**Answer on Question #66017-Physics-Mechanics-Relativity**

An insect of mass 20 g crawls from the center to the outside edge of a rotating disc of mass 200g and radius 20 cm. The disk was initially rotating at 22.0 rads−1. What will be its final angular velocity? What is the change in the kinetic energy of the system?

**Solution**

From the conservation of momentum:

$$I_1\omega_1 = I_2\omega_2$$

$$\omega_2 = \frac{I_1\omega_1}{I_2} = \frac{\frac{1}{2}Mr^2}{\frac{1}{2}Mr^2 + mr^2}\omega_1 = \frac{M}{M+2m} = \frac{200}{200 + 2(20)}22 = 18.3\frac{\text{rad}}{\text{s}}.$$

The change in kinetic energy:

$$\Delta K = \frac{I_2\omega_2^2}{2} - \frac{I_1\omega_1^2}{2} = \frac{1}{2}\left(\left[0.02(0.2)^2 + \frac{0.2}{2}(0.2)^2\right](18.3)^2 - \frac{0.2}{2}(0.2)^2(22)^2\right) = -164\,J.$$