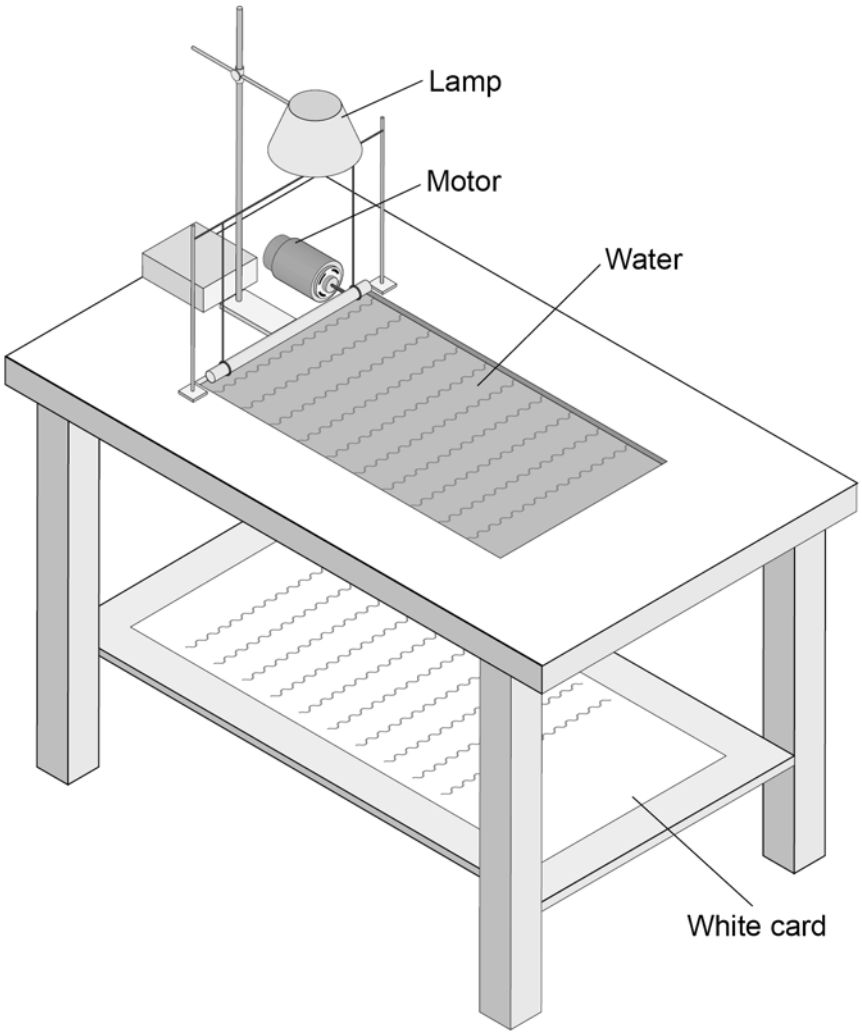
8

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 2 **Figure 3** shows a ripple tank.

Figure 3



0 2 . 1 The motor makes a noise when it is turned on.

Explain the differences between the properties of the sound waves produced by the motor and the water waves in the ripple tank.

[4 marks]

0 2 . 2 The period of the sound waves produced by the motor is 8.3 milliseconds.

Calculate the frequency of the sound waves.

[3 marks]

Use the Physics Equations Sheet.

Frequency = _____ Hz

Question 2 continues on the next page

0 2 . 3 Explain how a student could make appropriate measurements and use them to determine the wavelength of the waves in the ripple tank.

[6 marks]

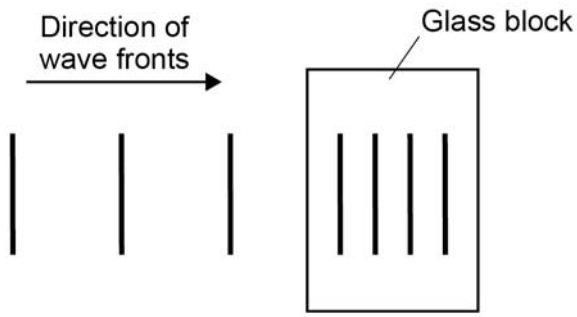
13

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 3 **Figure 4** is a wave front diagram showing light travelling through the air and into a glass block.

