A

Surname ____________________

Other Names ____________________

Centre Number ____________________

Candidate Number ____________________

Candidate Signature ____________________

GCSE

F

COMBINED SCIENCE: TRILOGY

Foundation Tier
Physics Paper 2F

8464/P/2F

Friday 15 June 2018 Morning

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

J U N 1 8 8 4 6 4 P 2 F 0 1

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.**
- **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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1 . 1 **Which of these is a scalar quantity? [1 mark]**

Tick ONE box.

☐ **displacement**

☐ **distance**

☐ **force**

☐ **velocity**

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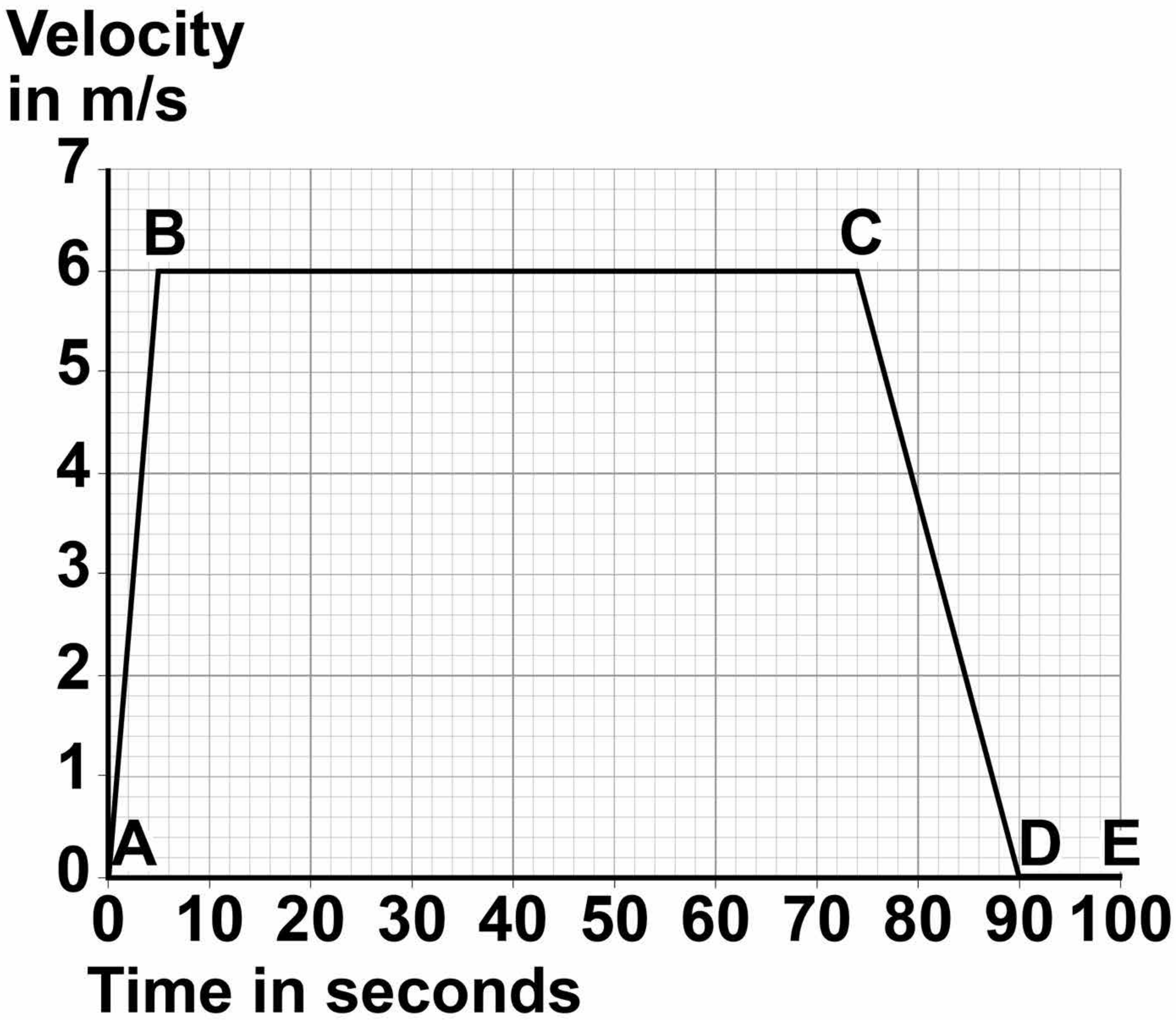
[Turn over]

FIGURE 1


Velocity in m/s
7
6
5
4
3
2
1
0
B
C
A
D
E
0
10
20
30
40
50
60
70
80
90
100
Time in seconds

0 1 . 2 A woman cycled along a straight flat road.

FIGURE 1, on the opposite page, shows how the woman's velocity changed with time.

Which part of the graph shows the woman moving at constant velocity? [1 mark]

Tick ONE box.

☐ BC ☐ CD ☐ DE

0 1 . 3 Which part of the graph shows the woman stationary? [1 mark]

Tick ONE box.

☐ BC ☐ CD ☐ DE

[Turn over]

Between points A and B the woman was accelerating.

0 1 . 4 **Use FIGURE 1 to determine the total time for which she was accelerating. [1 mark]**

____

____

Time = ____________________ s

[Turn over]

0 1 . 5 **Use FIGURE 1 to determine her increase in velocity between points A and B. [1 mark]**

____

____

Increase in velocity = ______________ m/s

0 1 . 6 **Calculate her acceleration between points A and B.**

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

[2 marks]

____

____

____

Acceleration = ___________ m/s^2

[Turn over]

0 1 . 7 **Estimate how a typical cycling speed of 6 m/s compares with a typical walking speed. [1 mark]**

Tick ONE box.

