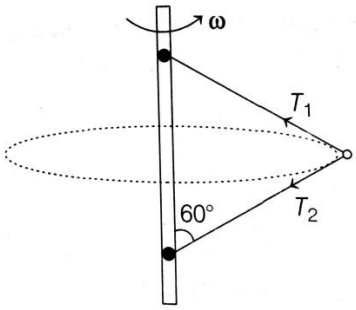
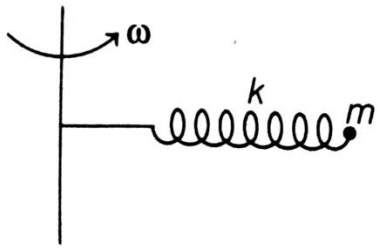
1. A small block is connected to one end of two identical massless strings of length $16\frac{2}{3}$ cm each with their other ends fixed to a vertical ro(d If the ratio of tensions $\frac{T_1}{T_2}$ be 4 : 1, then what will be angular speed ω of the block?

(a) 10 rad/s (b) 14 rad/s (c) 15 rad/s (d) 20 rad/s



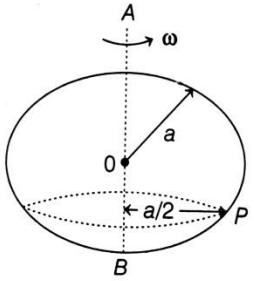
2. A particle of mass m is fixed to one end of a light spring of force constant k and unstretched length l. The system is rotated about the other end of the spring with an angular velocity ω In gravity free space. The increase in length of the spring will be

(a) $\frac{m\omega^2 l}{k}$ (b) $\frac{m\omega^2 l}{k-m\omega^2}$ (c) $\frac{m\omega^2 l}{k+m\omega^2}$ (d) None of these



3. A smooth wire is bent into a vertical circle of radius *(a)* A bead P can slide smoothly on the wire. The circle is rotated about diameter AB as axis with a speed ω as shown in figure. The bead P is at rest with respect to the circular ring in the position shown. Then, ω is equal to A

(a) $\left(\frac{2g}{a}\right)^{1/2}$ (b) $\left(\frac{2g}{\sqrt{3}a}\right)^{1/2}$ (c) $\left(\frac{\sqrt{3}g}{a}\right)^{1/2}$ (d) $\left(\frac{g}{2a}\right)^{1/2}$



4. A train A runs from east to west and another train B of the same mass runs from west to east at the same speed with respect to earth along the equator. Normal force by the track on train A is N1 and that on train B is N_2

(a) $N_1 > N_2$

(b) $N_1 < N_2$

(c) $N_1 = N_2$

(d) the information is insufficient to find the relation between N_1 and N_2.

5. A bead can slide along a straight rod The friction coefficient between them is μ. At a certain moment t = 0, the rod starts rotating about a perpendicular axis passing through its end At this moment, the bead is at distance 'r' from the rotation axis. The space is free of gravity. The angular velocity of the rod at any time t is $\omega = \alpha t^2$, where 'α' is a positive constant. The value of time t when the bead begins to move is

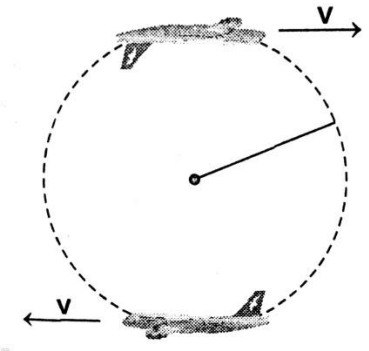
(a) infinite (b) $\left(\frac{4\mu}{\alpha}\right)^{2/3}$ (c) $\left(\frac{\mu}{\alpha}\right)^{1/3}$ (d) $\left(\frac{2\mu}{\alpha}\right)^{1/3}$

6. A body is thrown with the velocity u = 10 m/s at an angle of θ = 37° from the horizontal on a horizontal plane. Find the angular velocity of the body as observed from the point of projection at the time of landing.

(a) $\frac{5}{8}\ rad/s$ (b) $\frac{5}{6}\ rad/s$ (c) $\frac{5}{3}\ rad/s$ (d) None of these

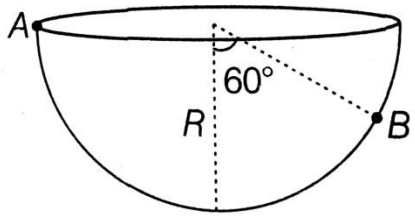
7. A jet travelling at a constant speed of 432 km/h executes a vertical loop with a radius of 500 m. Find the magnitude of the force of the seat on a 70 kg pilot at the top of the loop. ($g = 10\ ms^{-2}$)

(a) 1316 N (b) 2716 N (c) 700 N (d) 2000 N

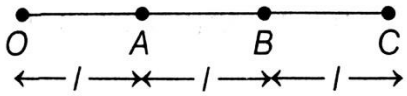


8. A small body A of mass m slides inside a large hemispherical bowl of radius R as shown in figure. If the body starts from rest at the top point A of the hemisphere, find the normal force exerted by the hemisphere on the body when it is at point B of the hemisphere.

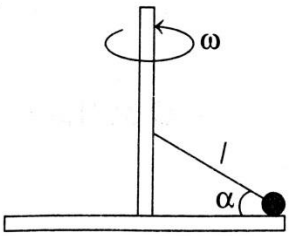
(a) $\frac{mg}{2}$ (b) mg (c) $\frac{3mg}{2}$ (d) 2mg



9. 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) 3 : 5 : 6



10. A circular platform rotates around a vertical axis with angular velocity of 10 rad/s. On the platform is a ball of mass 1 kg, attached to the long axis of the platform by a thin rod of length 10 cm. Find normal force exerted by the ball on the platform (in N). ($\alpha = 30°$) Friction is absent.



11. If angular velocity of a disc depends an angle rotated θ as $\omega = \theta^2 + 2\theta$, then find its angular acceleration α (in rad/s^2) at θ = **1 rad**
12. A body is thrown with a velocity of 10 m/s at an angle of 45° to the horizontal at t = 0. Find the radius of curvature (in m) of its trajectory at t = $\frac{1}{\sqrt{2}}$ s after the body began to move.

13. A stone is projected from level ground at t = 0 s, such that its horizontal and vertical components of initial velocity are 10 m/s and 40 m/s, respectively. Then, find the instant of time at which magnitude of tangential and magnitude of normal components of acceleration of stone are same. (Neglect air resistance) g = 10 m/s^2.

SUBJECT : TOPIC: CURCULAR MOTION TIME: DATE: