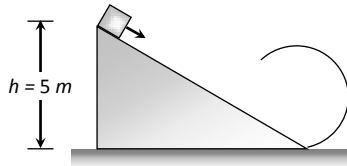


## Topic :- MOTION IN A PLANE

- Given that centripetal force  $F = -k/r^2$ . The total energy is  
a)  $-k/r^2$                       b)  $k/r$                       c)  $-k/2r^2$                       d)  $-k/2r$
- The area of parallelogram formed from the vectors  $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$  and  $\vec{B} = 3\hat{i} - 2\hat{j} + \hat{k}$  as adjacent sides is  
a)  $8\sqrt{3}$  units                      b) 64 units                      c) 32 units                      d)  $4\sqrt{6}$  units
- Two vectors  $\vec{A}$  and  $\vec{B}$  are inclined to each other at an angle  $\theta$ . Which of the following is the unit vector perpendicular to both  $\vec{A}$  and  $\vec{B}$ ?  
a)  $\frac{\vec{A} \times \vec{B}}{\vec{A} \cdot \vec{B}}$                       b)  $\frac{\hat{A} \cdot \hat{B}}{\sin\theta}$                       c)  $\frac{\vec{A} \times \vec{B}}{AB\sin\theta}$                       d)  $\frac{\hat{A} \times \hat{B}}{AB\cos\theta}$
- A coastguard ship locates a pirate ship at a distance 560 m. It fires a cannon ball with an initial speed 82 m/s. At what angle from horizontal the ball must be fired so that it hits the pirate ship  
a)  $54^\circ$                       b)  $125^\circ$                       c)  $27^\circ$                       d)  $18^\circ$
- What happens to the centripetal acceleration of a particle, when its speed is doubled and angular velocity is halved?  
a) Doubled                      b) Halved  
c) Remains unchanged                      d) Becomes 4 times
- A particle moves in a circular path with decreasing speed. Choose the correct statement  
a) Angular momentum remains constant  
b) Acceleration ( $\vec{a}$ ) is towards the centre  
c) Particle moves in a spiral path with decreasing radius  
d) The direction of angular momentum remains constant
- An object is projected so that its horizontal range  $R$  is maximum. If the maximum height attained by the object is  $H$ , then the ratio of  $R/H$  is  
a) 4                      b)  $\frac{1}{4}$                       c) 2                      d)  $\frac{1}{2}$

8. A cricketer can throw a ball to a maximum horizontal distance of 100 m. The speed with which he throws the ball is (to the nearest integer)
- a)  $30 \text{ ms}^{-1}$       b)  $42 \text{ ms}^{-1}$       c)  $32 \text{ ms}^{-1}$       d)  $35 \text{ ms}^{-1}$
9. The maximum height attained by a projectile when thrown at an angle  $\theta$  with the horizontal is found to be half the horizontal range. Then  $\theta$  is equal to
- a)  $\tan^{-2}(2)$       b)  $\frac{\pi}{6}$       c)  $\frac{\pi}{4}$       d)  $\tan^{-1}\left(\frac{1}{2}\right)$
10. The angular velocity of a wheel is  $70 \text{ rad/sec}$ . If the radius of the wheel is 0.5 m, then linear velocity of the wheel is
- a)  $70 \text{ m/s}$       b)  $35 \text{ m/s}$       c)  $30 \text{ m/s}$       d)  $20 \text{ m/s}$
11. A particle undergoes uniform circular motion. About which point on the plane of the circle, will the angular momentum of the particle remain conserved?
- a) center of the circle      b) on the circumference of the circle  
c) inside the circle      d) outside the circle
12. An aeroplane is flying horizontally with a velocity of  $216 \text{ kmh}^{-1}$  and at a height of 1960 m. When it is vertically above a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is (ignoring air resistance)
- a) 1200 m      b) 0.33 km      c) 3.33 km      d) 33 km
13. If the magnitude of the sum of the two vectors is equal to the difference of their magnitudes, then the angle between vectors is
- a)  $0^\circ$       b)  $45^\circ$       c)  $90^\circ$       d)  $180^\circ$
14. Which of the following sets of factors will affect the horizontal distance covered by an athlete in a long-jump event
- a) Speed before he jumps and his weight      b) The direction in which he leaps and the initial speed  
c) The force with which he pushes the ground and his speed      d) None of these
15. A point of application of a force  $\vec{F} = 5\hat{i} - 4\hat{j} + 2\hat{k}$  is moved from  $\vec{r}_1 = 2\hat{i} + 7\hat{j} + 4\hat{k}$  to  $\vec{r}_2 = 5\hat{i} + 2\hat{j} + 3\hat{k}$  the work done is
- a) 22 units      b)  $-22$  units      c) 33 units      d)  $-33$  units
16. If a particle of mass  $m$  is moving in a horizontal circle of radius  $r$  with a centripetal force  $(-K/r^2)$  the total energy is
- a)  $-\frac{K}{2r}$       b)  $-\frac{K}{r}$       c)  $-\frac{2K}{r}$       d)  $-\frac{4K}{r}$

17. The  $x$  and  $y$  components of a force are  $2\text{ N}$  and  $-3\text{ N}$ . The force is  
 a)  $2\hat{i} - 3\hat{j}$                       b)  $2\hat{i} + 3\hat{j}$                       c)  $-2\hat{i} - 3\hat{j}$                       d)  $3\hat{i} + 2\hat{j}$
18. As per given figure to complete the circular loop what should be the radius if initial height is  $5\text{ m}$



- a)  $4\text{ m}$                       b)  $3\text{ m}$                       c)  $2.5\text{ m}$                       d)  $2\text{ m}$
19. A particle is projected from the ground at an angle of  $60^\circ$  with horizontal with speed  $u = 20\text{ m s}^{-1}$ . The radius of curvature of the path of the particle, when its velocity makes an angle of  $30^\circ$  with horizontal is ( $g = 10\text{ ms}^{-2}$ )  
 a)  $10.6\text{ m}$                       b)  $12.8\text{ m}$                       c)  $15.4\text{ m}$                       d)  $24.2\text{ m}$
20. A body of mass  $1\text{ kg}$  thrown with a velocity of  $10\text{ ms}^{-1}$  at an angle of  $60^\circ$  with the horizontal. Its momentum at the highest point is  
 a)  $2\text{ kg ms}^{-1}$                       b)  $3\text{ kg ms}^{-1}$                       c)  $4\text{ kg ms}^{-1}$                       d)  $5\text{ kg ms}^{-1}$

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