Example ionization problems

1. What is the wavelength of light needed to ionize an H atom in the $n = 2$ energy level?
Answer: 365 nm.

2. The ionization wavelength of H atom in the $n = 2$ energy level is 365 nm. What will be the kinetic energy of the electron ionized by 295 nm light? By 245 nm light?
Answer: 1.29×10^{-19} J; 2.67×10^{-19} J.

3. The ionization wavelength of H atom in the $n = 2$ energy level is 365 nm. Will light of this wavelength ionize He^+ in the $n = 1$ level? Answer: No, since the ionization wavelength is 22.8 nm.

4. Photons of energy Ry are able to ionize H in its $n = 1$ energy level. Are photons of this energy are able to ionize He^+ in its $n = 2$ energy level? Answer: Yes, since the ionization energy of He^+ in its $n = 2$ energy level is $0 - (-\text{Ry}\ 2^2/2^2) = \text{Ry}$.

5. Photons of energy Ry are able to ionize H in its $n = 1$ energy level. Are photons of this energy are able to ionize Li^{2+} in its $n = 2$ energy level? Answer: No, since the ionization energy of Li^{2+} in its $n = 2$ energy level is$0 - (-\text{Ry}\ 3^2/2^2) = 2.25$ Ry.