Area 2: Velocity-Time Graphs and Acceleration

Multiple Choice Questions 1 → 10

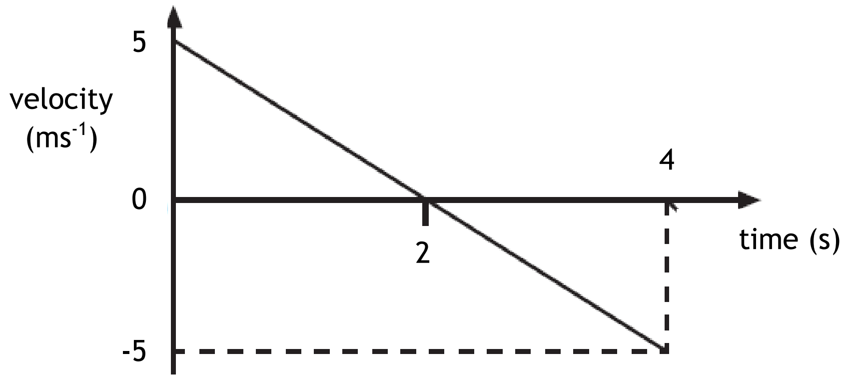
1. A car accelerates from 4·0 ms^{-1} to 20 ms^{-1} in 5·0 s.
   Calculate the acceleration of the car.

   A 0·5 ms^{-2}
   B 3·2 ms^{-2}
   C 4·0 ms^{-2}
   D 4·8 ms^{-2}
   E 16 ms^{-2}

2. A bus travelling at 4·8 ms^{-1} decelerates at 2·4 ms^{-2}.
   Calculate the time taken for the bus to come to a complete stop.

   A 0·5 s
   B 2·0 s
   C 2·4 s
   D 7·2 s
   E 11·5 s

3. The graph shows how the velocity of an object varies with time.



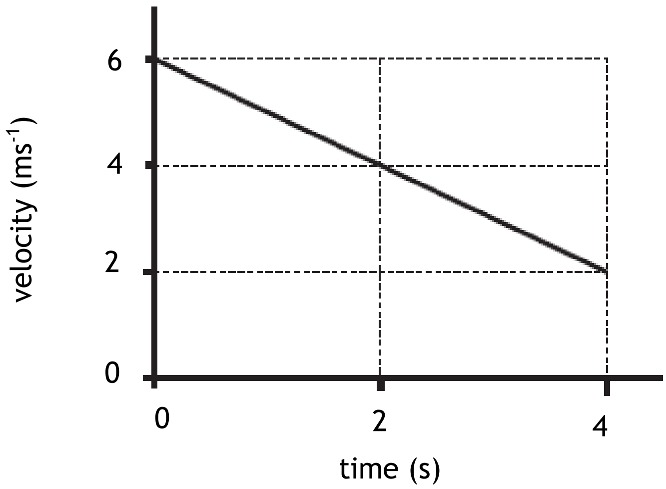
Identify which row in the table shows the displacement after 4 s and the acceleration of the object during the first 4 s.

	displacement (m)	acceleration (ms^{-2})
A	10	-10
B	10	2.5
C	0	2.5
D	0	-10
E	0	-2.5

4. A car travelling in a straight line decelerates uniformly from 20 ms^{-1} to 12 ms^{-1} in 4 s. Calculate the displacement of the car.

A 32 m
B 48 m
C 64 m
D 80 m
E 128 m

5. The graph shows how the velocity of a ball changes with time.



Calculate the acceleration of the ball.

A -8 ms^{-2}
B -1 ms^{-2}
C 1 ms^{-2}
D 8 ms^{-2}
E 24 ms^{-2}

6. The table shows the velocities of three objects X, Y and Z over a period of 3 s. Each object is moving in a straight line.