☐ **about twice as fast**

☐ **about four times faster**

☐ **about eight times faster**

8

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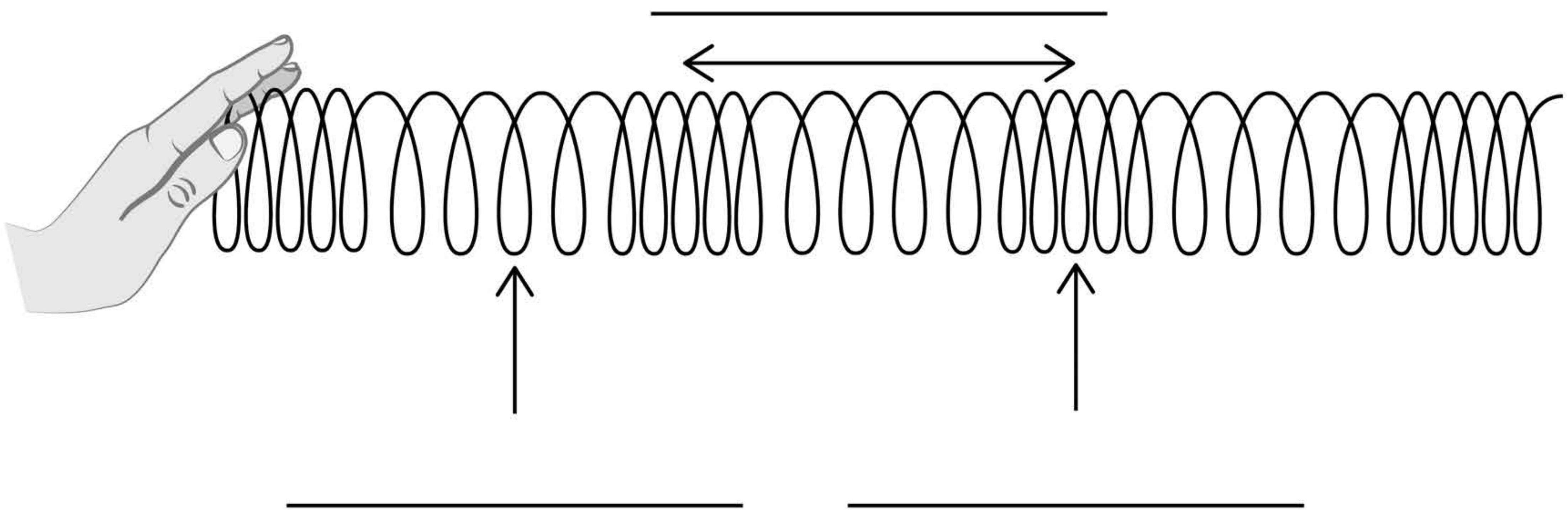
[Turn over]

0 2 FIGURE 2 shows a slinky spring used to model a sound wave.

FIGURE 2



0 2 . 1 Label the arrows on FIGURE 2

Choose the answers from the list. [3 marks]

amplitude
compression
frequency
rarefaction
wavelength

[Turn over]

0 2 . 2 **What type of wave is a sound wave? [1 mark]**

Tick ONE box.

☐ **electromagnetic**

☐ **longitudinal**

☐ **transverse**

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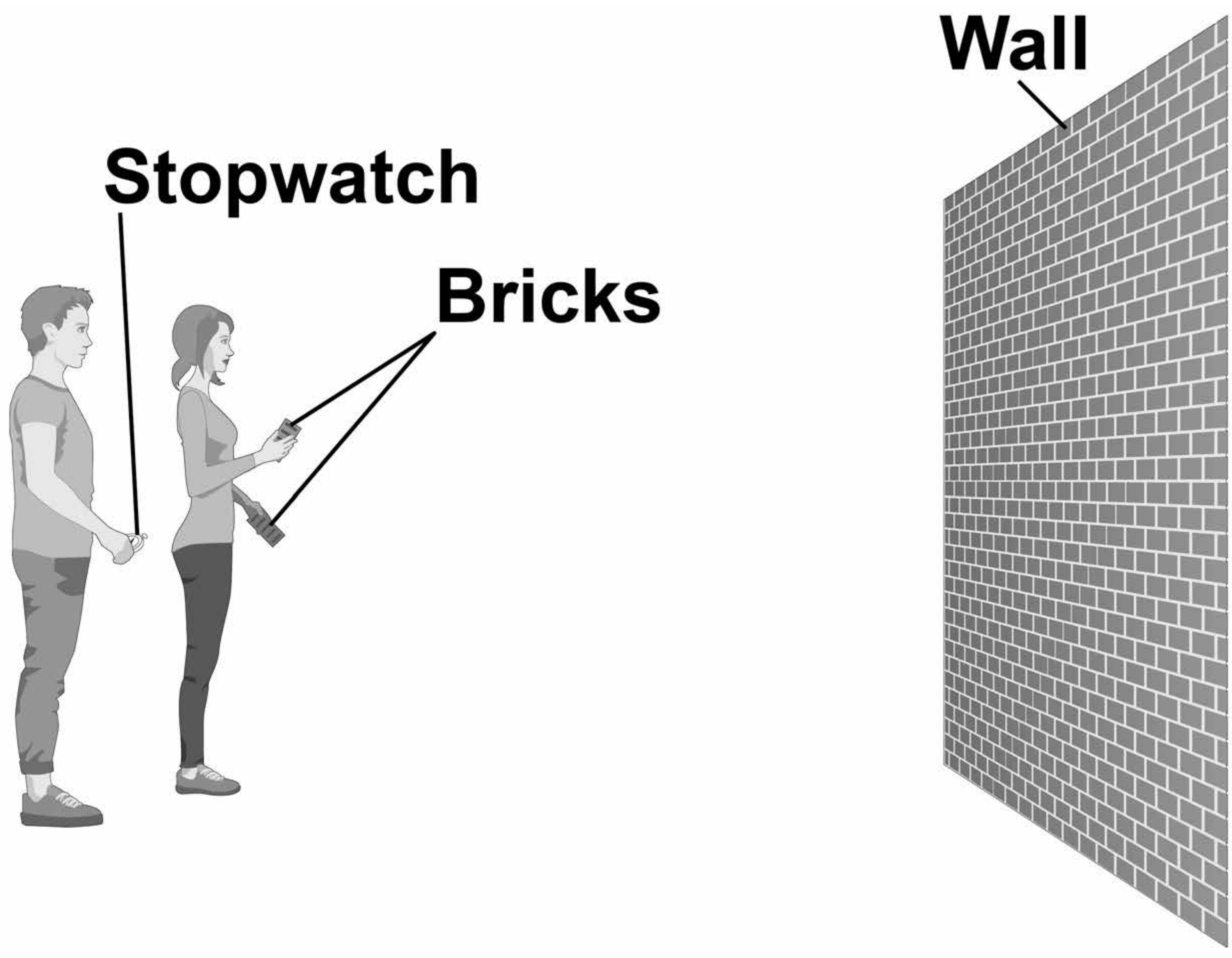
[Turn over]

0 2 . 3 **FIGURE 3 shows two students measuring the speed of sound in air.**

FIGURE 3



One student bangs two bricks together.

The sound wave produced is reflected from the wall and travels back to the students.

