

5.4 Describing Motion

Question Paper

Course	AQA GCSE Physics
Section	5. Forces
Topic	5.4 Describing Motion
Difficulty	Medium

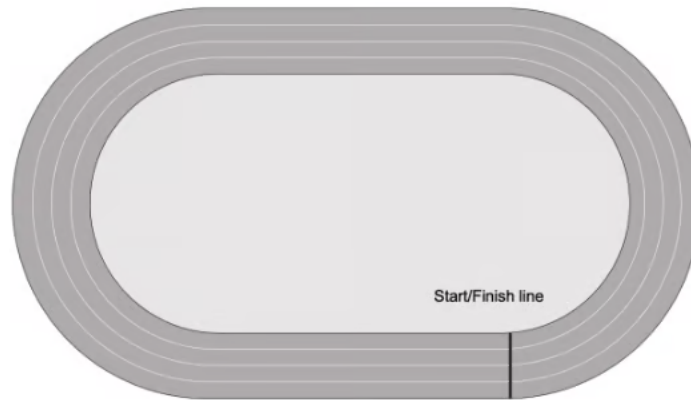
Time allowed: 70
Score: /51
Percentage: /100

Question 1a

Some students take part in a 400-metre running race.

They complete one lap of an athletics track shown in **Figure 1**, finishing at the point where they started.

Figure 1



One of the runners complete the lap in a time of 56 seconds.

(a)

Calculate the average speed of the runner. Give your answer to 2 significant figures.

[3 marks]

Question 1b

At the end of the race their Physics teacher jokes that their average velocity was zero.

(b)

Explain whether their Physics teacher was correct.

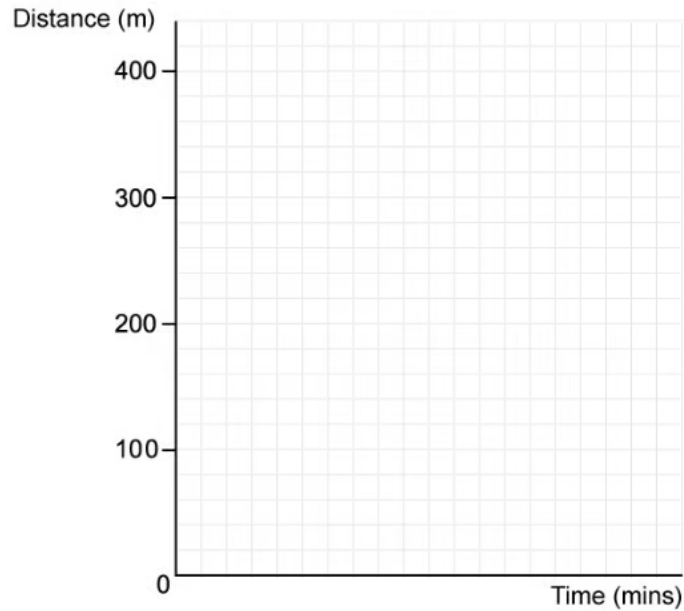
[3 marks]

[3 marks]

Question 1c

A student starts at the starting line of the track and begins to run. They accelerate uniformly for 200 m.

Figure 2



(c)

Complete the distance-time graph in **Figure 2** to show the motion of the student.

[2 marks]

[2 marks]

Question 1d

Halfway around the track, the student then comes to a rest to tie their shoelace which has come undone. After this, they run at constant speed to the finish line.

(d)

Complete the graph drawn in part (c) to show this motion.

