Ordinary Thinking

Objective Questions

Distance and Displacement

1. A Body moves 6 m north. 8 m east and 10m vertically upwards, what is its resultant displacement from initial position

(a) $10\sqrt{2}m$ (b) $10m$

(c) $\frac{10}{\sqrt{2}}m$ (d) $10\times 2m$

2. A man goes 10m towards North, then 20m towards east then displacement is

[KCET 1999; JIPMER 1999; AFMC 2003]

(a) 22.5m (b) 25m

(c) 25.5m (d) 30m

3. A person moves 30 m north and then 20 m towards east and finally $30\sqrt{2}$ m in south-west direction. The displacement of the person from the origin will be

[J & K CET 2004]

(a) 10 m along north (b) 10 m long south

(c) 10 m along west (d) Zero

4. An aeroplane flies 400 m north and 300 m south and then flies 1200 m upwards then net displacement is

[AFMC 2004]

(a) 1200 m (b) 1300 m

(c) 1400 m (d) 1500 m

5. An athlete completes one round of a circular track of radius R in 40 sec. What will be his displacement at the end of 2 min. 20 sec **[NCERT 1990; Kerala PMT 2004]**

(a) Zero (b) $2R$

(c) $2\pi R$ (d) $7\pi R$

6. A wheel of radius 1 meter 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

[BCECE 2005]

(a) 2π (b) $\sqrt{2}\pi$

(c) $\sqrt{\pi^2+4}$ (d) π

Uniform Motion

1. A person travels along a straight road for half the distance with velocity v_1 and the remaining half distance with velocity v_2 The average velocity is given by **[MP PMT 2001]**

(a) v_1v_2 (b) $\frac{v_2^2}{v_1^2}$

(c) $\frac{v_1+v_2}{2}$ **[DCE 2000]** (d) $\frac{2v_1v_2}{v_1+v_2}$

2. The displacement-time graph for two particles A and B are straight lines inclined at angles of 30^o and 60^o with the time axis. The ratio of velocities of $V_A : V_B$ is

[CPMT 1990; MP PET 1999; MP PET 2001; Pb. PET 2003]

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

(c) $\sqrt{3}:1$ (d) $1:3$

3. A car travels from A to B at a speed of 20 km/hr and returns at a speed of 30 km/hr. The average speed of the car for the whole journey is **[MP PET 1985]**

(a) 25 km/hr (b) 24 km/hr

(c) 50 km/hr (d) 5 km/hr

4. A boy walks to his school at a distance of 6 km with constant speed of 2.5 $km/hour$ and walks back with a constant speed of 4 km/hr. His average speed for round trip expressed in $km/hour$, is **[AIIMS 1995]**

(a) 24/13 (b) 40/13

(c) 3 (d) 1/2

5. A car travels the first half of a distance between two places at a speed of 30 km/hr and the second half of the distance at 50 km/hr. The average speed of the car for the whole journey is **[Manipal MEE 1995; AFMC 1998]**

(a) 42.5 km/hr (b) 40.0 km/hr

(c) 37.5 km/hr (d) 35.0 km/hr

6. One car moving on a straight road covers one third of the distance with 20 km/hr and the rest with 60 km/hr. The average speed is **[MP PMT 1999; CPMT 2002]**

(a) 40 km/hr (b) 80 km/hr

(c) $46\frac{2}{3}$ *km/hr* (d) 36 *km/hr*

7. A car moves for half of its time at 80 *km/h* and for rest half of time at 40 *km/h*. Total distance covered is 60 *km*. What is the average speed of the car [RPET 1996]

(a) 60 *km/h* (b) 80 *km/h*

(c) 120 *km/h* (d) 180 *km/h*

8. A train has a speed of 60 *km/h*. for the first one hour and 40 *km/h* for the next half hour. Its average speed in *km/h* is [JIPMER 1999]

(a) 50 (b) 53.33

(c) 48 (d) 70

9. Which of the following is a one dimensional motion [BHU 2000; CBSE PMT 2001]

(a) Landing of an aircraft

(b) Earth revolving a round the sun

(c) Motion of wheels of a moving trains

(d) Train running on a straight track

10. A 150 *m* long train is moving with a uniform velocity of 45 *km/h*. The time taken by the train to cross a bridge of length 850 meters is

(a) 56 *sec* (b) 68 *sec*

(c) 80 *sec* (d) 92 *sec*

11. 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 [CBSE PMT 2000; AFMC 2001]

(a) Displacement of the particle is zero

(b) Average speed of the particle is 3 *m/s*

(c) Displacement of the particle is 30 *m*

(d) Both (a) and (b)

12. A particle moves along a semicircle of radius 10*m* in 5 seconds. The average velocity of the particle is [Kerala (Engg.) 2001]

(a) $2\pi\ ms^{-1}$ (b) $4\pi\ ms^{-1}$

(c) $2\ ms^{-1}$ (d) $4\ ms^{-1}$

13. A man walks on a straight road from his home to a market 2.5 *km* away with a speed of 5 *km/h*. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 *km/h*. The average speed of the man over the interval of time 0 to 40 *min*. is equal to

(a) 5 *km/h* (b) $\frac{25}{4}$ *km/h*

(c) $\frac{30}{4}$ *km/h* (d) $\frac{45}{8}$ *km/h*

14. The ratio of the numerical values of the average velocity and average speed of a body is always

(a) Unity (b) Unity or less

(c) Unity or more (d) Less than unity

15. A person travels along a straight road for the first half time with a velocity v_1 and the next half time with a velocity v_2 . The mean velocity V of the man is [RPET 1999; BHU 2002]

(a) $\frac{2}{V}=\frac{1}{v_1}+\frac{1}{v_2}$ [CBSE PMT 2001] (b) $V=\frac{v_1+v_2}{2}$

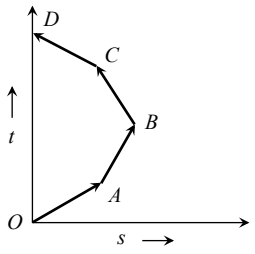
(c) $V=\sqrt{v_1 v_2}$ (d) $V=\sqrt{\frac{v_1}{v_2}}$

16. 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 [MP PMT 2003]

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

(c) $\frac{2v_1 v_2}{v_1+v_2}$ (d) $\frac{5v_1 v_2}{3v_1+2v_2}$

17. Which of the following options is correct for the object having a straight line motion represented by the following graph [DCE 2004]



(a) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.

(b) Velocity of the object increases uniformly

(c) Average velocity is zero

(d) The graph shown is impossible

18. The numerical ratio of displacement to the distance covered is always **[BHU 2004]**

(a) Less than one

(b) Equal to one

(c) Equal to or less than one

(d) Equal to or greater than one

19. A 100 m long train is moving with a uniform velocity of 45 *km/hr*. The time taken by the train to cross a bridge of length 1 *km* is **[BHU 2004]**

(a) 58 s (b) 68 s

(c) 78 s (d) 88 s

20. A particle moves for 20 *seconds* with velocity 3 *m/s* and then velocity 4 *m/s* for another 20 *seconds* and finally moves with velocity 5 *m/s* for next 20 *seconds*. What is the average velocity of the particle **[MH CET 2004]**

(a) 3 *m/s* (b) 4 *m/s*

(c) 5 *m/s* (d) Zero

21. The correct statement from the following is **[MP PET 1993]**

(a) A body having zero velocity will not necessarily have zero acceleration

(b) A body having zero velocity will necessarily have zero acceleration

(c) A body having uniform speed can have only uniform acceleration

(d) A body having non-uniform velocity will have zero acceleration

22. A bullet fired into a fixed target loses half of its velocity after penetrating 3 *cm*. How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion? **[AIEEE 2005]**

(a) 1.5 *cm* (b) 1.0 *cm*

(c) 3.0 *cm* (d) 2.0 *cm*

23. Two boys are standing at the ends A and B of a ground where $AB = a$. The boy at B starts running in a direction perpendicular to AB with velocity v_1. The boy at A starts running simultaneously with velocity v and catches the other boy in a time t, where t is **[CBSE PMT 2005]**

(a) $a/\sqrt{v^2 + v_1^2}$ (b) $\sqrt{a^2/(v^2 - v_1^2)}$

(c) $a/(v - v_1)$ (d) $a/(v + v_1)$

24. A car travels half the distance with constant velocity of 40 *kmph* and the remaining half with a constant velocity of 60 *kmph.* The average velocity of the car in *kmph* is **[Kerala PMT 2005]**

(a) 40 (b) 45

(c) 48 (d) 50

Non-uniform Motion

1. A particle experiences a constant acceleration for 20 sec after starting from rest. If it travels a distance S_1 in the first 10 sec and a distance S_2 in the next 10 sec, then **[NCERT 1972; CPMT 1997; MP PMT 2002]**

(a) $S_1 = S_2$ (b) $S_1 = S_2/3$

(c) $S_1 = S_2/2$ (d) $S_1 = S_2/4$

2. The displacement x of a particle along a straight line at time t is given by $x = a_0 + a_1 t + a_2 t^2$. The acceleration of the particle is **[NCERT 1974; RPMT 1999; AFMC 1999]**

(a) a_0 (b) a_1

(c) $2a_2$ (d) a_2

3. The coordinates of a moving particle at any time are given by $x = at^2$ and $y = bt^2$. The speed of the particle at any moment is **[DPMT 1984; CPMT 1997]**

(a) $2t(a + b)$ (b) $2t\sqrt{(a^2 - b^2)}$

(c) $t\sqrt{a^2 + b^2}$ (d) $2t\sqrt{(a^2 + b^2)}$

4. An electron starting from rest has a velocity that increases linearly with the time that is

$v = kt$, where $k = 2m/\sec^2$. The distance travelled in the first 3 seconds will be

[NCERT 1982]

(a) 9 m (b) 16 m

(c) 27 m (d) 36 m

5. The displacement of a body is given to be proportional to the cube of time elapsed. The magnitude of the acceleration of the body is

[NCERT 1990]

(a) Increasing with time (b)Decreasing with time

(c) Constant but not zero (d) Zero

6. The instantaneous velocity of a body can be measured

(a) Graphically (b) Vectorially

(c) By speedometer (d) None of these

7. A body is moving from rest under constant acceleration and let S_1 be the displacement in the first $(p-1)$ sec and S_2 be the displacement in the first $p$sec. The displacement in $(p^2 - p + 1)^{th}$ sec. will be

(a) $S_1 + S_2$ (b) $S_1 S_2$

(c) $S_1 - S_2$ (d) S_1 / S_2

8. A body under the action of several forces will have zero acceleration

(a) When the body is very light

(b) When the body is very heavy

(c) When the body is a point body

(d) When the vector sum of all the forces acting on it is zero

9. A body starts from the origin and moves along the X-axis such that the velocity at any instant is given by $(4t^3 - 2t)$, where t is in sec and velocity in m/s. What is the acceleration of the particle, when it is 2 m from the origin

(a) 28 m/s^2 (b) 22 m/s^2

(c) 12 m/s^2 (d) 10 m/s^2

10. The relation between time and distance is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is

[NCERT 1982; AIEEE 2005]

(a) $2\alpha v^3$ (b) $2\beta v^3$

(c) $2\alpha\beta v^3$ (d) $2\beta^2 v^3$

11. A point moves with uniform acceleration and v_1, v_2 and v_3 denote the average velocities in the three successive intervals of time t_1, t_2 and t_3. Which of the following relations is correct

[NCERT 1982]

(a) $(v_1 - v_2):(v_2 - v_3) = (t_1 - t_2):(t_2 + t_3)$

(b) $(v_1 - v_2):(v_2 - v_3) = (t_1 + t_2):(t_2 + t_3)$

(c) $(v_1 - v_2):(v_2 - v_3) = (t_1 - t_2):(t_1 - t_3)$

(d) $(v_1 - v_2):(v_2 - v_3) = (t_1 - t_2):(t_2 - t_3)$

12. The acceleration of a moving body can be found from

[DPMT 1981]