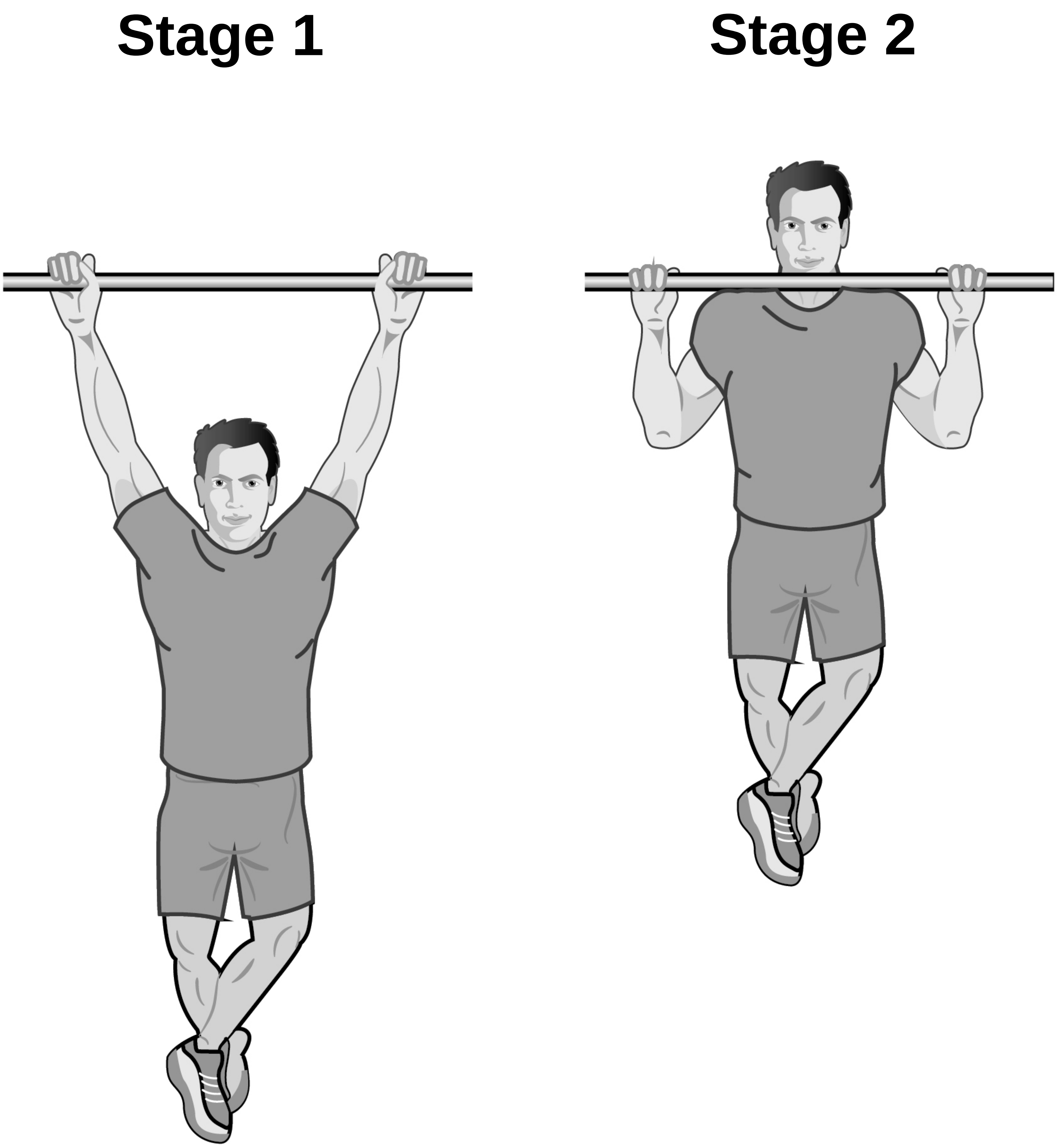
Describe how they can determine the speed of sound. [4 marks]

[Turn over]

8

0 3 **FIGURE 4 shows a man doing two stages of a pull up. In both diagrams the man is stationary.**

FIGURE 4



0 3 . 1 Complete the sentence.

Choose the answer from the list.
[1 mark]

equal to
less than
more than

In stage 1 the downwards force of the man on the bar is ______________________________ the upwards force of the bar on the man.

[Turn over]

03.2 **The man has a mass of 85 kg**

Gravitational field strength = 9.8 N/kg

Calculate the weight of the man.

Use the equation:

weight = mass × gravitational field strength
[2 marks]

____

____

Weight = ________________________ **N**

0 3 . 3 **The man raises his body a vertical distance of 0.63 m to go from stage 1 to stage 2**

Calculate the work done by the man.

Use your answer to question 03.2

Use the equation:

work done = force × distance

[2 marks]

____

____

____

Work done = ________________ J

[Turn over]

0 3 . 4 **The man was NOT moving at stage 2**

How much work is done by the man at stage 2? [1 mark]

Work done = ____________________ J

03.5 A woman uses the bar to do a pull up.

The woman has a mass of 62 kg

She accelerates at 11 m/s^2

Calculate the resultant force on the woman.

Use the equation:

force = mass × acceleration

[2 marks]

____

____

____

Force = ______________________________ N

__
8

0 4 FIGURE 5 shows types of waves within the electromagnetic spectrum.

Some of the types of waves are represented by letters.

FIGURE 5

P	microwaves	Q	visible light	R	S	gamma rays

0 4 . 1 Which letter shows the position of ultraviolet (UV) radiation within the electromagnetic spectrum? [1 mark]

Tick ONE box.

☐ P ☐ Q ☐ R ☐ S

04.2 A special lamp can produce UV radiation.

Which TWO statements describe the electromagnetic waves emitted by a UV lamp? [2 marks]

Tick TWO boxes.

- ☐ They have a higher frequency than X-rays.
- ☐ They have the same wave speed as visible light.
- ☐ They have a longer wavelength than microwaves.
- ☐ They have a lower frequency than gamma rays.
- ☐ They have a greater wave speed than radio waves.

0 4 . 3 **UV radiation is used to treat a vitamin D deficiency.**

People should NOT use a UV lamp for long periods of time.

State TWO risks of exposure to high levels of UV radiation.
[2 marks]

1 ______________________________

____

____

2 ______________________________

____

____

0 4 . 4 **Ionising radiation is used for some medical imaging.**

Name TWO types of electromagnetic waves that are used. [2 marks]

