Circular Motion

Questions on Circular Motion, Paper 1

No. Question

1 A body is allowed to slide on a frictional less track from rest under-gravity. The track ends in a circular loop of diameter D. What should be the minimum height of the body in terms of D, so that it may successfully complete the loop?
(a) $\frac{4}{5}$ D
(b) $\frac{5}{4}$ D
(c) D
(d) 2D

2 A body is moving along a circular path with variable speed. It has
(a) a radial acceleration
(b) a tangential acceleration
(c) zero acceleration
(d) both tangential and radial accelerations

3 A body is traveling in a circle at constant speed. It
(a) has constant velocity.
(b) has no acceleration
(c) has an inward acceleration
(d) has an outward radial acceleration

4 A body of mass 100 gram, tied at the end of a string of length 3 m rotates in a vertical circle and is just able to complete the circle. If the tension in the string at its lowest point is 3.7 N, then its angular velocity will be _____ ($g = 10\ m/s^2$)
(a) 4 rad/s
(b) 3 rad/s
(c) 2 rad/s
(d) 1 rad/s

5 A body of mass 500 gram is rotating in a vertical circle of radius 1 m. What is the difference in its kinetic energies at the top and the bottom of the circle?
(a) 4.9 J
(b) 19.8 J
(c) 2.8 J
(d) 9.8 J

6 A body of mass m is suspended from a string of length l. What is the minimum horizontal velocity that should be given to the body in its lowest position so that it may complete full revolution in the vertical plane with the point of suspension at the center of circle?
(a) $\sqrt{2gl}$ (b) $\sqrt{3gl}$
(c) $\sqrt{4gl}$ (d) $\sqrt{5gl}$

7 A body of mass m performing UCM with frequency n along the circumference of circle having radius r, force is given by
(a) $4\pi nm^2$
(b) $4\pi^2n^2m$
(c) π^2n^2mr
(d) $\frac{1}{2}\pi nm^2$

8 A bucket containing water is tied to one end of a rope of length 2.5 m and rotated about the other end in a vertical circle. What should be the minimum velocity of the bucket at the highest point, so that the water in the bucket will not spill? ($g = 10\ m/s^2$)
(a) 2.5 m/s
(b) 4 m/s
(c) 5 m/s
(d) 7 m/s

9 A bucket tied at the end of a 1.6 m long string is whirled in a vertical circle with a constant speed. What should be the minimum speed so that the water from the bucket does not spill when the bucket is at the highest position?
(a) 4 m/sec.
(b) 6.25 m/sec.
(c) 16 m/sec.
(d) None of these

10 A can filled with water is revolved in a vertical circle of radius 4 metre and the water does not fall down. The time period of revolution will be
(a) 1 sec
(b) 10 sec
(c) 8 sec
(d) 4 sec

11 A car has a linear velocity v on a circular track of radius r. If its speed is increasing at a rate of a m/s^2, then its resultant acceleration will be
(a) $\sqrt{\left(\frac{v^2}{r}\right)^2 + a^2}$ (b) $\sqrt{\left(\frac{v^2}{r}\right)^2 - a^2}$
(c) $\left(\frac{v^2}{r}\right)^2 + a^2$ (d) $\left(\frac{v^2}{r}\right)^2 - a^2$

12. A car is moving in a circular track of radius 10 metre with a constant speed of 10 m/sec. A plumb bob is suspended from the roof of the car by a light rigid rod of 1 metre long. The angle made by the rod with the track is
(a) zero
(b) 30°
(c) 45°
(d) 60°

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13 A car is moving in horizontal circular track of radius 10 m, with a constant speed of 36 km/hour. A simple pendulum is suspended from the roof of the car. If the length of the simple pendulum is 1 m, what is the angle made by the string with the track?
(a) 30°
(b) 45°
(c) 60°
(d) 90°

14 A car is moving on a circular path and takes a turn. If R_1 and R_2 are the reactions on the inner and outer wheels respectively, then
(a) $R_1 = R_2$
(b) $R_1 < R_2$
(c) $R_1 > R_2$
(d) $R_1 \geq R_2$

15 A car is moving with a speed of 30 m/s on a circular path of radius 500 m. Its speed is increasing at the rate of 2 m/s^2. The acceleration of the car is
(a) 9.8 m/s^2
(b) 1.8 $m/^2$
(c) 2 m/s^2
(d) 2.7 m/s^2

