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Motion (Part-2)

True/False questions

Mark the statement whether it is true or false. If the statement is false, write the true statement.

1. If a moving body has acceleration, its speed must change.
2. If a moving body has acceleration, its speed may change.
3. If velocity of a body changes, it must have some acceleration.
4. The average velocity of a particle is zero in a time interval. It is possible that the instantaneous velocity is never zero in an interval.
5. The average speed of a particle moving on a straight line is zero in a time interval. It is possible that the instantaneous velocity is never zero in the interval
6. It is possible to have a case in which the instantaneous speed of particle may be zero but the acceleration is not zero.
7. A body moving uniformly has constant acceleration.
8. Velocity of a body is the distance covered per unit time.
9. If a body is in motion, its velocity must change.
10. If displacement-time graph is a straight line, the moving body has uniform acceleration.

Fill in the blanks

1. The average speed of the particle in a given time is always ..... the magnitude of the average velocity.
2. Speed of a body can not be ..... .
3. Magnitude of instantaneous velocity is ..... instantaneous speed.
4. A body in uniform motion must have average velocity ..... instantaneous velocity.
5. Negative acceleration may lead to ..... in speed.
6. Area under velocity-time graph gives .....
7. A body moving with uniform acceleration will have velocity-time graph which is ..... .
8. Slope of velocity-time graph gives ..... .
9. Uniform circular motion involves constant .....
10. The path of a body having uniform motion is .....

Objective type questions

In the following questions, four options are given out of which only one is correct.

1. The relationship between average speed, time and distance is
   (1) average speed = distance × time
   (2) average speed $= \frac{\text{total distance}}{\text{total time}}$
   (3) time = average speed/distance
   (4) distance = average speed × time
2. The ratio of magnitude of average velocity of a body to its average speed is
   (1) less than 1
   (2) equal to 1
   (3) more than 1
   (4) equal to or less than 1
3. The average velocity is the
   (1) acceleration multiplied by time taken
   (2) distance travelled divided by time taken
   (3) displacement divided by the time taken
   (4) velocity multiplied by time
4. A particle is constrained to move on a straight line path. It returns to the starting point after 10 sec. The total distance covered by the particle during this time is 30 m. Which of the following statements about the motion of the particle is false?
   (1) Displacement of the particle is zero
   (2) Average speed of the particle is 3 m/s
   (3) Displacement of the particle is 30 m
   (4) Both (1) and (2)
5. A particle moves along a semicircle of radius 10 m in 5 seconds. Average velocity of the particle is
   (1) 2π m/s (2) 4π m/s
   (3) 2 m/s (4) 4 m/s

6. A person walks along a straight road for the first half time with velocity 40 km/h and the second half time with velocity 60 km/h. The mean velocity of the person is
(1) 20 km/h (2) 50 km/h
(3) 100 km/h (4) 48 km/h

7. A person walks towards north for 10 minutes with a speed of 40 km/h. He turns towards east and walks for 10 minutes with a speed of 40 km/h. The mean velocity of the person is about
(1) 40 km/h (2) 80 km/h
(3) 28 km/h (4) 56 km/h

8. If a car covers $2/5^{th}$ of the total distance with v_1 speed and $3/5^{th}$ distance with v_2 then average speed is
(1) $\frac{1}{2}\sqrt{v_1 v_2}$ (2) $\frac{v_1 + v_2}{2}$
(3) $\frac{2v_1 v_2}{v_1 + v_2}$ (4) $\frac{5v_1 v_2}{3v_1 + 2v_2}$

9. A car starts from Ambala, goes 50 km in a straight line to Chandigarh, immediately turns around, and returns to Ambala. The time for this round trip is 2 hours. The average speed and average velocity are respectively
(1) 0 km/h & 50 km/h
(2) 50 km/h & 50 km/h
(3) 0 km/h & 0 km/h
(4) 50 km/h & 0 km/h