1 ____________________________________

____

2 ____________________________________

____

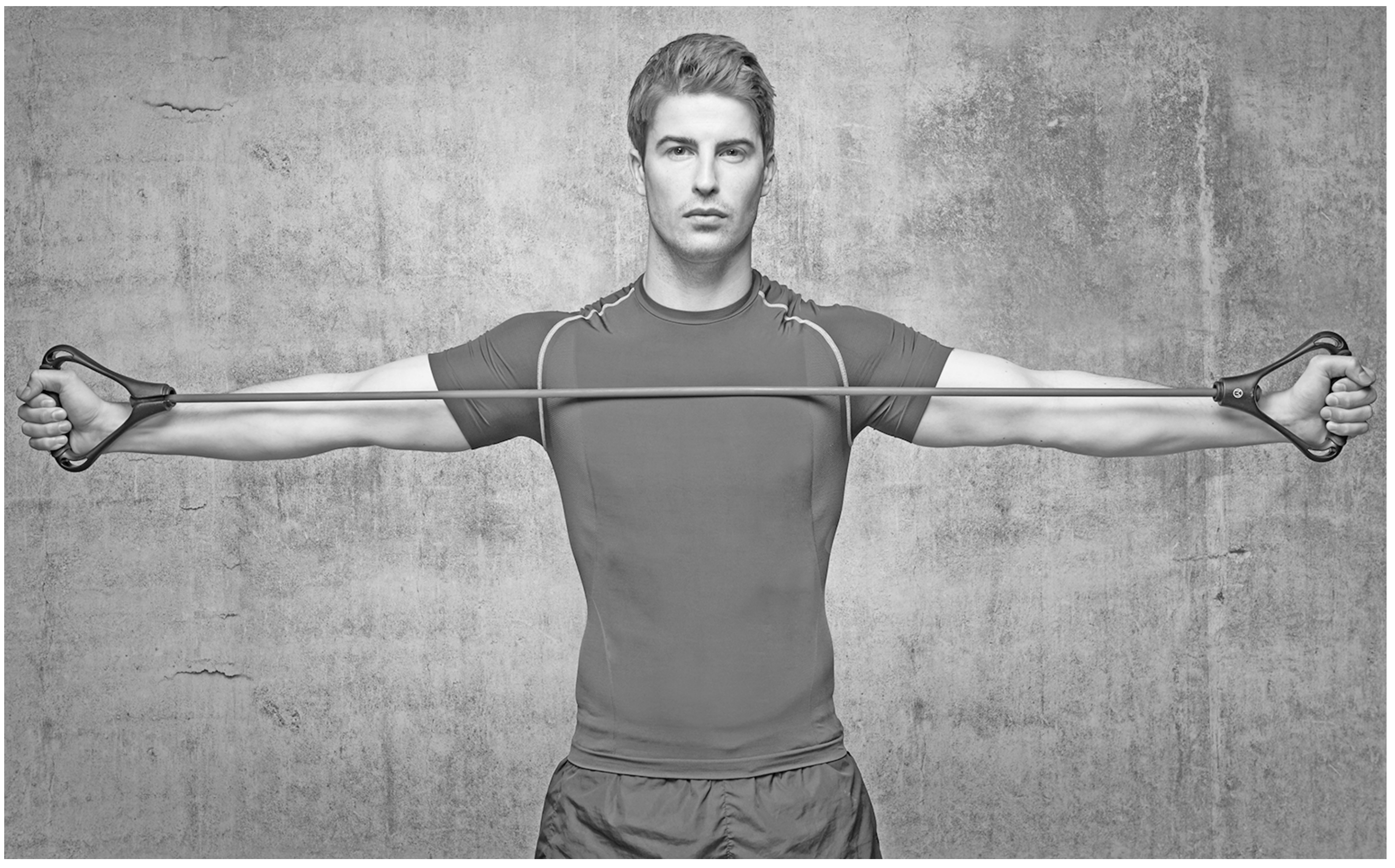
7

[Turn over]

0 5 **FIGURE 6 shows a man using a resistance band when exercising.**

The resistance band behaves elastically.

FIGURE 6



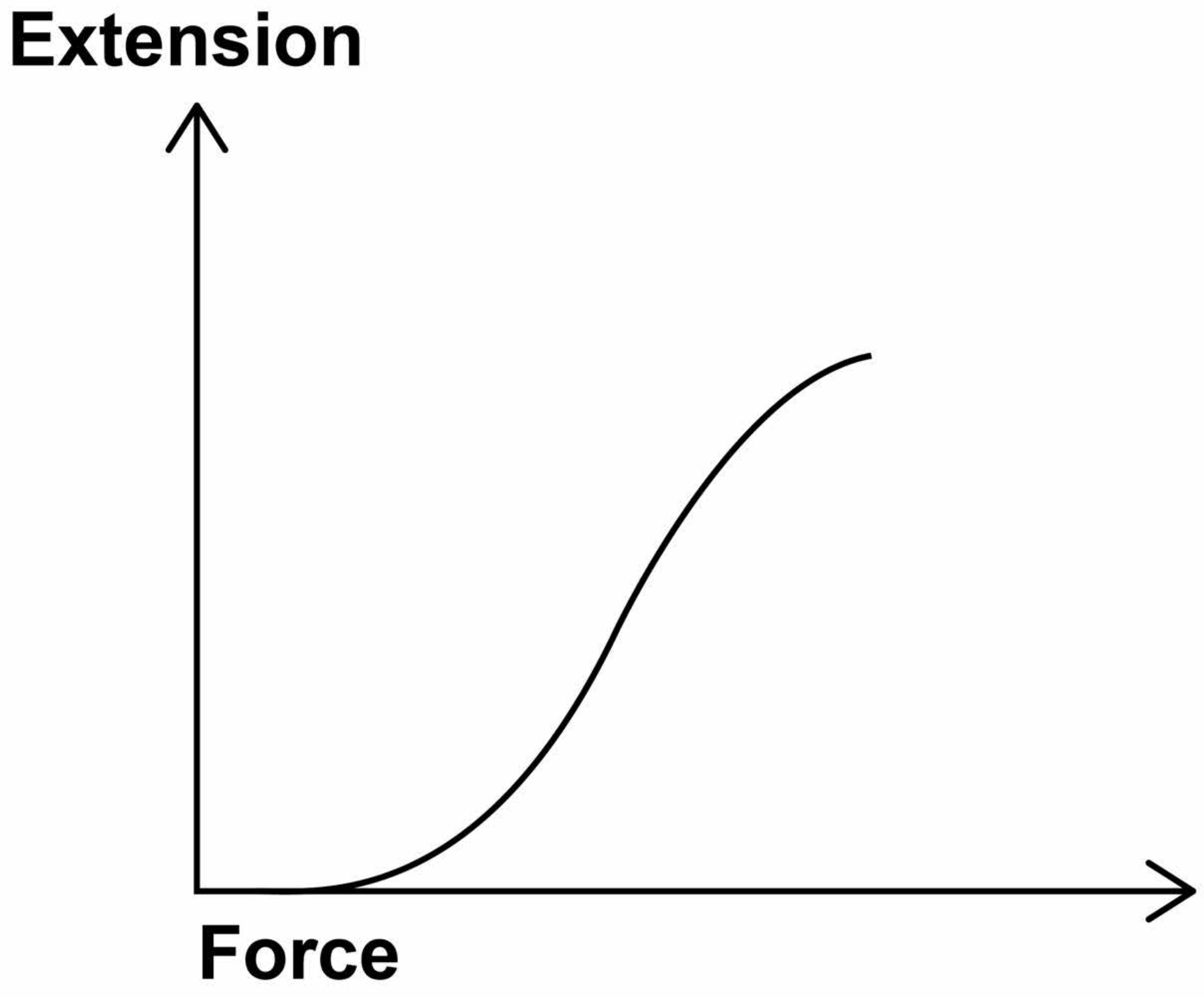
0 5 . 1 **What happens to the store of elastic potential energy of the resistance band when the band is stretched?**
[1 mark]

0 5 . 2 **Explain what happens to the resistance band as it is released.**
[2 marks]