Figure 4

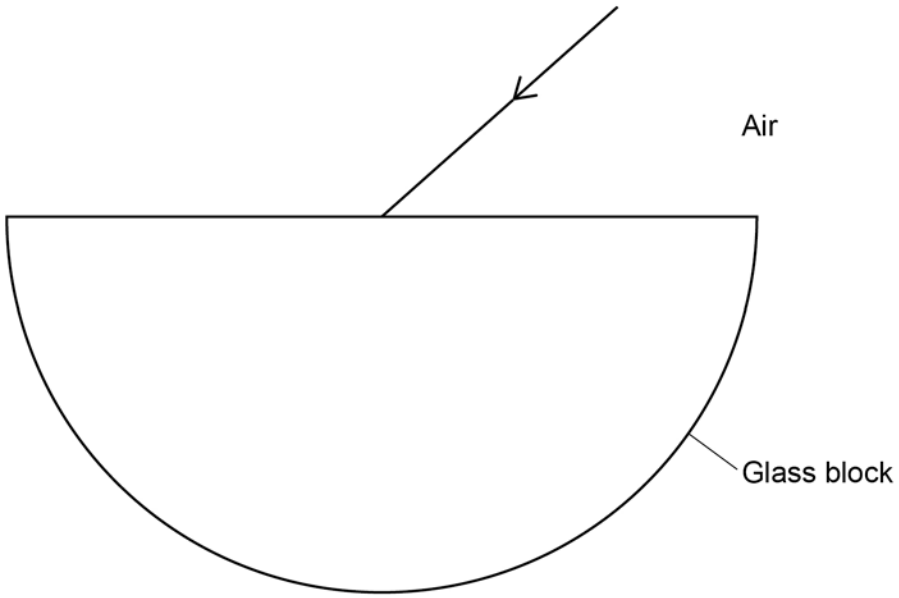


0 3 . 1 Complete **Figure 4** by drawing wave fronts after they have left the glass block.

[1 mark]

0 3 . 2 **Figure 5** shows a ray of light incident on a semi-circular glass block.

Figure 5



Complete the ray diagram in **Figure 5**.

- Draw the ray of light passing through and leaving the glass block.
- Label the angle of refraction.

[4 marks]

0 3 . 3 Explain why the light is refracted.

[2 marks]

Question 3 continues on the next page

Turn over ►

0 3 . 4 A student investigated how different coloured light was refracted by glass.

The student aimed rays of different coloured light at a glass block.

She measured the angle of refraction for each colour.

Give **two** variables that the student should control.

[2 marks]

1 _____

2 _____

Table 1 shows the student's results.

Table 1

Colour of light	Angle of refraction in degrees
Red	27.94
Orange	27.90
Yellow	27.82
Green	27.78
Blue	27.70

0 3 . 5 Explain why these results could **not** have been obtained with a normal protractor.

[2 marks]

_____

_____

_____

_____

0 3 . 6 What conclusion can be made about the relationship between the wavelength of light and the angle of refraction?

[1 mark]

0 3 . 7 Glass does **not** transmit ultraviolet radiation.

Suggest what happens to ultraviolet radiation when it is incident on glass.

[1 mark]

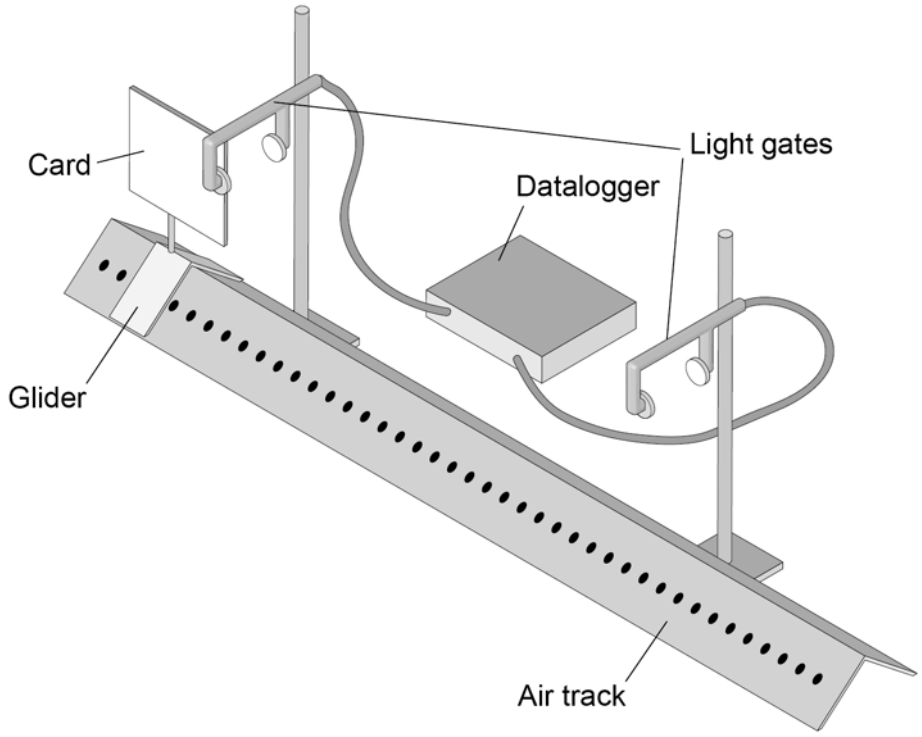
13

Turn over for the next question

0 4 A student investigated the motion of a glider on an air track.

