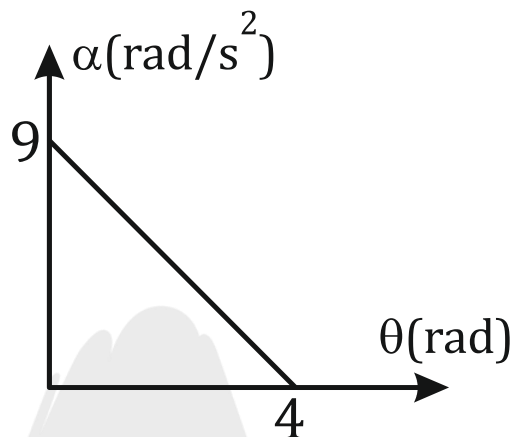


DPP 01

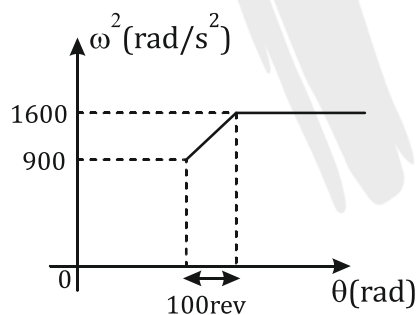
1. A particle starts moving in a non-uniform circular motion and has angular acceleration as shown in the figure. If the angular velocity at the end of  $4\text{rad}$  is given by  $\omega \text{ rad/s}$ , then find the value of  $\omega$ .



2. A particle begins to move with a tangential acceleration of constant magnitude  $0.6 \text{ m/s}^2$  in a circular path. If it slips when its total acceleration becomes  $1 \text{ m/s}^2$ , then the angle through which it would have turned before it starts to slip is  $\frac{\alpha}{\beta}$  radian. The value of  $(\alpha\beta)$  is \_\_\_\_

Type equation here.

3. The square of angular velocity  $\omega$  of a certain wheel increases linearly with the angular displacement  $\theta$  during 100 revolutions of the wheel's motion as shown in the figure. The time  $t$  required for given 100 revolutions is  $\frac{10\alpha\pi}{\beta}$ . The value of  $(\alpha + \beta)$  is \_\_\_\_

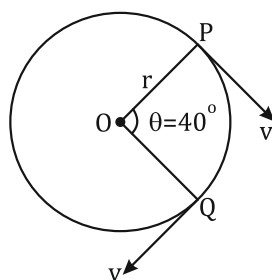


4. In uniform circular motion
- (A) Both velocity and acceleration are constant
  - (B) Acceleration and speed are constant but velocity changes
  - (C) Both acceleration and velocity changes
  - (D) Both acceleration and speed are constant

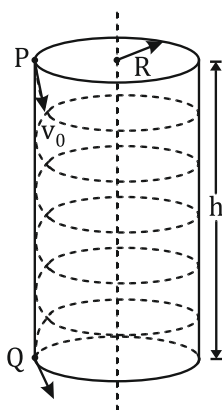
(Physics)

CIRCULAR MOTION

5. A particle is moving on a circular path of radius  $r$  with uniform speed  $v$ . The change in velocity when the particle moves from P to Q is ( $\angle POQ = 40^\circ$ )

