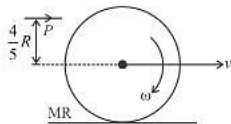


Ques.

A billiard ball at rest is struck horizontally one tenth of the diameter below the top. If  $P$  be the linear impulse of the blow find the initial kinetic energy of the ball is  $\frac{xP^2}{10M}$ . Then  $x$  is given by the mass of the ball is being  $M$ .



Using momentum equation

$$P = M \cdot v$$

$$\Rightarrow v = \frac{P}{M} \quad \dots(1)$$

using angular impulse-momentum equation. w.r.t. centre

$$P \frac{4}{5} R = \frac{2}{5} MR^2 \omega$$

$$\omega = \frac{2P}{MR}$$

Total K.E. = Translational K.E. + Rotational K.E.

$$= \frac{1}{2} Mv^2 + \frac{1}{2} I\omega^2$$

$$= \frac{1}{2} M \times \frac{P^2}{M} + \frac{1}{2} \cdot \frac{2}{5} MR^2 \cdot \frac{4P^2}{M^2 R^2} = \frac{13P^2}{10M}$$

The correct answer is: 13