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CLASS 11 PHYSICS · NCERT CHAPTER 2 · IMU CET PRACTICE

Motion in a Straight Line

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Questions: 47 MCQs

Each question has exactly one correct option. Attempt all questions first, then check the Answer Key and Solutions at the end.

- 1 A particle moves along a circle of radius R and completes half a revolution. The ratio of distance to magnitude of displacement is
(A) $\pi/2$ (B) 1
(C) $2/\pi$ (D) π
- 2 A car travels the first half of a distance at 40 km/h and the second half at 60 km/h. Its average speed is
(A) 48 km/h (B) 45 km/h
(C) 50 km/h (D) 52 km/h
- 3 A car moves for the first half of the time at 40 km/h and the second half of the time at 60 km/h. Its average speed is
(A) 52 km/h (B) 24 km/h
(C) 50 km/h (D) 48 km/h
- 4 The slope of a position–time graph gives
(A) jerk (B) displacement
(C) acceleration (D) velocity
- 5 The area under a velocity–time graph gives
(A) jerk (B) displacement
(C) velocity (D) acceleration
- 6 A body starts from rest with uniform acceleration 2 m/s^2 . The distance covered in the 5th second is
(A) 25 m (B) 16 m
(C) 9 m (D) 10 m
- 7 A ball is thrown vertically upward with speed 20 m/s. The maximum height reached is ($g = 10 \text{ m/s}^2$)
(A) 40 m (B) 10 m
(C) 30 m (D) 20 m



- 8 A ball is thrown upward with 30 m/s. The total time of flight before it returns to the hand is ($g = 10 \text{ m/s}^2$)
(A) 3 s (B) 6 s
(C) 4.5 s (D) 9 s
- 9 A stone is dropped from a height of 80 m. The time taken to reach the ground is ($g = 10 \text{ m/s}^2$)
(A) 2 s (B) 16 s
(C) 8 s (D) 4 s
- 10 A body dropped from a height h acquires speed v on reaching the ground. Its speed at height $h/2$ from the ground is
(A) $v/\sqrt{2}$ (B) $\sqrt{2} v$
(C) $v/2$ (D) $v/4$
- 11 A car moving at 72 km/h is brought to rest by applying brakes in a distance of 40 m. The retardation is
(A) 2.5 m/s^2 (B) 10 m/s^2
(C) 5 m/s^2 (D) 4 m/s^2
- 12 If the speed of a vehicle is doubled, its stopping distance for the same retardation becomes
(A) unchanged (B) double
(C) half (D) four times
- 13 The position of a particle is $x = 4t^3 - 3t^2 + 2$ (SI). Its acceleration at $t = 2$ s is
(A) 42 m/s^2 (B) 30 m/s^2
(C) 36 m/s^2 (D) 48 m/s^2
- 14 The position of a particle is $x = 6t - t^2$. The particle comes to rest momentarily at $t =$
(A) 1 s (B) 2 s
(C) 6 s (D) 3 s
- 15 For the particle with $x = 6t - t^2$ (SI), the distance travelled in the first 4 s is
(A) 16 m (B) 10 m
(C) 8 m (D) 9 m
- 16 Two trains, each 100 m long, move in opposite directions on parallel tracks at 36 km/h and 54 km/h. The time taken to cross each other is
(A) 4 s (B) 8 s
(C) 16 s (D) 20 s
- 17 Two cars move in the same direction at 60 km/h and 40 km/h. The relative velocity of the faster car with respect to the slower one is
(A) 20 km/h (B) 100 km/h
(C) 50 km/h (D) 2400 km/h
- 18 A body moving with uniform acceleration has velocities 10 m/s and 20 m/s at two points. Its velocity at the midpoint between them is
(A) 17.3 m/s (B) 15 m/s
(C) 14.1 m/s (D) 15.8 m/s