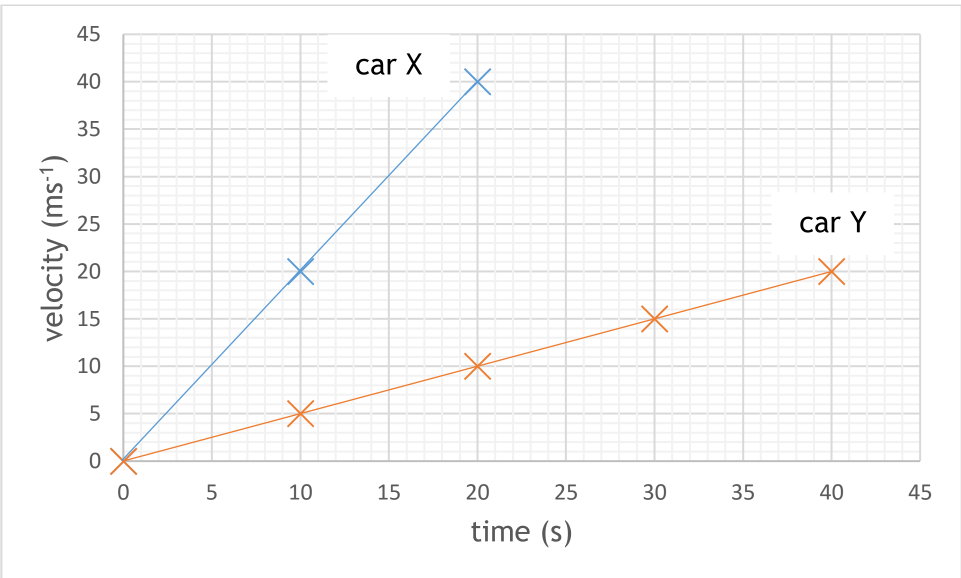
time (s)	0	1	2	3
velocity of X (ms^{-1})	2	4	6	8
velocity of Y (ms^{-1})	0	1	2	3
velocity of Z (ms^{-1})	0	2	5	9

Identify which of the following statements is/are correct.

I X moves with a constant velocity.
II Y moves with a constant acceleration.
III Z moves with a constant acceleration.

A I only
B II only
C I and II only
D I and III only
E II and III only

7. Two cars accelerate along the same length of long straight track. The velocity-time graph for their motions are shown.



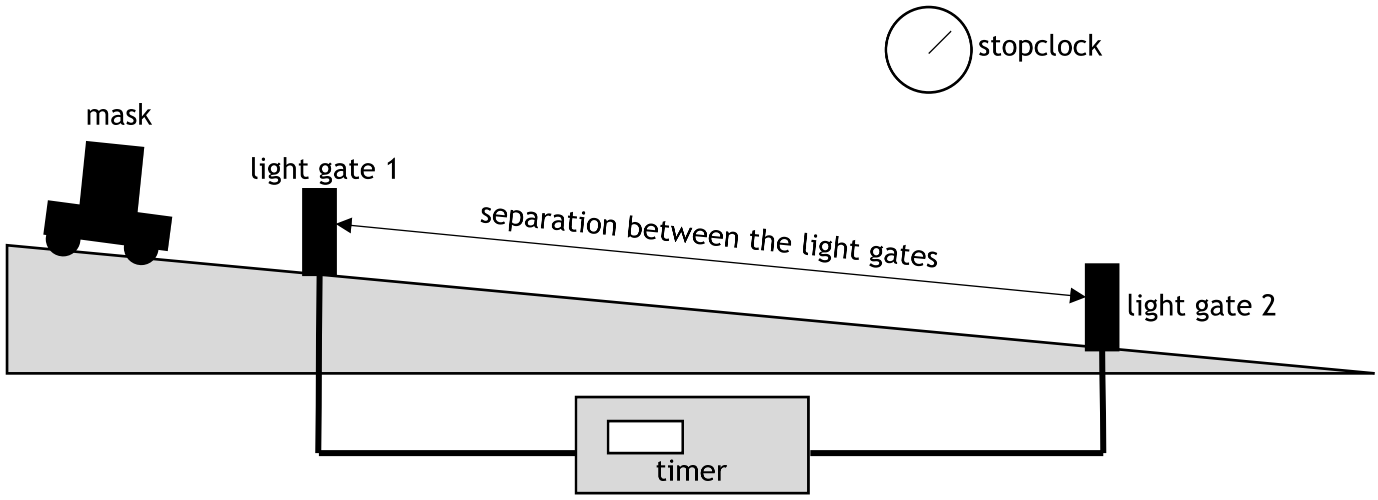
Identify which of the following statements is/are correct.

I Car X has a greater acceleration.
II Car Y has a greater acceleration.
III Both cars travel the same distance.

A I only
B II only
C III only
D I and III only
E II and III only

Use the following information for questions 8, 9 and 10.

The following apparatus was used in order to measure the average speed, instantaneous speed and the acceleration of a trolley down a slope.



The measurements made were:
d_1 = mask length, measured with a ruler.
d_2 = separation between the light gates, measured with a metre stick.
t_1 = time through the first light gate, measured by the timer.
t_2 = time through the second light gate, measured by the timer.
t_3 = time between the light gates, measured by the stopclock.

