Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier

Physics Paper 2F

F

8464/P/2F

Friday 14 June 2019 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]

For this paper you must have:

- **a protractor**
- **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

Magnetic force is a non-contact force.

0 1 . 1

Which TWO of these are also non-contact forces? [2 marks]

Tick (✓) TWO boxes.

☐ **Air resistance**

☐ **Electrostatic**

☐ **Friction**

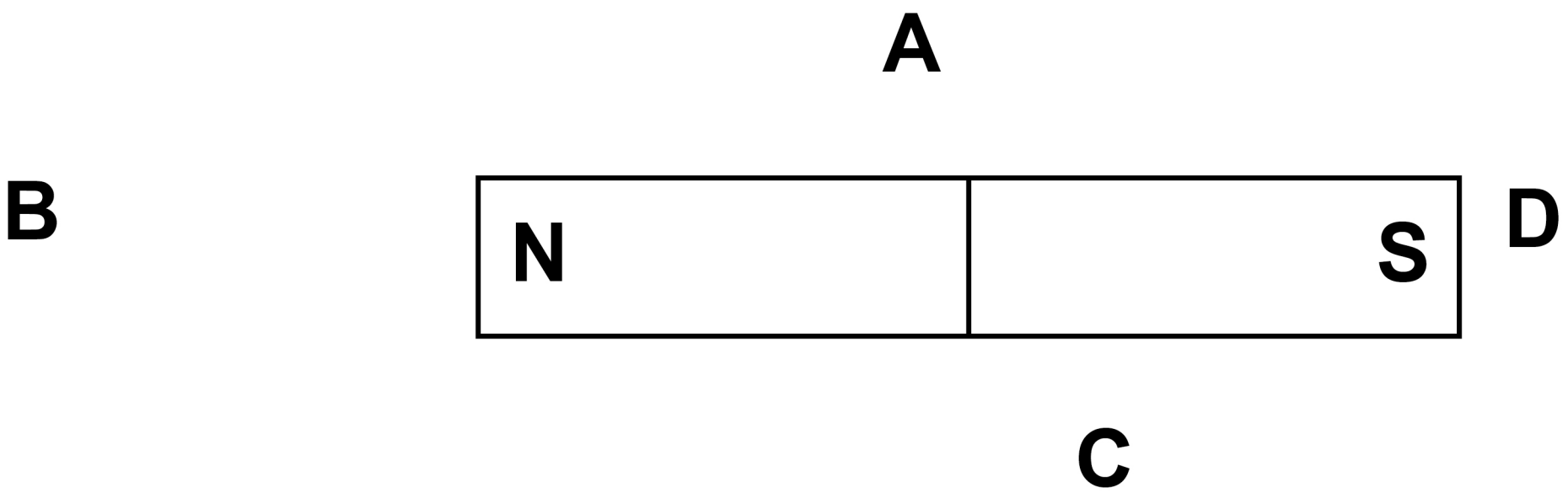
☐ **Gravitational**

☐ **Tension**

0 1 . 2

FIGURE 1 shows a bar magnet.

FIGURE 1



Which letter shows the position where the magnetic field around the bar magnet is strongest? [1 mark]

Tick (✓) ONE box.

☐ **A**

☐ **B**

☐ **C**

☐ **D**

0 1 . 3

When two magnets are brought close to each other they exert a force on each other.

Describe how two bar magnets can be used to demonstrate a force of attraction and a force of repulsion. [2 marks]

Force of attraction _____

_____

_____

Force of repulsion _____

_____

_____

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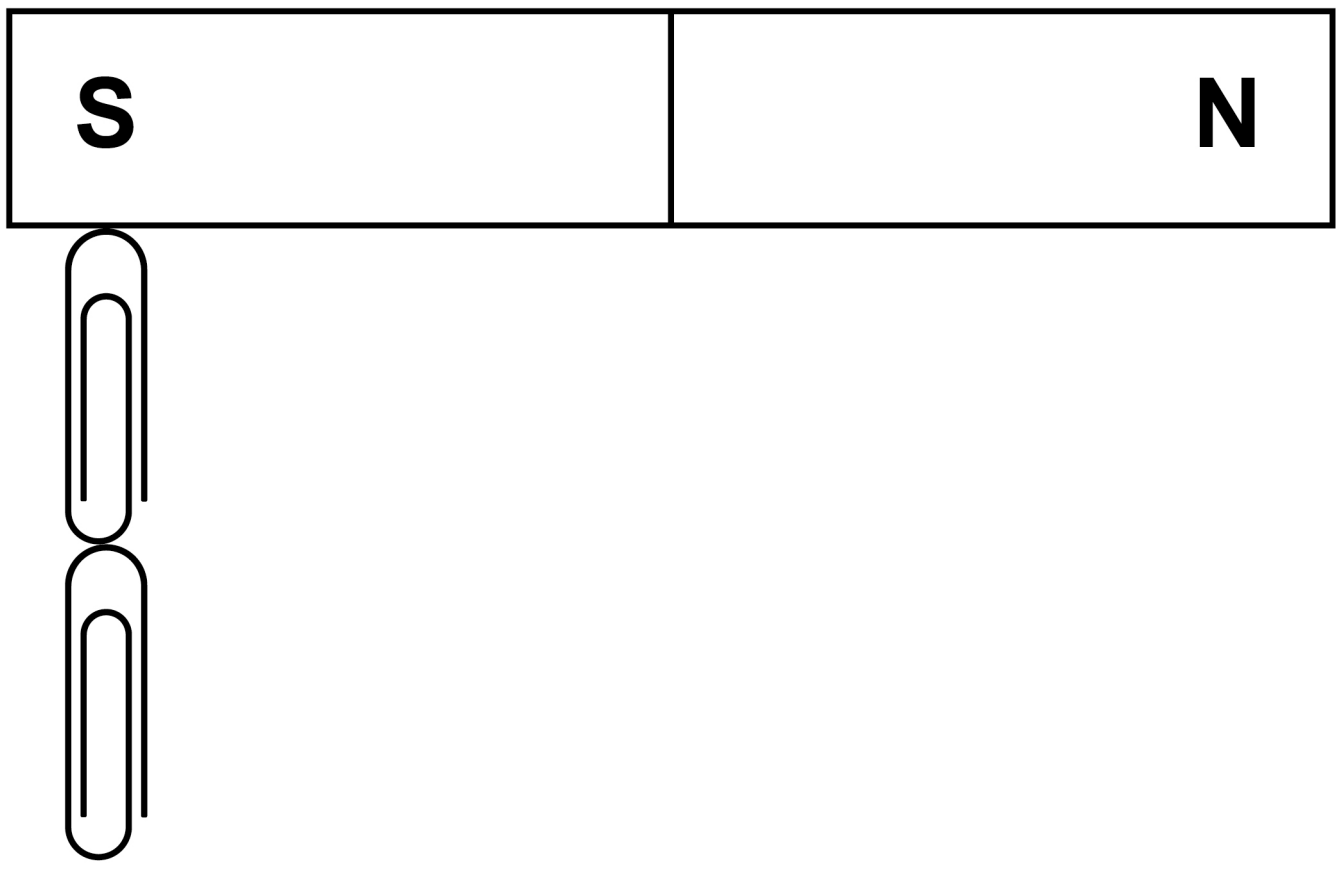
[Turn over]