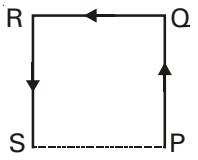
10. A man runs 200 m along a straight track in first 25 s and then turns back instantly and runs 100 m in next 15 s towards the starting point. The ratio of magnitude of average velocity and average speed of the man is
(1) $\frac{1}{3}$ (2) $\frac{2}{3}$
(3) $\frac{1}{2}$ (4) $\frac{5}{6}$

11. When a person leaves his home for sightseeing by his car, the meter reads 12352 km. When he returns home after two hours the reading is 12416 km. During journey he halts for 15 minutes at midpoint. The average speed of the car during this period is
(1) 16 km/h (2) 32 km/h
(3) 48 km/h (4) 24 km/h

12. A car is moving at 30 m/s along positive x-direction. The car takes a U-turn at constant speed in 5 seconds. The average acceleration of the car in this time is
(1) 6 m/s^2 towards positive x direction
(2) 12 m/s^2 towards positive x direction
(3) 12 m/s^2 towards negative x direction
(4) zero

13. A motor cycle covers first half of the distance at a speed of 40 km/h and second half at 60 km/h. Then average speed of the motor cycle is
(1) 55 km/h (2) 48 km/h
(3) 45 km/h (4) 50 km/h

14. A particle moves from P to Q with a velocity of 10 m/s and comes back Q to P with a velocity of 20 m/s. Average velocity of the particle is
(1) 12 m/s (2) 24 m/s
(3) 15 m/s (4) zero

15. 

A boy moves from P to S along the sides of a square of side 10 m with a constant speed of 2 m/s. Then average velocity of the boy is
(1) $\frac{1}{2}$ m/s (2) $\frac{2}{3}$ m/s
(3) $\frac{3}{2}$ m/s (4) 2 m/s

16. A car travels one-third distance on a straight road with a speed 10 km/h, next one-third with a speed 20 km/h and the last one-third with a speed 60 km/h. Average speed of the car in its whole journey will be
(1) 20 km/h (2) 18 km/h
(3) 8 km/h (4) 10 km/h

17. An object may have
a. varying speed without having varying velocity
b. varying velocity without having varying speed
c. Non zero acceleration without having varying velocity
d. non zero acceleration without having varying speed
(1) a, b & c (2) b, c & d
(3) both b & d (4) a, b, c & d

18. A body moves from rest with a constant acceleration of 5 m/s^2. Its instantaneous speed at the end of 10 s is
(1) 50 m/s (2) 5 m/s
(3) 2 m/s (4) 0.5 m/s

19. Out of the following which cannot be negative?
(1) Total path length (2) Velocity
(3) Acceleration (4) None of these

20. In uniformly accelerated motion
(1) displacement, velocity and acceleration remain contant
(2) displacement, velocity and acceleration change with time
(3) displacement remains constant but velocity and acceleration change with time
(4) acceleration remains constant but displacement and velocity change with time

21. For an object moving along a straight line, if brakes are applied, then during brakes
(1) speed increases
(2) displacement decreases
(3) distance travelled increases
(4) acceleration is zero

22. Average velocity of a particle moving with constant acceleration 'a' and initial velocity 'u' in first 't' second is
(1) $u + at$ (2) $u + \frac{1}{2}at$
(3) $\frac{u + at}{2}$ (4) $\frac{u}{2}$

23. A body starts from rest and moves with a uniform acceleration of 4 m/s^2. In first 5 seconds, the body will cover a distance of
(1) 40 m (2) 50 m
(3) 60 m (4) 20 m

24. Initial velocity of a car moving along a straight road is 10 m/s. If it accelerates uniformly at a rate of 3 m/s^2, then velocity after 4 seconds will be
(1) 15 m/s (2) 12 m/s
(3) 22 m/s (3) 28 m/s

25. If a train travelling at 72 kmph is to be brought to rest in a distance of 200 metres, then its retardation should be
(1) 20 m/s^2 (2) 10 m/s^2
(3) 2 m/s^2 (4) 1 m/s^2

