Photoelectric Effect

1. Explain what is meant by the photoelectric effect.

2. Explain what is meant by the work function of a photosurface.

3. Explain how a classical wave description would not result in the behavior exhibited in the photoelectric effect.

4. A photosurface has a work function of 3.00 eV. Calculate the critical frequency.

5. The photoelectric effect can, to a large part be explained using the concept of electrons and energy as classical waves. There are three aspects of the photoelectric effect that cannot be explained using classical wave theory.
    a. Describe the three observations.

    b. Explain how using the concept of photons explains the result.

6. Light of wavelength 5.4×10^{-7} m falls on a photosurface and causes the emission of electrons of maximum kinetic energy 2.1 eV at a rate of 10^{15} each second. The light is emitted by a 60 Watt light bulb.
    a. Calculate the electric current that leaves the photosurface.

    b. Determine the work function of the surface.

    c. Suppose the experiment was adjusted to use a 120 Watt light bulb. Determine the new maximum kinetic energy.

    d. Find the new current if the intensity is changed by using the 120 W bulb instead of the 60 W bulb.

7. When light of wavelength 208 nm fall on a photosurface, a voltage of 1.40 V is required to stop the emitted electrons from reaching the anode. Calculate the largest wavelength of light that will result in emission of electrons from this photosurface.

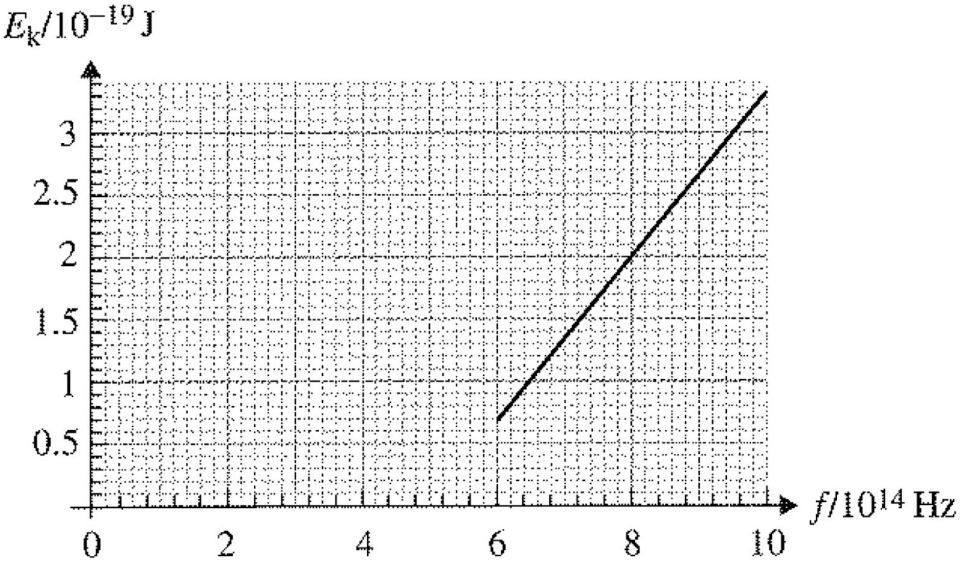
8. Light of wavelength 2.3×10^{-7} m is directed at the surface and the stopping voltage V_{S1} is recorded. When light of wavelength 1.8×10^{-7} m is used, the stopping voltage is $2(V_{S1})$. Determine the work function for this surface.

9. The graph given below shows the electron kinetic energy E_K versus frequency of incoming radiation.
    a. Determine the critical frequency of the photosurface.

    b. Determine the work function of the photosurface.

    c. Calculate the kinetic energy of an electron ejected when light of frequency 8.0×10^{14} Hz falls on the surface.

    d. Another surface has a critical frequency of 6.0×10^{14} Hz. Sketch the graph of the electron kinetic energy versus frequency on the graph below.



10. Explain how latitude could impact the performance of photovoltaic cells.