

# Circular Motion

- 1) In a uniform circular motion, the direction of linear velocity is along the
  - a) Tangent to the curve path
  - b) Radius vector towards the centre
  - c) Perpendicular to the plane of the circular motion
  - d) Radius vector
- 2) A satellite of the earth is revolving round the earth with a uniform speed 'v'. If the gravitational force suddenly disappears, the satellite will
  - a) Continue to move with the velocity v along the original orbit.
  - b) Move with a velocity v, tangentially to the original orbit.
  - c) Fall down with increasing velocity
  - d) Ultimately come to rest somewhere on the original orbit.
- 3) For a particle performing UCM, the physical quantities are constant
  - a) Speed and angular velocity
  - b) Kinetic energy and radius vector
  - c) Angular velocity and Kinetic energy
  - d) 'a' and 'c'
- 4) In a uniform circular motion, the velocity, position vector and angular velocity are
  - a) Parallel to each other
  - b) Mutually perpendicular to each other
  - c) They are co-planer
  - d) The angle between them  $45^\circ$
- 5) Angle between radius vector and centripetal acceleration is
  - a)  $0^\circ$
  - b)  $\pi^\circ$
  - c)  $2\pi^\circ$
  - d) None of these
- 6) A particle is moving in a uniform circular motion with radius 'r', in half revolution the displacement and distance covered by the particle are
  - a)  $2r, 2\pi r$
  - b)  $1.414 r, 3.142r$
  - c)  $2r, \pi r$
  - d)  $\pi r, 2r$
- 7) The ratio of the frequencies of rotation of the hour hand of a clock and the Earth is
  - a) 1: 12
  - b) 1: 2
  - c) 2:1
  - d) 12 : 1
- 8) The ratio of the angular speed of the minute hand of a clock to that of its hour hand is
  - a) 3600 : 1
  - b) 60 : 1
  - c) 24 : 1
  - d) 12 : 1
- 9) Which of the following quantities are constant for a body performing UCM?
  - a) The linear and angular velocities.
  - b) The linear speed and the acceleration
  - c) The linear velocity and the acceleration
  - d) The linear speed and the angular velocity
- 10) The angular speed of the wheels of a bicycle is  $8\pi$  rad/s. Their period of rotation is
  - a) 0.25 s
  - b) 0.4 s
  - c)  $\frac{\pi}{4}$  s
  - d) 4s
- 11) A particle describes a circular path of diameter 20 m every 2s. the average angular speed of the particle during 4s is
  - a)  $20\pi \text{ rad} / \text{s}$
  - b)  $10\pi \text{ rad} / \text{s}$
  - c)  $5\pi \text{ rad} / \text{s}$
  - d)  $\pi \text{ rad} / \text{s}$
- 12) A car goes round a circular track of radius 50m with a speed of 25 m/s. its angular speed is
  - a) 0.5 rad/s
  - b) 2 rad/s
  - c) 5 rad/s
  - d) 1250 rad/s
- 13) A belt passes over a wheel of radius 25 cm. if a point on the belt has a speed of 5 m/s, the belt is moving with an angular velocity of
  - a) 3.2 rad/s
  - b) 0.32 rad/s
  - c) 20 rad/s
  - d) 0.032 rad/s
- 14) A bicycle wheel, 80 cm in diameter, is rotating at 120 rpm. The linear speed of the midpoint of a spoke is
  - a)  $80\pi \text{ m} / \text{s}$
  - b)  $8.0\pi \text{ m} / \text{s}$
  - c)  $0.80\pi \text{ m} / \text{s}$
  - d)  $0.80 \text{ m} / \text{s}$

