Uniform Circular Motion

21. A particle reaches its highest point when it has covered exactly one half of its horizontal range. The corresponding point on the displacement time graph is characterised by

(a) Negative slope and zero curvature

(b) Zero slope and negative curvature

(c) Zero slope and positive curvature

(d) Positive slope and zero curvature

22. At the top of the trajectory of a projectile, the acceleration is

(a) Maximum   (b) Minimum

(c) Zero   (d) g

23. When a body is thrown with a velocity u making an angle θ with the horizontal plane, the maximum distance covered by it in horizontal direction is

(a) $\dfrac{u^2 \sin \theta}{g}$ (b) $\dfrac{u^2 \sin 2\theta}{2g}$

(c) $\dfrac{u^2 \sin 2\theta}{g}$ (d) $\dfrac{u^2 \cos 2\theta}{g}$

24. A football player throws a ball with a velocity of 50 *metre/sec* at an angle 30 degrees from the horizontal. The ball remains in the air for $(g = 10m/s^2)$

(a) 2.5 *sec*   (b) 1.25 *sec*

(c) 5 *sec*   (d) 0.625 *sec*

25. A body of mass 0.5 *kg* is projected under gravity with a speed of 98 *m/s* at an angle of 30° with the horizontal. The change in momentum (in magnitude) of the body is

(a) $24.5N - s$ (b) $49.0N - s$

(c) $98.0N - s$ (d) $50.0N - s$

26. A body is projected at such an angle that the horizontal range is three times the greatest height. The angle of projection is

(a) $25^o 8'$ (b) $33^o 7'$

(c) $42^o 8'$ (d) $53^o 8'$

27. A gun is aimed at a target in a line of its barrel. The target is released and allowed to fall under gravity at the same instant the gun is fired. The bullet will

(a) Pass above the target

(b) Pass below the target

(c) Hit the target

(d) Certainly miss the target

28. Two bodies are projected with the same velocity. If one is projected at an angle of 30° and the other at an angle of 60° to the horizontal, the ratio of the maximum heights reached is

(a) 3 : 1

(b) 1 : 3

(c) 1 : 2

(d) 2 : 1

29. If the range of a gun which fires a shell with muzzle speed V is R, then the angle of elevation of the gun is

(a) $cos^{-1}\left(\frac{V^2}{Rg}\right)$

(b) $cos^{-1}\left(\frac{gR}{V^2}\right)$

(c) $\frac{1}{2}\left(\frac{V^2}{Rg}\right)$

(d) $\frac{1}{2}sin^{-1}\left(\frac{gR}{V^2}\right)$

30. If time of flight of a projectile is 10 seconds. Range is 500 *meters*. The maximum height attained by it will be

(a) 125 *m*

(b) 50 *m*

(c) 100 *m*

(d) 150 *m*

31. If a body *A* of mass *M* is thrown with velocity *V* at an angle of 30° to the horizontal and another body *B* of the same mass is thrown with the same speed at an angle of 60° to the horizontal. The ratio of horizontal range of *A* to *B* will be

(a) 1 : 3

(b) 1 : 1

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

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

32. A bullet is fired from a cannon with velocity 500 *m/s*. If the angle of projection is 15° and $g = 10 m/s^2$. Then the range is

(a) $25 \times 10^3 m$

(b) $12.5 \times 10^3 m$

(c) $50 \times 10^2 m$

(d) $25 \times 10^2 m$

33. A ball thrown by a boy is caught by another after 2 *sec*. some distance away in the same level. If the angle of projection is 30º, the velocity of projection is

(a) 19.6 *m/s*

(b) 9.8 *m/s*

(c) 14.7 *m/s*

(d) None of these

34. A particle covers 50 m distance when projected with an initial speed. On the same surface it will cover a distance, when projected with double the initial speed

(a) 100 m (b) 150 m

(c) 200 m (d) 250 m

35. A ball is thrown upwards at an angle of 60° to the horizontal. It falls on the ground at a distance of 90 m. If the ball is thrown with the same initial velocity at an angle 30°, it will fall on the ground at a distance of

(a) 30 m (b) 60 m

(c) 90 m (d) 120 m

36. Four bodies *P, Q, R* and *S* are projected with equal velocities having angles of projection 15°, 30°, 45° and 60° with the horizontal respectively. The body having shortest range is

(a) *P*   (b) *Q*

(c) *R*   (d) *S*

37. For a projectile, the ratio of maximum height reached to the square of flight time is ($g = 10\ ms^{-2}$)

(a) 5 : 4   (b) 5 : 2

(c) 5 : 1   (d) 10 : 1

38. A stone projected with a velocity u at an angle θ with the horizontal reaches maximum height H_1. When it is projected with velocity u at an angle $\left(\frac{\pi}{2} - \theta\right)$ with the horizontal, it reaches maximum height H_2. The relation between the horizontal range R of the projectile, H_1 and H_2 is

(a) $R = 4\sqrt{H_1 H_2}$

(b) $R = 4(H_1 - H_2)$

(c) $R = 4(H_1 + H_2)$

(d) $R = \dfrac{H_1^{\ 2}}{H_2^{\ 2}}$

39. An object is projected with a velocity of 20 m/s making an angle of 45° with horizontal. The equation for the trajectory is $h = Ax - Bx^2$ where h is height, x is horizontal distance, A and B are constants. The ratio $A : B$ is ($g = 10\ ms^{-2}$)

(a) 1 : 5   (b) 5 : 1

(c) 1 : 40   (d) 40 : 1

40. Which of the following sets of factors will affect the horizontal distance covered by an athlete in a long–jump event

(a) Speed before he jumps and his weight

(b) The direction in which he leaps and the initial speed

(c) The force with which he pushes the ground and his speed

(d) None of these