SMART EXAM RESOURCES
SUBJECT: PHYSICS
TOPIC: DISTANCE-TIME GRAPH
SET-3-QP-MS

1 A car of mass *m* is travelling along a straight, horizontal road at a constant speed *v*.

At time *t* = 0, the driver of the car sees an obstruction in the road ahead of the car and applies the brakes.

The car does **not** begin to decelerate at *t* = 0.

(a) Explain what is meant by deceleration.

.....

.....

..... [2]

(b) Suggest **one** reason why the car does **not** begin to decelerate at *t* = 0.

.....

..... [1]

(c) Fig. 1.1 is the distance–time graph for the car from *t* = 0.

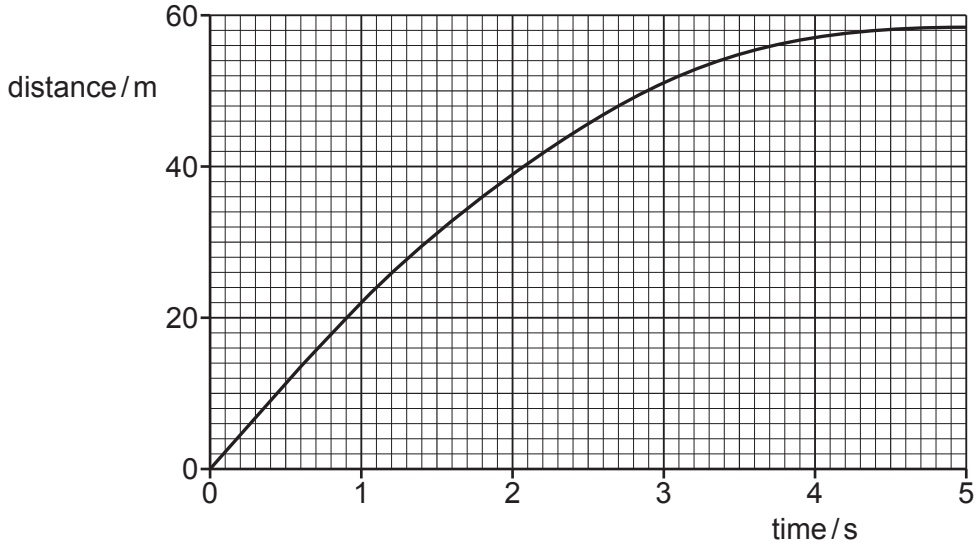

Fig. 1.1

(i) State the property of a distance–time graph that corresponds to speed.

..... [1]

(ii) Using Fig. 1.1, determine the initial speed *v* of the car.

v = ... [2]

(d) When the car is decelerating, there is a constant resistive force F on the car due to the brakes.

The deceleration of the car is greater than $\frac{F}{m}$ and is **not** constant.

Explain why:

(i) the deceleration of the car is greater than $\frac{F}{m}$

.....

..... [1]

(ii) the deceleration is **not** constant.

.....

.....

..... [2]

[Total: 9]

MARK SCHEME:

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Question	Answer	Marks
(a)	negative acceleration **or** decrease in velocity	**B1**
	change in velocity per unit time **or** rate of change of velocity	**B1**
(b)	delay in applying brakes **or** (human) reaction time **or** foot not removed from accelerator	**B1**
(c)(i)	gradient **or** slope	**B1**
(c)(ii)	20.5 m / s ⩽ answer ⩽ 23.5 m / s	**A2**
	the coordinates at one point on curve (e.g. (0.50, 11)) **and** (upper) time coordinate ⩽ 1.0 s	C1
(d)(i)	air resistance / air friction acts on the car	**B1**
(d)(ii)	air resistance / resultant / resistive force decreases **and** as speed decreases / car decelerates	**A2**
	air resistance / resultant / resistive force decreases / changes	C1

2 A train of mass 1.8×10^5 kg is at rest in a station. At time $t = 0$, the train begins to accelerate along a straight, horizontal track and reaches a speed of 20 m / s at $t = 15$ s. The train continues at a speed of 20 m / s for 10 s.

At $t = 25$ s, the driver applies the brakes and the resistive force on the train causes it to decelerate uniformly to rest in a further 24 s.

Fig. 4.1 is an incomplete distance–time graph for this journey.

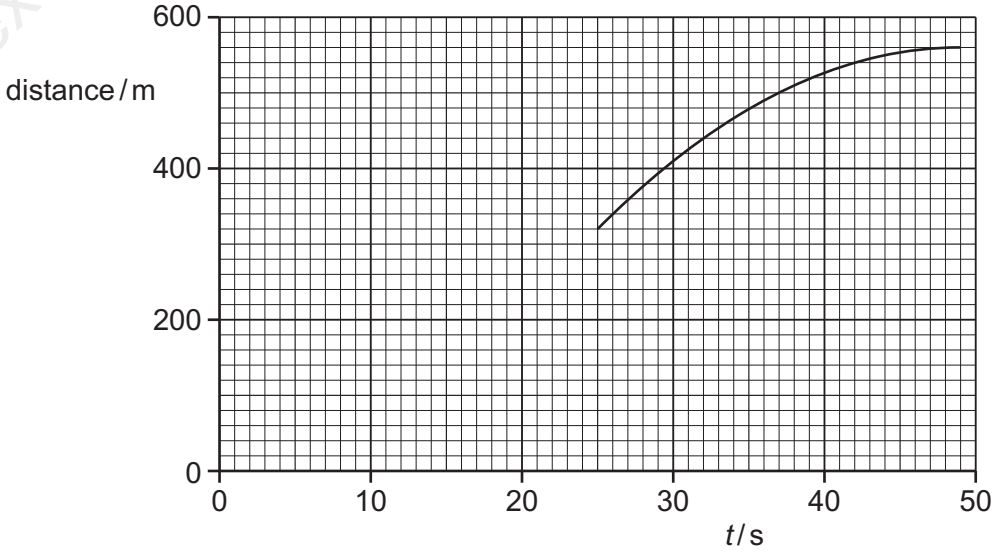

Fig. 4.1

(a) Complete Fig. 4.1 by drawing:

(i) a line to represent the motion of the train between $t = 15$ s and $t = 25$ s [1]

(ii) a curve to represent the motion of the train between $t = 0$ and $t = 15$ s. [1]

MARK SCHEME:

(i)	straight line begins at (15 s, 120 m) **and** continues to end of given line	**B1**
(ii)	curve with increasing gradient from origin to beginning of candidate's **(a)(i)**	**B1**