FIGURE 2 shows some paper clips that are attracted to a permanent magnet.

FIGURE 2



0 1 . 4

The paperclips become magnetised when they are close to the permanent magnet.

What is the name of this type of magnetism? [1 mark]

Tick (✓) ONE box.

☐ **Forced magnetism**

☐ **Induced magnetism**

☐ **Strong magnetism**

0 1 . 4

Label the north and south poles of the two magnetised paper clips in FIGURE 2, on the opposite page. [2 marks]

8

0 2

FIGURE 3, on the opposite page, shows a gymnast on a piece of gymnastic equipment.

The equipment consists of two bars at different heights.

0 2 . 1

The gymnast exerts a downward force on the bar.

What is the size of the upward force acting on the gymnast from the bar?
[1 mark]

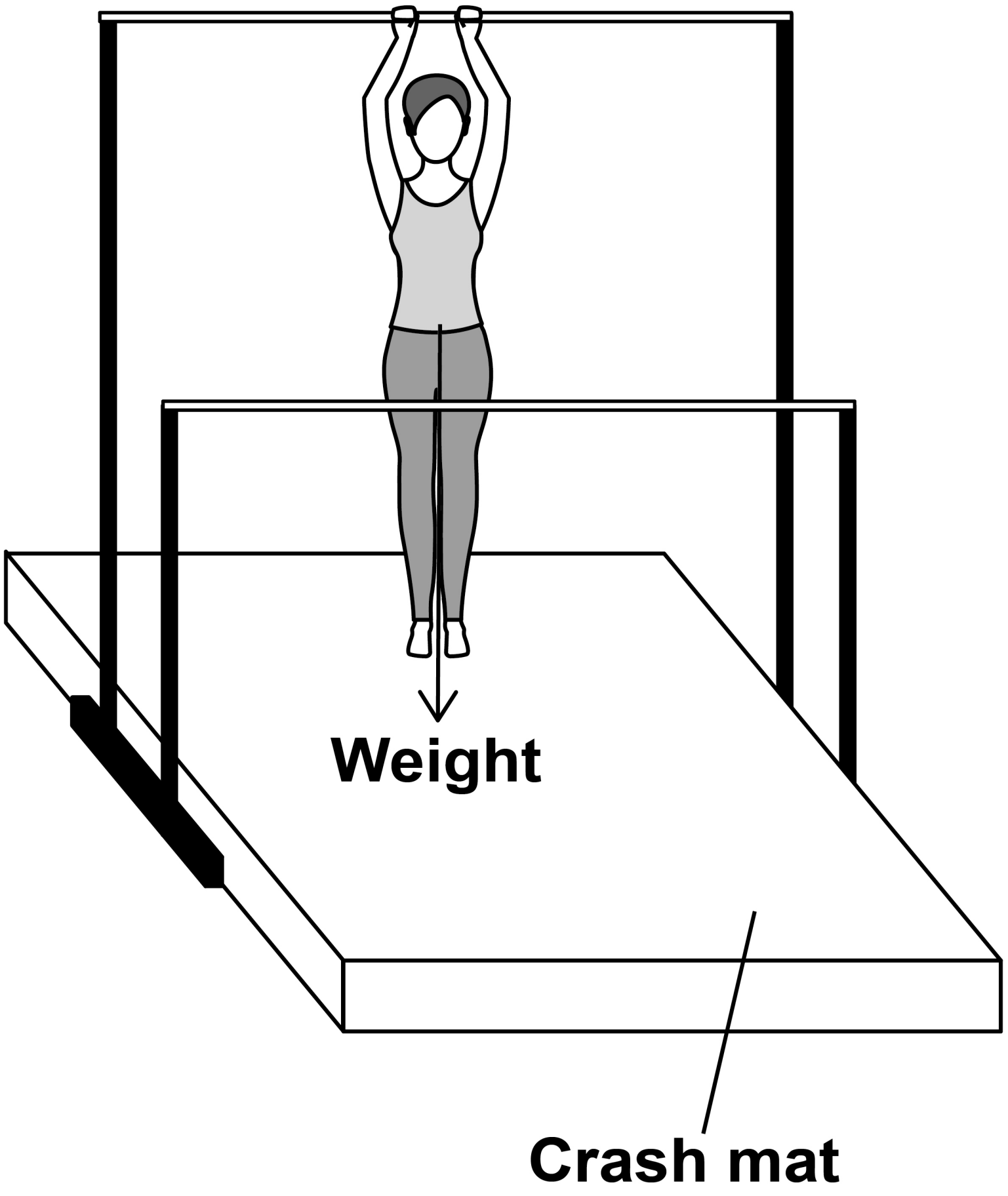
Tick (✓) ONE box.

