

GCSE Physics (9 – 1)

Velocity Time Graphs

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/4
2	/8
3	/5
4	/10
5	/7
6	/6
7	/10
Total	/50
%	
Grade	

Information

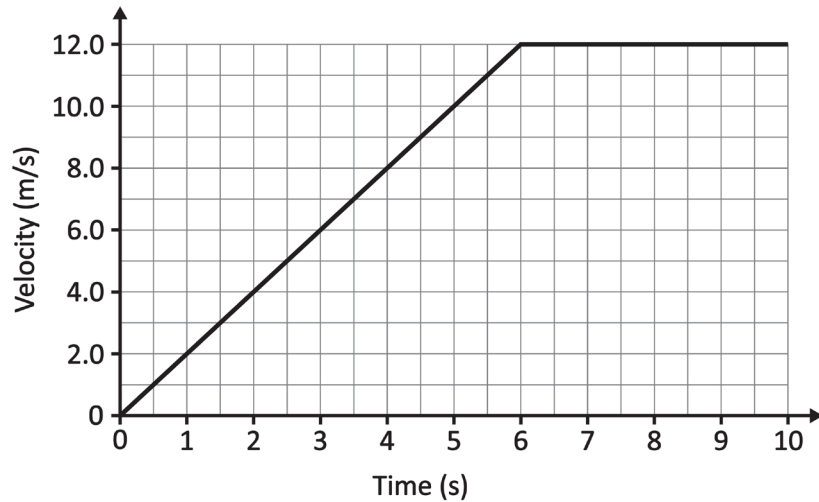
- The maximum mark for this paper is 50 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. A velocity time graph is a visual record of an object's motion, showing exactly how its speed increases, decreases, or stays constant over time. Out of the two types of motion graphs these ones are the much more likely to come up in the GCSE as these are considered more difficult.

For each of the following questions **circle** the letter of the correct answer.

- a) The graph below shows the motion of a cyclist. They accelerate steadily from rest to 12.0 m/s in 6.0 s.

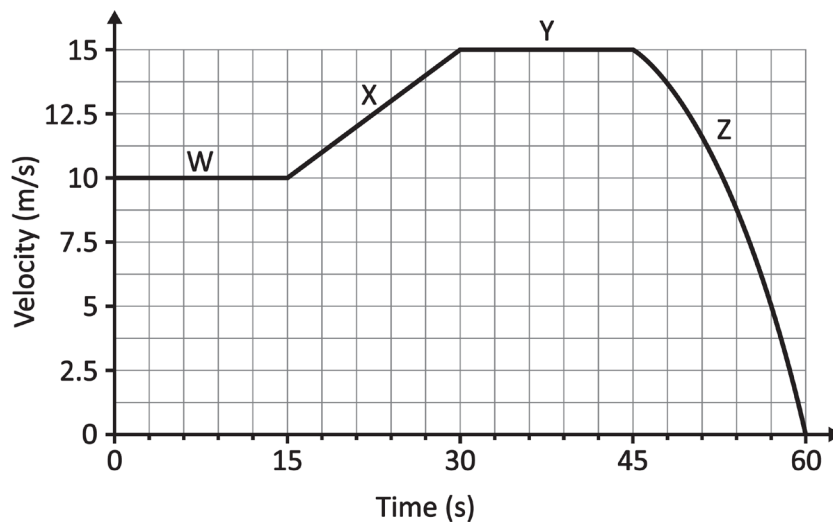


How far does the cyclist travel in the last four seconds?

- | | | | |
|----------|----------|----------|----------|
| A | B | C | D |
| 16 m | 32 m | 36 m | 48 m |

(1 mark)

- b) The velocity time graph for a drone is shown below.



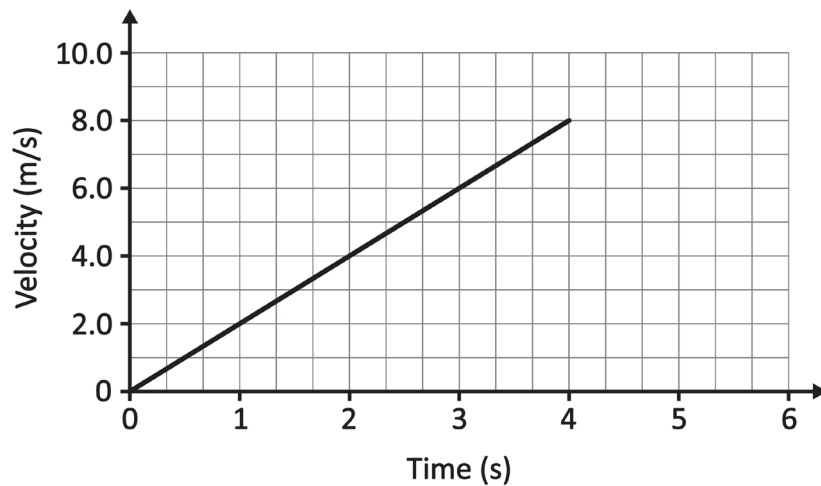
During which regions of the graph is the drone **accelerating or decelerating**?

