

Lab #8: Conservation of Linear Momentum

4/2/19

R:

$$v_b = 10 \text{ m/s}$$

$$p_b = 5 \text{ kg m/s}$$

$$v_a = 0 \text{ m/s}$$

$$p_a = 0 \text{ kg m/s}$$

G:

$$v_b = 0 \text{ m/s}$$

$$p_b = 0 \text{ kg m/s}$$

$$v_a = 10 \text{ m/s}$$

$$p_a = 5 \text{ kg m/s}$$

$$(m_1 v_1)_b + (m_2 v_2)_b = (m_1 v_1)_a + (m_2 v_2)_a$$

before

$$m_1 = .5 \text{ kg}$$

$$v_1 = 10 \text{ m/s}$$

$$m_2 = .5 \text{ kg}$$

$$v_2 = 0 \text{ m/s}$$

after

$$m_1 = .5 \text{ kg}$$

$$v_1 = 0 \text{ m/s}$$

$$m_2 = .5 \text{ kg}$$

$$v_2 = 10 \text{ m/s}$$

a. $p_{Ti} = 5 \text{ kg m/s}$

b. $p_{Tf} = 5 \text{ kg m/s}$

c. $p_{Ti} = p_{Tf}$

R:

$$v_i = 10 \text{ m/s}$$

$$p_i = 15 \text{ kg m/s}$$

$$v_f = 5 \text{ m/s}$$

$$p_f = 7.5 \text{ kg m/s}$$

G:

$$v_i = 0 \text{ m/s}$$

$$p_i = 0 \text{ kg m/s}$$

$$v_f = 15 \text{ m/s}$$

$$p_f = 7.5 \text{ kg m/s}$$

$$(m_1 v_1)_b + (m_2 v_2)_b = (m_1 v_1)_a + (m_2 v_2)_a$$

$m_1 = 1.5$ $m_1 = 1.5$ $v_1 = 10$ $m_2 = 0.5$ $v_2 = 0$	$m_2 = 0.5$ $m_2 = 0.5$ $v_1 = 0$ $m_1 = 1.5$ $v_2 = 15$
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a. $p_{Ti} = 15 \text{ kg m/s}$

b. $p_{Tf} = 15 \text{ kg m/s}$

c. $p_{Ti} = p_{Tf}$

$$R: \begin{aligned} p_i &= 5 \\ v_i &= 10 \\ p_f &= -2.5 \\ v_f &= -5 \end{aligned}$$

$$G: \begin{aligned} p_i &= -2.5 \\ v_i &= -5 \\ p_f &= 5 \\ v_f &= 10 \end{aligned}$$

$$m = 0.5$$

$$m = 0.5$$

$$(m_1 v_1)_b + (m_2 v_2)_b = (m_1 v_1)_a + (m_2 v_2)_a$$

a. $p_{Ti} = 2.5 \text{ kg m/s}$

b. $p_{Tf} = 2.5 \text{ kg m/s}$

c. $p_{Ti} = p_{Tf}$

Inelastic:

$$R: \begin{aligned} p_i &= 5 \\ v_i &= 10 \\ p_f &= 2.5 \\ v_f &= 5 \end{aligned}$$

$$G: \begin{aligned} p_i &= 0 \\ v_i &= 0 \\ p_f &= 2.5 \\ v_f &= 5 \end{aligned}$$

$$m = 0.5$$

$$m = 0.5$$

$$(m_1 v_1)_b + (m_2 v_2)_b = (m_1 + m_2) V_a$$

a. $p_{Ti} = 5 \text{ kg m/s}$

b. $p_{Tf} = 5 \text{ kg m/s}$

c. $p_{Ti} = p_{Tf}$

$$\begin{aligned}
 R: \quad p_i &= 15 \\
 v_i &= 10 \\
 p_f &= 11.25 \\
 v_f &= 7.5 \\
 m &= 1.5
 \end{aligned}$$

$$\begin{aligned}
 G: \quad p_i &= 0 \\
 v_i &= 0 \\
 p_f &= 3.75 \\
 v_f &= 7.5 \\
 m &= 0.5
 \end{aligned}$$

$$(m_1 v_1)_b + (m_2 v_2)_b = (m_1 + m_2) v_a$$

- $p_{Ti} = 15 \text{ kg m/s}$
- $p_{Tf} = 15 \text{ kg m/s}$
- $p_{Ti} = p_{Tf}$