PHYS143
Physics for Engineers
Tutorial - Chapter 40

Question 1
The temperature of an electric heating element is 150°C. At what wavelength does the radiation emitted from the heating element reach its peak?

Question 2
The radius of our Sun is 6.96×10^8 m, and its total power output is 3.85×10^{26} W. (a) Assuming the Sun's surface emits as a black body, calculate its surface temperature. (b) Using the result of part (a), find λ_{max} for the Sun. ($e = 1$, $\sigma = 5.67 \times 10^{-8}$ W/m^2.K^4).

Question 3
Molybdenum has a work function of 4.20 eV. (a) Find the cutoff wavelength and cutoff frequency for the photoelectric effect. (b) What is the stopping potential if the incident light has a wavelength of 180 nm? (c) If photons of energy 5.50 eV are incident on Molybdenum, what is the maximum kinetic energy of the ejected photoelectrons?

Question 4
Two light sources are used in a photoelectric experiment to determine the work function for a particular metal surface. When green light from a mercury lamp (λ = 546.1 nm) is used, a stopping potential of 0.376 V reduces the photocurrent to zero. (a) Based on this measurement, what is the work function for this metal? (b) What stopping potential would be observed when using the yellow light from a helium discharge tube (λ = 587.5 nm)?

Question 5
X-rays with a wavelength of 120.0 pm undergo Compton scattering. (a) Find the wavelengths of the photons scattered at an angle of 30.0°. (b) Find the energy of the scattered electron in each case.

Question 6
After a 0.800-nm x-ray photon scatters from a free electron, the electron recoils at 1.40×10^6 m/s. (a) What is the Compton shift in the photon's wavelength? (b) Through what angle is the photon scattered?