90. (a) The particle at A has $r = 0$ with respect to the axis of rotation. The particle at B is $r = L = 0.50$ m from the axis; similarly for the particle directly above A in the figure. The particle diagonally opposite A is a distance $r = \sqrt{2}\,L = 0.71$ m from the axis. Therefore,

$$I = \sum m_i r_i^2 = 2mL^2 + m\left(\sqrt{2}\,L\right)^2 = 0.20\ \text{kg}\cdot\text{m}^2\ .$$

(b) One imagines rotating the figure (about point A) clockwise by 90° and noting that the center of mass has fallen a distance equal to L as a result. If we let our reference position for gravitational potential be the height of the center of mass at the instant AB swings through vertical orientation, then

$$\begin{aligned} K_0 + U_0 &= K + U \\ 0 + (4m)gh_0 &= K + 0\ . \end{aligned}$$

Since $h_0 = L = 0.50$ m, we find $K = 3.9$ J. Then, using Eq. 11-27, we obtain

$$K = \frac{1}{2}\,I_A\,\omega^2 \quad\Longrightarrow\quad \omega = 6.3\ \frac{\text{rad}}{\text{s}}\ .$$