## Non-uniform Circular Motion

**26.** A particle is tied to 20*cm* long string. It performs circular motion in vertical plane. What is the angular velocity of string when the tension in the string at the top is zero

(a) $5rad/sec$ (b) $2rad/sec$

(c) $7.5rad/sec$ (d) $7rad/sec$

**27.** A stone tied with a string, is rotated in a vertical circle. The minimum speed with which the string has to be rotated

(a) Is independent of the mass of the stone

(b) Is independent of the length of the string

(c) Decreases with increasing mass of the stone

(d) Decreases with increasing in length of the string

**28.** For a particle in a non-uniform accelerated circular motion

(a) Velocity is radial and acceleration is transverse only

(b) Velocity is transverse and acceleration is radial only

(c) Velocity is radial and acceleration has both radial and transverse components

(d) Velocity is transverse and acceleration has both radial and transverse components

**29.** A fighter plane is moving in a vertical circle of radius '*r*'. Its minimum velocity at the highest point of the circle will be

(a) $\sqrt{3gr}$ (b) $\sqrt{2gr}$

(c) $\sqrt{gr}$ (d) $\sqrt{gr/2}$

**30.** A ball is moving to and fro about the lowest point *A* of a smooth hemispherical bowl. If it is able to rise up to a height of 20 *cm* on either side of *A*, its speed at *A* must be (Take = 10 $m/s^2$, mass of the body 5 *g*)

(a) 0.2 *m/s* (b) 2 *m/s*

(c) 4 *m/s* (d) 4.5 $ms^{-1}$

**31.** A stone of mass *m* is tied to a string and is moved in a vertical circle of radius *r* making *n* revolutions per *minute*. The total tension in the string when the stone is at its lowest point is

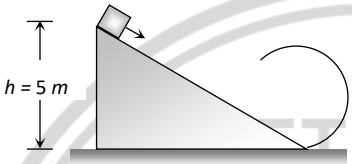
(a) *mg*

(b) $m(g + \pi nr^2)$

(c) $m(g + \pi nr)$

(d) $m\{g + (\pi^2 n^2 r)/900\}$

**32.** As per given figure to complete the circular loop what should be the radius if initial height is 5 *m*




(a) 4 *m*

(b) 3 *m*

(c) 2.5 *m*

(d) 2 *m*

**33.** A coin, placed on a rotating turn-table slips, when it is placed at a distance of 9 *cm* from the centre. If the angular velocity of the turn-table is trippled, it will just slip, if its distance from the centre is

(a) 27 *cm* (b) 9 *cm*

(c) 3 *cm* (d) 1 *cm*

**34.** When a ceiling fan is switched off its angular velocity reduces to 50% while it makes 36 rotations. How many more rotation will it make before coming to rest (Assume uniform angular retardation)

(a) 18 (b) 12

(c) 36 (d) 48

**35.** A body crosses the topmost point of a vertical circle with critical speed. Its centripetal acceleration, when the string is horizontal will be

(a) 6 *g* (b) 3 *g*

(c) 2 *g* (d) *g*

**36.** A simple pendulum oscillates in a vertical plane. When it passes through the mean position, the tension in the string is 3 times the weight of the pendulum bob. What is the maximum displacement of the pendulum of the string with respect to the vertical

(a) $30^o$ (b) $45^o$

(c) $60^o$ (d) $90^o$

**37.** A particle is moving in a vertical circle. The tensions in the string when passing through two positions at angles $30^o$ and $60^o$ from vertical (lowest position) are $T_1$ and $T_2$ respectively. then

(a) $T_1 = T_2$

(b) $T_2 > T_1$

(c) $T_1 > T_2$

(d) Tension in the string always remains the same

**38.** A particle is kept at rest at the top of a sphere of diameter 42 *m*. When disturbed slightly, it slides down. At what height '*h*' from the bottom, the particle will leave the sphere

(a) 14 *m* (b) 28 *m*

(c) 35 *m* (d) 7 *m*

**39.** The coordinates of a moving particle at any time '*t*' are given by $x = \alpha t^3$ and $y = \beta t^3$. The speed of the particle at time '*t*' is given by

(a) $\sqrt{\alpha^2 + \beta^2}$

(b) $3t\sqrt{\alpha^2 + \beta^2}$

(c) $3t^2\sqrt{\alpha^2 + \beta^2}$

(d) $t^2\sqrt{\alpha^2 + \beta^2}$

**40.** A small disc is on the top of a hemisphere of radius $R$. What is the smallest horizontal velocity *v* that should be given to the disc for it to leave the hemisphere and not slide down it ? [There is no friction]

(a) $v = \sqrt{2gR}$ (b) $v = \sqrt{gR}$

(c) $v = \frac{g}{R}$ (d) $v = \sqrt{g^2R}$

**41.** A body of mass 0.4 *kg* is whirled in a vertical circle making 2 *rev/sec*. If the radius of the circle is 2 *m*, then tension in the string when the body is at the top of the circle, is

(a) 41.56 *N* (b) 89.86 *N*

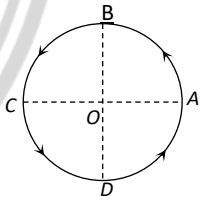
(c) 109.86 *N* (d) 115.86 *N*

**42.** A bucket full of water is revolved in vertical circle of radius 2*m*. What should be the maximum time-period of revolution so that the water doesn't fall off the bucket

(a) 1 *sec* (b) 2 *sec*

(c) 3 *sec* (d) 4 *sec*

**43.** Figure shows a body of mass *m* moving with a uniform speed *v* along a circle of radius *r*. The change in velocity in going from *A* to *B* is




(a) $v\sqrt{2}$

(b) $\boldsymbol{v/\sqrt{2}}$

(c) $v$

(d) zero

**44.** The maximum and minimum tension in the string whirling in a circle of radius 2.5 *m* with constant velocity are in the ratio 5 : 3 then its velocity is

(a) $\sqrt{98}m/s$ (b) $\boldsymbol{7m/s}$

(c) $\sqrt{490}m/s$ (d) $\sqrt{4.9}\boldsymbol{m/s}$

**45.** For a particle in circular motion the centripetal acceleration is

(a) Less than its tangential acceleration

(b) Equal to its tangential acceleration

(c) More than its tangential acceleration

(d) May be more or less than its tangential acceleration

**46.** A particle moves in a circular path with decreasing speed. Choose the correct statement.

(a) Angular momentum remains constant

(b) Acceleration ($\vec{a}$) is towards the center

(c) Particle moves in a spiral path with decreasing radius

(d) The direction of angular momentum remains constant

**47.** A body of mass 1 *kg* is moving in a vertical circular path of radius 1*m.* The difference between the kinetic energies at its highest and lowest position is

(a) $20J$

(b) $10J$

(c) $4\sqrt{5}J$

(d) $10(\sqrt{5}-1)J$

**48.** The angle turned by a body undergoing circular motion depends on time as $\theta = \theta_0 + \theta_1 t + \theta_2 t^2$ . Then the angular acceleration of the body is

(a) $\theta_1$ (b) $\theta_2$

(c) $2\theta_1$ (d) $2\theta_2$