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Daily Practice Problems

JEE PHYSICS

Topic: Circular Motion

Q.1 A neuton star of enormous density is rotating at the rate of one rotation/second. If the radius of the star is assessed to be 20 kms then the acceleration in m/sec^2 units for any particle situated at the equator of the star will be.

[1] 8×10^5 [2] 20×10^3 [3] 12×10^6 [4] 4×10^8

Q.2 A body of mass 100 gm is tied to one end of a 2m long string. The other end of the string is at the centre of the horizontal circle. The maximum revolution in one minute is 200. The maximum tensile strength of the string is approximately.

[1] 8.942 dyne [2] 8.942 N [3] 89.42 dyne [4] 89.42 N

Q.3 A stone is moved round a horizontal circle with a 20 cm long string tied to it. If centripetal acceleration is 9.8 m/sec^2, then its angular velocity will be

[1] 7 rad/s [2] 22/7 rad/s [3] 49 rad/s [4] 14 rad/s

Q.4 An aeroplane revolves in a circle above the surface of the earth at a fixed height with speed 100 km/hr. The change in velocity after completing 1/2 revolution will be.

[1] 200 km/hr [2] 150 km/hr [3] 300 km/hr [4] 400 km/hr

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

[1] 14 rpm [2] 10 rpm [3] 2.25 rpm [4] 7 rpm

Q.6 A wheel is subjected to uniform angular acceleration about its axis, initially its angular velocity is zero. In the first 2 sec, it rotates through an angle q_1, in the next 2 sec.it rotates through an additional angle q_2. The ratio of q_2 and q_1 is -

[1] 1 [2] 2 [3] 3 [4] 5

Q.7 A body of mass m is moving in a circle of radius r with a constant speed v. The force on the body is mv^2/s and u is directed towards the centre. What is the workdone by this force in moving the body over half the circumference of the circle -

[1] $\frac{mv^2}{r} \times \pi r$ [2] zero [3] mv^2/r [4] pr^2/mv^2

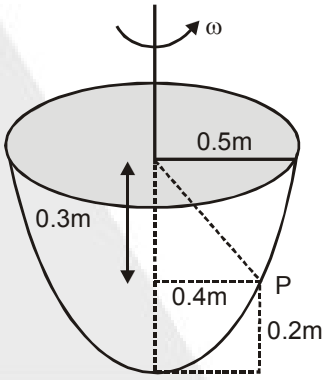
Q.8 A stone of mass 0.5 kg tied with a string of length 1 metre is moving in a circular path with a speed of
4 m/sec. The tension acting on the string in newton is -

[1] 2 [2] 8 [3] 0.2 [4] 0.8

Q.9 The breaking tension of a string is 10 N. A particle of mass 0.1 kg tied to it is rotated along a horizontal circle of radius 0.5 metre. The maximum speed with which the particle can be rotated without breaking the string is-

[1] $\sqrt{5}\,m/sec$ [2] $\sqrt{(50)}\ m/sec$ [3] $\sqrt{(500)}\ m/sec$ [4] $\sqrt{(1000)}\ m/sec$

Q.10 A particle P will be equilibrium inside a hemispherical bowl of radius 0.5 m at a height 0.2 m from the bottom when the bowl is rotated at an angular speed ($g = 10\ m/sec^2$)-



[1] $10/\sqrt{3}\,rad/sec$

[2] $10\sqrt{3}\,rad/sec$

[3] 10 rad/sec

[4] $\sqrt{20}\,rad/sec$

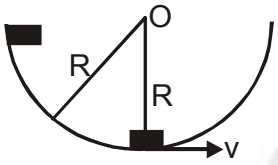
Q.11 A cyclist is moving on a circular track of radius 80 m with a velocity of 72 km/hr. He has to lean from the vertical approximately through an angle -

[1] $\tan^{-1}(1/4)$ [2] $\tan^{-1}(1)$ [3] $\tan^{-1}(1/2)$ [4] $\tan^{-1}(2)$

Q.12 The roadway of a bridge over a canal in the form of a circular arc of radius 18m. What is the greatest speed with which a motor cycle can cross the bridge without leaving ground -

[1] $\sqrt{9.8}\,m/s$ [2] $\sqrt{18\times9.8}\,m/s$ [3] 18 × 9.8 m/s [4] 18/9.8 m/s

Q.13 A block of mass m slides down along the surface of the bowl from the rim to the bottom as shown in fig. The velocity of the block at the bottom will be –



[1] $\sqrt{\pi Rg}$ [2] $2\sqrt{\pi Rg}$ [3] $\sqrt{2Rg}$ [4] $\sqrt{gR}$

Q.14 A mass m is revolving in a vertical circle at the end of a string of length 20 cm. By how much times does the tension of the string at the lowest point exceed the tension at the topmost point -

[1] 2 mg [2] 4 mg [3] 6 mg [4] 8 mg

Q.15 A car is travelling with linear velocity v on a circular road of radius r. If the speed is increasing at the rate of 'a' metre/sec^2, then the resultant acceleration will be -

