



# GCSE COMBINED SCIENCE: TRILOGY

# H

Higher Tier

Paper 6: Physics 2H

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.

## Advice

- In all calculations, show clearly how you work out your answer.
- When answering questions 01.6 and 06.3 you need to make 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.

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

Centre number       Candidate number

Surname

Forename(s)

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

**0 1**

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 1** shows their results.

**Table 1**

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 1**. **1**

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

[1 mark]

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**0 1**. **2**

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

Suggest a reason why.

[1 mark]

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**0 1**. **3**

Give **one** conclusion that can be made from the results in **Table 1**.

[1 mark]

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**0 1 . 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 2** shows the time taken by a boy to run different distances.

**Table 2**

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

**0 1 . 5** Reaction time is more important in a 100 m race than in an 800 m race.

Explain why.

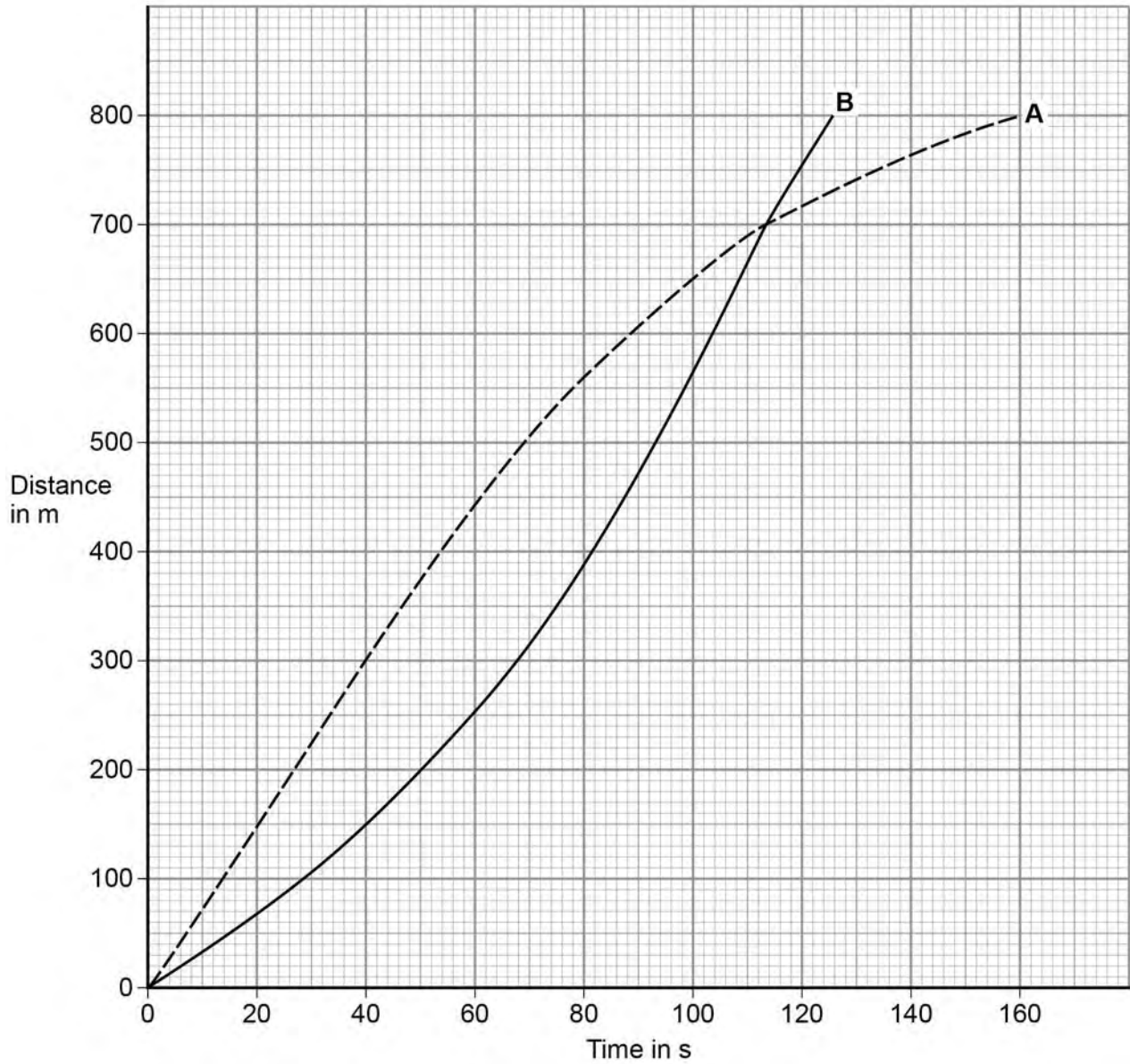
[2 marks]

