13.17. Model: The moment of inertia of any object depends on the axis of rotation. In the present case, the rotation axis passes through mass A and is perpendicular to the page.

Visualize: Please refer to Figure Ex13.17.

Solve: **(a)**
$$x_{\text{cm}} = \frac{\sum m_i x_i}{\sum m_i} = \frac{m_A x_A + m_B x_B + m_C x_C + m_D x_D}{m_A + m_B + m_C + m_D}$$
$$= \frac{(100\text{ g})(0\text{ m}) + (200\text{ g})(0\text{ m}) + (200\text{ g})(0.10\text{ m}) + (200\text{ g})(0.10\text{ m})}{100\text{ g} + 200\text{ g} + 200\text{ g} + 200\text{ g}} = 0.0571\text{ m}$$
$$y_{\text{cm}} = \frac{m_A y_A + m_B y_B + m_C y_C + m_D y_D}{m_A + m_B + m_C + m_D}$$
$$= \frac{(100\text{ g})(0\text{ m}) + (200\text{ g})(0.10\text{ m}) + (200\text{ g})(0.10\text{ cm}) + (200\text{ g})(0\text{ m})}{700\text{ g}} = 0.0571\text{ m}$$

(b) The distance from the axis to mass C is 14.14 cm. The moment of inertia through A and perpendicular to the page is
$$I_A = \sum_i m_i r_i^2 = m_A r_A^2 + m_B r_B^2 + m_C r_C^2 + m_D r_D^2$$
$$= (0.100\text{ kg})(0\text{ m})^2 + (0.200\text{ kg})(0.10\text{ m})^2 + (0.200\text{ kg})(0.1414\text{ m})^2 + (0.200\text{ kg})(0.10\text{ m})^2 = 0.0080\text{ kg m}^2$$