Figure 6 shows the apparatus.

Figure 6



0 4 . 1 The speed of the glider is the same at both ends of the air track.

What is the tendency for objects to continue at the same speed in the same direction called?

[1 mark]

_____

0 4 . 2 The glider has a mass of 0.14 kg and a velocity of 17 cm/s

Calculate the momentum of the glider.

[3 marks]

_____

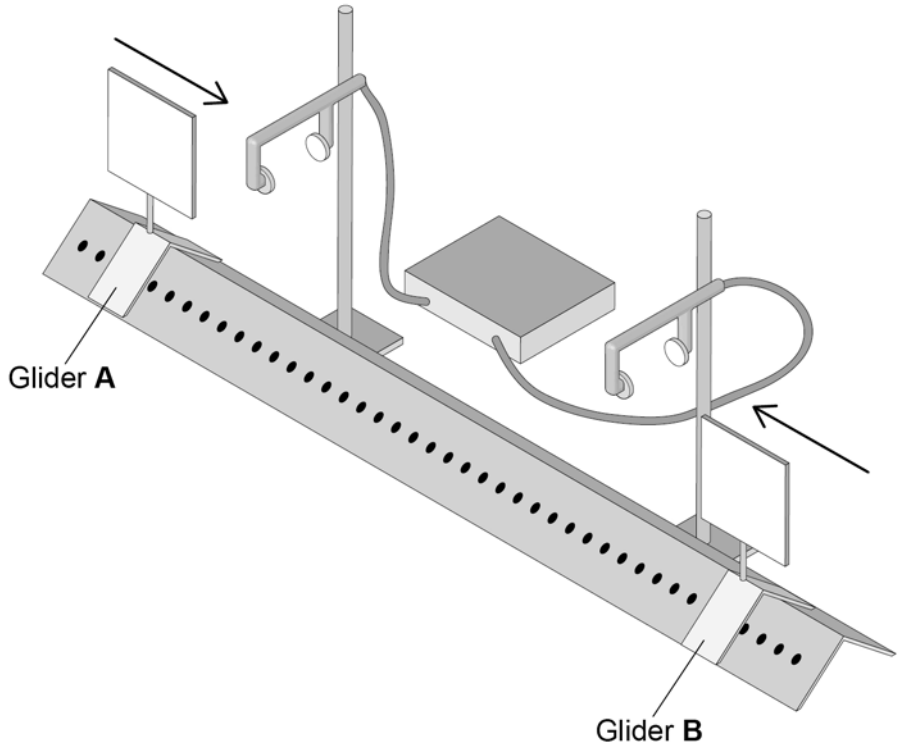
_____

_____

Momentum = _____ kg m/s

0 4 . 3 **Figure 7** shows two identical gliders travelling at the same speed in opposite directions.

Figure 7



The gliders collide and stick together.

Explain what happens to the momentum and speed of the gliders.

[4 marks]

Question 4 continues on the next page

0 4 . 4 The light gate on the air track shown in **Figure 8** aims a beam of light at a sensor.

A datalogger calculates the speed of the glider.

The datalogger divides the length of card by the time for which the card breaks the beam of light.