- 19 A particle starting from rest moves with uniform acceleration. The ratio of distances covered in the 1st, 2nd and 3rd seconds is
(A) 1 : 4 : 9 (B) 1 : 2 : 3
(C) 1 : 3 : 5 (D) 1 : 1 : 1
- 20 A particle starting from rest with constant acceleration covers distances in the first 2 s and next 2 s in the ratio
(A) 2 : 3 (B) 1 : 3
(C) 1 : 2 (D) 1 : 4
- 21 Which of the following situations is NOT possible?
(A) A body having zero velocity but non-zero acceleration
(B) A body having zero speed but non-zero velocity
(C) A body having non-zero velocity but zero acceleration
(D) A body having constant speed but variable velocity
- 22 The velocity–time graph of a body moving with uniform acceleration is
(A) a straight line parallel to the time axis
(B) a parabola
(C) a hyperbola
(D) a straight line inclined to the time axis
- 23 The position–time graph of a body moving with uniform acceleration from rest is
(A) a straight line through origin (B) a circle
(C) a straight line parallel to time axis (D) a parabola
- 24 A ball is dropped from a tall building. One second later another ball is thrown downward from the same point with 15 m/s. The second ball catches the first after the first has been falling for ($g = 10 \text{ m/s}^2$)
(A) 3 s (B) 2 s
(C) 1.5 s (D) 2.5 s
- 25 A stone is thrown vertically upward from the top of a 25 m tall tower with speed 20 m/s. The time taken to reach the ground is ($g = 10 \text{ m/s}^2$)
(A) 5 s (B) 2 s
(C) 4 s (D) 6 s
- 26 The velocity of a particle is $v = 3t^2 + 2t$ (SI). The displacement during the first 2 s is
(A) 8 m (B) 14 m
(C) 12 m (D) 16 m
- 27 The acceleration of a particle is $a = 6t$ (SI). If it starts from rest at the origin, its velocity at $t = 2$ s is
(A) 12 m/s (B) 24 m/s
(C) 8 m/s (D) 6 m/s
- 28 Which quantity remains constant for a freely falling body (neglecting air resistance)?
(A) Momentum (B) Velocity
(C) Acceleration (D) Kinetic energy



- 29 A body thrown vertically upward has, at the highest point,
(A) zero velocity and acceleration g downward
(B) zero velocity and acceleration g upward
(C) maximum velocity and zero acceleration
(D) zero velocity and zero acceleration
- 30 A particle moves 3 m north and then 4 m east. The magnitude of its displacement is
(A) 1 m (B) 12 m
(C) 7 m (D) 5 m
- 31 If a body covers equal distances in equal intervals of time, it is said to be in
(A) non-uniform motion (B) uniform motion
(C) circular motion only (D) uniformly accelerated motion
- 32 The displacement of a particle is $x = (t - 2)^2$ (SI). The distance travelled in the first 4 s is
(A) 0 m (B) 8 m
(C) 16 m (D) 4 m
- 33 A particle moves with velocity $v = 2x$ (SI), where x is position. Its acceleration at $x = 3$ m is
(A) 6 m/s^2 (B) 18 m/s^2
(C) 12 m/s^2 (D) 2 m/s^2
- 34 A body starts from rest and travels 120 m in 8 s with uniform acceleration. Its acceleration is
(A) 1.875 m/s^2 (B) 7.5 m/s^2
(C) 3.75 m/s^2 (D) 15 m/s^2
- 35 A ball dropped from rest falls 45 m. The distance it falls in the last second of its motion is ($g = 10 \text{ m/s}^2$)
(A) 20 m (B) 25 m
(C) 15 m (D) 30 m
- 36 The numerical ratio of displacement to distance for a moving body is
(A) always < 1 (B) always equal to 1
(C) always > 1 (D) always ≤ 1
- 37 The instantaneous velocity of a body is the slope of the
(A) chord of the x - t graph
(B) tangent to the x - t graph at that instant
(C) area under v - t graph
(D) tangent to the v - t graph
- 38 A bus accelerates uniformly from 5 m/s to 25 m/s in 10 s. The distance covered is
(A) 200 m (B) 150 m
(C) 250 m (D) 300 m
- 39 Two bodies are dropped from heights h and $4h$. The ratio of their times of fall is
(A) 1 : 4 (B) 1 : 16
(C) 1 : 2 (D) 2 : 1



