

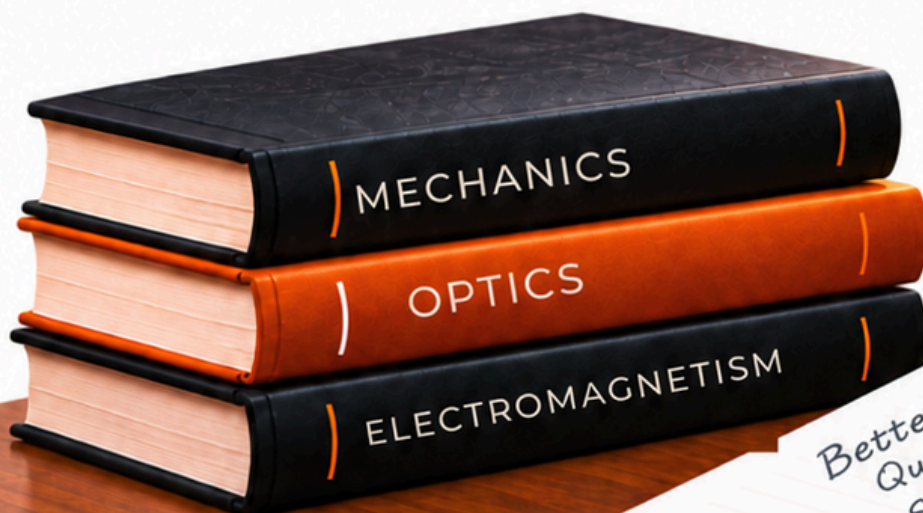
JEE Main Physics

Uniform circular motion PYQ

$$F = ma$$



$$v = u + at$$



Better
Questions
Stronger
Concepts
Brighter Future

Subject: Physics

Years: 2024-2004

Total Questions: 14

About this PYQ collection

What is inside

A complete topic-wise set of **14 previous year questions** on **Uniform circular motion** from **JEE Main (2024-2015)** and its predecessor **AIEEE (2012-2004)**, across **10 exam years**. **10 questions** are from 2019 onwards, so most of the set reflects the recent NTA pattern.

Questions are arranged to reduce unused page space, with newest-first priority and continuous numbering from 1. Each carries an exam date and shift tag to trace the original paper.

Topic-wise questions

TOPIC	QS	%
Uniform circular motion	14	100%

Question types

TYPE	QS	%
Single-correct MCQ	13	93%
Numerical value	1	7%

Numerical-value questions have no options; this question is from 2023 onwards.

How these questions help you

- **Know where the marks are:** uniform circular motion make up **14 of 14 questions (about 100%)**.
- **Build speed and accuracy:** practice the concepts and question styles used in previous papers.
- **Learn the patterns:** the same question styles return year after year.
- **Strengthen other chapters:** these concepts support further study in Physics.

Questions – Uniform circular motion

1. A clock has 75 cm, 60 cm long second hand and minute hand respectively. In 30 minutes duration the tip of second hand will travel x distance more than the tip of minute hand. The value of x in meter is nearly (Take $\pi = 3.14$) : (8 Apr 2024 | Shift 1)
- (A) 118.9 (B) 140.5
(C) 139.4 (D) 220.0
-
2. A man carrying a monkey on his shoulder does cycling smoothly on a circular track of radius 9 m and completes 120 revolutions in 3 minutes. The magnitude of centripetal acceleration of monkey is (in m/s^2) : (5 Apr 2024 | Shift 2)
- (A) $4\pi^2 \text{ ms}^{-2}$ (B) $16\pi^2 \text{ ms}^{-2}$
(C) $57600\pi^2 \text{ ms}^{-2}$ (D) Zero
-
3. A particle is moving with constant speed in a circular path. When the particle turns by an angle 90° , the ratio of instantaneous velocity to its average velocity is $\pi : x\sqrt{2}$. The value of x will be - (6 Apr 2023 | Shift 1)
- (A) 1 (B) 7
(C) 5 (D) 2
-
4. A stone tied to 180 cm long string at its end is making 28 revolutions in horizontal circle in every minute. The magnitude of acceleration of stone is $\frac{1936}{x} \text{ ms}^{-2}$. The value of x _____. (Take $\pi = \frac{22}{7}$) (30 Jan 2023 | Shift 2)
-
5. An object moves at a constant speed along a circular path in a horizontal plane with center at the origin. When the object is at $x = +2 \text{ m}$, its velocity is $-4\hat{j} \text{ m/s}$. The object's velocity (v) and acceleration (a) at $x = -2 \text{ m}$ will be (29 Jan 2023 | Shift 2)
- (A) $v = 4\hat{i} \text{ m/s}, a = 8\hat{j} \text{ m/s}^2$ (B) $v = 4\hat{j} \text{ m/s}, a = 8\hat{i} \text{ m/s}^2$
(C) $v = -4\hat{i} \text{ m/s}, a = -8\hat{j} \text{ m/s}^2$ (D) $v = -4\hat{j} \text{ m/s}, a = 8\hat{i} \text{ m/s}^2$