- | | | | |
|---------------|--------------|--------------|----------|
| A | B | C | D |
| W, X, Y and Z | W and Y only | X and Z only | X only |

(1 mark)

c) The velocity-time graph shows a car pulling away from a set of traffic lights.

What is the acceleration of the car?



A

0.5 m/s²

B

2.0 m/s²

C

4.5 m/s²

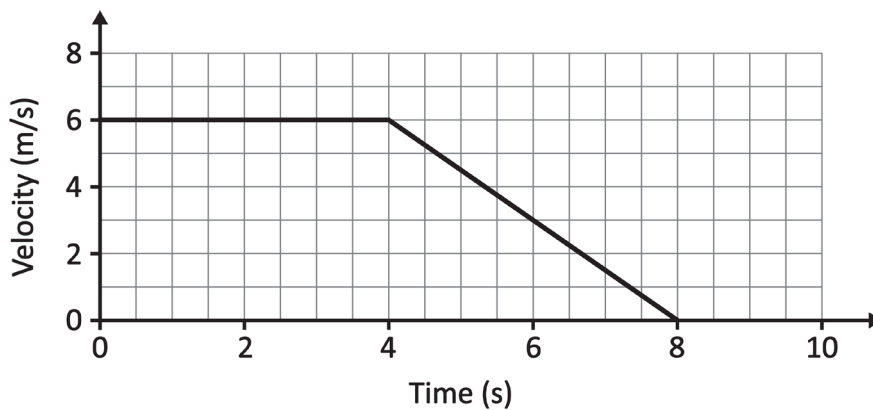
D

18 m/s²

(1 mark)

d) The velocity-time graph shows a cyclist traveling at a constant speed before applying the brakes.

What is the total distance travelled by the cyclist over the 8 seconds shown?



A

12 m

B

24 m

C

36 m

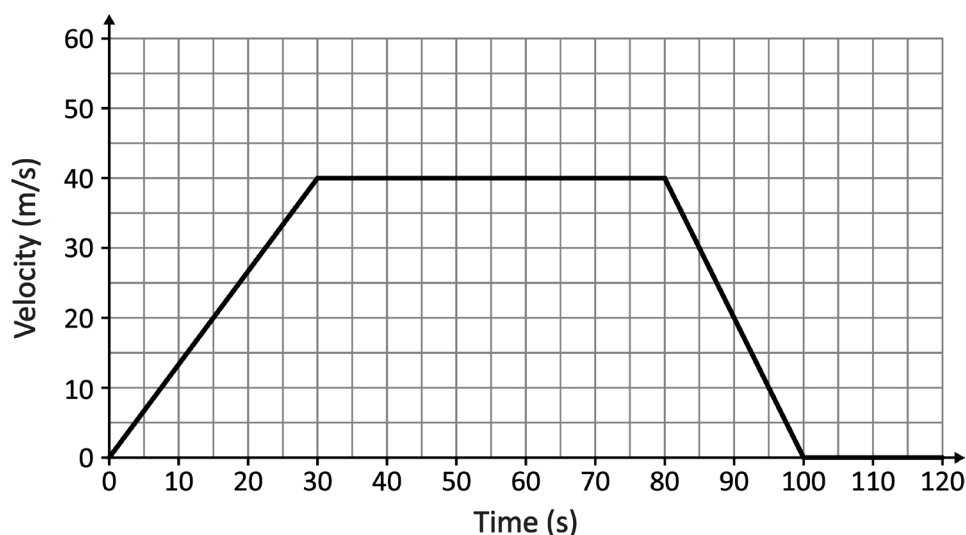
D

48 m

(1 mark)

(Total for Question 1 is 4 marks)

2. The figure below shows the velocity time graph for a train travelling between two stations.



The train leaves the first station and accelerates to its top speed.

It travels at this constant velocity for a time before decelerating and stopping at the second station.

a) State the total time the train spends travelling at a constant top speed.

Time = ... s

(1 mark)

b) Calculate the acceleration of the train as it leaves the first station.

Acceleration = ... unit = ...

(3 marks)

c) Calculate the total distance travelled by the train while it is decelerating.

Distance = ... m

(2 marks)

d) Determine the total distance between the two stations.

