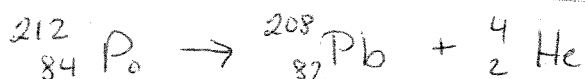
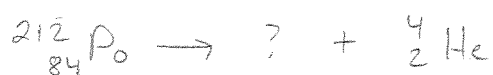


a) For alpha decay: $\alpha = {}^4_2\text{He}$



b) $V_\alpha = 2.02 \times 10^7 \text{ m/s}$

$$m_{\text{Pb}} \approx 208 \text{ u}$$

$$m_\alpha \approx 4 \text{ u}$$

$$m_1 v_1 = m_2 v_2$$

$$(4 \text{ u}) \cdot (2.02 \times 10^7 \text{ m/s}) = (208 \text{ u}) \cdot v_2$$

$$v_{\text{Pb}} = 388,500 \text{ m/s}$$

c) $m_{\text{Pb}} \approx 208 \text{ u} \cdot \frac{1.66 \times 10^{-27} \text{ kg}}{1 \text{ u}} = 3.45 \times 10^{-25} \text{ kg}$

$$m_\alpha \approx 4 \text{ u} \cdot \frac{1.66 \times 10^{-27} \text{ kg}}{1 \text{ u}} = 6.64 \times 10^{-27} \text{ kg}$$

$$\begin{aligned} KE &= KE_{\text{Pb}} + KE_\alpha = \frac{1}{2} m_{\text{Pb}} v_{\text{Pb}}^2 + \frac{1}{2} m_\alpha v_\alpha^2 \\ &= \frac{1}{2} (3.45 \times 10^{-25} \text{ kg}) (388,500 \text{ m/s})^2 + \frac{1}{2} (6.64 \times 10^{-27} \text{ kg}) (2.02 \times 10^7)^2 \\ &= 2.61 \times 10^{-14} \text{ J} + 1.35 \times 10^{-12} \text{ J} \end{aligned}$$

$$KE = 1.38 \times 10^{-12} \text{ J}$$