6. For a particle in uniform circular motion, the acceleration $\vec{a}$ at any point P(R, θ) on the circular path of radius R is (when θ is measured from the positive x-axis and v is uniform speed) :

(25 Jun 2022 | Shift 2)

- (A) $-\frac{v^2}{R} \sin \theta \hat{i} + \frac{v^2}{R} \cos \theta \hat{j}$ (B) $-\frac{v^2}{R} \cos \theta \hat{i} + \frac{v^2}{R} \sin \theta \hat{j}$
(C) $-\frac{v^2}{R} \cos \theta \hat{i} - \frac{v^2}{R} \sin \theta \hat{j}$ (D) $-\frac{v^2}{R} \hat{i} + \frac{v^2}{R} \hat{j}$
-

7. A huge circular arc of length 4.4 ly subtends an angle '4s' at the centre of the circle. How long it would take for a body to complete 4 revolution if its speed is 8 AU per second?

Given : 1 ly = 9.46×10^{15} m

1 AU = 1.5×10^{11} m

(27 Aug 2021 | Shift 1)

- (A) 4.1×10^8 s (B) 4.5×10^{10} s
(C) 3.5×10^6 s (D) 7.2×10^8 s
-

8. A clock has a continuously moving second's hand of 0.1 m length. The average acceleration of the tip of the hand (in units of ms^{-2}) is of the order of :

(6 Sept 2020 | Shift 1)

- (A) 10^{-3} (B) 10^{-1}
(C) 10^{-2} (D) 10^{-4}
-

9. A particle moves such that its position vector $\vec{r}(t) = \cos \omega t \hat{i} + \sin \omega t \hat{j}$ where ω is a constant and t is time. Then which of the following statements is true for the velocity $\vec{v}(t)$ and acceleration $\vec{a}(t)$ of the particle :

(8 Jan 2020 | Shift 2)

- (A) $\vec{v}$ and $\vec{a}$ both are perpendicular to $\vec{r}$ (B) $\vec{v}$ and $\vec{a}$ both are parallel to $\vec{r}$
(C) $\vec{v}$ is perpendicular to $\vec{r}$ and $\vec{a}$ is directed towards the origin (D) $\vec{v}$ is perpendicular to $\vec{r}$ and $\vec{a}$ is directed away from the origin
-