Figure 8

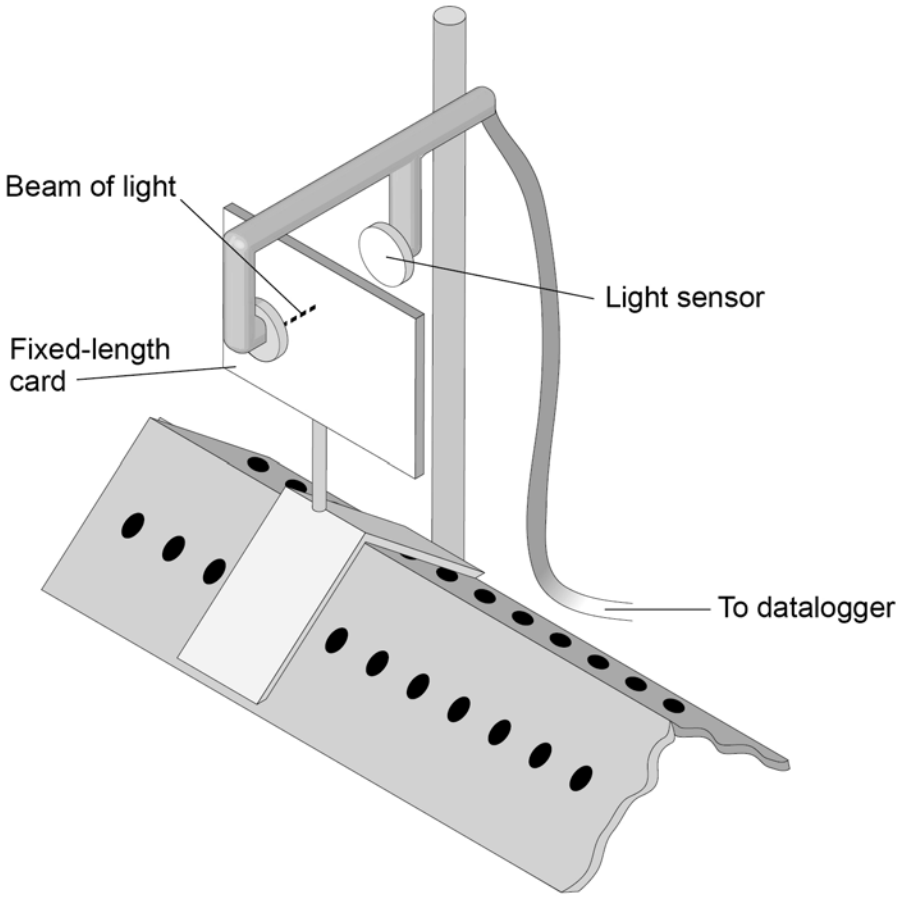
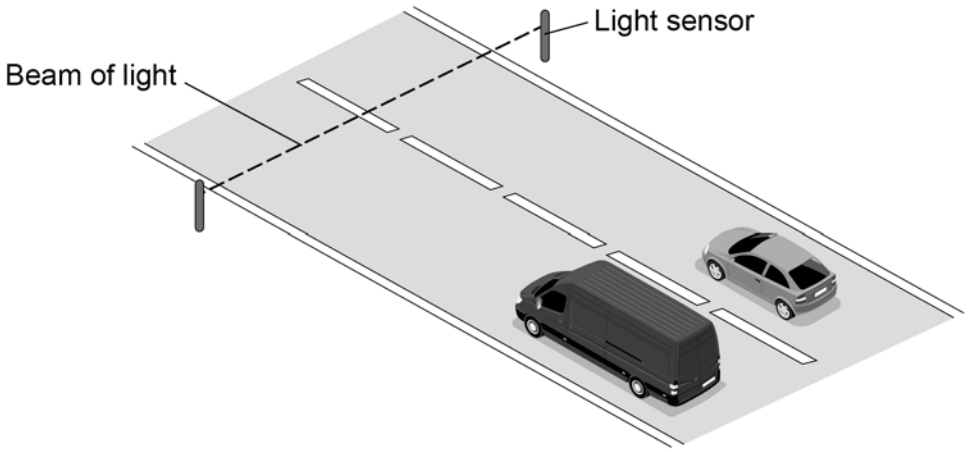


Figure 9 shows two vehicles on a road.

Figure 9



The beam of light and light sensor shown in **Figure 9** are **not** suitable for determining the speed of vehicles on the road.

Give **two** reasons why they are **not** suitable.

Give an explanation for each reason.

[4 marks]