**Question 1 continues on the next page**

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

**Figure 1** shows how the distance changed with time.

**Figure 1**







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**0 2** . **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 2** . **3** Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

Equation \_\_\_\_\_

**0 2** . **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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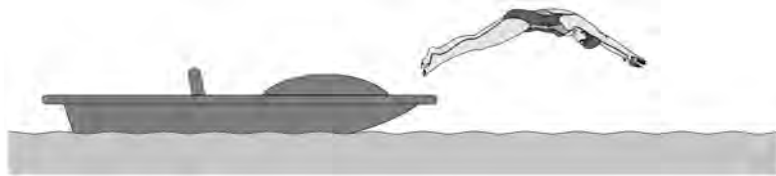
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Frequency = \_\_\_\_\_ Hz

**Turn over for the next question**

**0 3**

A swimmer dives off a boat.

Look at **Figure 2**.**Figure 2****0 3****1**What **two** factors determine the momentum of the swimmer?**[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_

**0 3****2**

What is the unit of momentum?

**[1 mark]**Tick **one** box.J/s kg m/s N m m/s<sup>2</sup>

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**0 3 . 3** The boat was stationary.

As the swimmer dives forwards, the boat moves backwards.

Use the idea of conservation of momentum to explain why the boat moves backwards.

**[4 marks]**

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**0 3 . 4** Explain what would happen to the motion of the boat if there were more people on the boat when the swimmer dived off.

**[2 marks]**

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**Question 3 continues on the next page**

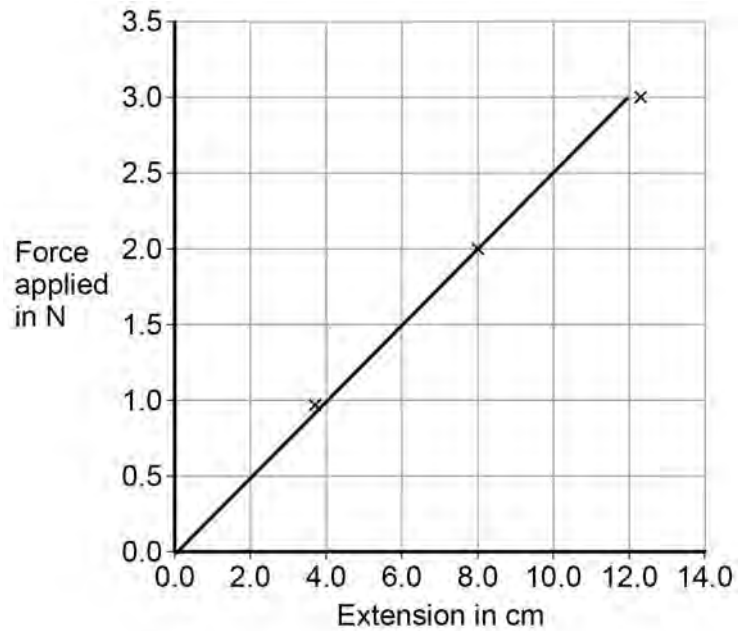


**0 4**

A student changed the force applied to a spring by adding weights.

