A

Surname ______________________

Other Names ______________________

Centre Number ______________________

Candidate Number ______________________

Candidate Signature ______________________

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Physics Paper 2F

8464/P/2F

Friday 14 June 2019 Morning

Time allowed: 1 hour 15 minutes

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

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

[Turn over]

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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

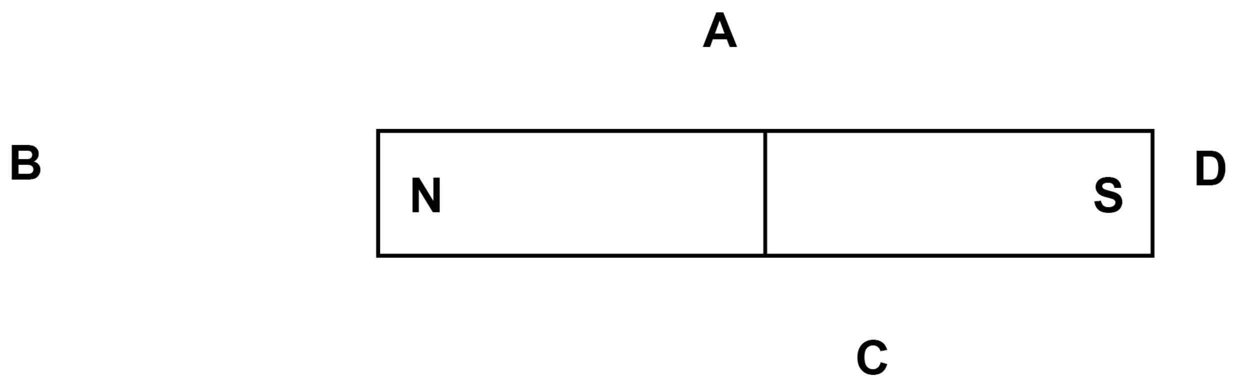
☐ Friction

☐ Gravitational

☐ Tension

01.2 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

[Turn over]

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 ______________________________

____

____

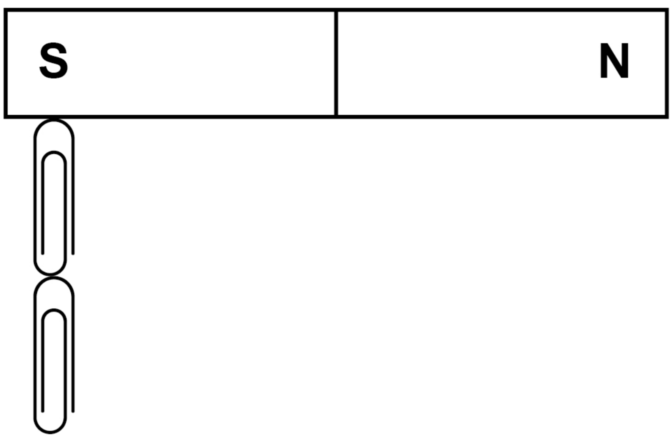
Force of repulsion ______________________________

