

Pistol firing

Calculate the recoil speed of a pistol (mass 0.90 kg) given that the bullet has mass 8.0 g and emerges from the pistol with a speed of 352 ms^{-1} . Assume the momentum of the exhaust gas is negligible.



Solution: Before firing the momentum is zero

$$p_i = 0$$

The only forces acting are internal forces, so the total momentum doesn't change.
Hence

$$\begin{aligned} p_f = p_i = 0 &= m_B v_B + m_P v_P \\ &= +0.008 \times 352 + 0.9 v_P \end{aligned}$$

so

$$v_P = -0.008 \times 352 / 0.9 = -3.1 \text{ ms}^{-1}$$

(the negative sign tells us the pistol recoils to the right).