

### Answer on Question #49921-Physics-Mechanics-Kinematics-Dynamics

A Rod of mass  $M$  and length  $L$  stands vertically on a smooth horizontal surface. A particle of mass  $m$  travelling at speed  $u$  strikes the top of the rod and comes to rest. The angular velocity of the rod after the impact is

#### Solution

Conservation of angular momentum:

$$muL = I\omega = \left(\frac{ML^2}{3} + mL^2\right)\omega.$$

The angular velocity of the rod after the impact is

$$\omega = \frac{muL}{\frac{ML^2}{3} + mL^2} = \frac{mu}{L} \left( \frac{1}{1 + \frac{M}{3m}} \right).$$

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