



# GCSE COMBINED SCIENCE: TRILOGY

# F

Foundation Tier      Paper 6: Physics 2F

Specimen 2018

Time allowed: 1 hour 15 minutes

## Materials

For this paper you must have:

- a ruler
- a calculator
- the Physics Equation Sheet (enclosed).

## Instructions

- 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.

## Information

- There are 70 marks available on this paper.
- 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.
- When answering questions 02.3 and 06.6 you need make to sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

## Advice

- In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number            Candidate number

Surname

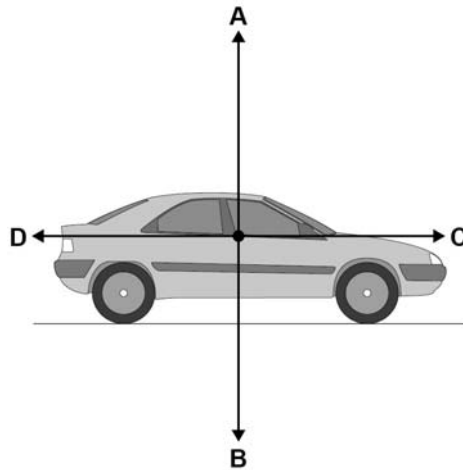
Forename(s)

Candidate signature \_\_\_\_\_

0 1

Figure 1 shows the forces acting on a car moving at a constant speed.

Figure 1



0 1 . 1

Which force would have to increase to make the car accelerate?

[1 mark]

Tick **one** box.

- A
- B
- C
- D

0 1 . 2

The car travels a distance of 2040 metres in 2 minutes.

Use the following equation to calculate the mean speed of the car.

$$\text{mean speed} = \frac{\text{distance}}{\text{time}}$$

[2 marks]

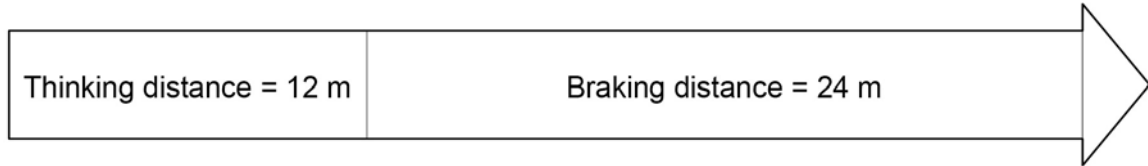
Mean speed = \_\_\_\_\_ m/s

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**0 1** . **3** The car makes an emergency stop.

**Figure 2** shows the thinking distance and braking distance of the car.

**Figure 2**



What is the stopping distance?

**[1 mark]**

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**0 1** . **4** The person driving the car is tired.

What effect will this have on the thinking distance and braking distance?

Tick **one** box for thinking distance.

Tick **one** box for braking distance.

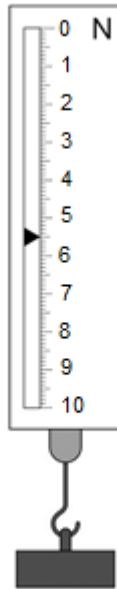
**[2 marks]**

	decreases	increases	stays the same
thinking distance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
braking distance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Turn over for the next question**

**0 2**

A newtonmeter measures the weight of objects.

Look at **Figure 3**.**Figure 3****0 2****. 1**What is the weight of the object in **Figure 3**?**[1 mark]**

Weight = \_\_\_\_\_ N

**0 2****. 2**

The spring inside the newtonmeter behaves elastically.

What happens to the length of the spring when the object is removed from the newtonmeter?

**[1 mark]**Tick **one** box.The spring gets longer The spring gets shorter The spring stays the same length

**0 2** . **3** A student carried out a practical to investigate the extension of a spring.

Write a method the student could have used.

**[4 marks]**

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**0 2** . **4** What could be done to improve the accuracy in this investigation?

**[2 marks]**

Tick **two** boxes.

