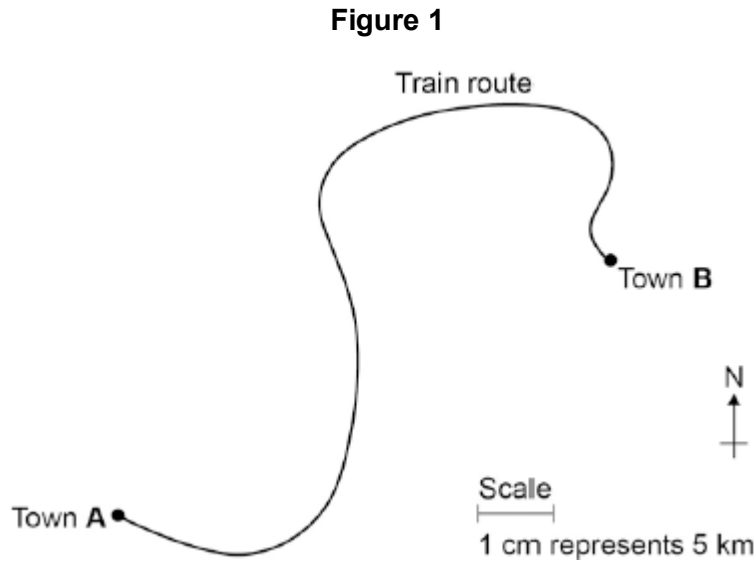


**Q1.**A train travels from town **A** to town **B**.

**Figure 1** shows the route taken by the train.  
**Figure 1** has been drawn to scale.



- (a) The distance the train travels between **A** and **B** is not the same as the displacement of the train.

What is the difference between distance and displacement?

.....  
.....  
.....

(1)

- (b) Use **Figure 1** to determine the displacement of the train in travelling from **A** to **B**.

Show how you obtain your answer.

.....  
.....

Displacement = ..... km

Direction = .....

(2)

- (c) There are places on the journey where the train accelerates without changing

speed.

Explain how this can happen.

.....

.....

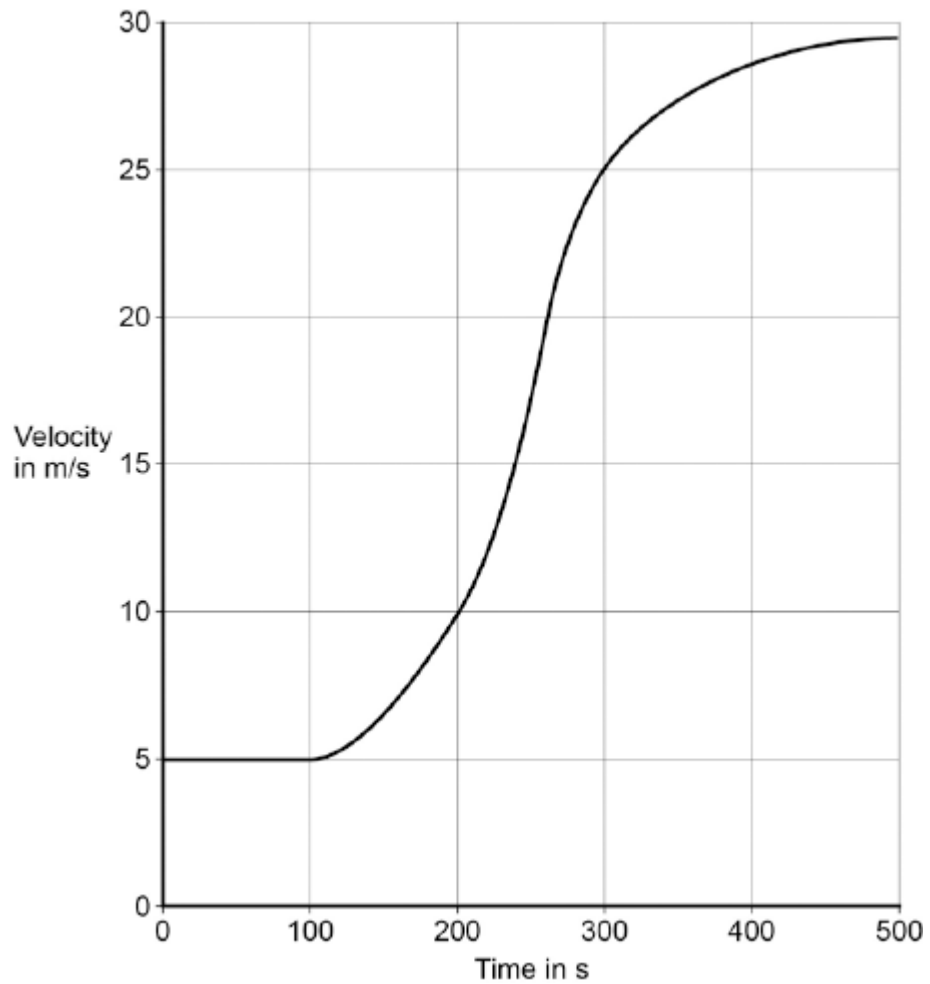
.....

