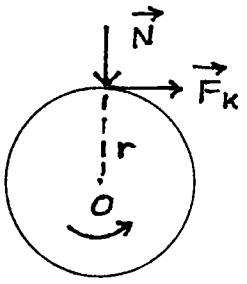
Exercise 9-24

(a)



$$F_K = \mu_K N$$
$$= 0.750\,(13.0\,N)$$
$$= 9.75\,N$$

$\tau_{NET} = I\alpha$, about O (− ↷, ↶ +)

$$\therefore -F_K \cdot r = I\alpha$$
$$\therefore -(9.75\,N)(0.280\,m) = (0.420\,kg\cdot m^2)\,\alpha$$
$$\Rightarrow \alpha = -6.50\ rad/s^2$$

$$\omega = \omega_0 + \alpha t \quad \therefore \quad t = \frac{\omega - \omega_0}{\alpha} = \frac{(0 - 20.0)\,rad/s}{-6.50\,rad/s^2} = 3.08\,s$$

(b)

Work done: $W = \Delta KE$

$$= KE_f - KE_i$$
$$= 0 - \tfrac{1}{2} I\omega_0^2$$
$$= -\tfrac{1}{2}(0.420\,kg\cdot m^2)(20.0\,rad/s)^2$$
$$= -84.0\,J$$