26. If speed of a car, moving along a straight road, changes from 9 m/s to 12 m/s over a distance of 21 m, then uniform acceleration of the car is
(1) 2 m/s^2 (2) 1.5 m/s^2
(3) 1 m/s^2 (4) 0.25 m/s^2

27. A car is moving along a straight line at 10 m/s undergoes a retardation of 2 m/s^2. After 2 seconds, its speed will be
(1) 8 m/s (2) 12 m/s
(3) 6 m/s (4) 18 m/s

28. Which of the following statements are true for a moving body ?
a. if its speed changes, its velocity must change and it must have some acceleration
b. if its velocity changes, its speed must change and it must have some acceleration
c. if its velocity changes, its speed may or may not change, and it must have some acceleration
d. if its speed changes but direction of motion does not change, its velocity may remain constant.
(1) a, b & c (2) b, c & d
(3) both a & c (4) a, b, c & d

29. A bullet, fired at a wooden block of thickness 10 cm, strikes it with a speed of 200 m/s. It emerges the block at a speed of 100 m/s after travelling through the wooden block. The uniform retardation suffered by the bullet is
(1) 1.5×10^5 m/s^2 (2) 2×10^5 m/s^2
(3) 1.2×10^5 m/s^2 (4) 0.5×10^5 m/s^2

30. Let speed of a car, moving along a straight road, increase uniformly from 20 m/s to 30 m/s over an interval of 5 seconds. Then acceleration of the car is
(1) 2 m/s^2 (2) 1.5 m/s^2
(3) 3 m/s^2 (4) 4 m/s^2

31. Let speed of a car, moving along a straight road, increase uniformly from 30 m/s to 50 m/s over an interval of 4 seconds. Then distance covered by the car in this time interval is
(1) 160 m (2) 320 m
(3) 250 m (4) 150 m

32. Let a car starting from rest, move along a straight road and cover a distance directly proportional to the square of the time elapsed. Then acceleration of the car will be
(1) zero (2) increasing
(3) decreasing (4) constant

33. If a body is accelerating, it may
a. speed up
b. speed down
c. move with same speed
d. move with same velocity
(1) a, b & c (2) b, c & d
(3) both a & c (4) a, b, c & d

34. The initial velocity of the particle is 10 m/s and its retardation is 2 m/s². The distance moved by the particle in 5th second of its motion is
(1) 1 m (2) 19 m
(3) 50 m (4) 75 m

35. A motor car moving with a uniform speed of 20 m/s comes to stop on the application of brakes after travelling a distance of 10 m Its acceleration is
(1) 20 m/s² (2) −20 m/s²
(3) −40 m/s² (4) 2 m/s²

36. A particle starting from rest travels a distance x in first 2 seconds and a distance y in next two seconds, then
(1) $y = x$ (2) $y = 2x$
(3) $y = 3x$ (4) $y = 4x$

37. A particle moving with a uniform acceleration travels 24 m and 64 m in the first two consecutive intervals of 4 second each. Its initial velocity is
(1) 1 m/s (2) 10 m/s
(3) 5 m/s (4) 2 m/s

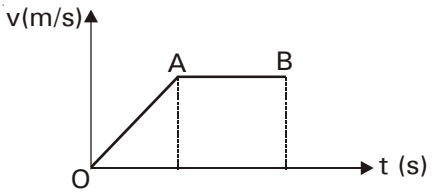
38. A car moving with a speed of 40 km/h can be stopped by applying brakes after atleast 2 m. If the same car is moving with a speed of 80 km/h, what is the minimum stopping distance
(1) 8 m (2) 2 m
(3) 4 m (4) 6 m

