AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

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).

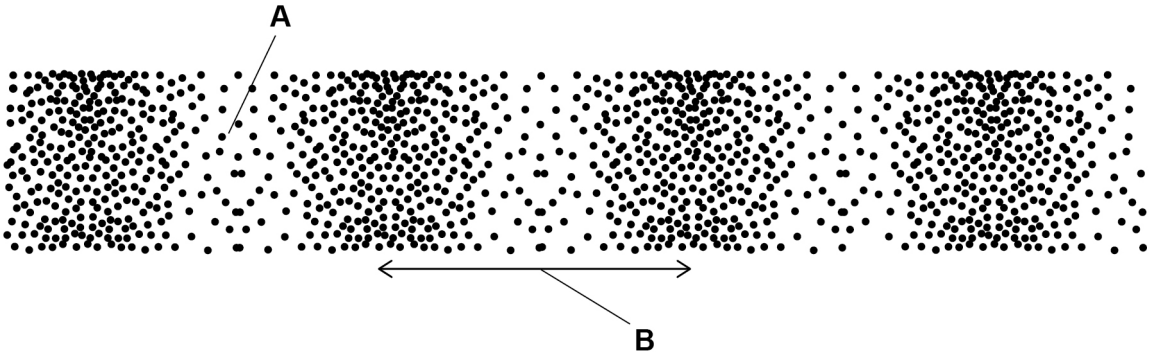
Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question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

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

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.

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]

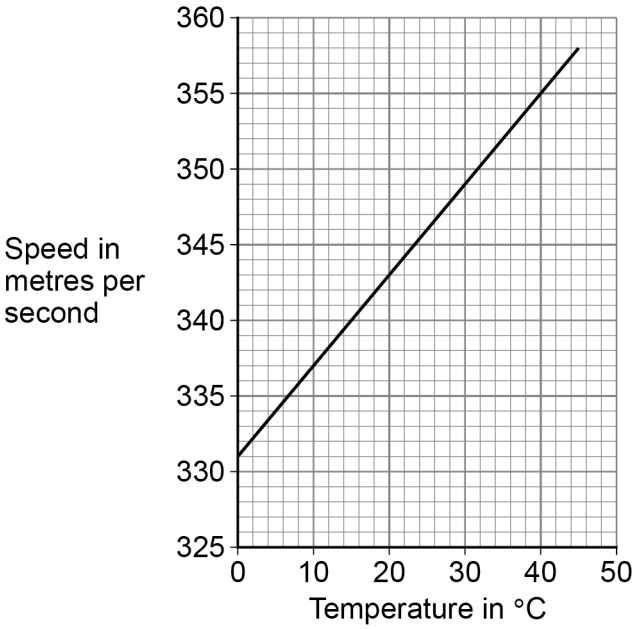
Period = _____ Unit _____

Question 1 continues on the next page

Sound waves are longitudinal.

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

Figure 2



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 (λ) and wave speed (v).

[1 mark]

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]

Wavelength = _____ m

Turn over for the next question

11

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]

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]

Average air resistance = _____ N

Question 2 continues on the next page

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]

Average speed = _____ m/s

0 2 . 5 Explain why the speed of a competitor changes during the race.

[4 marks]

Do not write outside the box

12

Turn over for the next question

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 kg m/s

mass of the train = 180 g

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

Use the Physics Equations Sheet.

[4 marks]

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]

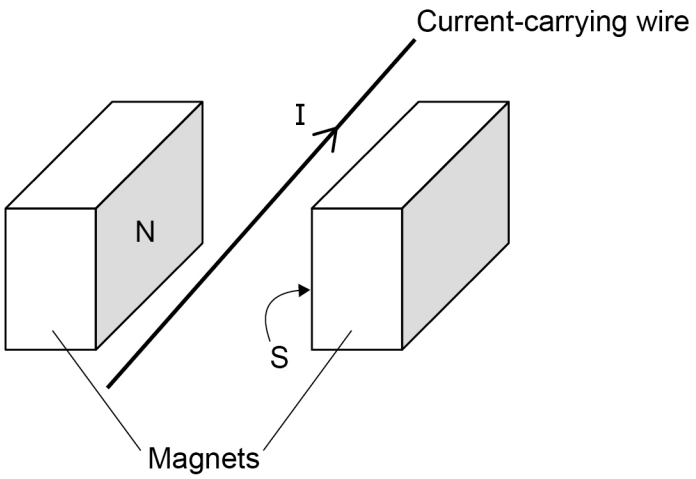
8

Turn over for the next question

0 4 A teacher demonstrated the motor effect.

Figure 5 shows the equipment used.

