Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier — Physics Paper 2F

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

Materials

For this paper you must have:
- a ruler
- a scientific calculator
- 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.

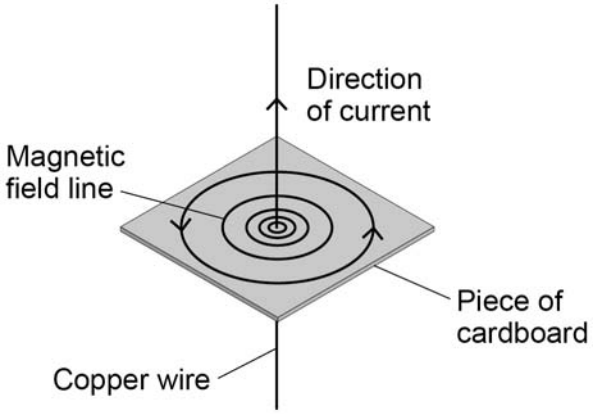
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 1 **Figure 1** shows the magnetic field around a copper wire carrying a current.

Figure 1



0 1 . 1 What do the arrows on the magnetic field line represent?

[1 mark]

_____

_____

0 1 . 2 Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**increases**	**stays the same**

As the distance from the copper wire increases, the

magnetic field strength _____ .

Question 1 continues on the next page

0 1 . 3 Suggest how the field lines on **Figure 1** show the variation in field strength.

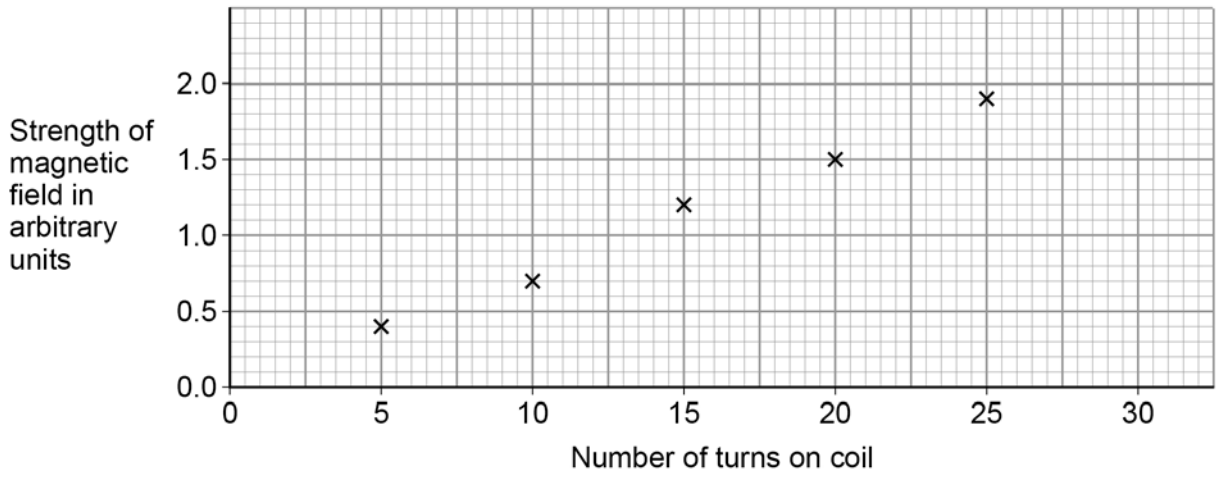
[2 marks]

A student coiled the copper wire a different number of times to form a solenoid.

Each time the student measured the strength of the magnetic field inside the solenoid.

Figure 2 shows the results.

Figure 2



0 1 . 4 Draw a line of best fit on **Figure 2**.

[1 mark]

0 1 . 5 Determine the increase in strength of magnetic field when the number of turns on the coil is changed from 12 to 18

[2 marks]

Increase in strength of magnetic field = _____ arbitrary units

0 1 . 6 How could the strength of the magnetic field be increased?

[2 marks]

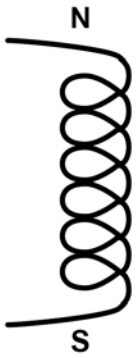
Tick **two** boxes.

- Increase the current through the solenoid. ☐
- Increase the potential difference across the solenoid. ☐
- Increase the temperature of the solenoid. ☐
- Spread the turns of wire on the solenoid further apart. ☐
- Use wire with a higher resistance to make the solenoid. ☐

Question 1 continues on the next page

0 1 . 7 **Figure 3** shows the north and south poles of a solenoid.

