Impulse and Momentum Review - Key

Note Title 6/8/2015

1. $\vec{p} = m\vec{v} = (500)(6.9) = 3450 \text{ kg}\cdot\text{m/s} = 3500 \text{ kg}\cdot\text{m/s}$ (2 sig figs)

$\vec{v} = 25 \text{ km/hr} \overset{\div 3.6}{=} 6.9 \text{ m/s}$

2. $\Delta\vec{p} = m\Delta\vec{v} = (0.05)(-5.0 - 5.0) = -0.5 \text{ N}\cdot\text{s}$ (V_f, V_i)

$50 \text{ g} = 0.05 \text{ kg}$; rebounds

3. $t = 0.10 \text{ s}$ $\quad \vec{F} = ?$

$\Delta\vec{p} = \vec{F}\cdot\Delta t \qquad \vec{F} = \dfrac{\Delta\vec{p}}{\Delta t} = \dfrac{-0.5 \text{ N}\cdot\text{s}}{0.10 \text{ s}}$

$\vec{F} = -5 \text{ N}$

4. $\Delta\vec{p} = m\Delta\vec{v} = (3)(5 - 0) = 15 \text{ kg}\cdot\text{m/s}$

same amount $15 \text{ kg}\cdot\text{m/s}$

5. momentum before collision = momentum after collision

6. $m_1\vec{v}_1 + m_2\vec{v}_2 = m_1\vec{v}_1 + m_2\vec{v}_2$ ($\vec{v}_2 = 0$)

$(15)(5.0) = (15)(2.0) + (20)\vec{v}_2$

$75 = 30 + 20\vec{v}_2$

$-30 \qquad -30$

$\dfrac{45}{20} = \dfrac{20\vec{v}_2}{20} \qquad \vec{v}_2 = +2.25 \text{ m/s} = +2.3 \text{ m/s}$

7. $90 \text{ km/hr} \overset{\div 3.6}{=} 25 \text{ m/s}$

$m_1\vec{v}_1 + m_2\vec{v}_2 = (m_1 + m_2)\vec{v}$ ($\vec{v}_2 = 0$)

$(1500)(25) + 0 = (1500 + 500)\vec{v}$

$\dfrac{37{,}500}{2000} = \vec{v} \qquad \vec{v} = 18.75 \text{ m/s} = 19 \text{ m/s}$

8. $m\vec{v} = m_1\vec{v}_1 + m_2\vec{v}_2$

$(100)(10.0) = (80)\vec{v}_1 + (20)\vec{v}_2$ ($\vec{v}_2 \to 0$)

$\frac{1000}{80} = \frac{80\vec{v}}{80}$

$\vec{v} = 12.5\ m/s$

9. $m\vec{v} = m_1\vec{v}_1 + m_2\vec{v}_2$

$0 = (6)(200) + (4)\vec{v}_2$

$\frac{-1200}{4} = \frac{4\vec{v}_2}{4}$

$\vec{v}_2 = -300\ m/s$