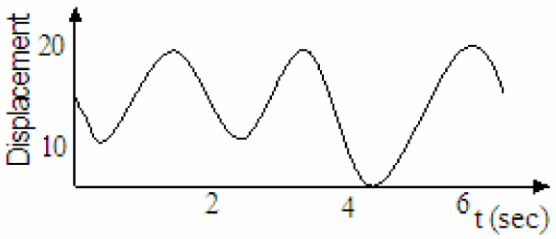
Exercise-2

Marked Questions can be used as Revision Questions.

PART-I : OBJECTIVE QUESTIONS

1. Figure shows the position of a particle moving on the x-axis as a function of time



(1) The particle has come to rest 6 times
(2) The maximum speed is at t = 6 sec
(3) The velocity remains positive for t = 0 to t = 6 sec
(4) The average velocity for the total period show in negative

2. A car starts from rest and has an acceleration a = t m/s^2. A truck is moving with a uniform velocity of 6 m/s. At what distance will the car overtake the truck? (at t = 0 both start their motion in the same direction from the same position)
(1) 36 m (2) 8 m (3) 32 m (4) 4 m

3. Between two stations a train accelerates uniformly at first, then moves with constant speed and finally retards uniformly to come to rest. If the ratios of time taken are 1 : 8 : 1 and the greatest speed is 60 km/hour. Then the average speed over the whole journey
(1) 45 km/hr (2) 54 km/hr (3) 35 km/hr (4) 53 km/hr

4. A ball is thrown vertically upwards with a velocity of 30 m/s. If the acceleration due to gravity is 10 m/s^2, what will be the distance travelled by it in the last second of motion before again come to his hand :
(1) 5 m (2) 10 m (3) 25 m (4) 30 m

5. Two balls are dropped from different heights. One ball is dropped 2 sec after the other but they both strike the ground at the same time, 3 sec after the first is dropped. The difference in the heights at which they were dropped is (g = 9.8 m/s^2)
(1) 7.8 m (2) 78 m (3) 15.6 m (4) 39.2 m

6. Two bodies are thrown vertically upward, with the same initial velocity of 98 m/s but 4 sec apart. How long after the first one is thrown when they meet ? (g = 9.8 m/s^2)
(1) 10 sec (2) 11 sec (3) 12 sec (4) 13 sec

7. Two balls are dropped from the same point after an interval of 1 s. If acceleration due to gravity is 10 m/s^2, what will be the separation 3 seconds after the release of first ball?
(1) 5 m (2) 10 m (3) 25 m (4) 30 m

8. Juggler keeps on moving four balls in the air continuously such that each ball attains 20m height. When the first ball leaves his hand, the position of the other balls (in metre height) will be
(1) 10, 20, 10 (2) 15, 20, 15 (3) 5, 51, 20 (4) 5, 10, 20

9. A particle moves with constant speed v along a regular hexagon ABCDEF in same order (ie., A to B, B to C, C to D, D to E, E to F, F to A....) Then magnitude of average velocity for its motion from A to C
(1) V (2) V/2 (3) $\sqrt{3}V/2$ (4) None of these

10. A ball is dropped from a height of 20 m and rebounds with a velocity which is 3/4th of the velocity with which it hits the ground. What is the time interval between the first and second bounces ($g = 10\ m/s^2$)
(1) 3 sec (2) 4 sec (3) 5 sec (4) 6 sec

11. A hall has the dimensions 10 m × 10 m × 10 m. A fly starting at one corner ends up at a diagonally opposite corner. The magnitude of its displacement is nearly
(1) $5\sqrt{3}$ m (2) $10\sqrt{3}$ m (3) $20\sqrt{3}$ m (4) $30\sqrt{3}$ m

12. A car runs at constant speed on a circular track of radius 100 m taking 62.8 s on each lap. What is the average speed and average velocity on each complete lap?
(1) velocity 10m/s, speed 10 m/s (2) velocity zero, speed 10 m/s
(3) velocity zero, speed zero (4) velocity 10 m/s, speed zero

13. Mark the correct statements :
(1) The magnitude of the instantaneous velocity of a particle is equal to its instantaneous speed.
(2) The magnitude of average velocity in an interval is equal to its average speed in that interval.
(3) It is possible to have a situation in which the speed of a particle is always zero but the average speed is not zero
(4) It is possible to have a situation in which the speed of the particle is never zero but the average speed in an interval is zero.