☐ **It is greater than the downward force.**

☐ **It is less than the downward force.**

☐ **It is the same size as the downward force.**

FIGURE 3



[Turn over]

0 2 . 2

Why is the weight of the gymnast represented by an arrow? [1 mark]

Tick (✓) ONE box.

- ☐ **Weight is a constant.**
- ☐ **Weight is a scalar.**
- ☐ **Weight is a unit.**
- ☐ **Weight is a vector.**

0 2 . 3

FIGURE 3, on page 11, shows the weight of the gymnast acting from a point.

What name is given to this point?
[1 mark]

Tick (✓) ONE box.

- ☐ **Centre of force**
- ☐ **Centre of mass**
- ☐ **Centre of tension**
- ☐ **Centre of weight**

[Turn over]

0 2 . 4

The gymnast has a mass of 45 kg

gravitational field strength = 9.8 N/kg

Calculate the weight of the gymnast.

Use the equation:

weight =
mass × gravitational field strength

[2 marks]

Weight = _____ N

0 2 . 5

The gymnast swings from one bar to the other bar several times.

Describe how the gravitational potential energy store and the kinetic energy store of the gymnast change as she moves between the bars. [4 marks]

0 2 . 6

Falling on the crash mat reduces the average deceleration of the gymnast compared with falling on a hard surface.

Explain why reducing the deceleration is important to the gymnast. [2 marks]

11

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[Turn over]

0 3

FIGURE 4 shows two children playing table tennis.

The boy hits the ball from one end of the table.

FIGURE 4

0 3 . 1

Why does the velocity of the ball change when the boy hits it? [1 mark]

Tick (✓) ONE box.

- ☐ **The direction of the ball does not change.**
- ☐ **There is a resultant force on the ball.**
- ☐ **The mass of the ball increases.**
- ☐ **The speed of the ball is constant.**

[Turn over]

0 3 . 2

The ball has an average speed of 11 m/s

The ball takes 0.25 s to travel the same distance as the length of the table.

Calculate the length of the table.

Use the equation:

distance travelled = speed × time

[2 marks]

Length of table = _____ m

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[Turn over]

0 3 . 3

A table tennis ball should only be used if it bounces to at least 75% of the height it was dropped from.

A manufacturer tested a table tennis ball.

TABLE 1 shows the results.

TABLE 1

Height ball was dropped from in cm	Height of bounce in cm
30.0	25.1

Determine whether the ball can be used.

Use the data from TABLE 1. [3 marks]

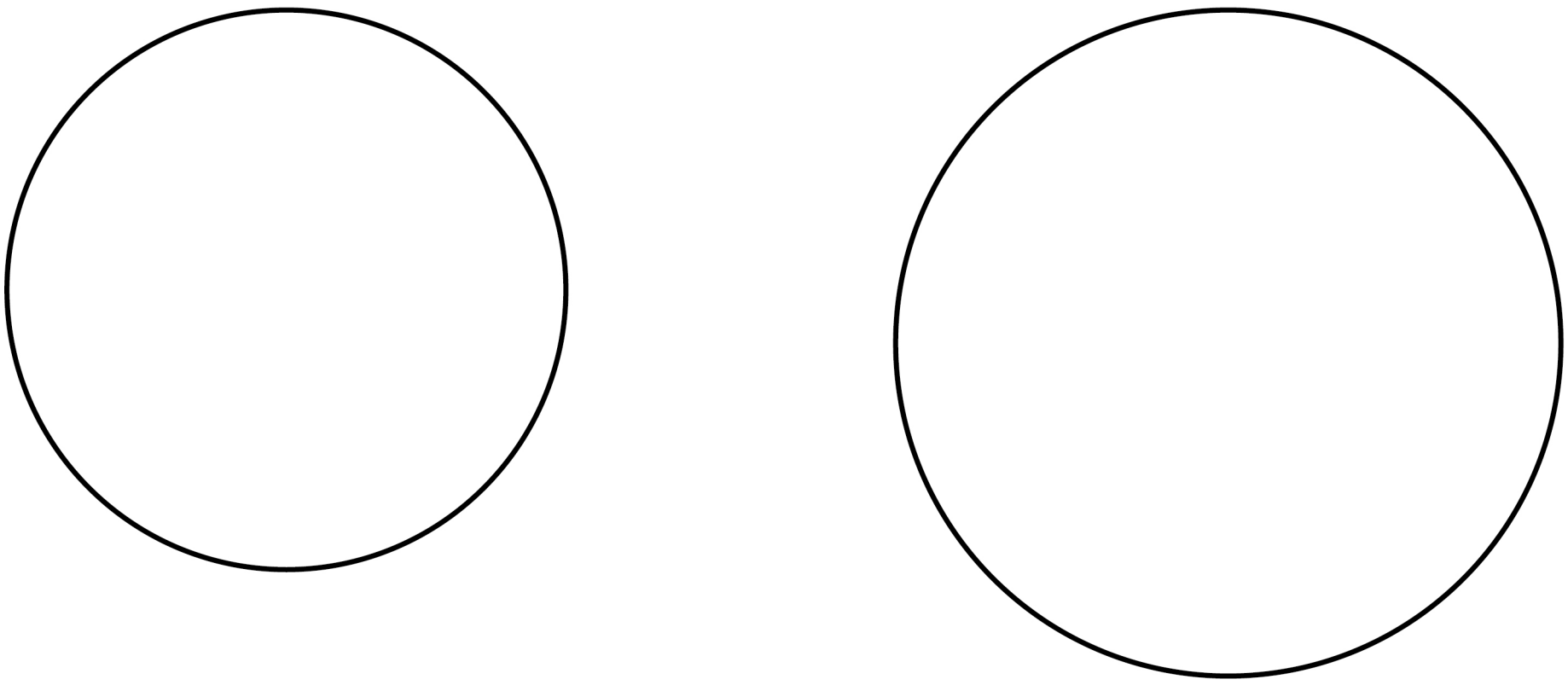
[Turn over]

0 3 . 4

FIGURE 5 shows two table tennis balls.

