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

Monday 16 June 2025 Morning 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	
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.

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0 1 In a dog-sled race, a team of dogs pull on a rope attached to a sled.

Figure 1 shows a dog-sled team.

Figure 1

Use the Physics Equations Sheet to answer questions **01.1** and **01.2**.

0 1 . 1 What equation links distance travelled, speed and time?

[1 mark]

Tick (✓) **one** box.

distance travelled = speed × time ☐

speed = time × distance travelled ☐

time = distance travelled × speed ☐

Do not write outside the box

0 1 . 2 The longest dog-sled race in the world covers a distance of 1 500 000 m.

One team finished the race in a time of 670 000 s.

Calculate the average speed of this team during the race.

[3 marks]

Average speed = _____ m/s

0 1 . 3 At the start of the race, 6 dogs pulled on the rope.

The average forward force on the sled from **each** dog was 370 N.

The backwards force on the sled from friction was 520 N.

Calculate the resultant force on the sled.

[2 marks]

Resultant force = _____ N

Question 1 continues on the next page

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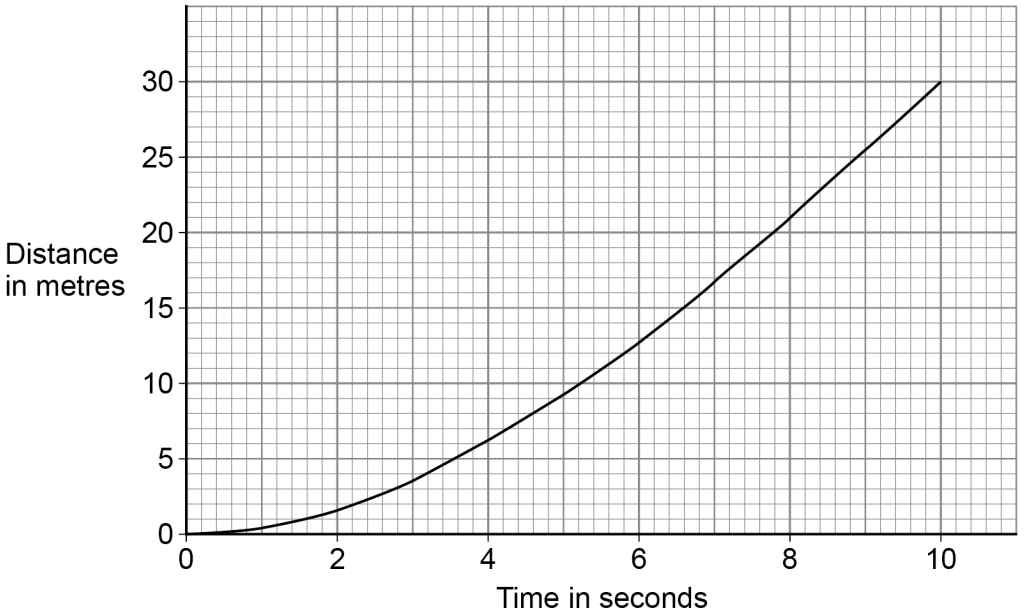
Figure 2 shows a distance–time graph for the sled at the start of the race.

Figure 2



0 1 . 4 What does the gradient of the graph in **Figure 2** represent?

[1 mark]

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0 1 . 5 Later in the race, the sled moved at a constant speed along a flat, horizontal path.

What was the relationship between the size of the horizontal forces acting when the sled moved at a constant speed?

[1 mark]

Tick (✓) **one** box.

friction + air resistance < pull of the rope on the sled ☐

friction + air resistance = pull of the rope on the sled ☐

friction + air resistance > pull of the rope on the sled ☐

0 1 . 6 The rope exerted a force on the sled when the sled was moving.

What is the Newton's Third Law pair to the force of the rope on the sled?

[1 mark]

Tick (✓) **one** box.

The force of friction on the sled ☐

The force of the dogs on the rope ☐

The force of the sled on the rope ☐

9

Turn over for the next question

Do not write outside the box

0 2 The stopping distance of a car is affected by the condition of the brakes and tyres.

A car is being driven around a corner when the driver sees some roadworks.

0 2 . 1 The driver applies the brakes when the car is 24 m away from the roadworks.

The velocity of the car changes from 18 m/s to 0 m/s.

Calculate the constant deceleration needed to stop the car in a distance of 24 m.

Use the Physics Equations Sheet.

[3 marks]

Deceleration = _____ m/s^2

Do not write outside the box

0 2 . 2 As a safety measure, the speed limit on the road was reduced.