14. A particle is thrown upwards from ground. It experiences a constant air resistance which can produce a retardation of 2 m/s^2 opposite to the direction of velocity of particle. The ratio of time of ascent to the time of descent is : [$g = 10\ m/s^2$]
(1) 1 : 1 (2) $\sqrt{\frac{2}{3}}$ (3) $\frac{2}{3}$ (4) $\sqrt{\frac{3}{2}}$

15. A truck travelling due to North at 20 m/s turns East and travels at the same speed. The change in its velocity is
(1) $20\sqrt{2}\ m/s$ North – East (2) $20\sqrt{2}\ m/s$ South – East
(3) $40\sqrt{2}\ m/s$ North – East (4) $20\sqrt{2}\ m/s$ North – West

PART - II : ASSERTION / REASONING

Section (A) : Assertion/Reasoning

A-1. **STATEMENT-1 :** A particle having negative acceleration will slow down.
STATEMENT-2 : Direction of the acceleration is not dependent upon direction of the velocity.
(1) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1
(2) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1
(3) STATEMENT-1 is true, STATEMENT-2 is false
(4) STATEMENT-1 is false, STATEMENT-2 is true

A-2. **STATEMENT-1 :** Magnitude of average velocity is equal to average speed.
STATEMENT-2 : Magnitude of instantaneous velocity is equal to instantaneous speed.
(1) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1
(2) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1
(3) STATEMENT-1 is true, STATEMENT-2 is false
(4) STATEMENT-1 is false, STATEMENT-2 is true

A-3. **STATEMENT-1 :** When velocity of a particle is zero then acceleration of particle must be zero at that instant.

STATEMENT-2 : Acceleration is equal to $a = v\left(\frac{dv}{dx}\right)$, where v is the velocity at that instant.

(1) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1

(2) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1

(3) STATEMENT-1 is true, STATEMENT-2 is false

(4) STATEMENT-1 is false, STATEMENT-2 is true

A-4. **STATEMENT-1 :** A particle moves in a straight line with constant accleration. The average velocity of this particle cannot be zero in any time interval

STATEMENT-2 : For a particle moving in straight line with constant acceleration, the average velocity in a time interval is $\frac{u+v}{2}$, where u and v are initial and final velocity of the particle in the given time interval.

(1) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1

(2) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1

(3) STATEMENT-1 is true, STATEMENT-2 is false

(4) STATEMENT-1 is false, STATEMENT-2 is true

A-5. **STATEMENT-1 :** For a particle moving in a straight line, velocity (v in m/s) of the particle in terms of time (t in sec) is given by $v = t^2 - 6t + 8$. Then the speed of the particle is minimum at t = 2 sec.

STATEMENT-2 : For a particle moving in a straight line the velocity v at any time t may be minimum or may be maximum when $\frac{dv}{dt} = 0$.

(1) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is correct explanation for STATEMENT-1

(2) STATEMENT-1 is true, STATEMENT-2 is true and STATEMENT-2 is not correct explanation for STATEMENT-1

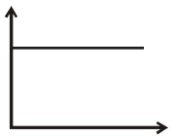
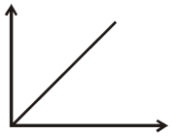
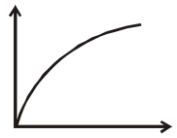
(3) STATEMENT-1 is true, STATEMENT-2 is false