.....

(2)

- (d) **Figure 2** shows how the velocity of the train changes with time as the train travels along a straight section of the journey.

**Figure 2**



Estimate the distance travelled by the train along the section of the journey shown in **Figure 2**.

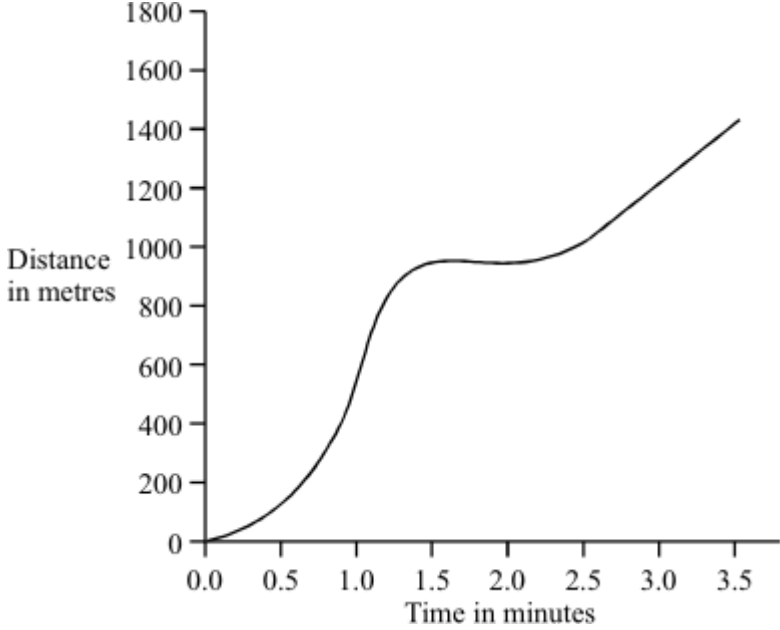
To gain full marks you must show how you worked out your answer.

.....  
.....  
.....  
.....

Distance = ..... m

**(3)**  
**(Total 8 marks)**

**Q2.** The graph shows how the distance travelled by a car changes with time during a short journey.



(i) Describe fully the motion of the car during the first **two** minutes of the journey.

.....

.....

.....

.....

.....

(3)

(ii) During the last minute of the journey the velocity of the car changes although the speed remains constant. How is this possible?

