Exercise - I (Conceptual Questions) Build Up Your Understanding

KINEMATICS OF CIRCULAR MOTION

1. A particle of mass 'm' describes a circle of radius (r). The centripetal acceleration of the particle is $\frac{4}{r^2}$. The momentum of the particle :–

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

PCM001

2. A particle is moving around a circular path with uniform angular speed (ω). The radius of the circular path is (r). The acceleration of the particle is :–

(1) $\frac{\omega^2}{r}$ (2) $\frac{\omega}{r}$ (3) vω (4) vr

PCM002

3. A car moves on a circular road, describing equal angles about the centre in equal intervals of times. Which of the statements about the velocity of car is true :–

(1) velocity is constant
(2) magnitude of velocity is constant but the direction of velocity change
(3) both magnitude and direction of velocity change
(4) velocity is directed towards the centre of circle

PCM003

4. An insect trapped in a circular groove of radius 12 cm moves along the groove steadily and completes 7 revolutions in 100 s. What is the linear speed of the motion :–

(1) 2.3 cm/s (2) 5.3 cm/s
(3) 0.44 cm/s (4) none of these

PCM004

5. A particle moves in a circle of the radius 25 cm at two revolutions per second. The acceleration of the particle in m/sec^2 is :–

(1) π^2 (2) $8\pi^2$
(3) $4\pi^2$ (4) $2\pi^2$

PCM005

6. A particle moves in a circle describing equal angle in equal times, its velocity vector :–

(1) remains constant
(2) change in magnitude
(3) change in direction
(4) changes in magnitude and direction

PCM006

7. A mass of 2 kg is whirled in a horizontal circle by means of a string at an initial speed of 5 r.p.m. Keeping the radius constant the tension in the string is doubled. The new speed is nearly :–

(1) 7 r.p.m. (2) 14 r.p.m.
(3) 10 r.p.m. (4) 20 r.p.m.

PCM007

8. A particle moving along a circular path. The angular velocity, linear velocity, angular acceleration and centripetal acceleration of the particle at any instant respectively are $\vec{\omega}$, $\vec{v}$, $\vec{\alpha}$, $\vec{a}_c$. Which of the following relation is/are correct:–

(a) $\vec{\omega} \perp \vec{v}$ (b) $\vec{\omega} \perp \vec{\alpha}$
(c) $\vec{v} \perp \vec{a}_c$ (d) $\vec{\omega} \perp \vec{a}_c$

(1) a,b,d (2) b,c,d (3) a,b,c (4) a,c,d

PCM008

9. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion of the particle takes place in a plane. It follows, that :–

(1) its velocity is constant
(2) its K.E. is constant
(3) its acceleration is constant
(4) it moves in a straight line

PCM009

10. If the equation for the displacement of a particle moving on a circular path is given by $(\theta) = 2t^3 + 0.5$, where θ is in radians and t in seconds, then the angular velocity of the particle after 2 s from its start is :–

(1) 8 rad/s (2) 12 rad/s
(3) 24 rad/s (4) 36 rad/s

PCM010

11. A sphere of mass m is tied to end of string of length ℓ and rotated through the other end along a horizontal circular path with speed v. The work done in full horizontal circle is :-

(1) 0 (2) $\left(\frac{mv^2}{\ell}\right).2\pi\ell$

(3) $mg.2\pi\ell$ (4) $\left(\frac{mv^2}{\ell}\right).\ell$

PCM011

12. A body moves with constant angular velocity on a circle. Magnitude of angular acceleration :-

(1) $r\omega^2$ (2) Constant

(3) Zero (4) None of the above

PCM012

13. A particle of mass (m) revolving in horizontal circle of radius (R) with uniform speed v. When particle goes from one end to other end of diameter, then:-

(1) K.E. changes by $\frac{1}{2}mv^2$

(2) K.E. change by mv^2

(3) no change in momentum

(4) change in momentum is 2 mv

PCM013

14. A stone is tied to one end of string 50 cm long and is whirled in a horizontal circle with constant speed. If the stone makes 10 revolutions in 20 s, then what is the magnitude of acceleration of the stone:-

