

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) 20π rad
 - (b) 40π rad
 - (c) 5π 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) $\frac{2ar}{s^2}$

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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 track 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 $g = 10 \text{ m/s}^2$)
 (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° ? ($g = 10 \text{ m/s}^2$)
 (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 $g = 9.8 \text{ m/s}^2$)
 (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}

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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)