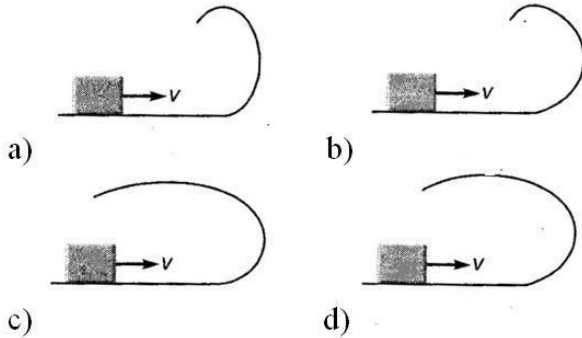


CIRCULAR MOTION (DPP -6)

- 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:
a) 10^{-3} b) 10^{-4}
c) 10^{-2} d) 10^{-1}
- A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 seconds in every circular loop. The average velocity and average speed for each circular loop respectively, is
a) 0, 10 m/s b) 10 m/s, 10 m/s
c) 10 m/s, 0 d) 0, 0
- The circular motion of a particle with constant speed is
a) periodic but not simple harmonic
b) simple harmonic but not periodic
c) periodic and simple harmonic
d) neither periodic nor simple harmonic
- Two particles of mass M and m are moving in a circle of radii R and r. If their time-periods are same, what will be the ratio of their linear velocities?
a) $MR : mr$ b) $M : m$
c) $R : r$ d) $1 : 1$
- A stone tied with a string, is rotated in a vertical circle. The minimum speed with which the string has to be rotated
a) is independent of the mass of the stone
b) is independent of the length of the string
c) decreases with increasing mass of the stone
d) decreases with increasing length of the string
- The wheel of a toy car rotates about fixed axis from 400 rps to 200 rps in two seconds its angular Retardation (in rad s^{-2})
a) 200π b) 100π
b) 400π d) None of these
- A sphere of mass 0.2 kg is attached to an inextensible string of length 0.5 m whose upper end is fixed to the ceiling. The sphere is made to describe a horizontal circle of radius 0.3 m. The speed of the sphere will be
a) 1.5 m s^{-1} b) 2.5 m s^{-1}
c) 3.2 m s^{-1} d) 4.7 m s^{-1}
- A body is acted upon by a constant force directed towards a fixed point. The magnitude of the force varies inversely as the square of the distance from the fixed point. What is the nature of the path?
a) Straight line b) Parabola
c) Circle d) Hyperbola
- An object of mass 10 kg is whirled round a horizontal circle of radius 4 m by a revolving string inclined 30° to the vertical. If the uniform speed of the object is 5 ms^{-1} , the tension in the string (approximately) is
a) 720 N b) 960 N
c) 114 N d) 125 N
- A car rounds an unbanked curve of radius 92 m without skidding at a speed of 26 ms^{-1} . The smallest possible coefficient of static friction between the tyres and the road is
a) 0.75 b) 0.60
c) 0.45 d) 0.30
- A wheel is rotating at 900 rpm about its axis when the power is cut off, it comes to rest in one minute. The angular retardation in rad s^{-2}
a) $\pi/2$ b) $\pi/4$ c) $\pi/6$ d) $\pi/8$

12. A small block is shot into each of the four tracks as shown below. Each of the frictionless track rises to the same height. The speed, which the block enters the tracks, is same in all cases. At the highest point of the track, normal reaction is maximum in



13. What is the angular velocity of earth?

- a) $\frac{2\pi}{86400} \text{ rad s}^{-1}$ b) $\frac{2\pi}{3600} \text{ rad s}^{-1}$
c) $\frac{2\pi}{24} \text{ rad s}^{-1}$ d) $\frac{2\pi}{6400} \text{ rad s}^{-1}$

14. A body of mass 1 kg is rotating in a vertical circle of radius 1m. What will be the difference in its kinetic energy at the top and bottom of the circle? (Take $g = 10 \text{ ms}^{-2}$)

- a) 10 J b) 20 J
c) 30 J d) 50 J

15. The maximum and minimum tension in the string whirling in a circle of radius 2.5 m with constant velocity are in the ratio 5 : 3 then its velocity is

- a) $\sqrt{98} \text{ ms}^{-1}$ b) 7 ms^{-1}
c) $\sqrt{490} \text{ ms}^{-1}$ d) $\sqrt{4.9} \text{ ms}^{-1}$

16. A plumb line is suspended from a ceiling of a car moving with horizontal acceleration of a . What will be the angle of inclination with vertical?

