1. A particle of mass 2 kg is moving along a circular path of radius 1 m. If its angular speed is 2π rad s^{-1}, the centripetal force on it is

(a) 4π N (b) 8π N
(c) $4\pi^4$ N (d) $8\pi^2$ N

2. Two particles of equal masses are revolving in circular paths of radii r_1 and r_2 respectively with the same speed. The ratio of their centripetal forces is

(a) $\frac{r_2}{r_1}$ (b) $\sqrt{\frac{r_2}{r_1}}$
(c) $\left(\frac{r_1}{r_2}\right)^2$ (d) $\left(\frac{r_2}{r_1}\right)^2$

3. A particle of mass m is 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 is

(a) pmr (b) $\frac{rm}{p}$
(c) $\frac{mp^2}{r}$ (d) $\frac{p^2}{rm}$

4. A stone of mass of 16 kg is attached to a string 144 m long and is whirled in a horizontal circle on a smooth surface. The maximum tension in the string that it can withstand is 16 N. The maximum velocity of revolution that can be given to the stone without breaking it, will be

(a) 20 ms^{-1} (b) 16 ms^{-1}
(c) 14 ms^{-1} (d) 12 ms^{-1}

5. If mass, speed and radius of the circle, of a particle moving uniformly in a circular path are all increased by 50%, the necessary force required to maintain the body moving in the circular path will have to be increased by

(a) 225% (b) 125% (c) 150% (d) 100%

6. A string of length 0.1 m cannot bear a tension more than 100 N. It is tied to a body of mass 100 g and rotated in a horizontal circle. The maximum angular velocity can be

(a) 100 rad s^{-1} (b) 1000 rad s^{-1}
(c) 10000 s^{-1} (d) 0.1 rad s^{-1}

7. A mass of 2 kg is whirled in a horizontal circle by means of a string at an initial speed of 5 rev min^{-1}. Keeping the radius constant the tension in the string is doubled. The new speed is nearly

(a) $\frac{5}{\sqrt{2}}$ rpm (b) 10 rpm
(c) $10\sqrt{2}$ rpm (d) $5\sqrt{2}$ rpm

8. A mass of 100 g is tied to one end of a string 2 m long. The body is revolving in a horizontal circle making a maximum of 200 rev min^{-1}. The other end of the string is fixed at the centre of the circle of revolution. The maximum tension that the string can bear is (approximately)

(a) 8.76 N (b) 8.94 N
(c) 89.42 N (d) 87.64 N

9. Radius of the curved road on national highway is R. Width of the road is b. The outer edge of the road is raised by h with respect to inner edge, so that a car with velocity v can pass safely over it. The value of h is

(a) $\frac{v^2b}{Rg}$ (b) $\frac{v}{Rgb}$
(c) $\frac{v^2R}{bg}$ (d) $\frac{v^2b}{R}$

10. A motor cyclist moving with a velocity of 72 km h^{-1} on a flat road takes a turn on the road at a point, where the radius of curvature of the road is 20 m. The acceleration due to gravity is 10 ms^{-2}. In order to avoid skidding, he must not bend with respect to the vertical plane by an angle greater than

(a) $\theta = \tan^{-1}(6)$ (b) $\theta = \tan^{-1}(2)$
(c) $\theta = \tan^{-1}(25.92)$ (d) $\theta = \tan^{-1}(4)$

11. 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}

12. Keeping the angle of banking unchanged, if the radius of curvature is made four times, the percentage increase in the maximum speed with which a vehicle can travel on a circular road is

(a) 25 % (b) 50%
(c) 75% (d) 100%

13. A person wants to drive on the vertical surface of a large cylindrical wooden 'well' commonly known as 'death well' in a circus. The radius of the well is R and the coefficient of friction between the tyres of the motorcycle and the wall of the well is $\propto_s$. The minimum speed, the motorcycle must have in order to prevent slipping, should be

(a) $\sqrt{\frac{Rg}{\propto_s}}$ (b) $\sqrt{\frac{\propto_s}{Rg}}$
(c) $\sqrt{\frac{\propto_s g}{R}}$ (d) $\sqrt{\frac{R}{\propto_s g}}$

14. A motorcyclist wants to drive on the vertical surface of wooden 'well' of radius 5 m, with a minimum speed of $5\sqrt{5}$ ms^{-1}. The minimum value of coefficient of friction between the tyres and the wall of the well must be (Take, $g = 10\,ms^{-2}$)

(a) 0.10 (b) 0.20
(c) 0.30 (d) 0.40

15. A block of mass m at the end of a string is whirled round in a vertical circle of radius R. The critical speed of the block at top of its swing below which the string would slacken before the block reaches the bottom is

(a) $\sqrt{5Rg}$ (b) $\sqrt{3Rg}$
(c) $\sqrt{2Rg}$ (d) $\sqrt{Rg}$