The balls are different sizes but have the same mass.

FIGURE 5



Both balls were dropped onto the table from the same height.

After they were dropped, the resultant force on the smaller ball was greater than the resultant force on the larger ball.

Explain why. [2 marks]

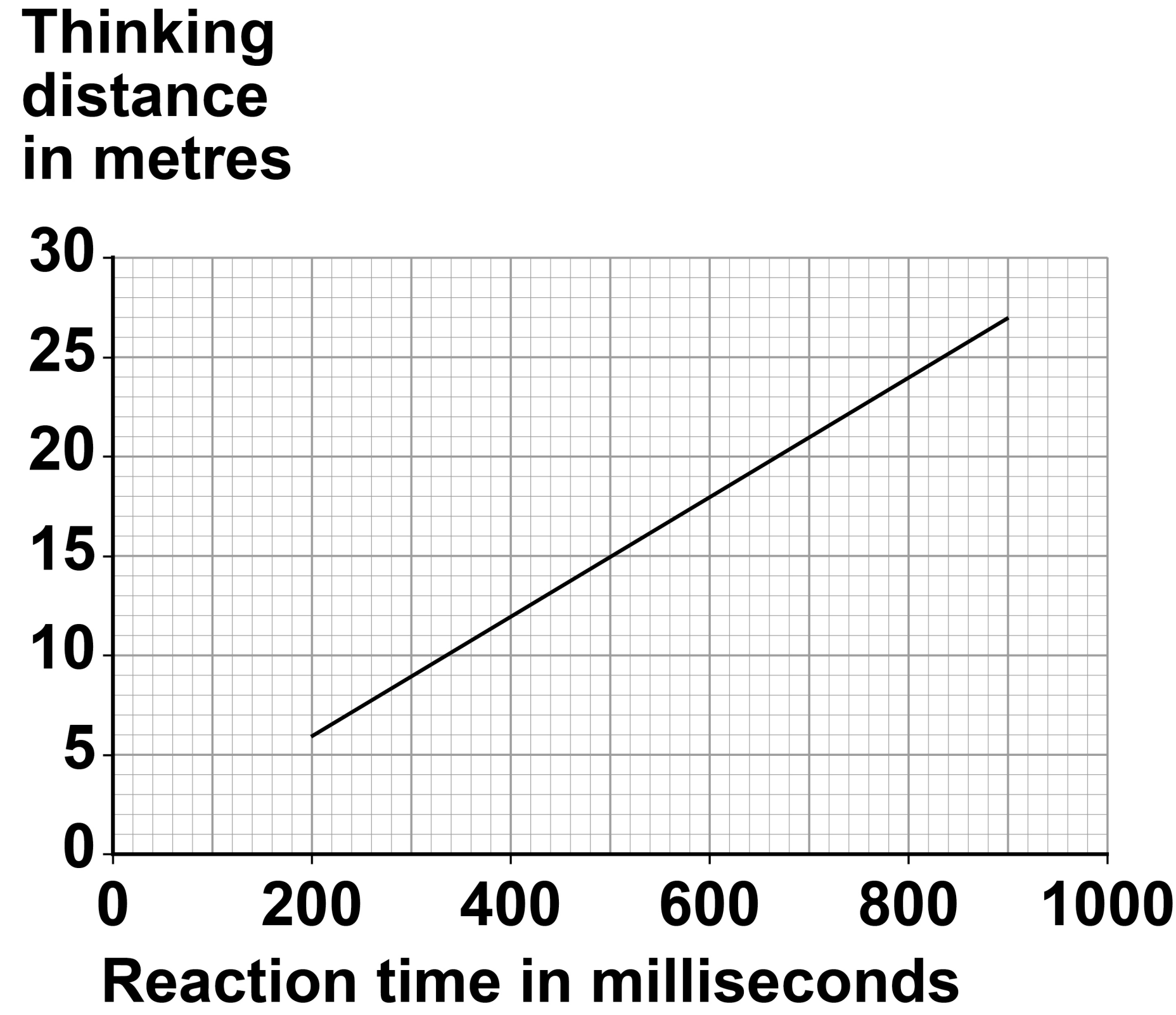
8

0 4

The thinking distance of a car depends on the reaction time of the driver.

FIGURE 6 shows how thinking distance varies with reaction time for a car travelling at 30 m/s

FIGURE 6



0 4 . 1

The reaction time of a driver can double if the driver is distracted.

Explain the effect doubling the reaction time has on the thinking distance.

Use data from FIGURE 6. [2 marks]

0 4 . 2

Give the reason why there are no values of thinking distance for reaction times less than 200 milliseconds. [1 mark]

A driver measured her reaction time using an online test. She did the test five times.

TABLE 2 shows the results.

