

Velocity

Question Paper 1

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

Time Allowed: 60 minutes

Score: /57

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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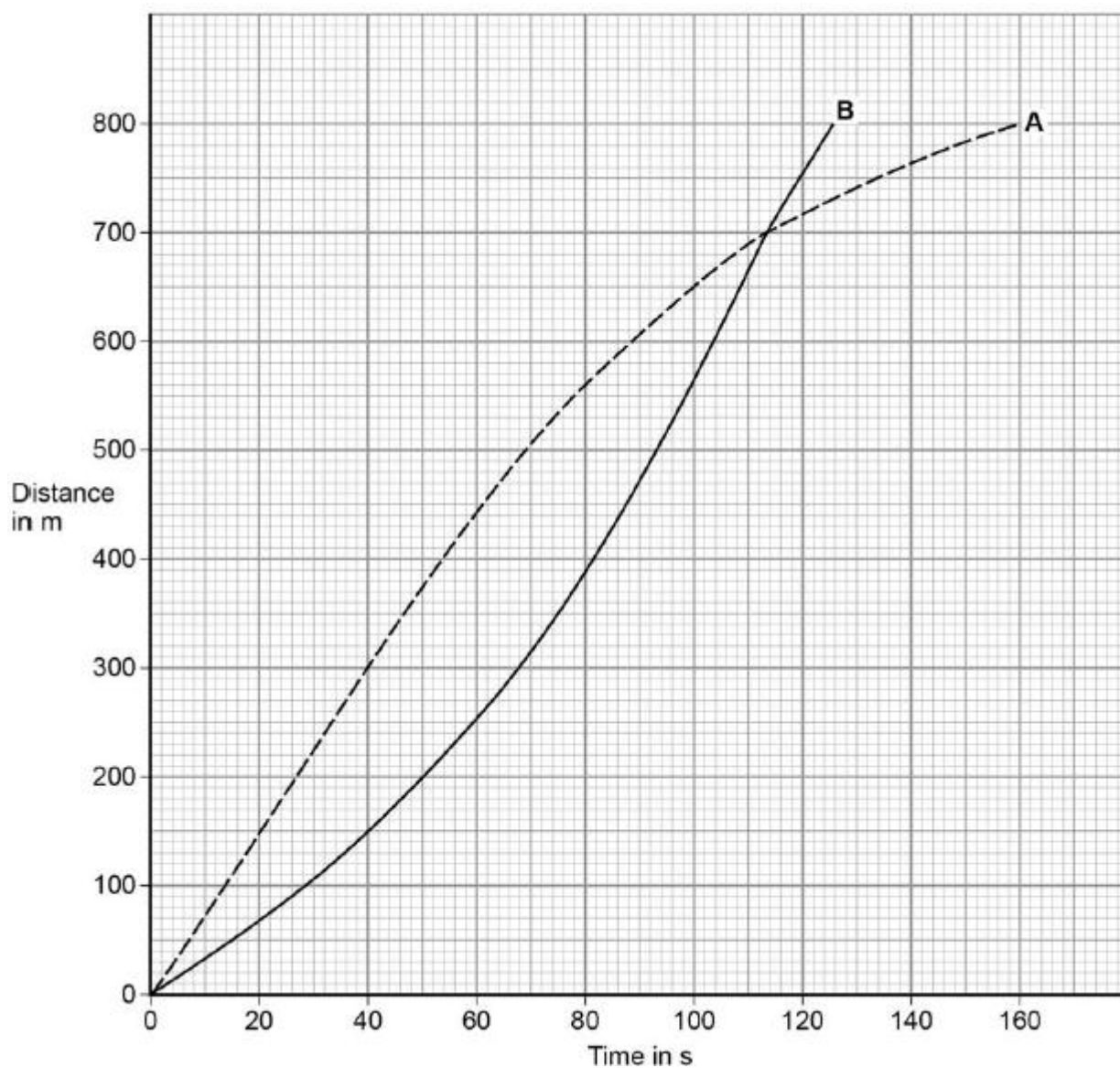
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(2)

