

October 27, 2025

1. An electron has a kinetic energy of 2.5 eV.
 - (a) What is its velocity?
 - (b) What is its momentum?
 - (c) What is the wavelength of the associated de Broglie wave?
2. A metal surface is illuminated with light of wavelength $2.5 \cdot 10^{-7}$ m. What is the velocity of the emitted electrons if the photoelectric effect starts at light with a wavelength of $2.77 \cdot 10^{-7}$ m? ($m_e = 9.1 \cdot 10^{-31}$ kg)
3. A photon ejects an electron with a maximum kinetic energy of 0.64 eV from a metal for which the work function is 3.74 eV.
 - (a) What is the energy of the photon in electronvolts?
 - (b) What is the wavelength of the applied ultraviolet radiation?
4. In a Compton scattering experiment, X-rays with a wavelength of 0.104 nm are used. ($m_e = 9.1 \cdot 10^{-31}$ kg)
 - (a) At what scattering angle does the wavelength of the radiation increase by 1%?
 - (b) At what angle does the wavelength become 0.05% larger?
5. X-rays are scattered by electrons. $\lambda_0 = 10^{-11}$ m. The magnitude of the wavelength change is $2.6 \cdot 10^{-12}$ m.
 - (a) What is the scattering angle of the photons?
 - (b) By how much did the photon energy change during the process? ($m_e = 9.1 \cdot 10^{-31}$ kg)

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