(a) Area under velocity-time graph

(b) Area under distance-time graph

(c) Slope of the velocity-time graph

(d) Slope of distance-time graph

13. The initial velocity of a particle is u (at $t = 0$) and the acceleration f is given by at. Which of the following relation is valid

[CPMT 1981; BHU 1995]

(a) $v = u + at^2$ (b) $v = u + a\frac{t^2}{2}$

(c) $v = u + at$ (d) $v = u$

14. The initial velocity of the particle is $10\ m/\sec$ and its retardation is $2m/\sec^2$. The distance moved by the particle in $5th$ second of its motion is

[CPMT 1976]

(a) 1 m (b) 19 m

(c) 50 m (d) 75 m

15. A motor car moving with a uniform speed of $20\ m/\sec$ comes to stop on the application of brakes after travelling a distance of $10\ m$ Its acceleration is

[EAMCET 1979]

(a) $20\ m/\sec^2$ (b) $-20 m/\sec^2$

(c) $-40\ m/\sec^2$ (d) $+2 m/\sec^2$

16. The velocity of a body moving with a uniform acceleration of $2\ m./\sec^2$ is $10\ m/\sec$. Its velocity after an interval of 4 *sec* is

[EAMCET 1979]

(a) 12 $m/\sec$ (b) 14 $m/\sec$

(c) 16 $m/\sec$ (d) 18 $m/\sec$

17. A particle starting from rest travels a distance x in first 2 *seconds* and a distance y in next two *seconds*, then **[EAMCET 1982]**

(a) $y = x$ (b) $y = 2x$

(c) $y = 3x$ (d) $y = 4x$

18. The initial velocity of a body moving along a straight line is 7 m/s. It has a uniform acceleration of $4\,m/s^2$. The distance covered by the body in the 5^{th} second of its motion is **[MP PMT 1994]**

(a) 25 *m* (b) 35 *m*

(c) 50 *m* (d) 85 *m*

19. The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body is undergoing **[MNR 1995; UPSEAT 2000]**

(a) Uniform acceleration

(b) Uniform retardation

(c) Non-uniform acceleration

(d) Zero acceleration

20. Which of the following four statements is false **[Manipal MEE 1995]**

(a) A body can have zero velocity and still be accelerated

(b) A body can have a constant velocity and still have a varying speed

(c) A body can have a constant speed and still have a varying velocity

(d) The direction of the velocity of a body can change when its acceleration is constant

21. A particle moving with a uniform acceleration travels 24 *m* and 64 *m* in the first two consecutive intervals of 4 *sec* each. Its initial velocity is **[MP PET 1995]**

(a) 1 *m/sec* (b) $10\,m/\sec$

(c) 5 *m/sec* (d) 2 *m/sec*

22. The position of a particle moving in the *xy*-plane at any time t is given by $x = (3t^2 - 6t)$ *metres*, $y = (t^2 - 2t)$ *metres*. Select the correct statement about the moving particle from the following **[MP PMT 1995]**

(a) The acceleration of the particle is zero at $t = 0$ second

(b) The velocity of the particle is zero at $t = 0$ second

(c) The velocity of the particle is zero at $t = 1$ second

(d) The velocity and acceleration of the particle are never zero

23. If body having initial velocity zero is moving with uniform acceleration $8\,m/\sec^2$ the distance travelled by it in fifth second will be **[MP PMT 1996; DPMT 2001]**

(a) 36 *metres* (b) 40 *metres*

(c) 100 *metres* (d) Zero

24. An alpha particle enters a hollow tube of 4 *m* length with an initial speed of 1 *km/s*. It is accelerated in the tube and comes out of it with a speed of 9 *km/s*. The time for which it remains inside the tube is

(a) $8 \times 10^{-3}\,s$ (b) $80 \times 10^{-3}\,s$

(c) $800 \times 10^{-3}\,s$ (d) $8 \times 10^{-4}\,s$

25. Two cars A and B are travelling in the same direction with velocities v_1 and $v_2\ (v_1 > v_2)$. When the car A is at a distance d ahead of the car B, the driver of the car A applied the brake producing a uniform retardation a There will be no collision when **[Pb. PET 2004]**

(a) $d < \frac{(v_1 - v_2)^2}{2a}$ (b) $d < \frac{v_1^2 - v_2^2}{2a}$

(c) $d > \frac{(v_1 - v_2)^2}{2a}$ (d) $d > \frac{v_1^2 - v_2^2}{2a}$

26. A body of mass 10 *kg* is moving with a constant velocity of 10 *m/s*. When a constant force acts for 4 *seconds* on it, it moves with a velocity 2 *m/sec* in the opposite direction. The acceleration produced in it is **[MP PET 1997]**

(a) $3\,m/\sec^2$ (b) $-3\,m/\sec^2$

(c) $0.3\,m/\sec^2$ (d) $-0.3\,m/\sec^2$

27. A body starts from rest from the origin with an acceleration of $6\,m/s^2$ along the *x*-axis and

$8\ m/s^2$ along the y-axis. Its distance from the origin after 4 seconds will be

[MP PMT 1999]

(a) 56 m (b) 64 m

(c) 80 m (d) 128 m

28. A car moving with a velocity of 10 *m/s* can be stopped by the application of a constant force F in a distance of 20 m. If the velocity of the car is 30 *m/s*, it can be stopped by this force in

[MP PMT 1999]

(a) $\frac{20}{3}m$ (b) 20 m

(c) 60 m (d) 180 m

29. The displacement of a particle is given by $y = a + bt + ct^2 - dt^4$. The initial velocity and acceleration are respectively [CPMT 1999, 2003]

(a) $b, -4d$ (b) $-b, 2c$

(c) $b, 2c$ (d) $2c, -4d$

30. 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

[CBSE PMT 1998,1999; AFMC 2000; JIPMER 2001, 02]

(a) 8 m (b) 2 m

(c) 4 m (d) 6 m

31. An elevator car, whose floor to ceiling distance is equal to 2.7 m, starts ascending with constant acceleration of 1.2 ms^{-2}. 2 *sec* after the start, a bolt begins fallings from the ceiling of the car. The free fall time of the bolt is [KCET 1994]

(a) $\sqrt{0.54}\ s$ (b) $\sqrt{6}\ s$

(c) 0.7 s (d) 1 s

32. The displacement is given by $x = 2t^2 + t + 5$, the acceleration at $t = 2s$ is [EAMCET (Engg.) 1995]

(a) $4\ m/s^2$ (b) $8\ m/s^2$

(c) $10\ m/s^2$ (d) $15\ m/s^2$

33. Two trains travelling on the same track are approaching each other with equal speeds of 40 *m*/*s*. The drivers of the trains begin to decelerate simultaneously when they are just 2.0 *km* apart. Assuming the decelerations to be uniform and equal, the value of the deceleration to barely avoid collision should be

[AMU 1995]

(a) 11.8 m/s^2 (b) 11.0 m/s^2

(c) 2.1 m/s^2 (d) 0.8 m/s^2

34. A body moves from rest with a constant acceleration of $5\ m/s^2$. Its instantaneous speed (in m/s) at the end of 10 *sec* is

[SCRA 1994]

(a) 50 (b) 5

(c) 2 (d) 0.5

35. A boggy of uniformly moving train is suddenly detached from train and stops after covering some distance. The distance covered by the boggy and distance covered by the train in the same time has relation [RPET 1997]

(a) Both will be equal

(b) First will be half of second

(c) First will be 1/4 of second

(d) No definite ratio

36. A body starts from rest. What is the ratio of the distance travelled by the body during the 4th and 3rd second

[CBSE PMT 1993]

(a) $\frac{7}{5}$ (b) $\frac{5}{7}$

(c) $\frac{7}{3}$ (d) $\frac{3}{7}$

37. The acceleration 'a in m/s^2 of a particle is given by $a = 3t^2 + 2t + 2$ where t is the time. If the particle starts out with a velocity $u = 2m/s$ at $t = 0$, then the velocity at the end of 2 *second* is [MNR 1994; SCRA 1994]

(a) 12 *m/s* (b) 18 *m/s*

(c) 27 *m/s* (d) 36 *m/s*

38. A particle moves along a straight line such that its displacement at any time t is given by

$S = t^3 - 6t^2 + 3t + 4$ *metres*

The velocity when the acceleration is zero is

[CBSE PMT 1994; JIPMER 2001, 02]

(a) $3ms^{-1}$ (b) $-12ms^{-1}$

(c) $42\ ms^{-1}$ (d) $-9\ ms^{-1}$

39. For a moving body at any instant of time [NTSE 1995]

(a) If the body is not moving, the acceleration is necessarily zero

(b) If the body is slowing, the retardation is negative

(c) If the body is slowing, the distance is negative

(d) If displacement, velocity and acceleration at that instant are known, we can find the displacement at any given time in future

40. The x and y coordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$, where x and y are in metre and t in seconds. The acceleration of particle at $t = 5\,s$ is **[SCRA 1996]**

(a) Zero (b) $8\ m/s^2$

(c) $20\ m/s^2$ (d) $40\ m/s^2$

41. The engine of a car produces acceleration $4\ m/s^2$ in the car. If this car pulls another car of same mass, what will be the acceleration produced **[RPET 1996]**

(a) $8\ m/s^2$ (b) $2\ m/s^2$

(c) $4\ m/s^2$ (d) $\frac{1}{2}\ m/s^2$

42. If a body starts from rest and travels 120 *cm* in the 6th second, then what is the acceleration **[AFMC 1997]**

(a) $0.20\ m/s^2$ (b) $0.027\ m/s^2$

(c) $0.218\ m/s^2$ (d) $0.03\ m/s^2$

43. If a car at rest accelerates uniformly to a speed of 144 *km/h* in 20 *s*. Then it covers a distance of **[CBSE PMT 1997]**

(a) 20 *m* (b) 400 *m*

(c) 1440 *m* (d) 2880 *m*

44. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to **[CBSE PMT 1997; BHU 1999; DPMT 2000; KCET 2000]**

(a) $\frac{a}{b}$ (b) $\frac{2a}{3b}$

(c) $\frac{a}{3b}$ (d) Zero

45. A truck and a car are moving with equal velocity. On applying the brakes both will stop after certain distance, then **[CPMT 1997]**

(a) Truck will cover less distance before rest

(b) Car will cover less distance before rest

(c) Both will cover equal distance

(d) None

46. If a train travelling at 72 *kmph* is to be brought to rest in a distance of 200 metres, then its retardation should be **[SCRA 1998; MP PMT 2004]**

(a) $20\ ms^{-2}$ (b) $10\ ms^{-2}$

(c) $2\ ms^{-2}$ (d) $1\ ms^{-2}$

47. The displacement of a particle starting from rest (at $t = 0$) is given by $s = 6t^2 - t^3$. The time in seconds at which the particle will attain zero velocity again, is **[SCRA 1998]**

(a) 2 (b) 4

(c) 6 (d) 8

48. What is the relation between displacement, time and acceleration in case of a body having uniform acceleration **[DCE 1999]**

(a) $S = ut + \frac{1}{2}ft^2$ (b) $S = (u + f)\,t$

(c) $S = v^2 - 2fs$ (d) None of these

49. Two cars A and B at rest at same point initially. If A starts with uniform velocity of 40 *m/sec* and B starts in the same direction with constant acceleration of $4\ m/s^2$, then B will catch A after how much time **[RPET 1999]**

(a) 10 *sec* (b) 20 *sec*

(c) 30 *sec* (d) 35 *sec*

50. The motion of a particle is described by the equation $x = a + bt^2$ where $a = 15$ *cm* and $b = 3$ *cm*/*s*^{2}. Its instantaneous velocity at time 3 *sec* will be **[AMU (Med.) 2000]**

(a) 36 *cm/sec* (b) 18 *cm/sec*

(c) 16 *cm/sec* (d) 32 *cm/sec*

51. A body travels for 15 *sec* starting from rest with constant acceleration. If it travels distances S_1, S_2 and S_3 in the first five seconds, second five seconds and next five seconds respectively the relation between S_1, S_2 and S_3 is **[AMU (Engg.) 2000]**