[Turn over]

0 5 . 3 **FIGURE 7 shows how the extension of the resistance band changes as the force applied changes.**

FIGURE 7

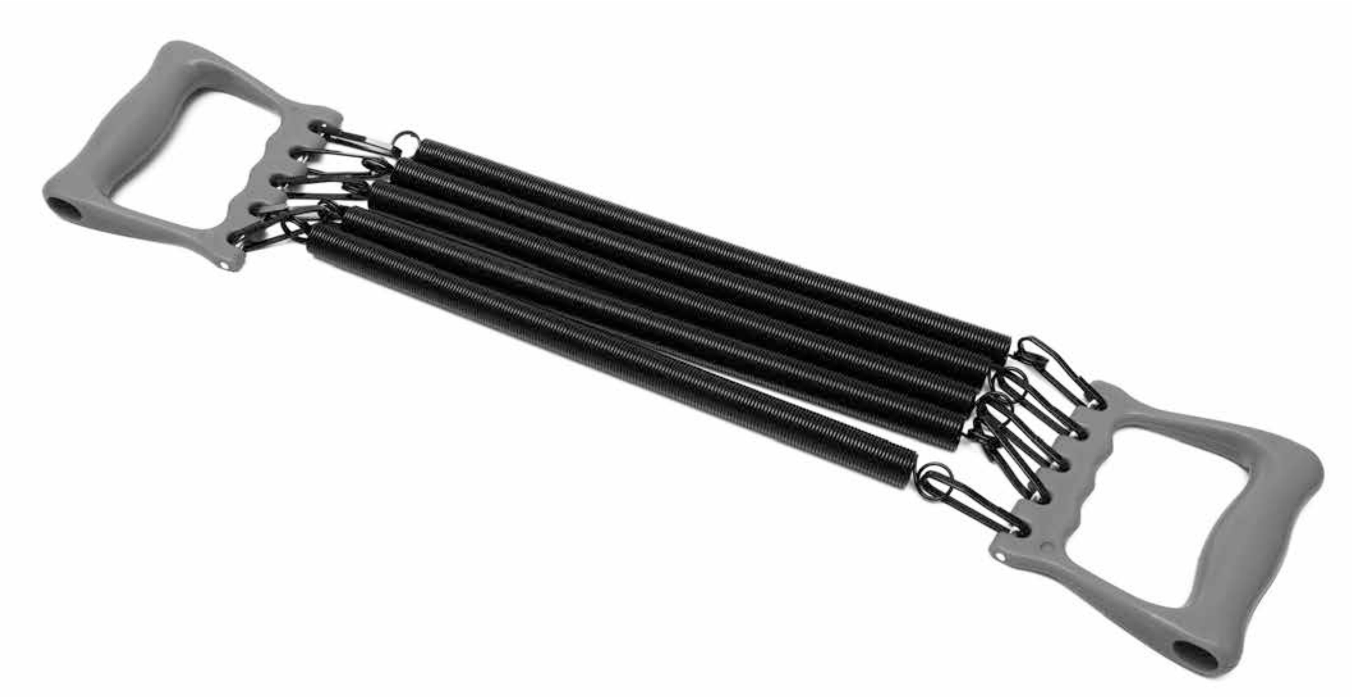


Describe the trend shown in the graph. [2 marks]

[Turn over]

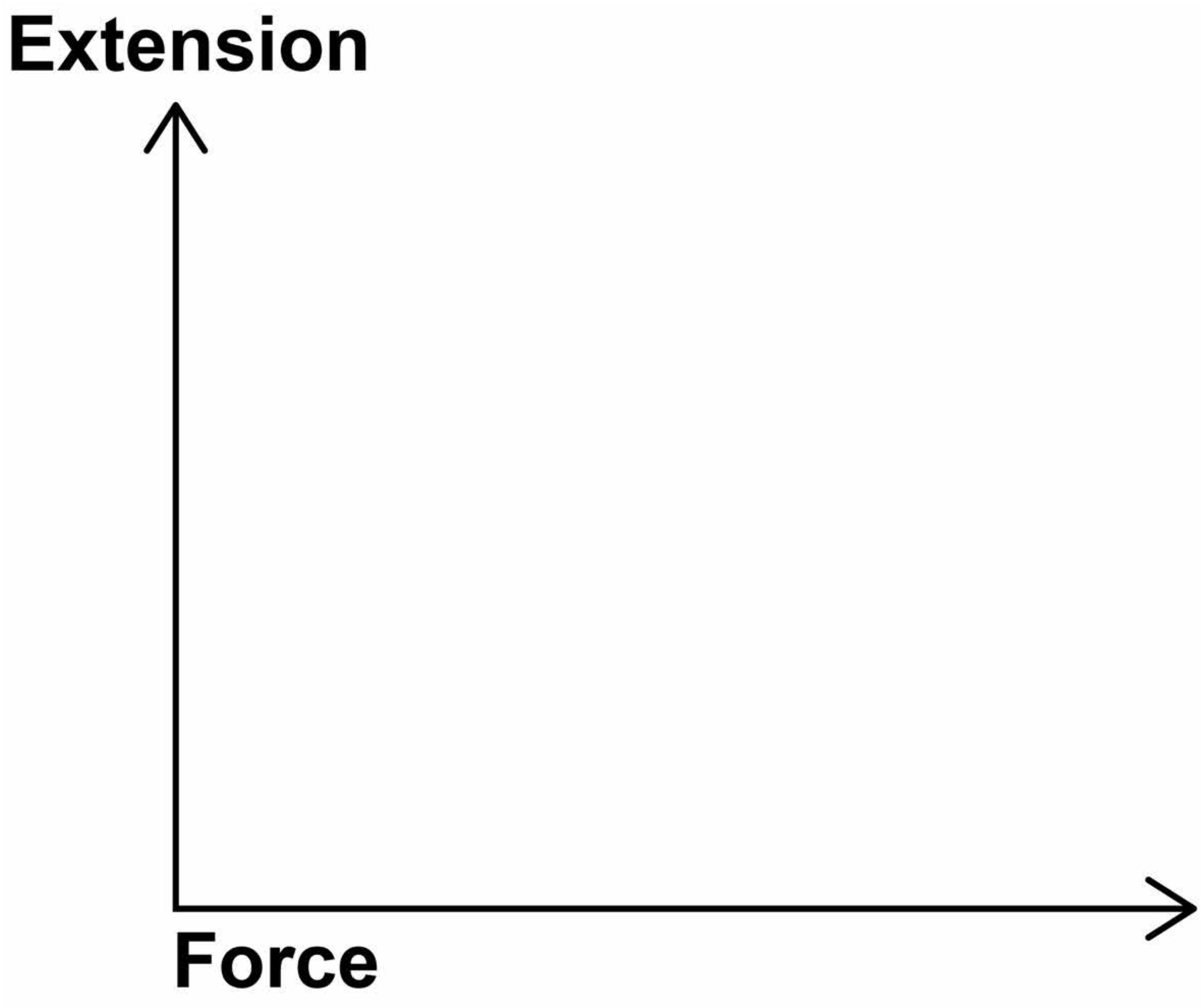
FIGURE 8 shows a chest expander.