Figure 3



Draw field lines to show the magnetic field around the solenoid.

[2 marks]

0 1 . 8 How can the solenoid be made into an electromagnet?

[1 mark]

_____

_____

12

0 2 . 1 Complete the sentences.

Choose the answers from the box.

[2 marks]

ionising	**light**	**sound**	**transmitted**	**waves**

X-rays travel at the speed of _____ .

X-rays can cause cancer because they are _____ .

0 2 . 2 How do X-rays compare with gamma rays?

[1 mark]

Tick **one** box.

X-rays have a longer wavelength and a higher frequency ☐

X-rays have a longer wavelength and a lower frequency ☐

X-rays have a shorter wavelength and a higher frequency ☐

X-rays have a shorter wavelength and a lower frequency ☐

Question 2 continues on the next page

A scientist measured the radiation dose that a person received at different distances from an X-ray machine.

Table 1 shows the results.

Table 1

Distance from machine in m	Dose in millisieverts			Mean dose in millisieverts
	Test 1	Test 2	Test 3	
0.5	0.152	0.146	0.155	0.151
1.0	0.039	0.035	0.040	**X**
1.5	0.017	0.018	0.017	0.017
2.0	0.012	0.007	0.007	0.009
2.5	0.007	0.006	0.005	0.006

0 2 . 3 Calculate value **X** in **Table 1**.

[2 marks]

Mean dose = _____ millisieverts

0 2 . 4 What conclusion can be made from the results in **Table 1**?

[1 mark]

Tick **one** box.

The dose decreases if you stand further from the machine. ☐

The dose is directly proportional to the distance. ☐

The dose is the same at all distances from the machine. ☐

There is a linear relationship between dose and distance. ☐

0 2 . 5 An X-ray gives a radiation dose of 0.180 millisieverts.

Natural sources give a dose of 0.012 millisieverts per day.

Calculate the time it would take for natural sources to give a dose of 0.180 millisieverts.

[2 marks]

Time = _____ days

0 2 . 6 Suggest why doctors use X-rays even though this increases the risk of cancer to the patient.

[1 mark]

0 2 . 7 X-rays can also be used to treat cancer.

A patient receives a dose of 20 millisieverts from an X-ray.

Proton beam therapy delivers 40% of this dose.

Calculate the dose delivered by proton beam therapy.

[2 marks]

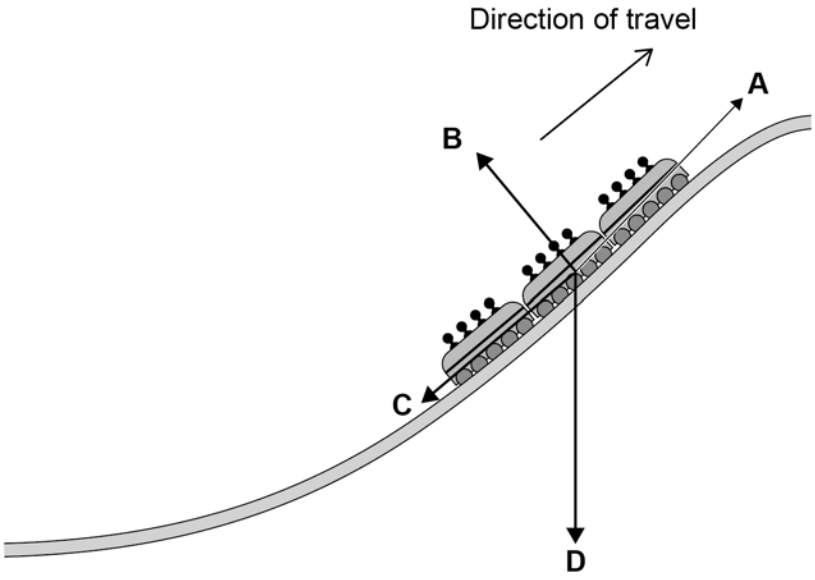
Dose = _____ millisieverts

11

0 3 **Figure 4** shows a rollercoaster train as it is pulled up a slope on the track.

The arrows, **A**, **B**, **C** and **D**, represent the forces acting on the rollercoaster train.

Figure 4



0 3 . 1 Give **two** ways that the force arrows show that forces are vector quantities.

[2 marks]

1 _____

2 _____

0 3 . 2 Which arrow shows the weight of the rollercoaster train?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 3 . 3 Which arrow shows the normal contact force?