Explain how the safety of road users is affected by:

- the condition of the brakes and tyres
- reduced speed.

You should refer to thinking distance and braking distance.

[6 marks]

Extra space

Question 2 continues on the next page

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0 2 . 3 Two identical cars were driven along a straight, level road.

One car had a greater speed than the other car.

The driver of each car applied the brakes until the cars stopped.

Both cars travelled the same distance while braking.

Explain how braking from a greater speed affected the risk of the brakes overheating.

[3 marks]

12

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0 3 A pair of sunglasses has lenses that absorb all ultraviolet and some visible light.

0 3 . 1 Ultraviolet and visible light are both transverse waves.

What is meant by 'transverse waves'?

[2 marks]

0 3 . 2 Ultraviolet can cause sunburn and eye damage.

Give **one** other risk to health from exposure to ultraviolet.

[1 mark]

0 3 . 3 Complete the sentence.

[1 mark]

Compared with the wavelength of visible light, the wavelength of ultraviolet

is _____.

Question 3 continues on the next page

Do not write outside the box

0 3 . 4 A wave of visible light has a frequency of 6.25×10^{14} Hz.

speed of light = 3.00×10^{8} m/s

Calculate the wavelength of this light.

Use the Physics Equations Sheet.

Give your answer in nanometres (nm).

[4 marks]

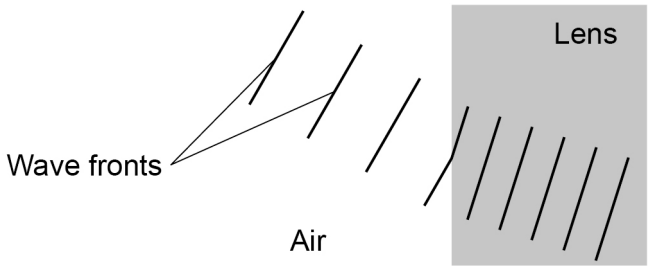
Wavelength = _____ nm

Do not write outside the box

0 3 . 5 A ray of visible light incident on the lens in a pair of sunglasses is refracted.

Figure 3 shows a wave front diagram for visible light incident on the lens.

Figure 3



For each wave front, one end of the wave front enters the lens before the other end.

Explain why the light refracts as it enters the lens.

[2 marks]

Question 3 continues on the next page

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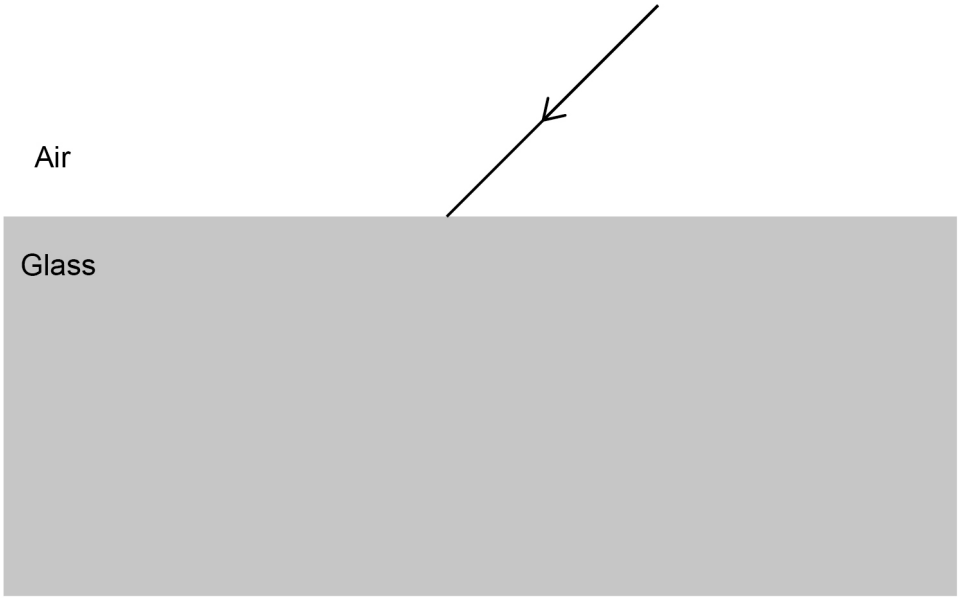
0 3 . 6 **Figure 4** shows a ray of visible light incident on glass.

The angle of incidence is 45°.

Figure 4



The angle of refraction of the ray in the glass is 28°.