15 A car moving on a horizontal road may be thrown out of the road is taking a turn
(a) by the gravitational force
(b) due to the lack of proper centripetal force
(c) due to the lack of frictional force between the tire and the road
(d) due to the reaction of the ground

17 A car of mass 1000 kg moves on a circular road with a speed of 20 m/s. Its direction changes by 90° after traveling 628 m on the road. The centripetal force acting on the car is
(a) 500 N
(b) 1000 N
(c) 1500 N
(d) 2000 N

18 A car of mass 800 kg moves on a circular track of radius 40 m. If the coefficient of friction is 0.5, then maximum velocity with which the car can move is
(a) 7 m/s (b) 14 m/s
(c) 8 m/s (d) 12 m/s

19 A car sometimes overturns while taking a turn. When it overturns, it is
(a) the inner wheel which leaves the ground first
(b) the outer wheel which leaves the ground first
(c) both the wheel leave the ground simultaneously
(d) either inner wheel or the outer wheel leaves the ground

20 A coin kept on a rotating gramophone disc just begins to slip if its centre is at a distance of 8 cm from the centre of the disc. The angular velocity of the gramophone disc is then doubled. Through what distance, the coin should be shifted towards the centre, so that the coin will just slip?
(a) 2 cm
(b) 4 cm
(c) 6 cm
(d) 16 cm

21 A cyclist goes round a circular path of circumference 343 m in $\sqrt{22}$ s. The angle made by him, with the vertical is
(a) 42°
(b) 43°
(c) 44°
(d) 45°

22 A cyclist is moving in a circular track of radius 80 m, with a velocity of 36 km/hour. In order to keep his balance, he has to lean inwards from the vertical through an angle θ. If g = 10 m/s^2, then θ is given by
(a) $\tan^{-1}(2)$
(b) $\tan^{-1}(4)$
(c) $\tan^{-1}\left(\frac{1}{4}\right)$
(d) $\tan^{-1}\left(\frac{1}{8}\right)$

23 A cyclist turns around a curve at 15 miles per hour. If he turns at double the speed, the tendency of overturn is
(a) doubled
(b) quadrupled
(c) halved
(d) unchanged

24 A fighter aeroplane flying in the sky dives with a speed of 360 km/hr in a vertical circle of radius 200 m. Weight of the pilot sitting in it is 75 kg. What will be the value of force with which the pilot presses his seat when the aeroplane is at highest position (g = 10 m/s^2)
(a) 3000 N (b) 1500 N
(c) $(75 \times g)$N (d) 300 N

25 A frictional track ABCDE ends in a circular loop of radius R, body slides down the track from point A which is at a height h of 5 cm. Maximum value of R for the body to successfully complete the loop is:
(a) 5 cm (b) $\frac{15}{4}$ cm
(c) $\frac{10}{3}$ cm (d) 2 cm

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Answers to Physics Circular Motion, Paper 1

1. Answer: B
2. Answer: D
3. Answer: C
4. Answer: B
5. Answer: D
6. Answer: D
7. Answer: B
8. Answer: C
9. Answer: A
10. Answer: D
11. Answer: A
12. Answer: C
13. Answer: B
14. Answer: B
15. Answer: D
16. Answer: C
17. Answer: B
18. Answer: B
19. Answer: A
20. Answer: A
21. Answer: D
22. Answer: D
23. Answer: B
24. Answer: B
25. Answer: D

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Questions on Circular Motion, Paper 2

1 A man whirls a stone of mass 250 gram, tied at the end of a string of length 2 m in a horizontal circle and at a height of 5 m from the ground. The string breaks and the stone flies off tangenitially and strikes the ground at a horizontal distance of 10 m from the man. What was the magnitude of the centripetal acceleration of the stone, when it was moving in the circle? ($g = 10\ m/s^2$)
(a) $50\ m/s^2$
(b) $40\ m/s^2$
(c) $30\ m/s^2$
(d) $25\ m/s^2$

2 A mass of 5 kg is tied to a string of length 1.0 m and is rotated in vertical circle with a uniform speed of 4 m/s. The tension in the string will be 130 N when the mass is at ($g = 10\ m/s^2$)
(a) highest point
(b) mid way
(c) bottom
(d) cannot be justified