- 15) For a particle performing circular motion, the relation between its linear and angular velocities is
- $\vec{v} = \vec{r} \times \vec{\omega}$
  - $\vec{v} = r \vec{\omega}$
  - $\vec{v} = \vec{\omega} r$
  - $\vec{v} = \vec{\omega} \times \vec{r}$
- 16) Two cars, A and B, take the same time to go around two concentric tracks of radii  $R_1$  and  $R_2$ , respectively. The ratio of the speed of car A to that of car B is
- 1
  - $\frac{R_1}{R_2}$
  - $\frac{R_2}{R_1}$
  - 2
- 17) A particle moves in a circular path of radius 10 cm with a constant speed of 10 cm/s. its acceleration is
- 100 cm/s<sup>2</sup>
  - 10 cm/s<sup>2</sup>
  - 1 cm/s<sup>2</sup>
  - Zero
- 18) The linear acceleration of a body performing uniform circular motion is given by
- $\vec{a} = \vec{\omega r}$
  - $\vec{a} = -\vec{\omega r}$
  - $\vec{a} = \omega^2 \vec{r}$
  - $\vec{a} = -\omega^2 \vec{r}$
- 19) If a particle moves in a circular path with an angular velocity which is uniformly changing in magnitude, then it has
- No centripetal acceleration
  - A constant centripetal acceleration plus a tangential acceleration
  - A tangential acceleration constant in magnitude and a centripetal acceleration which changes in magnitude
  - A constant tangential acceleration and a centripetal acceleration which increases in magnitude.
- 20) An object moving a circle will have an angular acceleration only if the net force on it
- Is entirely centripetal
  - Has a tangential component
  - Is entirely centrifugal
  - Is entirely tangential
- 21) A particle is moving in a circle of radius 'r' and centre O with constant speed. What is the change in velocity in moving from A and B? (If the angle between two velocity vector is  $\theta$ )
- $2v \sin^2 \theta / 2$
  - $2v \sin \theta / 2$
  - $2v \cos^2 \theta / 2$
  - $2v \cos \theta / 2$
- 22) The speed of revolution of a particle around a circle is halved and its angular speed is doubled what happens to the radial acceleration?
- Remains unchanged
  - Halved
  - Doubled
  - Quadrupled
- 23) The average acceleration vector for a particle having a uniform circular motion is
- A constant vector of magnitude  $v^2/r$
  - A vector of magnitude  $v^2/r$  directed normal to the plane
  - Equal to the instantaneous acceleration vector at the start of the motion
  - A null vector
- 24) A car is moving with speed 30 m/s on a circular path of radius 500 m. its speed is increasing at the rate of  $2\text{m/s}^2$ . The acceleration of car is
- 9.8 m/s<sup>2</sup>
  - 1.8 m/s<sup>2</sup>
  - 2 m/s<sup>2</sup>
  - 2.7 m/s<sup>2</sup>
- 25) The angular speed of a particle, moving in a circle of radius 20 cm, increases from 2 rad/s to 40 rad/s in 9 s the ratio of its centripetal acceleration to tangential acceleration at the end of 19 s is,
- 400: 1
  - 1: 800
  - 1:400
  - 800 : 1
- 26) A spirit level is placed at the edge of a turn table along its radius. The bubble will be
- At the centre of the container
  - At the outer edge of the container
  - At the inner edge of the container
  - Will oscillate about the centre of the container
- 27) Select the wrong statement
- Centrifugal force has same magnitude as that of centripetal force
  - Centrifugal force is along the radius, away from the centre

- c) Centrifugal force exist in inertial frame of reference
- d) Centrifugal force is called pseudo force as its origin cannot be explained
- 28) A body of mass 0.4 kg is revolved in a horizontal circle of radius 5m. If it performs 120 rev/min, the centripetal force acting on it is.
- $4\pi^2 N$
  - $8\pi^2 N$
  - $16\pi^2 N$
  - $32\pi^2 N$
- 29) A body of mass 1 kg is tied to a string and revolved in a horizontal circle of radius 100 cm. If the breaking tension of the string is 100 N, the maximum velocity with which the body can be revolved is
- 100 m/s
  - 10 m/s
  - 1 m/s
  - 0.1 m/s
- 30) A stone of mass m is tied to the end of a string of length l. When whirled in a horizontal circle, the tension in the string is F. To whirl it in a radius of  $\frac{1}{2}l$  with half the initial angular velocity, the new tension in the string should be
- F
  - $\frac{1}{2}F$
  - $\frac{1}{4}F$
  - $\frac{1}{8}F$
- 31) A rope can withstand a tension of  $\pi^2 kg wt$ . A body of mass 2 kg is tied to this rope and revolved in a horizontal circle of radius 5 m. the maximum frequency of revolution possible is [g =  $10m/s^2$ ]
- 0.2 rev/s
  - 0.5 rev/s
  - 1 rev/s
  - 2 rev/s
- 32) centripetal force in vector form can be expressed as
- $\vec{F} = -\frac{mv^2}{r}$
  - $\vec{F} = -\frac{mv^2}{r^3} \vec{r}$
- c)  $\vec{F} = -m\omega^2 \vec{r}$
- d)  $\vec{F} = -\frac{mv^2}{r} \vec{r}$
- 33) The centripetal force acting on a body of mass m revolving in a circle of radius r and completes n rev/sec, is
- $4\pi m r n^2$
  - $4\pi m r^2 n^2$
  - $4\pi^2 m r^2 n^2$
  - $4\pi^2 m r n^2$
- 34) If a small body of mass m is moving with angular velocity  $\omega$  in a circle of radius r, then its K. E. will be
- $\frac{m\omega r}{2}$
  - $\frac{m\omega^2 r}{2}$
  - $\frac{m\omega^2 r^2}{2}$
  - $\frac{m\omega r^2}{2}$
- 35) A particle of mass m executing uniform circular motion on a path of radius r. if P is the magnitude of its linear momentum, the radial force acting on the particle will be
- Pmr
  - $\frac{P^2}{rm}$
  - $\frac{rP}{m}$
  - $\frac{rm}{P^2}$
- 36) A coin placed on a rotating table just slips when it is placed at a distance 4r from the centre, on doubling the angular velocity of the table, the coin will just slip now the coin is at a distance from centre is
- 4r
  - r/4
  - r
  - 2 r
- 37) A car is moving along a horizontal curve of radius 20 cm. If the coefficient of friction between the road and wheels of the car is 0.25, then its maximum safe speed is
- 3 m/s