(a) $S_1 = S_2 = S_3$ (b) $5S_1 = 3S_2 = S_3$

(c) $S_1 = \frac{1}{3}S_2 = \frac{1}{5}S_3$ (d) $S_1 = \frac{1}{5}S_2 = \frac{1}{3}S_3$

52. A body is moving according to the equation $x = at + bt^2 - ct^3$ where $x =$ displacement and a, b and c are constants. The acceleration of the body is **[BHU 2000]**

(a) $a + 2bt$ (b) $2b + 6ct$

(c) $2b - 6ct$ (d) $3b - 6ct^2$

53. A particle travels 10m in first 5 *sec* and 10m in next 3 *sec*. Assuming constant acceleration what is the distance travelled in next 2 *sec*

(a) 8.3 m (b) 9.3 m

(c) 10.3 m (d) None of above

54. The distance travelled by a particle is proportional to the squares of time, then the particle travels with **[RPET 1999; RPMT 2000]**

(a) Uniform acceleration (b) Uniform velocity

(c) Increasing acceleration (d) Decreasing velocity

55. Acceleration of a particle changes when **[RPMT 2000]**

(a) Direction of velocity changes

(b) Magnitude of velocity changes

(c) Both of above

(d) Speed changes

56. The motion of a particle is described by the equation $u = at$. The distance travelled by the particle in the first 4 seconds

(a) $4a$ (b) $12a$

(c) $6a$ (d) $8a$

57. The relation $3t = \sqrt{3x} + 6$ describes the displacement of a particle in one direction where x is in *metres* and t in sec. The displacement, when velocity is zero, is **[CPMT 2000]**

(a) 24 *metres* (b) 12 *metres*

(c) 5 *metres* (d) Zero

58. A constant force acts on a body of mass 0.9 kg at rest for 10s. If the body moves a distance of 250 m, the magnitude of the force is

(a) $3N$ (b) $3.5N$

(c) $4.0N$ (d) $4.5N$

59. The average velocity of a body moving with uniform acceleration travelling a distance of 3.06 m is 0.34 ms^{-1}. If the change in velocity of the body is $0.18 ms^{-1}$ during this time, its uniform acceleration is **[EAMCET (Med.) 2000]**

(a) 0.01 ms^{-2} (b) 0.02 ms^{-2}

(c) 0.03 ms^{-2} (d) 0.04 ms^{-2}

60. Equation of displacement for any particle is $s = 3t^3 + 7t^2 + 14t + 8m$. Its acceleration at time $t = 1$ sec is **[CBSE PMT 2000]**

(a) 10 m/s^2 (b) 16 m/s^2

(c) 25 m/s^2 (d) 32 m/s^2

61. The position of a particle moving along the x-axis at certain times is given below : **[RPET 2000]**

t (s)	0	1	2	3
x (m)	–2	0	6	16

Which of the following describes the motion correctly **[AMU (Engg.) 2001]**

(a) Uniform, accelerated

(b) Uniform, decelerated

(c) Non-uniform, accelerated

(d) There is not enough data for generalization

62. Consider the acceleration, velocity and displacement of a tennis ball as it falls to the ground and bounces back. Directions of which of these changes in the process **[AMU (Engg.) 2001]**

(a) Velocity only **[DCE 2000]**

(b) Displacement and velocity

(c) Acceleration, velocity and displacement

(d) Displacement and acceleration

63. The displacement of a particle, moving in a straight line, is given by $s = 2t^2 + 2t + 4$ where s is in *metres* and t in seconds. The acceleration of the particle is **[CPMT 2001]**

(a) 2 m/s^2 (b) 4 m/s^2

(c) 6 m/s^2 (d) 8 m/s^2

64. A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5th second, after the start of A, then the ratio $a_1 : a_2$ is equal to **[EAMCET (Engg.) 2000] [AIIMS 2001]**

(a) 5 : 9 (b) 5 : 7

(c) 9 : 5 (d) 9 : 7

65. The velocity of a bullet is reduced from 200m/s to 100m/s while travelling through a wooden block of thickness 10cm. The retardation, assuming it to be uniform, will be

[AIIMS 2001]

(a) 10×10^4 m/s^2 (b) 12×10^4 m/s^2

(c) 13.5×10^4 m/s^2 (d) 15×10^4 m/s^2

66. A body of 5 kg is moving with a velocity of 20 m/s. If a force of 100N is applied on it for 10s in the same direction as its velocity, what will now be the velocity of the body

[MP PMT 2000; RPET 2001]

(a) 200 m/s (b) 220 m/s

(c) 240 m/s (d) 260 m/s

67. A particle starts from rest, accelerates at 2 m/s^2 for 10s and then goes for constant speed for 30s and then decelerates at 4 m/s^2 till it stops. What is the distance travelled by it

[DCE 2001; AIIMS 2002; DCE 2003]

(a) 750 m (b) 800 m

(c) 700 m (d) 850 m

68. The engine of a motorcycle can produce a maximum acceleration 5 m/s^2. Its brakes can produce a maximum retardation 10 m/s^2. What is the minimum time in which it can cover a distance of 1.5 km [Pb. PMT 2002]

(a) 30 sec (b) 15 sec

(c) 10 sec (d) 5 sec

69. The path of a particle moving under the influence of a force fixed in magnitude and direction is

[MP PET 2002]

(a) Straight line (b) Circle

(c) Parabola (d) Ellipse

70. A car, moving with a speed of 50 km/hr, can be stopped by brakes after at least 6m. If the same car is moving at a speed of 100 km/hr, the minimum stopping distance is

[AIEEE 2003]

(a) 6m (b) 12m

(c) 18m (d) 24m

71. A student is standing at a distance of 50metres from the bus. As soon as the bus begins its motion with an acceleration of 1ms^{-2}, the student starts running towards the bus with a uniform velocity u. Assuming the motion to be along a straight road, the minimum value of u, so that the student is able to catch the bus is [KCET 2003]

(a) 5 ms^{-1} (b) 8 ms^{-1}

(c) 10 ms^{-1} (d) 12 ms^{-1}

72. A body A moves with a uniform acceleration a and zero initial velocity. Another body B, starts from the same point moves in the same direction with a constant velocity v. The two bodies meet after a time t. The value of t is

[MP PET 2003]

(a) $\frac{2v}{a}$ (b) $\frac{v}{a}$

(c) $\frac{v}{2a}$ (d) $\sqrt{\frac{v}{2a}}$

73. A particle moves along X-axis in such a way that its coordinate X varies with time t according to the equation $x=(2-5t+6t^2)m$. The initial velocity of the particle is

[MNR 1987; MP PET 1996; Pb. PET 2004]

(a) $-5\,m/s$ (b) $6\,m/s$

(c) $-3\,m/s$ (d) $3\,m/s$

74. A car starts from rest and moves with uniform acceleration a on a straight road from time $t = 0$ to $t = T$. After that, a constant deceleration brings it to rest. In this process the average speed of the car is [MP PMT 2004]

(a) $\frac{aT}{4}$ (b) $\frac{3aT}{2}$

(c) $\frac{aT}{2}$ (d) aT

75. An object accelerates from rest to a velocity 27.5 m/s in 10 sec then find distance covered by object in next 10 sec

[BCECE 2004]

(a) 550 m (b) 137.5 m

(c) 412.5 m (d) 275 m

76. If the velocity of a particle is given by $v=(180-16x)^{1/2}$ m/s, then its acceleration will be

[J & K CET 2004]

(a) Zero (b) 8 m/s^2

(c) $-8\ m/s^2$ (d) $4\ m/s^2$

77. The displacement of a particle is proportional to the cube of time elapsed. How does the acceleration of the particle depends on time obtained **[Pb. PET 2001]**

(a) $a \propto t^2$ (b) $a \propto 2t$

(c) $a \propto t^3$ (d) $a \propto t$

78. Starting from rest, acceleration of a particle is $a = 2(t-1)$. The velocity of the particle at $t = 5s$ is **[RPET 2002]**

(a) 15 *m/sec* (b) 25 *m/sec*

(c) 5 *m/sec* (d) None of these

79. A body is moving with uniform acceleration describes 40 *m* in the first 5 *sec* and 65 *m* in next 5 *sec*. Its initial velocity will be **[Pb. PET 2003]**

(a) 4 *m/s* (b) 2.5 *m/s*

(c) 5.5 *m/s* (d) 11 *m/s*

80. Speed of two identical cars are u and $4u$ at a specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is **[AIEEE 2002]**

(a) 1 : 1 (b) 1 : 4

(c) 1 : 8 (d) 1 : 16

81. The displacement x of a particle varies with time $t, x = ae^{-\alpha t} + be^{\beta t}$, where a, b, α and β are positive constants. The velocity of the particle will **[CBSE PMT 2005]**

(a) Go on decreasing with time

(b) Be independent of α and β

(c) Drop to zero when $\alpha = \beta$

(d) Go on increasing with time

82. A car, starting from rest, accelerates at the rate f through a distance S, then continues at constant speed for time t and then decelerates at the rate $\frac{f}{2}$ to come to rest. If the total distance traversed is 15 S, then **[AIEEE 2005]**

(a) $S = \frac{1}{2}ft^2$ (b) $S = \frac{1}{4}ft^2$

(c) $S = \frac{1}{72}ft^2$ (d) $S = \frac{1}{6}ft^2$

83. A man is 45 *m* behind the bus when the bus start accelerating from rest with acceleration 2.5 m/s^2. With what minimum velocity should the man start running to catch the bus ? **[J&K CET 2005]**

(a) 12 *m/s* (b) 14 *m/s*

(c) 15 *m/s* (d) 16 *m/s*

84. A particle moves along x-axis as $x = 4(t-2) + a(t-2)^2$

Which of the following is true ? **[J&K CET 2005]**

(a) The initial velocity of particle is 4

(b) The acceleration of particle is $2a$

(c) The particle is at origin at $t = 0$

(d) None of these

85. A body starting from rest moves with constant acceleration. The ratio of distance covered by the body during the 5th *sec* to that covered in 5 *sec* is **[Kerala PET 2005]**

(a) 9/25 (b) 3/5

(c) 25/9 (d) 1/25

86. What determines the nature of the path followed by the particle **[AFMC 2005]**

(a) Speed (b) Velocity

(c) Acceleration (d) None of these

Relative Motion

1. Two trains, each 50 *m* long are travelling in opposite direction with velocity 10 *m/s* and 15 *m/s*. The time of crossing is **[CPMT 1999; JIPMER 2000; RPET 2001]**

(a) $2s$ (b) $4s$

(c) $2\sqrt{3}s$ (d) $4\sqrt{3}s$

2. A 120 *m* long train is moving in a direction with speed 20 *m/s*. A train *B* moving with 30 *m/s* in the opposite direction and 130 *m* long crosses the first train in a time **[CPMT 1996; Kerala PET 2002]**

(a) $6s$ (b) 36 *s*

(c) 38 *s* (d) None of these

3. A 210 meter long train is moving due North at a of 25*m/s*. A small bird is flying due South a little above the train with speed 5*m/s*. The time taken by the bird to cross the train is **[AMU (Med.) 2001]**

(a) $6s$ (b) $7s$

(c) $9s$ (d) $10s$

4. A police jeep is chasing with, velocity of 45 *km*/*h* a thief in another jeep moving with velocity 153 *km*/*h*. Police fires a bullet with muzzle velocity of 180 *m*/*s*. The velocity it will strike the car of the thief is **[BHU 2003; CPMT 2004]**

(a) 150 *m*/*s* (b) 27 *m*/*s*

(c) 450 *m*/*s* (d) 250 *m*/*s*

5. A boat is sent across a river with a velocity of 8 *km/hr.* If the resultant velocity of boat is 10 *km/hr,* then velocity of the river is : **[Pb. PET 2004]**

