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CIRCULAR MOTION

1.The string of a pendulum, having bob of mass m, is displaced through 90° from the vertical and then released .The minimum strength of the string in order to withstand the tension as the pendulum passes through the mean position is

(a)mg (b)3 mg (c)5 mg (d)6mg

2.A motor car of mass m travels with a uniform speed v on a circular bridge of radius r. When the car is at the highest point of the bridge, then the force exerted by the car on the bridge is

(a)mg (b)mg+$\frac{mv^2}{r}$ (c)mg-$\frac{mv^2}{r}$ (d)$\frac{mv^2}{r}$

3.A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle .The motion takes place in a plane .It follows that

(a)its velocity is constant

(b)its acceleration is constant

(c)its kinetic energy is constant

(d)None

4.A particle revolves round a circular path with a constant speed .The acceleration of the particle is

(a)along the circumference of the circle

(b)along the tangent

(c)along the radius

(d)zero

5.If r is the radius of the surface then the particle will leave the surface of a vertical distance below the highest point equal to

(a)r/3 (b)r/2 (c)2r/3 (d)3r/4

6.A wheel rotates about an axis passing through the centre and perpendicular to the place with slowly increasing angular speed .Thus is has

(a)radial velocity and radial acceleration

(b)tangential velocity and radial acceleration

(c)tangential velocity and tangential acceleration

(d)tangential velocity but acceleration having both components .

7.For traffic moving at 60km/h along a circular track of radius 0.1 km ,the correct angle of banking is

(a)$tan^{-1}\left[\frac{(60)^2}{0.1}\right]$ (b)$tan^{-1}\left[\frac{(50/3)^2}{100X9.8}\right]$

(c)$tan^{-1}\left[\frac{100\ x\ 9.8}{(\frac{50}{3})^2}\right]$ (d)$tan^{-1}\left[\sqrt{60\ x0.1\ x9.8}\right]$

8.Keeping the banking angle same ,to increase the maximum speed with which a vehicle can travel on a circular road by 10% ,the radius of curvature of the road has to be changed from 20 m to

(a)16m (b)18m (c)24.2m (d)30.5m

9.A can filled with water is revolved in a vertical circle of radius 4 m so that water does not fall down. The maximum possible period of revolution is

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

10.a stone of mass 1 kg tied to a light inextensible string of length L=(10/3)m is whiring in a circular path of radius L in a vertical plane .If the ratio of the maximum to the minimum tension in the string is 4 and g=10m/s^2,the speed of the stone at the highest point of the circle

(a)20m/s (b)$10\sqrt{3}$m/s (c)$5\sqrt{3}$m/s (d)10m/s

11.A particle of mass M is moving in a horizontal circle of radius R with a uniform speed V when it moves from one point to a diametrically opposite point ,its

(a)Kinetic energy changes by MV^2 /4

(b)momentum does not change

(c)momentum changes by 2 MV

(d)Kinetic energy changes by MV^2

12.A vehicle is moving with a velocity v on a curved road of width b and radius of curvature R. For counteracting the centrifugal force on the vehicle, the difference in elevation required in between the outer and the inner edges of the road is

(a)$\frac{v^2b}{Rg}$ (b)$\frac{vb}{Rg}$ (c)$\frac{vb^2}{Rg}$ (d) $\frac{vb}{R^2g}$

13.The work done by the centripetal force F when a body completes one revolution around a circle of radius R is

(a)$2\pi RF$ (b)2RF (c)RF (d)zero

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14.A small sphere is suspended by a thread of length L. The horizontal velocity that should be given to it so that it may just reach the same height as the point of suspension is

(a)$\sqrt{g\,L}$ (b)$\sqrt{5_g L}$ (c)2_gL (d)$\sqrt{2_g}$L

15.A stone mass 16 kg is attached to a string 144m long and is whirled in a horizontal circle .The maximum tension the string can stand is 16N.The maximum velocity of revolution that can be given to the stone without breaking the string is

