13. Two trains of length 50 m are approaching each other on parallel rails. Their velocities are 10 m/sec and 15 m/sec. They will cross each other in:

(1) 2 sec (2) 4 sec (3) 10 sec (4) 6 sec

Sol. Total length to be travelled = 50 + 50 = 100 m

Relative velocity $v_r = 15 + 10 = 25$ m/s

$\therefore$ Time to cross $t = \frac{100}{25} = 4$ second

Therefore, option (2) is the correct answer.

14. A particle located at $x = 0$ at time $t = 0$, starts moving along the positive x direction with a velocity v that varies as $v \propto \sqrt{x}$. The displacement of the particle varies with time as:

(1) $t^{1/2}$ (2) t^3 (3) t^2 (4) t

Sol. $v \propto \sqrt{x}$

$$\frac{dx}{dt} \propto \sqrt{x} \Rightarrow \int \frac{dx}{\sqrt{x}} = \int \alpha dt \Rightarrow 2\sqrt{x} = \alpha t + c$$

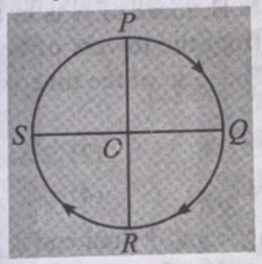
$\therefore x \propto t^2$

Therefore, option (3) is the correct answer.

Prarambh Exercise-1 (Topicwise)

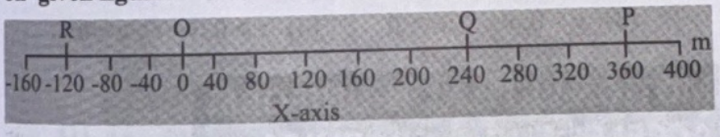
DISTANCE AND DISPLACEMENT

1. A cyclist starts from the point *P* of a circular ground of radius 2 km and travels along its circumference to the point *S*. The displacement of a cyclist is:



(1) 6 km (2) $\sqrt{8}$ km (3) 4 km (4) 8 km

Directions: (Q. 2 to 5) Answer the following questions based on given figure.



2. With reference to the given figure, the position coordinate of point P and R are:

(1) P = (+ 360, 0, 0); R = (–120, 0,0)
(2) P = (– 360, 0, 0); R = (+120, 0,0)
(3) P = (0, + 360, 0); R = (–120, 0,0)
(4) P = (0, 0, + 360); R = (0, 0, –120)

3. The displacement of car in moving from O to P and its displacement in moving from P to Q are

(1) + 360 m and –120 m (2) – 120 m and + 360 m
(3) + 360 m and +120 m (4) + 360 m and – 600 m

4. Which of the following statements is/are true?

A. For motion of the car from O to P, the magnitude of displacement is equal to the path length.
B. For motion of car from O to P and back to Q, magnitude of displacement is equal to + 240 m.
C. For motion of car from O to P and back to Q, magnitude of displacement is not equal to the path length.

(1) Only A (2) Only B
(3) Only C (4) All of these

5. If the car goes from O to P and returns back to O, the displacement and path length of the journey are:

(1) 0, 720 m (2) 720 m, 720 m
(3) 0, 0 (4) 720 m, 0

6. The displacement of a particle is given by $x = (t-2)^2$ where x is in metre and t in second. The distance covered by the particle in first 4 seconds is:

(1) 4 m (2) 8 m (3) 12 m (4) 16 m

SPEED, VELOCITY, ACCELERATION

7. A truck travels a distance A to B at a speed of 40 km/h and returns to A at a speed of 50 km/h, then what is the average velocity of the whole journey?

(1) 30 km/h (2) Zero
(3) 35 km/hr (4) 40 km/hr

8. Which of the following changes when a particle is moving with uniform velocity?

(1) Velocity (2) Speed
(3) Position (4) Acceleration

9. An athlete participates in a race, he is moving on a circular track of radius 80 m and completes half a revolution in 20 s. Its average velocity is:

(1) 8 m/s (2) 16 m/s
(3) 10 m/s (4) 12 m/s

10. The motion of a particle is described by the equation $x = a + bt^2$, where $a = 10$ cm, $b = 15$ cms^{-2}. Its instantaneous velocity at $t = 3$ second will be?

(1) 10 cms^{-1} (2) 20 cms^{-1}
(3) 60 cms^{-1} (4) 90 cms^{-1}

11. A car travel half the distance with constant velocity 40 kmph and the remaining half with a constant velocity 80 kmph. The average velocity of the car is:

(1) 32 km/hr (2) 53.3 km/hr
(3) 43.2 km/hr (4) 42 km/hr

12. A vehicle travels half the distance with speed v_1 and the other half with speed v_2, then its average speed is:

(1) $\frac{v_1+v_2}{2}$ (2) $\frac{2v_1+v_2}{v_1+v_2}$

(3) $\frac{2v_1v_2}{v_1+v_2}$ (4) $\frac{(v_1+v_2)}{v_1v_2}$

MOTION WITH UNIFORM ACCELERATION IN STRAIGHT LINE PATH, MOTION UNDER GRAVITY

13. The bus moving with a speed of 30 km/h is brought to a stop by applying brakes after 6 m . If the same bus is moving at a speed of 90 km/h, then the minimum stopping distance is:
(1) 36 m (2) 45 m (3) 60 m (4) 54 m

