

Distance and Displacement

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.5 Forces
Sub-Topic	Distance and Displacement
Difficulty Level	Silver Level
Booklet	Question Paper 1

Time Allowed: 52 minutes

Score: /49

Percentage: /100

Grade Boundaries:

Q1. 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	0.29
Girl 1	0.31	0.29	0.27	0.29
Girl 2	0.32	0.30	0.29	0.30

(a) What is meant by 'reaction time' in this experiment?

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(1)

(b) Boy 2 had an anomalous result in **Test 2**.

Suggest a reason why.

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(1)

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

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(1)

(d) Suggest further evidence that you could collect to support your conclusion.

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(1)

- (e) 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

Reaction time is more important in a 100 m race than in an 800 m race.

Explain why.

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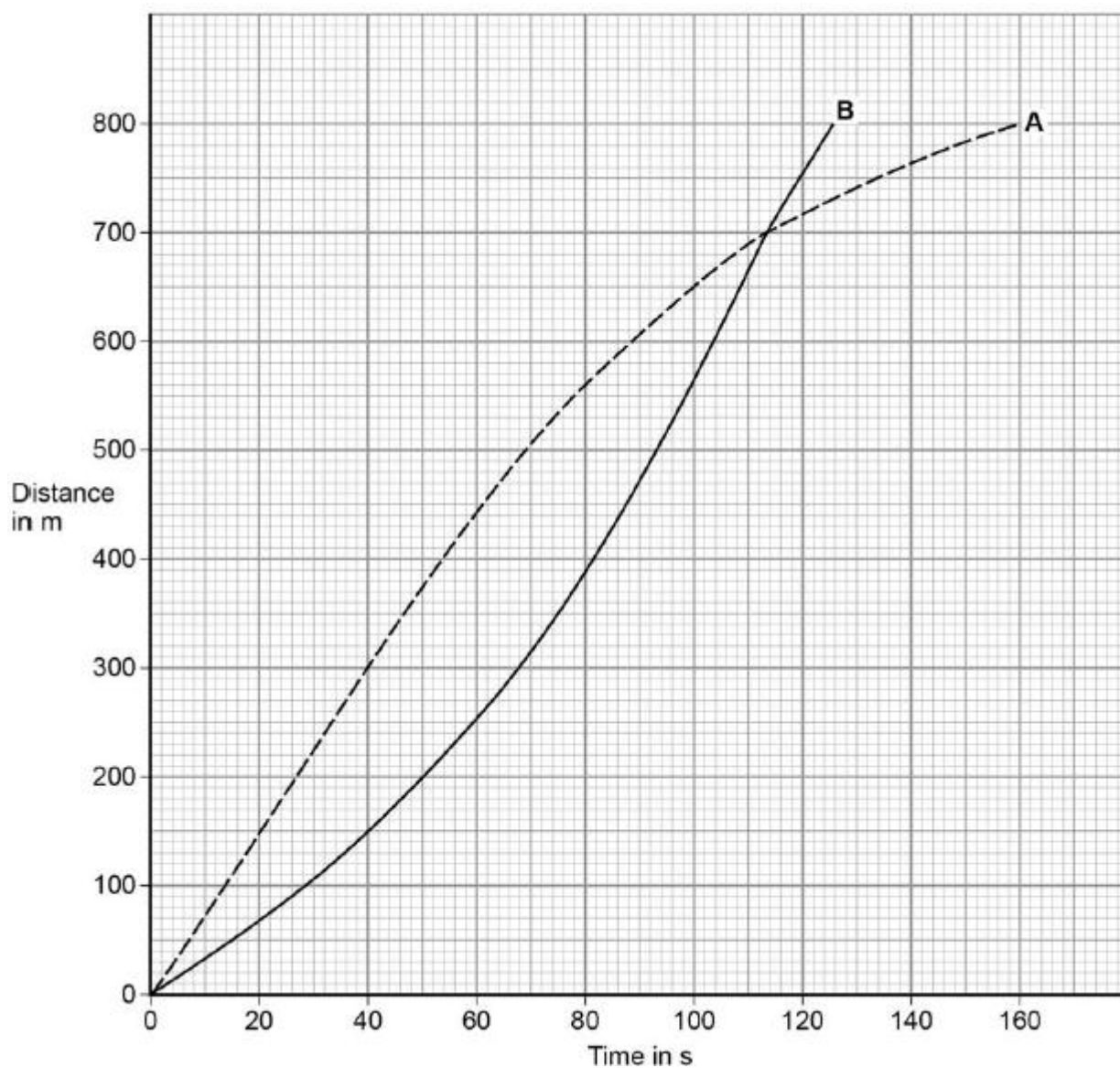
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(2)

- (f) Two girls, **A** and **B**, ran an 800 m race.

The figure below shows how the distance changed with time.



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

Include data from the figure above.

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(6)
(Total 12 marks)

Q2. This question is about speed.

- (a) What is a typical value for the speed of sound?

Tick **one** box.