39. The displacement is given by $s = 2t^2 + t$, the acceleration is
(1) 8 m/s² (2) 4 m/s²
(3) 10 m/s² (4) 15 m/s²

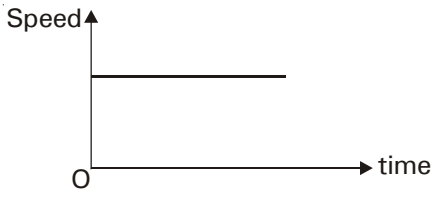
40. A particle moving in a straight line travels 10 m in first 5 seconds and 10 m in the next 3 seconds. Assuming constant acceleration, what is the distance travelled in next 2 seconds?
(1) 8.3 m (2) 9.3 m
(3) 10.3 m (4) None of above

41. The displacement of a body at any time 't' is given by $S = 10t - \frac{1}{2}(0.2)t^2$. The velocity of the body is zero at
(1) 50 sec (2) 100 sec
(3) 80 sec (4) 40 sec

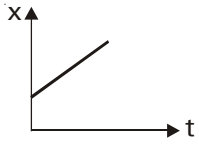
42. If a car accelerates uniformly from rest to a velocity of 30 m/s in 6 seconds, then the distance covered by the car in next 6 seconds is
(1) 90 m (2) 450 m
(3) 180 m (4) 270 m

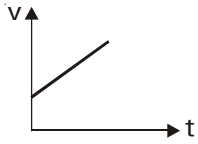
43. 

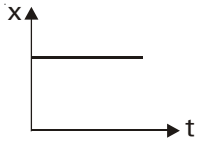
In the above velocity-time graph, the region OA and AB represents respectively
(1) uniform acceleration & uniform retardation
(2) uniform acceleration & zero velocity
(3) uniform velocity & uniform acceleration
(4) uniform acceleration & uniform velocity

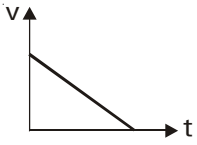
44. 

A car is moving along a straight road towards north. The speed–time graph of the car is shown above. Then the car
(1) moves with variable speed
(2) moves with uniform acceleration
(3) moves with a uniform speed
(4) is at rest

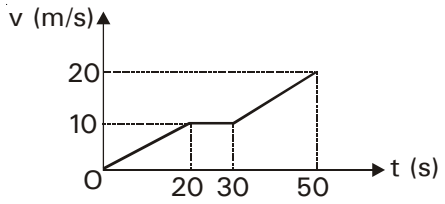
45. For a body moving along a straight path, which of the following graphs represents uniform motion?
(1) 

(2) 

(3) 

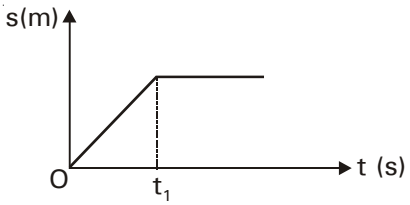
(4) 

46. Area under an acceleration-time graph gives
(1) final velocity of a moving object
(2) change in velocity of a moving object
(3) displacement of a moving object
(4) distance covered by a moving object

47. 

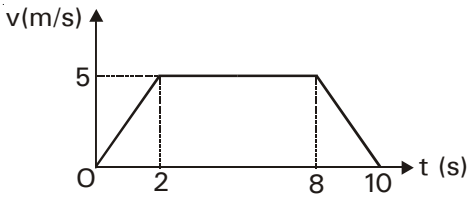
The velocity-time (v-t) graph of a moving object is given in figure. The acceleration of the body at t = 40 second is

(1) 0.5 m/s^2 (2) 2 cm/s^2
(3) 3 cm/s^2 (4) 1 cm/s^2

48. 

The displacement-time (s-t) graph shown in figure represents

(1) constant velocity
(2) velocity of the body is continuously changing
(3) body travels with variable velocity upto time t_1 and then travels with constant velocity
(4) body travels with constant velocity upto time t_1 and then stops

49. 

