

Practice: KE Inelastic Collisions

1) $m_{HB} = 0.002 \text{ kg}$ $m_{HB}v_{HBi} + m_B v_{Bi} = (m_{HB} + m_B) v_f$
 $v_{HB,i} = 2.0 \text{ m/s}$ ~~$0.002(2) + 0.0002(-8) = (0.0022)v_f$~~
 $m_B = 0.0002 \text{ kg}$ $0.002(2) + 0.0002(-8) = (0.0022)v_f$
 $v_B = -8 \text{ m/s}$ $v_f = 1.09 \text{ m/s}$

$v_f =$ $\Delta KE = KE_f - KE_i$

$$.5(0.0022)(1.09^2) - [(.5(0.002)(2^2)) + (.5(0.0002)(-8^2))]$$

$$.001360691 - [(.004) + (.0064)]$$

$$-.0104$$

$\Delta KE = 0.009039$

$$\% \frac{\Delta KE}{KE_{TOTAL}} = \frac{0.009039}{0.0104} = \boxed{86.92\%}$$

2) $m_L = 330 \text{ kg}$ $m_L v_{Li} + m_B v_{Bi} = (m_L + m_B) v_f$
 $v_{B,i} = 0 \text{ m/s}$ $330(6) + 0 = (330 + m_B)(2.5)$
 $v_{L,i} = 6.00 \text{ m/s}$ $m_B = 462.00 \text{ kg}$
 $v_f = 2.50 \text{ m/s}$

m_B $\Delta KE = KE_f - KE_i$

$$\Delta KE = .5(792)(2.5^2) - [(.5(330)(6^2)) + 0]$$

$$2475 - 5940 = \boxed{-3465.00 \text{ J}}$$

3) $m_1 = m_2 = 111 \text{ kg}$ $m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$
 $v_{1i} = 9.0 \text{ m/s, R}$ $111(9) + 111(-5) = 222 v_f$
 $v_{2i} = -5.0 \text{ m/s, R}$ $v_f = 2.00 \text{ m/s, R}$

$\Delta KE = KE_f - KE_i$

$$(.5(222)(2^2)) - [(.5)(111)(9^2) + (.5)(111)(-5^2)]$$

$$444 - 4495.5 + 1387.5$$

$$444 - 5003 = \boxed{-4559 \text{ J}}$$

$$4) m_1 = m_2 = 60 \text{ Kg} = 110 \text{ Kg} \quad m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$v_{1i} = 106 \text{ km/hr}, E = 29.44 \text{ m/s} \quad 110(29.44) + 110(20.83) = 220 v_f$$

$$v_{2i} = 75 \text{ km/hr}, W = 20.83 \text{ m/s} \quad 947.10 = 220 v_f$$

$$m_c = 50 \text{ Kg} \quad v_f = 4.305$$

$$\Delta KE = KE_f - KE_i$$

$$(.5)(220)(4.305^2) - \left[.5(110)(29.44^2) + .5(110)(20.83^2) \right]$$

$$2038.63275 - 71533.1375$$

$$\boxed{\Delta KE = -69,494.50 \text{ J}}$$

$$5) m_1 = 400,000 \text{ Kg} \quad m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$v_{1i} = 32 \text{ km/hr} = 8.89 \text{ m/s} \quad 4 \times 10^5 (8.89) + 1.6 \times 10^5 (12.5) = 5.6 \times 10^5 v_f$$

$$m_2 = 160,000 \text{ Kg} \quad 3556000 + 2000000 =$$

$$v_{2i} = 45 \text{ km/hr} = 12.50 \text{ m/s} \quad v_f = 9.92 \text{ m/s}$$

$$\Delta KE = KE_f - KE_i$$

$$.5(560000)(9.92^2) - \left[(.5)(160000)(12.5^2) + .5(400000)(8.89^2) \right]$$

$$27,553,792 - \left[12,500,000 + 15,806,420 \right]$$

$$27,553,792 - 28,306,420$$

$$\boxed{\Delta KE = -752,628.00 \text{ J}}$$

$$6) m_1 = 21.3 \text{ Kg} \quad m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$v_{1i} = 0 \text{ m/s} \quad 21.3(0) + .18 v_{2i} = 21.48(.06)$$

$$m_2 = 0.18 \text{ Kg} \quad v_{2i} = 7.16 \text{ m/s}$$

$$v_f = .06 \text{ m/s} \quad \Delta KE = KE_f - KE_i$$

$$.5(21.48)(.06^2) - \left[0 + .5(.18)(7.16^2) \right]$$

$$.038664 - 4.613904$$

$$\boxed{\Delta KE = -4.58 \text{ J}}$$