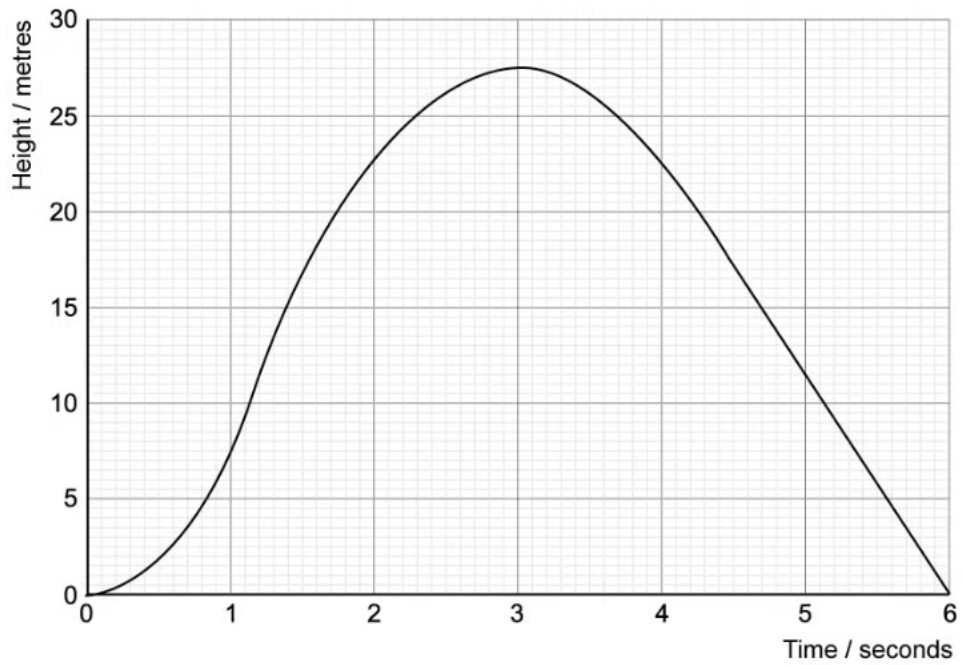
[3 marks]

[3 marks]

Question 2a

Some children launch a toy water rocket into the air. **Figure 1** shows how the displacement of the rocket changes over time.

Figure 1



(a)

Compare the rocket's average speed as it travels upwards to its average speed as it travels back down.

[3 marks]

[3 marks]

Question 2b

(b)
Explain how the velocity of the rocket could be found at any given time from the distance-time graph in **Figure 1**

[2 marks]

[2 marks]

Question 2c

After 3 seconds, the water from the toy water rocket runs out.

(c)
Explain the motion of the water rocket between 3 seconds to when it touches the ground, stating any relevant forces.
Assume the absence of air resistance.

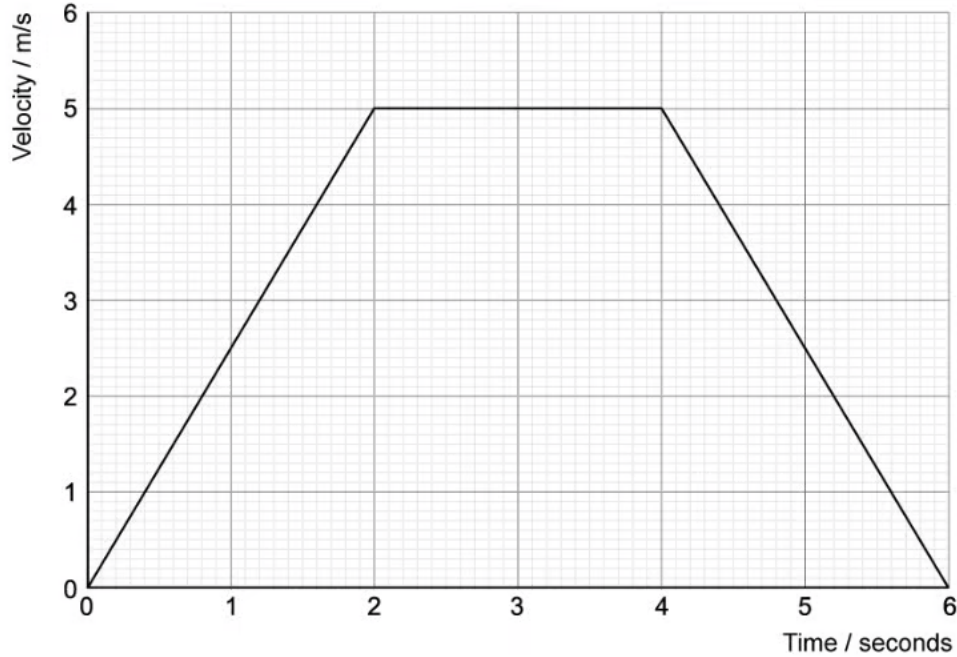
[3 marks]

[3 marks]

Question 3a

The graph shown in **Figure 1** is a velocity time graph for a lift travelling between two different floors in a tall building.