Complete the ray diagram in **Figure 4** to show the path of the ray in the glass.

You should:

- draw the normal line
- draw the refracted ray in the glass.

You do **not** need to draw the ray leaving the glass.

[2 marks]

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ANSWER IN THE SPACES PROVIDED

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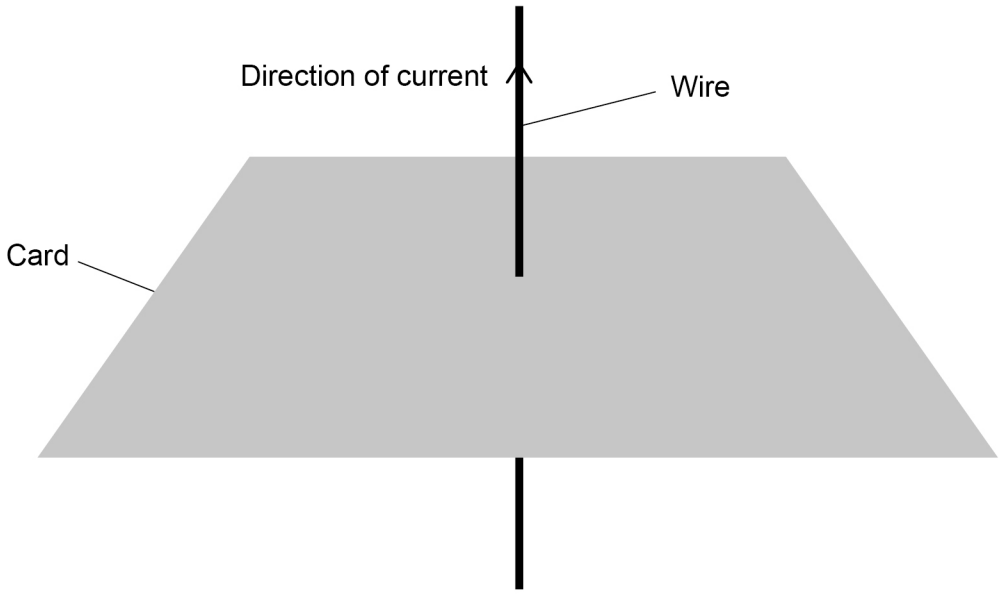
0 4 When there is a current in a wire, there is a magnetic field around the wire.

0 4 . 1 **Figure 5** shows a wire passing through a piece of card.

There is a current in the wire.

Figure 5



Draw **two** magnetic field lines on the card in **Figure 5** to show the magnetic field pattern around the wire.

[2 marks]

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0 4 . 2 A student positioned a straight wire in the magnetic field between two magnets.

The wire was perpendicular to the magnetic field.

There was a current of 0.56 A in the wire.

The magnetic force on the wire was 2.1 mN.

The length of wire in the magnetic field was 0.050 m.

Calculate the magnetic flux density of the magnetic field between the magnets.

Use the Physics Equations Sheet.

Give the unit.

[5 marks]

Magnetic flux density = _____ Unit _____

Question 4 continues on the next page

Do not write outside the box

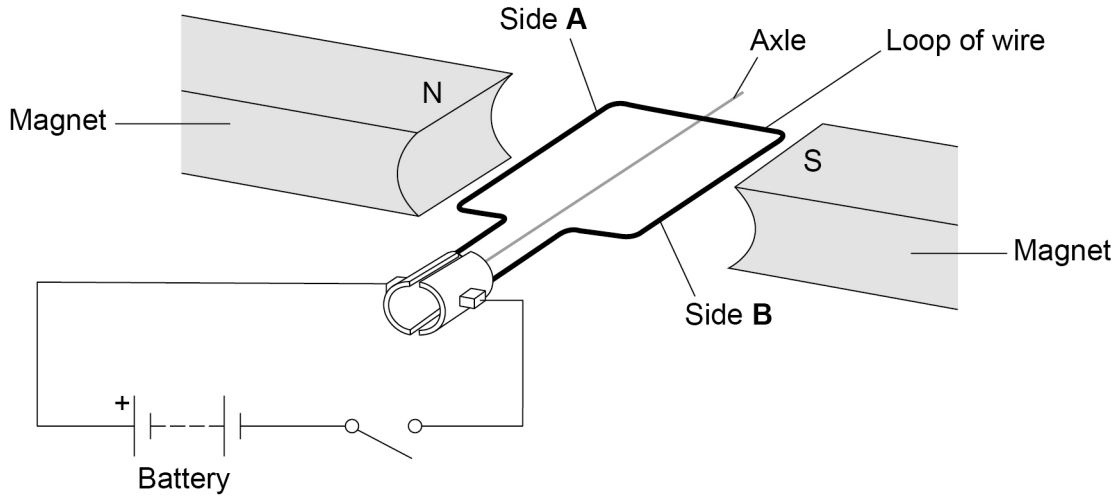
0 4 . 3 The student replaced the straight wire with a loop of wire.