- b) 5 m/s  
c) 7 m/s  
d) 9 m/s
- 38) The maximum safe speed of a vehicle on a circular track is 15 km/h. When the track becomes wet, the maximum safe speed is 10 km/h. the ratio of coefficient of friction of dry track to that of the wet track is  
a) 2:3  
b) 3:2  
c) 9:4  
d) 1:1
- 39) Angle of banking is independent of  
a) Velocity of vehicle  
b) Radius of curvature  
c) Mass of vehicle  
d) Width of road
- 40) A car is traveling on a circular banked road. The centripetal acceleration of a car is provided by  
a) Normal reaction  
b) Weight of a car  
c) Horizontal component of normal reaction  
d) Vertical component of normal reaction
- 41) At what angle should a road be banked so that the vehicle may a bend of radius 10 m traveling with a speed of 10 m/s ( $g = 10 \text{ m/s}^2$ )  
a)  $80^\circ$   
b)  $45^\circ$   
c)  $60^\circ$   
d)  $90^\circ$
- 42) A car can take a turn on a flat circular roadway relying on friction with a maximum speed  $v$ . The car now takes a turn on another flat circular roadway of twice the radius. If the coefficient of friction between the tyres and the road surface is the same as before, the maximum speed at which the car can now be driven is  
a)  $2v$   
b)  $\sqrt{2}v$   
c)  $\frac{v}{\sqrt{2}}$   
d)  $\frac{v}{2}$
- 43) An empty truck can take certain level turn at a maximum safe speed of 12 m/s without skidding. When the truck is carrying a load equal to its own weight, the maximum speed at which the truck can safely take the turn is  
a) 3 m/s  
b) 6 m/s  
c) 12 m/s  
d) 24 m/s
- 44) The maximum speed with which a car can be driven safely along a curve road of radius 17.32 m and banked at  $30^\circ$  with the horizontal is  
a) 5 m/s  
b) 10 m/s  
c) 15 m/s  
d) 20 m/s
- 45) The tangent of the banking angle is  
a) Proportional to  $v$   
b) Inversely proportional to  $v^2$   
c) Proportional to the radius of the turn  
d) Proportional to  $v^2$
- 46) A car takes a circular turn at an optimum speed on a road which is banked at an angle  $\theta = \sin^{-1} 0.1$ . If the required centripetal force is 400 N, the normal reaction on the car is  
a) 400 N, vertically upward  
b) 40N, normal to the road surface  
c) 4000 N, normal to the road surface  
d) 4000 N, vertically downward
- 47) The period of a conical pendulum,  $T$ , is given by  
a)  $2\pi\sqrt{\frac{L\cos\theta}{g}}$   
b)  $2\pi\sqrt{\frac{L\sin\theta}{g}}$   
c)  $2\pi\sqrt{\frac{L\tan\theta}{g}}$   
d)  $2\pi\sqrt{\frac{g}{L\cos\theta}}$
- 48) The time period of a conical pendulum is  $T$ . the tension in the string is, in the usual notation,  
a)  $\frac{4\pi^2 mL}{T^2}$   
b)  $\frac{2\pi mL}{T^2}$   
c)  $\frac{\pi mL}{T^2}$   
d)  $mg \cos \theta$
- 49) For a conical pendulum, the tension in the string is  
a)  $\frac{mv^2}{L\cos^2\theta}$   
b)  $\frac{mv^2}{L\sin^2\theta}$

- c)  $\frac{mv^2}{L \sin \theta}$
- d)  $\frac{mv^2}{L \cos \theta}$
- 50) The string of a conical pendulum has a length  $L$  and makes an angle  $\theta$  with the vertical. The equivalent simple pendulum with the same period has a length
- a)  $\frac{L}{\cos \theta}$
- b)  $L$
- c)  $L \cos \theta$
- d)  $L \sin \theta$
- 51) A bucket of water, tied to a rope is to be rotated without spilling in a vertical circle of radius 5 m. The minimum speed of the bucket at the highest position should be
- a) 0.7 m/s
- b) 2 m/s
- c) 4 m/s
- d) 7 m/s
- 52) A small bob tied to a string of length 1 m is revolved in a vertical circle such that the tension in the string is zero at the highest point. Its linear speed at the lowest point is
- a)  $7\sqrt{2} \text{ m/s}$
- b) 7 m/s
- c)  $3\sqrt{2} \text{ m/s}$
- d) 3 m/s
- 53) A motorcyclist rides in a vertical circle in a hollow sphere of radius 5m. the minimum speed required so that he does not lose contact with the sphere at the highest point is
- a) 4.6 m/s
- b) 7 m/s
- c) 7.5 m/s
- d) 8 m/s
- 54) A bob of mass 30 g suspended by a string is able to complete a vertical circular loop at a place where  $g = 10 \text{ m/s}^2$ . If the maximum change in its PE during the motion is 0.6 J, the radius of the path is
- a) 10 m
- b) 2m
- c) 1 m
- d) 0.5 m
- 55) A small body of mass  $m$ , tied to a string and revolved in a vertical circle is just able to reach to the top of the path and complete the circle. The tension in the string at the lowest point of the path is
- a)  $mg$
- b)  $2mg$
- c)  $4 mg$
- d)  $6 mg$
- 56) A stone tied to the end of a string is revolved in a vertical circle of radius  $R$  such that it is just able to complete the circle. its speed when the string is horizontal is
- a)  $\sqrt{5gR}$
- b)  $2\sqrt{gR}$
- c)  $\sqrt{3gR}$
- d)  $\sqrt{gR}$
- 57) The angular acceleration of a rotating body which slows down from 500 rpm to rest in 10 seconds is about
- a)  $5 \text{ rad/s}^2$
- b)  $-2.5 \text{ rad/s}^2$
- c)  $-5 \text{ rad/s}^2$
- d)  $-10 \text{ rad/s}^2$
- 58) The frequency of a particle performing circular motion changes from 60 rpm to 120 rpm in 20 seconds. Its angular acceleration is
- a)  $31.4 \text{ rad/s}^2$
- b)  $6.28 \text{ rad/s}^2$
- c)  $3.14 \text{ rad/s}^2$
- d)  $0.314 \text{ rad/s}^2$
- 59) A particle moves in a circular path of radius 0.2 m with an angular speed 2 rad/s. If it has a constant angular acceleration of  $4 \text{ rad/s}^2$  for 0.5 s, its angular speed becomes
- a) 0.4 rad/s
- b) 2 rad/s
- c) 4 rad/s
- d) 8 rad/s
- 60) A flywheel rotates about a fixed axis and slows down from 400 rpm to 200 rpm in one minute. How many revolutions does the flywheel complete in the same time?
- a) 200 rev
- b) 400 rev
- c) 300 rev
- d) 500 rev
- 61) If an electric fan revolving at 600 rpm is speeded up uniformly to 1200 rpm in 4s, then the angular acceleration of a fan will be
- a)  $\pi / 2 \text{ rad / s}^2$

