

OBJECTIVE QUESTIONS

KINEMATICS

Q1. A body is thrown vertically upward from A, the top of a tower, it reaches the ground in time t_1 , if it is thrown vertically downward from A with the same speed, it reaches the ground in time t_2 . If it is allowed to fall freely from A, then the time it takes to reach the ground is given by :

- (a) $t = (t_1 + t_2) / 2$ (b) $t = (t_1 + t_2) / 2$ (c) $\sqrt{t_1 t_2}$ (d) $\sqrt{t_1 / t_2}$

Q2. The velocity acquired by a body moving with uniform acceleration 30ms^{-1} in 2s and 60ms^{-1} in 4s. the initial velocity is:

- (a) zero (b) 2ms^{-1} (c) 3ms^{-1} (d) 10ms^{-1}

Q3. A stone is dropped from the top of a tower. When it has fallen by 5m from the top, another stone is dropped from a point 25m below the top. If both stones reach the ground at the same moment, then height of the tower from the ground is (take $g=10\text{ms}^{-2}$):

- (a) 45m (b) 50m (c) 60m (d) 65m

Q4. On an inclined plane of inclination 30° , a ball is thrown at an angle of 60° with the horizontal from the foot of the incline with a velocity of $10\sqrt{3}\text{ms}^{-1}$, then find the time in which ball will hit the inclined plane :

- (a) 1s (b) 6s (c) 2s (d) 4s

Q5. A particle is moving towards east with a speed of 10m/s . If it has an acceleration of 2ms^{-2} towards west the find the displacement (in meters) of particle in 6seconds.

- (a) 24 (b) 32 (c) 40 (d) 66

Q6. A ship is travelling due east at 10kmph . A ship is heading 30° east of north is always due north from the first ship. Find the speed of the second ship in kmph .

- (a) $20\sqrt{2}$ (b) $20\sqrt{3/2}$ (c) 20 (d) $20\sqrt{2/3}$

Q7. A boat which can move with a speed of 5m/s relative to water crosses a river of width 480m flowing with a constant speed of 4m/s . what is the time taken by the boat to cross the river along the shortest path?

- (a) 80s (b) 160s (c) 240s (d) 320s

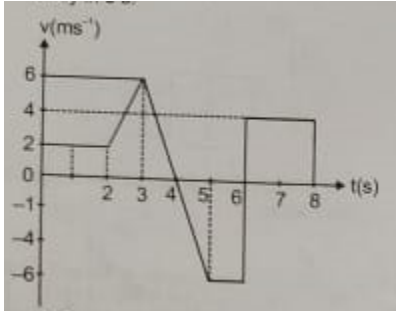
Q8. It is raining vertically downward with a velocity of 3kmph . A man walks in the rain with a velocity of 4kmph . The rain drops will fall on the man with a relative velocity of :

- (a) 1kmph (b) 3kmph (c) 4kmph (d) 5kmph

Q9. Rain drops are falling vertically with a velocity of 10m/s. To a cyclist moving on a straight road the raindrops appear to be coming with a velocity of 20m/s. Find the velocity of the cyclist.

- (a) 10m/s (b) $10\sqrt{3}$ m/s (c) 20m/s (d) $20\sqrt{3}$ m/s

Q10. The velocity time graph of a body is shown in the fig. find the displacement of the body in 8s.



- (a) 9m (b) 12m (c) 10m (d) 28m

Q11. A lift is descending with uniform acceleration. To measure the acceleration, a person in the lift drops a coin at the moment when lift was descending with speed of 6 ft/s. The coin is 4 ft above the floor of the lift at time it is dropped. The person observes that the coin strikes the floor in 1 second. Calculate from these data the acceleration of the lift (take $g=32\text{ft/s}^2$)

- (a) 22ft/s^2 (b) 11ft/s^2 (c) 33ft/s^2 (d) 44ft/s^2

Q12. Two cars get closer by 9m every second while travelling in the opposite directions. They get closer by 1m every second while travelling in the same directions. What are the speed of the cars?

- (a) 5m/s and 4m/s (b) 4m/s and 3m/s (c) 6m/s and 3m/s (d) 6m/s and 5m/s

Q13. A ball is thrown at some angle with horizontal, it returns the ground describing a parabolic path. Which of the following remains constant?