Figure 5



0 4 . 1 Explain why there is a force on the wire when there is a current in the wire.

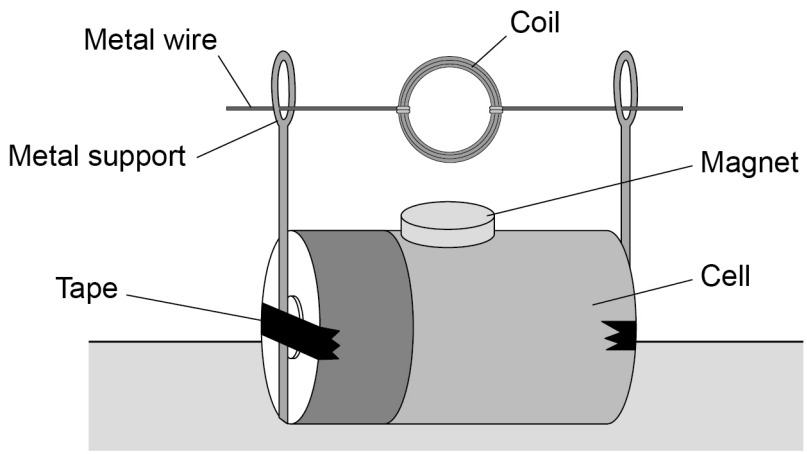
[2 marks]

0 4 . 2 Explain how the direction of the force on the wire can be predicted.

[3 marks]

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]

7

Turn over for the next question

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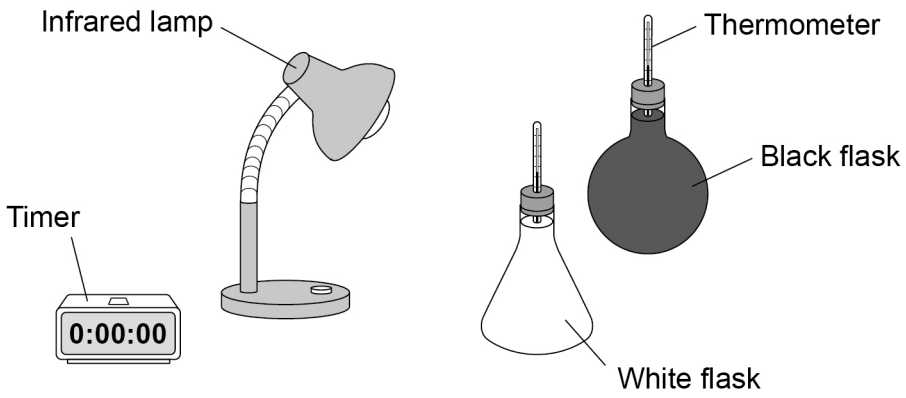
ANSWER IN THE SPACES PROVIDED

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 _____

_____

_____

_____

2 _____

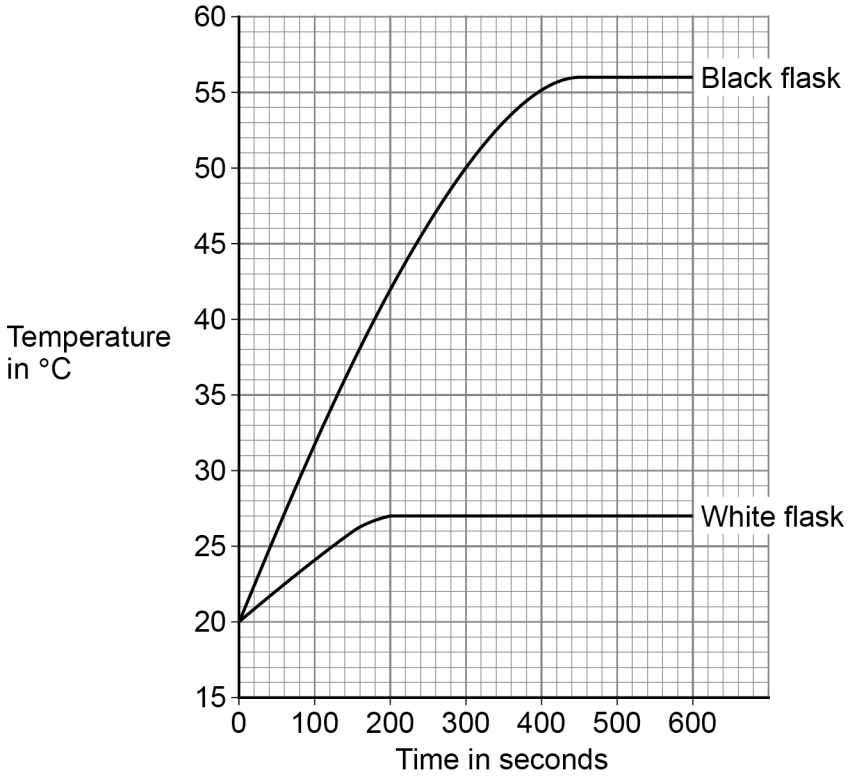
_____

_____

_____

Figure 8 shows the results for each flask.