TABLE 2

Reaction time in milliseconds				
258	265	302	248	327

0 4 . 3

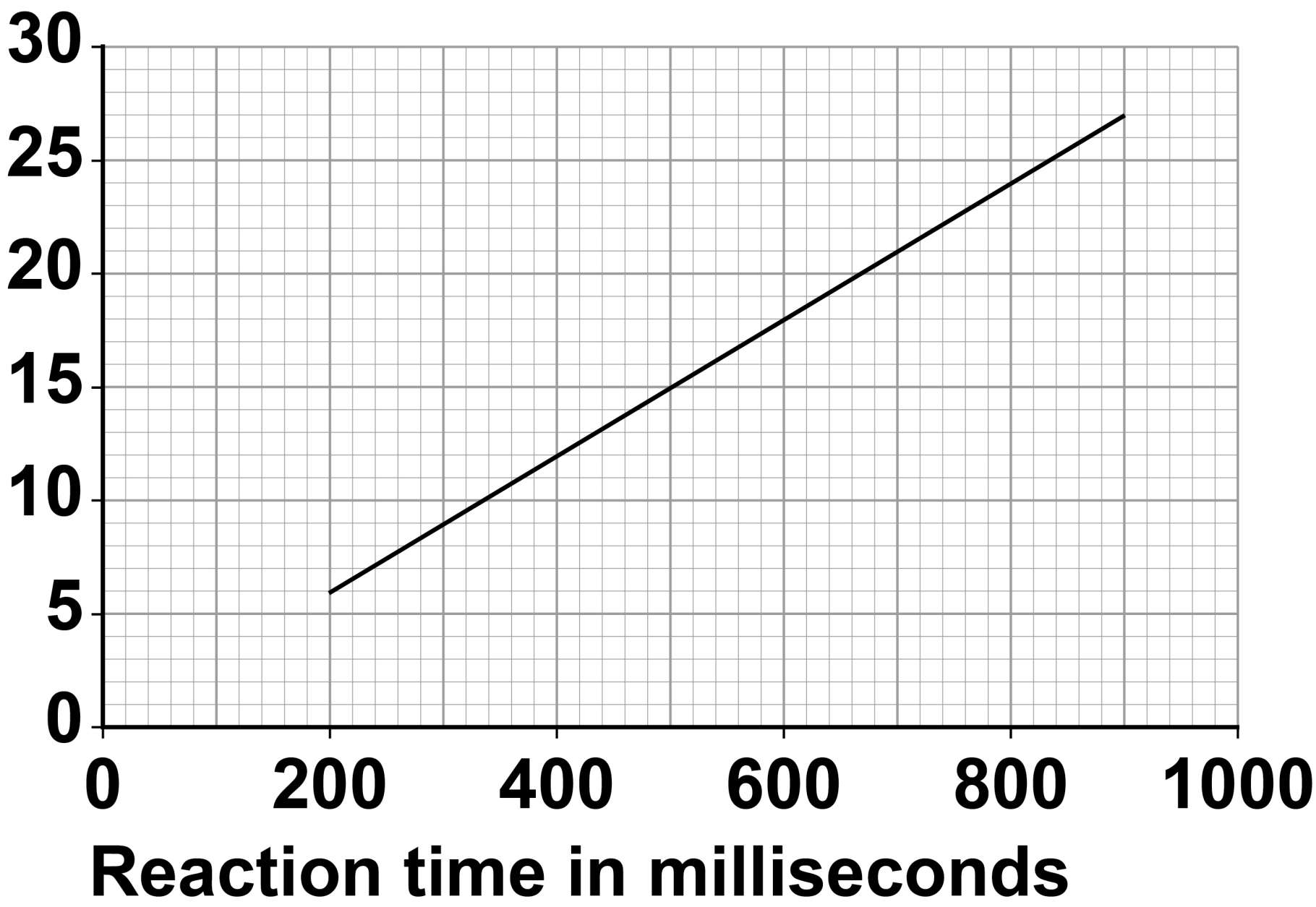
How does the data in TABLE 2 show that it was important that the driver did the test five times? [1 mark]

0 4 . 4

Calculate the mean reaction time of the driver. [2 marks]

Mean reaction time = _____ ms

Repeat of FIGURE 6



0 4 . 5

The driver is driving her car at 30 m/s

Determine the thinking distance.

Use FIGURE 6 and your answer from Question 04.4 [1 mark]

Thinking distance = _____ m

[Turn over]

0 4 . 6

The driver applies the brakes and the car comes to a stop.

The force exerted by the brakes affects the braking distance.

Give TWO other factors that affect the braking distance. [2 marks]

1 _____

_____

2 _____

_____

0 4 . 7

Write down the equation that links distance, force and work done. [1 mark]

_____

_____

0 4 . 8

When the driver applies the brakes, there is a constant resultant force of 6.0 kN on the car.

The car travels a distance of 75 m before stopping.

Calculate the work done in stopping the car. [3 marks]

Work done = _____ J

13

0 5

The Sun emits all types of electromagnetic waves.

FIGURE 7 shows the electromagnetic spectrum.

FIGURE 7

Radio waves	Micro-waves	Infra-red	Visible light	Ultra-violet	X-rays	Gamma rays

0 5 . 1

Complete the sentences on the opposite page.

Choose answers from the list on the opposite page.
[3 marks]

- **frequency**
- **mass**
- **power**
- **velocity**
- **wavelength**

In a vacuum, all electromagnetic waves travel at the same _____ .

Gamma waves have the greatest _____ .

Radio waves have the greatest _____ .