FIGURE 8



05.4 **Sketch a graph on FIGURE 9 to show how the extension of a spring in the chest expander changes as the force applied changes.**
[2 marks]

FIGURE 9



[Turn over]

When a force is applied to a spring, the spring extends by 7.5 cm

0 5 . 5 Write down the equation that links extension, force and spring constant. [1 mark]

0 5 . 6 **Calculate the force applied to the spring.**

The spring has a spring constant of 1 600 N/m

Use your equation from question 05.5 [3 marks]

____

____

____

____

Force = _______________________________ N

11

0 6 **FIGURE 10 shows a lorry.**

FIGURE 10

0 6 . 1 **The brakes of the lorry are in a poor condition.**

What effect will the condition of the brakes have on thinking distance and the braking distance of the lorry? [2 marks]

Thinking distance ____________________

____

____

Braking distance ____________________

____

____

[Turn over]

0 6 . 2 **Using a hand-held mobile phone while driving is illegal in the United Kingdom.**

TABLE 1 shows the effect of using a mobile phone on thinking distance.

TABLE 1

	Thinking distance
Not using a mobile phone	19 m
Using a mobile phone with hands-free kit	23 m
Using a hand-held mobile phone	27 m

Explain why driving while using a hand-held mobile phone is more dangerous than using a mobile phone with a hands-free kit.

Use data from TABLE 1 [4 marks]

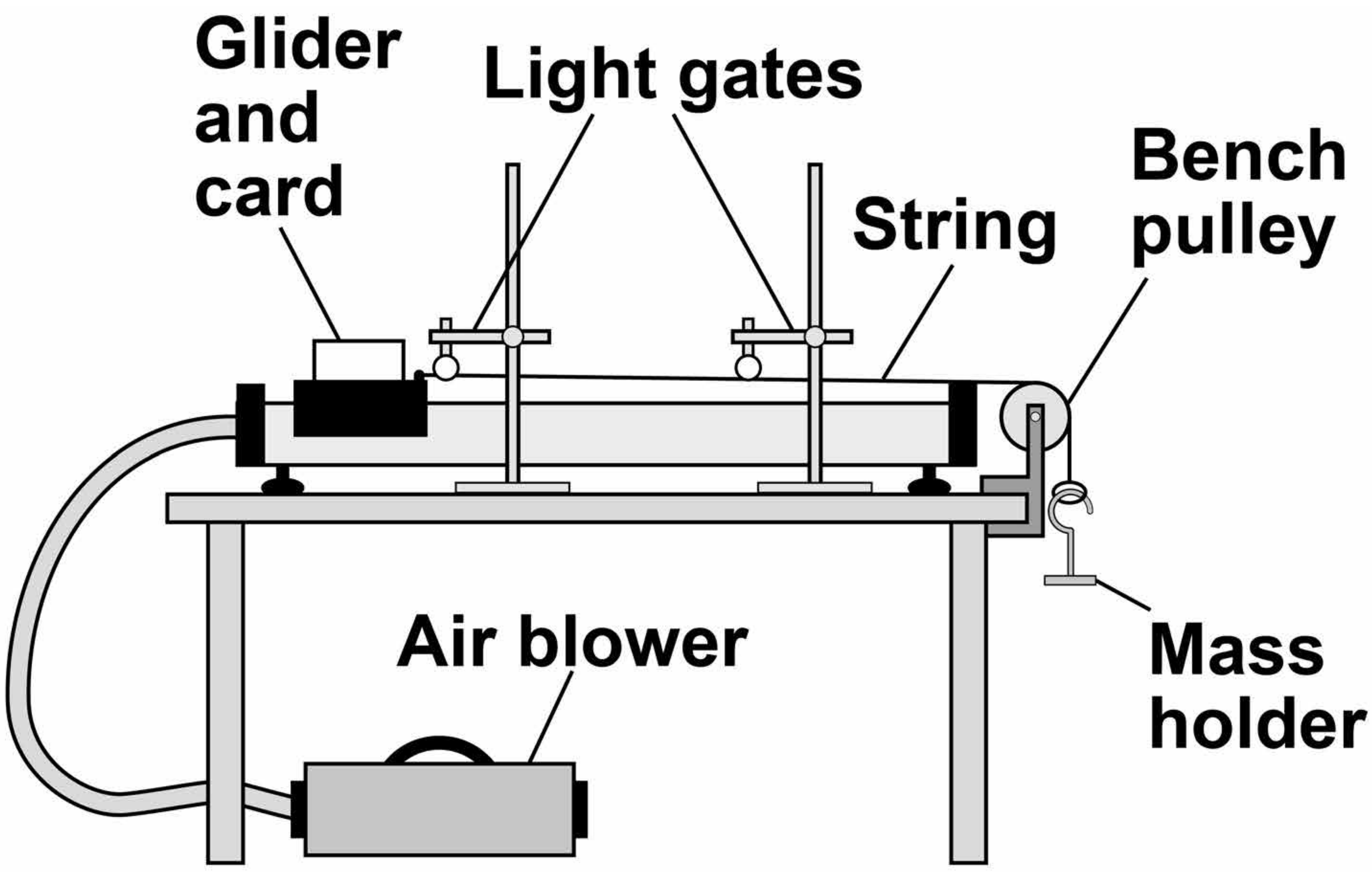
6

0 7 A student investigated acceleration using gliders, an air track and light gates.

The air track reduces friction between the glider and the track to zero.

FIGURE 11 shows the apparatus.

FIGURE 11



The glider was released from rest and moved along the track.

The mass holder hit the ground before the card passed through the second light gate.

0 7 . 1 **Which TWO statements describe the effect this would have on the glider? [2 marks]**

Tick TWO boxes.

☐ **Its acceleration would decrease to zero.**

☐ **Its acceleration would increase.**

☐ **The resultant force on it would decrease to zero.**

☐ **The resultant force on it would increase.**

☐ **Its speed would increase.**

0 7 . 2 The mass holder should NOT hit the ground before the card passes through the second light gate.

Suggest ONE way that the student could stop this happening.
[1 mark]

The student increased the resultant force acting on the glider by adding more masses to the mass holder.

She calculated the acceleration of the glider for each resultant force.

Each test was done three times.

TABLE 2 shows the results.

TABLE 2

Resultant force in N	Acceleration in m/s^2			Mean acceleration in m/s^2
	Test 1	Test 2	Test 3	
0.20	1.3	1.2	1.3	1.26667
0.39	2.6	2.5	2.6	2.6
0.59	3.8	3.8	3.9	3.8
0.78	5.1	5.1	5.1	5.1
0.98	6.4	7.2	6.4	6.7

[Turn over]

0 7 . 3 The student made TWO mistakes in the mean acceleration column.

