Physics Ch6
WKST 6f # 1, 2

1) Given:

Bat	Insect
$m_B = 2.0\ g$	$m_I = .20g$
$V_{Bi} = 2.0\ m/s$ forward	$V_{Ii} = 8.0\ m/s$ Backward
$V_{Bf} = ?$	$V_{If} = ?$

$V_{Bf} = V_{If} \Rightarrow V_f$

Find: ΔKE lost

Soln: Need V_f 1st inelastic eqn

(1) $m_B V_{Bi} + m_I V_{Ii} = V_f (m_B + m_I)$

$$V_f = \frac{m_B V_{Bi} + m_I V_{Ii}}{m_B + m_I} = \frac{(2.0g)(2.0m/s) + (.20g)(-8.0m/s)}{2.0g + .20g}$$

$V_f = 1.1\ m/s$ forward

(2) $KE_i = \frac{1}{2} m_B V_{Bi}^2 + \frac{1}{2} m_I V_{Ii}^2$ Note: mass must be in Kg!

$= \frac{1}{2}(2.0\times10^{-3}kg)(2.0m/s)^2 + \frac{1}{2}(2.0\times10^{-4}kg)(-8.0m/s)^2$

$= 1.0\times10^{-2}\ J$

(3) $KE_f = \frac{1}{2} m_B V_f^2 + \frac{1}{2} m_I V_f^2$

$= \frac{1}{2}(2.0\times10^{-3}kg)(1.1m/s)^2 + \frac{1}{2}(2.0\times10^{-4}kg)(1.1m/s)^2$

$KE_f = 1.3\times10^{-3}\ J$

(4) $\Delta KE = KE_f - KE_i = 1.3\times10^{-3}J - 1.0\times10^{-2}J$

$\Delta KE = -8.7\times10^{-3}\ J$

fraction KE Dissipated $= \frac{\Delta KE}{KE_i} = \frac{8.7\times10^{-3}J}{1.0\times10^{-2}J} =$ **.87**

2) Given:

lion	Boat	
$m_L = 313\ kg$	$m_B = ?$	
$V_{Li} = 6.00\ m/s$ AWAY	$V_{Bi} = 0$	
$V_{Lf} = 2.50\ m/s$ AWAY	$V_{Bf} = 2.50\ m/s$ AWAY	$V_{Lf} = V_{Bf} \Rightarrow V_f$

Find: KE lost in inelastic eqn

Soln: Need MASS of Boat 1st

(1) $m_L V_{Li} + m_B \overset{\nearrow 0}{V_{Bi}} = V_f (m_L + m_B)$ (?)

$m_L V_{Li} = V_f m_L + V_f m_B$

$$m_B = \frac{m_L V_{Li} - V_f m_L}{V_f} = \frac{(313\ kg)(6.00\ m/s) - (313\ kg)(2.50\ m/s)}{2.50\ m/s}$$

$m_B = 438\ kg$

$\Delta KE = KE_f - KE_i$

(2) $KE_i = \frac{1}{2} m_L V_i^2 + \frac{1}{2} \overset{\nearrow 0}{m_B} V_i^2 = \frac{1}{2}(313\ kg)(6.00\ m/s)^2$

$KE_i = 5630\ J$

(3) $KE_f = \frac{1}{2} m_L V_f^2 + \frac{1}{2} m_B V_f^2 = \frac{1}{2}(313\ kg)(2.50\ m/s)^2 + \frac{1}{2}(438\ kg)(2.50\ m/s)^2$

$KE_f = 2350\ J$

$\Delta KE = KE_f - KE_i = 2350\ J - 5630\ J$

$\boxed{\Delta KE = -3280\ J}$