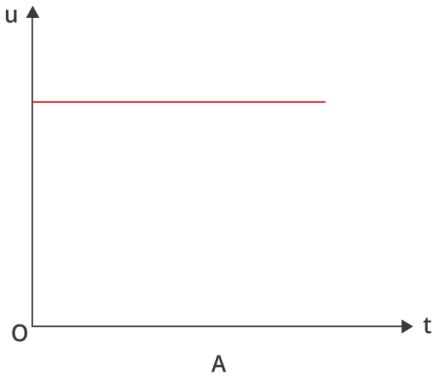
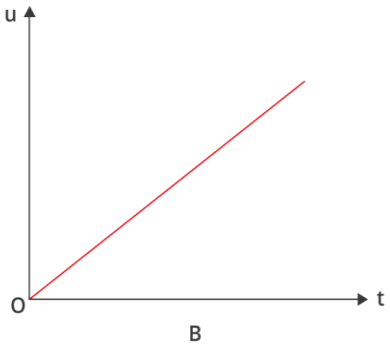
QUIZ: MOTION-II

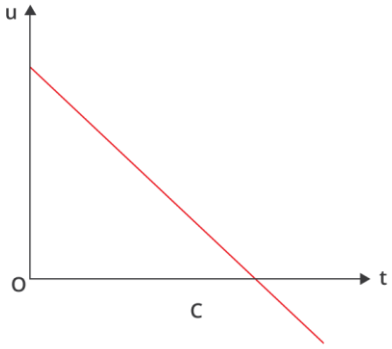
1. A ball is thrown vertically upward with velocity u_0. It reaches a height and then falls down. (Neglect air resistance) Which of the following correctly represent the velocity - time graph for the motion of the ball?



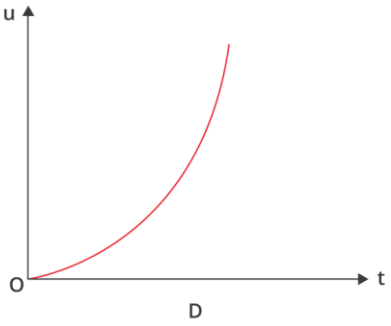
A



B



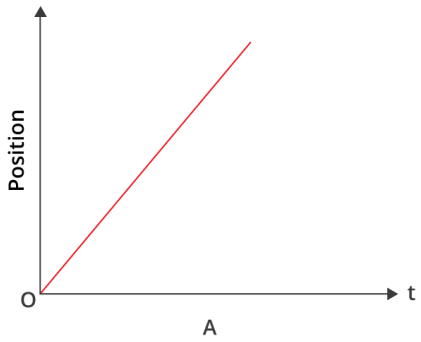
C

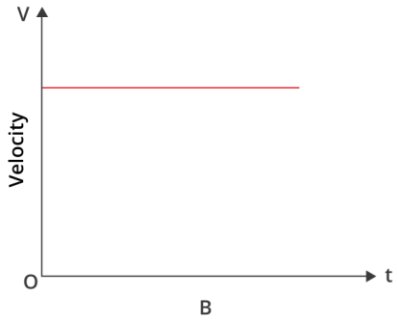


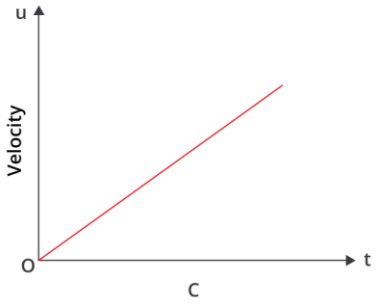
D

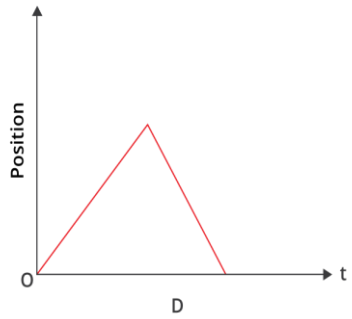
(a) A
(b) B
(c) C
(d) D

2. Which one of the following graphs represents the motion of an object under uniform acceleration?



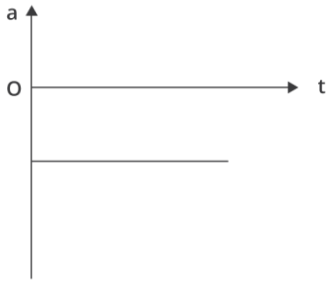




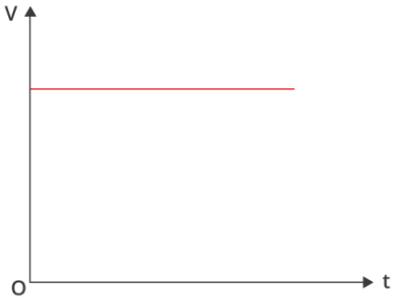


(a) A
(b) B
(c) C
(d) D

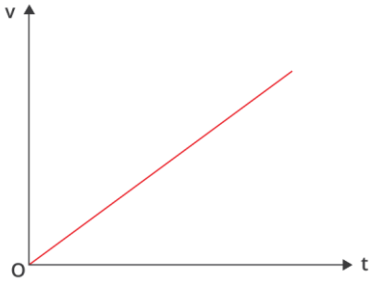
3. A ball is rolled with velocity u on a horizontal surface. It moves along a straight line. During its motion, the ball experiences an uniform deceleration with time as shown in Fig E.
Which of the following graphs represent correctly the variation of velocity with time?