[1] $\sqrt{\left[\frac{v^2}{r^2}-a^2\right]}$ [2] $\sqrt{\left[\frac{v^4}{r^2}+a^2\right]}$ [3] $\sqrt{\left[\frac{v^4}{r^2}-a^2\right]}$ [4] $\sqrt{\left[\frac{v^2}{r^2}+a^2\right]}$

Q.16 A body of mass 2kg is moving in a vertical plane of radius 2m. The work done when it moves from the lowest point to the highest point is -

[1] 80 J [2] 40 J [3] 20 J [4] 0

Q.17 A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity w_0. If the length of the string and angular velocity are doubled, the tension in the string which was initially T_0 is now -

[1] T_0 [2] $T_0/2$ [3] $4T_0$ [4] $8T_0$

Q.18 Two satellites of masses m_1 and m_2 ($m_1 > m_2$) are revolving round the earth in circular orbits of radii r_1 & r_2 ($r_1 > r_2$) respectively. Which of the following statement is true regarding their speed v_1 and v_2 -

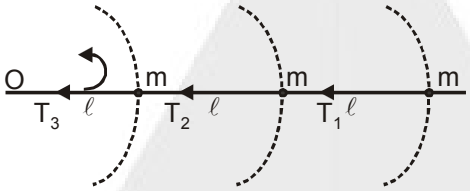
[1] $v_1 = v_2$ [2] $v_1 > v_2$ [3] $v_1 < v_2$ [4] $v_1/r_1 = v_2/r_2$

Q.19 A particle is projected so as to just move along a vertical circle of radius r. The ratio of the tension in the string when the particle is at the lowest and highest point on the circle is -

[1] 1 [2] finite but large [3] zero [4] infinite

Q.20 Three identical particle as shown in fig. tied with string and speed of outermost particle is v then ratio

$T_1 : T_2 : T_3$ will be - [where T_1 is tension in outside string]



(1) 3 : 5 : 7 (2) 3 : 5 : 6 (3) 3 : 4 : 5 (4) 7 : 5 : 3

Q.21 An string at 1 m whose one end is at rest, a mass of 100 gm is tied up at free end. String rotates at 2/p round per sec around vertical axis passing through its stationary end. Angle made by string with vertical & linear velocity at body will be respectively (in MKS) -

(1) 52º 14', 3.16 (2) 50º 14', 1.6 (3) 52º 14', 1.6 (4) 50º 14', 3.16

Q.22 A particle revolves in a horizontal circle on smooth plane of a cone kept inverted. Height of plane of circle from vertex of cone is 9.8 cm, speed of particle is -

(1) 9.8 m/s (2) 0.98 m/s (3) 0.098 m/s (4) 98 m/s

Q.23 A car is moving with speed of 200 m/sec on a path of radius 100 m, if speed of car increases by 100 m/sec. in each sec, then total acceleration of the car is -

(1) $100\sqrt{17}$ (2) $10\sqrt{7}$ (3) $10\sqrt{3}$ (4) $100\sqrt{3}$

Q.24 Centripetal acceleration of a particle of mass m on a path of constant radius r at any time t is given by $a_c = k^2rt^2$, where k is constant, then power given to the particle by forces acting on the particle will be -

(1) mk^2t^2r (2) $mk^2r^2t^2$ (3) $m^2k^2t^2r^2$ (4) mk^2r^2t

Q.25 Kinetic energy (T) of a moving particle on a circular path at radius R depends on distance (S) such that $T = as^2$, where a is constant then force acting on particle will be -

(1) $2as\left[1+\frac{s^2}{R^2}\right]^{1/2}$ (2) $\frac{2as}{R}$ (3) $2as\sqrt{s^2+R^2}$ (4) $\sqrt{\frac{2as}{R}}$

Q.26 A stone of mass 0.5 kg is tied up with a string of 1m length and moving in a circular path with speed of 4 m/sec. then tension in the string in newton is -

(1) 2 (2) 8 (3) 0.2 (4) 0.8

Q.27 A stone of mass 1kg is tied up with an unextensible string of length l = 10/3 m. It is rotated in vertical circle of l radius . If ratio of maximum & minimum tension in string is 4 and value of g is 10 m/sec^2 then speed of stone at highest point of circle will be -

(1) 20 m/sec (2) m/sec (3) m/sec (4) 10 m/sec

Q.28 An aeroplane is flying at 100 m/sec, it dives along a vertical circle of radius 200 m. Mass of pilot is 75 kg. What is force on pilot by seat of plane when it is at maximum height -

(1) 300 kg wt (2) 200 kg wt (3) 450 kg wt (4) 100 kg wt

Q.29 When pilot is at lowest point what will be the force in above question -

(1) 450 kg wt (2) 250 kg wt (3) 300 kg wt (4) 100 kg wt

Q.30 A string can with stand a tension of 100 newton without breaking. A body of mass one kg tied up at one end of the string is rotated in a horizontal plane that is -

(1) 10 m/s (2) 1 m/s (3) 100 m/s (4) 1000 m/s

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	1	4	1	1	4	3	2	2	2	1
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	3	2	3	3	2	1	4	2	4	2
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	1	2	1	4	1	2	4	1	1	1