- b)  $2\pi \text{ rad} / \text{s}^2$   
 c)  $3\pi / 2 \text{ rad} / \text{s}^2$   
 d)  $5\pi \text{ rad} / \text{s}^2$
- 62) An object of mass 2 kg is whirled round in a vertical circle of radius 1m with a constant speed of 4m/s. then the maximum tension in the string is (10 m/s )  
 a) 32 N  
 b) 52 N  
 c) 72 N  
 d) 92 N
- 63) Initial angular velocity of a wheel of a wheel is 2 rad/s. It rotates with a constant angular acceleration of  $3.5 \text{ rad/s}^2$ . Its angular displacement in 2 s is  
 a) 4 rad  
 b) 7 rad  
 c) 8 rad  
 d) 11 rad
- 64) A body of mass m performs ucm along a circular path of radius r with a velocity v. If its angular momentum is L, then its centripetal force is  
 a)  $L^2/mr^2$   
 b)  $L^2/mr^3$   
 c)  $L^2/mr$   
 d)  $L^2/r^3$
- 65) A motorcyclist rides in a horizontal circle along the inner wall of a cylindrical chamber of radius r. if the coefficient of friction between the tyres and the wall is  $\mu$ , what should be its minimum speed to prevent him from sliding down?  
 a)  $\sqrt{\frac{g}{r\mu}}$   
 b)  $\sqrt{\frac{rg}{\mu}}$   
 c)  $\sqrt{\frac{\mu g}{r}}$   
 d)  $\sqrt{\frac{r\mu}{g}}$
- 66) In circular motion, the radius vector  
 a) Changes in magnitude as well as direction  
 b) Changes in magnitude only  
 c) Changes in direction but has a fixed magnitude  
 d) Has constant magnitude and direction
- 67) Angular displacement is a vector quantity directed  
 a) Radially along the position vector  
 b) Perpendicular to the plane of revolution given by the left hand screw rule  
 c) Along the tangent to the circular path and given by the right hand rule  
 d) Perpendicular to the plane of revolution given by the right hand screw rule
- 68) The dimensions of angular velocity are  
 a)  $[M^0 L^0 T^0]$   
 b)  $[M^0 L^0 T^{-2}]$   
 c)  $[M^0 L T^{-1}]$   
 d)  $[M^0 L T^{-2}]$
- 69) Angular velocity of hour arm of a clock, in rad/sec, is  
 a)  $\frac{\pi}{43200}$   
 b)  $\frac{\pi}{21600}$   
 c)  $\pi/30$   
 d)  $\pi/1800$
- 70) Two particles of masses  $m_1$  and  $m_2$  move in circular paths of radii  $r_1$  and  $r_2$  respectively. If they take the same time for one complete revolution, their angular speeds are in the ratio  
 a)  $\frac{m_1}{r_1} : \frac{m_2}{r_2}$   
 b)  $m_1 r_1 : m_2 r_2$   
 c)  $r_1 : r_2$   
 d) 1:1
- 71) A bicycle is moving with a constant velocity  $\vec{v}$  the graph of angular speed  $\omega$  of its wheels against the distance travelled s is  
 a) A hyperbola  
 b) A straight line parallel to the  $\omega$  axis  
 c) A straight line parallel to the s axis  
 d) A parabola
- 72) When a body moves with a constant speed along a circle ,  
 a) Its linear velocity remains constant  
 b) No force acts on it  
 c) No work is done on it  
 d) No acceleration is produced in it
- 73) For a particle performing UCM,  
 a)  $\vec{v}$  is uniform  
 b)  $\vec{a} \cdot \vec{r} = 0$   
 c)  $\vec{v} \cdot \vec{r} = 0$   
 d)  $\vec{a} \cdot \vec{v} \neq 0$