**Figure 3** shows a graph of her results.

**Figure 3**

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

Write down the equation that links the force applied and extension for a spring.

[1 mark]

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

Identify the pattern shown in **Figure 3**.

Explain your answer.

[2 marks]

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**0 4** . **3**

Give **one** way the student could improve her investigation.

[1 mark]

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0 4 . 4

Describe the relationship between work done and elastic potential energy in stretching a spring.

[2 marks]

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0 4 . 5

Draw a line on **Figure 3** to show the results for a stiffer spring.

Explain the reason for the line you have drawn.

[3 marks]

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0 4 . 6

Explain what would happen to the spring if the student kept adding weights?

[2 marks]

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**0 5****Figure 4** shows a skydiver training in an indoor wind tunnel.

Large fans below the skydiver blow air upwards.

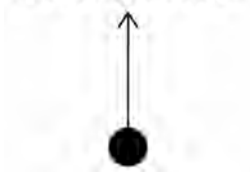
**Figure 4****0 5** . **1**

The skydiver is in a stationary position.

Complete the free body diagram for the skydiver.

**[2 marks]**

Force from the air

**Question 5 continues on the next page**

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**0 5** . **2** The skydiver now straightens his legs to increase his surface area.

This causes the skydiver to accelerate upwards.

Explain why straightening his legs cause the skydiver to accelerate upwards.

**[2 marks]**

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**0 5** . **3** A small aeroplane used for skydiving moves along a runway.

The aeroplane accelerates at  $2 \text{ m/s}^2$  from a velocity of  $8 \text{ m/s}$ .

After a distance of  $209 \text{ m}$  it reaches its take-off velocity.

Calculate the take-off velocity of the aeroplane.

**[3 marks]**

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Take-off velocity = \_\_\_\_\_ m/s

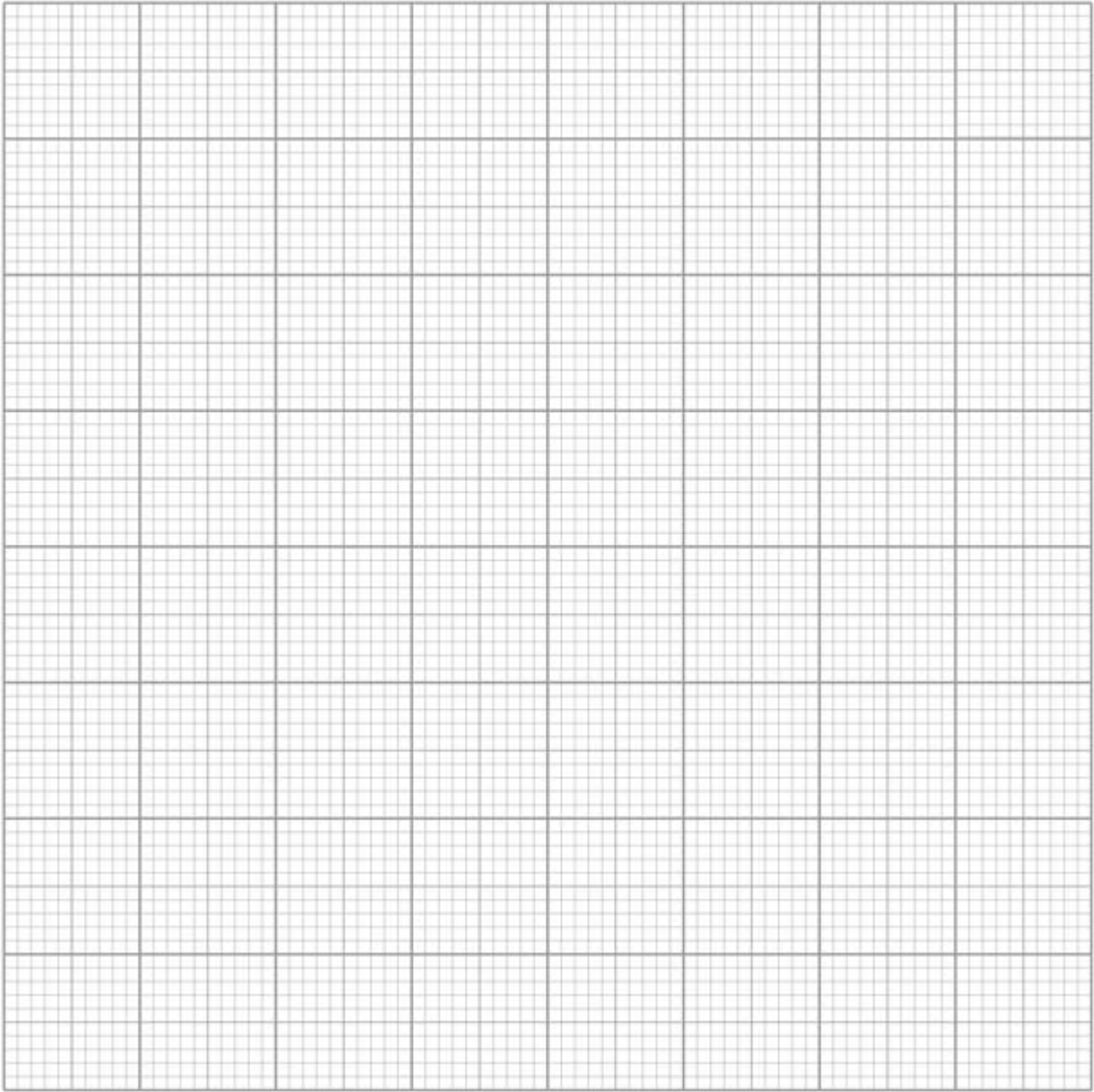
**0 5** . **4** A skydiver jumps from an aeroplane.

