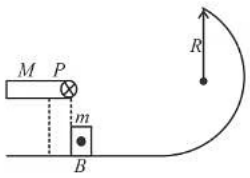
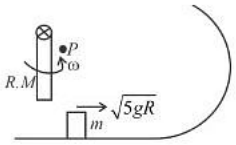
Ques.

A uniform rod of length *R* and mass *M* is freely to rotate about a horizontal axis passing through hinge *P* as is figure. First it is taken aside such that it becomes horizontal and then released. At the lowest point the rod hits the block *B* of mass *m* and stops. If ratio of mass of rod *M* to the mass of block *m* such that the block *B* completes the circle $\sqrt{x}$ then *x* is. Neglect any friction.



Minimum velocity required by block ***m*** to complete the motion in $\sqrt{5gR}$



conserving mechanical energy

$$\frac{1}{2}I\omega^2 = Mg \times \frac{R}{2}$$

$$\Rightarrow \omega = \sqrt{\frac{MgR}{I}}$$

conserving angular momentum w.r.t. ***P*** before and after collision.

$$I\omega = m \cdot R = \sqrt{5gR}$$

$$I \cdot \sqrt{\frac{MgR}{I}} = mR\sqrt{5gR}$$

Putting $I = \frac{ML^2}{3} = \frac{MR^2}{3}$ (since $L = R$)

$$\frac{M}{m} = \sqrt{15}$$

The correct answer is: 15