A lift is going up. The variation in the speed of the lift is as given in the graph. What is the height to which the lift takes the passengers

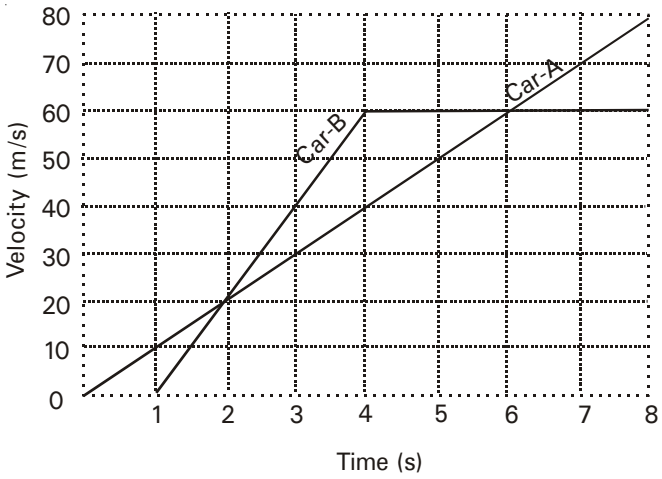
(1) 30 m (2) 50 m
(3) 40 m (4) zero

50. Which of the following statements is true for a body executing uniform circular motion?
a. Speed is constant
b. Direction of motion changes continuously
c. Acceleration is zero
d. Velocity is constant
(1) both a and b (2) both b and c
(3) both c and d (4) b, c & d

51. For a body moving along a circular path
(1) magnitude of average velocity and average speed are equal
(2) average speed is zero when the body completes one revolution
(3) if speed remains constant, then the body is unaccelerated
(4) at any instant, the direction of velocity is along the tangent to the circle

Paragraph type questions

Read the following and answer the question.
The velocity-time graph of two cars A and B, which starts from the same place and moving along a straight road in the same direction, as shown in diagram.



Calculate,

1. The acceleration of car A.
(1) 10 m/s^2 (2) 5 m/s^2
(3) 20 m/s^2 (4) 2 m/s^2
2. The acceleration of car B between 2 s to 4s.
(1) 15 m/s^2 (2) 20 m/s^2
(3) 25 m/s^2 (4) 5 m/s^2
3. The points of time at which both cars have the same velocity.
(1) 4s, 8s (2) 3s, 7s
(3) 2s, 6s (4) 1s, 5s
4. Which of the two cars is ahead after 8 seconds and by how much?
(1) car A is ahead by 10 m
(2) car B is ahead by 20 m
(3) car A is ahead by 20 m
(4) car B is ahead by 10 m.

Ansswers

True/False (T/F)

(1) False
(2) True
(3) True
(4) True
(5) False
(6) True
(7) False
(8) False
(9) False
(10) False

Fill in the blanks

1. greater than or equal to
2. negative
3. equal to
4. equal to
5. decrease/increase
6. displacement
7. straight line
8. acceleration
9. speed
10. a straight line

Objective Questions

1.	(2)	14.	(4)	27.	(3)	40.	(1)
2.	(4)	15.	(2)	28.	(3)	41.	(1)
3.	(3)	16.	(2)	29.	(1)	42.	(4)
4.	(3)	17.	(3)	30.	(1)	43.	(4)
5.	(4)	18.	(1)	31.	(1)	44.	(3)
6.	(2)	19.	(1)	32.	(4)	45.	(1)
7.	(3)	20.	(4)	33.	(1)	46.	(2)
8.	(4)	21.	(3)	34.	(1)	47.	(1)
9.	(4)	22.	(2)	35.	(2)	48.	(4)
10.	(1)	23.	(2)	36.	(3)	49.	(3)
11.	(2)	24.	(3)	37.	(1)	50.	(1)
12.	(3)	25.	(4)	38.	(1)	51.	(4)
13.	(2)	26.	(2)	39.	(2)		

Paragraph type questions

1. (1)
2. (2)
3. (3)
4. (4)