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AP 2 Photoelectric Effect ws 2

1. In the photoelectric effect, what is the relation between the threshold frequency f_0 and the work function W_0 ?
2. The threshold frequency for producing photoelectrons from a metal surface is 172 nm. What is the work function for this surface in electron volts?
3. Silicon films become better electrical conductors when illuminated by photons with energies of 1.14 eV or greater. What is the corresponding wavelength?
4. While conducting a photoelectric effect experiment with light of a certain frequency, you find that a reverse potential difference of 1.25 V is required to reduce the current to zero. Find a) the maximum kinetic energy; b) the maximum speed of the emitted photoelectrons.
5. Light sources have changed since Einstein's day. There is a certain probability that a single electron may simultaneously absorb *two* identical photons from a high-intensity laser. How would such an occurrence affect the threshold frequency and the maximum kinetic energy equations? Explain.

6. A nucleus in a transition from an excited level emits a gamma-ray photon with an energy of 3.25 MeV. a) What is the photon frequency? b) What is the photon wavelength? c) How does the wavelength compare with a typical nuclear diameter (of the order of 10^{-14}m)?

7. What is the maximum speed of the photoelectrons emitted from a clean gold surface when it is exposed to light with a frequency of 3.4×10^{15} Hz? (Work Function of gold: 5.1 eV)

8. The photoelectric work function of potassium is 2.3 eV. If light having a wavelength of 280 nm falls on potassium, find a) the stopping potential in volts; b) the kinetic energy in electron volts of the most energetic electrons ejected; c) the speeds of these electrons.

9. What will be the change in stopping potential for photoelectrons emitted from a surface if the wavelength of the incident light is reduced from 380 nm to 310 nm? (Both of these wavelengths are smaller than the threshold wavelength for the surface.)

10. The photoelectric work functions for particular samples of certain metals are as follows: cesium, 2.1 eV; copper, 4.7 eV; potassium, 2.3 eV; and zinc, 4.3 eV. a) What is the threshold wavelength for each metal surface? b) Which of these metals *could not* emit photoelectrons when irradiated with visible light (400 nm to 700 nm)?