13.54. **Model:** The object is a rigid rotating body. Assume the masses m_1 and m_2 are small and the rod is thin.
Visualize: Please refer to P13.54.
Solve: The moment of inertia of the object is the sum of the moment of inertia of the rod, mass m_1, and mass m_2. Using Table 13.3 for the moment of inertia of the rod, we get

$$I_{\text{rod}} = I_{\text{rod about center}} + I_{m_1} + I_{m_2} = \frac{1}{12}ML^2 + m_1\left(\frac{L}{2}\right)^2 + m_2\left(\frac{L}{4}\right)^2$$

$$= \frac{1}{12}ML^2 + \frac{1}{4}m_1L^2 + \frac{1}{16}m_2L^2 = \frac{L^2}{4}\left(\frac{M}{3} + m_1 + \frac{m_2}{4}\right)$$

Assess: With $m_1 = m_2 = 0$ kg, $I_{\text{rod}} = \frac{1}{12}ML^2$, as expected.