

## Topic :- MOTION IN A PLANE

- A body is tied to one end of the string and whirled in a vertical circle, the physical quantity which remains constant is  
a) Momentum                      b) Speed                      c) Kinetic energy                      d) Total energy
- A mass of 100 gm is tied to one end of a string 2 m long. The body is revolving in a horizontal circle making a maximum of 200 revolutions per min. 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
- A ball is projected with velocity  $u$  at an angle  $\alpha$  with horizontal plane. Its speed when it makes an angle  $\beta$  with the horizontal is  
a)  $u \cos \alpha$                       b)  $\frac{u}{\cos \beta}$                       c)  $u \cos \alpha \cos \beta$                       d)  $\frac{u \cos \alpha}{\cos \beta}$
- The angular speed of a car increases from 600 rpm to 1200 rpm in 10 s. What is the angular acceleration of the car?  
a) 600 rad s<sup>-1</sup>                      b) 60 rad s<sup>-1</sup>                      c) 60  $\pi$  rad m s<sup>-1</sup>                      d) 2  $\pi$  rad s<sup>-1</sup>
- A glass marble projected horizontally from the top of a table falls at a distance  $x$  from the edge of the table. If  $h$  is the height of the table, then the velocity of projection is  
a)  $h \sqrt{\frac{g}{2x}}$                       b)  $x \sqrt{\frac{g}{2h}}$                       c)  $gxh$                       d)  $gx + h$
- 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 the road should be changed to  
a) 25 m                      b) 100 m                      c) 150 m                      d) 200 m
- With what minimum speed a particle be projected from the origin so that it is able to pass through a given point (30 m, 40 m)?

- a)  $30 \text{ ms}^{-1}$                       b)  $40 \text{ ms}^{-1}$                       c)  $50 \text{ ms}^{-1}$                       d)  $60 \text{ ms}^{-1}$
8. A wheel rotates with a constant angular velocity of 300 rpm. The angle through which the wheel rotates in one second is  
a)  $\pi \text{ rad}$                       b)  $5 \pi \text{ rad}$                       c)  $10 \pi \text{ rad}$                       d)  $20 \pi \text{ rad}$
9. A cricketer hits a ball with a velocity  $25 \text{ m/s}$  at  $60^\circ$  above the horizontal. How far above the ground it passes over a fielder  $50 \text{ m}$  from the bat (assume the ball is struck very close to the ground)  
a)  $8.2 \text{ m}$                       b)  $9.0 \text{ m}$                       c)  $11.6 \text{ m}$                       d)  $12.7 \text{ m}$
10. A bucket filled with water is tied to a rope of length  $0.5 \text{ m}$  and is rotated in a circular path in vertical plane. The least velocity it should have at the lowest point of circle so that water does not spill is, ( $g = 10 \text{ ms}^{-2}$ )  
a)  $\sqrt{5} \text{ ms}^{-1}$                       b)  $\sqrt{10} \text{ ms}^{-1}$                       c)  $5 \text{ ms}^{-1}$                       d)  $2\sqrt{5} \text{ ms}^{-1}$
11. An object of mass  $5 \text{ kg}$  is whirled round in a vertical circle of radius  $2 \text{ m}$  with a constant speed of  $6 \text{ ms}^{-1}$ . The maximum tension in the string is  
a)  $152 \text{ N}$                       b)  $139 \text{ N}$                       c)  $121 \text{ N}$                       d)  $103 \text{ N}$
12. A body just being revolved in a vertical circle of radius  $R$  with a uniform speed. The string breaks when the body is at the highest point. The horizontal distance covered by the body after the string breaks is  
a)  $2R$                       b)  $R$                       c)  $R\sqrt{2}$                       d)  $4R$
13. The coefficient of friction between the tyres and the road is  $0.25$ . The maximum speed with which a car can be driven round a curve of radius  $40 \text{ m}$  without skidding is (assume  $g = 10 \text{ ms}^{-2}$ )  
a)  $40 \text{ ms}^{-1}$                       b)  $20 \text{ ms}^{-1}$                       c)  $15 \text{ ms}^{-1}$                       d)  $10 \text{ ms}^{-1}$
14. A car wheel is rotated to uniform angular acceleration about its axis. Initially its angular velocity is zero. It rotates through an angle  $\theta_1$  in the first  $2 \text{ s}$ , in the next  $2 \text{ s}$ , it rotates through an additional angle  $\theta_2$ , the ratio of  $\frac{\theta_2}{\theta_1}$  is  
a) 1                      b) 2                      c) 3                      d) 5
15. If a particle covers half the circle of radius  $R$  with constant speed then  
a) Change in momentum is  $mvr$                       b) Change in  $K.E.$  is  $1/2 mv^2$   
c) Change in  $K.E.$  is  $mv^2$                       d) Change in  $K.E.$  is zero
16. A cylinder full of water, is rotating about its own axis with uniform angular velocity  $\omega$ . The shape of free surface of water will be  
a) Parabola                      b) Elliptical                      c) Circular                      d) Spherical

17. What is the angle between  $\hat{i} + \hat{j} + \hat{k}$  and  $\hat{i}$   
a)  $0^\circ$                       b)  $\pi/6$                       c)  $\pi/3$                       d) None of these
18. A body moves along a circular path of radius 10 m and the coefficient of friction is 0.5. What should be its angular speed in  $\text{rad s}^{-1}$ , if it is not to slip from the surface? ( $g = 9.8 \text{ ms}^{-2}$ )  
a) 5                      b) 10                      c) 0.1                      d) 0.7
19. An object is projected at an angle of  $45^\circ$  with the horizontal. The horizontal range and maximum height reached will be in the ratio  
a) 1:2                      b) 2:1                      c) 1:4                      d) 4:1
20. 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 wheels leave the ground simultaneously  
d) Either wheel leaves the ground first

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