____

____

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

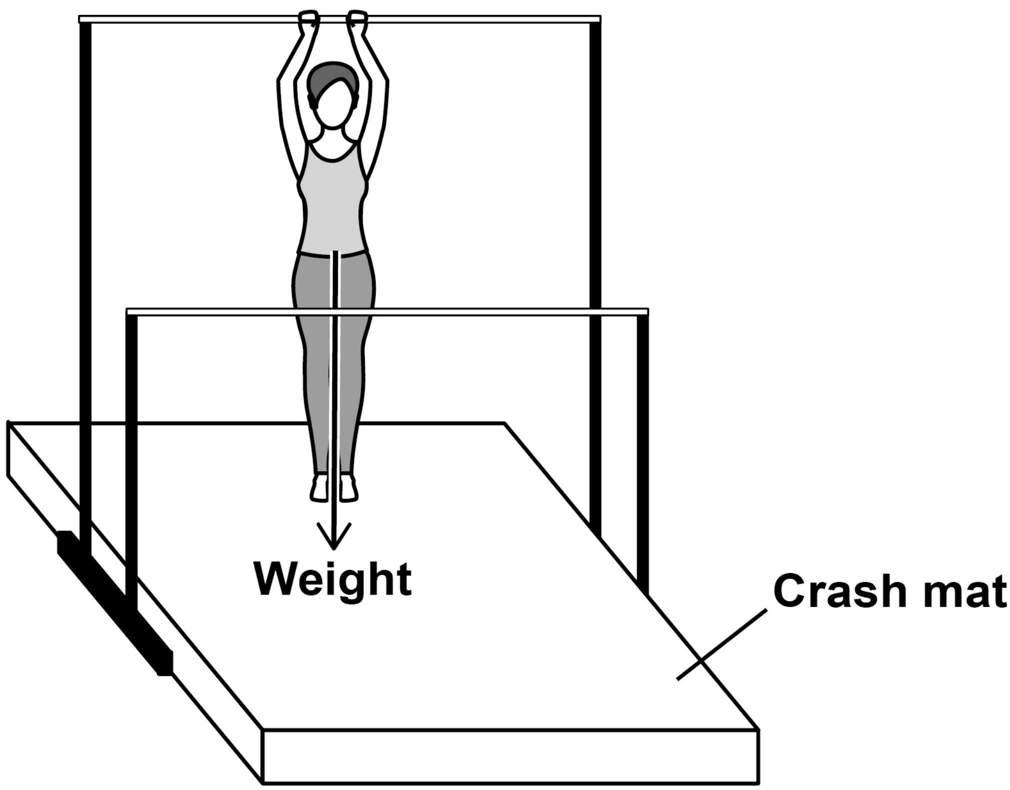
8

[Turn over]

0 2 FIGURE 3 shows a gymnast on a piece of gymnastic equipment.

The equipment consists of two bars at different heights.

FIGURE 3



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.**

[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 8, 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]

[Turn over]

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]

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____

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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.

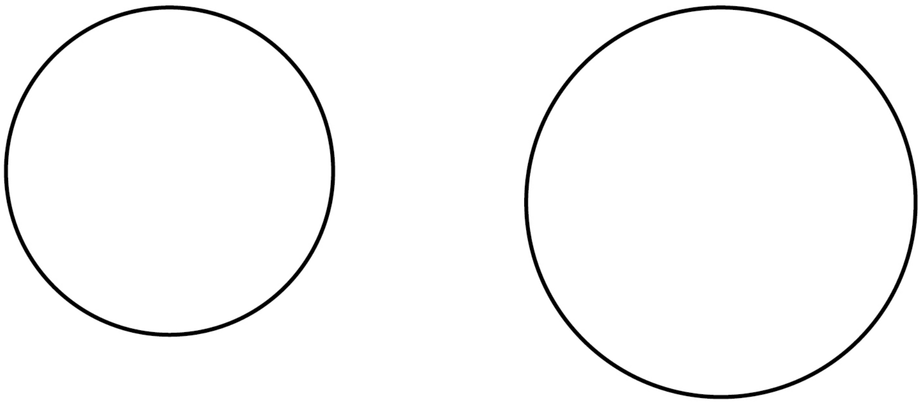
Use the data from TABLE 1. [3 marks]

[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]