(a) 10 *km/hr* (b) 8 *km/hr*

(c) 6 *km/hr* (d) 4 *km/hr*

6. A train of 150 *meter* length is going towards north direction at a speed of $10 m/\sec$. A parrot flies at the speed of $5 m/\sec$ towards south direction parallel to the railway track. The time taken by the parrot to cross the train is **[CBSE PMT 1992; BHU 1998]**

(a) 12 *sec* (b) 8 *sec*

(c) 15 *sec* (d) 10 *sec*

7. A boat is moving with velocity of $3\hat{i}+4\hat{j}$ in river and water is moving with a velocity of $-3\hat{i}-4\hat{j}$ with respect to ground. Relative velocity of boat with respect to water is : **[Pb. PET 2002]**

(a) $-6\hat{i}-8\hat{j}$ (b) $6\hat{i}+8\hat{j}$

(c) $8\hat{i}$ (d) $6\hat{i}$

8. The distance between two particles is decreasing at the rate of 6 *m/sec*. If these particles travel with same speeds and in the same direction, then the separation increase at the rate of 4 *m/sec*. The particles have speeds as **[RPET 1999]**

(a) 5 *m*/*sec* ; 1 *m*/*sec* (b) 4 *m*/*sec* ; 1 *m*/*sec*

(c) 4 *m*/*sec* ; 2 *m*/*sec* (d) 5 *m*/*sec* ; 2 *m*/*sec*

9. A boat moves with a speed of 5 *km/h* relative to water in a river flowing with a speed of 3 *km/h* and having a width of 1 *km.* The minimum time taken around a round trip is **[J&K CET 2005]**

(a) 5 min (b) 60 min

(c) 20 min (d) 30 min

10. For a body moving with relativistic speed, if the velocity is doubled, then **[Orissa JEE 2005]**

(a) Its linear momentum is doubled

(b) Its linear momentum will be less than double

(c) Its linear momentum will be more than double

(d) Its linear momentum remains unchanged

11. A river is flowing from W to E with a speed of 5 *m*/*min*. A man can swim in still water with a velocity 10 *m/min*. In which direction should the man swim so as to take the shortest possible path to go to the south. **[BHU 2005]**

(a) 30° with downstream (b) 60° with downstream

(c) 120° with downstream (d)

12. A train is moving towards east and a car is along north, both with same speed. The observed direction of car to the passenger in the train is **[J & K CET 2004]**

(a) East-north direction (b) West-north direction

(c) South-east direction (d) None of these

13. An express train is moving with a velocity v_1. Its driver finds another train is moving on the same track in the same direction with velocity v_2. To escape collision, driver applies a retardation a on the train. the minimum time of escaping collision will be **[RPET 2002]**

(a) $t=\frac{v_1-v_2}{a}$ (b) $t_1=\frac{v_1^2-v_2^2}{2}$

(c) None (d) Both

Motion Under Gravity

1. A stone falls from a balloon that is descending at a uniform rate of $12 m/s$. The displacement of the stone from the point of release after 10 *sec* is

(a) 490 *m* (b) 510 *m*

(c) 610 *m* (d) 725 *m*

2. A ball is dropped on the floor from a height of 10 m. It rebounds to a height of 2.5 m. If the ball is in contact with the floor for 0.01 *sec*, the average acceleration during contact is
[BHU 1997; CPMT 1997]
(a) 2100 $m/\sec^2$ downwards (b) 2100 $m/\sec^2$ upwards
(c) 1400 $m/\sec^2$ (d) 700 $m/\sec^2$

3. A body A is projected upwards with a velocity of 98 m/s. The second body B is projected upwards with the same initial velocity but after 4 *sec*. Both the bodies will meet after
(a) 6 sec (b) 8 sec
(c) 10 sec (d) 12 sec

4. Two bodies of different masses m_a and 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
[NCERT 1972; MP PMT 1993]
(a) $a:b$ (b) $b:a$
(c) $\sqrt{a}:\sqrt{b}$ (d) $a^2:b^2$

5. A body falls freely from rest. It covers as much distance in the last second of its motion as covered in the first three seconds. The body has fallen for a time of [MNR 1998]
(a) 3 s (b) 5 s
(c) 7 s (d) 9 s

6. A stone is dropped into water from a bridge 44.1 m above the water. Another stone is thrown vertically downward 1 *sec* later. Both strike the water simultaneously. What was the initial speed of the second stone
(a) 12.25 m/s (b) 14.75 m/s
(c) 16.23 m/s (d) 17.15 m/s

7. An iron ball and a wooden ball of the same radius are released from the same height in vacuum. They take the same time to reach the ground. The reason for this is
(a) Acceleration due to gravity in vacuum is same irrespective of the size and mass of the body
(b) Acceleration due to gravity in vacuum depends upon the mass of the body
(c) There is no acceleration due to gravity in vacuum
(d) In vacuum there is a resistance offered to the motion of the body and this resistance depends upon the mass of the body

8. A body is thrown vertically upwards. If air resistance is to be taken into account, then the time during which the body rises is
[RPET 2000; KCET 2001; DPMT 2001]
(a) Equal to the time of fall
(b) Less than the time of fall
(c) Greater than the time of fall
(d) Twice the time of fall

9. A ball P is dropped vertically and another ball Q is thrown horizontally with the same velocities from the same height and at the same time. If air resistance is neglected, then
[MNR 1986; BHU 1994]
(a) Ball P reaches the ground first
(b) Ball Q reaches the ground first
(c) Both reach the ground at the same time
(d) The respective masses of the two balls will decide the time

10. A body is released from a great height and falls freely towards the earth. Another body is released from the same height exactly one second later. The separation between the two bodies, two seconds after the release of the second body is [CPMT 1983; Kerala PMT 2002]
(a) 4.9 m (b) 9.8 m
(c) 19.6 m (d) 24.5 m

11. An object is projected upwards with a velocity of 100 m/s. It will strike the ground after (approximately)
[NCERT 1981; AFMC 1995]
(a) 10 sec (b) 20 sec
(c) 15 sec (d) 5 sec

12. A stone dropped from the top of the tower touches the ground in 4 sec. The height of the tower is about
[MP PET 1986; AFMC 1994; CPMT 1997; BHU 1998; DPMT 1999; RPET 1999; MH CET 2003]
(a) 80 m (b) 40 m

(c) 20 m (d) 160 m

13. A body is released from the top of a tower of height h. It takes t *sec* to reach the ground. Where will be the ball after time $t/2$ sec **[NCERT 1981; MP PMT 2004]**

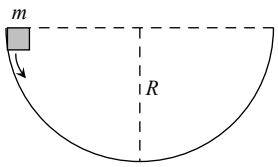
(a) At $h/2$ from the ground

(b) At $h/4$ from the ground

(c) Depends upon mass and volume of the body

(d) At $3h/4$ from the ground

14. A mass m slips along the wall of a semispherical surface of radius R. The velocity at the bottom of the surface is **[MP PMT 1993]**



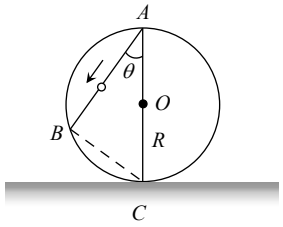
(a) $\sqrt{Rg}$

(b) $\sqrt{2Rg}$

(c) $2\sqrt{\pi Rg}$

(d) $\sqrt{\pi Rg}$

15. A frictionless wire AB is fixed on a sphere 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



(a) $\frac{2\sqrt{gR}}{g\cos\theta}$

(b) $2\sqrt{gR}.\frac{\cos\theta}{g}$

(c) $2\sqrt{\frac{R}{g}}$

(d) $\frac{gR}{\sqrt{g\cos\theta}}$

16. A body is slipping from an inclined plane of height h and length l. If the angle of inclination is θ, the time taken by the body to come from the top to the bottom of this inclined plane is

(a) $\sqrt{\frac{2h}{g}}$ (b) $\sqrt{\frac{2l}{g}}$

(c) $\frac{1}{\sin\theta}\sqrt{\frac{2h}{g}}$ (d) $\sin\theta\sqrt{\frac{2h}{g}}$

17. A particle is projected up with an initial velocity of 80 $ft/\sec$. The ball will be at a height of 96 ft from the ground after **[MP PMT 1985]**

(a) 2.0 and 3.0 *sec* (b) Only at 3.0 *sec*

(c) Only at 2.0 *sec* (d) After 1 and 2 *sec*

18. A body falls from rest, its velocity at the end of first second is $(g = 32\,ft/\sec)$ **[AFMC 1980]**

(a) 16 $ft/\sec$ (b) 32 $ft/\sec$

(c) 64 $ft/\sec$ (d) 24 $ft/\sec$

19. A stone thrown upward with a speed u from the top of the tower reaches the ground with a velocity $3u$. The height of the tower is **[EAMCET 1983; RPET 2003]**

(a) $3u^2/g$ (b) $4u^2/g$

(c) $6u^2/g$ (d) $9u^2/g$

20. Two stones of different masses are dropped simultaneously from the top of a building **[EAMCET 1978]**

(a) Smaller stone hit the ground earlier

(b) Larger stone hit the ground earlier

(c) Both stones reach the ground simultaneously

(d) Which of the stones reach the ground earlier depends on the composition of the stone

21. A body thrown with an initial speed of 96 $ft/\sec$ reaches the ground after $(g = 32\,ft/\sec^2)$ **[EAMCET 1980]**

(a) 3 *sec* (b) 6 *sec*

(c) 12 *sec* (d) 8 *sec*

22. A stone is dropped from a certain height which can reach the ground in 5 *second*. If the stone is stopped after 3 *second* of its fall and then allowed to fall again, then the time taken by the stone to reach the ground for the remaining distance is **[MNR 1985]**

(a) 2 *sec* (b) 3 *sec*

(c) 4 *sec* (d) None of these

23. A man in a balloon rising vertically with an acceleration of 4.9 $m/\sec^2$ releases a ball 2 *sec* after the balloon is let go from the ground. The greatest height above the ground reached by the ball is $(g = 9.8\,m/\sec^2)$ **[MNR 1986]**

(a) 14.7 m (b) 19.6 m

(c) 9.8 m (d) 24.5 m

24. A particle is dropped under gravity from rest from a height $h(g = 9.8\,m/\sec^2)$ and it travels a

distance $9h/25$ in the last second, the height h is [MNR 1987]

(a) 100 m (b) 122.5 m

(c) 145 m (d) 167.5 m

25. A balloon is at a height of 81 m and is ascending upwards with a velocity of 12 m/s. A body of $2kg$ weight is dropped from it. If $g = 10\,m/s^2$, the body will reach the surface of the earth in [MP PMT 1994]

(a) 1.5 s (b) 4.025 s

(c) 5.4 s (d) 6.75 s

26. An aeroplane is moving with a velocity u. It drops a packet from a height h. The time t taken by the packet in reaching the ground will be

(a) $\sqrt{\left(\frac{2g}{h}\right)}$ (b) $\sqrt{\left(\frac{2u}{g}\right)}$

(c) $\sqrt{\left(\frac{h}{2g}\right)}$ (d) $\sqrt{\left(\frac{2h}{g}\right)}$

27. Water drops fall at regular intervals from a tap which is 5 m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant [CBSE PMT 1995]

(a) 2.50 m (b) 3.75 m

(c) 4.00 m (d) 1.25 m

28. A ball is thrown vertically upwards from the top of a tower at $4.9\ ms^{-1}$. It strikes the pond near the base of the tower after 3 *seconds*. The height of the tower is [Manipal MEE 1995]

(a) 73.5 m (b) 44.1 m

(c) 29.4 m (d) None of these

29. An aeroplane is moving with horizontal velocity u at height h. The velocity of a packet dropped from it on the earth's surface will be (g is acceleration due to gravity) [MP PET 1995]