[Turn over]

0 5 . 2

Explain why it is important that the Earth's atmosphere absorbs gamma rays emitted by the Sun. [2 marks]

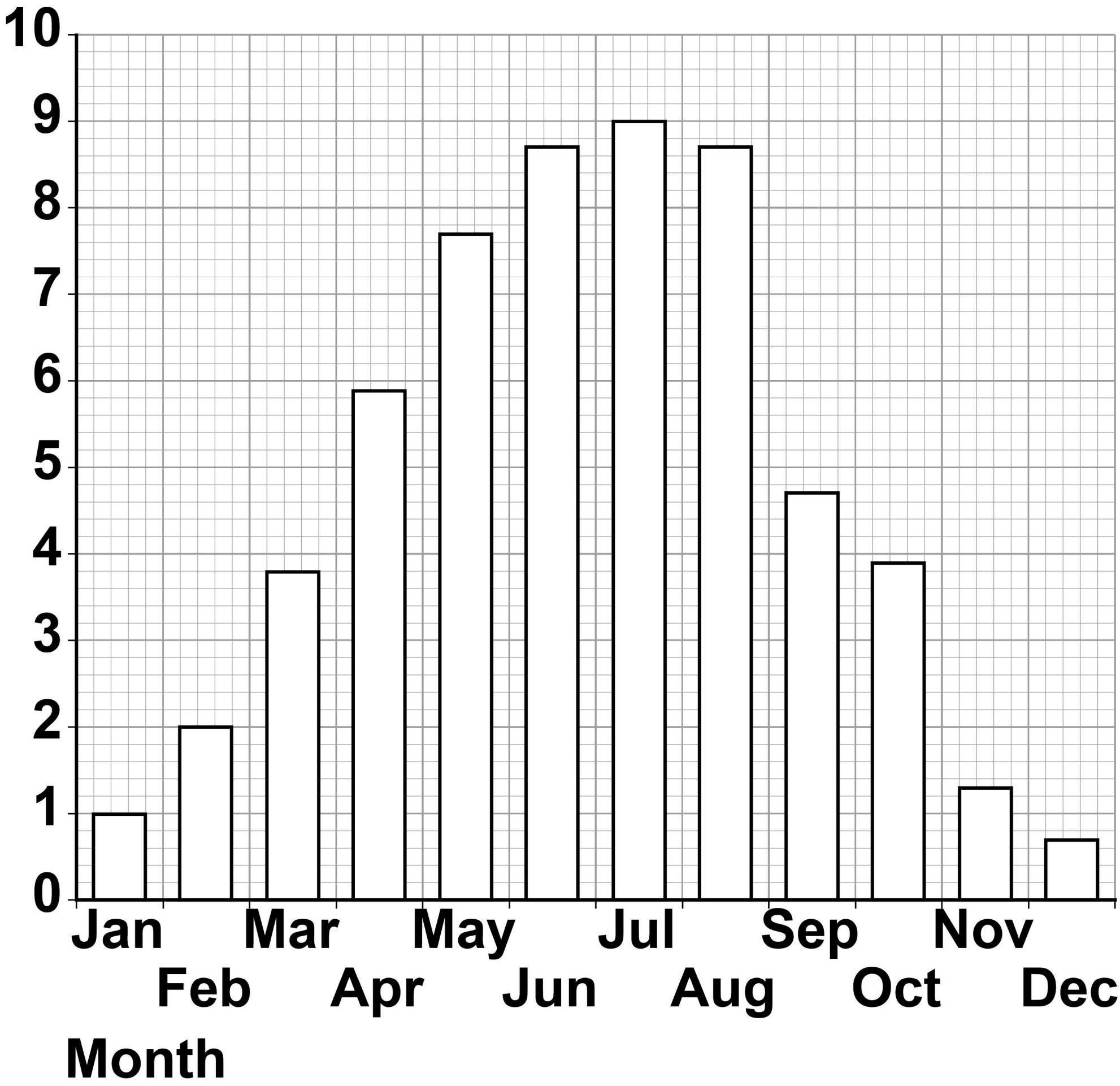
0 5 . 3

Some microwaves are NOT absorbed by the Earth's atmosphere.

Why is this useful? [1 mark]

[Turn over]

FIGURE 8


UV index
10
9
8
7
6
5
4
3
2
1
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month

Some ultraviolet (UV) radiation from the Sun passes through the atmosphere and reaches the surface of the Earth.

The amount of UV radiation that reaches the surface of the Earth can be measured on a scale called the UV index.

FIGURE 8, on page 38, shows the average midday UV index in the UK for 1 year.

0 5 . 4

Why is exposure to UV radiation harmful to humans? [1 mark]

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0 5 . 5

Compare the risk from UV radiation at different times of year in the UK.

Use data from FIGURE 8, on page 38.
[2 marks]

[Turn over]

0	6

FIGURE 9 shows a runner using a smart watch and a mobile phone to monitor her run.