[1 mark]

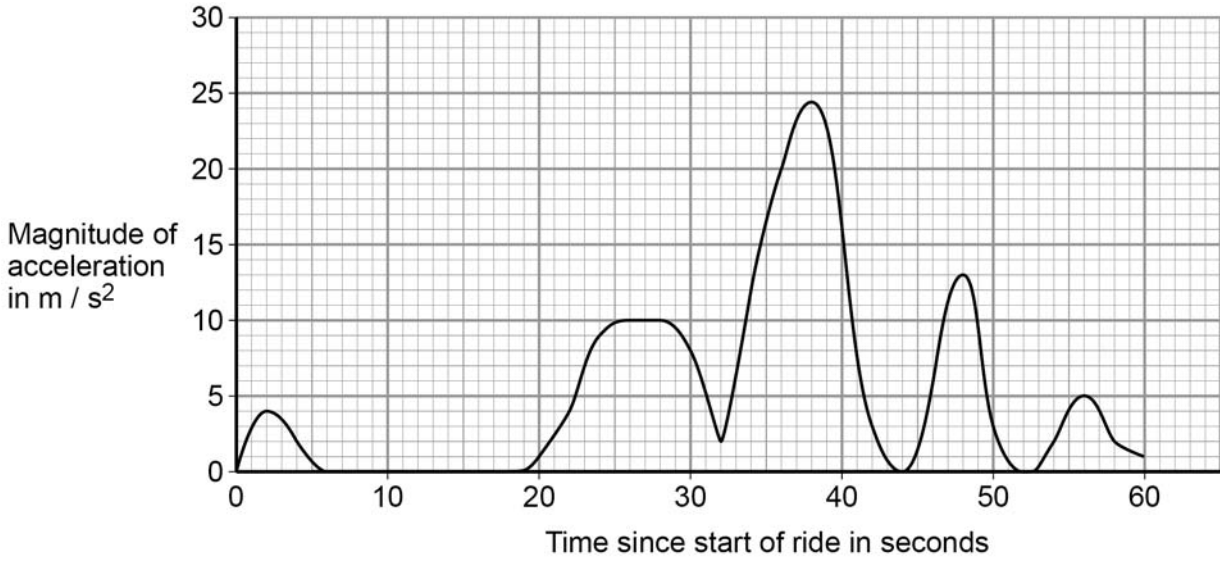
Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Question 3 continues on the next page

Figure 5 shows the magnitude of the acceleration of the rollercoaster train during the ride.

Figure 5



0 3 . 4 Why has a line graph been drawn instead of a bar chart?

[1 mark]

Tick **one** box.

Acceleration is a control variable. ☐

Both variables are continuous. ☐

Line graphs are easier to read. ☐

Time is a categoric variable. ☐

0 3 . 5 What conclusion can be made from **Figure 5** about the motion of the rollercoaster train between 10 and 15 seconds?

[1 mark]

Tick **one** box.

It is moving at a constant velocity. ☐

Its velocity is decreasing. ☐

Its velocity is increasing. ☐

Question 3 continues on the next page

0 3 . 6 What is the maximum acceleration of the rollercoaster train?

Use **Figure 5** on page 12.

[1 mark]

Acceleration = _____ m/s^2

0 3 . 7 The maximum safe acceleration for most people is 5 times the acceleration due to gravity.

Acceleration due to gravity = 9.8 m/s^2

Explain whether the acceleration of this rollercoaster train is safe for most people.

[3 marks]

0 3 . 8 One of the passengers on the rollercoaster train has a mass of 58 kg

Calculate the maximum force experienced by the passenger during the ride.

Use the equation:

force = mass × acceleration

Give the unit.

[3 marks]

Maximum force = _____ Unit _____

13

Turn over for the next question

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 4 **Figure 6** shows an electric wheelchair.

Figure 6

0 4 . 1 The wheelchair moves at a constant speed of 2.4 m/s for 4.5 seconds.

Calculate the distance moved by the wheelchair.

Use the equation:

distance = speed × time

[2 marks]

Distance = _____ m

Question 4 continues on the next page

0 4 . 2 What could be a reason for the speed of the wheelchair decreasing?

[1 mark]

Tick **one** box.

