#8.44 Consider a hoop, solid cylinder, solid sphere and thin spherical sphere, each with mass 4.8 kg and radius .23 m.

a.) What is "I" for each?

From Table 8.1:

$$I_{hoop} = mR^2 \qquad I_{solidsphere} = \frac{2}{5}mR^2 \qquad I_{cylinder} = \frac{1}{2}mR^2 \qquad I_{thinshelledsphere} = \frac{2}{3}mR^2$$

b. and c.) The object with the LEAST rotational inertia (I) will have the least resistance to changing its angular speed. That object will, as a consequence, angularly accelerate the fastest ending with the largest angular speed at the bottom. As rotational kinetic energy is a function of angular speed SQUARED (i.e., $KE_{rot} = \frac{1}{2}I\omega^2$), a small *moment of inertia* coupled with a large angular speed will produce a large rotational kinetic energy. This means that from highest to lowest, the rotational kinetic energies will be: the solid sphere, the cylinder, the thin shelled sphere, then the hoop (this, by the way, is the solution to Part C).

The system's kinetic energy is shared by the rotational motion and the translational motion (i.e., $KE_{total} = KE_{rot} + KE_{trans}$). If the rotational kinetic energy is large, the translational kinetic energy must be small. In other words, the order from highest to lowest for translational kinetic energy will be the exact reversal of the order listed above.