

44. (a) Using Table 11-2(c) and Eq. 11-27, the rotational kinetic energy is

$$\begin{aligned} K &= \frac{1}{2}I\omega^2 \\ &= \frac{1}{2}\left(\frac{1}{2}MR^2\right)\omega^2 \\ &= \frac{1}{4}(500\text{ kg})(200\pi\text{ rad/s})^2(1.0\text{ m})^2 \\ &= 4.9 \times 10^7\text{ J} . \end{aligned}$$

- (b) We solve  $P = K/t$  (where  $P$  is the average power) for the operating time  $t$ .

$$t = \frac{K}{P} = \frac{4.9 \times 10^7\text{ J}}{8.0 \times 10^3\text{ W}} = 6.2 \times 10^3\text{ s}$$

which we rewrite as  $t \approx 100\text{ min}$ .