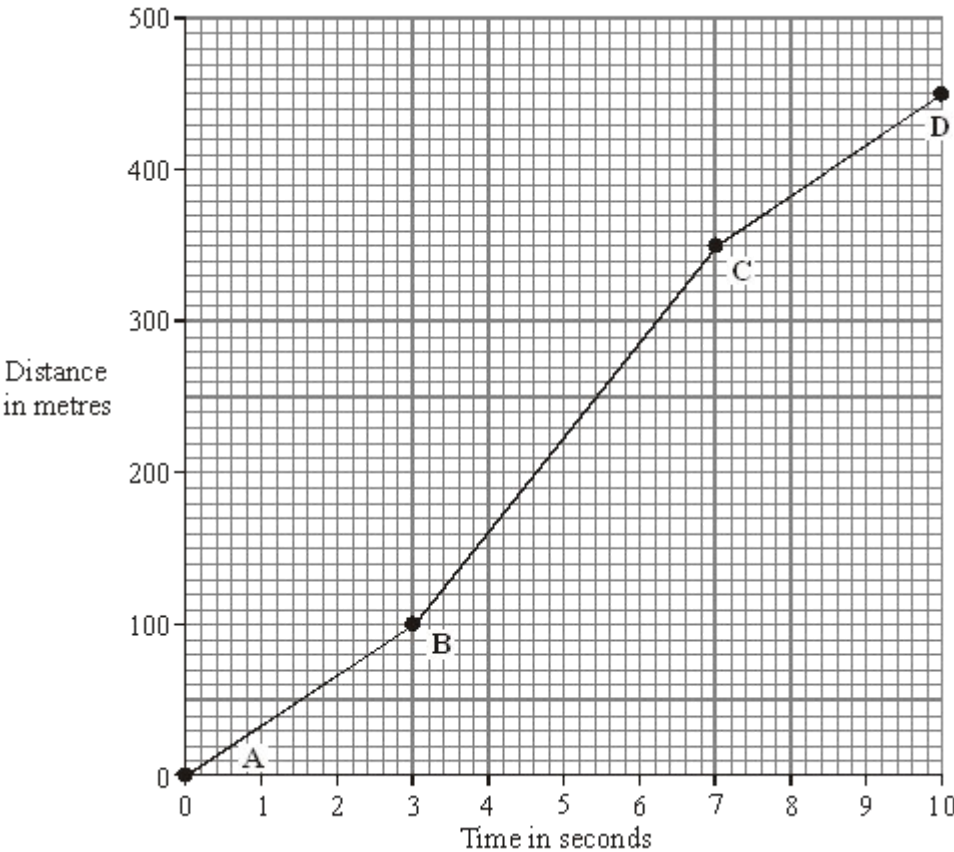
.....

.....

(1)

(Total 4 marks)

**Q3.** The distance-time graph represents the motion of a car during a race.



(a) Describe the motion of the car between point **A** and point **D**. You should not carry out any calculations.

*To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

.....

.....

.....

.....

.....

(3)