14. A particle having initial velocity 10 m/s moves with a constant acceleration 5 ms^{-2}, for a time 15 second along a straight line, what is the displacement of the particle in the last 2 second?
(1) 160 m (2) 200 m
(3) 210 m (4) 230 m

15. A ball thrown vertically upward with a speed of 19.6 m/s from the top of a tower returns to the earth in 6 second. What is the height of the tower?
(1) 40 m (2) 58.8 m
(3) 50 m (4) 70 m

16. On turning a corner, a motorist rushing at 40 m/s, finds a child on the road 108 m ahead. He instantly stops the engine and applies the brakes so as to stop it within 1 m of the child, what time is required to stop it?
(1) 5.4 second (2) 6.4 second
(3) 3.9 second (4) 2 second

17. A ball is thrown vertically upwards with a velocity of 40 ms^{-1} from the top of a multistory building of 25 m high. How high will the ball rise from building?
(1) 20 m (2) 80 m (3) 40 m (4) 10 m

18. A body starting from rest moves with constant acceleration. The ratio of distance covered by the body during 8^{th} second to that covered in 8 second is:

(1) $\frac{15}{60}$ (2) $\frac{15}{64}$

(3) $\frac{12}{15}$ (4) 1

19. A particle moves for 50 seconds if first accelerates from rest and then retard or deaccelerates to rest. If the retardation be 5 times the acceleration then the time for retardation is:
(1) 25/3 second (2) 50/3 second
(3) 25 second (4) 100/3 second

20. A truck travelling with uniform acceleration crosses two points A & B with velocities 60 m/s and 40 m/s respectively. The speed of the body at the mid point of A and B is nearest to:
(1) 17 m/s (2) 20 m/s
(3) 19.49 m/s (4) 50.9 m/s

21. A body thrown vertically upwards with a speed of 19.6 ms^{-1} from the top of a tower returns to the earth in 10 seconds. What will be the height of tower? ($g = 10\ m/s^2$)
(1) 304 m (2) 308 m
(3) 310 m (4) 312 m

22. A splash is heard after 3 second after the stone is dropped into a well of depth 20 m. The velocity of sound is:
(1) 18 m/s (2) 28 m/s
(3) 20 m/s (4) 19 m/s

23. A body is moving with uniform acceleration describes 20 m in the first 5 sec and 25 m in next 5 sec. Its initial velocity will be:
(1) 3.5 m/s (2) 2.5 m/s
(3) 5.5 m/s (4) 11 m/s

24. Two balls A & B, mass of A is m and that of B is 5 m are dropped from the towers of height 36 m and 64 m respectively. The ratio of the time taken by them to reach the ground is:
(1) 0.75 (2) 3/4
(3) Both (1) and (2) (4) 5/2

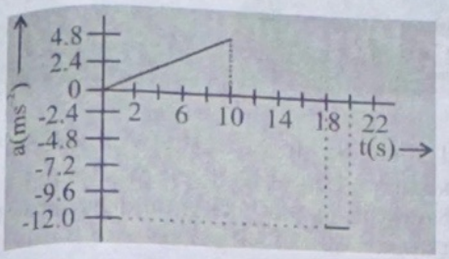
25. A lift is coming from 8^{th} floor and is just about to reach 4^{th} floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct?
(1) $x<0, v<0, a>0$ (2) $x>0, v<0, a<0$
(3) $x>0, v<0, a>0$ (4) $x>0, v>0, a<0$

MOTION WITH NON-UNIFORM ACCELERATION, GRAPHICAL REPRESENTATION OF MOTION

26. The velocity of the particle at any time t is given by $V = 2t(3-t)\ ms^{-1}$. At what time is its velocity maximum?
(1) 2 second (2) 1.5 seconds
(3) 1 second (4) 5 second

27. The acceleration a of the body starting from rest varies with time following the equation $a = 8t + 5$. The velocity of the body at time t = 2 sec will be:
(1) 22 m/s (2) 26 m/s
(3) 28 m/s (4) 30 m/s

28. The slope of the tangent to the v - t curve gives the value of:
(1) Instantaneous acceleration
(2) Instantaneous velocity
(3) Average acceleration
(4) Centripetal acceleration

29. 

With reference to the above graph there are three statements given below. Which of the statement(s) is/are correct?

A. The acceleration is non-uniform over, the period 0 s to 10 s

B. The acceleration is zero between 10 s to 18 s

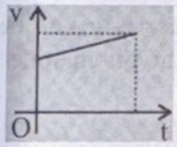
C. The acceleration is constant with value $-12\ ms^{-2}$ between 18 s to 20 s

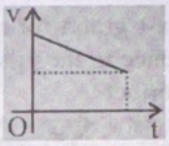
Choose the correct option from those given below.

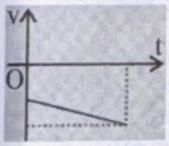
(1) Only A (2) A and B

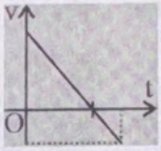
(3) B and C (4) A, B and C

30. An object is moving in a positive direction with a positive acceleration. The velocity-time graph with constant acceleration which represents the above situation is:

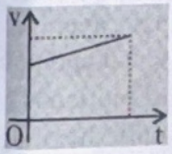
(1) 

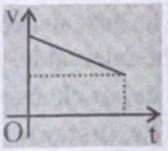
(2) 

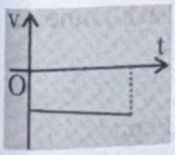
(3) 

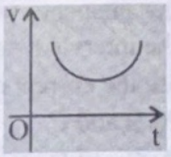
(4) 

31. The velocity-time graph for motion with constant acceleration for an object moving in positive direction with a negative acceleration is:

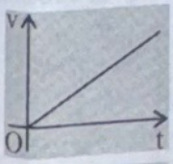
(1) 

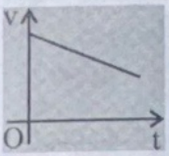
(2) 

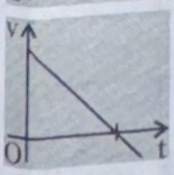
(3) 

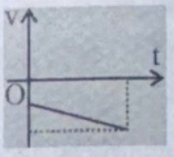
(4) 

32. An object is moving in negative direction with a negative acceleration. The velocity-time graph with constant acceleration which represents the above situation is:

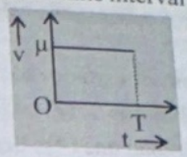
(1) 

(2) 

(3) 

(4) 

33. The v-t curve shown is a straight line parallel to time-axis. The displacement in the time interval t = 0 and t = T is equal to



(1) μT

(2) Area of the rectangle of height μ and base T

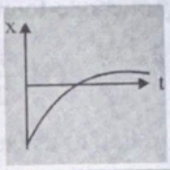
(3) Both (1) and (2)

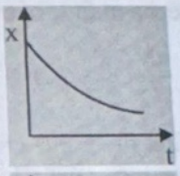
(4) Slope of the curve

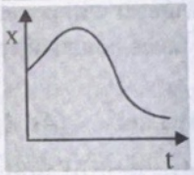
34. The displacement time graph for two particles A & B are straight line inclined at the angles of 30° & 45° with the time axis. The ratio of velocities of $V_A : V_B$ is:

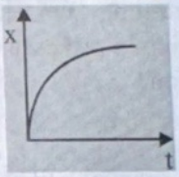
(1) $\frac{1}{\sqrt{3}}$ (2) $2\sqrt{3}$ (3) $\frac{2}{\sqrt{3}}$ (4) $\sqrt{3}$

35. Among the four graph shown in the figure there is only one graph for which average velocity over the time interval (0, T) can vanish for a suitably chosen T. Which one is it?

(1) 

(2) 

(3) 

(4) 

RELATIVE MOTION IN 1 D

36. A bus begins to move with an acceleration of $1\ ms^{-2}$. A man who is 48 m behind the bus starts running at $10\ ms^{-1}$ to catch the bus. The man will be able to catch the bus after:

(1) 6 s (2) 10 s (3) 3 s (4) 8 s

37. From a balloon rising vertically upward at 6 m/s, a stone is thrown up at 16 m/s relative to the balloon. Its velocity with respect to the ground after 2 second is:

(1) 10 m/s (2) 4 m/s (3) 6 m/s (4) 2 m/s

38. Two trains one 60 m long and other is 80 m long are travelling in opposite direction with velocity 10 m/s and 25 m/s. The time of crossing is:

(1) 4 second (2) 5 second

(3) 6 second (4) 3 second

39. Two trains are moving with equal speed in opposite directions along two parallel railway tracks. If the wind is blowing with speed u along the track so that the relative velocities of the trains with respect to the wind are in the ratio 1 : 2, then the speed of each train must be:

(1) 3u (2) 2u (3) 5u (4) 4u

40. Two balls are dropped from same height at 1 second interval of time. The separation between the two balls after 4 second of the drop of the 1st ball is:

(1) 30 m (2) 35 m (3) 40 m (4) 48 m

Prabal Exercise-2 (Learning Plus)

1. The numerical ratio of distance to displacement is:
(1) Always equal to one (2) Always less than one
(3) Always greater than one (4) Equal to or more than one

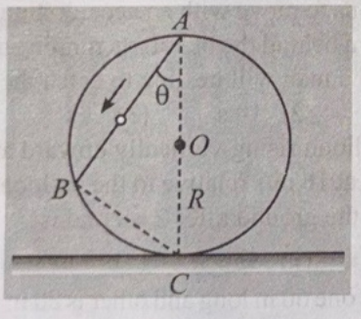
2. A wheel of radius 3 m rolls forward half a revolution on a horizontal ground. The magnitude of the displacement of the point of the wheel initially in contact with the ground is:
(1) 2π m (2) $\sqrt{2\pi}$ m
(3) $\sqrt{\pi^2+4}$ m (4) $3\sqrt{\pi^2+4}$ m

3. The displacement of a body along x-axis depends on time as $\sqrt{x} = 3t + 5$. Then the velocity of body:
(1) Increase with time (2) Independent of time
(3) Decrease with time (4) Data not sufficient