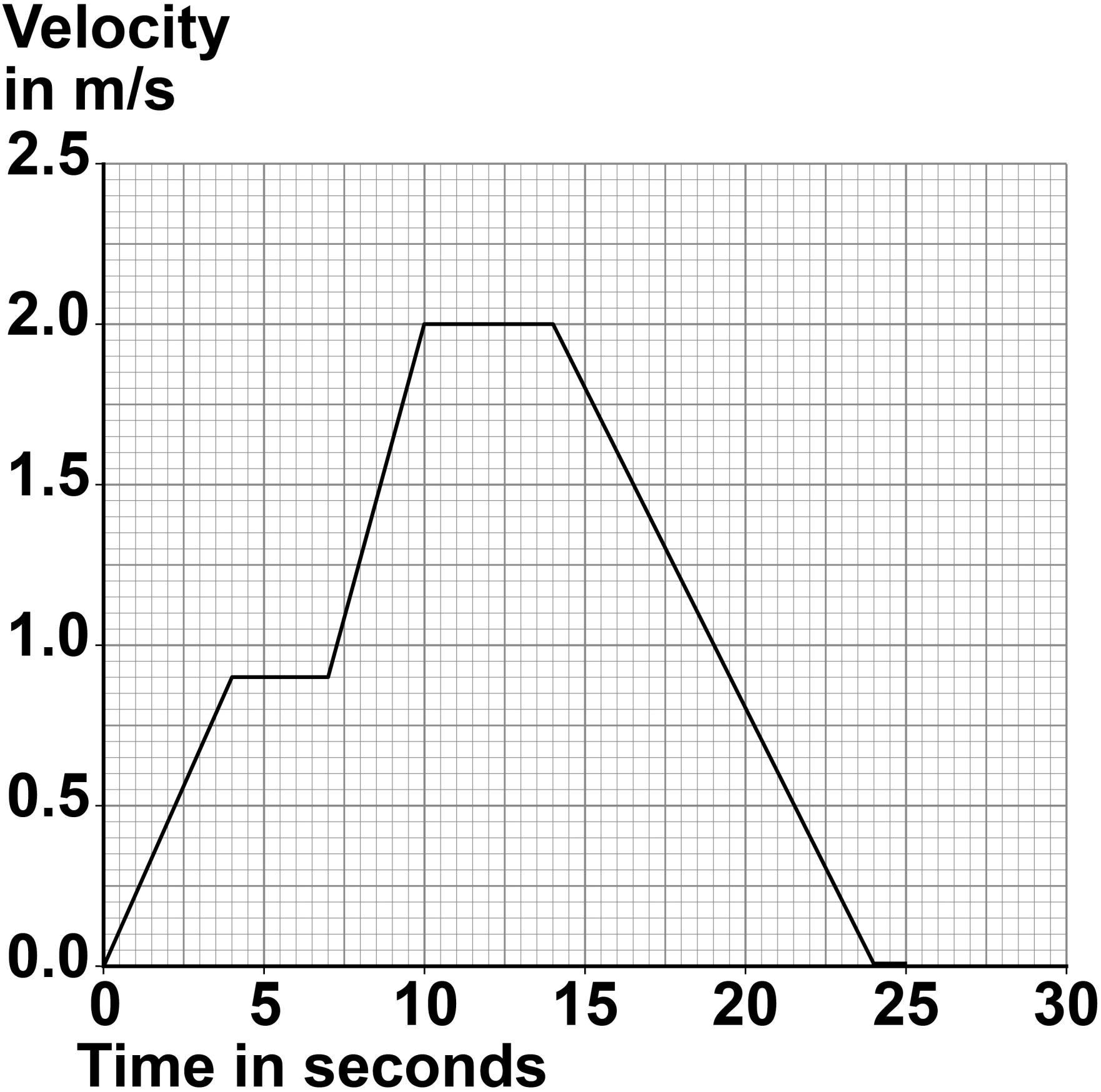
FIGURE 9

BLANK PAGE

[Turn over]

FIGURE 10 is a velocity–time graph for part of the runner's warm-up.

FIGURE 10



0 6 . 1

Determine the total time for which the velocity of the runner was increasing. [2 marks]

Time = _____ s

0 6 . 2

Determine the deceleration of the runner. [2 marks]

Deceleration = _____ m/s^2

[Turn over]

The smart watch and mobile phone are connected to each other by a system called Bluetooth.

Bluetooth is wireless and uses electromagnetic waves for communication.

0 6 . 3

Suggest why the phone and watch being connected by a wireless system is an advantage when running. [1 mark]

0 6 . 4

Write down the equation that links frequency, wave speed and wavelength. [1 mark]

0 6 . 5

The electromagnetic waves have a frequency of 2 400 000 000 Hz

The speed of electromagnetic waves is 300 000 000 m/s

Calculate the wavelength of the electromagnetic waves. [3 marks]

Wavelength = _____ m

0 6 . 6

TABLE 3 shows some information about four types of Bluetooth.

TABLE 3

Type	Power in milliwatts	Range in metres
1	100	100
2	2.50	10.0
3	1.00	1.00
4	0.50	0.50

Mobile phones use type 2 Bluetooth to communicate with other devices.