(a) $\sqrt{u^2 + 2gh}$ (b) $\sqrt{2gh}$

(c) $2gh$ (d) $\sqrt{u^2 - 2gh}$

30. A rocket is fired upward from the earth's surface such that it creates an acceleration of 19.6 m/sec^2. If after 5 *sec* its engine is switched off, the maximum height of the rocket from earth's surface would be [MP PET 1995]

(a) 245 m (b) 490 m

(c) 980 m (d) 735 m

31. A bullet is fired with a speed of $1000\ m/\sec$ in order to hit a target 100 m away. If $g = 10\ m/s^2$, the gun should be aimed [MP PET 1996]

(a) Directly towards the target

(b) 5 *cm* above the target

(c) 10 *cm* above the target

(d) 15 *cm* above the target

32. A body starts to fall freely under gravity. The distances covered by it in first, second and third *second* are in ratio [MP PET 1997; RPET 2001]

(a) $1:3:5$ (b) $1:2:3$

(c) $1:4:9$ (d) $1:5:6$

33. P, Q and R are three balloons ascending with velocities $U, 4U$ and $8U$ respectively. If stones of the same mass be dropped from each, when they are at the same height, then [ISM Dhanbad 1994]

(a) They reach the ground at the same time

(b) Stone from P reaches the ground first

(c) Stone from R reaches the ground first

(d) Stone from Q reaches the ground first

34. A body is projected up with a speed $'u$ and the time taken by it is T to reach the maximum height H. Pick out the correct statement [EAMCET (Engg.) 1995]

(a) It reaches $H/2$ in $T/2$ *sec*

(b) It acquires velocity $u/2$ in $T/2\sec$

(c) Its velocity is $u/2$ at $H/2$

(d) Same velocity at $2T$

35. A body falling for 2 seconds covers a distance S equal to that covered in next second. Taking $g = 10\ m/s^2$, $S =$

[EAMCET (Engg.) 1995]

(a) 30 *m* (b) 10 *m*
(c) 60 *m* (d) 20 *m*

36. A body dropped from a height h with an initial speed zero, strikes the ground with a velocity $3\,km/h$. Another body of same mass is dropped from the same height h with an initial speed $-u = 4\,km/h$. Find the final velocity of second body with which it strikes the ground **[CBSE PMT 1996]**

(a) 3 *km/h* (b) 4 *km/h*
(c) 5 *km/h* (d) 12 *km/h*

37. A ball of mass m_1 and another ball of mass m_2 are dropped from equal height. If time taken by the balls are t_1 and t_2 respectively, then **[BHU 1997]**

(a) $t_1 = \frac{t_2}{2}$ (b) $t_1 = t_2$

(c) $t_1 = 4t_2$ (d) $t_1 = \frac{t_2}{4}$

38. With what velocity a ball be projected vertically so that the distance covered by it in 5^{th} second is twice the distance it covers in its 6^{th} second $(g = 10\,m/s^2)$ **[CPMT 1997; MH CET 2000]**

(a) 58.8 *m/s* (b) 49 *m/s*
(c) 65 *m/s* (d) 19.6 *m/s*

39. A body sliding on a smooth inclined plane requires 4 seconds to reach the bottom starting from rest at the top. How much time does it take to cover one-fourth distance starting from rest at the top **[BHU 1998]**

(a) 1 *s* (b) 2 *s*
(c) 4 *s* (d) 16 *s*

40. A ball is dropped downwards. After 1 second another ball is dropped downwards from the same point. What is the distance between them after 3 seconds **[BHU 1998]**

(a) 25 *m* (b) 20 *m*
(c) 50 *m* (d) 9.8 *m*

41. A stone is thrown with an initial speed of 4.9 *m/s* from a bridge in vertically upward direction. It falls down in water after 2 *sec*. The height of the bridge is **[AFMC 1999; Pb. PMT 2003]**

(a) 4.9 *m* (b) 9.8 *m*
(c) 19.8 *m* (d) 24.7 *m*

42. A stone is shot straight upward with a speed of 20 *m/sec* from a tower 200 *m* high. The speed with which it strikes the ground is approximately **[AMU (Engg.) 1999]**

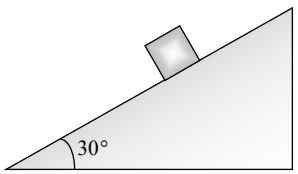
(a) 60 *m/sec* (b) 65 *m/sec*
(c) 70 *m/sec* (d) 75 *m/sec*

43. A body freely falling from the rest has a velocity '*v*' after it falls through a height '*h*'. The distance it has to fall down for its velocity to become double, is **[BHU 1999]**

(a) $2h$ (b) $4h$
(c) $6h$ (d) $8h$

44. The time taken by a block of wood (initially at rest) to slide down a smooth inclined plane 9.8 *m* long (angle of inclination is 30^o) is **[JIPMER 1999]**

(a) $\frac{1}{2}$ sec
(b) 2 sec
(c) 4 sec
(d) 1 sec



45. Velocity of a body on reaching the point from which it was projected upwards, is **[AIIMS 1999; Pb. PMT 199**

(a) $v = 0$ (b) $v = 2u$
(c) $v = 0.5u$ (d) $v = u$

46. A body projected vertically upwards with a velocity u returns to the starting point in 4 seconds. If $g = 10\,m/sec^2$, the value of u is **[KCET 1999]**

(a) 5 *m/sec* (b) 10 *m/sec*
(c) 15 *m/sec* (d) 20 *m/sec*

47. Time taken by an object falling from rest to cover the height of h_1 and h_2 is respectively t_1 and t_2 then the ratio of t_1 to t_2 is **[RPMT 1999; RPET 2002]**

(a) $h_1 : h_2$ (b) $\sqrt{h_1} : \sqrt{h_2}$
(c) $h_1 : 2h_2$ (d) $2h_1 : h_2$

48. A body is thrown vertically up from the ground. It reaches a maximum height of 100*m* in 5*sec*. After what time it will reach the ground from the maximum height position **[Pb. PMT 2000]**

(a) 1.2 *sec* (b) 5 *sec*

(c) 10 *sec* (d) 25 *sec*

49. A body thrown vertically upwards with an initial velocity u reaches maximum height in 6 seconds. The ratio of the distances travelled by the body in the first second and the seventh second is **[EAMCET (Engg.) 2000]**

(a) 1 : 1 (b) 11 : 1

(c) 1 : 2 (d) 1 : 11

50. A particle is thrown vertically upwards. If its velocity at half of the maximum height is 10 *m/s*, then maximum height attained by it is (Take $g = 10\ m/s^2$)

[CBSE PMT 2001, 2004]

(a) 8 *m* (b) 10 *m*

(c) 12 *m* (d) 16 *m*

51. A body, thrown upwards with some velocity, reaches the maximum height of 20*m*. Another body with double the mass thrown up, with double initial velocity will reach a maximum height of **[KCET 2001]**

(a) 200 *m* (b) 16 *m*

(c) 80 *m* (d) 40 *m*

52. A balloon starts rising from the ground with an acceleration of 1.25 m/s^2 after 8s, a stone is released from the balloon. The stone will ($g = 10\ m/s^2$) **[KCET 2001]**

(a) Reach the ground in 4 second

(b) Begin to move down after being released

(c) Have a displacement of 50 *m*

(d) Cover a distance of 40 *m* in reaching the ground

53. A body is thrown vertically upwards with a velocity u. Find the true statement from the following **[Kerala 2001]**

(a) Both velocity and acceleration are zero at its highest point

(b) Velocity is maximum and acceleration is zero at the highest point

(c) Velocity is maximum and acceleration is g downwards at its highest point

(d) Velocity is zero at the highest point and maximum height reached is $u^2/2g$

54. A man throws a ball vertically upward and it rises through 20 *m* and returns to his hands. What was the initial velocity (u) of the ball and for how much time (T) it remained in the air [$g = 10 m/s^2$] **[MP PET 2001]**

(a) $u = 10$ *m/s*, $T = 2s$ (b) $u = 10$ *m/s*, $T = 4s$

(c) $u = 20$ *m/s*, $T = 2s$ (d) $u = 20$ *m/s*, $T = 4s$

55. A particle when thrown, moves such that it passes from same height at 2 and 10*s*, the height is **[UPSEAT 2001]**

(a) g (b) $2g$

(c) $5g$ (d) $10g$

56. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point '*O*' along three different frictionless paths. The speeds of the three objects, on reaching the ground, will be in the ratio of **[AIIMS 2002]**

(a) $m_1 : m_2 : m_3$ (b) $m_1 : 2m_2 : 3m_3$

(c) 1 : 1 : 1 (d) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

57. From the top of a tower, a particle is thrown vertically downwards with a velocity of 10 *m/s*. The ratio of the distances, covered by it in the 3rd and 2nd seconds of the motion is (Take $g = 10 m/s^2$) **[AIIMS 2000; CBSE PMT 2002]**

(a) 5 : 7 (b) 7 : 5

(c) 3 : 6 (d) 6 : 3

58. Two balls *A* and *B* of same masses are thrown from the top of the building. *A*, thrown upward with velocity *V* and *B*, thrown downward with velocity *V*, then **[AIEEE 2002]**

(a) Velocity of *A* is more than *B* at the ground

(b) Velocity of *B* is more than *A* at the ground

(c) Both *A* & *B* strike the ground with same velocity

(d) None of these

59. A ball is dropped from top of a tower of 100*m* height. Simultaneously another ball was thrown upward from bottom of the tower with a speed of 50 *m/s* ($g = 10 m/s^2$). They will cross each other after **[Orissa JEE 2002]**

(a) $1s$ (b) $2s$
(c) $3s$ (d) $4s$

60. A cricket ball is thrown up with a speed of 19.6 ms^{-1}. The maximum height it can reach is
(a) 9.8 m (b) 19.6 m
(c) 29.4 m (d) 39.2 m

61. A very large number of balls are thrown vertically upwards in quick succession in such a way that the next ball is thrown when the previous one is at the maximum height. If the maximum height is $5m$, the number of ball thrown per minute is (take $g = 10\,ms^{-2}$) **[KCET 2002]**
(a) 120 (b) 80
(c) 60 (d) 40

62. A body falling from a high Minaret travels 40 meters in the last 2 seconds of its fall to ground. Height of Minaret in meters is (take $g = 10m/s^2$) **[MP PMT 2002]**
(a) 60 (b) 45
(c) 80 (d) 50

63. A body falls from a height $h = 200m$ (at New Delhi). The ratio of distance travelled in each 2 *sec* during $t = 0$ to $t = 6$ second of the journey is
(a) 1 : 4 : 9 (b) 1 : 2 : 4
(c) 1 : 3 : 5 (d) 1 : 2 : 3

64. A man drops a ball downside from the roof of a tower of height 400 meters. At the same time another ball is thrown upside with a velocity 50 *meter/sec*. from the surface of the tower, then they will meet at which height from the surface of the tower **[CPMT 2003]**
(a) 100 meters (b) 320 meters
(c) 80 meters (d) 240 meters

65. Two balls are dropped from heights h and $2h$ respectively from the earth surface. The ratio of time of these balls to reach the earth is
(a) $1:\sqrt{2}$ (b) $\sqrt{2}:1$
(c) 2 : 1 (d) 1 : 4

66. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of $2m$ on the surface of A. What is the height of jump by the same person on the planet B **[CBSE PMT 2003]**
(a) 18m (b) 6m
(c) $\frac{2}{3}m$ (d) $\frac{2}{9}m$

67. A body falls from rest in the gravitational field of the earth. The distance travelled in the fifth second of its motion is $(g = 10m/s^2)$ **[Kerala PMT 2002]**
(a) 25m (b) 45m
(c) 90m (d) 125m

68. If a body is thrown up with the velocity of 15 *m/s* then maximum height attained by the body is (g = 10 m/s^2) **[MP PMT 2003]**
(a) 11.25 m (b) 16.2 m
(c) 24.5 m (d) 7.62 m

