

**R** Please review O&C §5.4 and §10.3 and read §13.1.

**P** O&C Problems 10.7, 10.9, 10.10, 10.11, 10.15, 10.16

**P** Consider two particles of masses  $m_1$  and  $m_2$  and nonrelativistic velocities  $\mathbf{v}_1$  and  $\mathbf{v}_2$ . The two particles have relative velocity  $\mathbf{v} = \mathbf{v}_1 - \mathbf{v}_2$  and relative speed  $v = |\mathbf{v}|$ . Show that the kinetic energy of the system can be written as

$$K = \frac{1}{2}(m_1 + m_2)V^2 + \frac{1}{2}\mu v^2$$

where  $\mathbf{V}$  is the velocity of the center of mass and  $\mu$  is the reduced mass (O&C Eq. 2.23). The first term represents the kinetic energy of the center of mass. The second term is the portion of the total kinetic energy available for doing work against any force separating the two particles.