- (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

☐

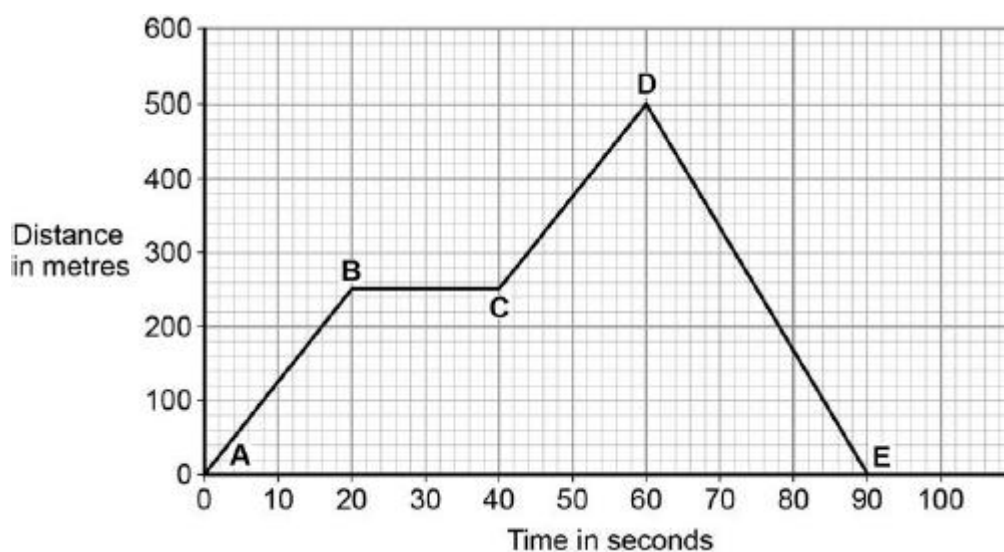
3.3×10^6 m / s

☐

(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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(4)
(Total 10 marks)

- Q4.** (a) The diagram shows the forces acting on a parachutist in free fall.



The parachutist has a mass of 75 kg.

Calculate the weight of the parachutist.

gravitational field strength = 10 N/kg

Show clearly how you work out your answer and give the unit.

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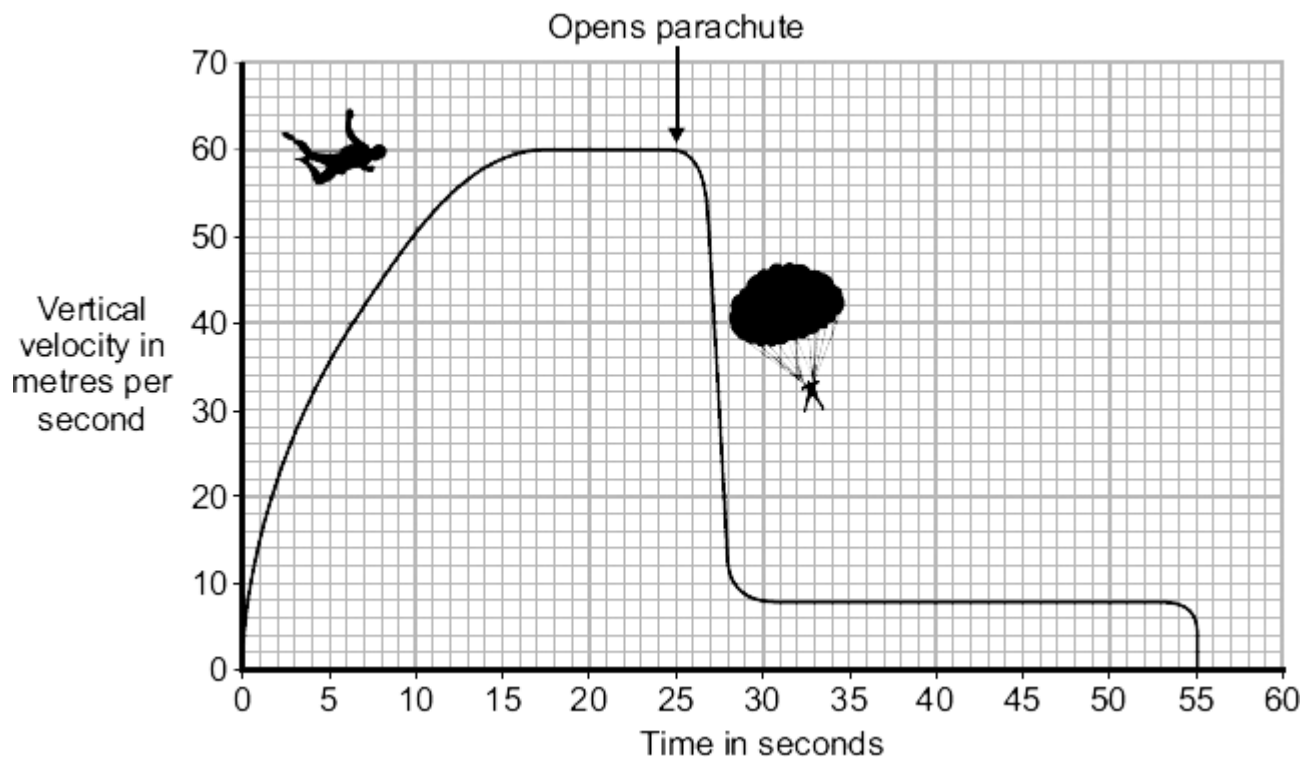
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Weight =