69. A balloon is rising vertically up with a velocity of 29 ms^{-1}. A stone is dropped from it and it reaches the ground in 10 seconds. The height of the balloon when the stone was dropped from it is (g = 9.8 ms^{-2}) **[KCET 2004]**
(a) 100 m (b) 200 m
(c) 400 m (d) 150 m

70. A ball is released from the top of a tower of height h meters. It takes T seconds to reach the ground. What is the position of the ball in T/3 seconds **[AIEEE 2004]**
(a) h/9 *meters* from the ground
[BHU 2003; CPMT 2004]
(b) 7h/9 *meters* from the ground
(c) 8h/9 *meters* from the ground
(d) 17h/18 *meters* from the ground

71. Two balls of same size but the density of one is greater than that of the other are dropped from the same height, then which ball will reach the earth first (air resistance is negligible) **[J & K CET 2004]**
(a) Heavy ball
(b) Light ball
(c) Both simultaneously
(d) Will depend upon the density of the balls

72. A packet is dropped from a balloon which is going upwards with the velocity 12 *m/s*, the velocity of the packet after 2 seconds will be **[CPMT 2003; Pb PMT 2004]**
(a) –12 *m/s* (b) 12 *m/s*
(c) –7.6 *m/s* (d) 7.6 *m/s*

73. If a freely falling body travels in the last second a distance equal to the distance travelled by it in the first three second, the time of the travel is **[Pb. PMT 2004; MH CET 2003]**
(a) 6 *sec* (b) 5 *sec*
(c) 4 *sec* (d) 3 *sec*

74. The effective acceleration of a body, when thrown upwards with acceleration a will be : **[Pb. PMT 2004]**

(a) $\sqrt{a-g^2}$ (b) $\sqrt{a^2+g^2}$

(c) $(a-g)$ (d) $(a+g)$

75. A body is thrown vertically upwards with velocity u. The distance travelled by it in the fifth and the sixth seconds are equal. The velocity u is given by ($g = 9.8\ m/s^2$) **[UPSEAT 2004]**

(a) 24.5 *m/s* (b) 49.0 *m/s*

(c) 73.5 *m/s* (d) 98.0 *m/s*

76. A body, thrown upwards with some velocity reaches the maximum height of 50 *m*. Another body with double the mass thrown up with double the initial velocity will reach a maximum height of **[BHU 2004]**

(a) 100 *m* (b) 200 *m*

(c) 300 *m* (d) 400 *m*

77. A parachutist after bailing out falls 50 *m* without friction. When parachute opens, it decelerates at 2 m/s^2. He reaches the ground with a speed of 3 *m/s*. At what height, did he bail out ? **[AIEEE 2005]**

(a) 293 *m* (b) 111 *m*

(c) 91 *m* (d) 182 *m*

78. Three particles *A, B* and *C* are thrown from the top of a tower with the same speed. *A* is thrown up, *B* is thrown down and *C* is horizontally. They hit the ground with speeds V_A, V_B and V_C respectively. **[Orissa JEE 2005]**

(a) $V_A = V_B = V_C$ (b) $V_A = V_B > V_C$

(c) $V_B > V_C > V_A$ (d) $V_A > V_B = V_C$

79. From the top of a tower two stones, whose masses are in the ratio 1 : 2 are thrown one straight up with an initial speed u and the second straight down with the same speed u. Then, neglecting air resistance **[KCET 2005]**

(a) The heavier stone hits the ground with a higher speed

(b) The lighter stone hits the ground with a higher speed

(c) Both the stones will have the same speed when they hit the ground.

(d) The speed can't be determined with the given data.

80. When a ball is thrown up vertically with velocity V_o, it reaches a maximum height of 'h'. If one wishes to triple the maximum height then the ball should be thrown with velocity **[AIIMS 2005]**

(a) $\sqrt{3}V_o$ (b) $3V_o$

(c) $9V_o$ (d) $3/2V_o$

81. An object start sliding on a frictionless inclined plane and from same height another object start falling freely **[RPET 2000]**

(a) Both will reach with same speed

(b) Both will reach with same acceleration

(c) Both will reach in same time

(d) None of above

Critical Thinking

Objective Questions

1. A particle moving in a straight line covers half the distance with speed of 3 *m/s*. The other half of the distance is covered in two equal time intervals with speed of 4.5 *m/s* and 7.5 *m/s* respectively. The average speed of the particle during this motion is **[IIT 1992]**

(a) 4.0 *m/s* (b) 5.0 *m/s*

(c) 5.5 *m/s* (d) 4.8 *m/s*

2. The acceleration of a particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_0 The distance travelled by the particle in time t will be **[CBSE PMT 1995]**

(a) $v_0 t + \frac{1}{3}bt^2$ (b) $v_0 t + \frac{1}{3}bt^3$

(c) $v_0 t + \frac{1}{6}bt^3$ (d) $v_0 t + \frac{1}{2}bt^2$

3. The motion of a body is given by the equation $\frac{dv(t)}{dt} = 6.0 - 3v(t)$. where $v(t)$ is speed in m/s and t in sec. If body was at rest at $t = 0$ **[IIT-JEE 1995]**

(a) The terminal speed is 2.0 m/s

(b) The speed varies with the time as $v(t) = 2(1 - e^{-3t}) m/s$

(c) The speed is $0.1 m/s$ when the acceleration is half the initial value

(d) The magnitude of the initial acceleration is $6.0 m/s^2$

4. A particle of mass m moves on the x-axis as follows : it starts from rest at $t = 0$ from the point $x = 0$ and comes to rest at $t = 1$ at the point $x = 1$. No other information is available about its motion at intermediate time $(0 < t < 1)$. If α denotes the instantaneous acceleration of the particle, then **[IIT-JEE 1993]**

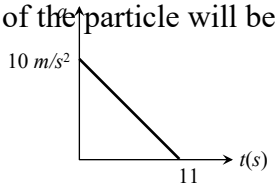
(a) α cannot remain positive for all t in the interval $0 \le t \le 1$

(b) $|\alpha|$ cannot exceed 2 at any point in its path

(c) $|\alpha|$ must be ≥ 4 at some point or points in its path

(d) α must change sign during the motion but no other assertion can be made with the information given

5. 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 **[IIT-JEE (Screening) 2004]**



(a) 110 *m/s*

(b) 55 *m/s*

(c) 550 *m/s*

(d) 660 *m/s*

6. A car accelerates from rest at a constant rate α for some time, after which it decelerates at a constant rate β and comes to rest. If the total time elapsed is *t,* then the maximum velocity acquired by the car is **[IIT 1978; CBSE PMT 1994]**

(a) $\left(\frac{\alpha^2 + \beta^2}{\alpha\beta}\right) t$ (b) $\left(\frac{\alpha^2 - \beta^2}{\alpha\beta}\right) t$

(c) $\frac{(\alpha + \beta) t}{\alpha\beta}$ (d) $\frac{\alpha\beta\, t}{\alpha + \beta}$

7. A stone dropped from a building of height h and it reaches after t seconds on earth. From the same building if two stones are thrown (one upwards and other downwards) with the same velocity u and they reach the earth surface after t_1 and t_2 seconds respectively, then **[CPMT 1997; UPSEAT 2002; KCET 2002]**

(a) $t = t_1 - t_2$ (b) $t = \frac{t_1 + t_2}{2}$

(c) $t = \sqrt{t_1 t_2}$ (d) $t = t_1^2 t_2^2$

8. A ball is projected upwards from a height h above the surface of the earth with velocity v. The time at which the ball strikes the ground is

(a) $\frac{v}{g} + \frac{2hg}{\sqrt{2}}$ (b) $\frac{v}{g}\left[1 - \sqrt{1 + \frac{2h}{g}}\right]$

(c) $\frac{v}{g}\left[1 + \sqrt{1 + \frac{2gh}{v^2}}\right]$ (d) $\frac{v}{g}\left[1 + \sqrt{v^2 + \frac{2g}{h}}\right]$

9. A particle is dropped vertically from rest from a height. The time taken by it to fall through successive distances of 1 *m* each will then be **[Kurukshetra CEE 1996]**

(a) All equal, being equal to $\sqrt{2/g}$ second

(b) In the ratio of the square roots of the integers 1, 2, 3.....

(c) In the ratio of the difference in the square roots of the integers *i.e.* $\sqrt{1}, (\sqrt{2} - \sqrt{1}), (\sqrt{3} - \sqrt{2}), (\sqrt{4} - \sqrt{3}) \ldots.$

(d) In the ratio of the reciprocal of the square roots of the integers *i.e.*,. $\frac{1}{\sqrt{1}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{4}}$

10. A man throws balls with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time (Given $g = 9.8 m/s^2$) **[CBSE PMT 2003]**

(a) At least 0.8 *m/s*

(b) Any speed less than 19.6 *m/s*

(c) Only with speed 19.6 *m/s*

(d) More than 19.6 *m/s*

11. If a ball is thrown vertically upwards with

speed u, the distance covered during the last t seconds of its ascent is

[CBSE PMT 2003]

(a) $\frac{1}{2}gt^2$ (b) $ut-\frac{1}{2}gt^2$

(c) $(u-gt)t$ (d) utd

12. A small block slides without friction down an inclined plane starting from rest. Let $S_n$be the distance travelled from time $t=n-1$ to $t=n$. Then $\frac{S_n}{S_{n+1}}$ is

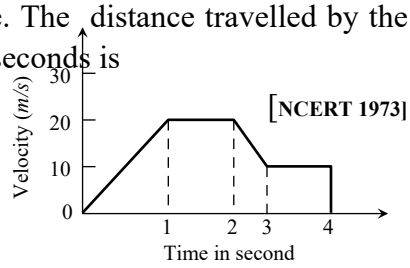
[IIT-JEE (Screening) 2004]

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

(c) $\frac{2n-1}{2n+1}$ (d) $\frac{2n}{2n+1}$

GQ Graphical Questions

1. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled by the particle in four seconds is



[NCERT 1973]

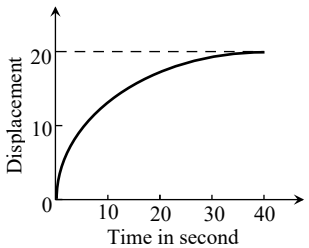
(a) 60 m

(b) 55 m

(c) 25 m

(d) 30 m

2. The displacement of a particle as a function of time is shown in the figure. The figure shows that



[CPMT 1970, 86]

(a) The particle starts with certain velocity but the motion is retarded and finally the particle stops

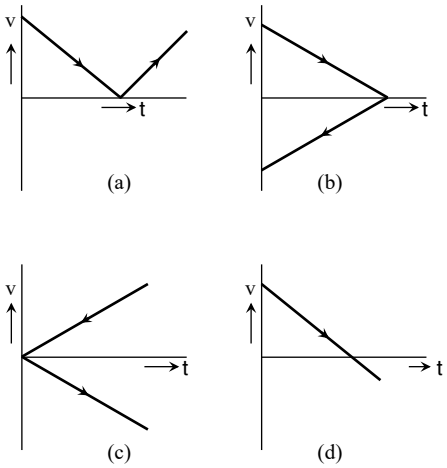
(b) The velocity of the particle is constant throughout

(c) The acceleration of the particle is constant throughout.

