

Physics 101- Chapter 12

Quiz No. 6

Name: Key	ID:	Sec: 30
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An object of mass $m = 100 \text{ g}$ and velocity $=V_0$ is fired onto one end of a uniform thin rod (Length $L = 0.4 \text{ m}$, and Mass $M = 1.0 \text{ kg}$) initially at rest. The rod can rotate freely about an axis through its center (O). The object sticks to the rod after collision. The angular velocity of the system (rod + object) is 10 rad/s immediately after the collision. Calculate V_0 . (Moment of Inertia of thin rod about axis through center perpendicular to length $I_{\text{com}} = (1/12) M L^2$).

$$\Delta \vec{L} = 0$$

$$\vec{L}_i = \vec{L}_f$$

$$\sum_{i=1}^n I_i \omega_i = \sum_{f=1}^n I_f \omega_f$$

$$[0.1 \times (0.2)^2] \times \frac{V_0}{0.2} + 0 = \left([0.1 \times (0.2)^2] + \left[\frac{1}{12} \times 1 \times (0.4)^2 \right] \right) \times 10$$

$$0.02 V_0 = 0.17333$$

$$V_0 = 8.7 \text{ m/s}$$