- 40** A body moving with uniform retardation covers 3 km before its speed is reduced to half of its initial value. It will cover a further distance of ___ before coming to rest.
- (A) 1 km (B) 3 km
(C) 2 km (D) 1.5 km
-
- 41** A person walks 10 m east in 5 s and then 10 m west in 5 s. His average velocity for the whole journey is
- (A) zero (B) 2 m/s
(C) 4 m/s (D) 1 m/s
-
- 42** A stone thrown up passes a point 15 m above the ground twice, with a time interval of 2 s. The initial speed of the stone from the ground is ($g = 10 \text{ m/s}^2$)
- (A) 10 m/s (B) 15 m/s
(C) 20 m/s (D) 25 m/s
-
- 43** A particle moving in a straight line has acceleration directed opposite to its velocity. Then the particle is
- (A) slowing down (B) at rest
(C) moving with constant speed (D) speeding up
-
- 44** The velocity of a body changes from 20 m/s to 10 m/s while covering 50 m with uniform retardation. The retardation is
- (A) 2 m/s^2 (B) 4 m/s^2
(C) 3 m/s^2 (D) 6 m/s^2
-
- 45** A particle moves with constant velocity. Its x - t graph is
- (A) a parabola (B) a horizontal line only
(C) a curve with increasing slope (D) a straight line with constant slope
-
- 46** Which graph cannot represent a real motion?
- (A) Position-time graph showing two positions at the same instant
(B) Position-time graph with zero slope
(C) Velocity-time graph crossing the time axis
(D) Velocity-time graph with a negative slope
-
- 47** A ball is dropped from 20 m and another is thrown upward from the ground with 20 m/s at the same instant along the same vertical line. They meet after ($g = 10 \text{ m/s}^2$)
- (A) 2 s (B) 0.5 s
(C) 1 s (D) 1.5 s
-

Answer Key

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

Hints & Solutions

- (A) Distance = πR , displacement = $2R$. Ratio = $\pi R/2R = \pi/2$.
- (A) For equal distances, $v_{avg} = 2v_1v_2/(v_1 + v_2) = 2 \times 40 \times 60/100 = 48$ km/h.
- (C) For equal time intervals, $v_{avg} = (v_1 + v_2)/2 = 50$ km/h.
- (D) $v = dx/dt$, the slope of the x - t graph.
- (B) Displacement = $\int v dt$ = area under the v - t curve.
- (C) $s_n = u + (a/2)(2n - 1) = 0 + 1 \times 9 = 9$ m.
- (D) $H = u^2/2g = 400/20 = 20$ m.
- (B) $T = 2u/g = 60/10 = 6$ s.
- (D) $h = \frac{1}{2}gt^2 \rightarrow 80 = 5t^2 \rightarrow t = 4$ s.
- (A) $v^2 = 2gh$. After falling $h/2$, $v'^2 = 2g(h/2) = v^2/2 \rightarrow v' = v/\sqrt{2}$.
- (C) $u = 20$ m/s. $0 = u^2 - 2as \rightarrow a = 400/80 = 5$ m/s².
- (D) $s = u^2/2a$, so $s \propto u^2$. Doubling u makes s four times.
- (A) $v = 12t^2 - 6t$; $a = 24t - 6 = 48 - 6 = 42$ m/s².
- (D) $v = 6 - 2t = 0 \rightarrow t = 3$ s.
- (B) It moves forward till $t = 3$ s: $x(3) = 9$ m. Then back: $x(4) = 8$ m. Distance = $9 + 1 = 10$ m.
- (B) Relative speed = $10 + 15 = 25$ m/s; distance = 200 m. $t = 200/25 = 8$ s.
- (A) $v_{rel} = 60 - 40 = 20$ km/h in the direction of motion.
- (D) $v_{mid} = \sqrt{(u^2 + v^2)/2} = \sqrt{(100 + 400)/2} = \sqrt{250} \approx 15.8$ m/s.
- (C) $s_n \propto (2n - 1) \rightarrow 1 : 3 : 5$ (Galileo's law of odd numbers).
- (B) $s(2) \propto 4$, $s(4) \propto 16 \rightarrow$ next 2 s $\propto 12$. Ratio $4 : 12 = 1 : 3$.
- (B) Speed is the magnitude of velocity; if speed is zero, velocity must be zero.
- (D) $v = u + at$ is linear in t , giving an inclined straight line of slope a .
- (D) $x = \frac{1}{2}at^2$ is quadratic in t , giving a parabola.