The loop of wire was on an axle so that the loop could rotate.

The student connected the loop of wire to a battery and a switch.

Figure 6 shows the apparatus.

Figure 6



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When the switch is closed, magnetic forces on the loop make the loop begin to rotate.

Explain how.

You should refer to side **A** and side **B** of the loop of wire in **Figure 6**.

[5 marks]

Extra space

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0 5 A student used a temperature probe to measure the temperature of melting ice.

This is the method used.

1. Place the temperature probe in iced water and record the temperature.
2. Remove the probe from the iced water and allow the probe to return to room temperature.
3. Repeat steps 1 and 2 four more times.

The measurements were:

–0.5 °C +0.2 °C –0.3 °C +0.5 °C +0.1 °C

0 5 . 1 What type of error is shown by the measurements?

[1 mark]

0 5 . 2 Determine the uncertainty in the measurements.

[2 marks]

Uncertainty = ± _____ °C

Question 5 continues on the next page

The student investigated how the colour of an object affects the rate of change of temperature of the object.

This is the method used.

1. Make two identical cubes using clay.

2. Paint one cube black and paint one cube white.

3. Push a temperature probe into the centre of each cube.

4. Place the cubes 10 cm from an infrared heater.

5. Record the temperature of each cube every two minutes.

Table 1 shows the results for the white cube.

Table 1

Time in minutes	**Temperature in °C**
0	18
2	55
4	68
6	73
8	65
10	76
12	76

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0 5 . 3 Complete **Figure 7**.

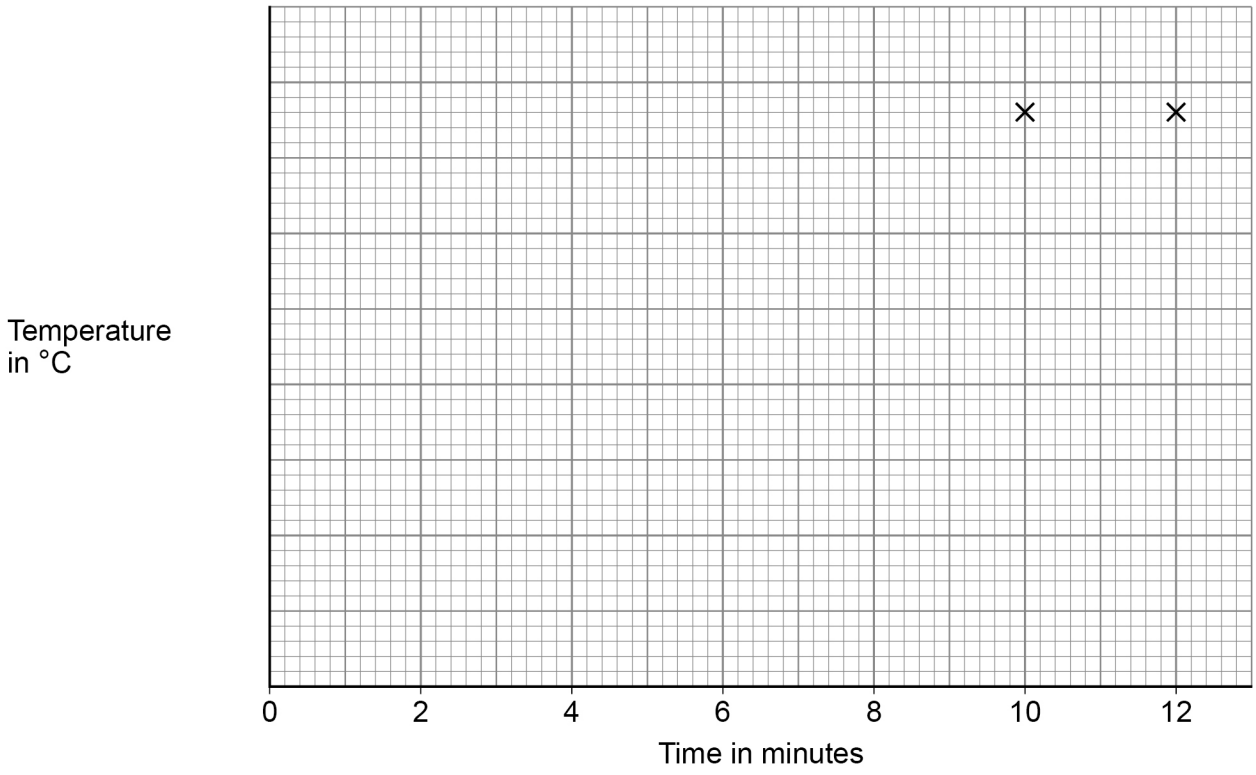
You should:

- use a suitable scale for the *y*-axis
- plot the data from **Table 1**
- draw a line of best fit.

The data for 10 minutes and 12 minutes have been plotted for you.

[4 marks]

Figure 7



Question 5 continues on the next page

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0 5 . 4 The temperature of the black cube increased from 18 °C to 63 °C in the first 2.0 minutes.

Calculate the average rate of change of temperature of the black cube in the first 2.0 minutes.

Give your answer in °C/s.

[3 marks]

Average rate of change of temperature = _____ °C/s

Do not write outside the box

0 5 . 5 The student made two observations:

1. The rate of change of temperature was initially greater for the black cube than for the white cube.

2. After a few minutes, both cubes stopped changing temperature.

Explain the student's observations.

You should refer to the absorption and emission of radiation from the surfaces of the cubes.

[4 marks]

Extra space

14

Turn over for the next question

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0 6 A triathlon race consists of swimming, cycling and running.

0 6 . 1 One athlete in a triathlon swims at a speed of 1.5 m/s.

How does the athlete's swimming speed compare with the typical speed of a person walking?

[1 mark]

Tick (✓) **one** box.

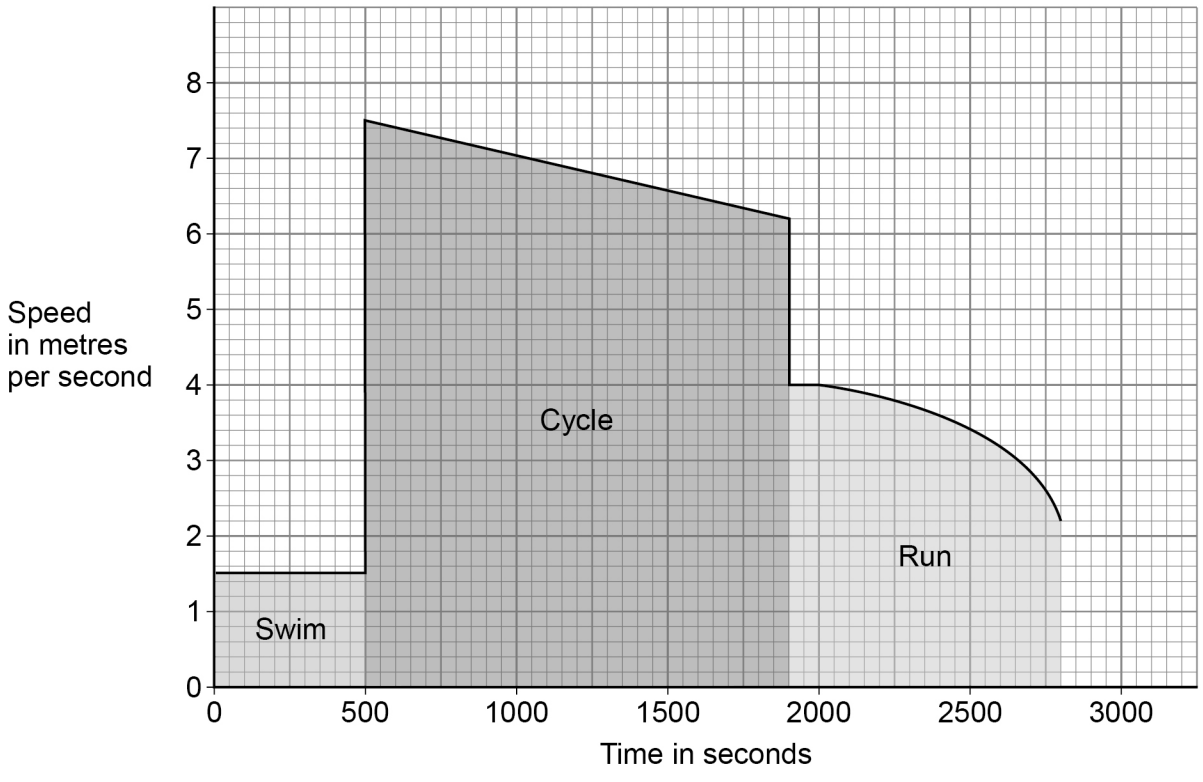
athlete's swimming speed > typical walking speed ☐

athlete's swimming speed = typical walking speed ☐

athlete's swimming speed < typical walking speed ☐

Figure 8 shows a speed–time graph for the athlete for the whole triathlon.

