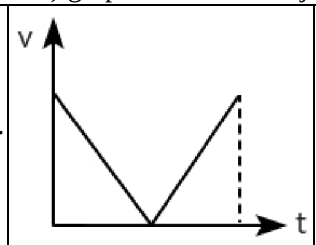
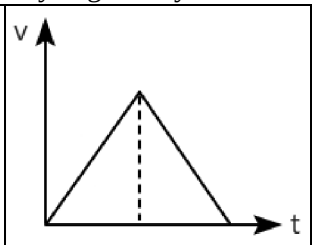
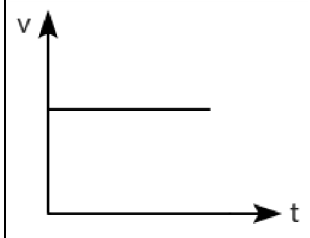
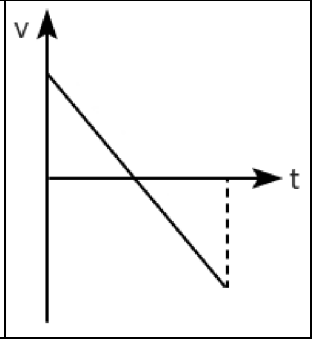
SECTION A

1 A ball is thrown vertically upward with a certain velocity from the surface of the earth and after some time it returns back to the earth. The velocity-time ($v - t$) graph for the entire journey is given by:

1. 

2. 

3. 

4. 

2 The relation between acceleration and time for an object is given by, $a = 2t + t^2$. If the object starts from rest, then its velocity at $t = 1$ s, is:
(a in m/s^2 and t in second)

1. $\frac{5}{3}$ m/s
2. $\frac{4}{3}$ m/s
3. 2 m/s
4. 3 m/s

3 A stone is thrown vertically downwards with an initial velocity of 40 m/s from the top of a building. If it reaches the ground with a velocity of 60 m/s, then the height of the building is: (Take $g = 10$ m/s^2)

1. 120 m
2. 140 m
3. 80 m
4. 100 m

4 The numerical ratio of displacement to the distance covered is always:

1.	less than one
2.	equal to one
3.	equal to or less than one
4.	equal to or greater than one

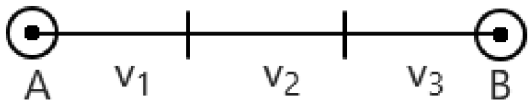
5 A car, which is initially stationary, accelerates for 5 s at 4.0 m/s^2 along a straight road. It then continues in the same direction for 20 s at a constant speed. What is the maximum speed of the car, and what is the distance traveled by the car in the final 20 s of its motion?

1.	maximum speed = 24 m/s; distance = 480 m
2.	maximum speed = 20 m/s; distance = 400 m
3.	maximum speed = 9.0 m/s; distance = 200 m
4.	maximum speed = 9.0 m/s; distance = 180 m

6 Two cars P and Q start from a point at the same time in a straight line and their positions are represented by; $x_p(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

1. $\frac{a-f}{1+b}$
2. $\frac{a+f}{2(b-1)}$
3. $\frac{a+f}{2(b+1)}$
4. $\frac{f-a}{2(1+b)}$

7 A car covers AB distance with the first one-third at velocity v_1 m/s, second one-third at v_2 m/s and last one-third at v_3 m/s. If $v_3 = 3v_1$, $v_2 = 2v_1$ and $v_1 = 11$ m/s then the average velocity of the car is:



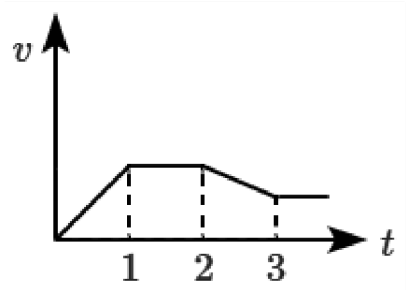
1. 12 m/s
2. 18 m/s
3. 16 m/s
4. 11 m/s

8 Given below are two statements:

Assertion (A):	Two balls of different masses are thrown vertically upward with the same speed. They will pass through their point of projection in the downward direction with the same speed.
Reason (R):	The maximum height and downward velocity attained at the point of projection are independent of the mass of the ball.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

9 Which of the following position-time $(x-t)$ graphs may be possible corresponding to given velocity-time $(v-t)$ graph?



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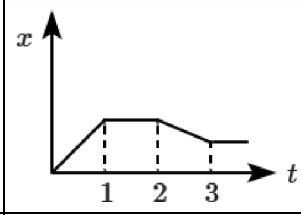

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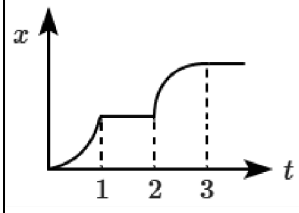

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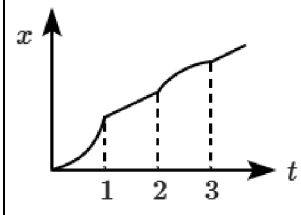

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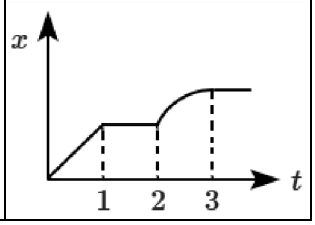


10 Given below are two statements:

Assertion (A):	A body is momentarily at rest at the instant it reverses the direction.
Reason (R):	A body cannot have acceleration if its velocity is zero at a given instant of time.