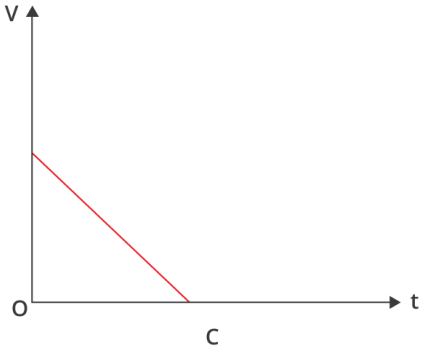
E



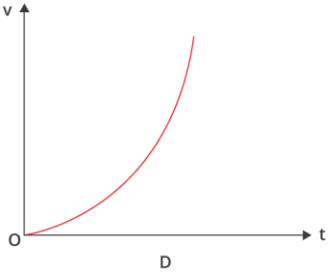
A



B



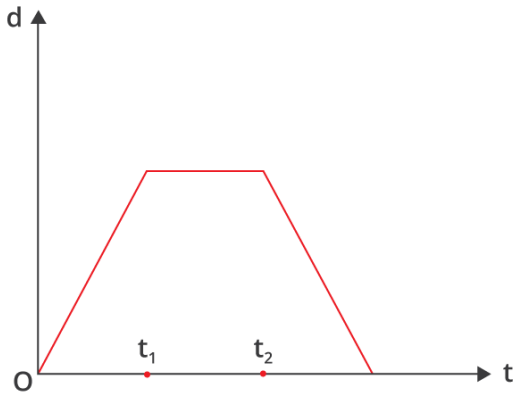
C



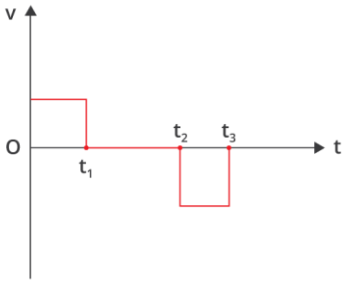
D

(a) A
(b) B
(c) C
(d) D

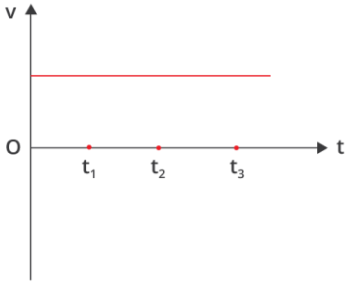
4. The displacement - time graph of an object is shown in Fig E. Which one of the following graphs correctly represents variation of velocity of the object with time?



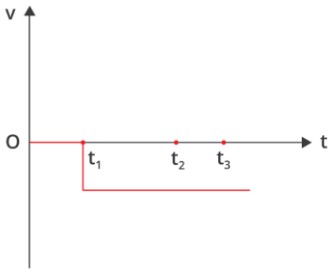
E



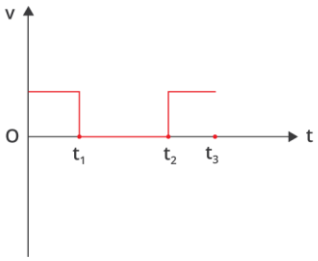
A



B



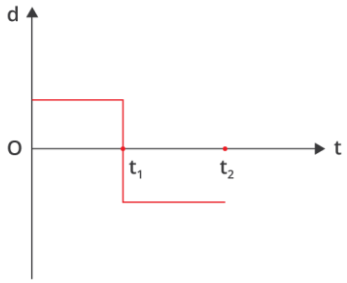
C



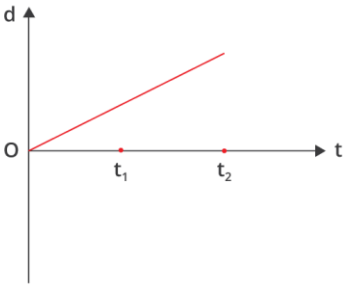
D

(a) A
(b) B
(c) C
(d) D

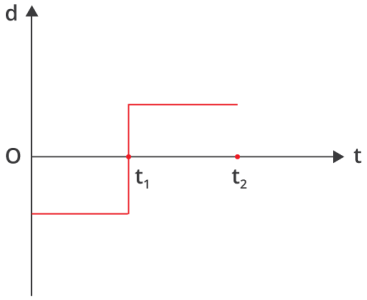
5. Figure E shows velocity-time graph of an object. Which of the following figures correctly represents the corresponding displacement-time graph?