- (a) speed of the ball (b) Kinetic energy of the ball (c) Vertical component of the velocity (d) horizontal component of the velocity:

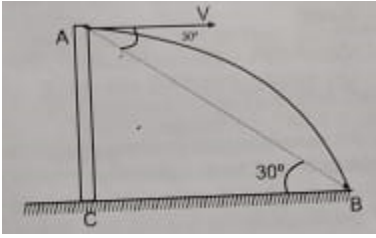
Q14. The velocity at the maximum height of a projectile is half of its initial velocity u . Find its range on the horizontal plane

- (a) $2u^2/3g$ (b) $\sqrt{3}u^2/2g$ (c) $u^2/3g$ (d) $u^2/2g$

Q15. A particle moves along the parabolic path $y=ax^2$ in such a way that the x component of the velocity remains constant. Say c . find the acceleration of the particle.

- (a) $ac\hat{k}$ (b) $2ac2\hat{j}$ (c) $ac2\hat{j}$ (d) $a2c\hat{j}$

Q16. An object is thrown horizontally from a point 'A' from a tower and hits the ground 3s later at B. The line from 'A' to 'B' makes an angle of 30° with the horizontal. Find the initial velocity of the object (take $g=10\text{m/s}^2$)



- (a) $15\sqrt{3}$ m/s (b) 15 m/s (c) $10\sqrt{3}$ m/s (d) $25\sqrt{3}$ m/s

Q17. A cricketer can throw a ball to a maximum horizontal distance of 100m. How much high above the ground (in m) can the cricketer throw the same ball ?

- (a)25 (b)100 (c)50 (d)40

Q18. the equation of a projectile is $y = \sqrt{3}x - (gx^2)/2$. Find the speed of the projection. Where at $t=0, x=0$ and $y=0$ Also $d^2x/dt^2=0$ & $d^2y/dt^2=-g$.

- (a) 2m/s (b)1m/s (c) 3m/s (d) $\sqrt{2}$ m/s

Q19. A ball is horizontally projected with a speed 'u', from the top of a plane inclined at an angle 45° with the horizontal. How far from the point of projection will the ball strike the plane ?

- (a) u^2/g (b) $\sqrt{2}u^2/g$ (c) $2u^2/g$ (d) $2\sqrt{2}u^2/g$

Q20. The initial velocity of a particle is given by u (at $t=0$) and the acceleration by f. where $f=at$ (here t is time and a is constant). Which of the following reaction is valid?

- (a) $v=u+at^2$ (b) $v=u+(at^2)/2$ (c) $v=u+at$ (d) $v=u$

Q21. A particle initially at $t=0$ moving with a velocity u, is subjected to a retarding force, as a result of which it decelerates at a rate $a = -k\sqrt{v}$. where v is the instantaneous velocity and k is a positive constant. The time taken by the particle to come to rest will be ?

- (a) $\sqrt{2u}/k$ (b) $2u/k$ (c) $2\sqrt{u}/k$ (d) \sqrt{u}/k

Q22. The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The acceleration of the particle at time t will be equal to zero where t is equal to:

- (a) a/b (b) a/2b (c) a/3b (d) zero

Q23. Between two stations, a train accelerates from rest uniformly at first, then moves with constant velocity and finally retards uniformly to come to rest. If the ratio of the time taken is 1:8:1 and the maximum speed attained is 60kmph, then what is the average speed over the whole journey ?

- (a) 48kmph (b) 52kmph (c) 54kmph (d) 56kmph

Q24. A train starts from rest and moves with a constant acceleration of 2.0 m/s^2 for half a minute. The brakes are then applied and the train comes to rest in one minute. Find the maximum speed attained by the train (assume retardation to be constant)

- (a) 30m/s (b) 40m/s (c) 60m/s (d) 50m/s

Q25. A ball is dropped from a tower. In the last second of its motion it travels a distance of 15m. find the height of the tower (take $g=10\text{m/s}^2$)

- (a) 20m (b) 10m (c) 25m (d) 15m

Q26. A body is dropped from a tower hits the ground after 4s. how much time does it take to cover the first half of the distance from the top of the tower?

- (a) $3\sqrt{2}\text{s}$ (b) $2\sqrt{2}\text{s}$ (c) $4\sqrt{2}\text{s}$ (d) $\sqrt{2}\text{s}$

Q27. A body moving in a straight line with initial velocity 5m/s and a constant acceleration, covers a distance of 30m in the third second. How much distance will it cover in the next two seconds?