It started going downhill. ☐

It started going uphill. ☐

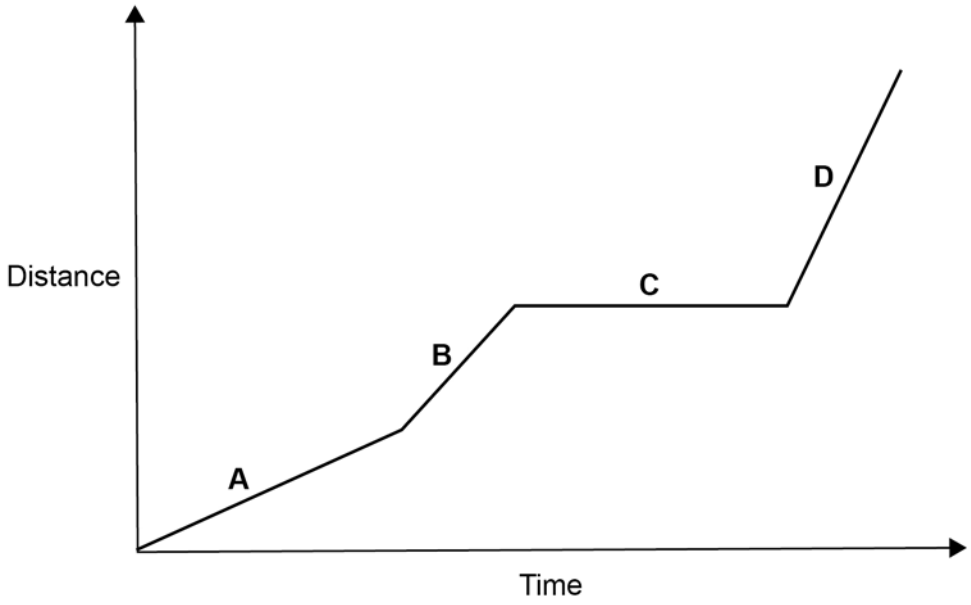
Its store of kinetic energy increased. ☐

It used more power from its battery. ☐

A student measured how the distance travelled by the wheelchair changed over time.

Figure 7 shows a sketch-graph of the results.

Figure 7



0 4 . 3 In which section of the graph, **A**, **B**, **C**, or **D**, did the wheelchair travel fastest?

Give the reason for your answer.

[2 marks]

Section _____

Reason _____

_____

0 4 . 4 The student used a data logger with a distance sensor to record the data.

Give **two** advantages of using a data logger rather than using a stopclock and tape measure.

[2 marks]

1 _____

_____

2 _____

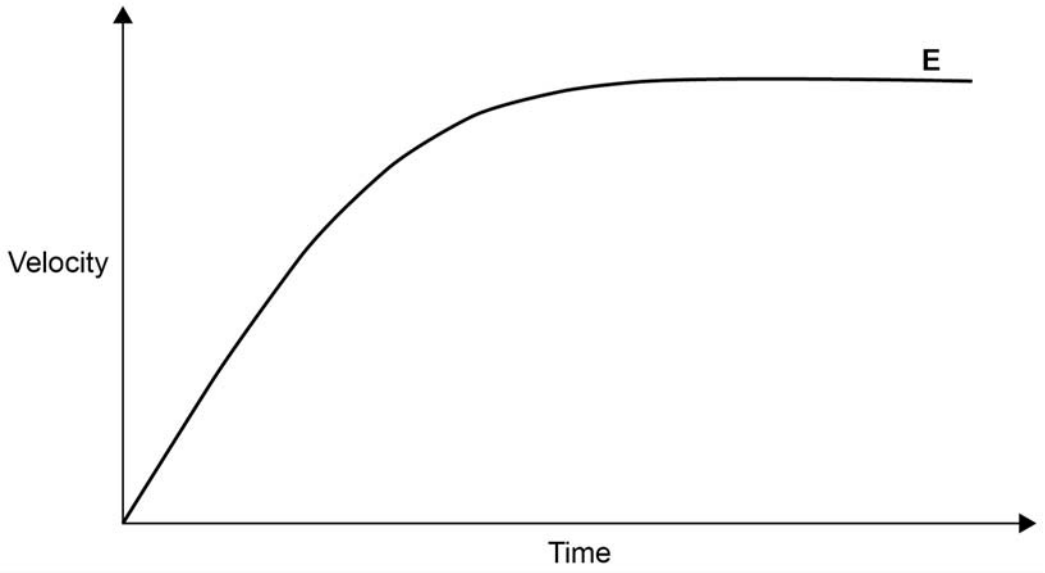
_____

Question 4 continues on the next page

The velocity of the wheelchair changes as it accelerates to its top speed.

