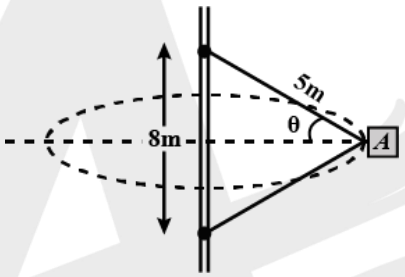
DPP-2

CIRCULAR MOTION

Q.1 A small sphere of mass 200gm is attached to an inextensible string of length 130 cm whose upper end is fixed to the ceiling. The sphere is made to describe a horizontal circle of radius 50 cm. the time period of this conical pendulum OF the string is $2\sqrt{\frac{6}{\beta}}$ sec., then value of βis $(\pi^2 = 10)$

Q.2 A 4 kg block is attached to a vertical rod by means of two strings of equal length. When the system rotates uniformly about the axis of the rod, the strings are extended as shown in figure. If tension in upper and lower chords are 200 newton and 10x newton respectively and angular velocity of particle is $\sqrt{\frac{y}{2}}$ than calculate value of $x + y$.

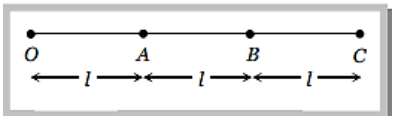


Q.3 A circular road of radius 1000 m has banking angle 45°. The maximum safe speed of a car having mass 2000 kg is $\frac{100\sqrt{k}\,m}{s}$. If the coefficient of friction between tyre and road is 0.5. Then value of k is.

Q.4 A weightless thread can support tension upto 30 N. A stone of mass 0.5 kg is tied to it and is revolved in a circular path of radius 2 m in a vertical plane. If $g = 10\ m/s^2$, find the maximum angular velocity of the stone.

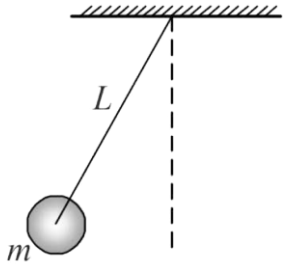
(A) 4rad/5 (B) 5rad/5 (C) 25rad/s (D) 16rad/5

Q.5 Three identical particles are joined together by a thread as shown in figure. All the three particles are moving on a smooth horizontal plane about point O. If the speed of the outermost particle is v_0, then the ratio of tensions in the three sections of the string is : (Assume that the string remains straight)



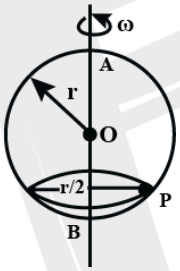
(A) 3: 5: 7 (B) 3: 4: 5 (C) 7: 11: 6 (D) 6: 5: 3

Q.6 A ball of mass m = 0.5 kg is attached to the end of a string having length L = 0.5 m. The ball is rotated on a horizontal circular path about vertical axis. The maximum tension that the string can bear is 324 N. The maximum possible value of angular velocity of ball (in radian/s) is :



(A) 9 (B) 18 (C) 27 (D) 36

Q.7 A smooth wire of length 2πr is bent into a circle and kept in a vertical plane. A bead can slide smoothly on the wire. When the circle is rotating with angular speed ω about the vertical diameter AB, as shown in figure, the bead is at rest with respect to the circular ring at position P as shown. Then the value of ω^2 is equal to :

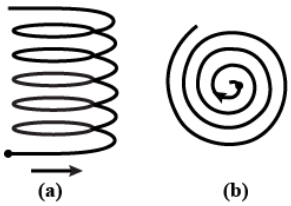


(A) $\frac{2g}{r}$ (B) $\frac{\sqrt{3}g}{2r}$ (C) $\frac{(g\sqrt{3})}{r}$ (D) $\frac{2g}{r\sqrt{3}}$

Q.8 A particle moves along a circle of radius $\left(\frac{20}{\pi}\right)$ m with tangential acceleration of constant magnitude. If the speed of the particle is 80 m/s at the end of the second revolution after motion has begun, the tangential acceleration is:

(A) 160π m/s^2 (B) 40π m/s^2 (C) 40 m/s^2 (D) 640π m/s^2

Q.9 A particle is going with constant speed along a uniform helical and spiral path separately as shown in figure (in case (a), verticle acceleration of particle is negligible)



(A) The velocity of the particle is constant in both cases

(B) The magnitude of acceleration of the particle is constant in both cases

(C) The magnitude of accleration is constant in (a) and decreasing in (b)

(D) The magnitude of accleration is decreasing continuously in both the cases

Q.10 If the radii of circular paths of two particles of same masses are in the ratio of 1: 2, then in order to have same centripetal force, their speeds should be in the ratio of :

(A) 1: 4 (B) 4: 1 (C) $1:\sqrt{2}$ (D) $\sqrt{2}:1$

Q.11 A rod of length L is hinged at one end and it is rotated with a constant angular velocity in a horizontal plane. Let T_1 and T_2 be the tensions at the points L/4 and 3L/4 away from the hinged end.

(A) $T_1 > T_2$

(B) $T_2 > T_1$

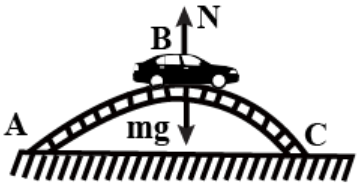
(C) $T_1 = T_2$

(D) The relation between T_1 and T_2 depends on whether the rod rotates clockwise or anticlockwise

Q.12 A particle of mass m is moving with constant velocity $\vec{v}$ on smooth horizontal surface. A constant force $\vec{F}$ starts acting on particle perpendicular to velocity v. Radius of curvature after force F start acting is :

(A) $\frac{mv^2}{F}$ (B) $\frac{mv^2}{F\cos\theta}$ (C) $\frac{mv^2}{F\sin\theta}$ (D) none of these

Q.13 A car is going on an overbridge of radius R, maintaining a constant speed. As the car is descending on the overbridge from point B to C, the normal force on it :



(A) increase (B) decreases

(C) remains constant (D) first increases then decreases.

ANSWER KEY

1.	5	**2.**	(50)	**3.**	(3)	**4.**	(B)	**5.**	(D)		
6.	(D)	**7.**	(D)	**8.**	(C)	**9.**	(C)	**10.**	(C)	**11.**	(A)
12.	(A)	**13.**	(B)								