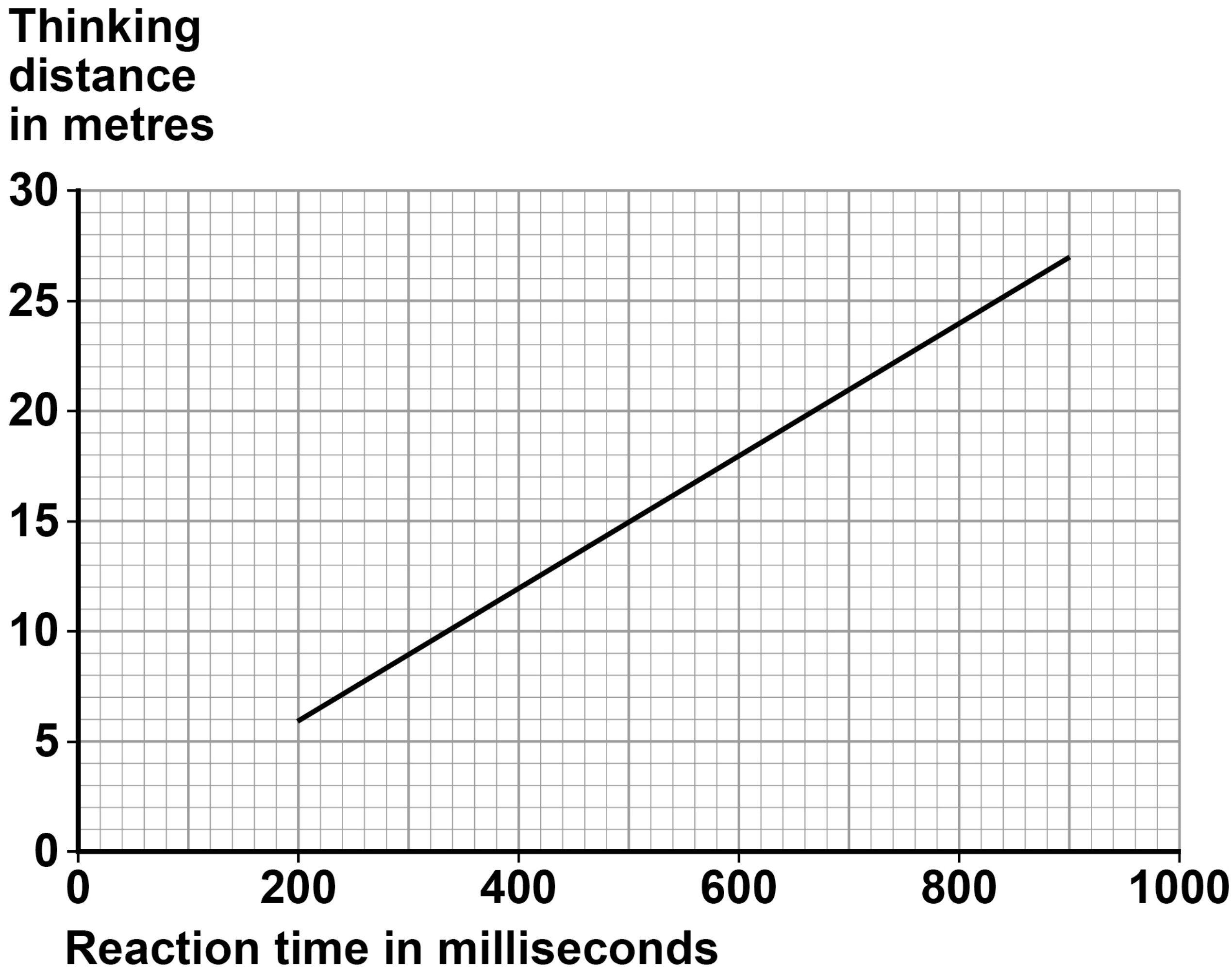
8

[Turn over]

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]**

[Turn over]

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]**

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____

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

____

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Mean reaction time = ____________________ ms

04.5 The driver is driving her car at 30 m/s

Determine the thinking distance.

Use FIGURE 6, on page 24, 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]**

____

____

04.8 **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	Microwaves	Infrared	Visible light	Ultraviolet	X-rays	Gamma rays

0 5 . 1 Complete the sentences on the opposite page.

Choose answers from the list. [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]