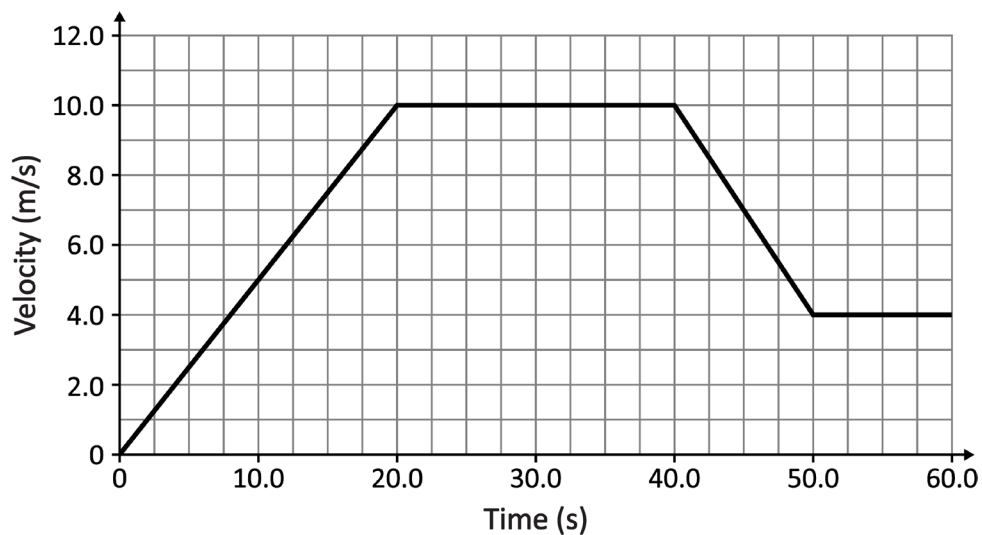
Show your working.

Distance = ... m

(2 marks)

(Total for Question 2 is 7 marks)

3. The figure below shows the velocity time graph for a cyclist travelling along a road.



The cyclist accelerates to their top speed and travels along a flat road.

They then encounter a steep hill, which causes them to slow down to a lower constant speed.

a) State the cyclist's maximum velocity.

Velocity = ... m/s
(1 mark)

b) Calculate the distance the cyclist travelled while moving at this maximum velocity.

Distance = ... m
(2 marks)

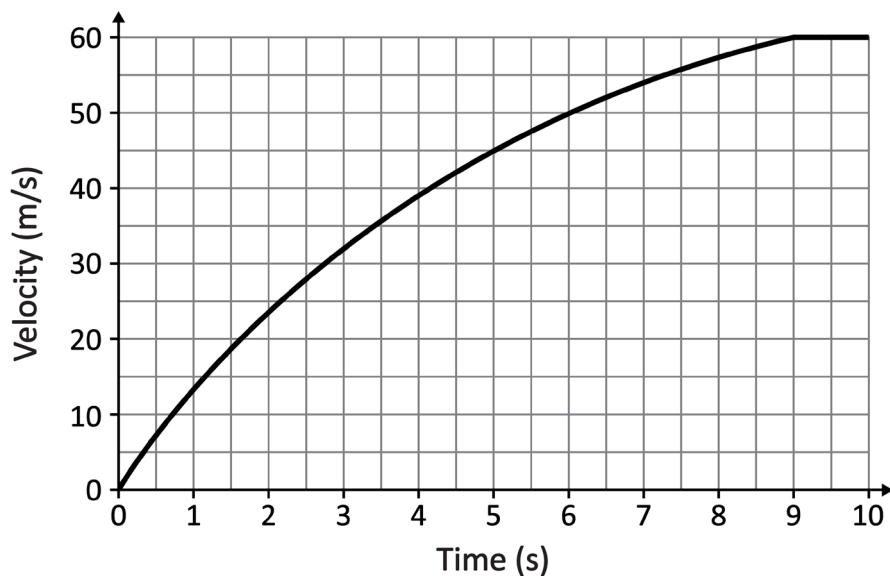
c) Determine the total distance the cyclist travelled during the first **50 seconds** of their journey.
Show your working.

Distance = ... m
(2 marks)

(Total for Question 3 is 5 marks)

4. A skydiver jumps from a plane.

The velocity time graph below shows their motion during the first 10 seconds of the jump.



- a) During the first 8 seconds, the skydiver's acceleration decreases.

Explain, in terms of the forces acting on the skydiver, why the acceleration decreases.

.....

.....

.....

.....

.....

(2 marks)

- b) The skydiver reaches a terminal velocity of 60 m/s.

Convert this terminal velocity into km/h.

Terminal velocity = ... km/h

(2 marks)

- c) By estimating the area under the graph, calculate the total distance the skydiver falls during the first 8 seconds. You must show clearly on the graph how you obtained your answer.

Distance fallen = ... m

(4 marks)

- d) The skydiver has a mass of 85 kg.

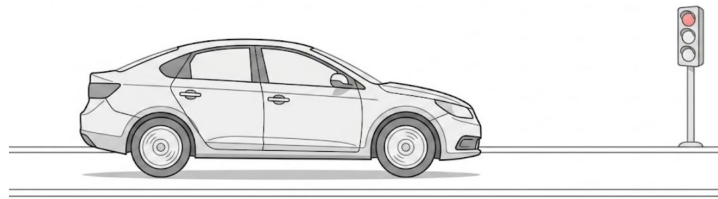
Calculate the resultant force acting on the skydiver at exactly $t = 9$ s.

Resultant force = ... N

(2 marks)

(Total for Question 4 is 10 marks)

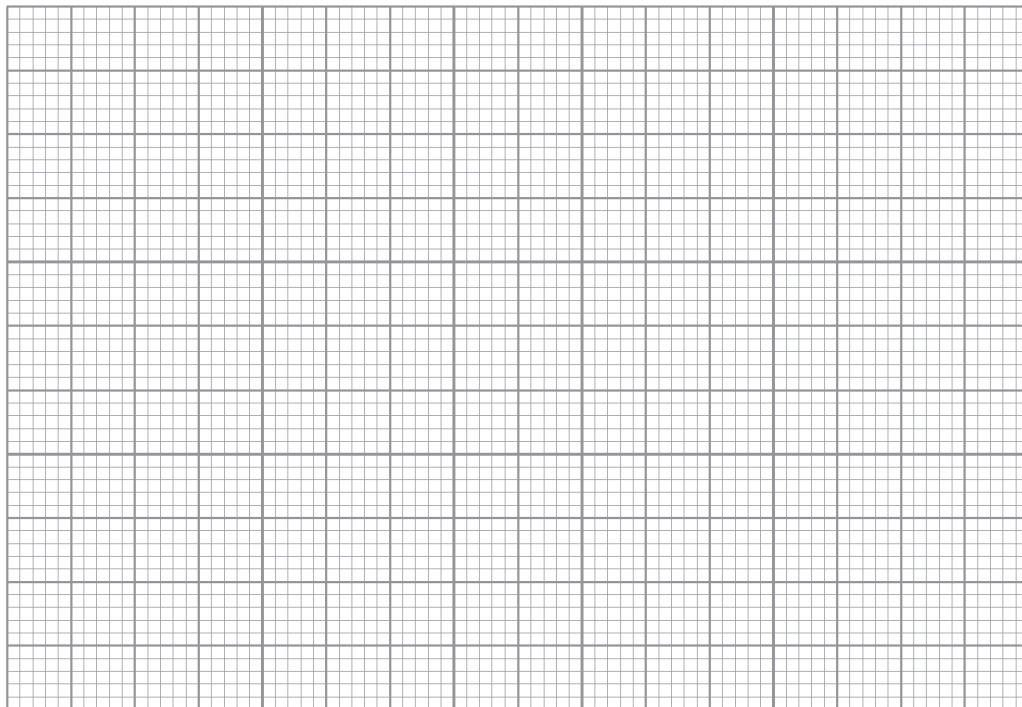
5. A car is waiting at a red traffic light on a straight road.
When the light turns green, the car begins its journey.



Here is a description of the car's journey:

- **0 to 10 seconds:** The car accelerates uniformly from rest to a velocity of **20 m/s**.
- **10 to 40 seconds:** The car travels at a constant velocity.
- **40 to 60 seconds:** The driver sees a hazard ahead and applies the brakes. The car decelerates uniformly and comes to a complete stop.

- a) Use the information above to draw a complete velocity time graph of the car's journey.



(4 marks)

- b) Calculate the deceleration of the car during the final 20 seconds of the journey.

Deceleration = ... m/s^2

(2 marks)

c) The car has a mass of 1200 kg.