Figure 8 shows a sketch-graph of the changes.

Figure 8



0 4 . 5 The forward force on the wheelchair is constant as it accelerates on flat ground.

Which force reduces the acceleration?

[1 mark]

Tick **one** box.

Air resistance ☐

Magnetism ☐

Tension ☐

Weight ☐

0 4 . 6 Explain the acceleration of the wheelchair at point **E** on **Figure 8**.

[2 marks]

0 4 . 7 The wheelchair starts from rest.

It accelerates at a constant rate until it has a speed of 1.5 m/s

The wheelchair travels a distance of 2.0 m while it is accelerating.

Calculate the acceleration of the wheelchair.

[3 marks]

Use the Physics Equations Sheet.

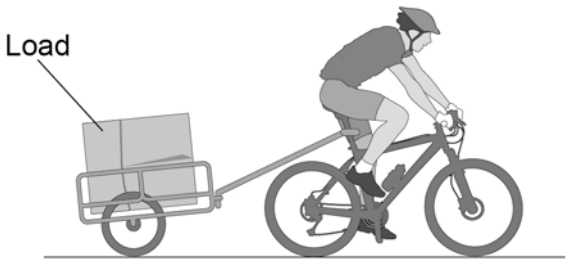
Acceleration = _____ m/s^2

13

Turn over for the next question

0 5 **Figure 9** shows a cyclist with a trailer attached to his bike.

Figure 9



0 5 . 1 Describe how Newton's Third Law applies to the forces between the bike and the trailer.

[2 marks]

0 5 . 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.

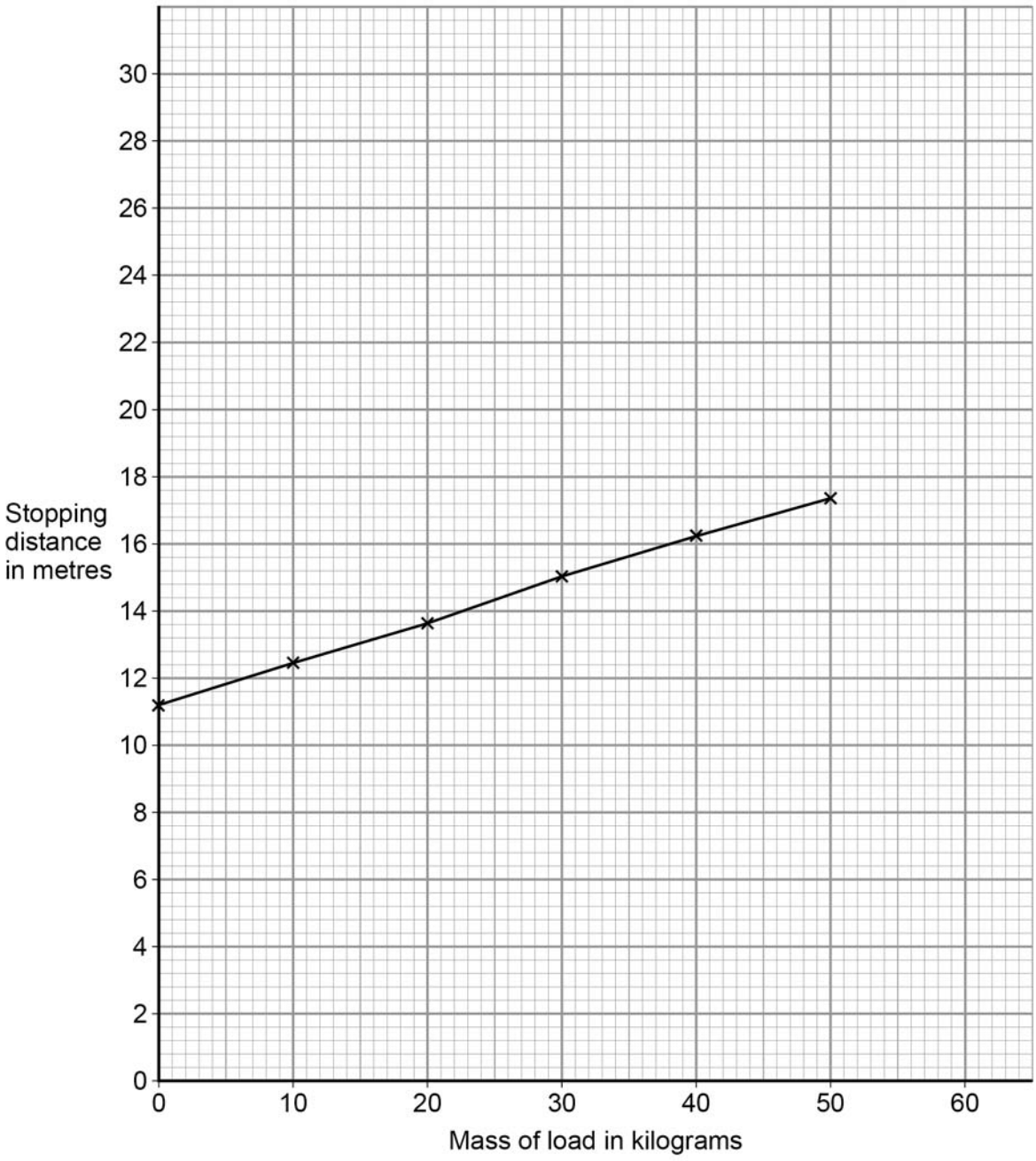
[2 marks]

