

78. The distances from P to the particles are as follows:

$$\begin{aligned}r_1 &= a \quad \text{for } m_1 = 2M \quad (\text{lower left}) \\r_2 &= \sqrt{b^2 - a^2} \quad \text{for } m_2 = M \quad (\text{top}) \\r_3 &= a \quad \text{for } m_1 = 2M \quad (\text{lower right})\end{aligned}$$

The rotational inertia of the system about P is

$$I = \sum_{i=1}^3 m_i r_i^2 = (3a^2 + b^2) M$$

which yields $I = 0.208 \text{ kg}\cdot\text{m}^2$ for $M = 0.40 \text{ kg}$, $a = 0.30 \text{ m}$ and $b = 0.50 \text{ m}$. Applying Eq. 11-44, we find

$$W = \frac{1}{2} I \omega^2 = \frac{1}{2} (0.208) (5.0)^2 = 2.6 \text{ J} .$$