8. Identify the measurements and calculation needed to determine the average speed down the slope.

	measurements	calculation
A	d_1 and t_1	$\frac{d_1}{t_1}$
B	d_1 and t_2	$\frac{d_1}{t_2}$
C	d_2 and t_1	$\frac{d_2}{t_1}$
D	d_2 and t_2	$\frac{d_2}{t_2}$
E	d_2 and t_3	$\frac{d_2}{t_3}$

9. Identify the measurements and calculation needed to determine the instantaneous speed through the first light gate.

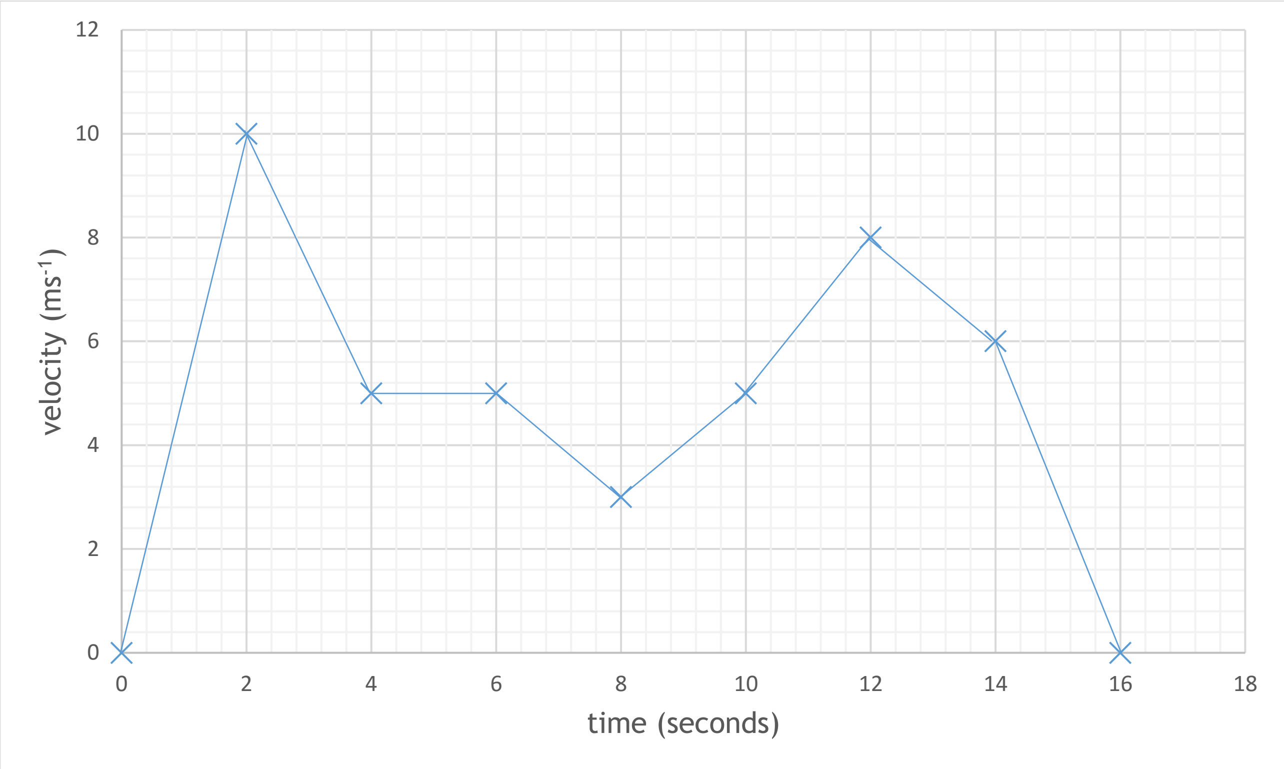
	measurements	calculation
A	d_1 and t_1	$\frac{d_1}{t_1}$
B	d_1 and t_2	$\frac{d_1}{t_2}$
C	d_2 and t_1	$\frac{d_2}{t_1}$
D	d_2 and t_2	$\frac{d_2}{t_2}$
E	d_2 and t_3	$\frac{d_2}{t_3}$

10. Identify the measurements and calculation needed to determine the instantaneous speed through the second light gate.

	measurements	calculation
A	d_1 and t_1	$\frac{d_1}{t_1}$
B	d_1 and t_2	$\frac{d_1}{t_2}$
C	d_2 and t_1	$\frac{d_2}{t_1}$
D	d_2 and t_2	$\frac{d_2}{t_2}$
E	d_2 and t_3	$\frac{d_2}{t_3}$

Full Response Questions 11→13

11. A car is driven over a short race track. The velocity-time graph shows the motion.



(a) Describe the motion of the car during the following times:

(i) 0 to 2 seconds

(ii) 2 to 4 seconds

(iii) 4 to 6 seconds

(iv) 14 to 16 seconds

(b) Calculate the acceleration of the car during 2 to 4 seconds.

(c) Calculate the acceleration of the car during 14 to 16 seconds.

(d) Calculate the distance travelled by the car, during the first 6 seconds.