1

2

0 5 . 3 **Figure 10** shows the results of the investigation.

Figure 10



Draw a line on **Figure 10** to show how the stopping distance would be different if a heavier cyclist rode the bike.

[1 mark]

Question 5 continues on the next page

Turn over ►

0 5 . 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]

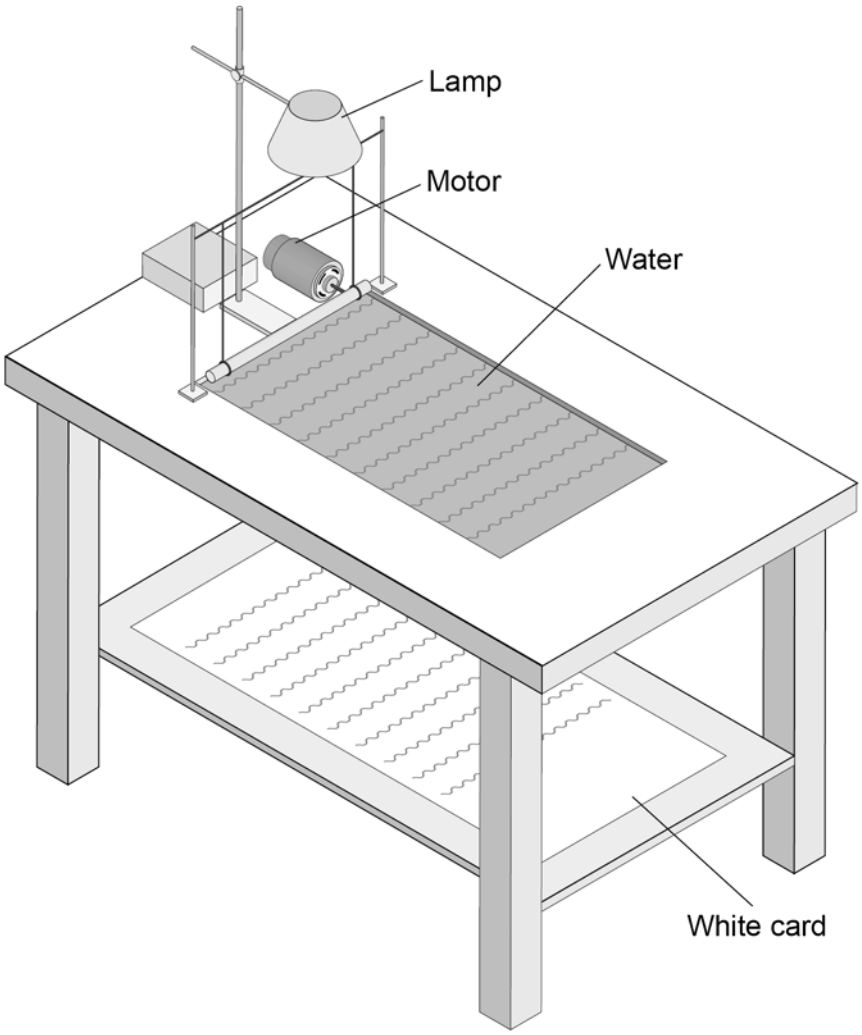
8

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

0 6 **Figure 11** shows a ripple tank.

Figure 11



0 6 . 1 The motor makes a noise when it is turned on.

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

[4 marks]

0 6 . 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 6 continues on the next page

0 6 . 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

END OF QUESTIONS