Identify the mistakes the student made.

Suggest how each mistake can be corrected. [4 marks]

Mistake ____________________________

____

____

Correction __________________________

____

____

Mistake ____________________________

____

____

Correction ______________________________

____

____

0 7 . 4 **Write a conclusion for this investigation.**

Use the data in TABLE 2, on page 43. [1 mark]

____

____

____

0 7 . 5 **The student used a constant resultant force to accelerate the glider.**

The student changed the mass of the glider and calculated the new acceleration.

She repeated this for different masses of the glider, keeping the resultant force constant.

The results are shown in TABLE 3

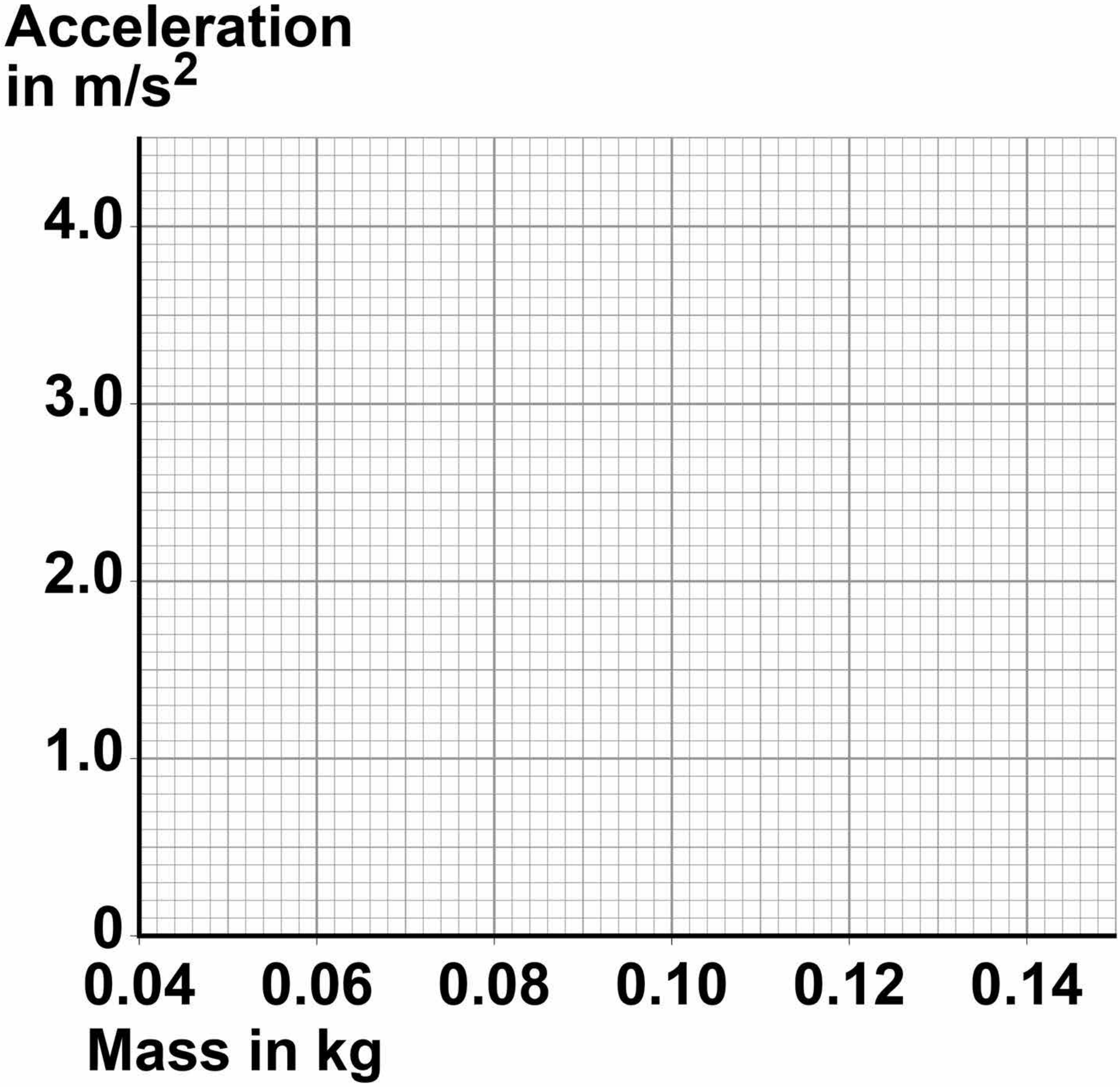
TABLE 3

Mass of the glider in kg	Acceleration in m/s^2
0.060	3.5
0.080	2.6
0.10	2.0
0.12	1.7
0.14	1.4

Plot the results on FIGURE 12

Draw a line of best fit. [3 marks]

FIGURE 12



0 7 . 6 Describe the relationship between mass and acceleration. [1 mark]

