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DPP – 5 (Kinematics)

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Q 1. The height y and distance x along the horizontal for a body projected in the vertical plane are given by $y = 8t - 5t^2$ and $x = 6t$. The initial speed of projection is

(a) 8 m/s (b) 9 m/s (c) 10 m/s (d) (10/3) m/s

Q 2. A particle is projected from the ground with an initial velocity of 20 m/s at an angle of 30° with horizontal. The magnitude of change in velocity in a time interval from t = 0 to t = 0.5s is : ($g = 10\ m/s^2$)

(a) 5 m/s (b) 2.5 m/s (c) 2 m/s (d) 4 m/s

Q 3. The velocity of a particle moving in the x-y plane is given by $\frac{dx}{dt} = 8\pi \sin 2\pi t$, $\frac{dy}{dt} = 5\pi \cos 2\pi t$. When t = 0, x = 8 and y = 0. The path of the particle is

(a) A straight line (b) A circle (c) An ellipse (d) Parabola

Q 4. A particle is projected at an angle of 60° above the horizontal with a speed of 10 m/s. After some time the direction of its velocity makes an angle of 30° above the horizontal. The speed of the particle at this instant is:

(a) $\frac{5}{\sqrt{3}} m/s$ (b) $5\sqrt{3} m/s$ (c) $5\ m/s$ (d) $\frac{10}{\sqrt{3}} m/s$

Q 5. A body is thrown horizontally from a tower, 100 m high with a velocity 10 ms^{-1}. It is moving at an angle 45^0 with horizontal after:

(a) 2 sec (b) 4 sec (c) 1 sec (d) 3 sec

Q 6. A ball is projected from origin with speed 20 m/s at an angle 30^0 with x-axis. The x-coordinate of the ball at the instant when the velocity of the ball becomes perpendicular to the velocity of projection will be

(a) $40\sqrt{3}$ m (b) 40 m (c) $20\sqrt{3}$ m (d) 20 m

Q 7. If the angle of projection of a particle from the horizontal is doubled keeping the speed of projection same, the particle strikes the same target on the ground, then the ratio of time of flight in the two cases will be

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

Q 8. A projectile is aimed at a mark on a horizontal plane through the point of projection and falls 6 m short when its elevation is 30^0 but overshoot the mark by 9 m when its elevation is 45^0. The angle of elevation of projectile to hit the target on the horizontal plane

(a) $\sin^{-1}\left[\frac{1}{5}\left(\frac{3\sqrt{3}}{2}+2\right)\right]$ (b) $\cos^{-1}\left[\frac{1}{5}\left(\frac{3\sqrt{3}}{2}+2\right)\right]$

(c) $\frac{1}{2}\cos^{-1}\left[\frac{1}{5}\left(\frac{3\sqrt{3}}{2}+2\right)\right]$ (d) $\frac{1}{2}sin^{-1}\left[\frac{1}{5}\left(\frac{3\sqrt{3}}{2}+2\right)\right]$

Q 9. A batsman hits a ball at an angle of 30^0 to the horizontal with an initial speed of 15 m/s. A fielder 70 m away in the direction of the hit starts immediately to catch the ball. The speed with which the fielder should run so as to catch the ball just before it touches the ground is

(a) 10 m/s (b) 33 m/s (c) 6.5 m/s (d)13 m/s

Q 10. A particle is projected from the ground with an initial speed of v at an angle θ with horizontal. The average velocity of the particle between its point of projection and highest point of trajectory is :

(a) $\frac{v}{2}\sqrt{1+2\,cos^2\,\theta}$ (b) $\frac{v}{2}\sqrt{1+cos^2\,\theta}$

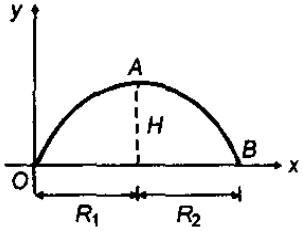
(c) $\frac{v}{2}\sqrt{1+3\,cos^2\,\theta}$ (d) $v\cos\theta$

Q 11. The horizontal range and maximum height attained by a projectile are Rand H respectively. If a constant horizontal acceleration a = $\frac{g}{4}$ is imparted to the projectile due to wind, then its horizontal range and maximum height will be:

(a) (R + H), $\frac{H}{2}$ (b) $\left(R+\frac{H}{2}\right), 2H$

(c) (R + 2H), H (d) (R + H), H

Q 12. In a projectile motion let $t_{OA} = t_1$ and $t_{AB} = t_2$. The horizontal displacement from O to A is R_1 and from A to B is R_2. Maximum height is H and time of flight is T. If air drag is to be considered, then choose the correct alternative(s).



(a) t_1 will decrease while t_2 will increase
(b) H will increase
(c) R_1 will decrease while R_2 will increase
(d) None of these

Q 13. A ball is projected from 10 m heigh tower with initial speed 10 m/s. Find maximum possible range on ground?

(a) $10\sqrt{3}$ m
(b) $5(1+\sqrt{5})$m
(c) $5\sqrt{5}$ m
(d) none of these

Answer Key

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