(1) 493 cm/s^2 (2) 720 cm/s^2

(3) 860 cm/s^2 (4) 990 cm/s^2

PCM014

15. For a particle in a non-uniform accelerated circular motion :–

(1) velocity is radial and acceleration is tangential only

(2) velocity is tangential and acceleration is radial only

(3) velocity is radial and acceleration has both radial and tangential components

(4) velocity is tangential and acceleration has both radial and tangential components

PCM015

16. The angular velocity of a particle rotating in a circular orbit 100 times per minute is

(1) 1.66 rad / s (2) 10.47 rad / s

(3) 10.47 degree / s (4) 60 degree / s

PCM016

17. Two particles having mass 'M' and 'm' are moving in a circular path having radius R and r. If their time period are same then the ratio of angular velocity will be :–

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

PCM017

18. Angular velocity of minute hand of a clock is :–

(1) $\frac{\pi}{30}$ rad/s (2) 8π rad/s

(3) $\frac{2\pi}{1800}$ rad/s (4) $\frac{\pi}{1800}$ rad/s

PCM018

19. A car moving with speed 30 m/s on a circular path of radius 500 m. Its speed is increasing at the rate of $2m/s^2$. The acceleration of the car is :–

(1) 9.8 m/s^2 (2) 1.8 m/s^2

(3) 2 m/s^2 (4) 2.7 m/s^2

PCM019

20. If a particle is rotating uniformly in a horizontal circle, then –

(1) no force is acting on particle

(2) velocity of particle is constant

(3) particle has no acceleration

(4) no work is done

PCM020

21. A body of mass 1 kg tied to one end of string is revolved in a horizontal circle of radius 0.1 m with a speed of 3 revolution/sec, assuming the effect of gravity is negligible, then linear velocity, acceleration and tension in the string will be :–

(1) 1.88 m/s, 35.5 m/s^2, 35.5 N

(2) 2.88 m/s, 45.5 m/s^2, 45.5 N

(3) 3.88 m/s, 55.5 m/s^2, 55.5 N

(4) None of these

PCM021

22. A particle moves along a circle of radius $\left(\frac{20}{\pi}\right)$ 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 :–

(1) 40 m/s^2 (2) 640 π m/s^2

(3) 160 π m/s^2 (4) 40 π m/s^2

PCM022

23. The angular velocity of a wheel is 70 rad/s. If the radius of the wheel is 0.5 m, then linear velocity of the wheel is :–

(1) 70 m/s (2) 35 m/s

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

PCM023

24. A stone tied to the end of a string of 1m long is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolution in 44 seconds, what is the magnitude and direction of acceleration of the stone :–

(1) π^2 m/s^2 and direction along the tangent to the circle.

(2) π^2 m/s^2 and direction along the radius towards the centre.

(3) $\frac{\pi^2}{4}$ m/s^2 and direction along the radius towards the centre.

(4) π^2 m/s^2 and direction along the radius away from the centre.

PCM024

25. A fly wheel rotating at 600 rev/min is brought under uniform deceleration and stopped after 2 minutes, then what is angular deceleration in rad/sec^2 ?

(1) $\frac{\pi}{6}$ (2) 10 π (3) $\frac{1}{12}$ (4) 300

PCM025

26. The linear and angular acceleration of a particle are 10 m/s^2 and 5 rad/s^2 respectively. It will be at a distance from the axis of rotation.

(1) 50 m (2) 25m (3) 1 m (4) 2 m

PCM026

DYNAMICS OF HORIZONTAL CIRCULAR MOTION

27. The angular acceleration of particle moving along a circular path with uniform speed :–

(1) uniform but non zero

(2) zero

(3) variable

(4) as can not be predicted from given information

PCM027

28. If the speed and radius both are trippled for a body moving on a circular path, then the new centripetal force will be :–

(1) Doubled of previous value

(2) Equal to previous value

(3) Triple of previous value

(4) One third of previous value

PCM028

29. When a body moves with a constant speed along a circle :–

(1) no acceleration is present in the body

(2) no force acts on the body

(3) its velocity remains constant

(4) no work gets done on it

PCM029

30. A pendulum is suspended from the roof of a rail road car. When the car is moving on a circular track the pendulum inclines :

(1) Forward

(2) Backward

(3) Towards the centre of the path

(4) Away from the centre of the path

PCM030

31. A string of length 0.1 m cannot bear a tension more than 100N. It is tied to a body of mass 100g and rotated in a horizontal circle. The maximum angular velocity can be -

(1) 100 rad/s (2) 1000 rad/s

(3) 10000 rad/s (4) 0.1 rad/s

PCM031

32. The radius of the circular path of a particle is doubled but its frequency of rotation is kept constant. If the initial centripetal force be F, then the final value of centripetal force will be :–

(1) F (2) $\frac{F}{2}$ (3) 4F (4) 2F

PCM032

33. A 0.5 kg ball moves in a circle of radius 0.4 m at a speed of 4 m/s. The centripetal force on the ball is :–
(1) 10N (2) 20N (3) 40N (4) 80N
PCM033

34. A body is revolving with a constant speed along a circle. If its direction of motion is reversed but the speed remains the same then :–
(a) the centripetal force will not suffer any change in magnitude
(b) the centripetal force will have its direction reversed
(c) the centripetal force will not suffer any change in direction
(d) the centripetal force is doubled
(1) a,b (2) b,c (3) c,d (4) a, c
PCM034

35. a_r and a_t represent radial and tangential acceleration. The motion of a particle will be uniform circular motion, if :–
(1) $a_r = 0$ and $a_t = 0$ (2) $a_r = 0$ but $a_t \neq 0$
(3) $a_r \neq 0$ but $a_t = 0$ (4) $a_r \neq 0$ and $a_t \neq 0$
PCM035

36. In uniform circular motion, the velocity vector and acceleration vector are
(1) Perpendicular to each other
(2) Same direction
(3) Opposite direction
(4) Not related to each other
PCM036

37. A string of length 10 cm breaks if its tension exceeds 10 newton. A stone of mass 250 g tied to this string, is rotated in a horizontal circle. The maximum angular velocity of rotation can be :-
(1) 20 rad/s (2) 40 rad/s
(3) 100 rad/s (4) 200 rad/s
PCM037

38. The earth ($M_e = 6 \times 10^{24}$ kg) is revolving around the sun in an orbit of radius (1.5×10^{8}) km with angular velocity of (2×10^{-7}) rad/s. The force (in newton) exerted on the earth by the sun will be :-
(1) 36×10^{21} (2) 16×10^{24}
(3) 25×10^{16} (4) Zero
PCM038

39. A 500 kg car takes a round turn of radius 50 m with a velocity of 36 km/hr. The centripetal force is :-
(1) 250 N (2) 1000N
(3) 750N (4) 1200 N
PCM039

40. A motor cycle driver doubles its velocity when he is taking a turn. The force exerted towards the centre will become :-
(1) double (2) half
(3) 4 times (4) $\frac{1}{4}$ times
PCM040

41. The force required to keep a body in uniform circular motion is :-
(1) Centripetal force (2) Centrifugal force
(3) Resistance (4) None of the above
PCM041

BANKING OF TRACKS

42. A car moving on a horizontal road may be thrown out of the road in taking a turn :–
(1) by the gravitational force
(2) due to lack of proper centripetal force
(3) due to rolling friction between the tyres and the Road
(4) due to reaction of the road
PCM042

43. Radius of the curved road on national highway is R. Width of the road is b. The outer edge of the road is raised by h with respect to inner edge so that a car with velocity v can pass safely over it. The value of h is :–
(1) $\frac{v^2 b}{Rg}$ (2) $\frac{v}{Rgb}$ (3) $\frac{v^2 R}{bg}$ (4) $\frac{v^2 b}{R}$
PCM043

44. A boy holds a pendulum in his hand while standing at the edge of a circular platform of radius r rotating at an angular speed ω. The pendulum will hang at an angle θ with the vertical so that :–
(Neglect length of pendulum)
(1) $\tan\theta = 0$ (2) $\tan\theta = \frac{\omega^2 r^2}{g}$
(3) $\tan\theta = \frac{r\omega^2}{g}$ (4) $\tan\theta = \frac{g}{\omega^2 r}$
PCM044

VERTICAL CIRCULAR MOTION

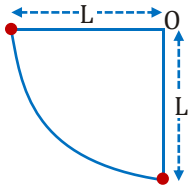
45. Let 'θ' denote the angular displacement of a simple pendulum oscillating in a vertical plane. If the mass of the bob is (m), then the tension in string is mg cosθ :–
(1) always
(2) never
(3) at the extreme positions
(4) at the mean position

PCM045

46. A pendulum bob has a speed 3 m/s while passing through its lowest position, length of the pendulum is 0.5 m then its speed when it makes an angle of 60° with the vertical is :–
($g = 10\ m/s^2$)
(1) 2 m/s (2) 1 m/s
(3) 4 m/s (4) 3 m/s

PCM046

47. The mass of the bob of a simple pendulum of length L is m. If the bob is left from its horizontal position then the speed of the bob and the tension in the thread in the lowest position of the bob will be respectively :–



(1) $\sqrt{2gL}$ and 3 mg (2) $\sqrt{3gL}$ and 2 mg
(3) $\sqrt{5gL}$ and 2 mg (4) $\sqrt{gL}$ and 3 mg

PCM047

48. A stone of mass 1 kg is tied to the end of a string of 1 m length. It is whirled in a vertical circle. If the velocity of the stone at the top be 4 m/s. What is the tension in the string (at that instant) ?
(1) 6 N (2) 16 N (3) 5 N (4) 10 N

PCM048

49. In a vertical circle of radius (r), at what point in its path a particle may have tension equal to zero :–
(1) highest point
(2) lowest point
(3) at any point
(4) at a point horizontal from the centre of radius

PCM049

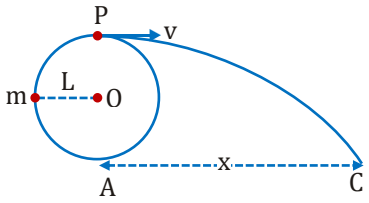
50. A stone attached to one end of a string is whirled in a vertical circle. The tension in the string is maximum when :–
(1) the string is horizontal
(2) the string is vertical with the stone at highest position
(3) the string is vertical with the stone at the lowest position
(4) the string makes an angle of 45° with the vertical

PCM050

51. A weightless thread can withstand tension upto 30 N. A stone of mass 0.5 kg is tied to it and is revolved in a circular path of radius 2m in a vertical plane. If $g = 10\ m/s^2$, then the maximum angular velocity of the stone can be :–
(1) 5 rad/s (2) $\sqrt{30}$ rad/s
(3) $\sqrt{60}$ rad/s (4) 10 rad/s

PCM051

52. A body tied to a string of length L is revolved in a vertical circle with minimum velocity, when the body reaches the upper most point the string breaks and the body moves under the influence of the gravitational field of earth along a parabolic path. The horizontal range AC of the body will be :–



(1) x = L (2) x = 2L
(3) $x = 2\sqrt{2}L$ (4) $x = \sqrt{2}L$

PCM052

53. A particle is moving in a vertical circle the tension in the string when passing through two position at angle 30° and 60° from vertical from lowest position are T_1 and T_2 respectively then :–
(1) $T_1 = T_2$ (2) $T_1 > T_2$
(3) $T_1 < T_2$ (4) $T_1 \geq T_2$

PCM053

54. A body crosses the topmost point of a vertical circle with critical speed. What will be its centripetal acceleration when the string is horizontal :–

(1) g (2) 2g

(3) 3g (4) 6g

PCM054

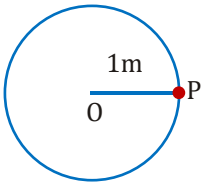
55. Stone tied at one end of light string is whirled round a vertical circle. If the difference between the maximum and minimum tension experienced by the string wire is 2 kg wt, then the mass of the stone must be :–

(1) 1 kg (2) 6 kg

(3) 1/3 kg (4) 2 kg

PCM055

56. A mass tied to a string moves in a vertical circle with a uniform speed of 5 m/s as shown. At the point P the string breaks. The mass will reach a height above P of nearly ($g = 10\ m/s^2$) :–



(1) 1 m (2) 0.5 m

(3) 1.75 m (4) 1.25 m

PCM056

57. If the overbridge is concave instead of being convex, then the reaction on the road at the lowest position will be :-

(1) $mg+\frac{mv^2}{r}$

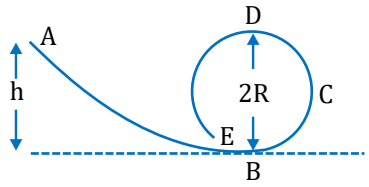
(2) $mg-\frac{mv^2}{r}$

(3) $\frac{m^2v^2g}{r}$

(4) $\frac{v^2g}{r}$

PCM057

58. A frictionless track ABCDE ends in a circular loop of radius R. A body slides down the track from point A which is at a height h = 5 cm. Maximum value of R for the body to successfully complete the loop is :–



(1) 5 cm.

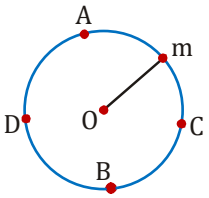
(2) 2 cm.

(3) $\frac{10}{3}$ cm.

(4) $\frac{15}{4}$ cm.

PCM058

59. A particle of mass m is performing vertical circular motion (see figure). If the average speed of the particle is increased, then at which point maximum breaking possibility of the string :–



(1) A (2) B

(3) C (4) D

PCM059

60. A stone tide with a string is moving in a vertical circle of radius 'r'. Its minimum velocity at the highest point of the circle will be :–

(1) $\sqrt{3gr}$

(2) $\sqrt{2gr}$

(3) $\sqrt{gr}$

(4) $\sqrt{\frac{gr}{2}}$

PCM060

61. A stone of mass 0.2 kg is tied to one end of a thread of length 0.1 m whirled in a vertical circle. When the stone is at the lowest point of circle, tension in thread is 52N, then velocity of the stone will be :–

(1) 4 m/s (2) 5 m/s

(3) 6 m/s (4) 7 m/s

PCM061

62. A suspended simple pendulum of length ℓ is making an angle θ with the vertical. On releasing, its velocity at lowest point will be :-

(1) $\sqrt{2g\ell(1+\cos\theta)}$ (2) $\sqrt{2g\ell\sin\theta}$

(3) $\sqrt{2g\ell(1-\cos\theta)}$ (4) $\sqrt{2g\ell}$

PCM062

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	3	2	2	3	3	1	4	2	3	1	3	4	1	4
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	2	3	4	4	4	1	1	2	2	1	4	2	3	4	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	1	4	2	4	3	1	1	1	2	3	1	2	1	3	3
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	1	1	1	3	1	2	2	3	3	4	1	2	2	3
Question	61	62													
Answer	2	3													

Exercise - II (Previous Year Questions) AIPMT/NEET

Re-AIPMT 2015

1. 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

PCM070

2. 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

PCM071

NEET-I 2016

3. 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

PCM072

4. 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) $\sqrt{5gR}$

PCM073

5. 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:-

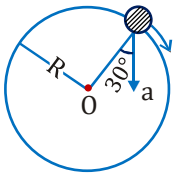
(1) $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$ (2) $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