____

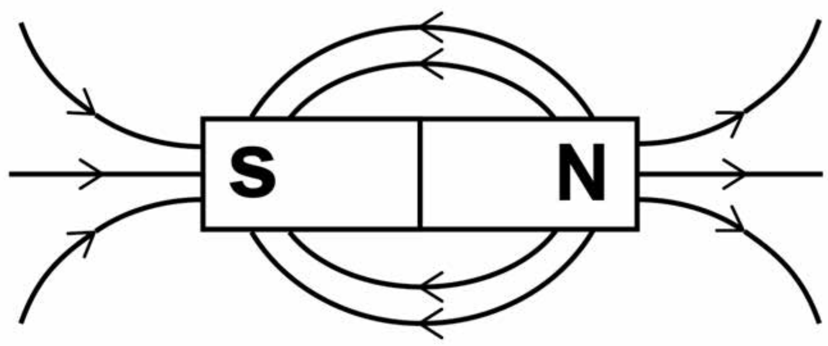
____

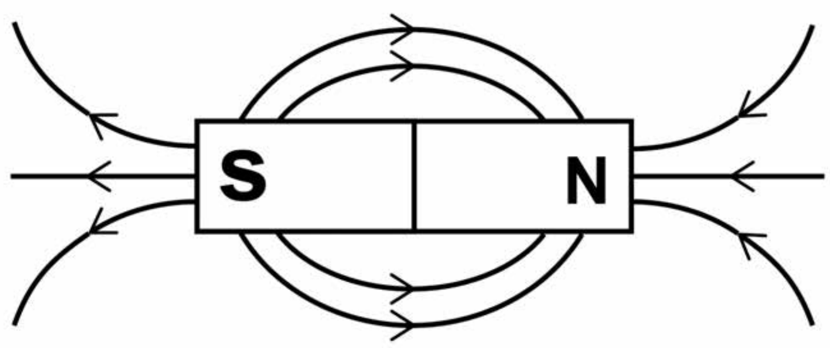
____

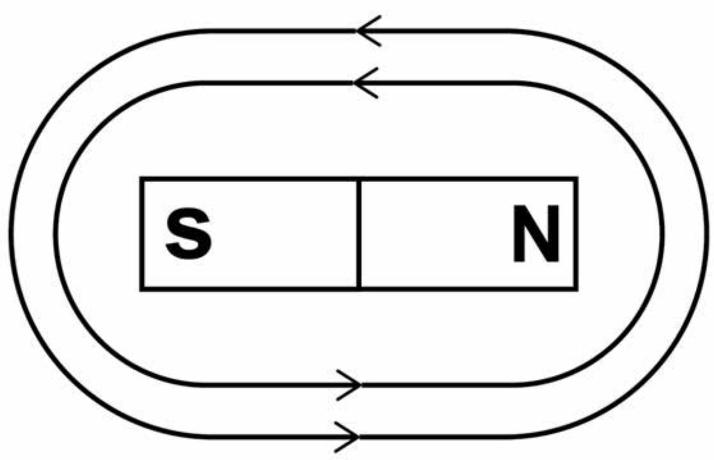
0 8 A magnet produces a magnetic field.

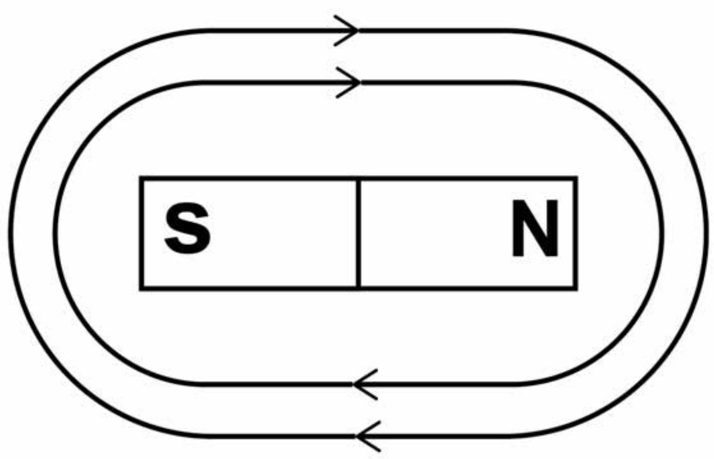
0 8 . 1 Which diagram shows the magnetic field pattern around a bar magnet? [1 mark]

Tick ONE box.

☐ 

☐ 

☐ 

☐ 

0 8 . 2 FIGURE 13 shows three metal blocks.

The blocks are not labelled.

One block is a permanent magnet, one is iron and one is aluminium.

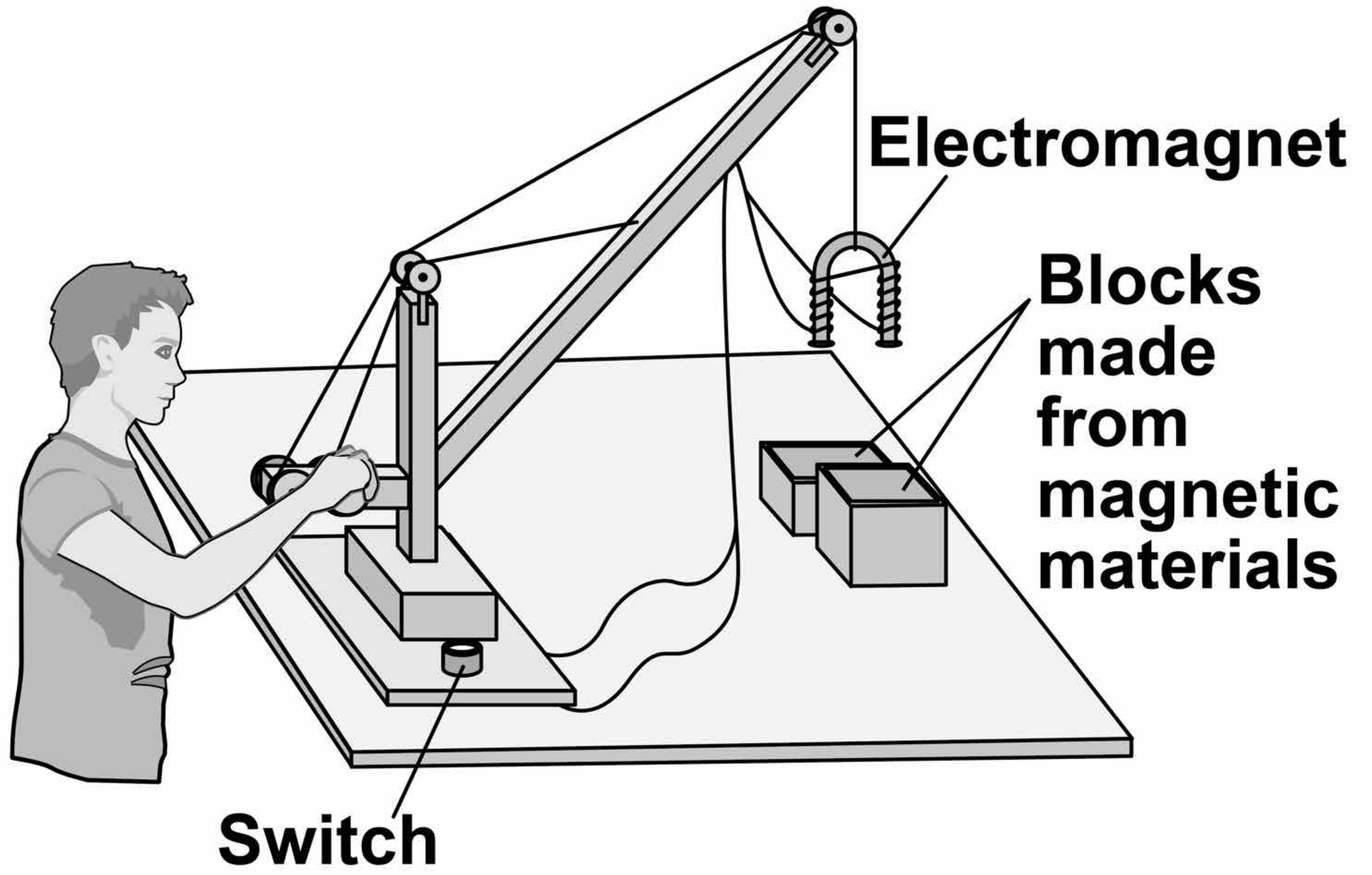
FIGURE 13

Describe how another permanent magnet can be used to identify the blocks. [3 marks]

[Turn over]

0 8 . 3 **FIGURE 14 shows a toy crane.**

FIGURE 14



The toy crane uses an electromagnet to pick up and move the blocks.

Explain how this electromagnet is able to pick up and move the blocks. [6 marks]

END OF QUESTIONS

10

There are no questions printed on this page

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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