

Unit 5: Electron Structure and Periodicity

adapted from http://www.phschool.com/advanced/lesson_plans/chem_brown_2003/index.html

Objectives:

- Understand the relationships $c = \lambda\nu$ and $E = h\nu$.
- Understand the concept of a quantized atom and its relationship to a line spectra of atoms.
- Explain the concept of ionization energy.
- Describe the Uncertainty Principle and its affect on atomic theory.
- Understand the relationship $\lambda = h/mv$ and its affect on atomic theory.
- Describe how quantum numbers define electron orbitals and their value limitations.
- Describe the shapes of the orbital types.
- Understand the concept of electron spin and how it relates to electron configuration.
- Write the electron configuration both symbolically and as an orbital diagram for any element.
- Be able to write electron configurations, especially valence configurations, for any element, using the periodic table with the knowledge of the s,p,d, and f blocks.
- Describe the variations of atomic radii in the groups and periods on the periodic table and the underlying reasons for the variations.
- Describe and explain the observed changes in successive ionization energies for a given atom.
- Describe the variations in first ionization energies in the groups and periods on the periodic table and the underlying reasons for the variations.
- Do the same with the electron affinities of the elements.
- Describe the periodic trends in metallic and nonmetallic behavior and chemical activity.

Key Words:

electronic structure	photoelectric effect	subshell	core electrons	metallic character
electromagnetic radiation	spectrum	quantum numbers	valence electrons	metal
wavelength	continuous spectrum	degenerate orbitals	effective nuclear charge	nonmetal
frequency	spectrum	Pauli exclusion principle	transition elements	metalloid
quantum	line spectrum	electron configuration	isoelectronic series	alkali metal
Planck's constant	ground state	Hund's rule atomic radius	ionization energy	alkaline earths
photon	excited state		electron affinity	hydride ion
	orbital electron shell			halogens
				noble gases

Tips:

- Orbitals are areas of highest probability of finding the electron, not the path of the electron.
- Electron shells in an atom are diffuse and overlap considerably.
- Electron affinity is not the opposite of ionization energy.