(a)20m/s (b)16m/s (c)14m/s (d)12m/s

16.A particle moves in a circle of radius 25 cm at two revolution per second. The acceleration of the particle is m/s² is

(a)π^2 (b)$8\pi^2$ (c)$4\pi^2$ (d)$2\pi^2$

17.The Kinetic energy K of a particle moving along a circle of radius R depends on the distance covered as K=as² .The force acting on the particle is

(a)$\frac{2as^2}{R}$ (b)$2as\left(1+\frac{s^2}{R^2}\right)^{1/2}$

(c)2as (d)$\frac{2aR^2}{s}$

18.A particle of mass m is executing uniform circular motion on a path of radius r. If p is the magnitude of its linear momentum ,them the radial force acting on the particle is

(a)pmr (b)$\frac{rm}{p}$ (c)$\frac{mp^2}{p}$ (d)$\frac{p^2}{rm}$

19.A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a ,is varying with time t a_c is varying with time t$a_c = k^2rt^2$,where k is a constant. The power delivered to the by the force acting on it is

(a)$2\pi mk^2r^2t$ (b)mk^2r^2t

(c)(m$k^1r^2t^5$)/3 (d)zero

20.A ball of mass 0.25 kg attached to the end of string of length 1.96 m is moving in a horizontal circle .The string will break if the tension is more than 25 N. what is the maximum speed with which the particle can be moved ?

(a)5m/s (b)3.92 m/s (c)3m/s (d)14m/s

21.A body of mass 100gm is rotating in a circular path of radius r meters with a constant speed .The work done in one complete revolution is

(a)100r J (b)(r/100)J (c)(100/r)J (d)zero

22. A weightless thread can bear tension upto 3.7 Kg wt. A stone of mass 500 g is tied and revolved in a circular path of radius 4 m in a vertical plane. If g=10ms^{-2},then the maximum angular velocity of the stone will be

(a)4 radians/sec (b)16 radian/sec

(c)$\sqrt{21}$ radian /sec (d)2 radian/sec

23.A mass of 2kg is whirled in a horizontal circle by means of a string at an initial speed of 5 revolution per minute .Keeping the radius constant the tension in the string is doubled .The new speed is nearly

(a)14rpm (b)10rpm (c)2.25 rpm (d)7 rpm

24.A stone of mass 1 kg tied to the end of a string of length 1m is whirled in a horizontal circle ,with a uniform angular velocity of 2 radius .The tension of the string is(N)

(a)4 (b)$\frac{1}{4}$ (c)2 (d)$\frac{1}{2}$

25.A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time of time, the stone is at its lowest position and has a speed u. The magnitude of the change in its velocity as it reaches a position where the string is horizontal is

(a)$\sqrt{u^2-2gL}$ (b)$\sqrt{2gL}$

(c)$\sqrt{u^2-gL}$ (d)$\sqrt{2(u^2-gl}$

26.For a body moving with constant speed in a horizontal circle, which of the following remains constant ?

(a)velocity (b)Acceleration

(c)Centripetal (d)Kinetic energy

27. Roadways are banked on curves so that :

(a)the speeding vehicles may not fall inwards

(b)the frictionless force between the road and vehicle may be decreased

(c)the wear and tear of tyre may be decreased

(d)the weight of the vehicle may be decreased

28.A stone of mass m is tied to a string and is moved in a vertical circle of radius r making n revolutions stone is at its lowest point is

(a)mg (b)m(g+πnr^2)

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

29.A cyclist riding the bicycle at a speed of $14\sqrt{3}ms^{-1}$ takes a turn around a circular road of radius $20\sqrt{3}$ m without skidding .Given g=9.8 ms^{-2}, What is inclination to the vertical?

(a)30° (b)90° (c)45° (d)60°

30.Two racing cars of masses m_1 and m_2 are moving in circles of radii $r_{1\ and} r_2$ respectively. Their speeds are such that each makes a complete circle in the same length of time. The ratio of the angular speed of the first car to that of the second car is

(a)$m_1 : m_2$ (b)$r_1 : r_2$ (c)1:1 (d)$m_1 r_1 : m_2 r_2$