4. A particle is moving with a constant speed V in a circle. What is the magnitude of average velocity after one-fourth rotation?
(1) $\frac{\pi V}{\sqrt{2}}$ (2) $\frac{\sqrt{2}V}{\pi}$ (3) $\frac{2\sqrt{2}V}{\pi}$ (4) $\frac{\pi R}{2V}$

5. A bullet fired into a fixed target loses half of its velocity after penetrating 4 cm. How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion?
(1) 0.2 cm (2) 5 cm (3) 3 cm (4) 1.33 cm

6. A frictionless wire AB is fixed on a circle of radius R. A very small spherical ball slips on this wire. The time taken by this ball to slip from A to B is



(1) $\frac{2\sqrt{gR}}{g\cos\theta}$ (2) $w\sqrt{gR}\cdot\frac{\cos\theta}{g}$
(3) $2\sqrt{\frac{R}{g}}$ (4) $\frac{gR}{\sqrt{g\cos\theta}}$

7. Two balls of different masses m_a & m_b are dropped from two different heights a and b. The ratio of the time taken by the two to cover these distances are:
(1) 1 (2) $\sqrt{a/b}$ (3) b : a (4) a : b

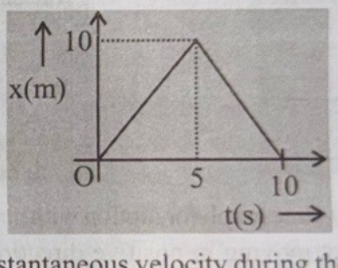
8. A stone is dropped from a bridge at a height of 180 m over a river. After 3 second, a second ball is thrown straight downwards. What should be the initial velocity of the second ball so that both hit the water simultaneously?
(1) 45 m/s (2) 48 m/s (3) 50 m/s (4) 55 m/s

9. When a ball is thrown up vertically with velocity V_0, it reaches a maximum height h. If one wishes to triple the maximum height then the ball should be thrown with velocity:
(1) $\sqrt{3}V_0$ (2) $3V_0$
(3) $9V_0$ (4) $3/2\,V_0$

10. A body thrown upwards with some velocity reaches the maximum height of 50 m. Another body with double the mass thrown up with four times the initial velocity will reach a maximum height of:
(1) 600 m (2) 200 m
(3) 800 m (4) 100 m

11. If the velocity of a car is given by $V = (150 - 10x)^{1/2}$ m/s. If car retards their motion by applying brakes then what will be the acceleration?
(1) 1 m/s^2 (2) 2 m/s^2
(3) 5 m/s^2 (4) –5 m/s^2

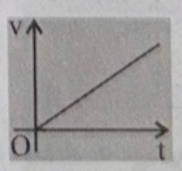
12. The x-t graph for motion of a car is given below. With reference to the graph which of the given statement (s) is/ are correct?

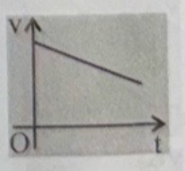


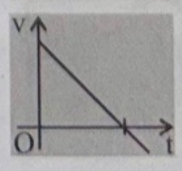
A. The instantaneous velocity during the interval t = 5 s to t = 10 s is negative at all time instants during the interval.
B. The instantaneous velocity and the average velocity for the interval t = 0 s to t = 5 is equal and positive.
C. The car changes its direction of motion at t = 5 s
D. The instantaneous speed and the magnitude of instantaneous velocity is equal at all time instants during the interval t = 0 s to t = 5 s

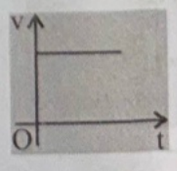
Choose the correct option:
(1) A, B and C (2) B and C
(3) B, C and D (4) A, B, C and D

13. An object is moving in positive direction for some time and then turns back with the same negative acceleration. The velocity time graph which best describes the situation is:

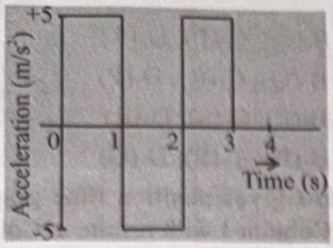
(1) 

(2) 

(3) 

(4) 

14. A particle starts from rest at t = 0 and moves in a straight line with an acceleration shown below. The velocity of the particle at t = 3 s is:



(1) 5 m/s (2) 6 m/s (3) 10 m/s (4) 15 m/s

15. A train of 200 m long travelling at 50 m/s overtakes another train 130 m long travelling at 30 m/s. The time taken by the first train to pass the second train is:
(1) 15 second (2) 17 second
(3) 16.5 second (4) 18 second

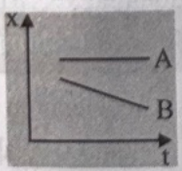
16. The distance between two trucks moving towards each other is decreasing at the rate of 10 m/s. If these trucks travel with same speeds in same direction the separation increases at the rate of 5 m/s. The velocity of the trucks are:
(1) $V_1 = 8.5$ m/s, $V_2 = 1.5$ m/s
(2) $V_1 = 7.5$ m/s, $V_2 = 2.5$ m/s
(3) $V_1 = 5$ m/s, $V_2 = 5$ m/s
(4) $V_1 = 10$ m/s, $V_2 = 10$ m/s

