

# NEET MOTION IN A PLANE — UNIFORM CIRCULAR MOTION (ANGULAR VELOCITY, CENTRIPETAL ACCELERATION) — PYQS

Max. Marks: 52

Questions: 13

## Section A (MCQ) — 13 questions

**Q.1** A particle moving with uniform speed in a circular path maintains: [NEET (UG) 2024]

- (1) Constant velocity
- (2) Constant acceleration
- (3) Constant velocity but varying acceleration
- (4) Varying velocity and varying acceleration

Scan or tap for the full solution



**Q.2** Let  $\omega_1$ ,  $\omega_2$  and  $\omega_3$  be the angular speed of the second hand, minute hand and hour hand of a smoothly running analog clock, respectively. If  $x_1$ ,  $x_2$  and  $x_3$  are their respective angular distances in 1 minute then the factor which remains constant (k) is [RE-NEET (UG) 2024]

- (1)  $\frac{\omega_1}{x_1} = \frac{\omega_2}{x_2} = \frac{\omega_3}{x_3} = k$
- (2)  $\omega_1 x_1 = \omega_2 x_2 = \omega_3 x_3 = k$
- (3)  $\omega_1 x_1^2 = \omega_2 x_2^2 = \omega_3 x_3^2 = k$
- (4)  $\omega_1^2 x_1 = \omega_2^2 x_2 = \omega_3^2 x_3 = k$

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**Q.3** Two particles A and B are moving in uniform circular motion in concentric circles of radii  $r_A$  and  $r_B$  with speed  $v_A$  and  $v_B$  respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be : [NEET (UG) 2019]

- (1)  $v_A : v_B$
- (2) 1:1
- (3)  $r_B : r_A$
- (4)  $r_A : r_B$

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**Q.4** A particle moves so that its position vector is given by  $\vec{r} = \cos \omega t \hat{x} + \sin \omega t \hat{y}$ , where  $\omega$  is a constant. Which of the following is true?

[NEET 2016 (Phase 1)]

- (1) Velocity is perpendicular to  $\vec{r}$  and acceleration is directed towards the origin.
- (2) Velocity is perpendicular to  $\vec{r}$  and acceleration is directed away from the origin.
- (3) Velocity and acceleration both are perpendicular to  $\vec{r}$
- (4) Velocity and acceleration both are parallel to  $\vec{r}$

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**Q.5** A particle of mass 10 g moves along a circle of radius 6.4 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to  $8 \times 10^{-4}$  J by the end of the second revolution after the beginning of the motion?

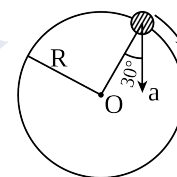
[NEET 2016 (Phase 1)]

- (1) 0.18 m/s<sup>2</sup>
- (2) 0.2 m/s<sup>2</sup>
- (3) 0.1 m/s<sup>2</sup>
- (4) 0.15 m/s<sup>2</sup>

Scan or tap for the full solution



**Q.6** In the given figure,  $a = 15 \text{ m s}^{-2}$  represents the total acceleration of particle moving in the clockwise direction in a circle of radius  $R = 2.5 \text{ m}$  at a given instant of time. The speed of the particle is [NEET 2016 (Phase 2)]



- (1) 4.5 m s<sup>-1</sup>
- (2) 5.0 m s<sup>-1</sup>
- (3) 5.7 m s<sup>-1</sup>
- (4) 6.2 m s<sup>-1</sup>

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**Q.7** The position vector of a particle  $\vec{R}$  as a function of time is given by  $\vec{R} = 4\sin(2\pi t)\hat{i} + 4\cos(2\pi t)\hat{j}$ . Where R is in meters, t is in seconds and  $\hat{i}$  and  $\hat{j}$  denote unit vectors along x-and y-directions, respectively. Which one of the following statements is wrong for the motion of particle? [AIPMT 2015]

- (1) Magnitude of the velocity of particle is 8 meter/second.  
 (2) Path of the particle is a circle of radius 4 meter.  
 (3) Acceleration vector is along  $-\vec{R}$ .  
 (4) Magnitude of acceleration vector is  $\frac{v^2}{R}$  where  $v$  is the velocity of particle.

Scan or tap for the full solution



- Q.8** A particle moves in a circle of radius 5 cm with constant speed and time period  $0.2\pi$  s. The acceleration of the particle is [AIPMT 2011 (Prelims)]  
 (1)  $15 \text{ m/s}^2$  (2)  $25 \text{ m/s}^2$  (3)  $36 \text{ m/s}^2$  (4)  $5 \text{ m/s}^2$

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- Q.9** A particle moves in x-y plane according to rule  $x = a \sin \omega t$  and  $y = a \cos \omega t$ . The particle follows

[AIPMT 2010 (Mains)]

- (1) an elliptical path  
 (2) a circular path  
 (3) a parabolic path  
 (4) a straight line path inclined equally to x and y-axes

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- Q.10** A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 seconds for every circular lap. The average velocity and average speed for each circular lap respectively is [AIPMT 2006]

- (1) 10 m/s, 0 (2) 0, 0  
 (3) 0, 10 m/s (4) 10 m/s, 10 m/s.

Scan or tap for the full solution



- Q.11** A stone tied to the end of a string of 1 m long is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolutions in 44 seconds, what is the magnitude and direction of acceleration of the stone? [AIPMT 2005]

- (1)  $\pi^2 \text{ m s}^{-2}$   
 and direction along the radius towards the centre  
 (2)  $\pi^2 \text{ m s}^{-2}$   
 and direction along the radius away from the centre  
 (3)  $\pi^2 \text{ m s}^{-2}$   
 and direction along the tangent to the circle  
 (4)  $\pi^2/4 \text{ m s}^{-2}$   
 and direction along the radius towards the centre.

Scan or tap for the full solution



- Q.12** A particle moves along a circle of radius  $\left(\frac{20}{\pi}\right) \text{ m}$  with constant tangential acceleration. If the velocity of the particle is 80 m/s at the end of the second revolution after motion has begun, the tangential acceleration is [AIPMT 2003]  
 (1)  $40 \text{ m/s}^2$  (2)  $640\pi \text{ m/s}^2$   
 (3)  $160\pi \text{ m/s}^2$  (4)  $40\pi \text{ m/s}^2$

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- Q.13** Two particles having mass  $M$  and  $m$  are moving in a circular path having radius  $R$  and  $r$ . If their time periods are the same, then the ratio of their angular velocities will be [AIPMT 2001]

- (1)  $\frac{r}{R}$  (2)  $\frac{R}{r}$  (3) 1 (4)  $\sqrt{\frac{R}{r}}$

Scan or tap for the full solution



### ANSWER KEY

| Ques. | 1  | 2  | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|-------|----|----|---|---|---|---|---|---|---|----|----|
| Ans.  | 4  | 1  | 2 | 1 | 3 | 3 | 1 | 4 | 2 | 3  | 1  |
| Ques. | 12 | 13 |   |   |   |   |   |   |   |    |    |
| Ans.  | 1  | 3  |   |   |   |   |   |   |   |    |    |