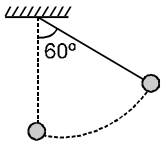
1. Acceleration of a body moving with constant speed in a circle is :

(A) zero (B) $\omega \times r$ (C) $\frac{\omega^2}{r}$ (D) $\omega^2 r$

2. A pendulum of length l = 1 m is released from $\theta_0 = 60^\circ$. The rate of change of speed of the bob at $\theta = 30^\circ$ is ($g = 10\ m/s^2$)



(A) $5\sqrt{3}\ m/s^2$ (B) $5\ m/s^2$ (C) $10\ m/s^2$ (D) $2.5\ m/s^2$

3. A particle is revolving in a circle with increasing its speed uniformly . Which of the following is constant?

(A) Centripetal acceleration (B) Tangential acceleration

(C) Angular acceleration (D) None of these

4. Two particles A and B revolve concentrically in a horizontal plane in the same direction. The time required to complete one revolution for particle A is 3 min. while for particle B is 1 min. The time required for A to make one revolution relative to B is :

(A) 3 min (B) 1 min (C) 1.5 min (D) None of these

5. A particle moves along a circular path of constant radius. The magnitude of its acceleration is

(A) uniform (B) variable

(B) zero (D) such as cannot be predicted from the given information

6. What is angular displacement ? what are its units ? What is the angular displacement of a particle moving in a circle in :

(i) One rotation (ii) Half rotation (iii) Quarter rotation

7. A car goes around a traffic circle in 60 seconds. What is the angular displacement in 10 seconds ? (Give your answer in radians) ? What is the angular velocity in rad/sec.

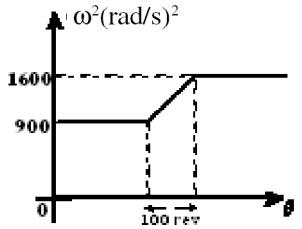
8. Find the angular velocity of the earth around the sun. (Assume it to have a circular path and a non-leap year). Similarly find the angular velocity of the moon (Moon takes 29 days to complete one revolution of earth). Give your answer in rad/sec.

9. A fan rotating at an angular velocity of 20π radian/sec. is switched off. It is observed that the fan stops in 20 seconds. Find the angular deceleration of the fan and the number of revolutions made by it till it stops.

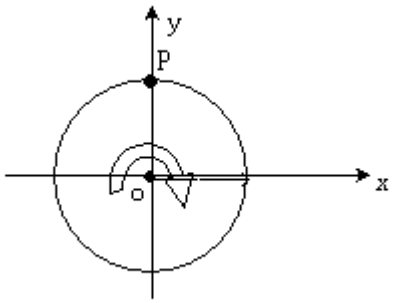
10. If a body moving in a circle of radius 2 m has a velocity of 4 m/s. Find its angular velocity.

11. Find the acceleration of a particle placed on the surface of the earth at equator due to earth's rotation. The diameter of earth = 12800 km. the period of earth's rotation = 24 hrs.

12. The square of the angular velocity ω of a certain wheel increases linearly with the angular displacement during 100 rev of the wheel's motion as shown. Compute the time t required for the increase .



13. A ring of radius 1 m rotates about z axis as shown in figure . The plane of rotation is xy. At a certain instant the acceleration of a particle P (shown in figure) on the ring is, $\vec{a} = -3\hat{i} - 4\hat{j}$ m/s² . At that instant angular acceleration of the ring is _____ & the angular velocity is _____ .



14. A particle starts moving at t = 0 in a circle of radius R = 2 m with constant angular acceleration of α = 3 rad/sec². Initial angular speed of the particle is 1 rad/sec. At the instant when the angle between the acceleration vector and the velocity vector of the particle is 37°, calculate ;

(a) the value of 't' at this moment

(b) magnitude of the acceleration of the particle

(c) distance travelled by the particle upto this moment

15. A stone weighing 50 g tied to one end of the string is to be rotated in a horizontal circle of 1 metre with a speed of 5 ms^{-1}. The centripetal force required to do so is _____.

16. A flywheel makes 600 rpm. The angular speed of any point on the wheel and the linear speed of a point 5 cm from the centre of the wheel are _____.

Answers

RACE # 27

1. (D) **2.** (B) **3.** (C) **4.** (C) **5.** (D) **6.** $2\pi,\ \pi,\ \frac{\pi}{2}$ **7.** $\frac{\pi}{3}\text{rad}, \frac{\pi}{30}\text{rad/s}$

8. $\omega_e = \frac{2\pi}{365\times24\times60\times60}, \omega_m = \frac{2\pi}{29\times24\times60\times60}$ **9.** $\alpha = \pi$ rad/sec^2. 10 revolutions

10. $\omega = \frac{V}{r} = \frac{4}{2} = 2$ rad/sec. **11.** 0.033 m/s^2 **12.** $\frac{40\pi}{7}$ **13.** 3 rad/s^2 , 2 rad/s^2

14. (a) $\frac{1}{6}$sec (b) 7.5 (c) $\frac{5}{12}$ **15.** 1.25 N **16.** 100 π cm s^{-1}