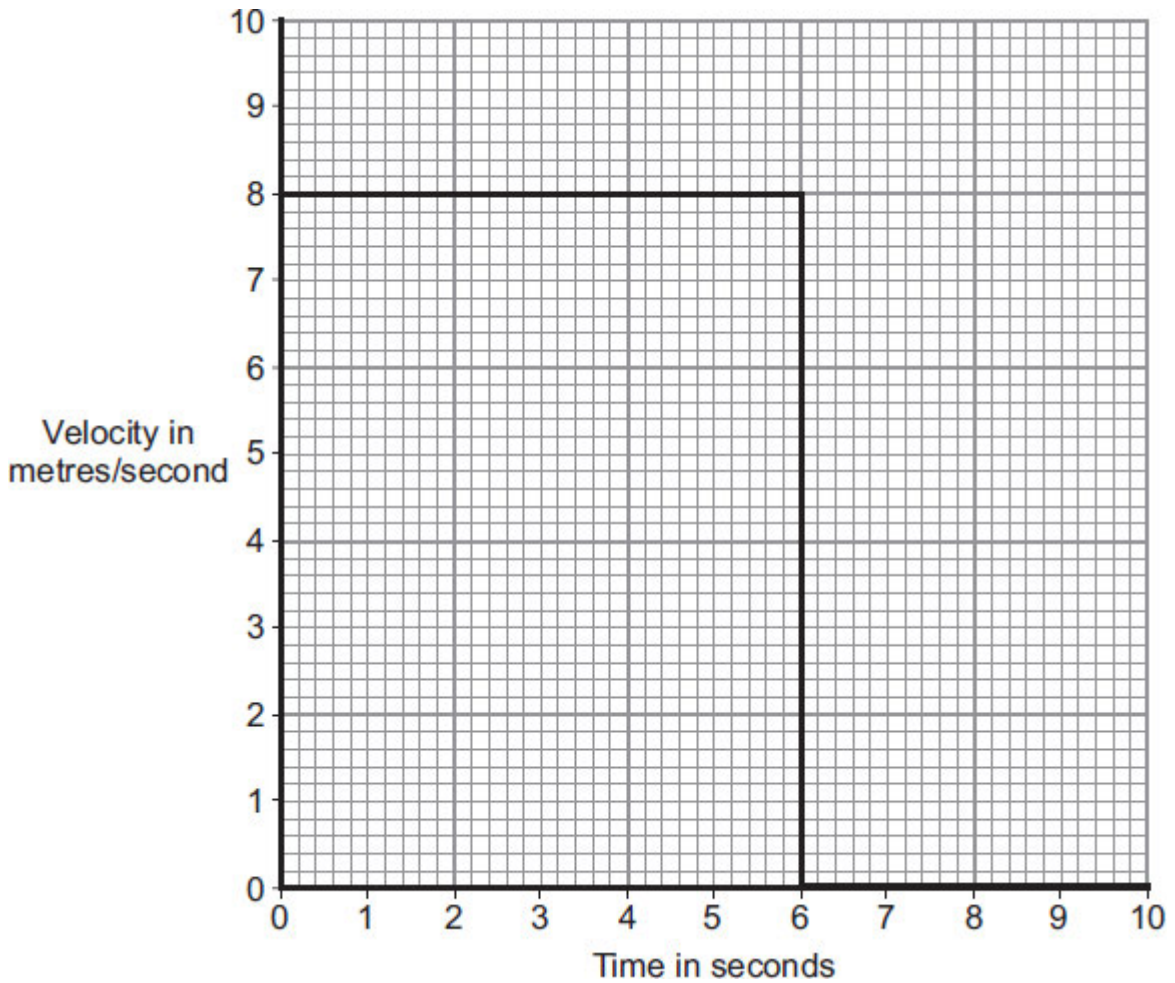
- (b) Calculate the gradient of the graph between point **B** and point **C**. Show clearly how you get your answer.

.....  
.....  
.....

gradient = .....

(3)  
(Total 6 marks)

**Q4.** The diagram shows the velocity-time graph for an object over a 10 second period.



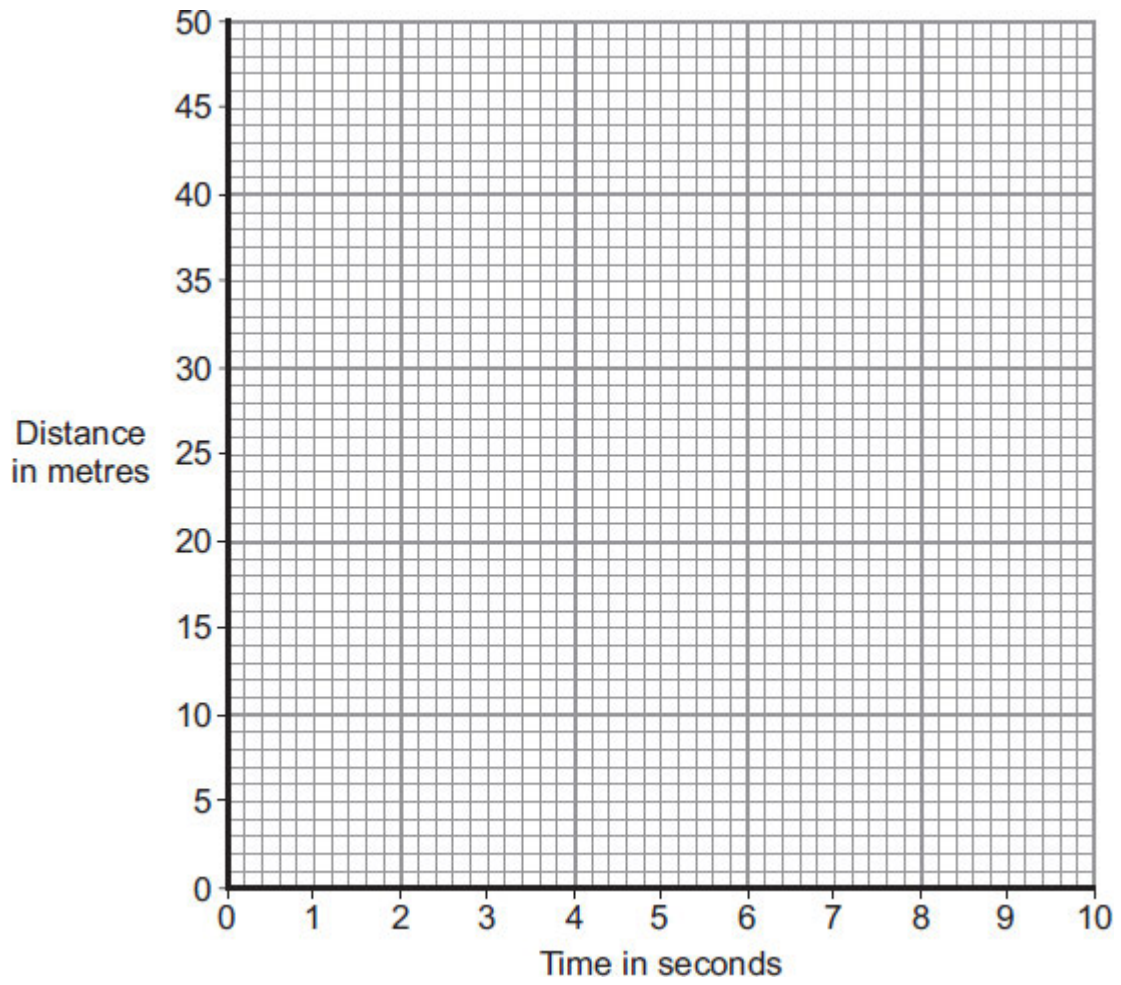
- (a) Use the graph to calculate the distance travelled by the object in 10 seconds.  
Show clearly how you work out your answer.

.....  
.....

Distance = ..... m

(2)

- (b) Complete the distance-time graph for the object over the same 10 seconds.