Figure 1



(a)
Calculate the acceleration of the lift during the first 2 seconds. Show your working clearly and give your answer with appropriate units.

[3 marks]

[3 marks]

Question 3b

(b)
Explain the motion of the lift between 4–6 seconds by referring to **Figure 1**. State any important values.

[3 marks]

[3 marks]

Question 3c

The lift is now called to travel between two floors that are much further apart, with no stops in between.

(c)

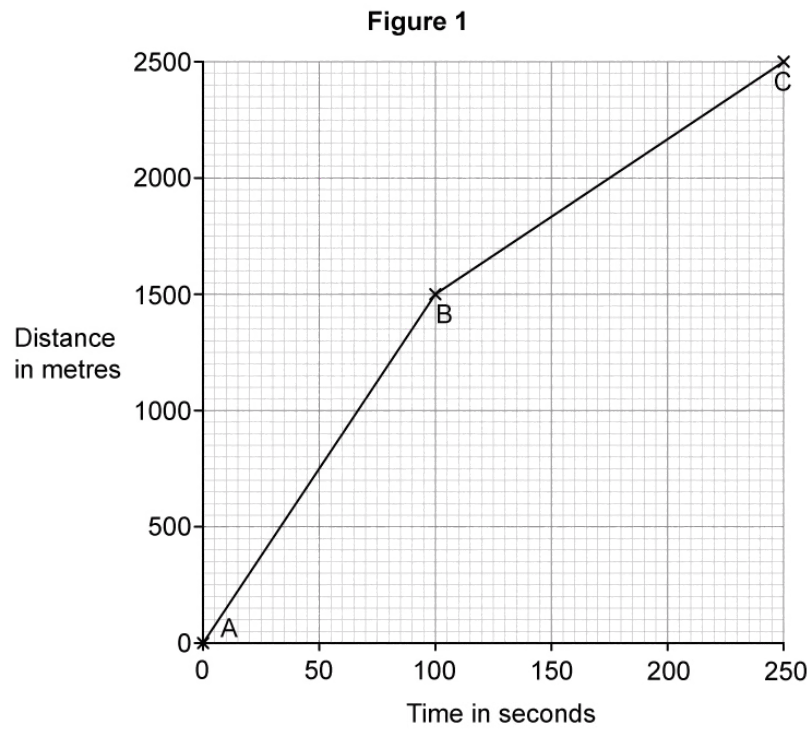
Assuming that the lift has the same acceleration as before, explain how the graph in **Figure 1** would change to reflect this.

[2 marks]

[2 marks]

Question 4a

Figure 1 shows a distance-time graph for a train.



(a)
State whether the train is travelling faster from **A** to **B** or from **B** to **C**.

Explain your answer.

[2 marks]

[2 marks]

Question 4b

(b)

Calculate the speed of the train from **A** to **B**.

Give your answer to 2 significant figures.

[3 marks]

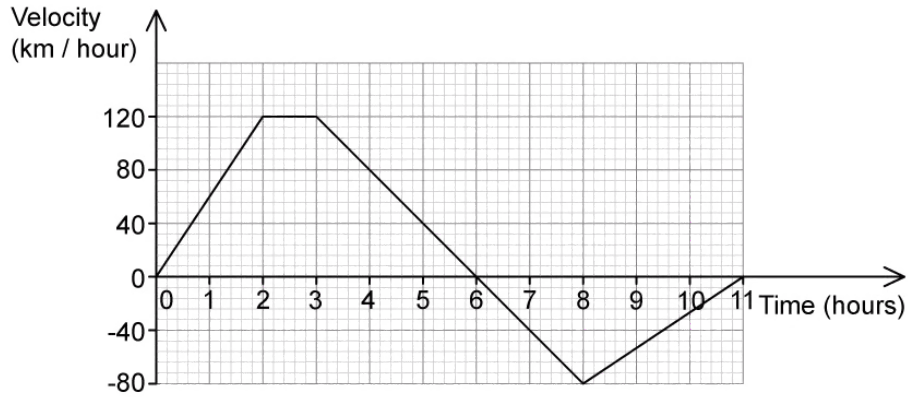
Speed (2 significant figures) = m/s

[3 marks]

Question 4c
Higher Only

The velocity-time graph of another train is shown in **Figure 2**.

