

General Chemistry I
Topic: Atomic Structure and Periodicity

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The student should be able to:

1. Differentiate between the Thomson and Rutherford models of the atom, and explain the experimental basis for the Rutherford model.
2. Correlate the energy content of electromagnetic radiation as a function of frequency and wavelength.
3. Explain the relationship between atomic emission and atomic absorption spectra and the Bohr model of the atom.
4. Explain the major modification introduced by the wave mechanical (quantum theory) model of atomic structure and the justification for the modification.
5. Explain what atomic orbitals are and what parameters are used to describe them.
6. Describe the Aufbau principle of electron arrangement in atoms.
7. State and/or recognize examples of the Pauli Exclusion principle.
8. State and/or recognize examples of Hund's rule, and provide a physical justification for it.
9. Write the electron configuration for any atom or ion consistent with the Aufbau principle.
10. Identify valence electrons for an atom based on its electron configuration.
11. Define and identify isoelectronic atoms/ions.
12. Arrange isoelectronic atoms/ions according to size.
13. Define ionization energy (ionization potential), electron affinity, and electronegativity.
14. Explain the relationship between the arrangement of the table of elements and periodicity (Periodic law).
15. Define a period and a group in the Periodic table, and relate the electron configuration of the atoms within a period/group.
16. Identify the main group (representative), transition metal, lanthanoid, and actinoid elements given a Periodic table.
17. Recognize and give examples of alkali metals, alkaline earth metals, chalcogens, halogens, and inert (noble) gases.
18. Predict trends in ionization energy, electron affinity, electronegativity, and size of atoms in the Periodic table based on electron configuration considerations.