Figure 8



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]

0 5 . 4 Explain why the temperature of the water in the flasks increased and then became constant.

[4 marks]

Turn over for the next question

11

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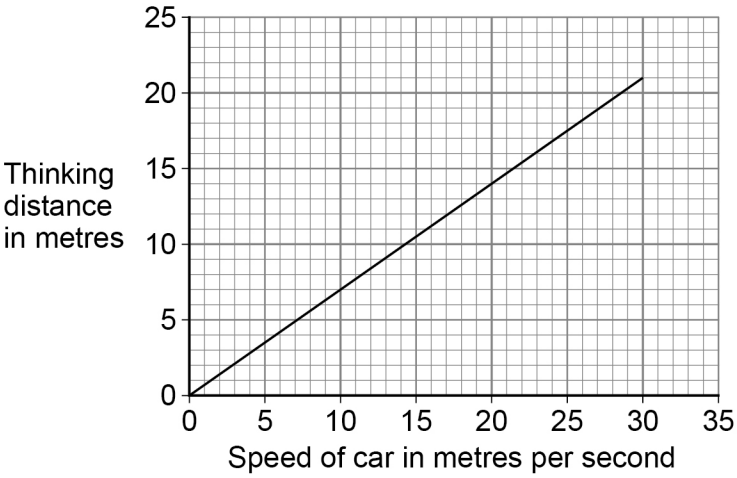
ANSWER IN THE SPACES PROVIDED

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.

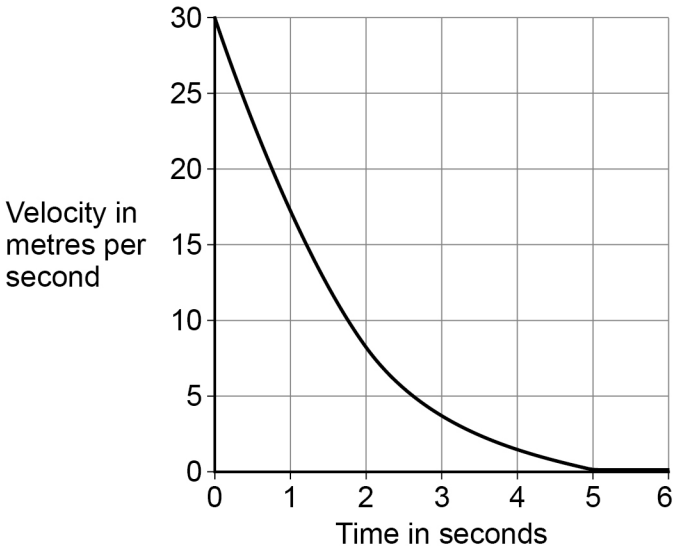
[3 marks]

Reaction time = _____ s

Question 6 continues on the next page

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]

Braking distance = _____ m

Do not write outside the box

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]

9

Turn over for the next question

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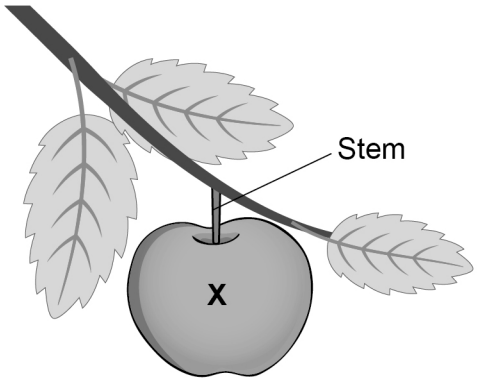
ANSWER IN THE SPACES PROVIDED

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]

Question 7 continues on the next page

0 7 . 2 It takes 0.50 s for the apple to fall to the ground.

The initial velocity of the apple is 0 m/s

acceleration due to gravity = 9.8 m/s^2

Calculate the distance fallen by the apple.

Use the Physics Equations Sheet.

[6 marks]

Distance = _____ m

Do not write outside the box

0 7 . 3 In Question **07.2** it was assumed that the acceleration was a constant 9.8 m/s^2

Evaluate this assumption.

[4 marks]

END OF QUESTIONS

12

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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