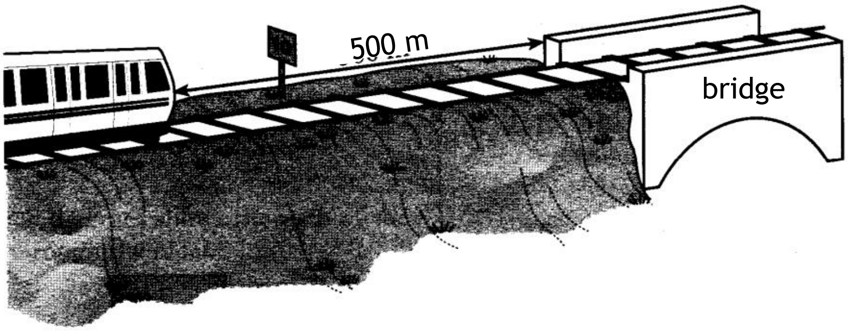
(e) State whether the acceleration of the car is greater between 8 and 10 seconds or between 10 and 12 seconds.
You must justify your answer.

12. Explain the results of these experiments:

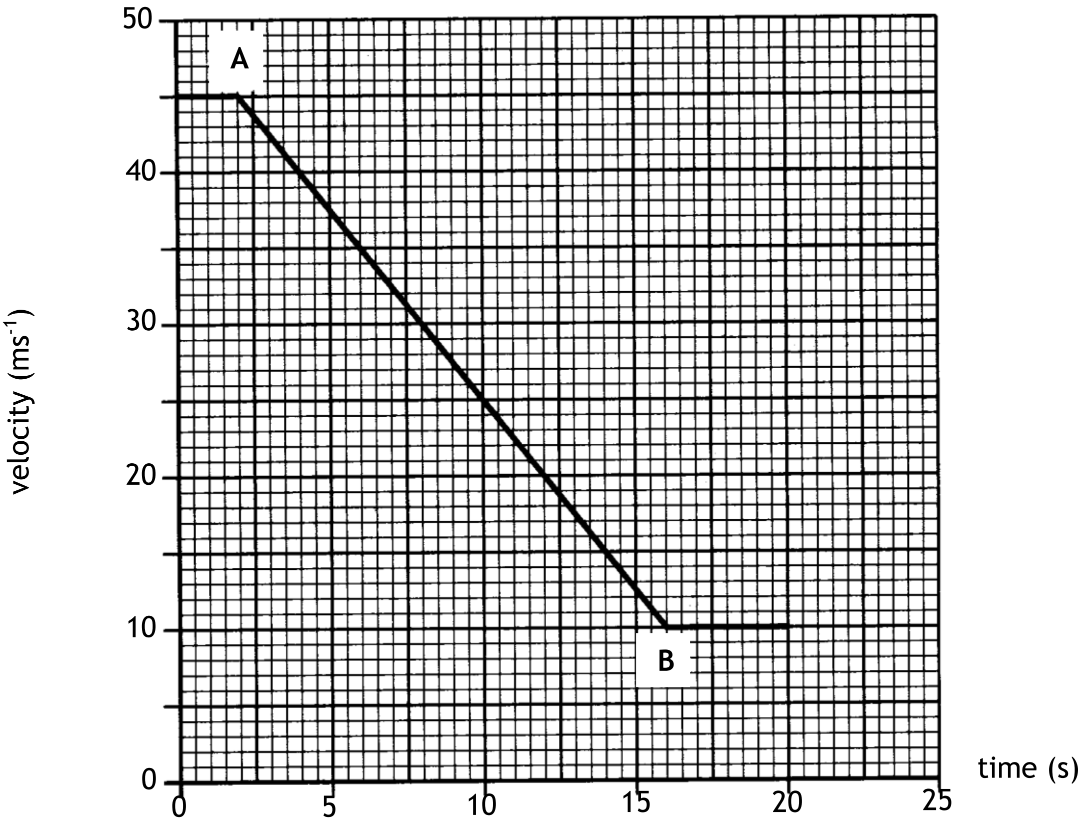
(a) A hammer will hit the ground before a feather, when released from the same height on Earth.

(b) A hammer will hit the ground at the same time as a feather, when released from the same height on the Moon.

13. The driver of a train, travelling at 45 ms^{-1} sees a sign indicating that there is a speed limit of 10 ms^{-1} on a bridge on the track ahead. At this point the distance from the train to the bridge is 500 m.



The velocity-time graph of the train's motion, from the moment the driver sees the sign, is shown.



(a) State the time at which the driver starts to apply the brakes.
You must justify your answer.

(b) Calculate the acceleration of the train between points A and B.

(c) Determine whether the train is travelling at 10 ms^{-1} when it reaches the bridge.
You must justify your answer with an appropriate calculation.