There is a resultant vertical force of  $300 \text{ N}$  on the skydiver.

There is a horizontal force from the wind of  $60 \text{ N}$ .

Draw a vector diagram on **Figure 5** to determine the magnitude and direction of the resultant force on the skydiver.

**[4 marks]**

**Figure 5**

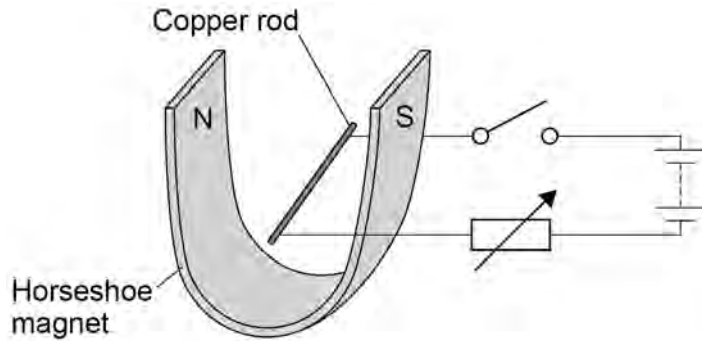
Magnitude of resultant force = \_\_\_\_\_ N

**Turn over for the next question**

**0 6**

A teacher used the equipment shown in **Figure 6** to demonstrate the motor effect.

**Figure 6**



**0 6**

. **1**

Describe how Fleming's left-hand rule can be used to determine the direction in which the rod will move when the switch is closed, and state the direction.

**[4 marks]**

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**0 6** . **2** Increasing the current can increase the force acting on the copper rod.

Give **one** other way in which the size of the force acting on the copper rod could be increased.

[1 mark]

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**0 6** . **3** The copper rod in **Figure 6** has a length of 7 cm and a mass of  $4 \times 10^{-4}$  kg.

When there is a current of 1.12 A the resultant force on the copper rod is 0 N.

Calculate the magnetic flux density.

Gravitational field strength = 9.8 N/kg

[5 marks]

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Magnetic flux density = \_\_\_\_\_ T

**END OF QUESTIONS**

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

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