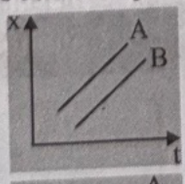
17. A bus is moving with a speed of 10 m/s on the straight road. A scooterist wishes to overtake the bus in 50 seconds. If the bus is at a distance of 1 km from the scooterist, with what speed should the scooterist chase the bus?
(1) 50 m/s (2) 60 m/s (3) 80 m/s (4) 30 m/s

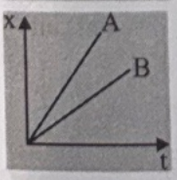
18. A rocket travelling at a speed of 200 m/s ejects its products of combustion at the speed of 1200 m/s relative to the rocket, then the speed of escaping vapours with respect to the person on the ground is:
(1) 1000 m/s (2) 1200 m/s
(3) 1400 m/s (4) 200 m/s

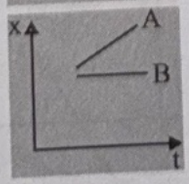
19. From a building two balls A and B are thrown such that A is thrown upwards and B downwards with same velocity. V_A & V_B are the velocities on reaching the ground then:
(1) $V_B > V_A$
(2) $V_A = V_B$
(3) $V_A > V_B$
(4) Velocity depends upon mass

20. Which one of the following represents the x-t graph of two object A and B moving with zero relative speed?

(1) 

(2) 

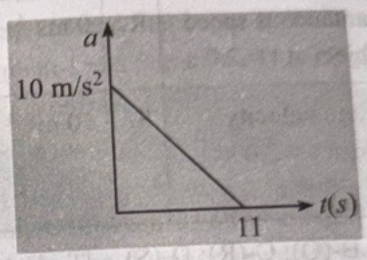
(3) 

(4) 

21. An object falling through a fluid is observed to have acceleration given by $a = g - bv$ where g = gravitational acceleration and b is constant. After a long time of release, it is observed to fall with constant speed. The value of constant speed is
(1) $\frac{g}{b}$ (2) $\frac{b}{g}$ (3) bg (4) b

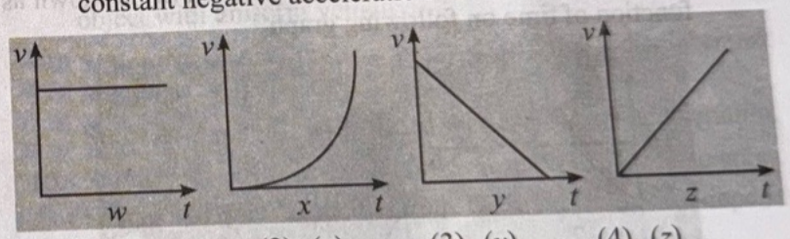
22. The velocity v and displacement r of a body are related as $v^2 = kr$, where k is a constant. What will be the velocity after 1 second? (Given that the displacement is zero at t = 0).
(1) $\sqrt{kr}$ (2) kr^2
(3) $\frac{k}{2}r^0$ (4) Data is not sufficient

23. A particle starts from rest. Its acceleration (a) versus time (t) is as shown in the figure. The maximum speed of the particle will be:



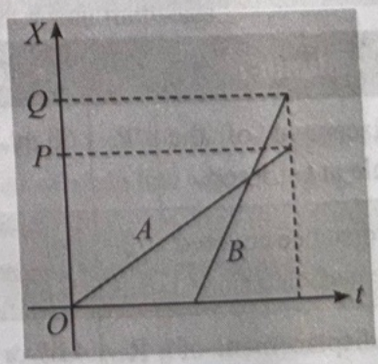
(1) 110 m/s (2) 55 m/s (3) 550 m/s (4) 660 m/s

24. Given below are four curves describing variation of velocity with time of a particle. Which one of those describe the motion of a particle initially in positive direction with constant negative acceleration



(1) (w) (2) (x) (3) (y) (4) (z)

25. The position-time graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in figure.



(1) B lives closer to the school.
(2) B starts from the school earlier.
(3) A walks faster.
(4) A and B reach home at the same time.

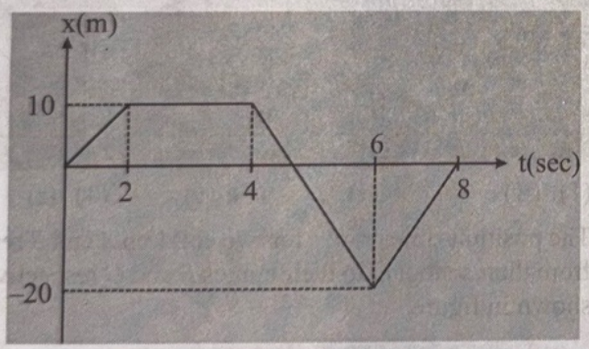
MATCH THE COLUMN MCQs

1. The position of an object moving along X-axis is given by $x = a - bt^2$, where $a = 8.5$ m, $b = 2.5\ ms^{-2}$ and t is measured in seconds. For the given situation, match the terms in Column-I with the values of Column-II and choose the correct option from the codes given below:

	Column-I		Column-II
A.	Velocity of object at $t = 2.0$ s	P.	$-15\ ms^{-1}$
B.	Velocity of object at $t = 0$s	Q.	$-10\ ms^{-1}$
C.	Instantaneous speed of object at $t = 2.0$ s	R.	$0\ ms^{-1}$
D.	Average velocity between $t = 2.0$ s and $t = 4.0$ s	S.	$10\ ms^{-1}$

(1) A-(P); B-(Q); C-(R); D-(S)
(2) A-(Q); B-(R); C-(S); D-(P)
(3) A-(S); B-(R); C-(Q); D-(P)
(4) A-(R); B-(Q); C-(P); D-(S)

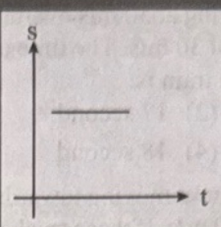
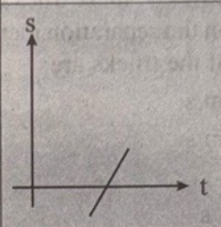
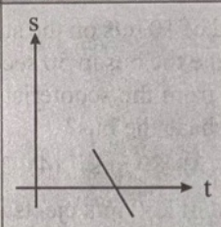
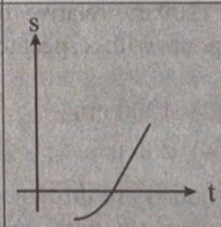
2. A particle moves along x-axis. Its position (x) is shown as function of time on following graph



	Column-I		Column-II
A.	Displacement of the particle at $t = 1$ sec.	P.	60 m
B.	Total distance covered by the particle.	Q.	5m
C.	Total displacement of the particle.	R.	4.67 or 14/3 sec
D.	The instant i.e. time when particle crosses is initial position.	S.	zero

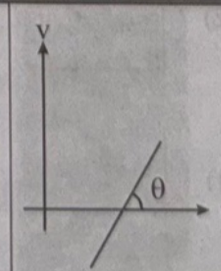
(1) A-(P); B-(Q); C-(P); D-(R)
(2) A-(R); B-(Q); C-(R); D-(P)
(3) A-(Q); B-(P); C-(S); D-(R)
(4) A-(Q); B-(R); C-(S); D-(Q)

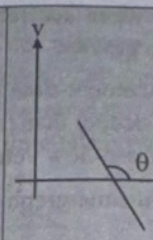
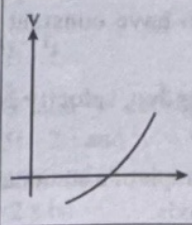
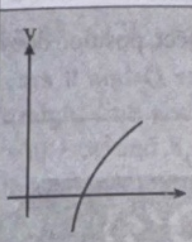
3. The Column-I gives position time graph and match the situation in Column-I with results in Column-II.

	Column-I		Column-II
A.		P.	Velocity = –ve constant
B.		Q.	Velocity = 0
C.		R.	Velocity = +ve constant
D.		S.	Velocity = +ve and increases

(1) A-(P); B-(Q); C-(R); D-(S)
(2) A-(Q); B-(P); C-(R); D-(S)
(3) A-(Q); B-(R); C-(P); D-(S)
(4) A-(Q); B-(R); C-(Q); D-(R)

4. Column-I gives velocity/time graph, match the figures in Column-I with the statements in Column-II.

	Column-I		Column-II
A.		P.	Acceleration (a) $= \tan\theta < 0$, $\lvert a \rvert$ = constant

B.		Q.	Acceleration (a) $= \tan\theta > 0$, $\|a\|$ = constant
C.		R.	Acceleration (a) > 0, $\|a\|$ = decreases
D.		S.	Acceleration (a) > 0, $\|a\|$ = increases

(1) A-(P); B-(Q); C-(S); D-(R)

(2) A-(Q); B-(P); C-(S); D-(R)

(3) A-(Q); B-(P); C-(S); D-(R)

(4) A-(P); B-(Q); C-(R); D-(S)

5. A particle moves along a straight line such that its displacement S varies with time t as $S = \alpha + \beta t + \gamma t^2$.

	Column-I		Column-II
A.	Acceleration at t = 2 s	P.	$\beta + 5\gamma$
B.	Average velocity during third second	Q.	2γ
C.	Velocity at t = 1 s	R.	α
D.	Initial displacement	S.	$\beta + 2\gamma$

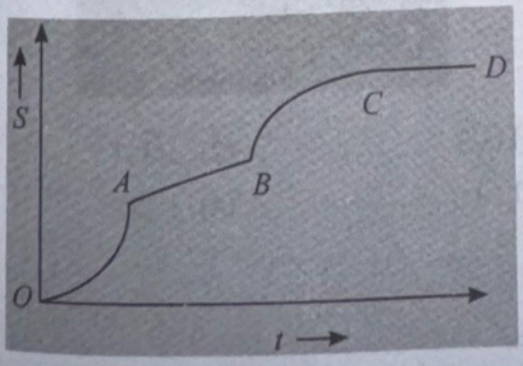
(1) A-(P); B-(Q); C-(S); D-(R)

(2) A-(Q); B-(P); C-(S); D-(R)

(3) A-(P); B-(Q); C-(R); D-(S)

(4) A-(R); B-(S); C-(P); D-(Q)

6. The displacement versus time curve is given. Sections OA and BC are parabolic. CD is parallel to the time axis.



	Column-I		Column-II
A.	OA	P.	Velocity increases with time linearly
B.	AB	Q.	Velocity decreases with time
C.	BC	R.	Velocity is independent of time
D.	CD	S.	Velocity is zero

(1) A-(P); B-(Q); C-(R); D-(S)

(2) A-(Q); B-(P); C-(S); D-(R)

(3) A-(P); B-(R); C-(Q); D-(S)

(4) A-(R); B-(S); C-(Q); D-(P)

STATEMENT BASED MCQs

(1) Both Statement-I and Statement-II are correct.

