



(KTXFI2EBNF) Physics II. Practice

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Correction

Diagram: A photon with energy E_{photon} strikes an electron at rest with mass m_e and velocity v . The electron recoils with velocity v and kinetic energy E_0 . The photon's wavelength changes from λ_0 to λ .

Given: $\lambda_0 = 1.5 \cdot 10^{-7} \text{ m} (= 150 \text{ nm})$, $\lambda = 2.67 \cdot 10^{-7} \text{ m} (= 267 \text{ nm})$, $m_e = 9.1 \cdot 10^{-31} \text{ kg}$.

Equations:

$$E_{\text{photon}} = E_0 + \frac{1}{2} m_e v^2$$

$$E_{\text{ph}} = h \cdot f = h \cdot \frac{c}{\lambda} = 6.63 \cdot 10^{-34} \cdot \frac{3 \cdot 10^8}{2.67 \cdot 10^{-7}} = 7.45 \cdot 10^{-19} \text{ J}$$

$$E_0 = h \cdot f_0 = h \cdot \frac{c}{\lambda_0} = 6.63 \cdot 10^{-34} \cdot \frac{3 \cdot 10^8}{1.5 \cdot 10^{-7}} = 1.326 \cdot 10^{-18} \text{ J}$$

$$\frac{1}{2} m_e v^2 = E_{\text{ph}} - E_0$$

$$v = \sqrt{\frac{2(E_{\text{ph}} - E_0)}{m_e}}$$

$$v = \sqrt{\frac{2(7.45 \cdot 10^{-19} - 1.326 \cdot 10^{-18})}{9.1 \cdot 10^{-31}}} = \sqrt{\frac{2(-5.81 \cdot 10^{-19})}{9.1 \cdot 10^{-31}}} = \sqrt{-1.28 \cdot 10^{12}} = 1.13 \cdot 10^{12} \text{ m/s}$$

Exercises

- ▶ See other documents
- ▶ Photoelectric Effect
- ▶ Compton Scattering
- ▶ etc.

The End

Thank you for your attention!