

PHYS 215 Assignment 2:

Due 8.30am Thursday 21st January.

Show all your working. Incorrect answers that do not show intermediate steps will receive zero marks.

- Equation 25 of your notes assumes that a liberated photo-electron is moving non-relativistically. Consider a photo-electron liberated from a sodium target (work function $\phi = 2.36$ eV) with a measured kinetic energy equal to 3ϕ .
 - What is the velocity of the liberated electron expressed as a fraction of the speed of light?
 - What was the wavelength of the incident photon that liberated the electron?
- A 2.0 milli-W laser ($\lambda = 530$ nm) shines on a cesium cathode ($\phi = 1.95$ eV). Assume that one photo-electron is produced and collected for every 10^5 incident photons. What is the photo-current produced (recall that 1 ampere = 1 coulomb per second).
- A television creates an image by accelerating electrons across a potential of 15 kV to strike a phosphorescent screen. This process also creates a continuum spectrum of X-rays. What is the minimum wavelength of X-rays produced in this manner?
- A photon of wavelength 1×10^{-3} nm strikes a stationary free electron.
 - The Compton scattered photon is observed at a scattering angle $\theta = 45^\circ$. What is the wavelength of the scattered photon? Express your answer in nanometres.
 - What is the kinetic energy of the recoil electron? Express your answer as a function of the rest mass energy of the electron.