1.	Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is correct but **(R)** is incorrect.
4.	**(A)** is incorrect but **(R)** is correct.

11 Mark the correct statements for a particle going on a straight line:

a.	if the velocity and acceleration have opposite sign, the object is slowing down.
b.	if the position and velocity have opposite sign, the particle is moving towards the origin.
c.	if the velocity is zero at an instant, the acceleration should also be zero at that instant.
d.	if the velocity is zero for a time interval, the acceleration is zero at any instant within the time interval.

Choose the correct option:

1.	(a), (b) and (c)
2.	(a), (b) and (d)
3.	(b), (c) and (d)
4.	(a), (b), (c), and (d)

12 A Cheetah can accelerate from 0 to 96 km/h in 2 s. What is the average acceleration of the Cheetah?

1. 10 m/s^2
2. 13.3 m/s^2
3. 15 m/s^2
4. 48 m/s^2

13 When brakes are applied to a moving vehicle, the distance it travels before stopping is called stopping distance. It is an important factor for road safety and depends on the initial velocity v_0 and the braking capacity, or deceleration, $-a$ that is caused by the braking. Expression for stopping distance of a vehicle in terms of v_0 and a is:

1. $\frac{v_o^2}{2a}$
2. $\frac{v_o}{2a}$
3. $\frac{v_o^2}{a}$
4. $\frac{2a}{v_o^2}$

14 The motion of a particle along a straight line is described by the equation $x = 8 + 12t - t^3$ where x is in meter and t in seconds. The retardation of the particle when its velocity becomes zero is:

1. 24 ms^{-2}
2. zero
3. 6 ms^{-2}
4. 12 ms^{-2}

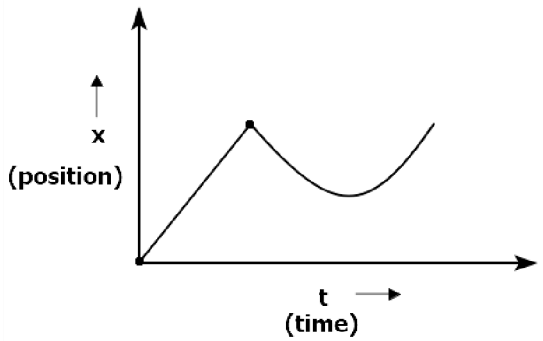
15 A food packet is released from a helicopter rising steadily at speed of 9.6 m/s. After 2 s, speed of the packet will be:

1. 10 m/s
2. 19.6 m/s
3. 29.2 m/s
4. 9.8 m/s

16 A person standing near the edge of the top of a building throws two balls A and B. The ball A is thrown vertically upward and B is thrown vertically downward with the same speed. The ball A hits the ground with a speed v_A and the ball B hits the ground with a speed v_B. We have:

1.	$v_A > v_B$
2.	$v_A < v_B$
3.	$v_A = v_B$
4.	the relation between v_A and v_B depends on height of the building above the ground

17 Which of the following statements is true about the motion depicted in the diagram?



1.	The acceleration is constant and non-zero.
2.	The velocity changes suddenly during the motion.
3.	The velocity is positive throughout.
4.	All of the above are true.

SECTION B

18 The study of the motion of objects, without consideration of its cause, is:

1. statics
2. kinematics
3. mechanics
4. dynamics

19 A ball released from a height falls 5 m in one second. In 4 s, it falls through:

(Take $g = 10$ m/s^2)

1. 40 m
2. 20 m
3. 80 m
4. 120 m

20 A drunkard walking in a narrow lane takes 5 steps forward and 3 steps backward, followed again by 5 steps forward and 3 steps backward, and so on. Each step is 1 m long and requires 1 s. There is a pit on the road 13 m away from the starting point. The drunkard will fall into the pit after:

1. 37 s
2. 31 s
3. 29 s
4. 33 s

21 A particle moving along x-direction has at any instant its x-coordinate given by, $x = 2 - 5t + 6t^2$. The initial velocity of the particle is (x is in meter and t is in seconds):
1. 2 m/s
2. -5 m/s
3. 3 m/s
4. 12 m/s

22 A car travels 4 km distance with a speed of 3 km/hr and next 4 km with a speed of 5 km/hr. What is the average speed of the car?
1. $\frac{15}{2}$ km/hr
2. $\frac{15}{4}$ km/hr
3. 15 km/hr
4. 10 km/hr

23 A particle moves along a straight line with its velocity (v) varying as the square root of its displacement (x): $v \propto \sqrt{x}$
Then its acceleration varies as:
1. $\frac{1}{\sqrt{x}}$
2. $x^{3/2}$
3. $x^{-3/2}$
4. x^0

24 A stone is released from an elevator going up with an acceleration a. The acceleration of the stone after the release is:
1. a upward
2. $(g - a)$ upward
3. $(g - a)$ downward
4. g downward

25 A rocket moves vertically up with a constant acceleration of 8 m/s^2. After sometime, its fuel gets exhausted and it falls under gravity. If the maximum height attained by the rocket is 180 m, what was the speed when the fuel exhausted?
1. 30 m/s
2. 40 m/s
3. 60 m/s
4. 50 m/s

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