Use a pointer from the spring to measure the length.

Use a stronger spring in the practical.

Use a new spring between each reading.

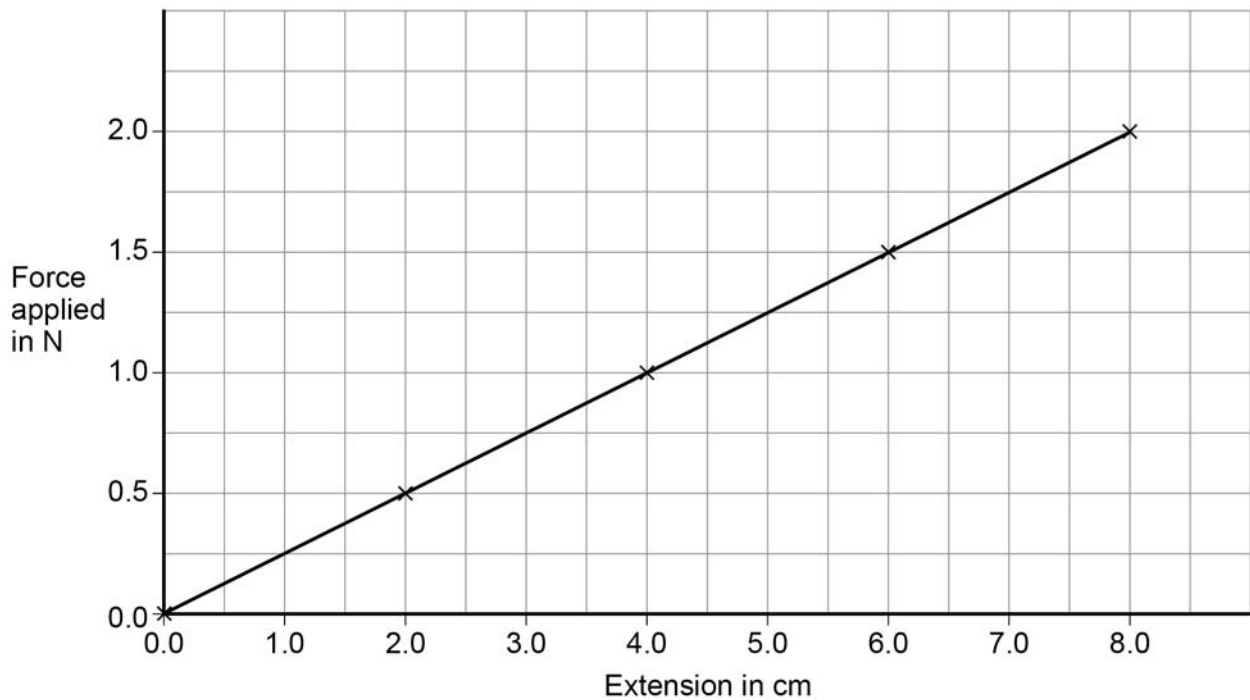
Make sure the spring is stationary before measuring length.

Use a longer rule when measuring length.

The student added weights to a spring and measured the extension of the spring.

**Figure 4** shows his results.

**Figure 4**



**0 2** . **5** What is the relationship between force applied and extension?

[1 mark]

Tick **one** box.

Extension is inversely proportional to force

Extension increases by smaller values as force increases

Extension is directly proportional to force

**0 2** . **6** Use **Figure 4** to determine the additional force needed to increase the extension in the spring from 5.0 cm to 7.0 cm.

[1 mark]

Force needed = \_\_\_\_\_ N

**0 2 . 7** Table 1 shows some results with a different spring.

**Table 1**

Force applied in N	Extension in m
0.0	0.000
0.5	0.025
1.0	0.050
1.5	0.075

What would the extension be with a force of 2.0 N?

**[1 mark]**

Tick **one** box.