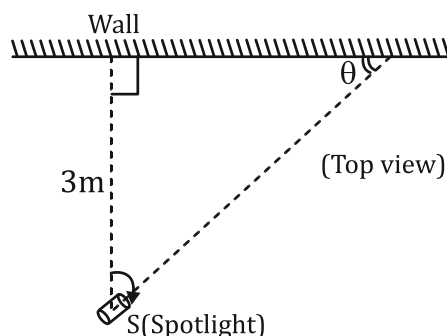


- (A)  $2v \cos 40^\circ$  (B)  $2v \sin 40^\circ$  (C)  $2v \sin 20^\circ$  (D)  $2v \cos 20^\circ$
6. A particle P is moving in a circle of radius 'a' with a uniform speed  $v$ , C is the centre of the circle and AB is a diameter. When passing through B the angular velocity of P about A and C are in the ratio
- (A) 1:1 (B) 1:2 (C) 2:1 (D) 4:1
7. What is the value of linear velocity, if  $\vec{\omega} = 3\hat{i} - 4\hat{j} + \hat{k}$  and  $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$ ?
- (A)  $6\hat{i} + 2\hat{j} - 3\hat{k}$  (B)  $-18\hat{i} - 13\hat{j} + 2\hat{k}$  (C)  $4\hat{i} - 13\hat{j} + 6\hat{k}$  (D)  $6\hat{i} - 2\hat{j} + 8\hat{k}$
8. When a ceiling fan is switched off its angular velocity reduces to 50% while it makes 36 rotations. How many more rotation will it make before coming to rest (Assume uniform angular retardation)?
- (A) 18 (B) 12 (C) 36 (D) 48
9. A hollow vertical cylinder of radius  $R$  and height  $h$  has smooth internal surface. A small particle is placed in contact with the inner side of the upper rim at a point P. It is given a horizontal speed  $v_0$  tangential to rim. It leaves the lower rim at point Q, vertically below P. The number of revolutions made by the particle will

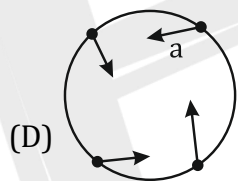
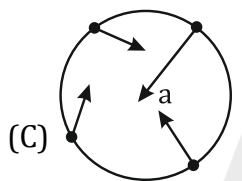
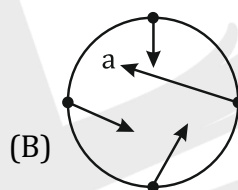
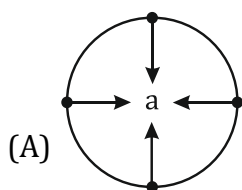


- (A)  $\frac{h}{2\pi R}$  (B)  $\frac{v_0}{\sqrt{2gh}}$  (C)  $\frac{2\pi R}{h}$  (D)  $\frac{v_0}{2\pi R} \left( \sqrt{\frac{2h}{g}} \right)$

10. A spotlight S rotates in a horizontal plane with a constant angular velocity of  $0.1 \text{ rad/s}$ . The spot P of light moves along the wall at a distance 3 m. The velocity of the spot P when  $\theta = 45^\circ$  is  $v \text{ (m/s)}$ . Find  $5v$ .



11. A car speeds up in a circular path. Which of the following figure illustrates the acceleration of the car?



12. A car is travelling with linear velocity  $v$  on a circular road of radius  $r$ . If it is increasing its speed at the rate of ' $a$ ' meter/ $\text{sec}^2$ , then the resultant acceleration will be

(A)  $\sqrt{\left\{\frac{v^2}{r^2} - a^2\right\}}$       (B)  $\sqrt{\left\{\frac{v^4}{r^2} + a^2\right\}}$       (C)  $\sqrt{\left\{\frac{v^4}{r^2} - a^2\right\}}$       (D)  $\sqrt{\left\{\frac{v^2}{r^2} + a^2\right\}}$

13. A particle is moving in a circular path with velocity varying with time as  $v = 1.5t^2 + 2t$ . If 2 cm the radius of circular path, the angular acceleration at  $t = 2 \text{ sec}$  will be

(A)  $4 \text{ rad/sec}^2$       (B)  $40 \text{ rad/sec}^2$       (C)  $400 \text{ rad/sec}^2$       (D)  $0.4 \text{ rad/sec}^2$

ANSWER KEY

- |     |     |     |     |     |     |    |     |    |     |     |     |
|-----|-----|-----|-----|-----|-----|----|-----|----|-----|-----|-----|
| 1.  | 6   | 2.  | 6   | 3.  | 11  |    |     |    |     |     |     |
| 4.  | (C) | 5.  | (C) | 6.  | (B) | 7. | (B) | 8. | (B) | 9.  | (D) |
| 11. | (B) | 12. | (B) | 13. | (C) |    |     |    |     | 10. | 3   |

