

Consider right as positive

$$m_V = ? \quad m_G = 4.5 \times 10^2 \text{ kg}$$

$$\vec{v}_V = -45 \text{ m/s} \quad \vec{v}_G = 1.4 \times 10^3 \text{ m/s}$$

$$\vec{p}_V = ? \quad \vec{p}_G = 6.3 \times 10^5 \text{ kg} \cdot \text{m/s}$$

$$\vec{p}_{\text{after}} = \vec{p}_{\text{before}} = 0$$

$$\vec{p}_{\text{after}} = \vec{p}_V + \vec{p}_G = 0$$

$$\vec{p}_V = -6.3 \times 10^5 \text{ kg} \cdot \text{m/s}$$

$$m_V = \frac{\vec{p}_V}{\vec{v}_V}$$

$$= \frac{-6.3 \times 10^5 \text{ kg} \cdot \text{m/s}}{-45 \text{ m/s}}$$

$$= 1.4 \times 10^4 \text{ kg}$$

9. before collision



$$m = 7.0 \text{ kg}$$

$$v = 0$$

$$p = 0$$

$$\vec{p}_{\text{before}} = 0$$

after collision



Consider right as positive

$$m_B = 5.0 \text{ kg} \quad m_A = 2.0 \text{ kg}$$

$$\vec{v}_B = ? \quad \vec{v}_A = 10.0 \text{ m/s}$$

$$\vec{p}_B = ? \quad \vec{p}_A = 20.0 \text{ kg} \cdot \text{m/s}$$

$$\vec{p}_{\text{after}} = \vec{p}_{\text{before}} = 0$$

$$\vec{p}_{\text{after}} = \vec{p}_A + \vec{p}_B = 0$$

$$\vec{p}_B = -20.0 \text{ kg} \cdot \text{m/s}$$

$$\vec{v}_B = \frac{\vec{p}_B}{m_B}$$

$$= \frac{-20.0 \text{ kg} \cdot \text{m/s}}{5.0 \text{ kg}}$$

$$= 4.0 \text{ m/s left}$$

10. before collision



Consider north as positive

$$m_T = 1.02 \times 10^4 \text{ kg}$$

$$\vec{v}_T = 15 \text{ m/s}$$

$$\vec{p}_T = 1.53 \times 10^5 \text{ kg} \cdot \text{m/s}$$

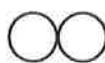
$$m_C = 1.02 \times 10^3 \text{ kg}$$

$$\vec{v}_C = -25 \text{ m/s}$$

$$\vec{p}_C = -2.55 \times 10^4 \text{ kg} \cdot \text{m/s}$$

$$\therefore \vec{p}_{\text{before}} = \vec{p}_T + \vec{p}_C = 1.28 \times 10^5 \text{ kg} \cdot \text{m/s}$$

after collision



$$m = 1.12 \times 10^4 \text{ kg}$$

$$\vec{v} = ?$$

$$\vec{p} = \vec{p}_{\text{after}} = 1.28 \times 10^5 \text{ kg} \cdot \text{m/s}$$

$$\vec{v} = \frac{\vec{p}}{m}$$

$$= \frac{1.28 \times 10^5 \text{ kg} \cdot \text{m/s}}{1.12 \times 10^4 \text{ kg}}$$

$$= 11 \text{ m/s north}$$

11. a) before collision



Consider right as positive

$$m_1 = 225 \text{ g}$$

$$\vec{v}_1 = 30.0 \text{ cm/s}$$

$$\vec{p}_1 = 6.75 \times 10^3 \text{ g} \cdot \text{cm/s}$$

$$m_2 = 125 \text{ g}$$

$$\vec{v}_2 = 10.0 \text{ cm/s}$$

$$\vec{p}_2 = 1.25 \times 10^3 \text{ g} \cdot \text{cm/s}$$

$$\therefore \vec{p}_{\text{before}} = \vec{p}_1 + \vec{p}_2 = 8.00 \times 10^3 \text{ g} \cdot \text{cm/s}$$

after collision



$$m_1 = 225 \text{ g} \quad m_2 = 125 \text{ g}$$

$$\vec{v}'_1 = ? \quad \vec{v}'_2 = 24 \text{ cm/s}$$

$$\vec{p}'_1 = ? \quad \vec{p}'_2 = 3.00 \times 10^3 \text{ g} \cdot \text{cm/s}$$

$$\vec{p}_{\text{sys(after)}} = \vec{p}_{\text{sys(before)}} = 8.00 \times 10^3 \text{ g} \cdot \text{cm/s}$$

$$\vec{p}'_1 = 5.00 \times 10^3 \text{ g} \cdot \text{cm/s}$$

$$\vec{v}'_1 = \frac{\vec{p}'_1}{m}$$

$$= \frac{5.00 \times 10^3 \text{ g} \cdot \text{cm/s}}{225 \text{ g}}$$

$$= 22.2 \text{ cm/s right}$$