0.080 m

0.090 m

0.095 m

0.100 m

**0 2 . 8** The spring constant for the spring in **Table 1** is 20 N/m.

Calculate the work done in stretching the spring until the extension of the spring is 0.050m

Use the correct equation from the Physics Equation Sheet.

**[2 marks]**

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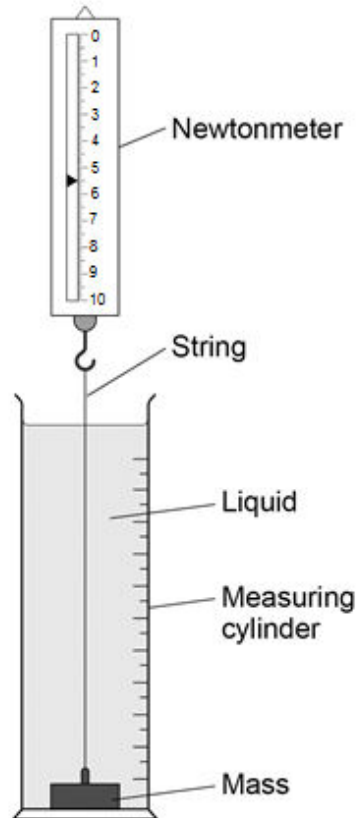
Work done = \_\_\_\_\_ J

0 3

A student investigated the force needed to raise a mass through different liquids at a constant speed.

She set up the apparatus shown in **Figure 5**.

**Figure 5**



0 3 . 1

In the investigation there are several variables.

Draw **one** line from each variable to the correct description for this investigation.

**[3 marks]**

Variable	Description
Control	Distance the mass was lifted
Dependent	Value of force on the newtonmeter
Independent	Mass
	Type of liquid



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**Table 2** shows the student's results.

**Table 2**

Liquid	Force in N
Water	10.0
Washing up liquid	11.1
Glycerol	11.5
Syrup	13.8

**0 3 . 2** What was the resolution of the newtonmeter?

Tick **one** box.

**[1 mark]**

0.1 N

0.5 N

1 N

10 N

**Question 3 continues on the next page**

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**0 3** . **3** The student wanted to display her results.

How should she display her results?

[1 mark]

Tick **one** box.

A bar chart

A line graph

A pie chart

**0 3** . **4** Give a reason for your answer to part **03.3**.

[1 mark]

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**0 3** . **5** A force of 13.8 N was used to lift the mass 30 cm vertically through the liquid.

Use the following equation to calculate the work done in lifting the mass.

Work done = force  $\times$  distance

Choose the correct unit from the box.

[3 marks]

<b>J</b>	<b>m/s</b>	<b>N</b>
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Work done = \_\_\_\_\_

Unit = \_\_\_\_\_

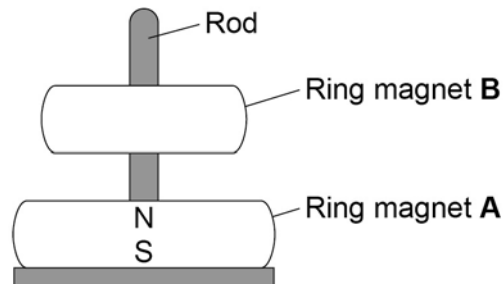
**0 4**

A magnetic toy uses ring-shaped magnets.

Look at **Figure 6**.

The magnets can move up and down the rod. Ring magnet **B** appears to float.

**Figure 6**

**0 4****. 1**

The magnetic poles are labelled on ring magnet **A**.

Label the magnetic poles on ring magnet **B**.

[1 mark]

**0 4****. 2**

What would happen if ring magnet **B** was turned upside down?

