1 Cognitive reasoning in the chemical sciences 3.10

Study Group

1. The threshold frequency of a metal is $1.2 \times 10^{15}\,s^{-1}$. Will a beam of light with wavelength 200nm eject electrons from the sample? If so, what is the velocity of the electron that is emitted?

2. A Li^{2+} ion has an electron in the ground state. What is frequency of a beam of light required to remove this electron? If the emitted electron has a velocity of 2.0×10^3 m/s what was the wavelength of the beam of light absorbed?

3. An element with Z protons has an electron in the n=2 state. It is struck by a beam of light that causes the electron to be emitted with a kinetic energy twice the energy required to remove the electron. What is the wavelength of the beam of light? What is velocity of the electron?

4. A hydrogen electron in the ground state absorbs the energy from a beam of light and jumps up to n=5. What is wavelength of the beam of light?

5. An electron in Be^{3+} falls from energy level of n=6 and emits a photon of light. If the wavelength of the light is in the visible spectrum, what are final energy level of the electron and the wavelength of the photon emitted?

6. An excited hydrogen atom emits a photon with a frequency of 1.141×10^{14} Hz to reach the n=4 state. From what state did the electron originate?