

10.8

D:

$$e = 1,6 \cdot 10^{-19} \text{ C}$$

$$U = 30 \text{ kV} = 30000 \text{ V} = 3 \cdot 10^4 \text{ V}$$

$$\lambda = 1,17 \cdot 10^{-13} \text{ m}$$

$$h = 6,63 \cdot 10^{-34} \text{ J}\cdot\text{s}$$

Sz:  $m = ?$ 

Roxw:

$$U_e = E_k$$

$$W_e = eU$$

$$E_k = \frac{mv^2}{2}$$

$$eU = \frac{mv^2}{2}$$

$$\lambda = \frac{h}{mv} \Rightarrow v \cdot \lambda = \frac{h}{m} \Rightarrow v = \frac{h}{\lambda m}$$

$$eU = \frac{m \left( \frac{h}{\lambda m} \right)^2}{2}$$

$$eU = \frac{m \cdot \frac{h^2}{\lambda^2 m^2}}{2}$$

$$eU = \frac{h^2}{2\lambda^2 m}$$

$$m = \frac{h^2}{2\lambda^2 eU}$$

$$m \cdot eU = \frac{h^2}{2\lambda^2}$$

$$m = \frac{(6,63 \cdot 10^{-34} \text{ J}\cdot\text{s})^2}{2 \cdot (1,17 \cdot 10^{-13} \text{ m})^2 \cdot 1,6 \cdot 10^{-19} \text{ C} \cdot 3 \cdot 10^4 \text{ V}} =$$

$$= \frac{43,8569 \cdot 10^{-68}}{13,1444 \cdot 10^{-41}} \text{ J} \cdot \frac{\text{s}^2}{\text{m}^2} \approx 3,34 \cdot 10^{-27} \text{ kg} \cdot \frac{\text{m}^2}{\text{s}^2} \cdot \frac{\text{s}^2}{\text{m}^2} =$$

$$= 3,34 \cdot 10^{-27} \text{ kg}$$

$$m_p = 1,67 \cdot 10^{-27} \text{ kg} \quad \wedge \quad m_n = 1,67 \cdot 10^{-27} \text{ kg}$$

$$m = m_p + m_n = 1,67 \cdot 10^{-27} \text{ kg} + 1,67 \cdot 10^{-27} \text{ kg} = 3,34 \cdot 10^{-27} \text{ kg}$$