- 74) For a particle performing UCM,
- $\vec{\omega}$  is parallel to  $\vec{v}$
  - $\vec{\omega}$  is parallel to  $\vec{a}$
  - $\vec{a}$  is parallel to  $\vec{v}$
  - $\vec{\omega}$  is perpendicular to  $\vec{r}$
- 75) Two particles, whose masses are in the ratio 7:3, go around two concentric tracks whose radii are in the ratio 1:2. If their linear speeds are in the ratio 1:2, their centripetal accelerations are in the ratio
- 7:6
  - 1:1
  - 1:2
  - 1:4
- 76) A body performing circular motion with a constant speed has a constant
- Momentum
  - Angular velocity
  - Radius vector
  - Acceleration
- 77) Two particles A and B, of masses M and m, take the same time to go around two concentric tracks of radii R and r, respectively. The ratio of centripetal acceleration of B to that of A is
- $\frac{M}{m} \cdot \frac{R}{r}$
  - $\frac{m}{M} \cdot \frac{r}{R}$
  - $\frac{r}{R}$
  - $\frac{R}{r}$
- 78) The particle is performing uniform circular motion, the true statement/s is/are
- A) the direction of linear velocity, acceleration and force changes instantaneously
- B) the magnitude of linear velocity, acceleration and force changes instantaneously.
- C) the magnitude of linear velocity, acceleration and force remains constant.
- D) linear velocity, acceleration and force are in the same direction.
- A and D
  - A and C
  - B, C and D
  - A, B, and C
- 79) The work done on a particle performing UCM is
- Constant but non zero
  - $\frac{mv^2}{r} \times 2\pi r$
  - Zero
  - Infinite
- 80) A particle is performing uniform circular motion, has constant
- Velocity
  - Kinetic energy
  - Momentum
  - Acceleration
- 81) The vector relation among radial acceleration, angular velocity and linear velocity is
- $\vec{a}_r = \vec{\omega} \bullet \vec{v}$
  - $\vec{a}_r = \vec{\omega} \times \vec{v}$
  - $\vec{a}_r = \vec{v} \times \vec{\omega}$
  - $\vec{a}_r = \vec{v} \bullet \vec{\omega}$
- 82) Two particles of masses  $m_1$  and  $m_2$  are moving in concentric circles of radii  $r_1$  and  $r_2$  such that their periods are same. Then the ratio of their centripetal force is
- $r_1^2 / r_2^2$
  - $r_2^2 / r_1^2$
  - $r_1 / r_2$
  - $r_2 / r_1$
- 83) For a particle moving in a circle, the acceleration vector makes an angle of  $30^\circ$  with the velocity vector. If  $a_c$  and  $a_t$  represent the centripetal and tangential accelerations, the ratio  $a_c / a_t$  is
- 1
  - 0.866
  - $1/\sqrt{3}$
  - 0.50
- 84) Two particles with their masses in the ratio 2:3 perform uniform circular motion with orbital radii in the ratio 3:2. If the centripetal force acting on them is the same, the ratio of their speeds is
- 4:9
  - 1:1
  - 3:2
  - 9:4
- 85) A body of mass 0.5 kg is revolved in a horizontal circle of radius 20 cm. If the angular speed of revolution is 0.5 rad/s, the centripetal force acting on the body is
- 0.025 N

