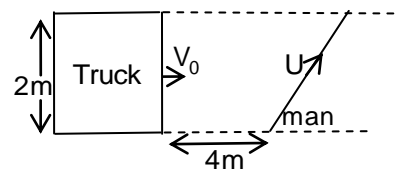


Single Correct Answer Type:

1. A 2m wide truck is moving with a uniform speed $V_0 = 8 \text{ m/s}$ along a straight horizontal road. A pedestrian starts to cross the road with a uniform speed U . When the truck is 4 m away from him. The minimum value of U so that he can cross the road safely is _____

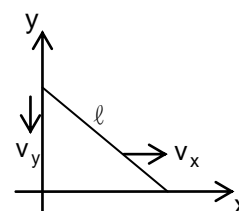


- (A) 2.62 m/s^{-1} (B) 4.6 m/s^{-1}
(C) 3.57 m/s^{-1} (D) 1.414 m/s^{-1}

2. Two particles are released from the same height at an interval of 1 s. How long after the first particle begins to fall will the two particles be 10 m apart ($g = 10 \text{ m/s}^{-2}$)

- (A) 1.5 s (B) 2 s (C) 1.25 s (D) 2s

3. A rod of length ' ℓ ' leans by its upper end against a smooth vertical wall, while its other end leans against the floor. The end that leans against the wall moves uniformly downward then



- (A) The other end also moves uniformly
(B) The speed of other end goes on decreasing
(C) The speed of other end goes on increasing
(D) The speed of other end first decreases and then increases

4. A point moves in x-y plane according to the law $x = 4\sin 6t$ and $y = 4(1 - \cos 6t)$. The distance traversed by the particle in 4 sec is _____

- (A) 96 m (B) 48 m (C) 24 m (D) 108 m

5. A particle is projected vertically upwards from O with velocity ' v ' and a second particle is projected at the same instant from 'p' (at a height 'h' above O) with velocity ' v ' at an angle of projection θ . The time when the distance between them is minimum is _____

- (A) $\frac{h}{2v \sin \theta}$ (B) $\frac{h}{2v \cos \theta}$ (C) $\frac{h}{v}$ (D) $\frac{h}{2v}$

6. With what minimum speed must a particle be projected from origin so that it is able to pass through a given point (30 m, 40 m). (Take $g = 10 \text{ ms}^{-2}$)

- (A) 60 ms^{-1} (B) 30 ms^{-1} (C) 50 ms^{-1} (D) 40 ms^{-1}

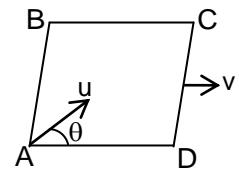
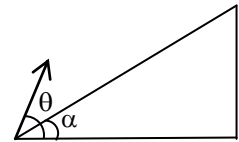
7. A particle leaves the origin with an initial velocity $\vec{v} = 3\hat{i} \text{ ms}^{-1}$ and a constant acceleration $\vec{a} = (-1.0\hat{i} - 0.5\hat{j}) \text{ ms}^{-2}$. Its velocity \vec{v} and position vector \vec{r} when it reaches its maximum x-coordinate are

- (A) $\vec{v} = -2\hat{j}$ (B) $\vec{v} = (-1.5\hat{j})$ (C) $\vec{r} = (2.5\hat{i} - 1.25\hat{j})$ (D) $\vec{r} = (3\hat{i} - 2\hat{j})$

8. The acceleration 'a' in ms^{-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 $U = 2 \text{ ms}^{-1}$ at $t=0$, then the velocity at the end of 2 sec is