Figure 8



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0 6 . 2 The cycling part of the race was on a straight road.

The work done by the forward force on the bicycle was 110 000 J.

Determine the mean forward force on the bicycle.

Use the Physics Equations Sheet.

[6 marks]

Mean forward force = _____ N

Question 6 continues on the next page

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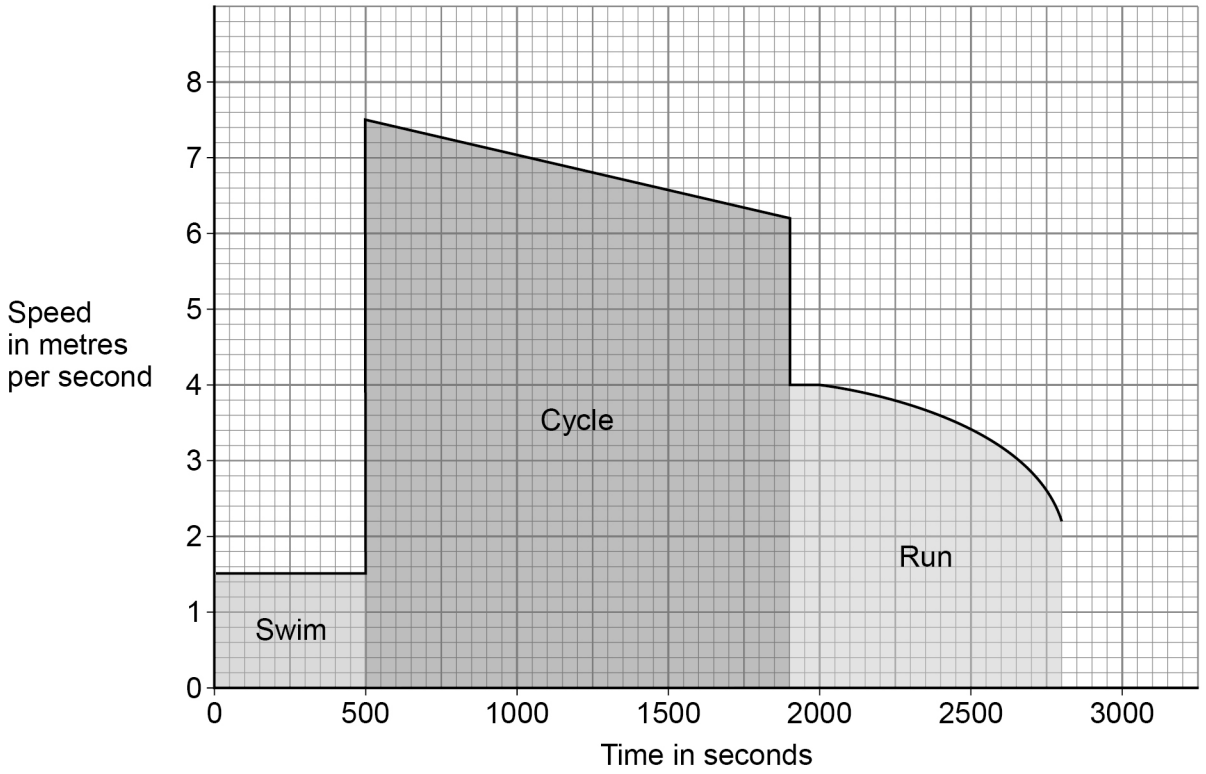
Figure 8 is repeated below.

Figure 8



0 6 . 3 The first part of the **run** was on a circular track.

The time taken for the athlete to run round the track was 100 s.

Describe the velocity of the athlete during the first 100 s of the **run**.

Use **Figure 8**.

[2 marks]

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0 6 . 4 After running round the track once, the rest of the run was on a straight, horizontal road.

Explain how **Figure 8** shows that the magnitude of the deceleration of the athlete increased.

[2 marks]

11

END OF QUESTIONS

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