CBSE TEST PAPER-06

CLASS - XI PHYSICS (Kinematics)
Topic: - Motion in Plane [ANSWERS]

Ans1: Four times the initial horizontal range.

Ans2: Three times the initial vertical height.

Ans3: $\pi/6$ radian per hour.

Ans4: Acceleration must be perpendicular to the direction of motion and is called centripetal acceleration.

Ans5: When a stone is moving around a circular path, its velocity acts tangent to the circle. When the string breaks, the centripetal force will not act. Due to inertia, the stone continues to move along the tangent to circular path, and flies off tangentially to the circular path.

Ans6: $R = \dfrac{u^2 \sin 2\theta}{g} = \dfrac{(30)^2 \sin 2\theta}{10} = 45$

$\Rightarrow \sin 2\theta = \dfrac{450}{(30)^2}$

$\sin 2\theta = 1/2$

$2\theta = 30^o \text{ or } 150^o \Rightarrow \theta = 15^o \text{ or } 75^o$

Ans7: $v = 600 \text{ revolutions/min}$

$v = \dfrac{600}{60} \text{ revolutions/sec.}$

$w = 2\pi v = 2 \times \pi \times \dfrac{600}{60}$

$w = 20\pi \text{ rad / s}$

Ans8: When an object moves in a circular path with constant speed then the motion is called uniform circular motion

Time period – The time taken by the object to complete one revolution

Frequency – The total number of revolutions in one second is called the frequency.

Angular velocity – It is defined as the time rate of change of angular displacement.

$W = \dfrac{2\pi}{T} = 2\pi v \qquad \left(\because \dfrac{1}{T} = v\right)$

Ans9: (1) When $\theta = 30^o \; R_A = \frac{\mu^2}{g}\sin 2\left(30^o\right)$

$$R_A = \frac{\mu^2}{g} \times \frac{\sqrt{3}}{2}$$

When $\theta = 60^o \; R_B = \frac{\mu^2}{g}\sin 2\left(60^o\right)$

$$R_B = \frac{\mu^2}{g} \times \frac{\sqrt{3}}{2}$$

$$R_A : R_B = 1:1$$

(2) When $\theta = 30^o \; H_A = \frac{\mu^2}{g}\sin^2 30^o$

$$H_A = \frac{\mu^2}{2g}\left(\frac{1}{4}\right)$$

When $\theta = 60^o \; H_B = \frac{\mu^2}{2g}\sin^2 60^o$

$$H_B = \frac{\mu^2}{g}\left(3/4\right)$$

$$H_A : H_B = 1:3$$

Ans10: (1) P.E. Will be maximum at the highest point

(P.E.) highest point = mgH

$$\left(P.E\right)_H = mg\left(\frac{\mu^2 \sin^2\theta}{2g}\right)$$

$$\left(P.E\right)_H = \frac{1}{2}m\mu^2 \sin^2\theta$$

(2) K.E will be minimum at the highest point

$$\left(K.E.\right)_H = \frac{1}{2}m\left(v_H\right)^2$$

(Vertical component of velocity is zero)

$$\left(K.E.\right)_H = \frac{1}{2}mv^2 \cos^2\theta$$

(3) Total mechanical energy

$$\left(K.E.\right)_H + \left(P.E.\right)_H$$

$$\frac{1}{2}mu^2\cos^2\theta + \frac{1}{2}mu^2\sin^2\theta$$

$$\frac{1}{2}mu^2\left(\cos^2\theta + \sin^2\theta\right)$$

$$\boxed{\frac{1}{2}m\,u^2}$$