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°

Circular Motion

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

Circular Motion

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