24. (B) Let first ball fall t s: $5t^2 = 15(t - 1) + 5(t - 1)^2 \rightarrow 5t^2 = 15t - 15 + 5t^2 - 10t + 5 \rightarrow 0 = 5t - 10 \rightarrow t = 2$ s.
25. (A) Taking up positive: $-25 = 20t - 5t^2 \rightarrow t^2 - 4t - 5 = 0 \rightarrow t = 5$ s.
26. (C) $x = \int_0^2 (3t^2 + 2t) dt = [t^3 + t^2]_0^2 = 8 + 4 = 12$ m.
27. (A) $v = \int 6t dt = 3t^2 \rightarrow$ at $t = 2$ s, $v = 12$ m/s.
28. (C) A freely falling body has constant acceleration g ; velocity, momentum and KE all increase.
29. (A) At the top the velocity is zero, but gravity still acts, so $a = g$ downward.
30. (D) Displacement $= \sqrt{3^2 + 4^2} = 5$ m.
31. (B) Equal distances in equal time intervals (in a straight line) define uniform motion.
32. (B) $x(0) = 4$, $x(2) = 0$, $x(4) = 4$. Distance $= 4 + 4 = 8$ m (displacement $= 0$).
33. (C) $a = v dv/dx = (2x)(2) = 4x = 12$ m/s².
34. (C) $s = \frac{1}{2}at^2 \rightarrow 120 = \frac{1}{2} \times a \times 64 \rightarrow a = 3.75$ m/s².
35. (B) $t = \sqrt{2h/g} = 3$ s. Distance in 3rd second $= (g/2)(2 \times 3 - 1) = 5 \times 5 = 25$ m.
36. (D) $|\text{Displacement}| \leq \text{distance}$, so the ratio is ≤ 1 (equal only for straight-line motion without reversal).
37. (B) $v = dx/dt$ equals the slope of the tangent to the x - t curve at that instant.
38. (B) $s = (u + v)t/2 = (5 + 25) \times 10/2 = 150$ m.
39. (C) $t = \sqrt{2h/g} \propto \sqrt{h} \rightarrow \sqrt{h} : \sqrt{4h} = 1 : 2$.
40. (A) $u^2 - u^2/4 = 2a(3) \rightarrow 3u^2/4 = 6a$. Then $(u/2)^2 = 2as' \rightarrow u^2/4 = 2as' \rightarrow s' = (u^2/4)/(2a) = (6a/3)/(2a) = 1$ km.
41. (A) Net displacement is zero, so average velocity $= 0$ (average speed $= 2$ m/s).
42. (C) At 15 m the speed v satisfies $2v/g = 2$ s $\rightarrow v = 10$ m/s. $u^2 = v^2 + 2gh = 100 + 300 = 400 \rightarrow u = 20$ m/s.
43. (A) When a and v are antiparallel, the speed decreases (retardation).
44. (C) $v^2 = u^2 - 2as \rightarrow 100 = 400 - 100a \rightarrow a = 3$ m/s².
45. (D) $x = x_0 + vt$, linear in t with slope v .
46. (A) A body cannot be at two places at the same instant, so an x - t curve with two x -values for one t is impossible.
47. (C) Relative acceleration is zero; relative speed 20 m/s covers the 20 m gap in $t = 20/20 = 1$ s.

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