

1. $V_e = 0.6c$ $V_d = 0.8c$ $m_0 = 9.11 \cdot 10^{-31} \text{ kg}$ (מסת אלקטרון)

$$E_e = mc^2 = \frac{m_0 c^2}{\sqrt{1 - \frac{v_e^2}{c^2}}} = \frac{m_0 c^2}{\sqrt{1 - 0.6^2}}$$

: ערך האנרגיה

$$E_e = 1.02 \cdot 10^{-13} \text{ J}$$

$$E_e' = m'c^2 = \frac{m_0 c^2}{\sqrt{1 - \frac{v_e'^2}{c^2}}}$$

: ערך האנרגיה

$$v_e' = \frac{v_e - v_d}{1 - \frac{v_e v_d}{c^2}} = \frac{0.6c - 0.8c}{1 - 0.6 \cdot 0.8} = -0.38c$$

$$E_e' = \frac{m_0 c^2}{\sqrt{1 - (-0.38)^2}} = 8.86 \cdot 10^{-14} \text{ J}$$

2. $m_1 = m_0$ $m_2 = 3m_0$
 $v_1 = 0.8c$ $v_2 = 0$

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: ערך המסה

ⓑ $m_u v_1 = M_u u$

ⓓ $m_1 v_1^2 + 3m_0 c^2 = M_u c^2$

: ערך המסה

ⓔ $\frac{m_0 \cdot 0.8c}{\sqrt{1 - (0.8)^2}} = M_u u \Rightarrow \frac{4m_0 c}{3} = M_u u$

ⓖ $M_u = \frac{m_0}{\sqrt{1 - (0.8)^2}} + 3m_0 = \frac{14m_0}{3}$ (2.3)

$$\frac{4m_0 c}{3} = \frac{14m_0}{3} u \Rightarrow u = \frac{4}{14} c = \frac{2}{7} c = 0.29c$$

$$M_u = \frac{M_0}{\sqrt{1 - (0.29)^2}} \Rightarrow M_0 = M_u \sqrt{1 - (0.29)^2}$$

$$M_0 = \frac{14m_0}{3} \cdot \sqrt{1 - (0.29)^2} = 4.47 m_0$$

$$3. \quad m_0 = 4.0026 \text{ u} = 6.6463 \cdot 10^{-27} \text{ kg}$$

$$m_0 \text{ (corrected)} \quad M_0 = 8.0053 \text{ u} = 1.3293 \cdot 10^{-26} \text{ kg}$$

$$M_0 c^2 = 2 m_0 c^2 + 2 E_k$$

используем

$$2 E_k = (M_0 - 2 m_0) c^2$$

$$\text{выразим } E_k = \frac{(M_0 - 2 m_0) c^2}{2} = \frac{2.0065 \cdot 10^{-31} \cdot c^2}{2} = 9.0292 \cdot 10^{-15} \text{ J}$$