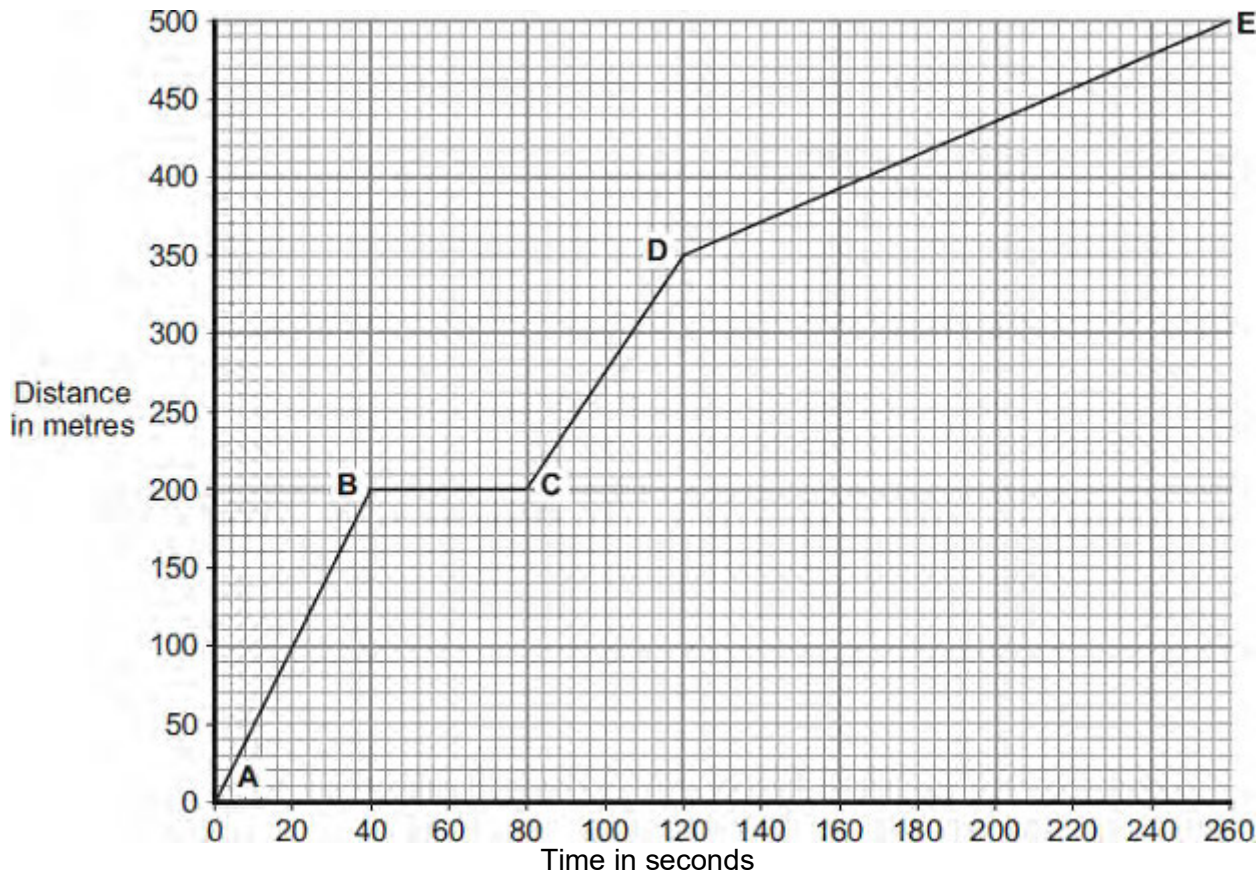


(2)  
(Total 4 marks)



**Q5.** Part of a bus route is along a high street.

The distance-time graph shows how far the bus travelled along the high street and how long it took.



(a) Between which two points was the bus travelling the slowest?

Put a tick (✓) in the box next to your answer.

Points	Tick (✓)
A – B	
C – D	
D – E	

Give a reason for your answer.

.....

.....

(2)

- (b) The bus travels at 5 m/s between points **A** and **B**.  
The bus and passengers have a total mass of 16 000 kg.

Use the equation in the box to calculate the momentum of the bus and passengers between points **A** and **B**.

momentum = mass x velocity
----------------------------

Show clearly how you work out your answer.

.....  
.....

Momentum = ..... kg m/s

(2)

- (c) A cyclist made the same journey along the high street.  
The cyclist started at the same time as the bus and completed the journey in 220 seconds. The cyclist travelled the whole distance at a constant speed.

- (i) Draw a line on the graph to show the cyclist's journey.

(2)

- (ii) After how many seconds did the cyclist overtake the bus?