- (A) 12 ms^{-1} (B) 18 ms^{-1} (C) 27 ms^{-1} (D) 36 ms^{-1}

9. 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
10. A stone is projected from level ground such that its horizontal and vertical components of initial velocity are $U_x = 10 \text{ ms}^{-1}$ and $U_y = 20 \text{ ms}^{-1}$ respectively. Then the angle between velocity vector of stone one second before and one second after it attains maximum height is
 (A) 30° (B) 45° (C) 60° (D) 90°
11. An aeroplane is to go along straight line from A to B and back again. The relative speed with respect to wind is 'U', the wind blows perpendicular to line AB with speed v. The distance between A and B is ' ℓ '. The total time for the round trip is
 (A) $\frac{2\ell}{\sqrt{U^2 - v^2}}$ (B) $\frac{2v\ell}{U^2 - v^2}$ (C) $\frac{2v\ell}{U^2 + v^2}$ (D) $\frac{2\ell}{\sqrt{U^2 + v^2}}$
12. A cat runs along a straight line with constant velocity of magnitude ' v '. A dog chases the cat such that velocity of dog is always directed towards the cat the speed of dog 'U' and always constant. At the instant both are separated by distance ' x ' and their velocities are mutually perpendicular, the magnitude of acceleration of dog is _____
 (A) $\frac{Uv}{x}$ (B) $\frac{U^2}{x}$ (C) $\frac{v^2}{x}$ (D) $\frac{U^2 + v^2}{x}$
13. A projectile is fired at an angle ' θ ' with the horizontal. Find the condition under which it lands perpendicular on an inclined plane inclination α as shown in figure.
 (A) $\sin \alpha = \cos(\theta - \alpha)$ (B) $\cos \alpha = \sin(\theta - \alpha)$
 (C) $\tan \theta = \cot(\theta - \alpha)$ (D) $\cot(\theta - \alpha) = 2 \tan \alpha$
14. A smooth square platform ABCD is moving towards right with a uniform speed ' v ', at what angle ' θ ' must a particle be projected from A with speed 'U' so that it strike the point B
 (A) $\sin^{-1}\left(\frac{U}{v}\right)$ (B) $\cos^{-1}\left(\frac{v}{u}\right)$
 (C) $\cos^{-1}\left(\frac{U}{v}\right)$ (D) $\sin^{-1}\left(\frac{v}{u}\right)$
15. Initial acceleration of a particle moving in a straight line is a_0 and initial velocity is zero. The acceleration reduces continuously to half in every t_0 seconds. The terminal velocity of the particle is
 (A) $a_0 t_0 \ln(2)$ (B) $\frac{a_0 t_0}{\ln(2)}$ (C) $a_0 t_0$ (D) $\frac{a_0 t_0}{2}$
16. After one second the velocity of a projectile makes an angle of 45° with the horizontal. After another one second it is travelling horizontally. The magnitude of its initial velocity and angle of projection are
 (A) 14.62 m/s, 60° (B) 14.62 m/s, $\tan^{-1}(2)$ (C) 22.36 m/s, $\tan^{-1}(2)$ (D) 22.36, 60°



17. A particle of moving in x-y plane. At certain instant of time, the components of its velocity and acceleration are $v_x = 3\text{ms}^{-1}$, $v_y = 4\text{ms}^{-1}$, $a_x = 2\text{ms}^{-2}$, $a_y = 1\text{ms}^{-2}$, the rate of change of speed at this moment is
 (A) $\sqrt{10}\text{ms}^{-2}$ (B) 4ms^{-2} (C) $\sqrt{5}\text{ms}^{-2}$ (D) 2ms^{-2}
18. The relation between time 't' and distance 'x' is $t = \alpha x^2 + \beta x$ where α and β are constants. The retardation is _____
 (A) $2\alpha v^3$ (B) $2\beta v^3$ (C) $2\alpha\beta v^3$ (D) $2\beta^2 v^3$
19. A particle moving in a straight line has velocity and displacement equation as $v = 4\sqrt{1+S}$, where v is in ms^{-1} and 'S' is in m. The initial velocity of the particle is _____
 (A) 4ms^{-1} (B) 16ms^{-1} (C) 2ms^{-1} (D) zero
20. The motion of a body falling from rest in a viscous medium is described by $\frac{dv}{dt} = A - Bv$. Where A and B are constants, the velocity at time 't' is given by
 (A) $\frac{A}{B}(1 - e^{Bt})$ (B) $A(1 - e^{-B^2t})$ (C) ABe^{-1} (D) $AB^2(1-t)$

Numerical Based:

21. The displacement of a particle moving in straight line is given as function of time as $S = \frac{t^3}{3} - \frac{3t^2}{2} + 2t$. S is in 'm' and 't' is in seconds. The particle comes to momentary rest n times. Find the value of 'n'?
22. A particle has initial velocity $(2\hat{i} + 3\hat{j})\text{ms}^{-1}$ when it was at origin and has constant acceleration $(3\hat{i} + 2\hat{k})\text{ms}^{-2}$. Find angle made by displacement after 2 sec with xy plane $\sin^{-1}\left(\sqrt{\frac{K}{21}}\right)$. Find the value of K.
23. A particle is projected with velocity $(6\hat{i} + 5\hat{j} + 8\hat{k})\text{ms}^{-1}$ from a vertical tower of height 10m. If the y-axis is vertical up find time of flight in sec.
24. A particle is thrown horizontally from the top of a tall tower with a speed of 10ms^{-1} . If radius of curvature of path followed is $4\sqrt{2}\text{km}$ at $t = 1\text{sec}$. Then find the value of 'k'.
25. A ball is projected vertically upward with speed v. Another ball of the same mass is projected at an angle of 60° with the vertical with the same velocity. The ratio of their potential energy at the highest point is

KEY

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|-------|-------|-------|-------|-------|
| 1. C | 2. A | 3. B | 4. A | 5. D |
| 6. B | 7. B | 8. B | 9. A | 10. D |
| 11. A | 12. A | 13. D | 14. B | 15. B |
| 16. C | 17. D | 18. A | 19. A | 20. A |
| 21. 2 | 22. 2 | 23. 2 | 24. 5 | 25. 4 |

** Wish You all the Best **