[1 mark]

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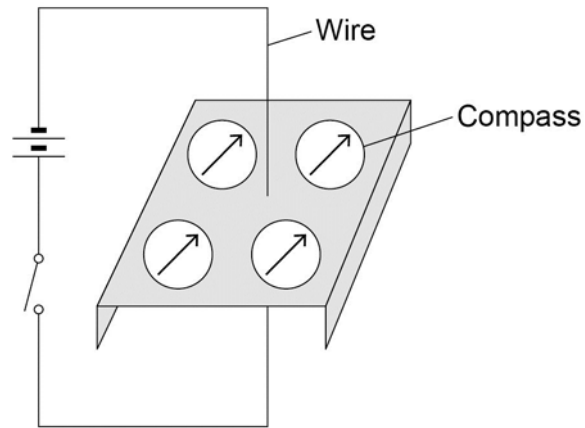
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**Question 4 continues on the next page**

**Figure 7** shows four plotting compasses arranged around a wire.

The needle of a compass is a magnet.

**Figure 7**



**0 4 . 3** In **Figure 7** the switch is open and there is no current in the wire.

Explain why the compass needles all point in the same direction.

**[2 marks]**

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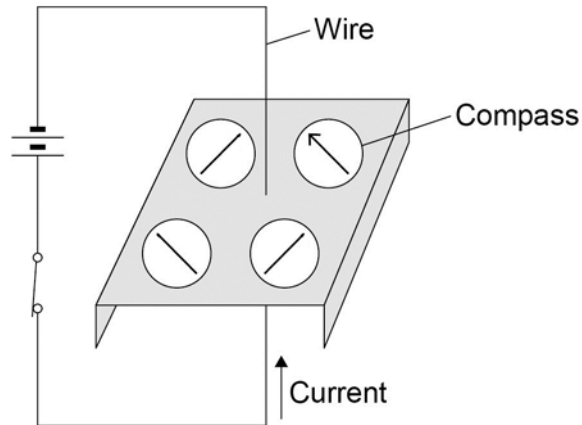
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Figure 8 shows the switch closed.

Figure 8



0 4 . 4 There is now a current in the wire.

The compass needles change direction.

On **Figure 8** draw arrowheads on the three incomplete compass needles to show their direction.

[1 mark]

0 4 . 5 What would happen to the direction of the compass needles if the current was reversed?

[1 mark]

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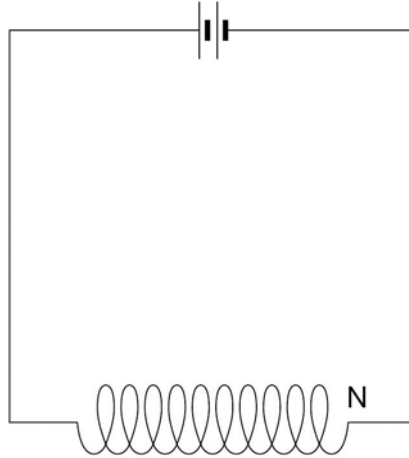
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Question 4 continues on the next page

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**Figure 9** shows a coil of wire in a circuit.

**Figure 9**



**0 4 . 6** On **Figure 9** draw the magnetic field due to the current in the coil.

**[3 marks]**

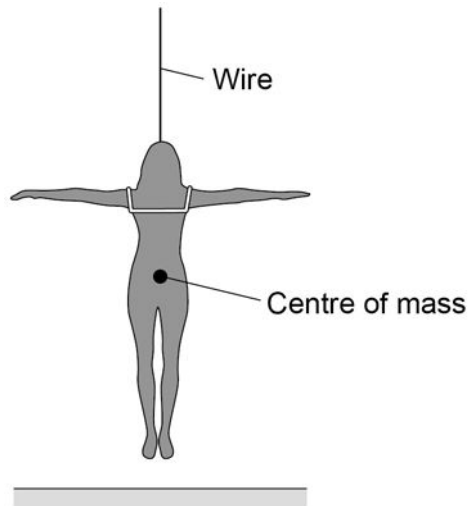
**Turn over for the next question**

**0 5**

An actor is attached to a wire so that she can hang above the stage.

Look at **Figure 10**.