- b) 0.05 N  
c) 0.25 N  
d) 0.5 N
- 86) If the angular speed of a particle in circular motion is halved, the magnitude of the centripetal force
- Becomes half the initial magnitude
  - Becomes one-fourth the initial magnitude
  - Remains unchanged
  - Becomes doubled the initial magnitude.
- 87) A body is moving along a circular path with constant speed. If the direction of rotation is reversed and the speed is doubled,
- Direction of centripetal acceleration is reversed
  - Direction of centripetal acceleration is remains unchanged
  - Magnitude of centripetal acceleration is doubled
  - Magnitude of centripetal acceleration is halved
- 88) The angle made by a motorcyclist with the vertical when negotiating a bend along an unbanked road of radius 10 m with a speed of 27 km/h is about [ $g = 10 \text{ m/s}^2$ ]
- $\tan^{-1}\left(\frac{9}{16}\right)$
  - $\tan^{-1}\left(\frac{5}{8}\right)$
  - $\tan^{-1}\left(\frac{9}{8}\right)$
  - $\tan^{-1}\left(\frac{9}{4}\right)$
- 89) At a curve, a highway is banked so that a fully loaded truck can negotiate the curve at an optimum speed of 90 kmph. For a car  $\frac{1}{3}$ rd the weight of the truck, the optimum speed at the curve is
- 30 kmph
  - 90 kmph
  - 156 kmph
  - 180 kmph
- 90) The frequency of a conical pendulum,  $f$ , is given by
- $\frac{1}{2\pi} \sqrt{\frac{g \cos \theta}{L}}$
  - $\frac{1}{2\pi} \sqrt{\frac{g}{L \sin \theta}}$
  - $\frac{1}{2\pi} \sqrt{\frac{g}{L \tan \theta}}$
  - $\frac{1}{2\pi} \sqrt{\frac{g}{L \cos \theta}}$
- 91) The bob of a conical pendulum has a  $m$  and angular speed  $\omega$ . If the string of length  $L$  makes an angle  $\theta$  with the vertical, the tension in the string is
- $m\omega^2 L$
  - $mg$
  - $mg \cos \theta$
  - $mg \sin \theta$
- 92) A small bob of mass  $m$  is tied to a string and revolved in a vertical circle of radius  $r$ . If its speed at the highest point is  $\sqrt{3rg}$ , the tension in the string at the lowest point is
- 5 mg
  - 6 mg
  - 7 mg
  - 8 mg
- 93) A car accelerates from 0 to 72 kmph in 5 seconds. If it has wheels of diameter 50 cm. the angular acceleration of its wheels is
- 1.6 rad/s<sup>2</sup>
  - 8 rad/s<sup>2</sup>
  - 16 rad/s<sup>2</sup>
  - 160 rad/s<sup>2</sup>
- 94) For motion along a circular path, a particle starts from rest and moves with a constant angular acceleration of  $8\pi \text{ rad/s}^2$  It will reach a speed of  $60\pi \text{ rad/s}$  after
- $7.5\pi \text{ s}$
  - 20 s
  - 15 s
  - 7.5 s
- 95) An automobile, whose speed is increasing at a rate of  $0.6 \text{ m/s}^2$ , travels along a circular road of radius 20m. when the instantaneous speed of the automobile is 4 m/s its angular acceleration is
- 0.03 rad/s<sup>2</sup>
  - 0.15 rad/s<sup>2</sup>
  - 1.2 rad/s<sup>2</sup>
  - 0.4 rad/s<sup>2</sup>
- 96) A wheel, initially at rest, begins to rotate about its axis with a constant angular acceleration. If it



rotates through an angle  $\theta_1$  in the first 2 s and a

further angle  $\theta_2$  in the next 2s, the ratio  $\frac{\theta_2}{\theta_1}$  is

- a) 4
- b) 3
- c) 2
- d) 1

97) The frequency of a particle performing circular motion changes from 60 rpm to 180 rpm in 20s. then the angular acceleration is

- a)  $0.1\pi \text{ rad} / \text{s}^2$
- b)  $0.2\pi \text{ rad} / \text{s}^2$
- c)  $0.3\pi \text{ rad} / \text{s}^2$
- d)  $0.4\pi \text{ rad} / \text{s}^2$

98) A particle of mass  $m$  is moving in a horizontal circle of radius  $R$  with a uniform speed. When it moves to a point diametrically opposite then

- a) K.E. changes by  $mv^2/4$
- b) Momentum does not change
- c) Momentum changes by  $2mv$
- d) K.E. changes by  $mv^2$

99) A stone is tied to a string of length  $L$  and is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time, the stone is at its lowest position and has a speed  $u$ . The magnitude of change in velocity as it reaches a horizontal position where the string is

- a)  $\sqrt{u^2 - 2gL}$
- b)  $\sqrt{2gL}$
- c)  $\sqrt{u^2 - gL}$
- d)  $\sqrt{2(u^2 - gL)}$

100) The acceleration of an athlete running at 36 kmph when negotiating a turn of radius 25 m is

- a)  $1 \text{ m/s}^2$
- b)  $2 \text{ m/s}^2$
- c)  $4 \text{ m/s}^2$
- d)  $8 \text{ m/s}^2$

101) A disc of radius 0.1 m starts from rest with an angular acceleration of  $4.4 \text{ rad/s}^2$ . Then linear velocity of the point on its rim after 5s is

- a) 0.22 m/s
- b) 2.2 m/s
- c) 4.4 m/s
- d) 1.1 m/s

102) If the over bridge is concave instead being convex, the trust on the road at the lowest position will be

- a)  $mg + \frac{mv^2}{r}$
- b)  $mg - \frac{mv^2}{r}$
- c)  $\frac{m^2 v^2 g}{r}$
- d)  $\frac{v^2 g}{r}$

103) A mass is supported on frictionless smooth horizontal surface. It is attached to a string rotated about a fixed centre at an angular velocity  $\omega$ . If the length of the string and the angular velocity are doubled (the initial tension is  $T$ ), then the tension in the string will be

- a)  $T$
- b)  $T/2$
- c)  $4T$
- d)  $8T$

104) An object of an mass 50 kg is moving in a horizontal circle of radius 8m. If the centripetal force is 40 N, then the kinetic energy of an object will be

- a) 320 J
- b) 260J
- c) 220 J
- d) 160 J

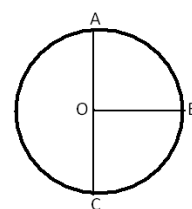
105) A body is tied at the end of a string and whirled round in a horizontal circle. At any instant, its kinetic energy is found to be numerically equal to the centripetal force on it. Then the radius of the circle will

- a)  $1/2m$
- b)  $1m$
- c)  $2m$
- d)  $4m$

106) If a body of mass 5 kg is moving in a circle of radius 1m with an angular velocity 2 rad/s, then the centripetal force will be