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

PCM074

NEET-II 2016

6. 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

PCM075

7. 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

PCM076

NEET(UG) 2017

8. 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) :-

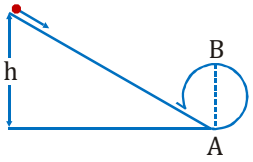
(1) $T+\frac{mv^2}{l}$ (2) $T-\frac{mv^2}{l}$

(3) Zero (4) T

PCM077

NEET(UG) 2018

9. 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) $\frac{5}{4}D$

PCM078

NEET(UG) 2019

10. 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

PCM079

11. 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

PCM080

12. 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

PCM081

NEET(UG) 2019 (Odisha)

13. 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) $\frac{V_0^2}{4\pi nr}\text{rad}/s^2$

PCM082

NEET(UG) 2020 (COVID-19)

14. 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/s² (2) 28π rad/s²

(3) 120π rad/s² (4) 1 rad/s²

PCM083

15. 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

PCM084

NEET(UG) 2022

16. 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/s² is :

(1) 4π (2) 12π

(3) 104π (4) 2π

PCM085

NEET(UG) 2023

17. The angular acceleration of a body, moving along the circumference of a circle, is :

(1) along the radius towards the centre

(2) along the tangent to its position

(3) along the axis of rotation

(4) along the radius, away from centre

PCM094

18. Calculate the maximum acceleration of a moving car so that a body lying on the floor of the car remains stationary. The coefficient of static friction between the body and the floor is 0.15
($g = 10\ m\ s^{-2}$).

(1) $150\ m\ s^{-2}$ (2) $1.5\ m\ s^{-2}$

(3) $50\ m\ s^{-2}$ (4) $1.2\ m\ s^{-2}$

PCM095

RE-NEET(UG) 2023

19. A particle is executing uniform circular motion with velocity $\vec{v}$ and acceleration $\vec{a}$. Which of the following is true ?

(1) $\vec{v}$ is a constant; $\vec{a}$ is not a constant

(2) $\vec{v}$ is not a constant; $\vec{a}$ is not a constant

(3) $\vec{v}$ is a constant; $\vec{a}$ is a constant

(4) $\vec{v}$ is not a constant; $\vec{a}$ is a constant

PCM096

NEET(UG) 2024

20. A bob is whirled in a horizontal plane by means of a string with an initial speed of ω rpm. The tension in the string is T. If speed becomes 2ω while keeping the same radius, the tension in the string becomes :

(1) T (2) 4T

(3) $\frac{T}{4}$ (4) $\sqrt{2}T$

PCM097

21. A particle moving with uniform speed in a circular path maintains :

(1) constant velocity

(2) constant acceleration.

(3) constant velocity but varying acceleration

(4) varying velocity and varying acceleration

PCM098

RE-NEET(UG) 2024

22. A bob is whirled in a horizontal circle by means of a string at an initial speed of 10 rpm. If the tension in the string is quadrupled while keeping the radius constant, the new speed is:

(1) 20 rpm (2) 40 rpm

(3) 5 rpm (4) 10 rpm

PCM099

23. Let ω_1, ω_2 and ω_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:

(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) $\omega_1^2 x_1 = \omega_2^2 x_2 = \omega_3^2 x_3 = k$

PCM100

EXERCISE-II (Previous Year Questions) ANSWER KEY

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

Exercise - III (Analytical Questions) Master Your Understanding

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.

PCM086

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.

PCM087

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

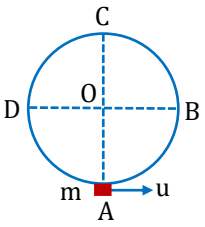
(2) A $\rightarrow$ P, B $\rightarrow$ Q, C $\rightarrow$ R

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

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

PCM088

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

PCM089

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

PCM090

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

PCM091

EXERCISE-III (Analytical Questions) ANSWER KEY

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