(d) The particle starts with constant velocity, then motion is accelerated and finally the particle moves with another constant velocity

3. A ball is thrown vertically upwards. Which of the following graph/graphs represent velocity-time graph of the ball during its flight (air resistance is neglected)

[CPMT 1993; AMU (Engg.) 2000]

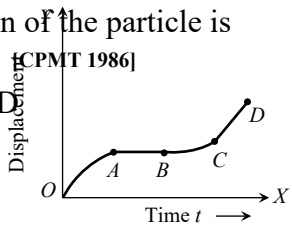


(a) A (b) B

(c) C (d) D

4. The graph between the displacement x and time t for a particle moving in a straight line is shown in figure. During the interval OA, AB, BC and CD, the acceleration of the particle is

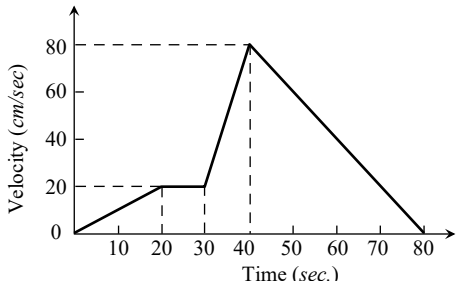
[CPMT 1986]



	OA,	AB,	BC,	CD
(a)	+	0	+	+
(b)	–	0	+	0
(c)	+	0	–	+
(d)	–	0	–	0

5. The $v-t$ graph of a moving object is given in figure. The maximum acceleration is

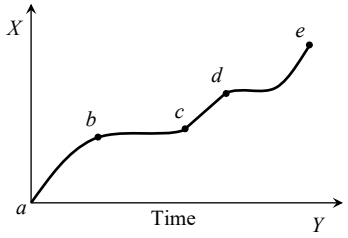
[NCERT 1972]



(a) $1 cm/sec^2$ (b) $2 cm/sec^2$

(c) $3 cm/sec^2$ (d) $6 cm/sec^2$

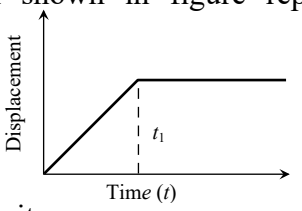
6. The displacement versus time graph for a body moving in a straight line is shown in figure. Which of the following regions represents the motion when no force is acting on the body **[NCERT 1971]**



(a) *ab* (b) *bc*

(c) *cd* (d) *de*

7. The $x-t$ graph shown in figure represents **[CPMT 1984]**



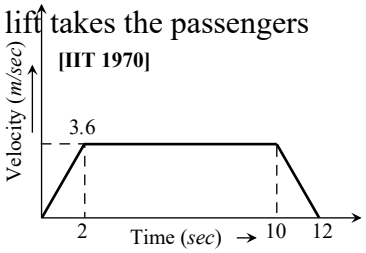
(a) Constant velocity

(b) Velocity of the body is continuously changing

(c) Instantaneous velocity

(d) The body travels with constant speed upto time t_1 and then stops

8. 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 **[IIT 1970]**



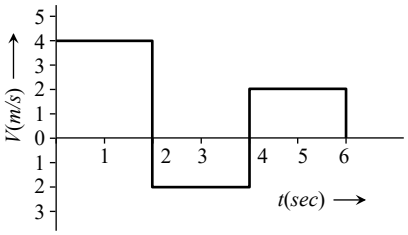
(a) 3.6 *m*

(b) 28.8 *m*

(c) 36.0 *m*

(d) Cannot be calculated from the above graph

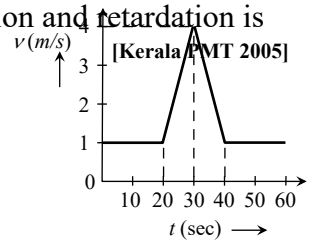
9. The velocity-time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 *sec* are respectively **[MP PET 1994]**



(a) 8 *m*, 16 *m* (b) 16 *m*, 8 *m*

(c) 16 *m*, 16 *m* (d) 8 *m*, 8 *m*

10. Velocity-time (v-t) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-zero acceleration and retardation is **[Kerala PMT 2005]**



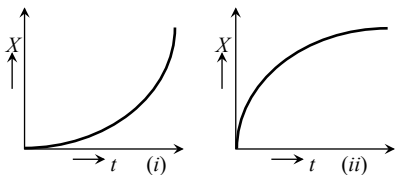
(a) 60 *m*

(b) 50 *m*

(c) 30 *m*

(d) 40 *m*

11. Figures (i) and (ii) below show the displacement-time graphs of two particles moving along the x-axis. We can say that **[Kurukshetra CEE 1996]**



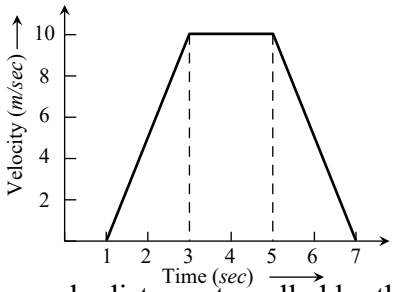
(a) Both the particles are having a uniformly accelerated motion

(b) Both the particles are having a uniformly retarded motion

(c) Particle (i) is having a uniformly accelerated motion while particle (ii) is having a uniformly retarded motion

(d) Particle (i) is having a uniformly retarded motion while particle (ii) is having a uniformly accelerated motion

12. For the velocity-time graph shown in figure below the distance covered by the body in last two seconds of its motion is what fraction of the total distance covered by it in all the seven seconds **[MP PMT/PET 1998; RPET 2001]**



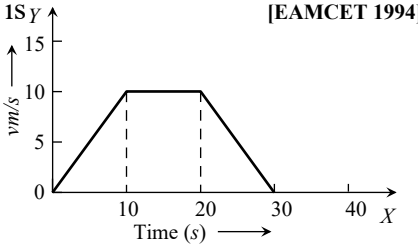
(a) $\frac{1}{2}$

(b) $\frac{1}{4}$

(c) $\frac{1}{3}$

(d) $\frac{2}{3}$

13. In the following graph, distance travelled by the body in metres is **[EAMCET 1994]**



(a) 200

(b) 250

(c) 300

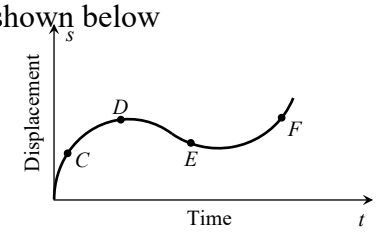
(d) 400

14. Velocity-time curve for a body projected vertically upwards is **[EAMCET (Med.) 1995; AIIMS 1999; Pb. PMT 2004; BHU 2004]**

(a) Parabola (b) Ellipse

(c) Hyperbola (d) Straight line

15. The displacement-time graph of moving particle is shown below

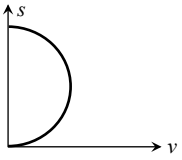


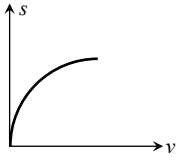
The instantaneous velocity of the particle is negative at the point **[CBSE PMT 1994]**

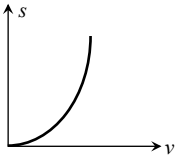
(a) D (b) F

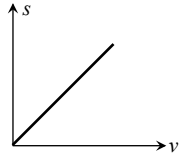
(c) C (d) E

16. An object is moving with a uniform acceleration which is parallel to its instantaneous direction of motion. The displacement (s) – velocity (v) graph of this object is **[SCRA 1998; DCE 2000; AIIMS 2003; Orissa PMT 2004]**

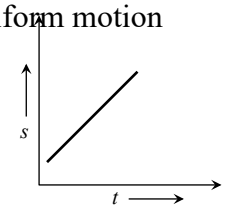
(a) 

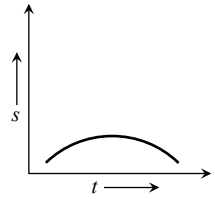
(b) 

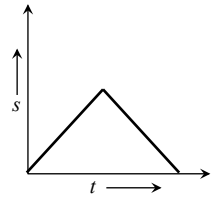
(c) 

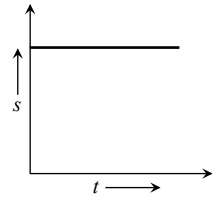
(d) 

17. Which of the following graph represents uniform motion **[DCE 1999]**

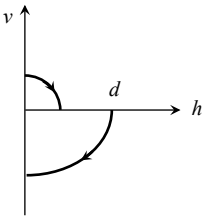
(a) 

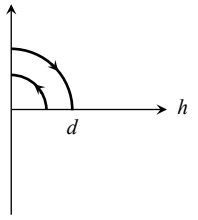
(b) 

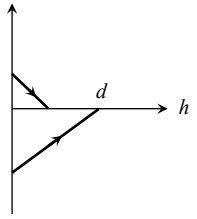
(c) 

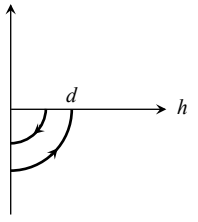
(d) 

18. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height $d/2$. Neglecting subsequent motion and air resistance, its velocity v varies with the height h above the ground is **[IIT-JEE Screening 2000]**

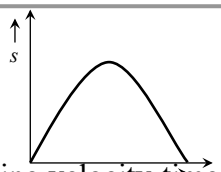
(a) 

(b) 

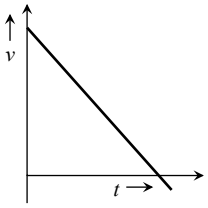
(c) 

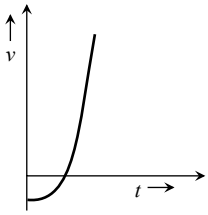
(d) 

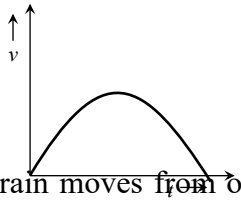
19. The graph of displacement v/s time is

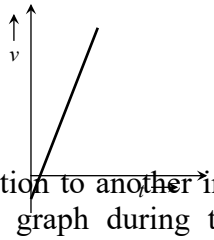


Its corresponding velocity-time graph will be [DCE 2001]

(a) 

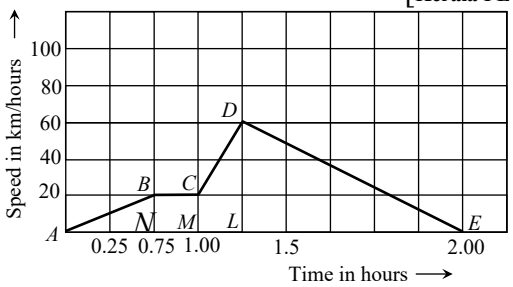
(b) 

(c) 

(d) 

20. A train moves from one station to another in 2 hours time. Its speed-time graph during this motion is shown in the figure. The maximum acceleration during the journey is

[Kerala PET 2002]



(a) 140 $km\ h^{-2}$ (b) 160 $km\ h^{-2}$

(c) 100 $km\ h^{-2}$ (d) 120 $km\ h^{-2}$

21. The area under acceleration-time graph gives

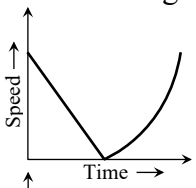
[Kerala PET 2005]

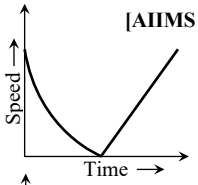
(a) Distance travelled (b) Change in acceleration

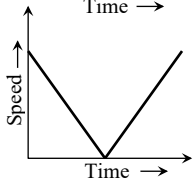
(c) Force acting (d) Change in velocity

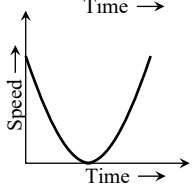
22. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its height if the air resistance is not ignored

[AIIMS 2003]

(a) 

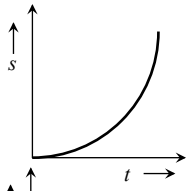
(b) 

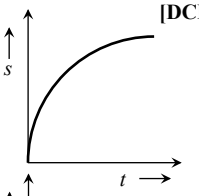
(c) 

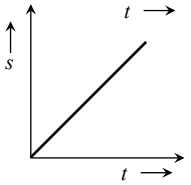
(d) 

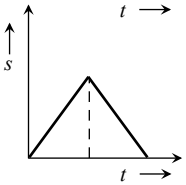
23. Which graph represents the uniform acceleration

[DCE 2003]

(a) 

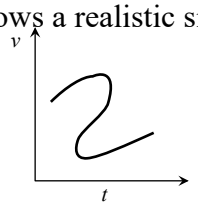
(b) 

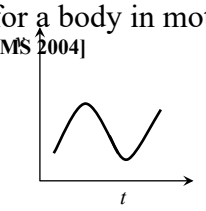
(c) 

