

Answer on Question #45539 – Physics – Other

Question.

A revolver of mass 500g fires a bullet of mass 10g with a speed of 100m/s. Find:

- (i) Momentum of the bullet,
- (ii) Initial momentum of revolver and bullet as a system
- (iii) Recoil velocity of the revolver.

Given:

$$m_1 = 500 \text{ g} = 0.5 \text{ kg}$$

$$m_2 = 10 \text{ g} = 0.01 \text{ kg}$$

$$v_2 = 100 \frac{\text{m}}{\text{s}}$$

Find:

- (i) $p_2 = ?$
- (ii) $p_0^{system} = ?$
- (iii) $v_1 = ?$

Solution.

By definition the momentum is:

$$p = mv$$

The law of conservation of momentum:

$$p_0^{system} = p^{system}$$

- (i) $p_2 = m_2 v_2$
- (ii) $p_0^{system} = p_0^{rev} + p_0^{bullet}$
 $v_0^{rev} = v_0^{bullet} = 0 \rightarrow p_0^{system} = 0$
- (iii) $p_0^{system} = p^{system} = m_1 v_1 + m_2 v_2 = 0$
 $v_1 = -\frac{m_2}{m_1} v_2$

Calculate:

- (i) $p_2 = 0.01 \cdot 100 = 1 \frac{\text{kg} \cdot \text{m}}{\text{s}}$
- (ii) $p_0^{system} = 0$
- (iii) $v_1 = -\frac{0.01}{0.5} \cdot 100 = -2 \frac{\text{m}}{\text{s}}$

Answer.

$$(i) \quad p_2 = m_2 v_2 = 1 \frac{kg \cdot m}{s}$$

$$(ii) \quad p_0^{system} = 0$$

$$(iii) \quad v_1 = -\frac{m_2}{m_1} v_2 = -2 \frac{m}{s}$$

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