3 A mass suspended on a frictional less horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity ω_0. If length of the string and angular velocity are doubled the tension in the string which was initially T_0 is now
(a) T_0
(b) $\frac{T_0}{2}$
(c) $4\ T_0$
(d) $8\ T_0$

4 A metal sphere of mass 0.1 kg is attached to an inextensible string of length 130 cm whose upper end is fixed to the rigid support. If the sphere is made to describe a horizontal circle of radius 50 cm, the time for its one revolution is near about
(a) 1.2 sec
(b) 2.2 sec
(c) 1.5 sec
(d) 3 sec

5 A motor cyclist loops a vertical circular loop of diameter 18 m, without dropping down, even at the highest point of the loop. What should be his minimum speed at the lowest point of the loop?
(a) 10 m/s
(b) 16 m/s
(c) 21 m/s
(d) 30 m/s

6 A motor cyclist moving with a velocity of 75 km/hr on a flat road takes a turn on the road at a point where the radius of curvature of the road is 20 m. If the g is $10\ m/s^2$ the maximum angle of banking with vertical for no skidding is
(a) $\tan^{-1}(6)$
(b) $\tan^{-1}(2)$
(c) $\tan^{-1}(12)$
(d) $\tan^{-1}(4)$

7 A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion takes place in a plane. It follows that
(a) its velocity is constant
(b) its acceleration is constant
(c) its motion is linear
(d) its motion is circular

8 A particle is moving along a circular path. Let v, ω, α and a_c be its linear velocity, angular velocity, angular acceleration and centripetal acceleration respectively. Which is the wrong statement from the followings?
(a) $\vec{\omega} \perp \vec{v}$
(b) $\vec{\omega} \perp \vec{a}_c$
(c) $\vec{\omega} \perp \vec{\alpha}$
(d) $\vec{v} \perp \vec{a}_c$

9 A particle is performing a U.C.M. Which is the wrong statement regarding its motion?
(a) The velocity vector is tangential to the circle
(b) The acceleration vector is tangential to the circle
(c) The acceleration vector is directed towards the centre of the circle
(d) The velocity and acceleration vectors are perpendicular to each other

10 A particle is performing U.C.M. along a circular path of radius r, with a uniform speed v. Its tangential and radial acceleration are
(a) zero and infinite
(b) $\frac{v^2}{r}$ and zero
(c) zero and $\frac{v^2}{r}$
(d) $r\omega^2$ and infinite

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11 A particle moves in a circular path of radius r, in half of its period. Its displacement and distance covered are,

(a) 2r, 2πr (b) $r\sqrt{2}$, πr

(c) 2r, πr (d) r, πr

12 A particle moving in a circle of radius 25 cm at 2 revolutions per second. The acceleration of the particle is S.I. unit is

(a) $4\pi^2$ (b) $3\pi^2$

(c) $2\pi^2$ (d) π^2

13 A particle of mass 'm' moves with a constant speed along a circular path of radius r under the action of a force F. Its speed is given by

(a) $\sqrt{\frac{Fr}{m}}$ (b) $\sqrt{\frac{F}{mr}}$

(c) $\sqrt{\frac{F}{r}}$ (d) $\sqrt{Fmr}$

14 A particle of mass m is executing uniform circular motion on a path of radius r. If P is the magnitude of its linear momentum, then, the radial force acting on the particle is,

(a) pmr (b) $\frac{rm}{p}$

(c) $\frac{mp^2}{r}$ (d) $\frac{p^2}{rm}$

15 A particle of mass m is moving in a horizontal circle of radius R with uniform speed v. When it moves from one point to a diametrically opposite point its

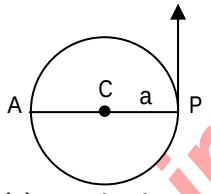
(a) kinetic energy changes by $Mv^2/4$

(b) momentum does not change

(c) momentum changes by $2\ Mv^2$

(d) kinetic energy changes by Mv^2

16 A particle P is moving in a circle of radius 'a' with uniform speed v. C is the centre of the circle and AP is diameter. 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

17 A particle rests on the top of a hemisphere of radius R. The smallest horizontal velocity that must be imparted to the particle if it is to leave the hemisphere without sliding down is

(a) $\sqrt{gR}$ (b) $\sqrt{2gR}$

(c) $\sqrt{3gR}$ (d) $\sqrt{5gR}$

18 A particle revolves round a circular path. The acceleration of the particle is

(a) along the circumference of the circle

(b) along the tangent

(c) along the radius

(d) zero

19 A person with his hands in his pocket is skating on ice at the rate of 10 m/s and describes a circle of radius 50 m. What is his inclination to the vertical? ($g = 10\ m/s^2$)

(a) $\tan^{-1}\left(\frac{1}{2}\right)$ (b) $\tan^{-1}\left(\frac{1}{5}\right)$

(c) $\tan^{-1}\left(\frac{3}{5}\right)$ (d) $\tan^{-1}\left(\frac{1}{10}\right)$

20 A pulley one metre in diameter rotating at 600 r.p.m. is brought to rest in 80 sec. by a constant force of friction on its shaft. How many revolutions does it makes before coming to rest?

(a) 200

(b) 300

(c) 400

(d) 500

21 A satellite has mass m speed v and radius r, the force acting on it is:

(a) zero

(b) mrv^2

(c) $\frac{mv^2}{r}$

(d) $\frac{mv^2}{r}$

22 A simple pendulum of effective length 'l' is kept in equilibrium in vertical position. What horizontal velocity should be given to its bob, so that it just completes a vertical circular motion?

(a) $\sqrt{5gl}$ (b) $\sqrt{3gl}$

(c) $\sqrt{gl}$ (d) $\sqrt{7gl}$

23 A simple pendulum of mass m and length l stands in equilibrium in vertical position. The maximum horizontal velocity that should be given to the bob at the bottom so that it completes on revolution is

(a) $\sqrt{lg}$

(b) $\sqrt{2lg}$

(c) $\sqrt{3lg}$

(d) $\sqrt{5lg}$

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24 A small body attached at the end of an inextensible string completes a vertical circle, then its
(a) angular velocity remains constant
(b) angular momentum remains constant
(c) total mechanical energy remains constant
(d) linear momentum remains constant

25 A small body is to be moved inside a vertical circular tube of radius l. What minimum velocity should be imparted to it, as its lowest point so that it can just complete the vertical circle?
(a) $\sqrt{5gl}$
(b) $\sqrt{gl}$
(c) $\sqrt{3gl}$
(d) $\sqrt{4gl}$

Answers to Circular Motion, Paper 2

1. Ans.: a
2. Ans.: c
3. Ans.: d
4. Ans.: b
5. Ans.: c
6. Ans.: b
7. Ans.: d
8. Ans.: c
9. Ans.: b
10. Ans.: c
11. Ans.: c
12. Ans.: a
13. Ans.: a
14. Ans.: d
15. Ans.: b
16. Ans.: b
17. Ans.: a
18. Ans.: c
19. Ans.: b
20. Ans.: c
21. Ans.: d
22. Ans.: a
23. Ans.: d
24. Ans.: c
25. Ans.: d

Circular Motion

Questions on Circular Motion, Paper 3

1. A stone attached to a rope of length l = 80 cm is rotated with a speed of 240 r.p.m. At the moment when the velocity is directed vertically upwards, the rope breaks. To what height does the stone rise further?
   (a) 1.2 m
   (b) 41.2 m
   (c) 20.6 m
   (d) 24.9 m

2. A stone is tied to one end of a string. Holding the other end, the string is whirled in a horizontal plane with progressively increasing speed. It breaks at some speed because
   (a) gravitational forces of the earth is greater than the tension in string.
   (b) the required centripetal force is greater than the tension sustained by the string.
   (c) the required centripetal force is less than the tension in the string.
   (d) the centripetal force is greater than the weight of the stone.

3. A stone of mass 250 gram, attached at the end of a string of length 1.25 m is whirled in a horizontal circle at a speed of 5 m/s. What is the tension in the string?
   (a) 2.5 N
   (b) 5 N
   (c) 6 N
   (d) 8 N

4. 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 outer end is
   (a) $\frac{ML\omega^2}{2}$ (b) $ML\omega^2$
   (c) $\frac{ML^2\omega^2}{2}$ (d) $\frac{ML\omega^2}{4}$

5. A van is moving with speed of 108 km/hr. on level road where coefficient of friction between tires and road 0.5. For the safe driving of van the minimum radius of curvature of the road will be (g = 10 m/s^2)
   (a) 80 m
   (b) 40 m
   (c) 180 m
   (d) 20 m

6. A weightless thread can bear tension upto 3.7 kg weight. A stone of mass 500 gram is tied at its one end and revolved in a vertical circular path of radius 4 m. If g = 10 m/s^2, then the maximum angular velocity of the stone is (radians/sec) will be
   (a) 3 (b) 4
   (c) 5 (d) 6

7. A wheel is subjected to uniform angular acceleration about its axis. Initially its angular velocity is zero. In the first two seconds, it rotates through θ_1 and in next two seconds, it rotates through θ_2. What is the ratio θ_2 / θ_1?
   (a) 1 (b) 2
   (c) 3 (d) 4

8. A wheel of diameter 20 cm is rotating at 600 rpm. The linear velocity of particle at its rim is
   (a) 6.28 cm/s (b) 62.8 cm/s
   (c) 0.628 cm/s (d) 628.4 cm/s

9. A wheel rotates with a constant angular velocity of 600 r.p.m. What is the angle through which the wheel rotates in one second?
   (a) 5π radian (b) 20π radian
   (c) 15π radian (d) 10π radian

10. An aeroplane is taking a turn in a horizontal plane
    (a) its remains horizontal
    (b) it inclines inward
    (c) it inclines outward
    (d) its wings becomes vertical

11. An electric fan has blades of length 30 cm as measured from the axis of rotation. If the fan is rotating at 1200 r.p.m., then the acceleration of a point on the tip of the blade is (take π^2 = 10)
    (a) 1600 m/s^2 (b) 3200 m/s^2
    (c) 4800 m/s^2 (d) 6000 m/s^2

12. An electron revolve around the nucleolus the radius of the circular orbit is r to double the kinetic energy of electron its orbit radius of
    (a) $\sqrt{2}$ r (b) $-\sqrt{2}$ r
    (c) $\sqrt{3}$ r (d) $-\sqrt{3}$ r

13. Angle between Centripetal acceleration and radius vector is
    (a) 90° (b) 180°
    (c) 0° (d) 45°

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14. Angular velocity of an hour hand of a watch
(a) $\frac{\pi}{43200}$ rad/s
(b) $\frac{\pi}{21600}$ rad/s
(c) $\frac{\pi}{30}$ rad/s
(d) $\frac{\pi}{1800}$ rad/s

15. At a curved path of the road, the road bed is raised a little on the side away from the centre of the curved path. The slope of the road bed is given by
(a) $\tan\theta = \left(\frac{r}{gv^2}\right)$
(b) $\tan\theta = \left(\frac{rg}{v^2}\right)$
(c) $\tan\theta = \left(\frac{v^2 g}{r}\right)$
(d) $\tan\theta = \left(\frac{v^2}{rg}\right)$

16. Centripetal force in vector form can be expressed as
(a) $\vec{F} = \frac{mv^2}{r}$
(b) $\vec{F} = \frac{mv^2}{r}\vec{r}$
(c) $\vec{F} m\omega^2 \vec{r}$
(d) $\vec{F} = -\frac{mv^2}{\vec{r}}\vec{r}$

17. For a particle performing a U.C.M. the acceleration is
(a) constant in direction
(b) constant in magnitude but not in direction
(c) constant in magnitude and direction
(d) constant in neither magnitude nor in direction

18. If a cycle wheel of radius 0.4 m completes one revolution in one second, then acceleration of the cycle is
(a) $0.4\ \pi\ m/s^2$
(b) $0.8\ \pi\ m/s^2$
(c) $0.4\ \pi^2\ m/s^2$
(d) $1.6\ \pi^2\ m/s^2$

19. If a particle moves with uniform speed that its tangential acceleration will be
(a) zero (b) constant
(c) infinite (d) none of these

20. If a stone of mass m is rotated in a vertical circular path of radius 1 m, the critical velocity will be
(a) 6.32 m/s (b) 3.13 m/s
(c) 9.48 m/s (d) 12.64 m/s

21. If T_1 and T_2 are the periods of a simple pendulum and a conical pendulum respectively, of the same length, then
(a) $T_1 = T_2$ (b) $T_1 > T_2$
(c) $T_1 < T_2$ (d) $T_1 = \frac{T_2}{2}$

22. In a tension of a string is 6.4 N. Load at the lower end of a string is 0.1 kg the length of string is 6 m then find its angular velocity? ($g = 10\ m/sec^2$)
(a) 4 rad/sec (b) 3 rad/sec
(c) 2 rad/sec (d) 1 rad/sec

23. In a vertical circle of radius r at what point in its path, a particle has a tension equal to zero?
(a) Highest point
(b) Lowest point
(c) Any point
(d) An horizontal point

24. In an atom two electrons move round the nucleus in circular orbits of radii R and 4R respectively, the ratio of time taken by them to complete one revolution is
(a) $\frac{1}{4}$ (b) $\frac{4}{1}$
(c) $\frac{8}{1}$ (d) $\frac{1}{8}$

25. In cycle wheel of radius 0.4 m completes one revolution in one second, then acceleration of the cycle is
(a) $0.4\ \pi m/s^2$
(b) $0.8\ \pi m/s^2$
(c) $0.4\ \pi^2 m/s^2$
(d) $1.6\ \pi^2 m/s^2$

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Answers to Circular Motion, Paper 3

1. Ans.: (c)
2. Ans.: (b)
3. Ans.: (b)
4. Ans.: (b)
5. Ans.: (c)
6. Ans.: (b)
7. Ans.: (c)
8. Ans.: (d)
9. Ans.: (b)
10. Ans.: (b)
11. Ans.: (c)
12. Ans.: (a)
13. Ans.: (b)
14. Ans.: (b)
15. Ans.: (d)
16. Ans.: (c)
17. Ans.: (b)
18. Ans.: (d)
19. Ans.: (a)
20. Ans.: (b)
21. Ans.: (b)
22. Ans.: (b)
23. Ans.: (a)
24. Ans.: (d)
25. Ans.: (d)

Circular Motion

Questions on Circular Motion, Paper 4

1. In order to cause something to move in a circular path, we must apply
   (a) Inertial force
   (b) Centripetal force
   (c) Centrifugal force
   (d) Gravitational force

2. In the case of uniform circular motion, which one of the following physical quantities does not remain constant?
   (a) mass
   (b) speed
   (c) linear momentum
   (d) kinetic energy

3. Kinetic energy of a particle moving along the circle is ax^2. If R is the radius of the circle. The radial force on the particle is
   (a) $2\frac{ax^2}{R}$ (b) $\left[\frac{1+x^2}{R^2}\right]^{1/2}$
   (c) 2ax (d) $2\frac{aR^2}{x}$

4. Maximum safe speed does not depend upon
   (a) radius of curvature
   (b) angle of inclination with the horizontal
   (c) mass of the vehicle
   (d) acceleration due to gravity

5. The angle between radius vector and centripetal acceleration is
   (a) $\frac{\pi}{2}$ rad
   (b) 2π rad
   (c) $\frac{3\pi}{2}$ rad
   (d) π rad

6. The angle described in 2 sec by an object rotating at a rate of 600 rpm is
   (a) 20 π rad
   (b) 40 π rad
   (c) 5 π rad
   (d) zero

7. The angular speed of a flywheel making 180 r.p.m. is
   (a) 2π rad/s
   (b) 4π rad/s
   (c) 6π rad/s
   (d) $3\pi^2$ rad/s

8. The angular velocity of a fly wheel increases from 0 to 40 rad/s, in 8 seconds. What is its total angular displacement in this time?
   (a) 80 rad
   (b) 160 rad
   (c) 200 rad
   (d) 120 rad

9. The angular velocity of a wheel is 70 rad/sec. If the radius of the wheel is 0.5 m, then linear velocity of the wheel is
   (a) 10 m/s
   (b) 20 m/s
   (c) 35 m/s
   (d) 70 m/s

10. The banking angle is independent of
    (a) velocity of vehicle
    (b) mass of vehicle
    (c) radius of curvature of road
    (d) height of inclination

11. The driver of a car traveling at velocity v suddenly sees a broad wall in front of him at a distance a. He should
    (a) break sharply
    (b) turn sharply
    (c) both a and b
    (d) none of the above

12. The earth (mass = 6×10^{24} kg), revolves around the sun with an angular velocity of 2×10^{-7} rad/s, in a circular orbit of radius 1.5×10^8 k. The force exerted by the sun on the earth is
    (a) zero
    (b) 18×10^{20} N
    (c) 27×10^{30} N
    (d) 3.6×10^{22} N

