NEET : CHAPTER WISE TEST-5

SUBJECT :- PHYSICS
CLASS :- 11th
CHAPTER :- CIRCULAR MOTION

DATE...
NAME...
SECTION...

(SECTION-A)

1. Two racing cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 respectively; their speeds are such that they each make a complete circle in the same time t. The ratio of the angular speed of the first to the second car is :

(A) $m_1 : m_2$ (B) $r_1 : r_2$
(C) 1 : 1 (D) $m_1r_1 : m_2r_2$

2. A wheel is at rest. Its angular velocity increases uniformly and becomes 80 radian per second after 5 second. The total angular displacement is :

(A) 800 rad (B) 400 rad
(C) 200 rad (D) 100 rad

3. The relation between an angular velocity, the position vector and linear velocity of a particle moving in a circular path is.

(A) $\vec{\omega} \times \vec{r} = \vec{v}$ (B) $\vec{\omega}.\vec{r} = \vec{v}$
(C) $\vec{r} \times \vec{\omega} = \vec{v}$ (D) $\vec{\omega}\,\vec{r} = \vec{v}$

4. In uniform circular motion

(A) Both the angular velocity and the angular momentum vary
(B) The angular velocity varies but the angular momentum remains constant.
(C) Both the angular velocity and the angular momentum stay constant
(D) The angular momentum varies but the angular velocity remains constant.

5. The angular velocity of the second's needle in watch is-

(A) $\frac{\pi}{30}$ (B) 2π
(C) π (D) $\frac{60}{\pi}$

6. Angular velocity of minute hand of a clock is :

(A) $\frac{\pi}{30}$ rad/s (B) π rad/s
(C) 2π rad/s (D) $\frac{\pi}{1800}$ rad/s

7. An aeroplane revolves in a circle above the surface of the earth at a fixed height with speed 100 km/hr. The change in velocity after completing 1/2 revolution will be.

(A) 200 km/hr (B) 150 km/hr
(C) 300 km/hr (D) 400 km/hr

8. A particle moving on a circular path travels first one third part of circumference in 2 sec & next one third part in 1 sec. Average angular velocity of the particle is (in rad/sec) -

(A) $\frac{2\pi}{3}$ (B) $\frac{\pi}{3}$
(C) $\frac{4\pi}{9}$ (D) $\frac{5\pi}{3}$

9. A grind-stone starts revolving from rest, if its angular acceleration is 4.0 rad/sec^2 (uniform) then after 4 sec.What is its angular displacement & angular velocity respectively -

(A) 32 rad, 16 rad/sec
(B) 16 rad, 32 rad/sec
(C) 64 rad, 32 rad/sec
(D) 32 rad, 64 rad/sec

10. Angular displacement of any particle is given $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ where ω_0 & α are constant if ω_0 = 1 rad/sec, α = 1.5 rad/sec^2 then in t = 2 sec. angular velocity will be (in rad/sec)

(A) 1 (B) 5 (C) 3 (D) 4

11. Which of the following statements is false for a particle moving in a circle with a constant angular speed ?

(A) The velocity vector is tangent to the circle
(B) The acceleration vector is tangent to the circle
(C) The acceleration vector point to the center of the circle
(D) The velocity and acceleration vectors are perpendicular to each other

12. 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

(A) its velocity is constant
(B) its acceleration is constant
(C) its kinetic energy is constant
(D) it moves in a straight line

13. A wheel is subjected to uniform angular acceleration about its axis. Initially its angular velocity is zero. In the first 2 sec, it rotates through an angle θ_1. In the next 2 sec, it rotates through an additional angle θ_2. The ratio of $\frac{\theta_2}{\theta_1}$ is

(A) 1 (B) 2 (C) 3 (D) 5

14. 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 sec from its start is

(A) 8 rad/sec (B) 12 rad/sec
(C) 24 rad/sec (D) 36 rad/sec

15. Let a_r and a_t represent radial and tangential acceleration. The motion of a 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

16. A stone tied to one end of string 80 cm long is whirled in a horizontal circle with a constant speed. If stone makes 14 revolutions in 25 sec, the magnitude of acceleration of stone is :

(A) 850 cm/s^2 (B) 996 cm/s^2
(C) 720 cm/s^2 (D) 650 cm/s^2

17. If the radii of circular paths of two particles of same masses are in the ratio of 1 : 2, then in order to have same centripetal force, their speeds should be in the ratio of :

(A) 1 : 4 (B) 4 : 1
(C) 1 : $\sqrt{2}$ (D) $\sqrt{2}$: 1

18. A weightless thread can bear tension upto 3.7 *kg wt*. A stone of mass 500 *gms* is tied to it and revolved in a circular path of radius 4 *m* in a vertical plane. If $g = 10\, ms^{-2}$, then the maximum angular velocity of the stone will be

(A) 4 *radians/sec* (B) 16 *radians/sec*
(C) $\sqrt{21}$ *radians/sec* (D) 2 *radians/sec*