- a) $\tan^{-1} \left(\frac{a}{g} \right)$
b) $\tan^{-1} \left(\frac{g}{a} \right)$
c) $\cos^{-1} \left(\frac{a}{g} \right)$
d) $\cos^{-1} \left(\frac{g}{a} \right)$

17. The wheel of toy car rotates about axis. It slows down from 400 rps to 200 rps in 2s. Then its angular retardation in rads^{-2} is

- a) 200π b) 100
c) 400π d) None of these

18. A body of mass 1 kg is moving in a vertical circular path of radius 1 m. The difference between the kinetic energies at its highest and lowest point is

- a) 20 J b) 10 J
c) $4\sqrt{5} \text{ J}$ d) $10\sqrt{5} \text{ J}$

19. A wheel completes 2000 revolutions to cover the 9.5 km distance, then the diameter of the wheel is

- a) 1.5 m b) 1.5 cm
c) 7.5 cm d) 7.5 m

20. A can filled with water is revolved in a vertical of radius 4 m and the water does not fall down. The time period for a revaluation is about

- a) 2 s b) 4 s
c) 8 s d) 10 s

21. A body moving along a circular path of radius R with velocity v, has centripetal acceleration a . If its velocity is made equal to $2v$, then its centripetal acceleration is

- a) $4a$ b) $2a$
c) $\frac{a}{4}$ d) $\frac{a}{2}$

22. If KE of the particle of mass m performing UCM in a circle of radius r is E. Find the acceleration of the particle

- a) $\frac{2E}{mr}$ b) $\left(\frac{2E}{mr} \right)^2$
c) $2 E mr$ d) $\frac{4E}{mr}$

23. Given that centripetal force $F = -k/r^2$. The total energy is

- a) $-k/r^2$ b) k/r
c) $-k/2r^2$ d) $-k/2r$

24. The minimum speed for a particle at the lowest point of a vertical circle of radius r, to describe the circle is v. If the radius of the circle is reduced to one-fourth its value, the corresponding minimum speed will be

- a) $v/4$
b) $v/2$
c) $2v$
d) $4v$

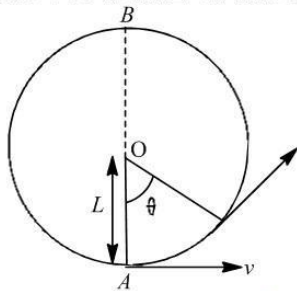
25. A heavy small sized sphere is suspended by a string of length l . The sphere is rotated uniformly in a horizontal circle with the string making an angle θ with the vertical. The time period of this conical pendulum is

- a) $2\pi\sqrt{\frac{l\tan\theta}{g}}$ b) $2\pi\sqrt{l\sin\theta/g}$
c) $2\pi\sqrt{\frac{l}{g}}$ d) $2\pi\sqrt{\frac{l\cos\theta}{g}}$

26. An object of mass 5 kg is whirled round in a vertical circle of radius 2 m with a constant speed of 6 ms^{-1} . The maximum tension in the string is

- a) 152 N b) 139 N
c) 121 N d) 103 N

27. A bob of mass M is suspended by a massless string of length L . The horizontal velocity v at position A is just sufficient to make it reach the point B. The angle θ at which the speed of the bob is half of that at A, satisfies



- a) $\theta = \frac{\pi}{4}$ b) $\frac{\pi}{4} < \theta < \frac{\pi}{2}$
c) $\frac{\pi}{2} < \theta < \frac{3\pi}{4}$ d) $\frac{3\pi}{4} < \theta < \pi$

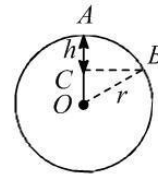
28. A particle is moving on a circular track of radius 30 cm with constant speed of 6 m/s its acceleration is

- a) 0 b) 120 m/s^2
c) 1.2 m/s^2 d) 36 m/s^2

29. Let a_t and a_r represent tangential and radial Accelerations. The motion of particle may be Circular, if

- a) $a_r=0, a_t=0$ b) $a_r=0, a_t \neq 0$
c) $a_r \neq 0, a_t=0$ d) None of these

30. In figure, a particle is placed at the highest point A of a smooth sphere of radius r . It is given slight push, and it leaves the sphere at B, at a depth h vertically below A such that h is equal to



- a) $\frac{r}{6}$ b) $\frac{1}{4}r$
c) $\frac{1}{3}r$ d) $\frac{1}{2}r$

31. A particle describes a horizontal circle in a conical funnel whose inner surface is smooth with speed of 0.5 ms^{-1} . What is the height of the plane of circle from vertex of the funnel?

- a) 0.25 cm b) 2 cm
c) 4 cm d) 2.5 cm

32. A cyclist is moving on a circular track of radius 80 m with a velocity $v = 36\text{ kmh}^{-1}$. He has to lean from the vertical approximately through an angle (take $g = 10\text{ ms}^{-2}$)

- a) $\tan^{-1}(4)$ b) $\tan^{-1}\left(\frac{1}{3}\right)$
c) $\tan^{-1}\left(\frac{1}{4}\right)$ d) $\tan^{-1}\left(\frac{1}{8}\right)$

33. A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following a :

- (a) Straight line path (b) Circular path
(c) Parabolic path (d) Hyperbolic path

34. A particle is projected from the ground at an angle of 60° with horizontal with speed $u = 20\text{ ms}^{-1}$. The radius of curvature of the path of the particle, when its velocity makes an angle of 30° with horizontal is ($g = 10\text{ ms}^{-2}$)

- a) 10.6 m b) 12.8 m
c) 15.4 m d) 24.2 m