Reason1 _____

_____

Explanation _____

_____

Reason 2 _____

_____

Explanation _____

_____

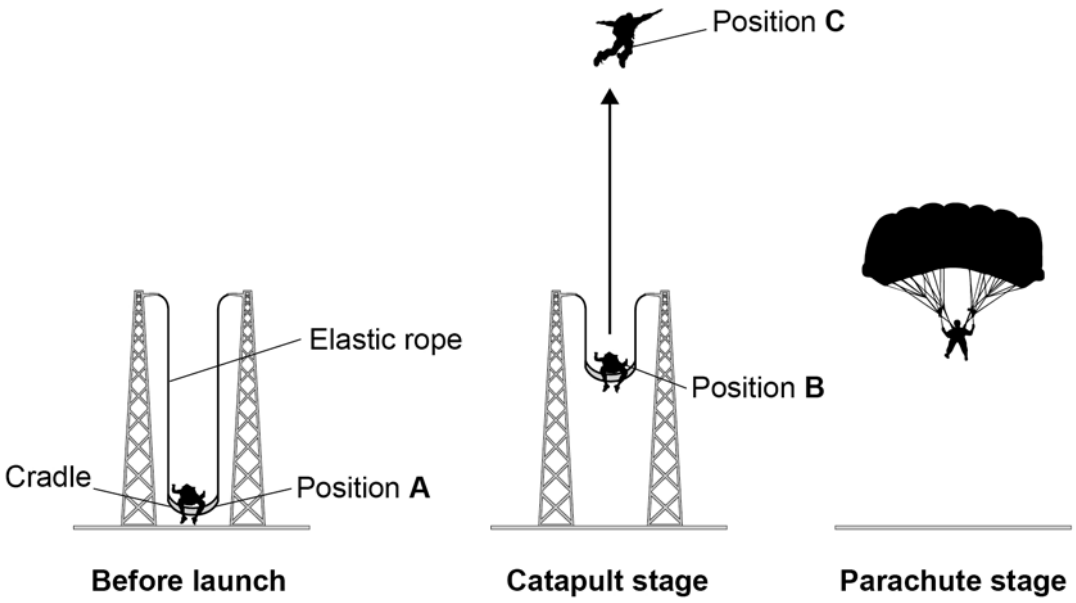
12

Turn over ►

0 5 **Figure 10** shows the stages of an extreme sport called 'human catapult'.

- A person lies in a cradle which is held to the ground.
- The cradle is released.
- The person is launched vertically into the air by an elastic rope.
- The person then parachutes back to the ground.

Figure 10



0 5 . 1 In position **A** there is a store of elastic energy.

Position **C** is the person's maximum height.

Describe the energy transfers from position **A**, through position **B**, to position **C**.

[3 marks]

0 5 . 2 In the last few metres of his descent during the parachute stage, the person travels at a terminal velocity.

Explain why.

[2 marks]

0 5 . 3 When stretched in position **A**, the elastic rope stores 25 000 joules.

The elastic rope behaves like a spring, with a spring constant of 125 N/m

Calculate the extension of the elastic rope.

[4 marks]

Use the Physics Equations Sheet.

Extension of elastic rope = _____ m

Question 5 continues on the next page

Turn over ►

0 5 . 4 The vertical velocity of the person at position **B** in **Figure 10** is 26 m/s

The vertical velocity at position **C** is 0 m/s

Calculate the distance between position **B** and position **C**.

[4 marks]

Use the Physics Equations Sheet.

Distance = _____ m

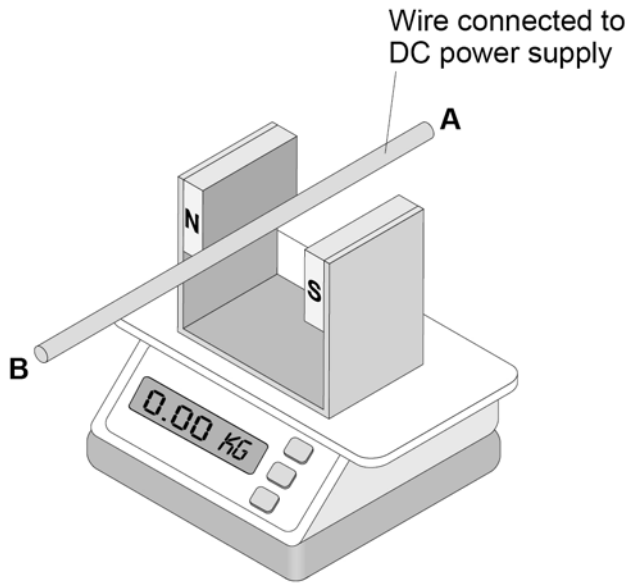
13

0 6 A student placed a permanent magnet on a top-pan balance.

He clamped a straight piece of wire so that it was suspended in the magnetic field.

Figure 11 shows the apparatus.

Figure 11



0 6 . 1 When a current passed through the wire from **A** to **B**, the reading on the balance increased.

Explain why.

[4 marks]

Question 6 continues on the next page

0 6 . 2 The student increased the current in the wire.

Sketch a graph on **Figure 12** to show the relationship between the current and magnetic force on the wire.

Label the axes, with the independent variable on the x-axis.

[2 marks]

Figure 12

0 6 . 3 The length of the wire in the magnetic field in **Figure 11** is 4.8×10^{-2} m

The current in the wire is 0.80 A

The reading on the balance is 1.2×10^{-3} kg

Gravitational field strength = 9.8 N/kg

Calculate the magnetic flux density of the permanent magnet.

[5 marks]

Use the Physics Equations Sheet.

Magnetic flux density = _____ tesla

11

END OF QUESTIONS

Turn over ►

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED