

Please write clearly in block capitals.

Centre number

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Candidate number

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Candidate signature

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I declare this is my own work.

# GCSE COMBINED SCIENCE: TRILOGY

# H

Higher Tier  
Physics Paper 2H

Time allowed: 1 hour 15 minutes

## Materials

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.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

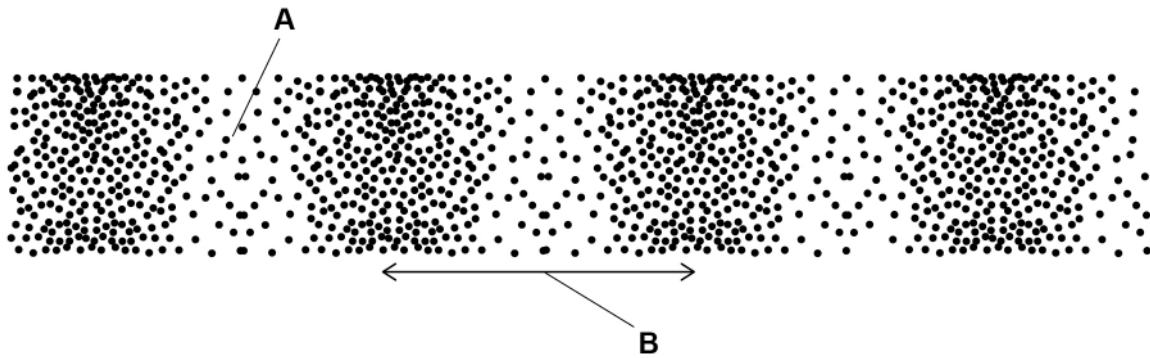
For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>TOTAL</b>	



0 1

Figure 1 shows a longitudinal wave.

Figure 1



0 1 . 1

What do the labels **A** and **B** on **Figure 1** represent?

Choose answers from the box.

[2 marks]

amplitude

frequency

rarefaction

reflection

wavelength

A \_\_\_\_\_

B \_\_\_\_\_



0 1 . 2 The wave shown in **Figure 1** has a frequency of 4.0 kHz

Calculate the period of the wave.

Use the Physics Equations Sheet.

Give the unit.

**[4 marks]**

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

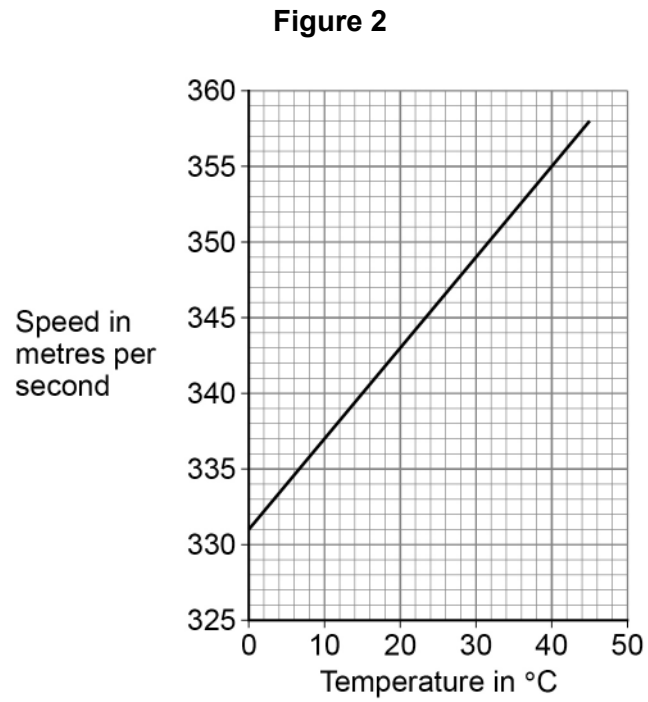
**Question 1 continues on the next page**

**Turn over ►**



Sound waves are longitudinal.

**Figure 2** shows how the speed of sound varies with the temperature of the air.



Use the Physics Equations Sheet to answer questions **01.3** and **01.4**.

**0 1 . 3** Write down the equation that links frequency ( $f$ ), wavelength ( $\lambda$ ) and wave speed ( $v$ ).  
**[1 mark]**

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**0 1 . 4** A sound wave with a frequency of 300 Hz travels through the air.

The air has a temperature of 28.0 °C

Determine the wavelength of the sound wave.

Use **Figure 2**.

**[4 marks]**

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Wavelength = \_\_\_\_\_ m

11

**Turn over for the next question**

**Turn over ►**



0 2

**Figure 3** shows competitors in the wheelchair race at the London Marathon.

The distance of the London Marathon is 42 000 m

**Figure 3**



Use the Physics Equations Sheet to answer questions **02.1** and **02.2**.

**0 2 . 1** Write down the equation that links distance ( $s$ ), force ( $F$ ) and work done ( $W$ ).

**[1 mark]**

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**0 2 . 2** During the race competitors work against air resistance.

The work done against air resistance by the winner of the race was 3 360 000 J

Calculate the average air resistance acting on the winner of the race.

**[3 marks]**

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Average air resistance = \_\_\_\_\_ N

**Question 2 continues on the next page**

**Turn over ►**



Use the Physics Equations Sheet to answer questions **02.3** and **02.4**.

**0 2 . 3** Which equation links distance travelled, speed and time?

**[1 mark]**

Tick (✓) **one** box.

distance travelled = speed × time

time = distance travelled × speed

speed = distance travelled × time

**0 2 . 4** The distance of the London Marathon is 42 000 m

The winning time for the race was 5600 seconds.

Calculate the average speed of the winner of the race.

**[3 marks]**

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Average speed = \_\_\_\_\_ m/s





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0 2 . 5

Explain why the speed of a competitor changes during the race.

[4 marks]

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12

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0 3

**Figure 4** shows a child playing with a toy train.

The train is on a bridge.

**Figure 4**



When the child lets go of the train, the train rolls down the bridge.

0 3 . 1

The momentum of the train at the bottom of the bridge is  $0.216 \text{ kg m/s}$

mass of the train =  $180 \text{ g}$

Calculate the velocity of the train at the bottom of the bridge.

Use the Physics Equations Sheet.

**[4 marks]**

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Velocity = \_\_\_\_\_ m/s



0 3 . 2

The train collides with a stationary carriage on the track.

Explain why the velocity of the train after the collision is less than it was before the collision.

Use ideas about momentum in your answer.

**[4 marks]**

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8

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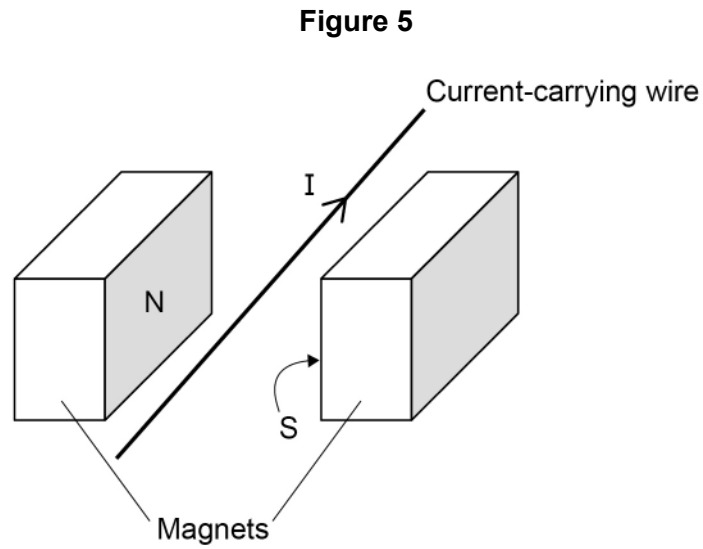
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0 4

A teacher demonstrated the motor effect.

Figure 5 shows the equipment used.



0 4 . 1

Explain why there is a force on the wire when there is a current in the wire.

[2 marks]

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0 4 . 2

Explain how the direction of the force on the wire can be predicted.

[3 marks]

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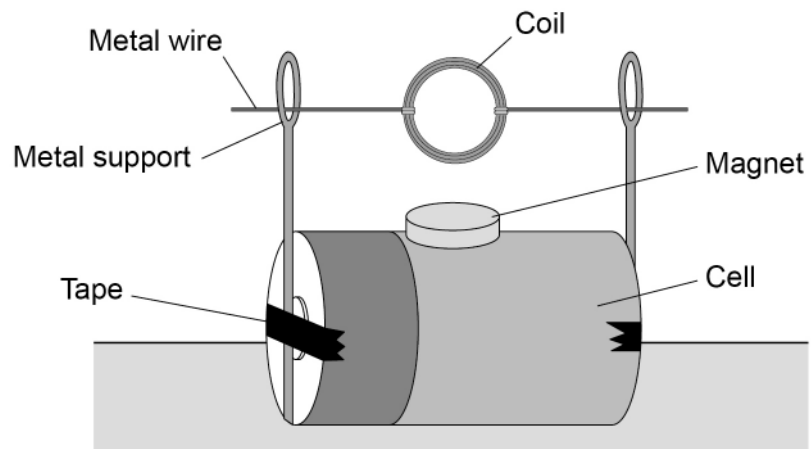


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**0 4 . 3** Figure 6 shows a simple electric motor.

**Figure 6**



Explain **one** way that the motor could be changed to increase the rate at which the coil rotates.

**[2 marks]**

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7

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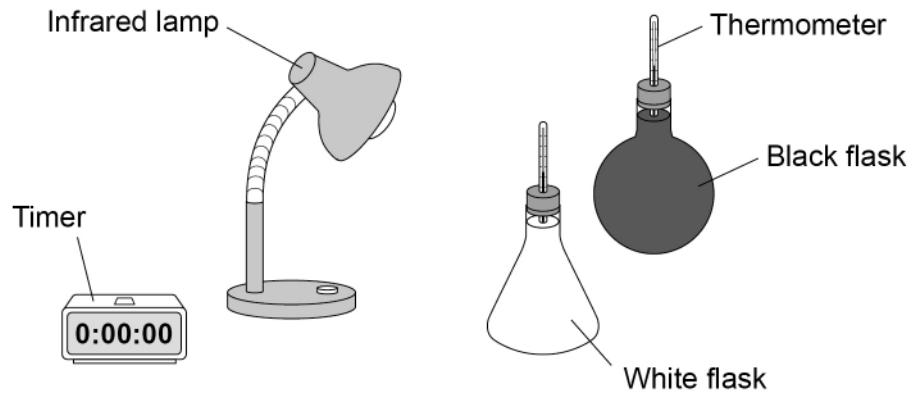
0 5

A student investigated how the colour of a surface affects the amount of infrared radiation the surface absorbs.

**Figure 7** shows the equipment used.

The two flasks are painted different colours.

**Figure 7**



This is the method used.

1. Pour water at 20 °C into each flask.
2. Place a bung and thermometer into each flask.
3. Place each flask in front of the infrared lamp.
4. Measure the temperature of the water every 30 seconds for 10 minutes.

0 5 . 1

Explain **two** improvements to the method the student used.

**[4 marks]**

1 \_\_\_\_\_

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2 \_\_\_\_\_

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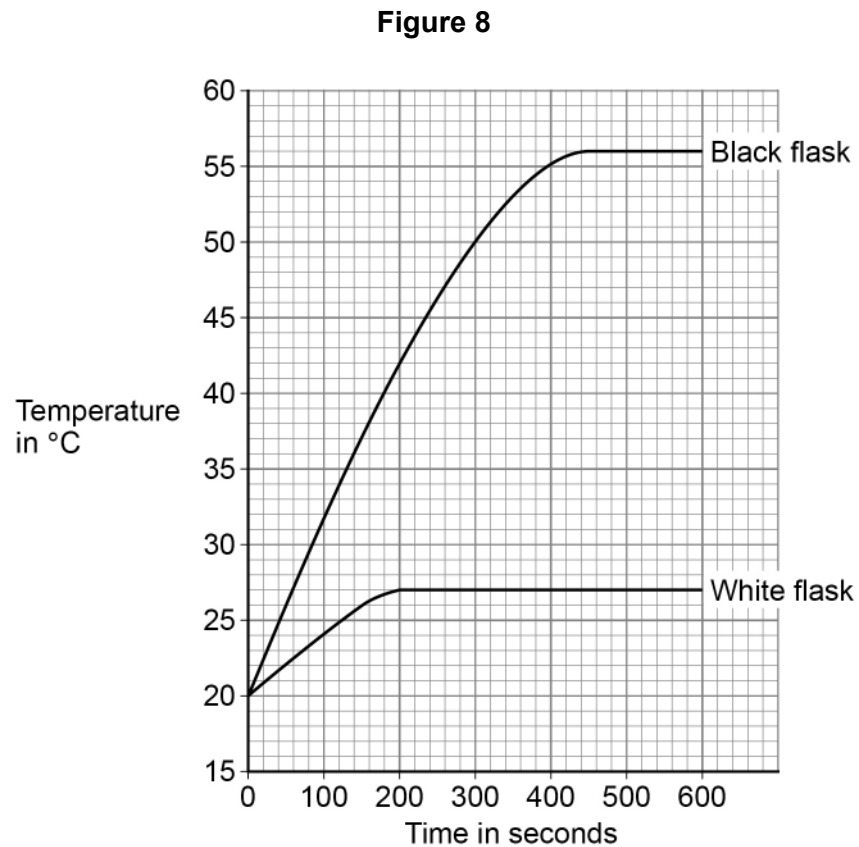
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Figure 8 shows the results for each flask.



**0 5 . 2** Complete the sentences.

**[2 marks]**

After 100 seconds the temperature difference between the black flask and the white flask was \_\_\_\_\_ °C

The temperature of the white flask stopped increasing. The temperature inside the black flask continued to increase for a further \_\_\_\_\_ seconds.





0 5 . 3

The initial rate of absorption of infrared radiation by the black flask was greater than the initial rate of absorption by the white flask.

How does **Figure 8** show this?

[1 mark]

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0 5 . 4

Explain why the temperature of the water in the flasks increased and then became constant.

[4 marks]

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11

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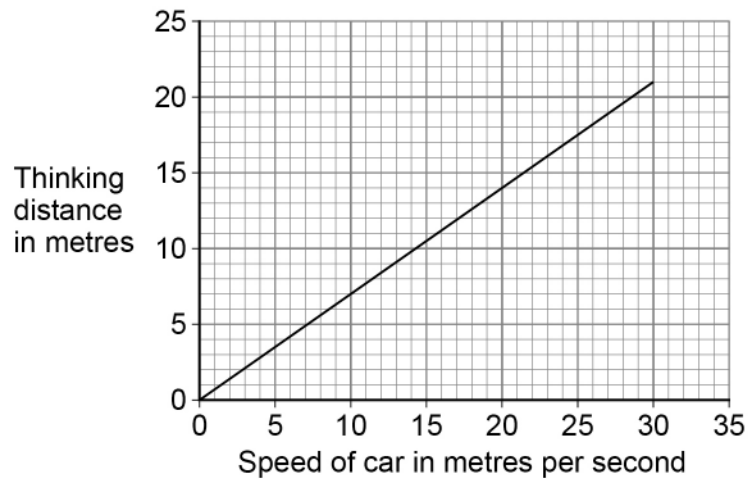


**0 6**

The distance a car travels during the driver's reaction time is called the thinking distance.

**0 6****1**

**Figure 9** shows how thinking distance depends on speed for a car.

**Figure 9**

Determine the driver's reaction time.

Use the Physics Equations Sheet.

**[3 marks]**


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Reaction time = \_\_\_\_\_ s

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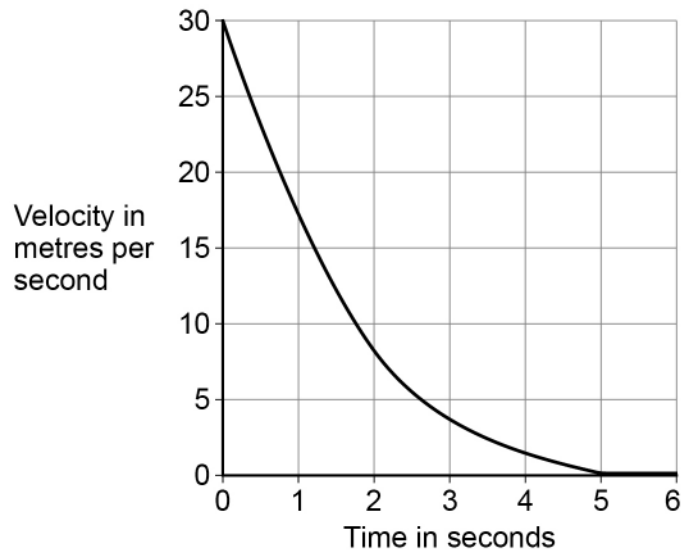
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0 6 . 2

Figure 10 shows how the velocity of a car changes during braking.

Figure 10



Determine the braking distance of the car.

[3 marks]

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Braking distance = \_\_\_\_\_ m



0 6 . 3

Explain how the gradient of the line on **Figure 10** shows that the resultant force on the car was **not** constant.

**[3 marks]**

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**9**

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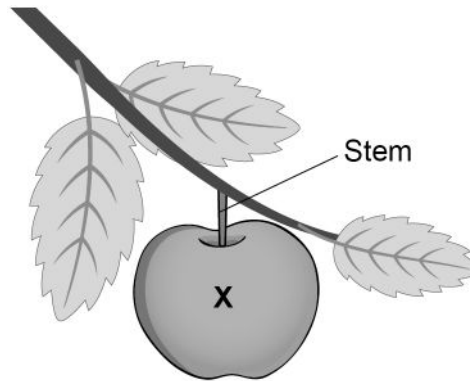


0 7

**Figure 11** shows a stationary apple hanging from a tree.

The **X** marks the centre of mass of the apple.

**Figure 11**



0 7 . 1

Draw **two** arrows on **Figure 11** to show the forces acting on the apple.

**[2 marks]**

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