19. If a_r and a_t represent radial and tangential accelerations, the motion of a particle will be uniformly circular if

(A) $a_r = 0$ and $a_t = 0$
(B) $a_r = 0$ but $a_t \neq 0$
(C) $a_r \neq 0$ but $a_t = 0$
(D) $a_r \neq 0$ and $a_t \neq 0$

20. A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turntable is doubled , it will just slip at a distance of

(A) 1 cm (B) 2 cm
(C) 4 cm (D) 8 cm

21. A stone of mass 0.5 kg tied with a string of length 1 metre is moving in a circular path with a speed of 4 m/sec. The tension acting on the string in newton is -

(A) 2 (B) 8 (C) 0.2 (D) 0.8

22. A 500 kg car takes around turn of radius 50 m with a speed of 36 km/hr. The centripetal force acting on the car will be :

(A) 1200 N (B) 1000 N
(C) 750 N (D) 250 N

23. A heavy & big sphere is hang with a string of length ℓ, this sphere moves in a horizontal circular path making an angle θ with vertical then its time period is -

(A) $T = 2\pi\sqrt{\frac{\ell}{g}}$

(B) $T = 2\pi\sqrt{\frac{\ell \sin\theta}{g}}$

(C) $T = 2\pi\sqrt{\frac{\ell \cos\theta}{g}}$

(D) $T = 2\pi\sqrt{\frac{\ell}{g \cos\theta}}$

24. Two masses M and m are attached to a vertical axis by weightless threads of combined length ℓ. They are set in rotational motion in a horizontal plane about this axis with constant angular velocity ω. If the tensions in the threads are the same during motion, the distance of M from the axis is.

(A) $\frac{M\ell}{M+m}$ (B) $\frac{m\ell}{M+m}$

(C) $\frac{M+m}{M}\ell$ (D) $\frac{M+m}{m}\ell$

25. The velocity and acceleration vectors of a particle undergoing circular motion are $\vec{v} = 2\hat{i}$ m/s and $\vec{a} = 2\hat{i} + 4\hat{j}$ m/s^2 respectively at an instant of time. The radius of the circle is

(A) 1m (B) 2m (C) 3m (D) 4m

26. The tension in the string revolving in a vertical circle with a mass m at the end when it is at the lowest position.

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

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

27. A particle is moving in a vertical circle. The tensions in the string when passing through two positions at angles 30° and 60° from vertical (lowest positions) are T_1 and T_2 respectively. Then

(A) $T_1 = T_2$

(B) $T_2 > T_1$

(C) $T_1 > T_2$

(D) Tension in the string always remains the same

28. A heavy mass is attached to a thin wire and is whirled in a vertical circle. The wire is most likely to break.

(A) When the mass is at the height point of the circle

(B) When the mass is at the lowest point of the circle

(C) When the wire is horizontal

(D) At an angle of $\cos^{-1}$ (1/3) from the upward vertical

29. A cane filled with water is revolved in a vertical circle of radius 4 meter and the water just does not fall down. The time period of revolution will be-

(A) 1 sec (B) 10 sec

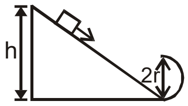
(C) 8 sec (D) 4 sec

30. A body is suspended from a smooth horizontal nail by a string of length 0.25 metre. What minimum horizontal velocity should be given to it in the lowest position so that it may move in a complete vertical circle with the nail at the centre ?

(A) 3.5 ms^{-1} (B) 4.9 ms^{-1}

(C) $7\sqrt{2}$ ms^{-1} (D) $\sqrt{9.8}$ ms^{-1}

31. A block follows the path as shown in the figure from height h. If radius of circular path is r, then relation holds good to complete full circle is.



(A) h < 5r/2 (B) h > 5r/2

(C) h = 5r/2 (D) h ≥ 5r/2

32. A stone of 1 kg tied up with 10/3 metre long string rotated in a vertical circle. If the ratio of maximum & minimum tension in string is 4 then speed of stone at heighest point of circular path will be - (g = 10 m/s^2)

(A) 20 m/s (B) $10\sqrt{3}$ m/s

(C) $5\sqrt{2}$ m/s (D) 10 m/s

33. In a circus, stuntman rides a motorbike in a circular track of radius R in the vertical plane. The minimum speed at highest point of track will be :

(A) $\sqrt{2gR}$ (B) 2gR

(C) $\sqrt{3gR}$ (D) $\sqrt{gR}$

34. A car moving on a horizontal road may be thrown out of the road in taking a turn :

(A) By the gravitational force

(B) Due to lack of sufficient centripetal force

(C) Due to friction between road and the tyre

(D) Due to reaction of earth

35. A cane filled with water is revolved in a vertical circle of radius 4 meter and the water just does not fall down. The time period of revolution will be

(A) 1 sec (B) 10 sec

(C) 8 sec (D) 4 sec

(SECTION-B)