(4) STATEMENT-1 is false, STATEMENT-2 is true

Section (B) : Match the column

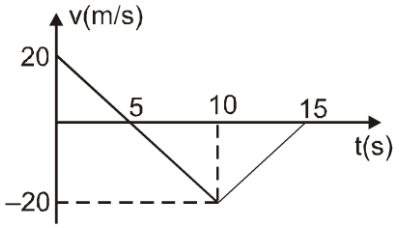
B-1. **Match the following :**

A particle is moving along a straight line. Its velocity varies with time as v = kt, where k is a positive constant and t is the time. Match the graphs in Column II with the statements in Column I and indicate your answer by darkening appropriate bubbles in the 4 × 4 matrix given in the OMR.

Column I	**Column II**
(1) Acceleration versus time curve	(p) 
(2) Acceleration versus displacement curve	(q) 
(3) Velocity versus time curve	(r) 
(4) Displacement versus velocity curve	(s) 

B-2. Match the following :

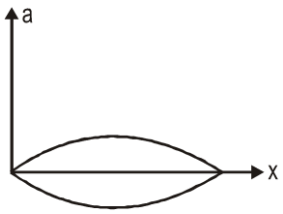
For the velocity–time graph shown in figure, in a time interval from t = 0 to t = 15 s, match the following :

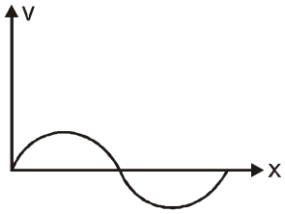


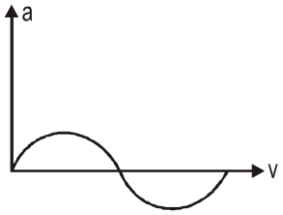
Column–I	**Column–II**
(1) Change in velocity (in m/s)	(p) –4/3
(2) Average acceleration (in m/s^2)	(q) –20
(3) Total displacement (in m)	(r) –10
(4) Acceleration at t = 7 s (in m/s^2)	(s) – 4
	(t) –50

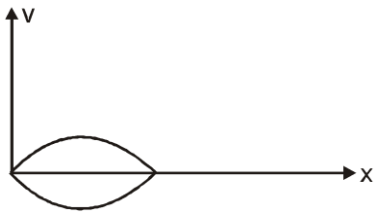
Section (C) : One or More Than One Options Correct

C-1. Which of the following graphs are wrong for a particle performing rectilinear motion :

(1) 

(2) 

(3) 

(4) 

C-2. Which of the following option/s are correct :

(1) $\left|\frac{d\vec{v}}{dt}\right|$ = magnitude of instantaneous acceleration

(2) $\left|\frac{d\vec{r}}{dt}\right|$ =magnitude of instantaneous velocity

(1) $\frac{d|\vec{v}|}{dt}$ = magnitude of instantaneous speed

(4) average speed is always greater than zero

C-3. Which is/are correct ?

(1) If velocity of a body changes it must have some acceleration

(2) If speed of a body changes it must have some acceleration

(3) If body has acceleration its speed must change

(4) If body has acceleration its velocity must change

C-4. A particle is moving along x-axis such that its position is given by $x = 4 - 9t + \frac{t^3}{3}$ where t is time in seconds, x is in meters. Mark the correct statement(s) :

(1) Direction of motion is not changing at any of the instants

(2) Direction of the motion is changing at t = 3 seconds

(3) For $0 < t < 3$ sec. the particle slowing down

(4) For $3 < t < 6$ sec. the particle is speeding up

C-5. A particle moves along a straight line and its velocity depends on time 't' as $v = 4t - t^2$. Here v is in m/sec. and t is in second. Then for the first 5 seconds :

(1) Magnitude of average velocity is $\frac{5}{3}$ m/s

(2) Average speed is $\frac{13}{5}$ m/s

(3) Average speed is $\frac{11}{5}$ m/s

(4) Average acceleration is $-1 m/s^2$