Suggest TWO reasons why. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

11

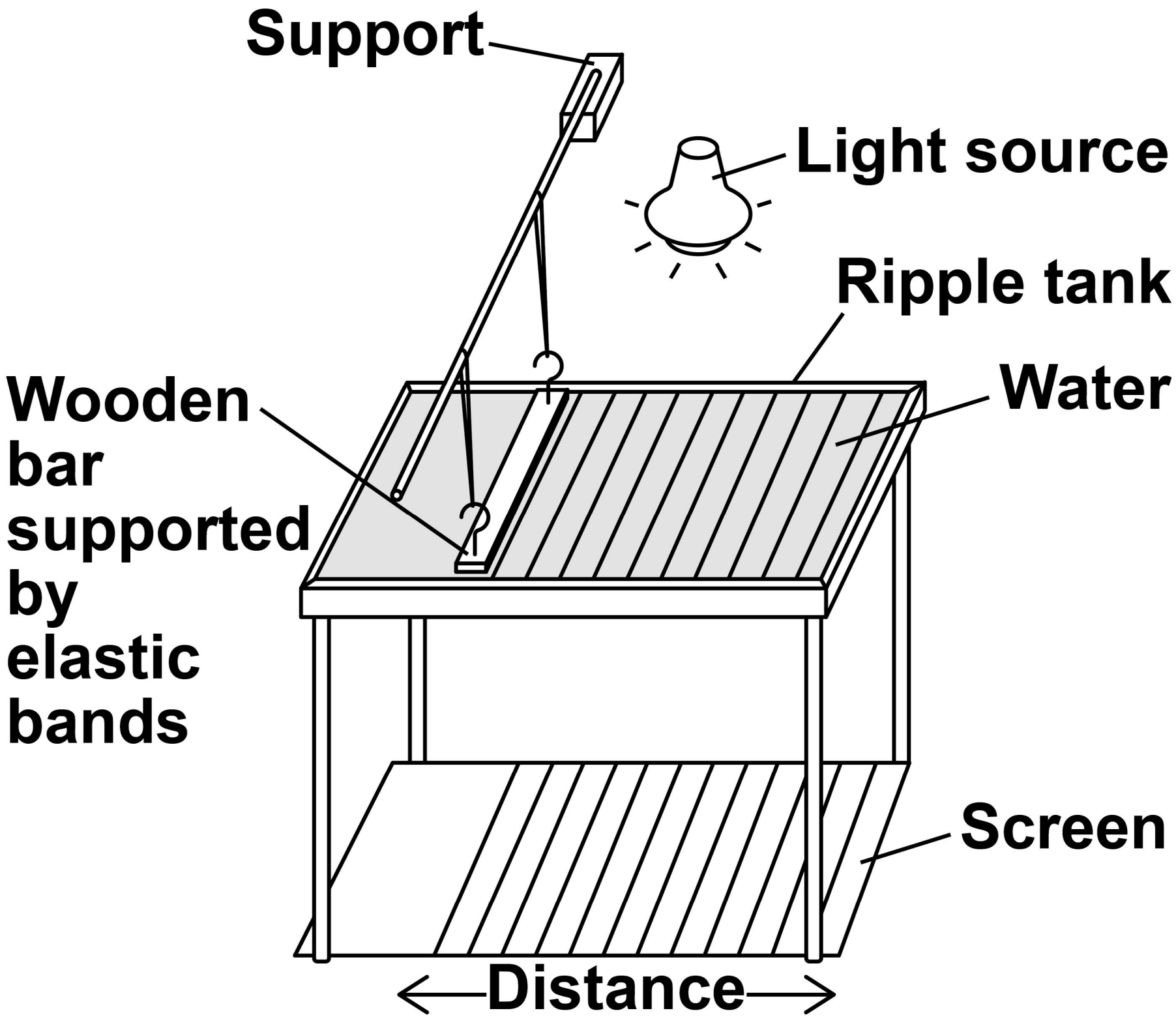
0 7

FIGURE 11 shows the equipment a teacher used to determine the speed of a water wave.

The equipment includes:

- **a ripple tank filled with water**
- **a wooden bar that creates ripples on the surface of the water**
- **a light source which causes a shadow of the ripples on the screen.**

FIGURE 11



[Turn over]

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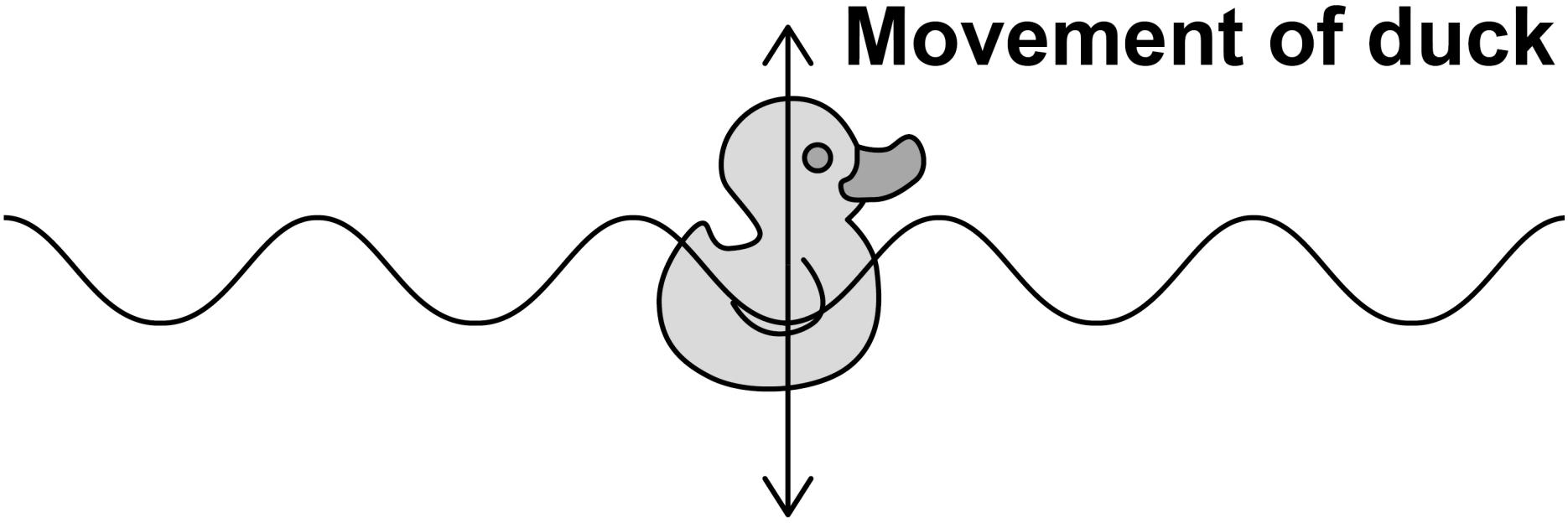
0 7 . 1

Describe how equipment in FIGURE 11, on page 51, can be used to measure the wavelength, frequency and speed of a water wave. [6 marks]

The teacher put a plastic duck in the ripple tank as shown in FIGURE 12.

The plastic duck moved up and down as the waves in the water passed.

FIGURE 12



0 7 . 2

How does the movement of the plastic duck in FIGURE 12 demonstrate that water waves are transverse? [1 mark]

0 7 . 3

The teacher measured the maximum height and the minimum height of the plastic duck above the screen as the wave passed.

The teacher repeated his measurements.

TABLE 4 shows the teacher's measurements.

TABLE 4

Maximum height in mm	**509**	**513**	**511**
Minimum height in mm	**503**	**498**	**499**

Calculate the mean amplitude of the water wave. [3 marks]

Mean amplitude = _____ mm

10

END OF QUESTIONS

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