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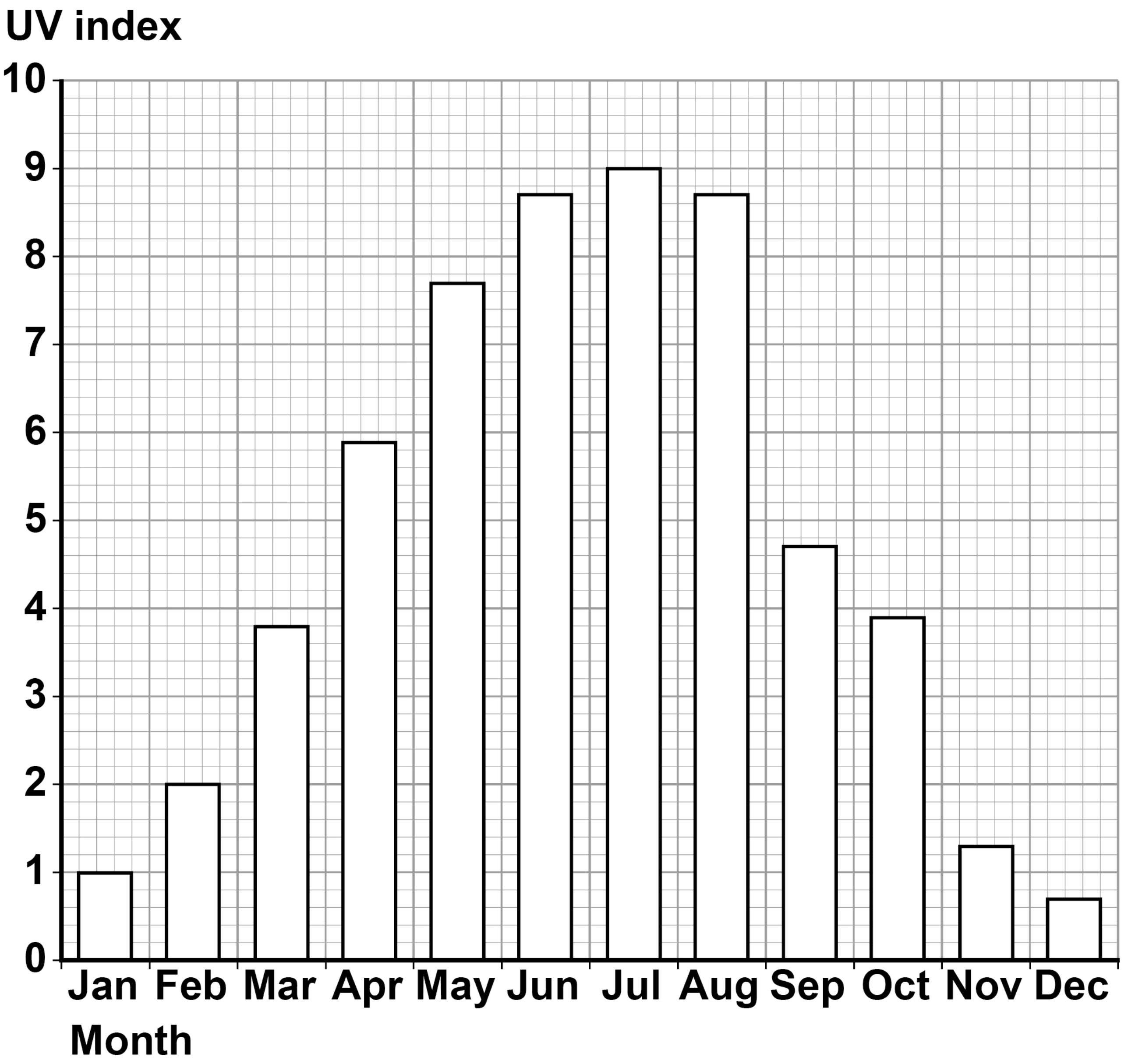
0 5 . 2 **Explain why it is important that the Earth's atmosphere absorbs gamma rays emitted by the Sun. [2 marks]**

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 34, 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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____

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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 34.
[2 marks]

9

0 6 **FIGURE 9 shows a runner using a smart watch and a mobile phone to monitor her run.**

