AIPMT 2006

1. A tube of length L is filled completely with an incompressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is :–

(1) $\frac{ML\omega^2}{2}$ (2) $\frac{ML^2\omega}{2}$

(3) $ML\omega^2$ (4) $\frac{ML^2\omega^2}{2}$

2. 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 :-

(1) 0,0 (2) 0, 10 m/s

(3) 10 m/s, 10 m/s (4) 10 m/s, 0

AIPMT 2008

3. A roller coaster is designed such that riders experience "weightlessness" as they go round the top of a hill whose radius of curvature is 20 m. The speed of the car at the top of the hill is between. ($g = 10\ m/s^2$)

(1) 16 m/s and 17 m/s

(2) 13 m/s and 14 m/s

(3) 14 m/s and 15 m/s

(4) 15 m/s and 16 m/s

AIPMT (Pre) 2010

4. A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if :-

(1) $r \geq \frac{\mu g}{\omega^2}$ (2) $r = \mu g\omega^2$

(3) $r < \frac{\omega^2}{\mu g}$ (4) $r \leq \frac{\mu g}{\omega^2}$

AIPMT 2011

5. A particle moves in a circle of radius 5 cm with constant speed and time period 0.2π s. The acceleration of the particle is :-

(1) 15 m/s^2 (2) 25 m/s^2

(3) 36 m/s^2 (4) 5 m/s^2

AIPMT (Pre) 2012

6. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is :-

(1) 5 m/s (2) 10 m/s

(3) 20 m/s (4) 30 m/s

AIPMT (Mains) 2012

7. A car of mass m is moving on a level circular track of radius R. If μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by :-

(1) $\sqrt{mRg/\mu_s}$ (2) $\sqrt{\mu_s Rg}$

(3) $\sqrt{\mu_s mRg}$ (4) $\sqrt{Rg/\mu_s}$

Re-AIPMT 2015

8. Two stones of masses m and 2 m are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and the lighter one in radius r. The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is :

(1) 1 (2) 2 (3) 3 (4) 4

9. 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 ?

(1) Path of the particle is a circle of radius 4 meter

(2) Acceleration vectors is along $-\vec{R}$

(3) Magnitude of acceleration vector is $\frac{v^2}{R}$ where v is the velocity of particle.

(4) Magnitude of the velocity of particle is 8 meter/second

NEET-I 2016

10. 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 8×10^{-4} J by the end of the second revolution after the beginning of the motion?

(1) 0.1 m/s^2 (2) 0.15 m/s^2
(3) 0.18 m/s^2 (4) 0.2 m/s^2

11. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop ?

(1) $\sqrt{gR}$ (2) $\sqrt{2gR}$
(3) $\sqrt{3gR}$ (4) $\sqrt{5gR}$

12. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is:-

(1) $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (2) $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
(3) $\sqrt{\frac{g}{R}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (4) $\sqrt{\frac{g}{R^2}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

NEET-II 2016

13. In the given figure, a = 15 m/s^2 represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5 m at a given instant of time. The speed of the particle is :-

(1) 5.7 m/s (2) 6.2 m/s
(3) 4.5 m/s (4) 5.0 m/s

14. A particle moves so that its position vector is given by $\vec{r}=\cos\omega t\,\hat{x}+\sin\omega t\,\hat{y}$. Where ω is a constant.

Which of the following is true ?

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

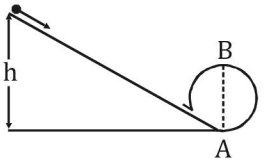
NEET(UG) 2017

15. One end of string of length l is connected to a particle of mass 'm' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed 'v' the net force on the particle (directed towards centre) will be (T represents the tension in the string) :-

(1) $T+\frac{mv^2}{l}$ (2) $T-\frac{mv^2}{l}$
(3) Zero (4) T

NEET(UG) 2018

16. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter AB = D. The height h is equal to :-



(1) $\frac{3}{2}$D (2) D
(3) $\frac{7}{5}$D (4) $\frac{5}{4}$D

NEET(UG) 2019

17. A block of mass 10 kg is in contact against the inner wall of a hollow cylindrical drum of radius 1m. The coefficient of friction between the block and the inner wall of the cylinder is 0.1. The minimum angular velocity needed for the cylinder to keep the block stationary when the cylinder is vertical and rotating about its axis, will be : (g = 10 m/s^2)

(1) $\sqrt{10}$ rad/s (2) $\frac{10}{2\pi}$ rad/s
(3) 10 rad/s (4) 10π rad/s

18. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when :
(1) the mass is at the highest point
(2) the wire is horizontal
(3) the mass is at the lowest point
(4) inclined at an angle of 60° from vertical

19. Two particles A and B are moving in uniform circular motion in concentric circles of radius r_A and r_B with speed υ_A and υ_B respectively. The time period of rotation is the same. The ratio of angular speed of A to that of B will be :
(1) $r_A : r_B$ (2) $\upsilon_A : \upsilon_B$
(3) $r_B : r_A$ (4) 1 : 1

NEET(UG) 2019 (Odisha)

