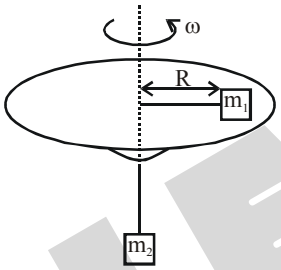
1. A particle performs circular motion of radius 1m from rest. The tangential accelration of the particle at any time t is given by $a_t = t\ ms^{-2}$. The radial acceleration of the particle at t = 2 sec is :-

(A) $1\ ms^{-2}$ (B) $2\ ms^{-2}$ (C) $0.5\ ms^{-2}$ (D) $4\ ms^{-2}$

2. A point moves along the circumference of a circle with a speed $v = \alpha t$. (α is a constant). The acceleration of the particle when it has covered 1/nth of the circumference is _____.

3. A block of mass m_1 kg rests on a horizontal turntable rotating uniformly at ω rad/s. A string attacted to thin block passes through a hole in the centre of the table and supports another block of mass m_2 kg. The coefficient of static friction between the first block and the table is μ. Find the ratio of the maximum and minimum values of R for which the first block does not slide on the turn table [There is no friction between string & table] :-

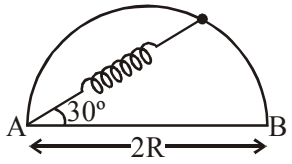


(A) $\frac{m_2}{m_1}$ (B) $\frac{m_2+\mu_s m_1}{m_2-\mu_s m_1}$ (C) $\frac{m_2-\mu_s m_1}{m_2+\mu_s m_1}$ (D) $\frac{m_2+m_1}{m_2-m_1}$

4. An unbanked circular highway curve on level ground makes a turn of 90°. The highway carries traffic at 108 km-hr^{-1}, and the centripetal force on a vehicle is not to exceed $\frac{1}{10}$ of its weight. What is the minimum length of the curve ?

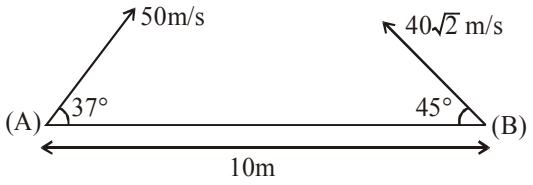
(A) 1.4 km (B) 1 km (C) 0.6 km (D) 1.7 km

5. On a fixed smooth semicircular ring of radius R, one end of a spring of spring constant k and natural length R is attached at end A as shown in the figure. The another end of the spring is fixed to a bead of mass m which can slide without friction on the ring. The bead is placed in such a position that the spring makes angle 30º with diameter AB. Then the acceleration of the bead, when it is released is (The system lies on a horizontal plane)



(A) $\frac{kR}{2m}$ (B) $\frac{kR}{(\sqrt{3}-1)m}$ (C) $\frac{(\sqrt{3}-1)kR}{2m}$ (D) $\frac{kR}{\sqrt{3}m}$

6. For the given situation select the **INCORRECT** statement :-



(A) $\frac{d|\vec{r}_{A/B}|}{dt} = 80$ m/s

(B) Rate of change of angular position of (A) w.r.t (B) is 1rad/sec

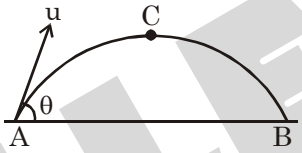
(C) Magnitude of rate of change in position vector of (A) w.r.t (B) is $10\sqrt{65}$ m/s

(D) $\frac{d|\vec{r}_{A/B}|}{dt} = 50 + 40\sqrt{2}$ m/s

7. If r_{min} is radius of curvature of trajectory of a projectile at highest point A, then the radius of curvature r of the trajectory at B where tangent on it forms α angle with vertical is

(A) $\frac{r_{min}}{\cos^3\alpha}$ (B) $\frac{r_{min}}{\cos^2\alpha}$ (C) $\frac{r_{min}}{\sin^3\alpha}$ (D) $\frac{r_{min}}{\sin^2\alpha}$

8. A particle is projected making an angle θ to horizontal as shown in figure :



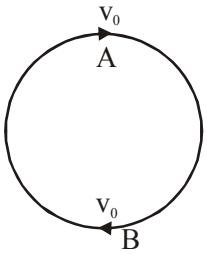
(A) Radius of curvature at highest point is $\frac{u^2\cos^2\theta}{g}$

(B) Normal acceleration is same at A and B in magnitude

(C) Normal acceleration at A is g cos θ.

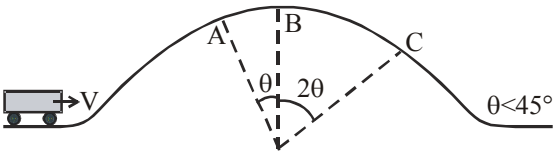
(D) Work done by gravity is zero from A to B.

9. Two particle are moving along a circular path of radius R with velocity v_0 each as shown in figure. For the position shown, the radius of curvature of particle 'A' with respect to particle 'B' is :-



(A) R (B) 2R (C) 3R (D) 4R

10. A self propelled vehicle (assume it as a point mass) runs on a track with constant speed V. It passes through three positions A, B and C on the circular part of the track. Suppose N_A, N_B and N_C are the normal forces exerted by the track on the vehicle when it is passing through points A, B and C respectively then :-



(A) $N_A = N_B = N_C$ (B) $N_B > N_A > N_C$ (C) $N_C > N_A > N_B$ (D) $N_B > N_C > N_A$

N_Race # 36			ANSWER KEY
1. Ans. (D)	**2. Ans.** $\alpha\sqrt{1+\frac{16\pi^2}{n^2}}$	**3. Ans. (B)**	**4. Ans. (A)**
5. Ans. (C)	**6. Ans. (D)**	**7. Ans. (C)**	**8. Ans. (A,B,C,D)**
9. Ans. (B)	**10. Ans. (B)**		