Figure 2



(c)
Using **Figure 2**, calculate the distance travelled in the first 6 hours.

Give your answer to 2 significant figures.

[4 marks]

Distance (2 significant figures) = km

[4 marks]

Question 4d

Higher Only

(d)

Explain why the total displacement after 11 hours is less than your answer to part (c).

[2 marks]

[2 marks]

Question 5a

A train travels at a constant speed of 45.0 m/s.

(a)

Calculate the distance it travels in 1.50 minutes.

Give your answer to 3 significant figures.

[4 marks]

Distance (3 significant figures) = m

[4 marks]

Question 5b

(b)

Calculate how long it takes (in minutes) for the same train travelling at the same speed to travel 10.0 km.

Give your answer to 3 significant figures.

[4 marks]

Time (3 significant figures) = minutes

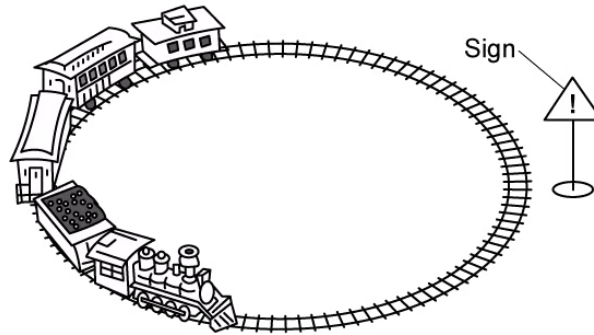
[4 marks]

Question 5c
Higher Only

A toy train is made based on the train in parts **(a)** and **(b)**. The toy train is shown in **Figure 1**.

A toy sign is placed at the side of the track.

Figure 1



(c)

The toy train is powered by a battery and moves along a circular track.

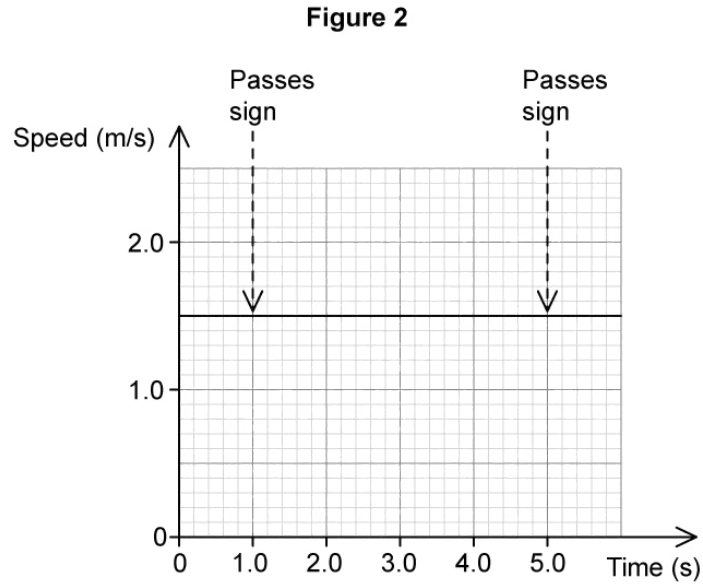
Compare the speed of the train and the velocity of the train.

[2 marks]

[2 marks]

Question 5d
Higher Only

The speed-time graph of the model train is shown in **Figure 2**.



(d)
The points at which the train passes the sign are indicated on the graph.

Calculate the circumference of the circular track.

Give your answer to 2 significant figures.

[3 marks]

Circumference (2 significant figures) = m

[3 marks]