- a) 40 N
- b) 20N
- c) 30N
- d) 10N

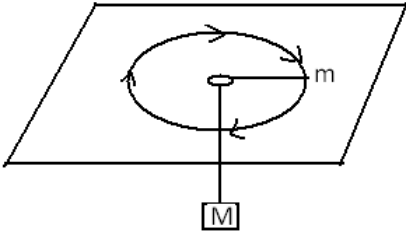
107) The ratio of velocities at points A, B and C in



vertical circular motion is

- a) 1:9:25
- b) 1:2:3
- c) 1:3:5
- d)  $1:\sqrt{3}:\sqrt{5}$

108) A mass  $m$  on a friction less table is attached to a hanging mass  $M$  by a cord through a hole in the table. Then the angular speed with which  $m$  must spin for  $M$  to stay at rest will be,



- a)  $\sqrt{\frac{Mg}{mr}}$
- b)  $\sqrt{\frac{mg}{Mr}}$
- c)  $\sqrt{\frac{mr}{Mg}}$
- d)  $\sqrt{\frac{g}{r}}$

109) What will be the maximum speed of a car when it safely driven along a curve road of radius 100 m? ( $\mu = 0.2$ )

- a) 14 m/s
- b) 12 m/s
- c) 13 m/s
- d) 11 m/s

110) A curved road of 50 m radius is banked at correct angle for a given speed. If the speed is to be doubled keeping the same banking angle, the radius of curvature of road should be changed to

- a) 25 m
- b) 100 m
- c) 200 m
- d) 400 m

111) When the road is dry and the coefficient of friction is  $\mu$ , the maximum speed of a car in a circular path is 10 m/s. If the road becomes wet and  $\mu' = \mu/2$  then the maximum speed permitted will be

- a) 5 m/s
- b) 10 m/s
- c)  $5\sqrt{2}m/s$
- d)  $10\sqrt{2}m/s$

112) A simple pendulum has a length  $l$ . What minimum velocity should be imparted to its bob at the mean position so that the bob reaches a height equal to  $l$  above the point of suspension?

- a)  $\sqrt{gr}$
- b)  $\sqrt{5gl}$
- c)  $\sqrt{2gl}$
- d)  $\sqrt{\frac{l}{g}}$

113) The angular speed of a conical pendulum,  $\omega$ , is given by

- a)  $\sqrt{\frac{g \cos \theta}{L}}$
- b)  $\sqrt{\frac{g}{L \cos \theta}}$
- c)  $\sqrt{\frac{g}{L \tan \theta}}$
- d)  $\sqrt{\frac{g}{L \sin \theta}}$

114) A bob is suspended from an ideal string of length  $l$ . Now it is pulled to a side till the string makes an angle  $60^\circ$  to the vertical and whirled along a horizontal circle. Then its period of revolution

- a)  $\pi \sqrt{\frac{l}{g}}$
- b)  $\pi \sqrt{\frac{l}{2g}}$
- c)  $\pi \sqrt{\frac{2l}{g}}$
- d)  $2\pi \sqrt{\frac{l}{g}}$

115) In a well of death motor cycle rider drives round the inner wall of a hollow cylindrical chamber. If the radius of the cylindrical chamber is 8m. what would be minimum speed of the rider to prevent him from sliding down?

