

Answer on Question 79671, Physics, Other

Question:

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

- 1) momentum of the bullet;
- 2) initial momentum of revolver and bullet as a system;
- 3) recoil velocity of the revolver.

Solution:

1) We can find the momentum of the bullet from the formula:

$$p_b = m_b v_b = 0.01 \text{ kg} \cdot 100 \frac{\text{m}}{\text{s}} = 1 \text{ kg} \cdot \frac{\text{m}}{\text{s}}.$$

2) Initially both the revolver and the bullet are at rest, therefore the initial momentum of the system is zero:

$$p_i = m_b v_b (\text{initial}) + M_r v_r (\text{initial}) = 0.$$

3) We can find the recoil velocity of the revolver from the law of conservation of momentum:

$$p_i = p_f,$$

$$M_r v_{\text{recoil}} + m_b v_b = 0,$$

$$M_r v_{\text{recoil}} = -m_b v_b,$$

$$v_{\text{recoil}} = -\frac{m_b v_b}{M_r} = -\frac{0.01 \text{ kg} \cdot 100 \frac{\text{m}}{\text{s}}}{0.5 \text{ kg}} = -2 \frac{\text{m}}{\text{s}}.$$

The sign minus indicates that the recoil velocity of the revolver directed in the opposite direction to the velocity of the bullet.

Answer:

1) $p_b = 1 \text{ kg} \cdot \frac{\text{m}}{\text{s}}.$

2) $p_i = 0.$

3) $v_{\text{recoil}} = -2 \frac{\text{m}}{\text{s}}.$

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