36. The driver of a car travelling at full speed suddenly sees a wall at a distance r directly in front of him. To avoid collision,
(A) he should apply brakes sharply
(B) he should turn the car sharply
(C) he should apply brakes and then sharply turn
(D) None of these

37. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2 rt^2$ where k is a constant. The power delivered to the particle by the force acting on it is-
(A) $2 \pi mk^2 r^2$ (B) $mk^2 r^2 t$
(C) $\frac{(mk^4r^2t^5)}{3}$ (D) Zero

38. Centrifugal force is an inertial force when considered by -
(A) An observer at the centre of circular motion
(B) An outside observer
(C) An observer who is moving with the particle which is experiencing the force
(D) none of the above

39. If a particle of mass m is moving in a horizontal circle of radius r with a centripetal force $\left(-\frac{K}{r^2}\right)$, the total energy is-
(A) $-\frac{K}{2r}$ (B) $-\frac{K}{r}$
(C) $-\frac{2K}{r}$ (D) $-\frac{4K}{r}$

40. A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if
(A) $r = \mu g\omega^2$ (B) $r = \frac{\omega^2}{\mu g}$
(C) $r \le \frac{\mu g}{\omega^2}$ (D) $r \ge \frac{\mu g}{\omega^2}$

41. A particle moves in a circle of radius 5 cm with constant speed and time period 0.2 πs. The acceleraiton of the particle is :
(A) 15 m/s^2 (B) 25 m/s^2
(C) 36 m/s^2 (D) 5 m/s^2

42. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45°, the speed of the car is :
(A) 20 ms^{-1} (B) 30 ms^{-1}
(C) 5 ms^{-1} (D) 10 ms^{-1}

43. A car of mass m is moving on a level circular track of radius R. If μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by :
(A) $\sqrt{\mu_s mRg}$ (B) $\sqrt{Rg/\mu_s}$
(C) $\sqrt{mRg/\mu_s}$ (D) $\sqrt{\mu_s Rg}$

44. A mass m is attached to a thin wire and whirled in a vertical circle. The wire is most likely to break when:
(A) inclined at a angle of 60° from vertical
(B) the mass is at the highest point
(C) the wire is horizontal
(D) the mass is at the lowest point

45. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed υ_A and υ_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be :
(A) 1 : 1 (B) $r_A : r_B$
(C) $\upsilon_A : \upsilon_B$ (D) $r_B : r_A$

46. Two cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2, respectively. Their speeds are such that they make complete circles in the same time t. The ratio of their centripetal acceleration is :
(A) $m_1 r_1 : m_2 r_2$ (B) $m_1 : m_2$
(C) $r_1 : r_2$ (D) 1 : 1

47. Assertion : In circular motion, work done by centripetal force is zero.
Reason : In circular motion centripetal force is perpendicular to the displacement.
(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

48. Assertion : Cream gets separated out of milk when it is churned, it is due to gravitational force.

Reason : In circular motion gravitational force is equal to centripetal force.

(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(B) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(C) If assertion is true but reason is false.

(D) If the assertion and reason both are false.

49. In a uniform circular motion

(A) Velocity and acceleration remain constant

(B) Kinetic energy remains constant

(C) Speed and acceleration changes

(D) Only velocity changes, acceleration remain constant

50. The following are the parameter of circular motion of a body : u $\rightarrow$ speed of the body, R $\rightarrow$ radius vector, a $\rightarrow$ total acceleration a_R $\rightarrow$ radial acceleration, a_T $\rightarrow$ tangential acceleration ω $\rightarrow$ angular velocity, match the following.

Column I	**Column II**
(a) $\vec{a} = \vec{\omega} \times \left(\vec{\omega} \times \vec{R}\right)$	(p) $\lvert \vec{a}_r \rvert = 0$
(b) $\vec{a} = \vec{\alpha} \times \vec{R}$	(q) $\lvert \vec{a}_R \rvert = \dfrac{v^2}{R}$
(c) $\lvert \vec{a} \rvert = \sqrt{2} \lvert \vec{a}_R \rvert$	(r) $\lvert \vec{a}_r \rvert = \lvert \vec{a}_R \rvert$
(d) $\vec{a} = \vec{\omega} \times \vec{v}$	(s) $\dfrac{dv}{dt} = a$

(A) (a) $\rightarrow$p,q (b) $\rightarrow$q,s (c) $\rightarrow$ q,r (d) $\rightarrow$p,q

(B) (a) $\rightarrow$p,q (b) $\rightarrow$q,r (c) $\rightarrow$ p,s (d) $\rightarrow$q,s

(C) (a) $\rightarrow$p,s (b) $\rightarrow$r,p (c) $\rightarrow$ q,r (d) $\rightarrow$p,q

(D) (a) $\rightarrow$ r (b) $\rightarrow$q, (c) $\rightarrow$ s, (d) $\rightarrow$ p