(2) Both Statement-I and Statement-II are incorrect.

(3) Statement-I is correct & Statement-II is incorrect.

(4) Statement-I is incorrect & Statement-II is correct.

7. **Statement-I:** The speed of the particle remains constant when the angle between $\vec{a}$ and $\vec{v}$ is equal to 90°

Statement-II: The distance covered by a particle never decrease with time.

8. **Statement-I:** The average speed of a body is equal to its instantaneous speed if the body moves with a constant speed.

Statement-II: A force is required to move the body or an object with uniform velocity.

9. **Statement-I:** Area under velocity-time graph = displacement of the particle.

Statement-II: Slope of velocity – time graph = acceleration.

10. **Statement-I:** All bodies fall freely with the same acceleration.

Statement-II: The acceleration of the falling bodies depend on the mass of the body.

11. **Statement-I:** If acceleration is in same direction as velocity then speed of the particle increases.

Statement-II: If acceleration is opposite direction to the velocity then speed increases.

12. **Statement-I:** The area under a – t graph gives the change in velocity.

Statement-II: For uniformaly accelerated motion ($a \neq 0$), v – t graph is a straight line whose slope gives the acceleration of the particle.

ASSERTION & REASON MCQs

(1) Assertion (A) is true, Reason (R) is true; Reason (R) is a correct explanation for Assertion (A).

(2) Assertion (A) is true, Reason (R) is true; Reason (R) is not a correct explanation for Assertion (A).

(3) Assertion (A) is true, Reason (R) is false.

(4) Assertion (A) is false, Reason (R) is true.

13. **Assertion (A):** If the displacement of the body is zero, the distance covered by it may not be zero.

Reason (R): Displacement is a vector quantity and distance is a scalar quantity.

14. **Assertion (A):** A body may be accelerated even when it is moving with constant speed.

Reason (R): When direction of motion of the body is changing then body may have acceleration.

15. **Assertion (A):** A body having non-zero acceleration can have a constant velocity.

Reason (R): Acceleration is the rate of change of velocity.

16. **Assertion (A):** The average and instantaneous velocity have same value in a uniform motion.

Reason (R): In uniform motion, the velocity of an object increases uniformly.

17. **Assertion (A):** A body falling freely may do so with constant velocity.

Reason (R): The body fall freely, when acceleration of a body is equal to acceleration due to gravity.

18. **Assertion (A):** The slope of displacement-time graph of a body moving with high velocity is steeper than the slope of displacement-time graph of a body with low velocity.

Reason (R): Slope of displacement-time graph = velocity of the body.

19. **Assertion (A):** An object can have constant speed but variable velocity.

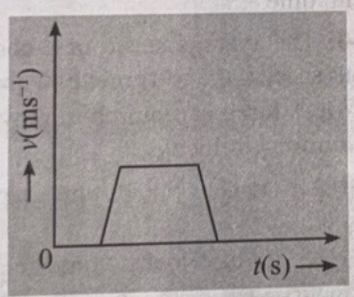
Reason (R): Speed is a scalar but velocity is a vector quantity.

20. **Assertion (A):** Position-time graph of a stationary object is a straight line parallel to time axis.

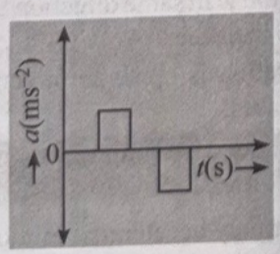
Reason (R): For a stationary object, position does not change with time.

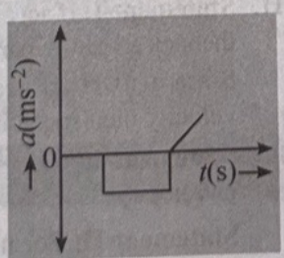
PYQ's Exercise-4 (Important NEET PYQ's)

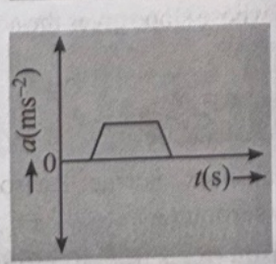
1. The velocity (v)-time (t) plot of the motion of a body is shown below: **(2024)**

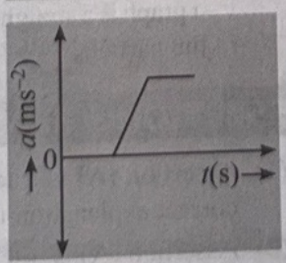


The acceleration (a)-time (t) graph that best suits this motion is:

(1) 

(2) 

(3) 