20. A particle starting from rest, moves in a circle of radius 'r'. It attains a velocity of V_0 m/s in the n^{th} round. Its angular acceleration will be :-
(1) $\frac{V_0}{n}\text{rad}/s^2$ (2) $\frac{V_0^2}{2\pi nr^2}\text{rad}/s^2$
(3) $\frac{V_0^2}{4\pi nr^2}\text{rad}/s^2$ (4) $\frac{V_0^2}{4\pi nr}\text{rad}/s^2$

NEET(UG) 2020 (COVID-19)

21. The angular speed of the wheel of a vehicle is increased from 360 rpm to 1200 rpm in 14 second. Its angular acceleration is
(1) 2π rad/s^2 (2) 28π rad/s^2
(3) 120π rad/s^2 (4) 1 rad/s^2

22. A point mass 'm' is moved in a vertical circle of radius 'r' with the help of a string. The velocity of the mass is $\sqrt{7gr}$ at the lowest point. The tension in the string at the lowest point is :
(1) 6 mg (2) 7 mg
(3) 8 mg (4) 1 mg

NEET(UG) 2022

23. The angular speed on a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration in rad/s^2 is :
(1) 4π (2) 12π
(3) 104π (4) 2π

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	2	3	4	4	4	2	2	4	1	4	2	1	3	4
Question	16	17	18	19	20	21	22	23							
Answer	4	3	3	4	3	1	3	1							

1. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In circular motion, work done by the centripetal force is always zero.

Reason (R) : Centripetal force is always perpendicular to the instantaneous displacement.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

2. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In uniform circular motion speed of body is constant but its velocity is variable.

Reason (R) : In uniform circular motion tangential acceleration of body is zero, but body has normal acceleration

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

3. For a body moving in a circular path of radius R = 1m in anticlockwise direction with constant speed V.

	Column-I		**Column-II**
(A)	Angle between instantaneous velocity and instantaneous acceleration	(P)	Non-zero
(B)	Total acceleration of the body	(Q)	Zero
(C)	Tangential acceleration of the body	(R)	$\pi/2$
		(S)	$\pi/3$

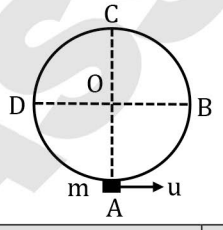
(1) A $\rightarrow$ R, B $\rightarrow$ P, C $\rightarrow$ Q

(2) A $\rightarrow$ P, B $\rightarrow$ Q, C $\rightarrow$ R

(3) A $\rightarrow$ Q, B $\rightarrow$ R, C $\rightarrow$ P

(4) A $\rightarrow$ R, B $\rightarrow$ Q, C $\rightarrow$ P

4. A particle suspended from a string of length ℓ is given a horizontal speed $u = 3\sqrt{g\ell}$ at the bottom. Then for the particle match the following column –



	Column-I		**Column-II**
(A)	Speed at B	(P)	7 mg
(B)	Speed at C	(Q)	$\sqrt{5g\ell}$
(C)	Tension in string at B	(R)	$\sqrt{7g\ell}$
(D)	Tension in string at C	(S)	4 mg

(1) A $\rightarrow$ R, B $\rightarrow$ Q, C $\rightarrow$ P, D $\rightarrow$ S

(2) A $\rightarrow$ R, B $\rightarrow$ P, C $\rightarrow$ Q, D $\rightarrow$ S

(3) A $\rightarrow$ P, B $\rightarrow$ Q, C $\rightarrow$ S, D $\rightarrow$ R

(4) A $\rightarrow$ Q, B $\rightarrow$ P, C $\rightarrow$ S, D $\rightarrow$ R

5. A body is connected to a string of length r and revolved in vertical circle with one end of string as the centre of circle. Its velocity at bottom most point v_L is twice that of its value v_H at the top most point. Then

Choose correct statement -

(A) Velocity at highest point is $\sqrt{4gr/3}$

(B) $v_L^2 - v_H^2$ is equal to 4gr

(C) Tension in string at bottom most point is 6 mg

(D) Ratio of maximum tension to minimum tension in string is 10/9

(1) A & C (2) A & B

(3) B & D (4) B & C

6. Speed of a body moving in a circular path changes with time as v = 2t, then –
(A) Magnitude of acceleration remains constant
(B) Magnitude of acceleration increases
(C) Angle between velocity and acceleration remains constant
(D) Angle between velocity and acceleration increases
(1) A & C (2) A & D
(3) B & C (4) B & D

7. A car of mass M is moving on a horizontal circular path of radius r. At an instant its speed is v and is increasing at a rate 'a' . Choose correct statements
(A) the acceleration of the car is towards the centre of the path
(B) the magnitude of the frictional force on the car is greater than mv^2/r
(C) magnitude of its net acceleration will remain constant
(D) magnitude of its net acceleration will be varying with time
(1) A, B & C (2) A, B & D
(3) B & C (4) B & D

8. A person applies a constant force $\vec{F}$ on a particle of mass m and finds that the particle moves in a circle of radius r with a uniform speed v.
Choose correct statements
(A) this is not possible
(B) there are other forces also on the particle
(C) the resultant of other forces is mv^2/r towards centre
(D) the resultant of the other forces varies in magnitude as well as direction
(1) B, C (2) only A
(3) B, D (4) All are correct

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8
Answer	1	1	1	1	2	4	4	3