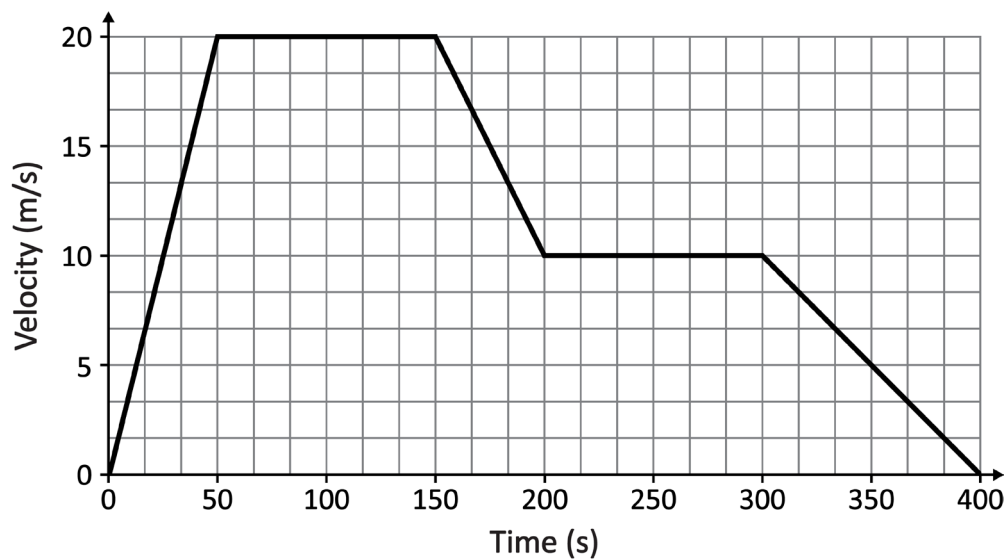
Calculate the resultant braking force required to stop the car during the final 20 seconds.

Braking force = ... N
(2 marks)

(Total for Question 5 is 8 marks)

6. A small passenger ferry travels between two ports.

The velocity time graph below shows the ferry's journey from port to port.



Calculate the total distance travelled by the ferry during the entire journey.

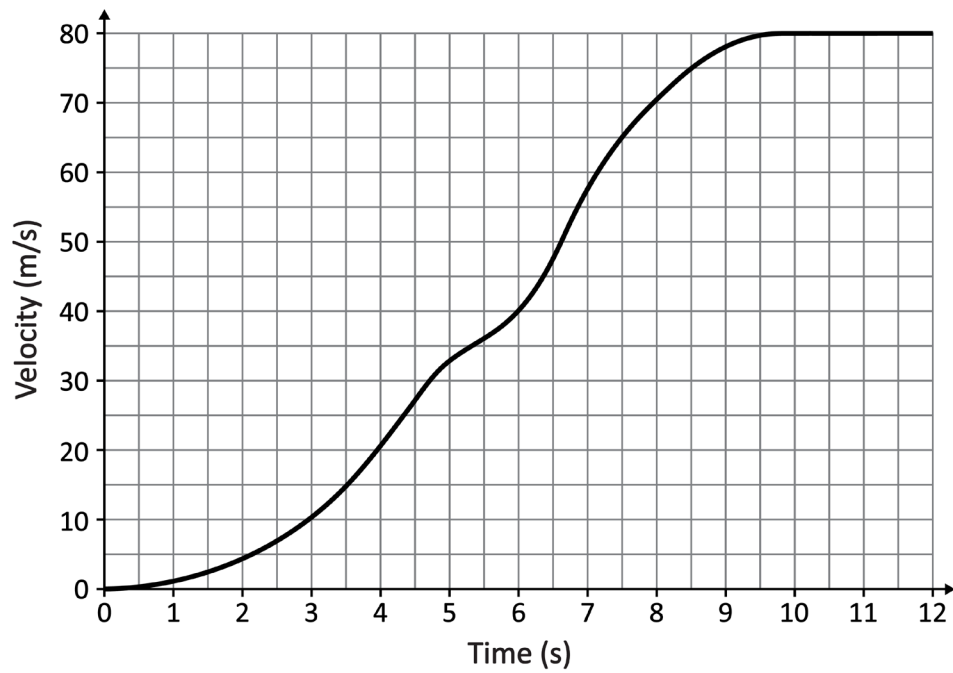
You **must** show all of your working. You may add lines to the graph to help you.

Total distance = ... m

(6 marks)

(Total for Question 6 is 6 marks)

7. A prototype electric hypercar is being tested on a test track.



- a) The car has a mass of 1850 kg. Determine the acceleration of the hypercar at exactly $t = 6$ s.
You **must** show clearly on the graph how you obtained your answer.

Acceleration = ... m/s^2
(4 marks)

- b) Use your answer to part (a) to calculate the resultant force acting on the hypercar at $t = 6$ s.

Resultant force = ... N
(2 marks)

- c) By estimating the area under the curve, calculate the total distance the hypercar travels during the first **8 seconds** of the test.

You must show clearly on the graph how you obtained your answer.

Distance = ... m

(4 marks)

(Total for Question 7 is 10 marks)