(4) 

2. A vehicle travels half the distance with speed θ and the remaining distance with speed 2θ. Its average speed is: **(2023)**

(1) $\frac{3\theta}{4}$ (2) $\frac{\theta}{3}$

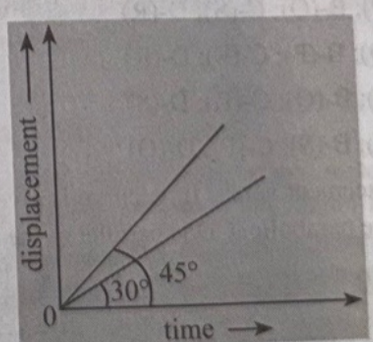
(3) $\frac{2\theta}{3}$ (4) $\frac{4\theta}{3}$

3. The ratio of the distance traveled by a freely falling body in the 1st, 2nd, 3rd and 4th second: **(2022)**

(1) 1 : 1 : 1 : 1 (2) 1 : 2 : 3 : 4

(3) 1 : 4 : 9 : 16 (4) 1 : 3 : 5 : 7

4. The displacement time graphs of two moving particle make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is: **(2022)**



(1) $1:\sqrt{3}$ (2) $\sqrt{3}:1$

(3) 1 : 1 (4) 1 : 2

5. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be: **(2017-Delhi)**

(1) $\frac{t_1 t_2}{t_2 - t_1}$ (2) $\frac{t_1 t_2}{t_2 + t_1}$

(3) $t_2 - t_1$ (4) $\frac{t_1 + t_2}{2}$

6. The 'x' and 'y' coordinates of the particle at any time are 'x' $= 5t - 2t^2$ and 'y' $= 10t$, respectively, where 'x' and 'y' are in metres and 't' in seconds. The acceleration of the particle at $t = 2$ s is: **(2017-Delhi)**

(1) 5 m/s^2 (2) –4 m/s^2 (3) –8 m/s^2 (4) 0

7. 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? **(2016 - II)**

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

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

8. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is: **(2016-I)**

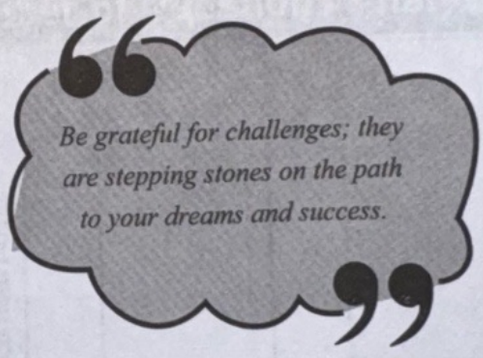
(1) $\frac{3}{2}A + 4B$ (2) $3A + 7B$

(3) $\frac{3}{2}A + \frac{7}{3}B$ (4) $\frac{A}{2} + \frac{B}{3}$

9. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $v(x) = \beta x^{-2n}$ where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x, is given by: **(2015)**

(1) $-2n\beta^2 x^{-4n-1}$ (2) $-2\beta^2 x^{-2n+1}$

(3) $-2n\beta^2 e^{-4n+1}$ (4) $-2n\beta^2 x^{-2n-1}$



ANSWER KEY

CONCEPT APPLICATION

1. (3)	2. (4)	3. (4)	4. (2)	5. (4)	6. (2)	7. (3)	8. (1)	9. (2)	10. (3)
11. (2)	12. (2)	13. (2)	14. (3)	15. (2)	16. (1)	17. (3)	18. (1)	19. (2)	20. (3)

PRARAMBH EXERCISE-1 (TOPICWISE)

1. (2)	2. (1)	3. (1)	4. (4)	5. (1)	6. (2)	7. (2)	8. (3)	9. (1)	10. (4)
11. (2)	12. (3)	13. (4)	14. (1)	15. (2)	16. (1)	17. (2)	18. (2)	19. (1)	20. (4)
21. (1)	22. (3)	23. (1)	24. (3)	25. (1)	26. (2)	27. (2)	28. (1)	29. (4)	30. (1)
31. (2)	32. (4)	33. (3)	34. (1)	35. (3)	36. (4)	37. (4)	38. (1)	39. (1)	40. (2)

PRABAL EXERCISE-2 (LEARNING PLUS)

1. (4)	2. (4)	3. (1)	4. (3)	5. (4)	6. (3)	7. (2)	8. (1)	9. (1)	10. (3)
11. (4)	12. (4)	13. (3)	14. (1)	15. (3)	16. (2)	17. (4)	18. (1)	19. (2)	20. (2)
21. (1)	22. (3)	23. (2)	24. (3)	25. (4)					

PARIKSHIT EXERCISE-3 (MULTICONCEPT)

1. (2)	2. (3)	3. (3)	4. (3)	5. (2)	6. (3)	7. (1)	8. (3)	9. (1)	10. (3)
11. (3)	12. (1)	13. (1)	14. (1)	15. (4)	16. (3)	17. (4)	18. (1)	19. (1)	20. (1)

PYQ's EXERCISE-4 (IMPORTANT NEET PYQ's)

1. (1)	2. (4)	3. (4)	4. (1)	5. (2)	6. (2)	7. (2)	8. (3)	9. (1)