(3)

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

The graph shows how the vertical velocity of a parachutist changes from the moment the parachutist jumps from the aircraft until landing on the ground.



Using the idea of forces, explain why the parachutist reaches a terminal velocity and why opening the parachute reduces the terminal velocity.

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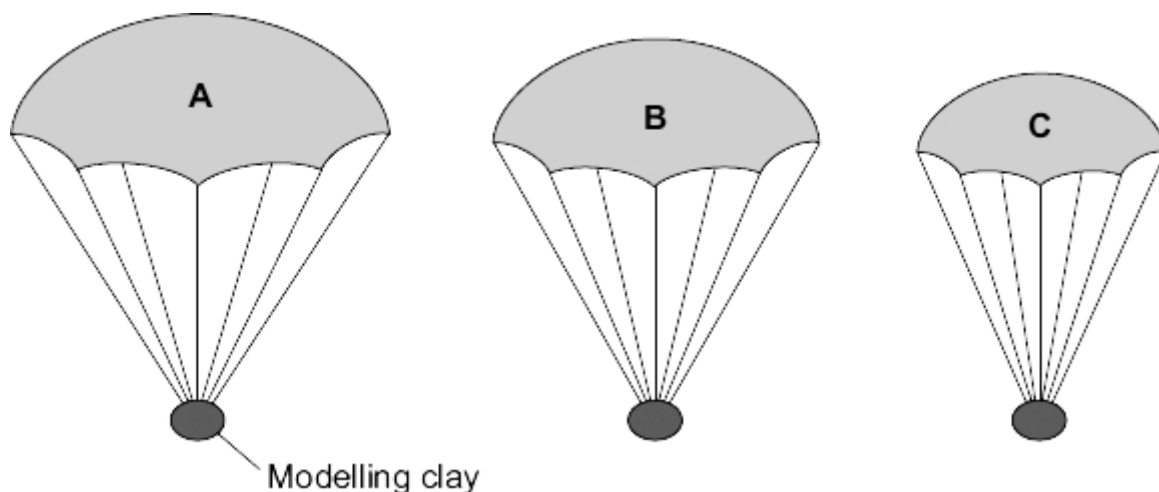
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(6)

- (c) A student wrote the following hypothesis.

‘The larger the area of a parachute, the slower a parachutist falls.’

To test this hypothesis the student made three model parachutes, **A**, **B** and **C**, from one large plastic bag. The student dropped each parachute from the same height and timed how long each parachute took to fall to the ground.



- (i) The height that the student dropped the parachute from was a control variable.

Name **one** other control variable in this experiment.

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(1)

- (ii) Use the student's hypothesis to predict which parachute, **A**, **B** or **C**, will hit the ground first.

Write your answer in the box.

Give a reason for your answer.

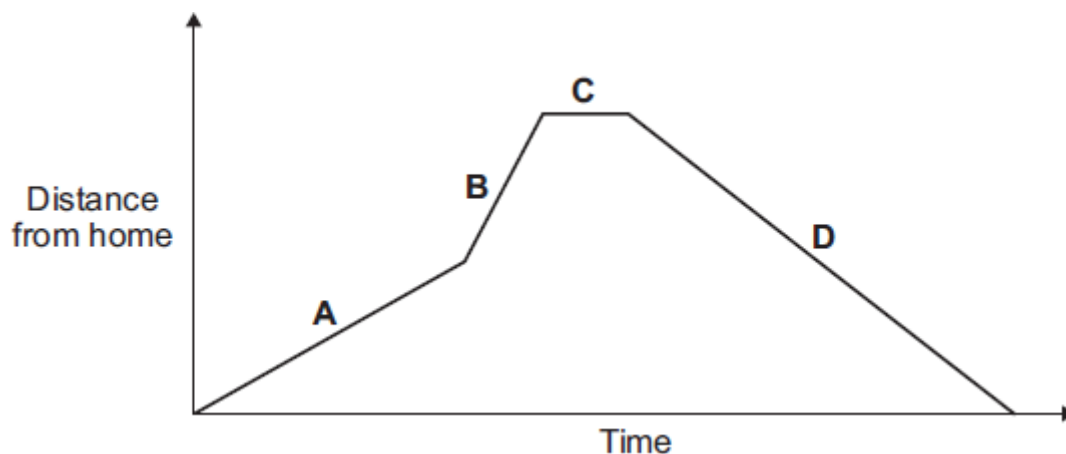
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(2)
 (Total 12 marks)

Q5. (a) A person takes their dog for a walk.

The graph shows how the distance from their home changes with time.



Which part of the graph, **A**, **B**, **C** or **D**, shows them walking the fastest?

Write your answer in the box.

Give the reason for your answer.

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(2)

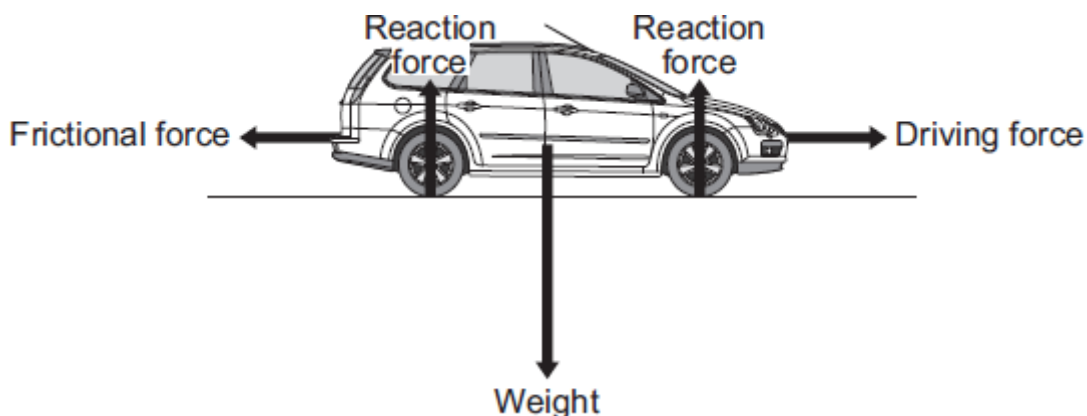
(b) During the walk, both the speed and the velocity of the person and the dog change.

How is *velocity* different from *speed*?

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(1)
(Total 3 marks)

Q6. The diagram shows the forces acting on a car. The car is being driven along a straight, level road at a constant speed of 12 m/s.



- (a) The driver then accelerates the car to 23 m/s in 4 seconds.

Use the equation in the box to calculate the acceleration of the car.

$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken for change}}$
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Show clearly how you work out your answer and give the unit.

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Acceleration =

(3)

- (b) Describe how the horizontal forces acting on the car change during the first **two** seconds of the acceleration.

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(3)
(Total 6 marks)