$$(g = 10m/s^2, \mu = 0.2)$$

- a) 10 m/s
- b) 20 m/s
- c) 30 m/s
- d) 40 m/s

- 116) If a body of mass 0.1kg tied with a string of length 1m, is rotated in a vertical circle, then the energy of the body at the highest position will be ( $g=9.8 \text{ m/s}^2$ )
- 2.45 J
  - 1.25 J
  - 3.45 J
  - 4.45 J
- 117) A bucket full of water is tied at the end of rope of length 1.6m. it is rotated in vertical circle with constant speed around the other end. What should be the minimum speed of bucket so that water does not spill out at the highest position of the circle?
- 16m/s
  - 4m/s
  - 8m/s
  - 2m/s
- 118) A body of mass 0.5 kg is whirled in a vertical circle an angular frequency of 10rad/s. if the radius of the circle is 0.5m. what is the tension in the string when the body is at the top of the circle ? ( $g= 10 \text{ m/s}^2$ )
- 10 N
  - 20 N
  - 30 N
  - 40 N
- 119) A body of mass 4kg is moved in a vertical circle with sufficient speed. Its tangential acceleration, when the string makes an angle of  $30^\circ$  with the vertical downward is ( $g= 10\text{m/s}^2$ )
- $4 \text{ m/s}^2$
  - $5 \text{ m/s}^2$
  - $8 \text{ m/s}^2$
  - $7.8 \text{ m/s}^2$
- 120) A mass of 2 kg tied to a string 1m length is rotated in a vertical circle with a uniform speed of 4m/s. the tension in the string will be 52N, when the mass is at ( $g=10 \text{ m/s}^2$ )
- Bottom
  - Highest point
  - Midway
  - horizontal position
- 121) a body of mass m tied to a string of length r is its lowest position. What should be the minimum speed given to it so as just to complete one revolution ?
- $\sqrt{gr}$
  - $\sqrt{3gr}$
  - $\sqrt{5gr}$
  - $\sqrt{7gr}$
- 122) A mass is hanging by a string of length l. the velocity  $v_0$  which must be imparted to it to just reach the top is
- $\sqrt{3gl}$
  - $\sqrt{4gl}$
  - $\sqrt{5gl}$
  - $\sqrt{6gl}$
- 123) a bucket full of water is revolved in vertical circle of radius 2m. what should be the maximum time-period of revolution so that the water doesn't fall off the bucket
- 1 s
  - 2 s
  - 3 s
  - 4 s
- 124) A wheel is subjected to uniform angular acceleration about its axis with its angular velocity is zero. In the first two seconds, it rotates through an angle  $\theta_1$  and in the next two seconds it rotates through an angle  $\theta_2$  then the ratio of  $\theta_2 / \theta_1$
- 1:1
  - 2:1
  - 3:1
  - 4:1
- 125) A wheel starts from rest and acquires an angular velocity of 60 rad/s in half a minute. Then its angular acceleration is
- $4 \text{ rad/s}^2$
  - $2 \text{ rad/s}^2$
  - $1 \text{ rad/s}^2$
  - $0.5 \text{ rad/s}^2$
- 126) A flywheel is revolving at 150 revolutions per minute. If it decelerates at a constant rate of  $2\pi \text{ rad/s}^2$ , then time required to stop it is
- 10 s
  - 5 s
  - 2.5 s
  - 1.25 s
- 127) In 20 seconds, the speed of a motor changes from 1200 rpm to 1800 rpm. In this period, of number of revolutions completed by it is
- 500
  - 400
  - 200
  - 100

- 128) The car of a wheel rotating with certain angular velocity is stopped in 7 seconds and before it stops, it makes 35 revolutions. Then initially it was rotating with the frequency.
- 10 Hz
  - 20 Hz
  - 15 Hz
  - 30 Hz
- 129) A mass of 5 kg is tied to a string of length 1.0m and is rotate in vertical circle with a uniform speed of 4m/s The tension in the string will be 130 N when the mass is at ( $g = 10\text{m/s}^2$ )
- Highest point
  - Mid way
  - Bottom
  - Cannot be justified
- 130) A body is moving in a circular orbit with static friction 0.2. If radius through which body revolve is 100 m and  $g = 9.8 \text{ m/s}^2$ , then maximum speed with which body revolved is
- 14 m/sec
  - 19 m/sec
  - 11 m/sec
  - 13 m/sec
- 131) 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 one revolution is
- $\sqrt{l g}$
  - $\sqrt{2l g}$
  - $\sqrt{3l g}$
  - $\sqrt{5l g}$
- 132) A wheel of diameter 20 cm is rotating at 600 rpm The linear velocity of particle at its rim is
- 6.28 cm/sec
  - 62.8 cm/sec
  - 0.628 cm /sec
  - 628.4 cm/sec
- 133) Banking of roads is independent of
- Radius of path
  - Mass of the vehicle
  - Acceleration due to gravity
  - Maximum velocity of the vehicle around the curved path
- 134) Two wheels of radii 10cm and 30cm are connected to each other. If the smaller disc has an angular acceleration of  $\pi \text{ rad} / \text{s}^2$  then the time taken by the vehicle around disc to attain a speed of 100 rpm is
- 2 sec
  - 4 sec
  - 10 sec

1	2	3	4	5	6	7	8	9	10
A	B	D	B	B	C	C	D	D	A
11	12	13	14	15	16	17	18	19	20
D	A	C	C	B	B	B	D	C	B
21	22	23	24	25	26	27	28	29	30
B	A	D	D	D	C	C	D	B	D
31	32	33	34	35	36	37	38	39	40
B	B	D	C	B	C	C	D	C	C
41	42	43	44	45	46	47	48	49	50
B	B	C	B	D	C	A	A	B	C
51	52	53	54	55	56	57	58	59	60
D	B	B	C	D	C	C	D	C	C
61	62	63	64	65	66	67	68	69	70
D	B	D	D	B	C	D	C	B	D
71	72	73	74	75	76	77	78	79	80
B	C	C	D	C	B	C	B	C	B
81	82	83	84	85	86	87	88	89	90
B	C	C	C	A	B	B	A	B	D
91	92	93	94	95	96	97	98	99	100
A	D	C	D	A	B	B	C	D	C
101	102	103	104	105	106	107	108	109	110

B	A	D	D	C	B	D	A	A	C
<b>111</b>	<b>112</b>	<b>113</b>	<b>114</b>	<b>115</b>	<b>116</b>	<b>117</b>	<b>118</b>	<b>119</b>	<b>120</b>
C	B	B	C	B	A	B	B	B	A
<b>121</b>	<b>122</b>	<b>123</b>	<b>124</b>	<b>125</b>	<b>126</b>	<b>127</b>	<b>128</b>	<b>129</b>	<b>130</b>
C	C	C	C	B	C	A	C	A	D
<b>131</b>	<b>132</b>	<b>133</b>	<b>134</b>						
D	D	B	C						

SAPTARSHI