3.3 m / s

☐

3.3×10^2 m / s

☐

3.3×10^3 m / s

☐

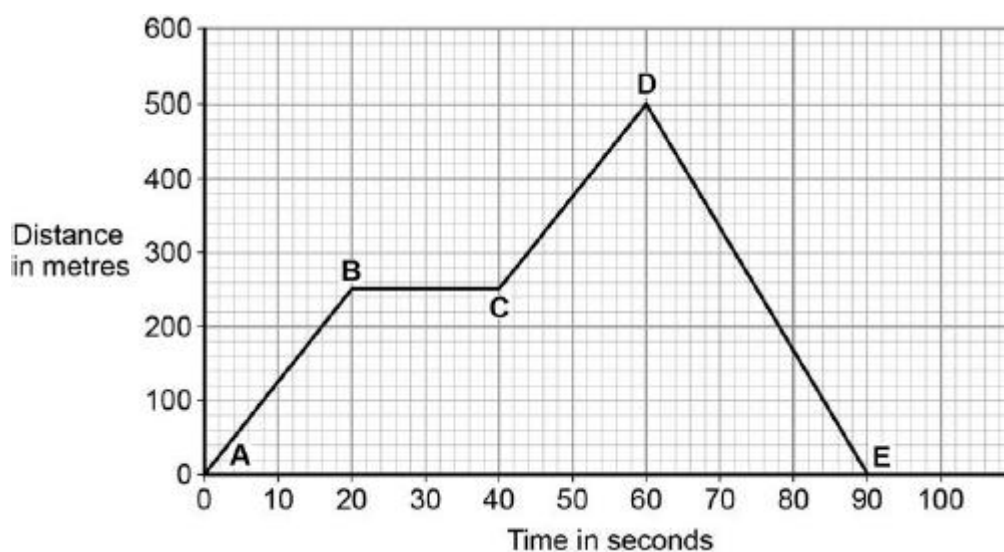
3.3×10^6 m / s

☐

(1)

- (b) **Figure 1** shows a distance–time graph of a car.

Figure 1



Explain what **Figure 1** shows about the motion of the car between point **A** and point **E**.

You should use values from **Figure 1** in your answer.

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(4)

- (c) The kinetic energy of a moving car depends on the car's mass and speed.

Write down the equation that links kinetic energy, mass and speed.

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(1)

- (d) A car has a mass of 1 650 kg.

The table below shows the kinetic energy of the car moving at 11 m / s.

Mass of car in kg	Speed in m / s	Kinetic energy in J
1 650	11	99 825
1 650	30	

Calculate the missing value in the table above.

Give your answer in kilojoules (kJ).

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Kinetic energy = kJ

(2)

- (e) A man is driving his car at a constant speed on a wet road.

He sees a fallen tree on the wet road and tries to stop quickly to prevent an accident.

Figure 2



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Explain why the man may not be able to stop in time.

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(6)
(Total 14 marks)

Q3. The figure below shows an ice skater standing on the ice.



Mass
70 kg

- (a) Write down the equation that links acceleration, change in velocity and time.

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(1)

- (b) As the skater pushes away across the ice there is a small frictional force.

After pushing, the skater starts to move with a velocity of 5 m / s.

He slows to 3 m / s in 6 seconds.

Calculate the acceleration of the skater.

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Acceleration = m / s²

(2)

- (c) Write down the equation that links acceleration, force and mass.

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(1)

- (d) Friction reduces the speed of the skater.

Calculate the frictional force acting on the skater to slow him down.

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Frictional force = N

(2)

- (e) The skater stands still on the ice.

He throws his bag to a friend.

As he throws his bag forwards, the skater moves backwards across the ice.

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

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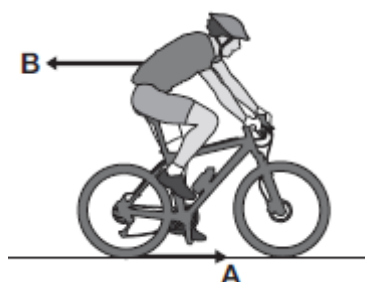
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(4)
(Total 10 marks)

Q4.(a) **Figure 1** shows the horizontal forces acting on a moving bicycle and cyclist.

Figure 1



(i) What causes force **A**?

Draw a ring around the correct answer.

friction

gravity

weight

(1)

(ii) What causes force **B**?

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(1)

(iii) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Figure 2 shows how the velocity of the cyclist changes during the first part of a journey along a straight and level road. During this part of the journey the

Figure 2



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(6)

- (b) (i) The cyclist used the brakes to slow down and stop the bicycle.

A constant braking force of 140 N stopped the bicycle in a distance of 24 m.

Calculate the work done by the braking force to stop the bicycle. Give the unit.

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Work done =

(3)

- (ii) Complete the following sentences.

When the brakes are used, the bicycle slows down. The kinetic energy of the bicycle

At the same time, the of the brakes increases.

(2)

(Total 13 marks)