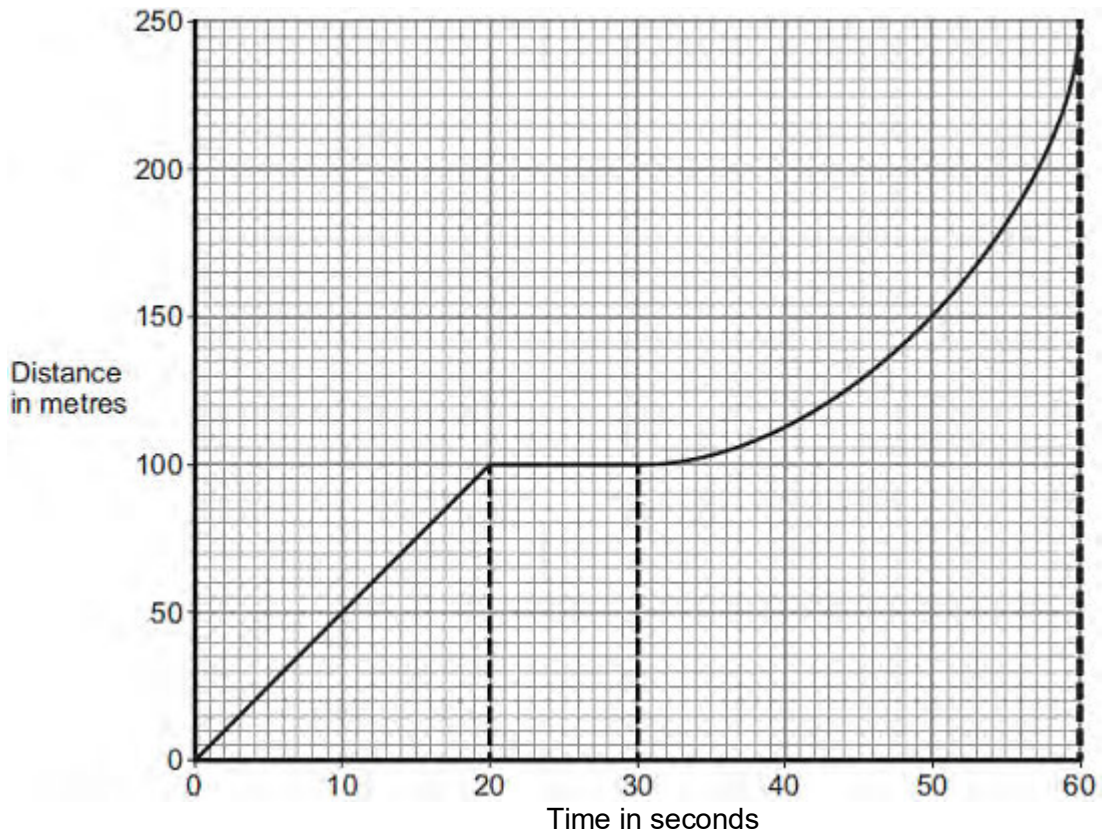
The cyclist overtook the bus after ..... seconds.

(1)

(Total 7 marks)

**Q6.** A bus is taking some children to school.

- (a) The bus has to stop a few times. The figure below shows the distance–time graph for part of the journey.



- (i) How far has the bus travelled in the first 20 seconds?

Distance travelled = ..... m

(1)

- (ii) Describe the motion of the bus between 20 seconds and 30 seconds.

.....  
 .....

(1)

- (iii) Describe the motion of the bus between 30 seconds and 60 seconds.

Tick (✓) **one** box.

Tick (✓)

Accelerating	
Reversing	
Travelling at constant speed	

(1)

(iv) What is the speed of the bus at 45 seconds?

Show clearly on the figure above how you obtained your answer.

.....  
 .....  
 .....

Speed = ..... m / s

(3)

(b) Later in the journey, the bus is moving and has 500 000 J of kinetic energy.  
 The brakes are applied and the bus stops.

(i) How much work is needed to stop the bus?

.....

Work = ..... J

(1)

(ii) The bus stopped in a distance of 25 m.

Calculate the force that was needed to stop the bus.

.....  
 .....

Force = ..... N

(2)

(iii) What happens to the kinetic energy of the bus as it is braking?

.....  
.....  
.....  
.....

(2)  
(Total 11 marks)