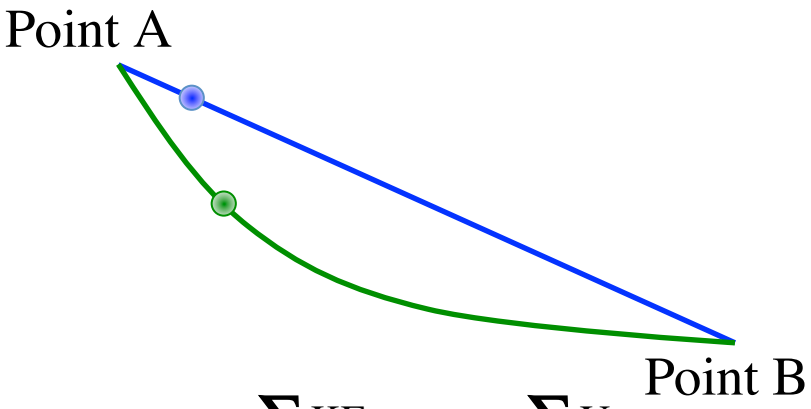
Problem 8.18



a.) Using the modified conservation of energy relationship:

$$\sum KE_1 + \sum U_1 + \sum W_{ext} = \sum KE_2 + \sum U_2$$

$$0 + m\ g\ y_2 + (-f\ d) = \frac{1}{2}\ m\ v_2^{\,2} + 0$$

$$(0.0250\text{kg})\left(9.80\text{m/s}^2\right)(0.200\text{m}) + (-1)(0.0250\ \text{N})(0.600\ \text{m}) = \frac{1}{2}(0.0250\ \text{kg})\,v_2^{\,2}$$

$$\Rightarrow \quad v_2 = \left[\frac{2\left[(0.0250\ \text{kg})\left(9.80\ \text{m/s}^2\right)(0.200\ \text{m}) - (0.0250\ \text{N})(0.600\ \text{m})\right]}{(0.0250\ \text{kg})}\right]^{1/2}$$

$$= 1.65\ \text{m/s}$$

b.) Which bead is moving fastest at the end of the run:

Both systems begin with the same amount of *potential energy*. The bead on the blue line travels a shorter distance, so friction will take less energy out of the system during its motion. Conclusion? The blue bead should have more kinetic energy, hence speed, at the end of its run.