

Key Q's and Vocab – Coulombic Interactions

Vocab:

1. **Coulomb's Law** – states that the force between 2 charged particles is proportional to the magnitude of the charge and inversely proportional to the square of the distance between them ($F \propto \frac{Q}{r^2}$)
2. **Ionization energy** – amount of energy required to remove an electron from an element in the gaseous state
3. **First ionization energy** – amount of energy required to remove the least tightly held electron from a gaseous state atom (usually valence electron because it is farthest from nucleus)
4. **Photoelectron spectroscopy** – based on photoelectric effect and that ionization occurs when elements interact with light of sufficient energy.
5. **Photoelectron spectra** – plot of binding energies of an element and gives us the evidence to support the shell model of an atom
6. **Binding energy** – amount of energy needed to overcome the coulombic forces of attraction within an atom to eject an electron

Key Questions:

1. An n=2 electron in a nitrogen atom has a lower force of attraction than an n=1 electron in the same atom. Justify.
2. An n=2 electron in a nitrogen atom has a higher force of attraction than an n=2 electron in a carbon atom. Justify.
3. Predict how many ionization energies a calcium atom would have and also identify the electrons that would show a large jump in ionization energy.
4. Looking back at the electrons in question #2 predict which would have the higher ionization energy. Justify.
5. Sketch a PES plot and explain the axis and what the height of each peak represents (hint: use Na as example and be sure to properly show the large energy jumps between peaks)
6. Explain how having two different peaks within the same general energy region (binding energies that are distinct from each other but similar in magnitude) supports the shell/subshell model of an atom. (hint: you must reference Coulomb's law to properly explain this)