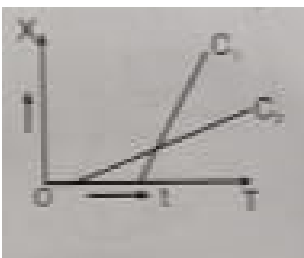
- (a) 90m (b) 80m (c) 70m (d) 50m

Q28. the displacement time graph of two particles A and B are straight lines making angles of respectively 30° and 60° with the time axis. If the velocity of A is V_A and of B is V_B . Then find the value of V_A/V_B

- (a) $1/2$ (b) $1/\sqrt{3}$ (c) $\sqrt{3}$ (d) $1/3$

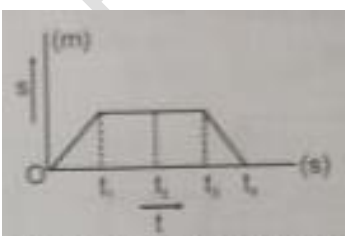
Q29. Shown in the figure are the position time graph for two children going home from the school. Which of the following statement about their relative motion is true after both of them started moving?

Their relative velocity : (consider 1.D motion)

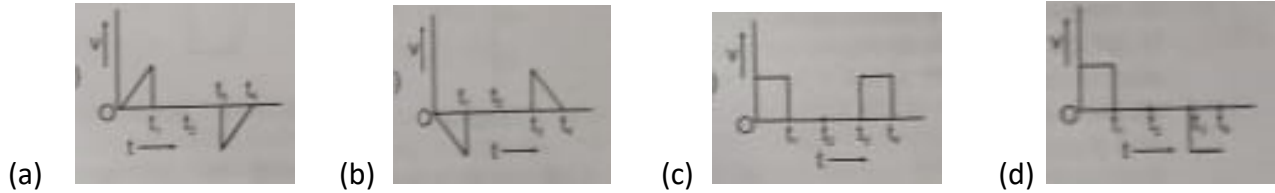


- (a) First increases and decreases (b) first decreases the increases (c) is zero (d) is non zero constant

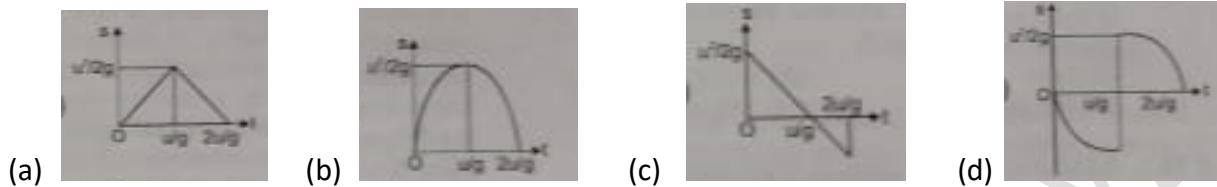
Q30. The displacement- time graph of a body is shown in following figure



The velocity time graph of the motion of the body will be :



Q31. An object is vertically thrown upwards. Then the displacement time graph for the motion is as shown in :



Q32. A body covers first $\frac{1}{3}$ part of its journey with a velocity of 2m/s , next $\frac{1}{3}$ part with a velocity of 3m/s and rest of the journey with a velocity 6m/s the average velocity of the body will be ?

- (a) 3m/s (b) $11/3\text{ m/s}$ (c) $8/3\text{ m/s}$ (d) $4/3\text{ m/s}$

Q33. A man walking with a speed v (constant in magnitude and direction) passes under a lantern hanging at height H above the ground (consider lantern as a point source) Find the velocity with which the edge of the shadow of the man's head over the ground, if his height is h .

- (a) $Vh/(H-h)$ (b) $Vh/(H+h)$ (c) $VH/(H-h)$ (d) $VH/(H+h)$

Q34. If the displacement of a particle is zero, the distance covered:

- (a) must be zero (b) may or may not be zero (c) cannot be zero (d) depends upon the particle

Q35. A body starts from rest and is uniformly accelerated for 30s . The distance travelled in the first 10s is x_1 , next 10s is x_2 and the last 10s is x_3 ; then $x_1 : x_2 : x_3$ is the same as

- (a) $1:2:4$ (b) $1:2:5$ (c) $1:3:5$ (d) $1:3:9$

Q36. A stone is released from an elevator going up with an acceleration ' a ' and speed ' u '. the acceleration and speed of the stone just after the release is :



- (a) a upward, zero (b) $(g-a)$ upward, u (c) $(g-a)$ downward, zero (d) g -upward, u