

Practice: Inelastic Collisions

1) $m_1 = 155 \text{ kg}$

$v_{zi} = 6 \text{ m/s} \rightarrow$

$v_{bi} = 0 \text{ m/s}$

$v_f = 2.2 \text{ m/s} \rightarrow$

$$m_1 v_i + m_2 v_2 = m_T v_f$$

$$155(6) + 0 = m_T(2.2)$$

$$m_T = 422.73$$

$$m_T = m_1 + m_2$$

$$m_{\text{BOAT}} = 267.73 \text{ kg}$$

2) $v_{is} = 10.8 \text{ m/s}$

$v_{fi} = 0 \text{ m/s}$

$v_{f+s, f} = 10.01 \text{ m/s}$

$m_s = 63$

$m_f =$

$$m_s v_{si} + m_f v_{fi} = (m_s + m_f) v_f$$

$$63(10.8) + 0 = (m_s + m_f)(10.01)$$

$$67.972 = (m_s + m_f)$$

$$m_f = 4.97 \text{ kg}$$

3) $v_i = 4.48 \text{ m/s R}$

$v_{es} = 0 \text{ m/s}$

$v_f = 4.0 \text{ m/s R}$

$m_s = 54 \text{ kg}$

$m_G =$

$$m_e v_{ei} + m_s v_{si} = (m_G + m_s) v_f$$

$$m_e(4.48) + 0 = (m_e + 54)(4)$$

$$4.48 m_G = 4 m_G + 216$$

$$m_e = 450.00 \text{ kg}$$

4) $m_B = 28,000 \text{ kg}$

$m_T = 12,000 \text{ kg}$

$v_{bi} = 0$

$v_{ti} =$

$v_E = 3.0 \text{ m/s}$

$$m_B v_{bi} + m_T v_{ti} = (m_B + m_T) v_f$$

$$0 + 12,000 v_{ti} = 40,000(3)$$

$$v_{ti} = 10.00 \text{ m/s, F}$$

$$\begin{aligned}
 5) \quad m_A &= 227 \text{ kg} \\
 m_K &= 267 \text{ kg} \\
 v_{Ai} &= -4 \text{ m/s} \\
 v_{Ki} &= \\
 v_F &= 0
 \end{aligned}$$

$$\begin{aligned}
 m_A v_{Ai} + m_K v_{Ki} &= m_C v_F \\
 227(-4) + 267 v_{Ki} &= 0
 \end{aligned}$$

$$v_{Ki} = 3.40 \text{ m/s, Right}$$

$$\begin{aligned}
 6) \quad m_C &= 9.50 \text{ kg} \\
 v_{Ci} &= 24 \text{ km/hr} = 6.67 \text{ m/s, N} \\
 m_D &= 32 \text{ kg} \\
 v_F &= 11.0 \text{ km/hr, N} = 3.055 \text{ m/s}
 \end{aligned}$$

$$m_C v_{Ci} + m_D v_{Di} = (m_C + m_D) v_F$$

$$9.5(6.67) + 32 v_{Di} = 41.5(3.055)$$

$$v_{Di} = 1.98 \text{ m/s, N}$$

$$\begin{aligned}
 7) \quad m_1 &= m_2 \\
 v_{1,i} &= 89 \text{ km/hr} \\
 v_{2,i} &= 69 \text{ km/hr} \\
 v_F &=
 \end{aligned}$$

$$m_1 v_{1,i} + m_2 v_{2,i} = (m_1 + m_2) v_F$$

$$m_1 = m_2 = m$$

$$89m + 69m = 2m(v_F)$$

$$158 = 2v_F$$

$$v_F = 79 \text{ km/hr} = 21.94 \text{ m/s, F}$$

$$\begin{aligned}
 8) \quad m_S &= 3000 \text{ kg} \\
 m_F &= 250 \text{ kg} \\
 v_{Fi} &= -3.0 \text{ m/s} \\
 v_{Si} &= 1.0 \text{ m/s} \\
 v_F &=
 \end{aligned}$$

$$m_S v_{Si} + m_F v_{Fi} = (m_S + m_F) v_F$$

$$3000(1) + 250(-3) = 3250 v_F$$

$$v_F = 0.69 \text{ m/s } \uparrow$$

$$9) m_c = 2267 \text{ Kg} > m_1 = 2767 \text{ Kg}$$

$$m_R = 500 \text{ Kg}$$

$$v_i = -2.00 \text{ m/s}$$

$$m_2 = 1800 + 500 = 2300 \text{ Kg}$$

$$v_{2i} = 1.40 \text{ m/s}$$

$$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$2767(-2) + 2300(1.4) = 5067 v_f$$

$$-5534 + 3220 = 5067 v_f$$

$$\boxed{v_f = -0.46 \text{ m/s, R}}$$