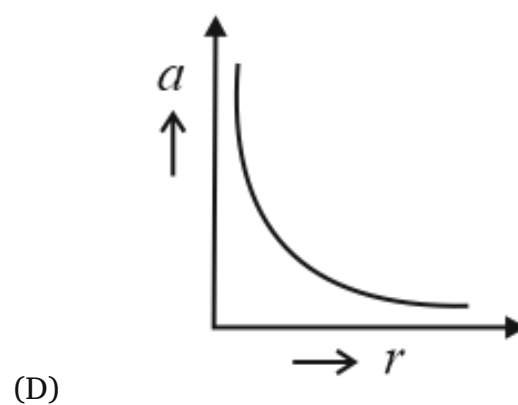
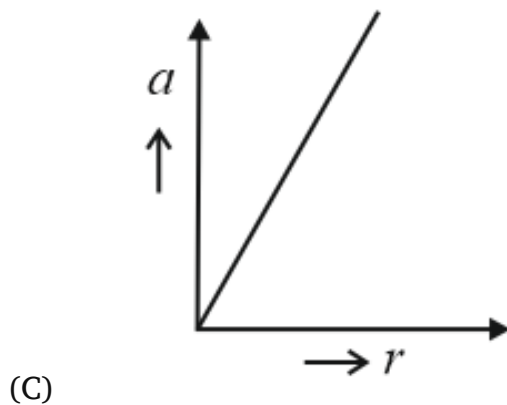
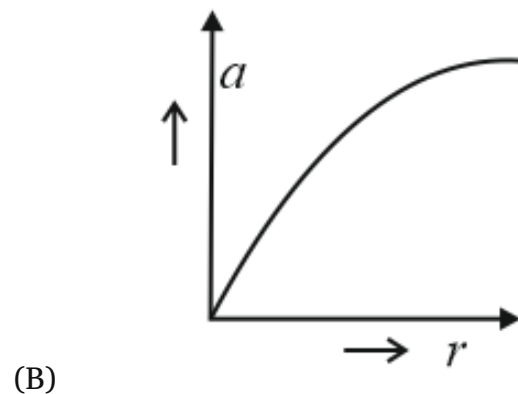
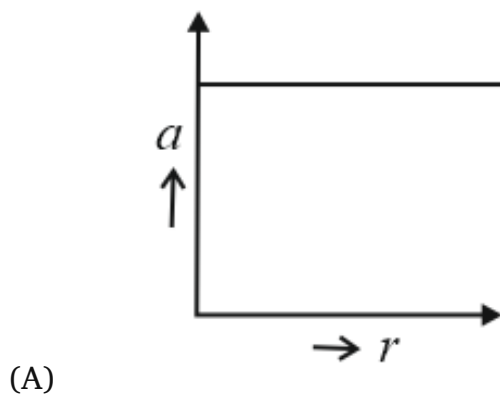
10. A particle is moving along a circular path with a constant speed of 10 ms^{-1} . What is the magnitude of the change in velocity of the particle, when it moves through an angle of 60° around the centre of the circle?

(11 Jan 2019 | Shift 1)

- (A) zero (B) 10 m/s
(C) $10\sqrt{2} \text{ m/s}$ (D) $10\sqrt{3} \text{ m/s}$
-

11. If a body moving in a circular path maintains constant speed of 10 m s^{-1} , then which of the following correctly describes the relation between acceleration and radius?

(10 Apr 2015 | Single slot)



12. Two cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 , respectively. Their speeds are such that they make complete circles in the same time t . The ratio of their centripetal acceleration is

(29 Apr 2012 | Single sitting)

- (A) $m_1 r_1 : m_2 r_2$ (B) $m_1 : m_2$
(C) $r_1 : r_2$ (D) $1 : 1$

13. For a particle in uniform circular motion the acceleration $\vec{a}$ at a point $P(R, \theta)$ on the circle of radius R is (here θ is measured from the x-axis)

(25 Apr 2010 | Single sitting)

- (A) $-\frac{v^2}{R} \cos \theta \hat{i} + \frac{v^2}{R} \sin \theta \hat{j}$ (B) $-\frac{v^2}{R} \sin \theta \hat{i} + \frac{v^2}{R} \cos \theta \hat{j}$
(C) $-\frac{v^2}{R} \cos \theta \hat{i} - \frac{v^2}{R} \sin \theta \hat{j}$ (D) $\frac{v^2}{R} \hat{i} + \frac{v^2}{R} \hat{j}$

14. Which of the following statements is **FALSE** for a particle moving in a circle with a constant angular speed? (23 May 2004 | Single sitting)

- | | |
|---|--|
| (A) The velocity vector is tangent to the circle. | (B) The acceleration vector is tangent to the circle. |
| (C) The acceleration vector points to the centre of the circle. | (D) The velocity and acceleration vectors are perpendicular to each other. |