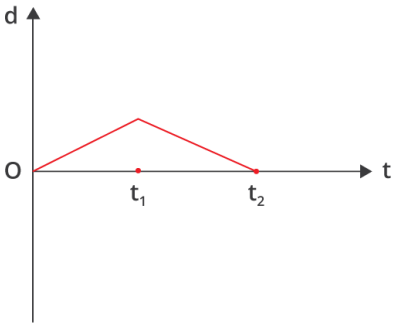
E



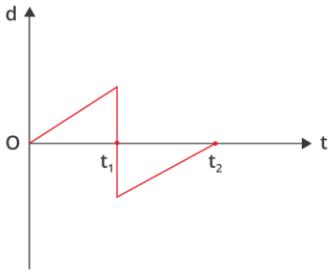
A



B



C



D

(a) A
(b) B
(c) C
(d) D

Answers:

1. (c)
Options:

(a) This graph shows that the velocity is constant throughout the motion. As ball goes up, velocity decreases and attain zero and increases as it goes down. Hence this option is wrong.
(b) This graph shows that velocity increases during the entire motion. However, as the ball goes up, velocity decreases and attain zero and increases again as it goes down. Hence this option is wrong.
(c) At time t = 0, the ball is thrown up with velocity u_0. As it goes up, its velocity decreases and becomes zero at the maximum height. When it falls from this height, its velocity increases. But all along (upward and downward motion), the acceleration is the same 9.8 m/s^2 always acting downward. Hence option (c) is correct.
(d) This graph shows that velocity increases during the entire duration of the motion. Hence this option is wrong.

2. (c)

Options:

(a) For motion with uniform acceleration, position changes with time as $s = ut + \frac{1}{2}at^2$ and thus the variation of position with time cannot be a straight line. Hence this option is wrong.
(b) For the given motion, velocity changes as $v = u + at$. Hence it must change with increase in time. Hence this option is wrong.
(c) For motion with constant acceleration, velocity changes as v = u + at. If u = 0, then v = at or v increases with t. Hence this option is correct.
(d) For motion with uniform acceleration, position changes with time as $s = ut + \frac{1}{2}at^2$ and thus the variation of position with time cannot be a straight line. Hence this option is wrong.

3. (c)

Options:

(a) According to Fig E, the ball is moving with negative acceleration. Thus velocity is not constant. Hence this option is wrong.
(b) According to Fig E, the ball experiences a negative acceleration, thus velocity of ball decreases. Hence this option is wrong.
(c) According to Fig E, the acceleration is negative and constant with time. So it is a motion with uniform deceleration. Hence, according to equation v = u + at, the velocity goes on decreasing with time linearly and finally becomes zero. Hence this option is correct.
(d) According to Fig E, the ball experiences a negative acceleration, thus velocity of ball decreases. Hence this option is wrong.

Note for teachers: This question is designed based on a given a-t graph. From the graph, one has to extract information and reach a conclusion and select the appropriate option from the four options provided.
Similar questions can be designed by providing d-t or v-t graphs and generating four options for the MCQ.

4. (a)

Options:

(a) For interval 0-t_1, displacement is increasing linearly. Hence the object is moving with constant positive velocity. So v-t graph is horizontal with a positive v value. During time interval t_1 - t_2, displacement is having constant value. This means that the object is at rest and thus v is zero for this interval. For time interval t_2 - t_3, d is decreasing, thus v is negative and constant. Hence this option is correct.

(b) The velocity is constant during the entire motion between t_1 to t_3. But according to fig E, displacement time graph indicate velocity has a constant positive value for time interval 0-t_1, and constant negative value for time interval t_2 - t_3, zero for period t_1 - t_2. Hence this option is wrong.

(c) For interval 0 - t_1, displacement is increasing linearly. Hence the object is moving with constant positive velocity. So v-t graph is horizontal with a positive v value. But velocity time graph shows velocity is zero for time interval 0-t_1. Hence this option is wrong.

(d) For interval 0 - t_1, displacement is increasing linearly. Hence the object is moving with constant positive velocity. So v-t graph is horizontal with a positive v value. But during duration time interval t_2 - t_3, the value of v is a constant negative. Hence this option is wrong.

5. (c)

Options:

(a) Motion of an object between time interval 0-t_1, velocity is constant and has a positive value which implies increasing nature of displacement. Between time interval t_1 - t_2, velocity has a constant negative velocity and thus displacement is decreasing and becoming zero at t_2.Hence this option is wrong.

(b) Motion of an object during time interval 0-t_1 and t_1 - t_2 displacement have constant negative and positive values respectively which correspond to zero velocity during the entire

duration and is contrary to given variation of v (fig E). Hence this option is wrong.

(c) Motion during the interval 0-t_1, displacement is increasing, thus v is positive. And for motion during the interval t_1 - t_2, displacement is decreasing. Thus v has a constant negative value which is in consonance with the given variation of v (fig E). Hence this option is correct.

(d) Motion of an object between time interval 0-t_1, velocity is constant and has a positive value which implies increasing nature of displacement. However motion during the interval t_1-t_2, velocity has a constant negative velocity and thus displacement is decreasing which is in contradiction to given d–t behavior. Hence this option is wrong.