FIGURE 9

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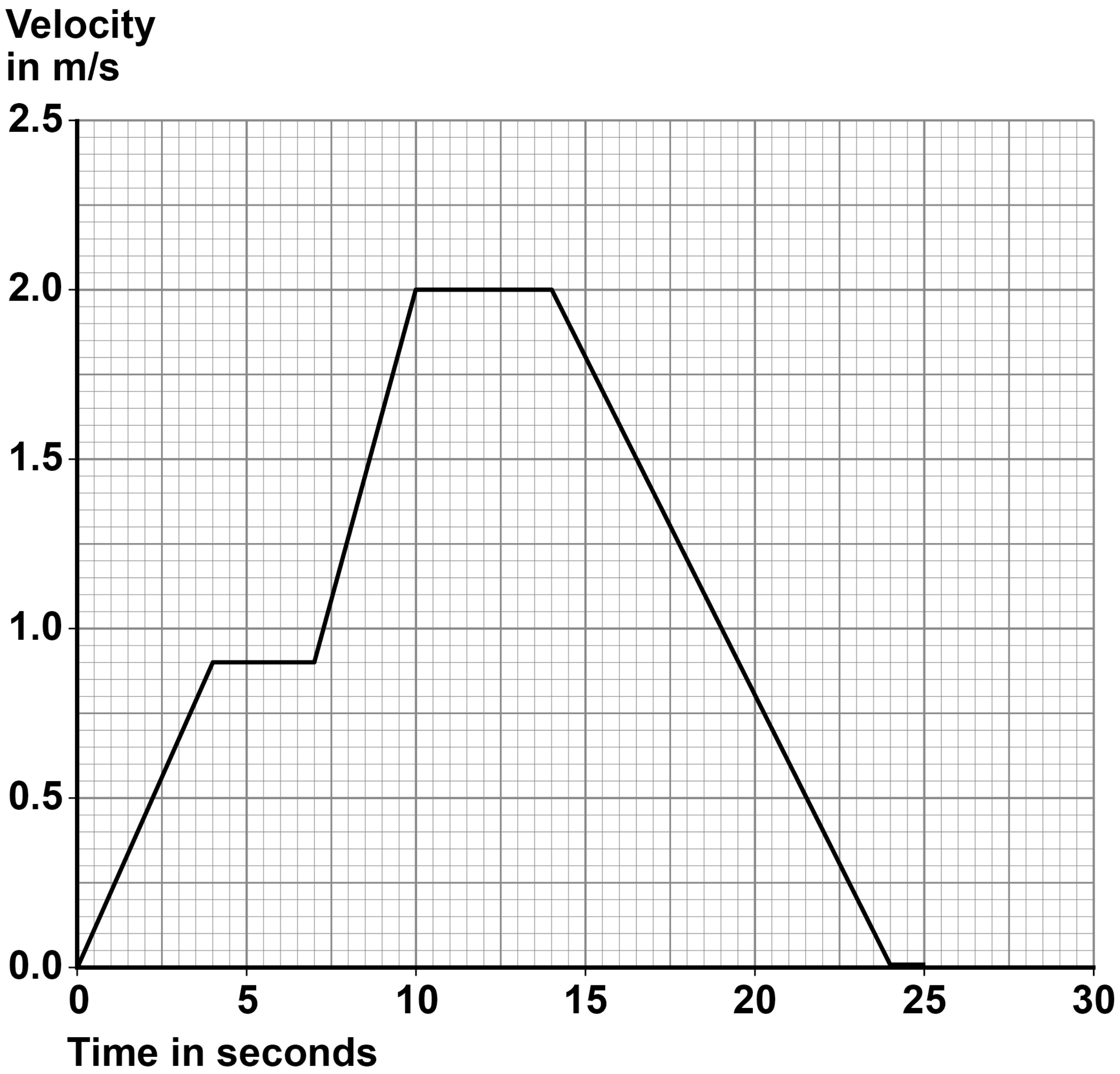
[Turn over]

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]**

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Time = ______________________ s

0 6 . 2 **Determine the deceleration of the runner. [2 marks]**

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____

Deceleration = ______________________ m/s^2

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]

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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

[Turn over]