13. The K.E. (K) of a particle moving along a circle of radius r depends upon the distance covered (s) as $K = as^2$. The centripetal force acting on the particle is given by
    (a) 2as
    (b) $2as^2$
    (c) $\frac{2as^2}{r}$
    (d) $\frac{2ar}{s^2}$

Circular Motion

14. The maximum safe speed for a vehicle taking a turn on a curved banked road, does not depend upon
(a) acceleration due to gravity
(b) mass of the vehicle
(c) angle of inclination (θ) with the horizontal
(d) radius of curvature of the track

15. The maximum safe speed of a vehicle on a circular tract is 15 km/hr. When the track becomes wet, the maximum safe speed is 10 km/hr. The ratio of coefficient of friction of the dry track to that of Wet track is
(a) 9 : 4 (b) 3 : 2
(c) 2 : 3 (d) 1.5 : 1

16. The maximum velocity with which a driver must drive his car on a flat curved road of radius of curvature 150 m and coefficient of friction 0.6, to avoid the skidding of his car is (take g = 10 m/s^2)
(a) 60 m/s (b) 50 m/s
(c) 40 m/s (d) 30 m/s

17. The radius of a curved path on a national highway is R. The width of a road is b. The outer edge of the road is raised by 'h' w.r.t. the inner edge, so that a car with a velocity V can safely pass over it. What is the value of h?
(a) $\frac{Rg}{bv^2}$ (b) $\frac{v^2b}{R}$
(c) $\frac{v}{bgR}$ (d) $\frac{v^2b}{Rg}$

18. The ratio of angular speed of minute hand and hour hand of a watch is
(a) 6: 1 (b) 1: 6
(c) 1 : 12 (d) 12 : 1

19. The rider in circus rides along a circular track in a vertical plane. The minimum velocity at the highest point of the track will be
(a) $\sqrt{gR}$ (b) $\sqrt{2gR}$
(c) $\sqrt{3gR}$ (d) $\sqrt{5gR}$

20. What is the apparent weight of a body of mass m attached at the end of a string and which is just completing the loop in a vertical circle, at the lowest point in its path?
(a) 0 (b) mg
(c) 3 mg (d) 6 mg

21. What is the smallest radius of a curve on a horizontal road, at which a cyclist can travel if his speed is 36 km/hour and the angle of inclination is 45°? (g = 10 m/s^2)
(a) 25 m
(b) 20 m
(c) 15 m
(d) 10 m

22. What will be the maximum speed of a car on a road turn of radius 30 m, if the coefficient of friction between the tyres and the road is 0.4 (Take g = 9.8 m/s^2)
(a) 10.84 m/s
(b) 9.84 m/s
(c) 8.84 m/s
(d) 6.84 m/s

23. When a vehicle is moving along the horizontal curve road, centripetal force is provided by
(a) vertical component of normal reaction
(b) horizontal component of normal reaction
(c) frictional force between road surface and tyres
(d) all of these

24. When particle revolves with uniform speed on a circular path
(a) no force acts on it
(b) no acceleration acts on it
(c) no work is done by it
(d) its velocity is constant

25. When the angular velocity of a uniformly rotating body has increased thrice the resultant of forces applied to it increases by 60 N. find the acceleration of the body in two cases if the mass of the body is 3 kg
(a) 2.5 m s^{-2}, 7.5 m s^{-2}
(b) 7.5 m s^{-2}, 67.5 m s^{-2}
(c) 5 m s^{-2}, 45 m s^{-2}
(d) 2.5 m s^{-2}, 22.5 m s^{-2}

Circular Motion

Answers to Circular Motion, Paper 4

1. Ans.: (b)
2. Ans.: (c)
3. Ans.: (a)
4. Ans.: (c)
5. Ans.: (d)
6. Ans.: (b)
7. Ans.: (c)
8. Ans.: (b)
9. Ans.: (c)
10. Ans.: (b)
11. Ans.: (a)
12. Ans.: (d)
13. Ans.: (c)
15. Ans.: (a)
16. Ans.: (d)
17. Ans.: (d)
18. Ans.: (d)
19. Ans.: (a)
20. Ans.: (d)
21. Ans.: (d)
22. Ans.: (a)
23. Ans.: (c)
24. Ans.: (c)
25. Ans.: (b)