1) Since it is looking for horizontal speed only, $P_{ix} = P_{fx}$ (use x direction only) (only in x)

$$m_1 v_1 + m_2 v_2 = m_1 v_3 + m_2 v_4$$

$$0 + 0 = 9(30 \cos 35) + 400(v_4)$$

$$v_4 = \frac{-9(30 \cos 35)}{400} = -0.55 \ \frac{m}{s}$$

2) $$J_{TRUCK} = \Delta(mv) = m(\Delta v) = 1000(0.8)$$

$$J_{TRUCK} = 800 = J_{MALLOW\ TOT}$$

$$\frac{J}{mallow} = m\Delta v = 0.005(60) = 0.3 \ \frac{kg \cdot m}{s}$$

$$\frac{800}{0.3} = \#\ \text{mallow launches} = 2667 \text{ mallows}$$

3) $P_i = P_f$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_3$$

$$0.04(25) + 0 = 6.04\, v_3$$

$$\frac{1}{6.04} = 0.166 = v_3 \quad \left(\frac{m}{s}\right)$$

4) $p_i = p_c$

$m_1 v_1 + m_2 v_2 = m_1 v_3 + m_2 v_4$

$100(0) + 15(20) = 100(v_3) + 15(14)$

$0 + 300 = 100 v_3 + 210$

$\frac{300 - 210}{100} = v_3 = 0.9 \frac{m}{s}$

5) $p_i = p_f$ then $E_i = E_F$

$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_3$

$20\cancel{(0)}^{0} + 2.5(7) = 22.5 v_3$

$\frac{17.5}{22.5} = v_3 = 0.78 \frac{m}{s}$

$E_i = E_F$

$\cancel{U_i}^{0} + K_i + \cancel{W_c}^{0} = U_F + K_F$

$\frac{1}{2} m_b v_{bi}^2 = mgh_b + \frac{1}{2} m_{(b+r)} v_f^2$

$\frac{1}{2}(2.5)(7)^2 = 22.5(10) h_b + \frac{1}{2}(22.5)(.78)^2$

$61.25 = 225 h_b + 6.84$

$\frac{54.48}{225} = \boxed{h_b = 0.24 \text{ m}}$

6) $p_i = p_f$

$m_1 v_1 + m_2 \cancel{v_2^{\,0}} = m_1 v_3 + m_2 v_4$

$8(4) = 8v_3 + 1.5(6.5)$

$\frac{32 - 9.75}{8} = v_3 = 2.78$

% reduced by $= \frac{\Delta v}{v_0} = \frac{4 - 2.78}{4} = 30.5\%$ reduction

$\boxed{69.5\%\ v_0} = \frac{2.78}{4}$

$\boxed{0.695\ v_0}$ as a factor

as a percent