**Figure 10**

**0 5** . **1**

On **Figure 10** draw **two** arrows to show the forces acting on the actor.

[2 marks]

**0 5** . **2**

Which **two** forces are acting on the actor?

[2 marks]

Tick **two** boxes.

Air resistance force

Electrostatic force

Gravitational force

Magnetic force

Tension force



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**0 5** . **3** The actor hangs above the stage in a stationary position.

What is the resultant force on the actor?

[1 mark]

Resultant force = \_\_\_\_\_ N

**0 5** . **4** The actor has a mass of 70 kg.

Gravitational field strength = 9.8 N/kg

Use the following equation to calculate the weight of the actor.

Weight = mass  $\times$  gravitational field strength

Give your answer to 2 significant figures.

[2 marks]

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Weight of actor = \_\_\_\_\_ N

**0 5** . **5** A motor pulls vertically upwards on the wire with a force of 720 N.

Calculate the resultant force on the actor.

[1 mark]

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Resultant force = \_\_\_\_\_ N

**Question 5 continues on the next page**

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Another actor has a mass of 65 kg.

This actor is attached to the wire and the motor pulls her vertically upwards.

The resultant force on the actor is 25 N.

**0 5** . **6** Write down the equation that links acceleration, mass and resultant force.

**[1 mark]**

Equation \_\_\_\_\_

**0 5** . **7** Calculate the acceleration of the actor.

**[3 marks]**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceleration of actor = \_\_\_\_\_ m/s<sup>2</sup>

**Turn over for the next question**

**0 6**

Four students tested their reaction times using a computer program.

When a green light appeared on the screen the students had to press a key.

**Table 3** shows their results.

**Table 3**

Student	Reaction time in s			Mean reaction time in s
	Test 1	Test 2	Test 3	
Boy 1	0.28	0.27	0.26	0.27
Boy 2	0.28	0.47	0.22	0.25
Girl 1	0.31	0.29	0.27	0.29
Girl 2	0.32	0.30	0.29	0.30

**0 6****. 1**

What is meant by 'reaction time' in this experiment?

[1 mark]

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**0 6****. 2**

Boy 2 had an anomalous result in **Test 2**.

Suggest a reason why.

[1 mark]

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**0 6****. 3**

Give **one** conclusion that can be made from the results in **Table 3**.

[1 mark]

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**0 6** . **4** Suggest further evidence that you could collect to support your conclusion.

[1 mark]

Reaction time is important at the start of a race.

**Table 4** shows the time taken by a boy to run different distances.

**Table 4**

Distance in m	Time in s
100	12.74
200	25.63
800	139.46

**0 6** . **5** Reaction time is more important in a 100 m race than in an 800 m race.

Explain why.

