



Flipping Physics Lecture Notes:

Introductory Perfectly Inelastic Collision Problem Demonstration

Knowns:  $m_c = 0.599\text{kg}$ ;  $m_b = 0.066\text{kg}$ ;  $\Delta t_b = 0.16\text{sec}$ ;

$$\bar{v}_{bi} = \frac{\Delta \bar{x}_b}{\Delta t_b} = \frac{x_f - x_i}{\Delta t_b} = \frac{0.313 - 0.566}{0.16} = -1.58125 \frac{m}{s}$$

Conservation of momentum:

$$\sum \bar{p}_i = \sum \bar{p}_f \Rightarrow \bar{p}_{bi} + \bar{p}_{ci} = \bar{p}_{bf} + \bar{p}_{cf} \Rightarrow m_b \bar{v}_{bi} + m_c \bar{v}_{ci} = m_b \bar{v}_{bf} + m_c \bar{v}_{cf} \Rightarrow m_b \bar{v}_{bi} = (m_b + m_c) \bar{v}_f$$

Note:  $\bar{v}_{ci} = 0$  &  $\bar{v}_{cf} = \bar{v}_{bf} = \bar{v}_f$

$$\Rightarrow \bar{v}_f = \frac{m_b \bar{v}_{bi}}{m_b + m_c} = \frac{(0.066)(-1.58125)}{0.066 + 0.599} = -0.15694 \frac{m}{s} \approx -0.16 \frac{m}{s} (\text{predicted})$$

$$(\text{observed}) \bar{v}_f = \frac{\Delta \bar{x}_c}{\Delta t_c} = \frac{x_{cf} - x_{ci}}{\Delta t_c} = \frac{0.267 - 0.306}{0.25} = -0.156 \frac{m}{s}$$

$$E_r = \frac{O - A}{A} \times 100 = \frac{(-0.15694 - (-0.156))}{-0.156} \times 100 = 0.6001 \approx 0.60\%$$