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 ____

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____

11

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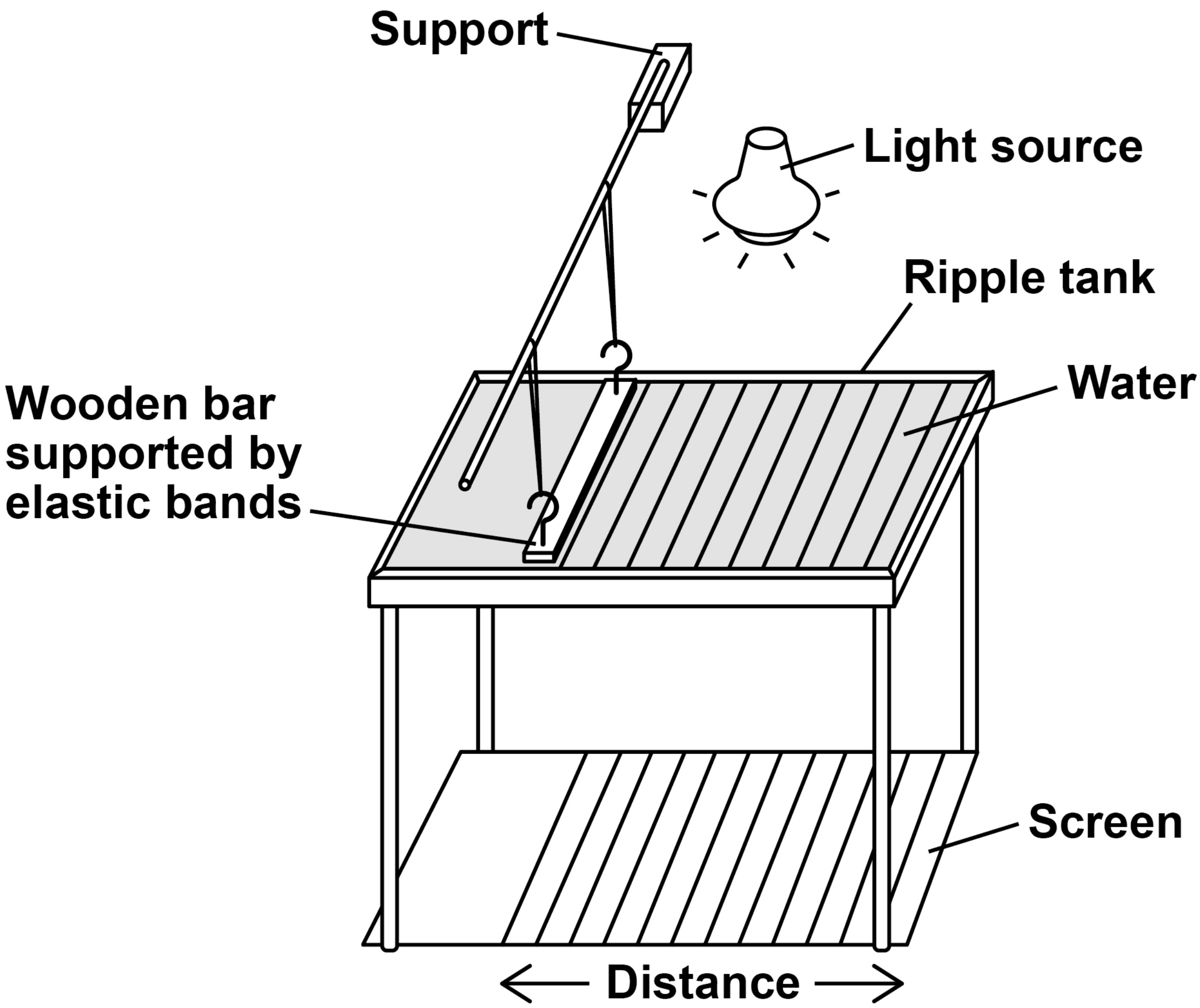
[Turn over]

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

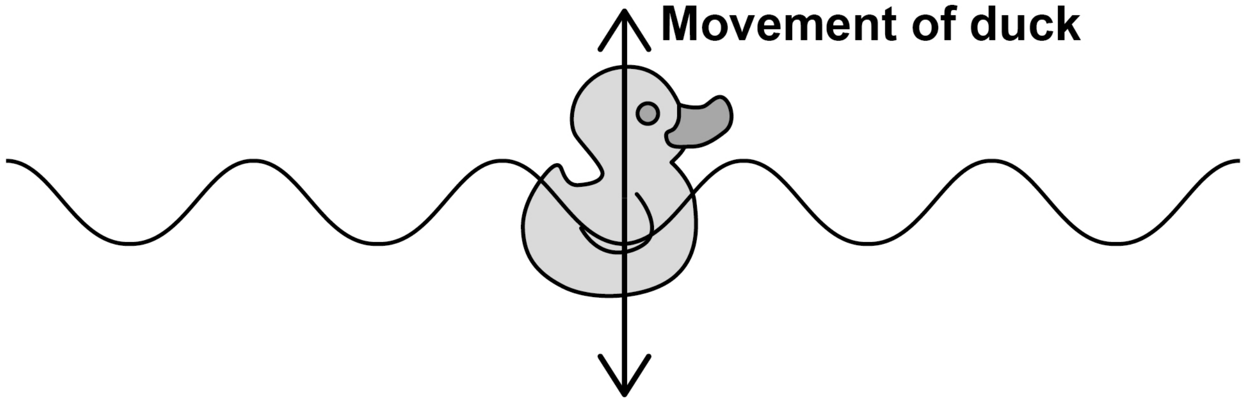


07.1 **Describe how equipment in FIGURE 11 can be used to measure the wavelength, frequency and speed of a water wave. [6 marks]**

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]

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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**

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END OF QUESTIONS

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

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1 9 6 G 8 4 6 4 / P / 2 F