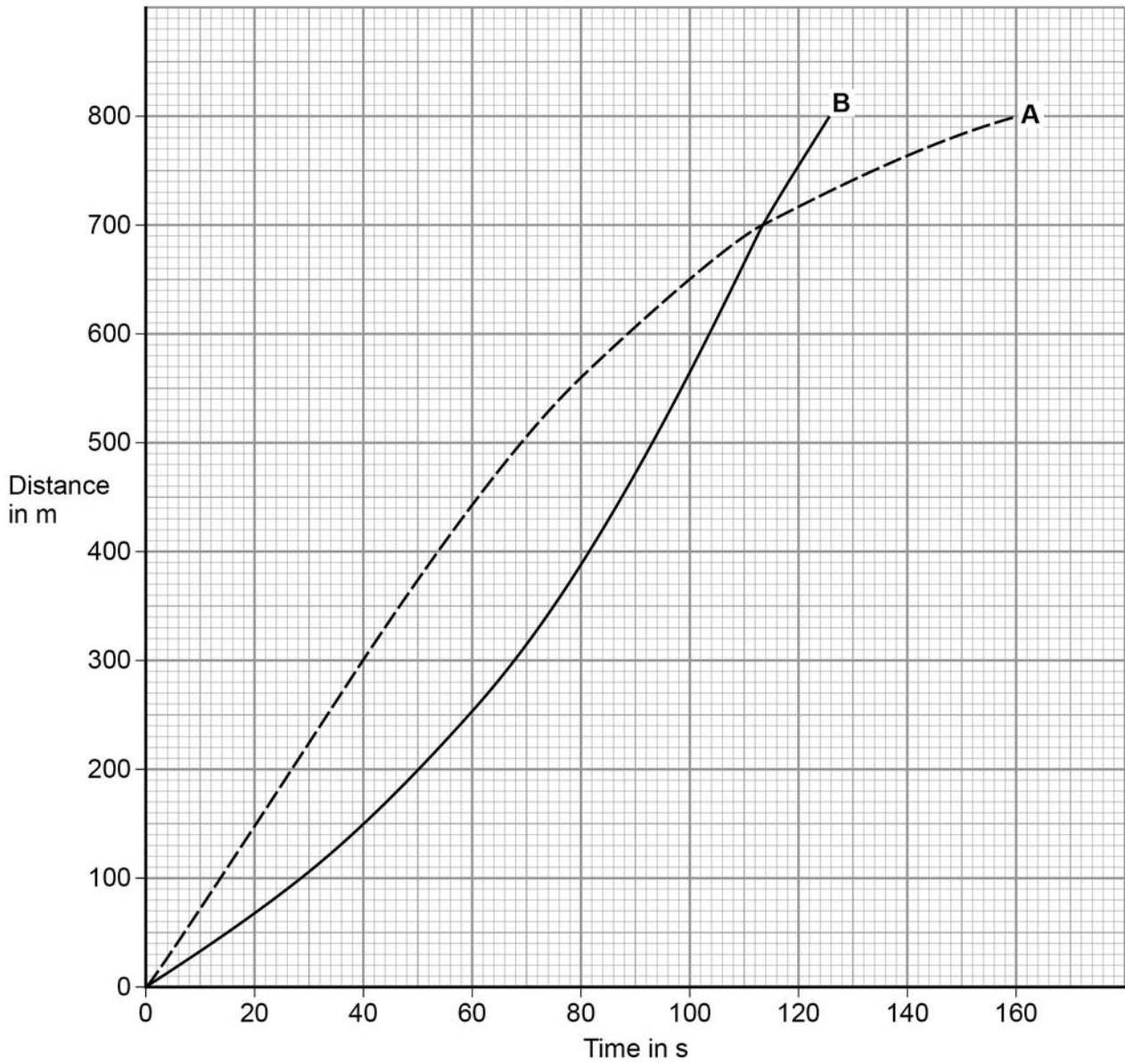
[2 marks]

**Question 6 continues on the next page**

Two girls, **A** and **B**, ran an 800 m race.

**Figure 11** shows how the distance changed with time.

**Figure 11**



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**0 6** . **6** Compare the motion of runners **A** and **B**.

Include data from **Figure 11**.

**[6 marks]**

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**Turn over for the next question**

**0** **7**

A baby monitor has a sensor unit that transmits an image of the baby and the noises the baby makes to a monitor unit.

The monitor unit then displays an image of the baby and emits the noises the baby makes.

**0** **7**

**1**

Compare the properties of the waves that transmit images and noises from the monitor unit.

**[4 marks]**

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**0 7** . **2** The sensor unit can detect infrared and visible light.

Suggest **one** advantage of being able to detect infrared.

[1 mark]

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**0 7** . **3** Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

Equation \_\_\_\_\_

**0 7** . **4** The signals for the monitor unit are transmitted as electromagnetic waves with a wavelength of 0.125 m.

Wave speed of electromagnetic waves =  $3 \times 10^8$  m/s

Calculate the frequency of the signal.

[3 marks]

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Frequency = \_\_\_\_\_ Hz

**END OF QUESTIONS**

**There are no questions printed on this page**

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