

PHY251 Exam 2. 90 min. 100 pts

1. Consider a 100W lamp placed 75cm away from the surface of a 1cm^2 size potassium target. Assume that 5% of the power is converted into light with 3000 angstrom wavelength.
 - a. Consider light as continuous wave, and assume each potassium atom to be a circular disk with 1 angstrom diameter. How long does it take for a potassium atom to absorb enough energy to overcome its work function of 2.0eV? (10 pts)
 - b. Now consider the light emitted to be particles (photons). If each photon can knock out an electron, how many electrons get knocked out per second from the potassium target? What is the kinetic energy of the photoelectrons? (15 pts)
2. In Compton scattering, if the maximum energy the scattered electron can absorb from the incident photon is 45 keV:
 - a. What is the angle of the scattered photon when maximum energy is absorbed by the electron? (5 pts)
 - b. What is the wavelength of the incident photon? (20 pts)
3. An electron with speed $0.8c$ annihilates with a rest positron and generates 2 photons. One of the photons is emitted perpendicular to the direction of the incident electron. Find out the energies of the two photons. (30 pts)
4. The visible light has wavelength ranging from 3800 to 7700 angstrom. Find out all the transitions in hydrogen atom which emit visible light. (20 pts)