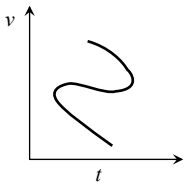
(d) 

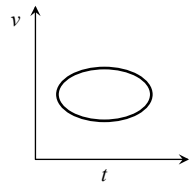
24. Which of the following velocity-time graphs shows a realistic situation for a body in motion

[AIIMS 2004]

(a) 

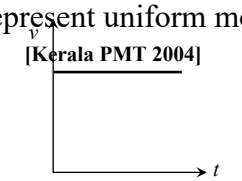
(b) 

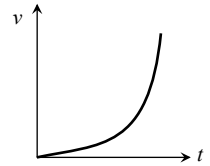
(c) 

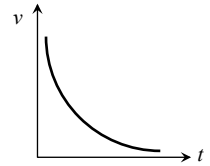
(d) 

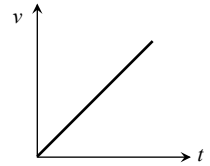
25. Which of the following velocity-time graphs represent uniform motion

[Kerala PMT 2004]

(a) 

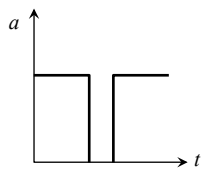
(b) 

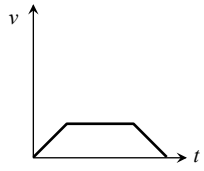
(c) 

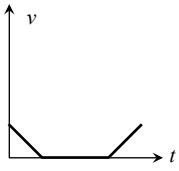
(d) 

26. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is

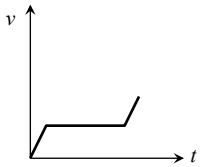
[DPMT 2004]

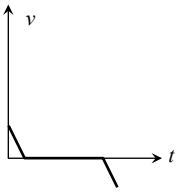






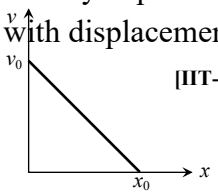
(a) (b)





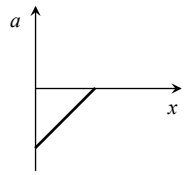
(c) (d)

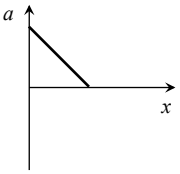
27. The given graph shows the variation of velocity with displacement. Which one of the graph given below correctly represents the variation of acceleration with displacement



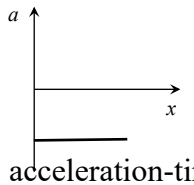
[IIT-JEE (Screening) 2005]

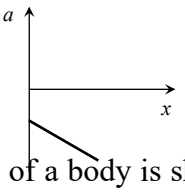
(a) (b)



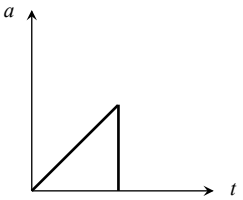


(c) (d)



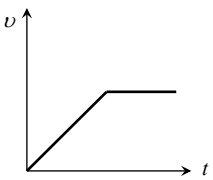


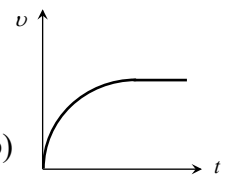
28. The acceleration-time graph of a body is shown below



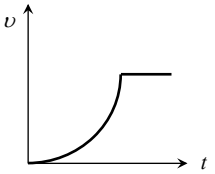
The most probable velocity-time graph of the body is

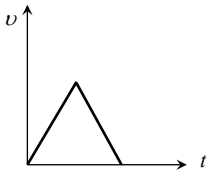
(a) (b)



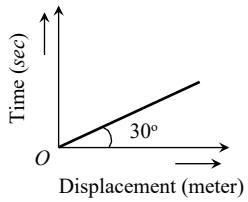


(c) (d)





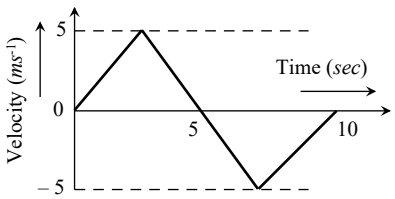
29. From the following displacement-time graph find out the velocity of a moving body



(a) $\frac{1}{\sqrt{3}}$ *m/s* (b) 3 *m/s*

(c) $\sqrt{3}$ *m/s* (d) $\frac{1}{3}$

30. The $\upsilon - t$ plot of a moving object is shown in the figure. The average velocity of the object during the first 10 seconds is



(a) 0 (b) 2.5 ms^{-1}

(c) 5 ms^{-1} (d) 2 ms^{-1}

AR Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below:

Read the assertion and reason carefully to mark the correct option out of the options given below:

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : A body can have acceleration even if its velocity is zero at a given instant of time.
Reason : A body is momentarily at rest when it reverses its direction of motion.

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

3. Assertion : If the displacement of the body is zero, the distance covered by it may not be zero.
Reason : Displacement is a vector quantity and distance is a scalar quantity.

4. Assertion : The average velocity of the object over an interval of time is either smaller than or equal to the average speed of the object over the same interval.
Reason : Velocity is a vector quantity and speed is a scalar quantity.

5. Assertion : An object can have constant speed but variable velocity.
Reason : Speed is a scalar but velocity is a vector quantity.

6. Assertion : The speed of a body can be negative.
Reason : If the body is moving in the opposite direction of positive motion, then its speed is negative.

7. Assertion : The position-time graph of a uniform motion in one dimension of a body can have negative slope.
Reason : When the speed of body decreases with time, the position-time graph of the moving body has negative slope.

8. Assertion : A positive acceleration of a body can be associated with a '*slowing down*' of the body.
Reason : Acceleration is a vector quantity.

9. Assertion : A negative acceleration of a body can be associated with a '*speeding up*' of the body.
Reason : Increase in speed of a moving body is independent of its direction of motion.

10. Assertion : When a body is subjected to a uniform acceleration, it always move in a straight line.
Reason : Straight line motion is the natural tendency of the body.

11. Assertion : Rocket in flight is not an illustration of projectile.
Reason : Rocket takes flight due to combustion of fuel and does not move under the gravity effect alone.

12. Assertion : The average speed of a body over a given interval of time is equal to the average velocity of the body in the same interval of time if a body moves in a straight line in one direction.
Reason : Because in this case distance travelled by a body is equal to the displacement of the body.

13. Assertion : Position-time graph of a stationary object is a straight line parallel to time axis.
Reason : For a stationary object, position does not change with time.

14. Assertion : 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 : Slope of displacement-time graph = Velocity of the body.

15. Assertion : Distance-time graph of the motion of a body having uniformly accelerated motion is a straight line inclined to the time axis.

Reason : Distance travelled by a body having uniformly accelerated motion is directly proportional to the square of the time taken.

16. Assertion : A body having non-zero acceleration can have a constant velocity.

Reason : Acceleration is the rate of change of velocity.

17. Assertion : A body, whatever its motion is always at rest in a frame of reference which is fixed to the body itself.

Reason : The relative velocity of a body with respect to itself is zero.

18. Assertion : Displacement of a body may be zero when distance travelled by it is not zero.

Reason : The displacement is the longest distance between initial and final position.

19. Assertion : The equation of motion can be applied only if acceleration is along the direction of velocity and is constant.

Reason : If the acceleration of a body is constant then its motion is known as uniform motion.

Assertion : A bus moving due north takes a turn and starts moving towards east with same speed. There will be no change in the velocity of bus.

Reason : Velocity is a vector-quantity.

20. Assertion : The relative velocity between any two bodies moving in opposite direction is equal to sum of the velocities of two bodies.

Reason : Sometimes relative velocity between two bodies is equal to difference in velocities of the two.

21. Assertion : The displacement-time graph of a body moving with uniform acceleration is a straight line.

Reason : The displacement is proportional to time for uniformly accelerated motion.

22. Assertion : Velocity-time graph for an object in uniform motion along a straight path is a straight line parallel to the time axis.

Reason : In uniform motion of an object velocity increases as the square of time elapsed.

23. Assertion : A body may be accelerated even when it is moving uniformly.

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

24. Assertion : A body falling freely may do so with constant velocity.

Reason : The body falls freely, when acceleration of a body is equal to acceleration due to gravity.

25. Assertion : Displacement of a body is vector sum of the area under velocity-time graph.

Reason : Displacement is a vector quantity.

26. Assertion : The position-time graph of a body moving uniformly is a straight line parallel to position-axis.

Reason : The slope of position-time graph in a uniform motion gives the velocity of an object.

27. Assertion : The average speed of an object may be equal to arithmetic mean of individual speed.

Reason : Average speed is equal to total distance travelled per total time taken.

28. Assertion : The average and instantaneous velocities have same value in a uniform motion.
Reason : In uniform motion, the velocity of an object increases uniformly.

29. Assertion : The speedometer of an automobile measure the average speed of the automobile.
Reason : Average velocity is equal to total displacement per total time taken.

Answers

Distance and Displacement

1	a	2	a	3	c	4	a	5	b
6	c								

Uniform Motion

1	d	2	d	3	b	4	b	5	c
6	d	7	a	8	b	9	d	10	c
11	c	12	d	13	d	14	b	15	b
16	d	17	c	18	c	19	d	20	b
21	a	22	b	23	b	24	c		

Non-uniform Motion

1	b	2	c	3	d	4	a	5	a
6	ac	7	a	8	d	9	b	10	a
11	b	12	c	13	b	14	a	15	b
16	d	17	c	18	a	19	c	20	b
21	a	22	c	23	a	24	d	25	c
26	b	27	c	28	d	29	c	30	a
31	c	32	a	33	d	34	a	35	b
36	a	37	b	38	d	39	d	40	b
41	b	42	c	43	b	44	c	45	b
46	d	47	b	48	a	49	b	50	b
51	c	52	c	53	a	54	a	55	c
56	d	57	d	58	d	59	b	60	d
61	c	62	b	63	b	64	a	65	d
66	b	67	a	68	a	69	a	70	d
71	c	72	a	73	a	74	c	75	c
76	c	77	d	78	a	79	c	80	d
81	d	82	c	83	c	84	b	85	a
86	d								

Relative Motion

1	b	2	d	3	b	4	a	5	c
6	d	7	b	8	a	9	d	10	c
11	c	12	b	13	a				

Motion Under Gravity

1	c	2	b	3	d	4	c	5	b
6	a	7	a	8	b	9	c	10	d
11	b	12	a	13	d	14	b	15	c
16	c	17	a	18	b	19	b	20	c
21	b	22	c	23	a	24	b	25	c
26	d	27	b	28	c	29	a	30	d
31	b	32	a	33	b	34	b	35	a
36	c	37	b	38	c	39	b	40	a
41	b	42	b	43	b	44	b	45	d
46	d	47	b	48	b	49	b	50	b
51	c	52	a	53	d	54	d	55	d
56	c	57	b	58	c	59	b	60	b
61	c	62	b	63	c	64	c	65	a
66	a	67	b	68	a	69	b	70	c
71	c	72	c	73	b	74	c	75	b
76	b	77	a	78	a	79	c	80	a
81	a								

Critical Thinking Questions

1	a	2	c	3	abd	4	ad	5	b
6	d	7	c	8	c	9	c	10	d
11	a	12	c						

Graphical Questions

1	b	2	a	3	d	4	b	5	d
6	c	7	d	8	c	9	a	10	b
11	c	12	b	13	a	14	d	15	d
16	c	17	a	18	a	19	a	20	b
21	d	22	c	23	a	24	b	25	a
26	c	27	a	28	c	29	c	30	a

Assertion and Reason

1	a	2	a	3	a	4	a	5	a
6	d	7	c	8	b	9	b	10	e
11	a	12	a	13	a	14	a	15	e
16	e	17	a	18	c	19	d	20	e
21	b	22	d	23	c	24	e	25	e
26	a	27	e	28	b	29	c	30	e