First-Year SL Chemistry

3. Atomic Theory: Electronic structure

Read: Zumdahl[2] Chapter 7: Sections 1-4 (pp. 289-299)
Green & Damji Chapter 2: Sections 2.

Presumed knowledge (from GCSE)

- Electronic structure, main level electron configuration, shell, outer shell, core shell, outer electron, core electron, noble (inert) gas configuration

Concepts to be mastered:

To master a concept, you must be able to do three things:

1. define the concept
2. explain the concept, and
3. give an example of the concept.

- Dalton's Atomic Theory, Bohr's Quantized Planetary Model,
- Line spectrum, continuous spectrum
- Electronic transition, excited state, ground state, quantization, Energy level, shell, valence shell, valence electron, main level electron configuration
- Hydrogen emission spectra, Lyman, Balmer, Paschen, Brackett, Pfund

Skills to be mastered:

To master a skill, you must be able to

1. recognize when the skill is needed,
4. recognize what information is needed to execute the skill,
5. execute the skill, and
6. assess whether the skill has been executed correctly.

	Zumdahl[2] problems
• Provide a ground state electron configuration (electronic structures) of the type desired for an atom or a monatomic ion in terms of main energy levels	
• Determine the number of valence and core electrons for an atom or a monatomic ion	**8**.31, 32
• State the relationship between energy and frequency or wavelength of electromagnetic radiation	
• Explain the emission of light by atoms in excited states	
• Describe and explain the difference between a continuous spectrum and a line spectrum	
• Explain how the lines in an emission spectrum are related to the energy levels of electrons	
• Explain the properties of the hydrogen emission spectrum based upon Bohr's atomic model	

Additional problems from Zumdahl

7. 33, 34.

Further problems:

1. Explain why the emission spectrum of hydrogen is composed of separate lines and not a continuous band of colors.
2. Which electronic transition involves greater energy change, $n = 3 \rightarrow n = 2$ or $n = 2 \rightarrow n = 1$? Explain.

3. Which line in the hydrogen emission spectrum is closer to the violet end of the visible spectrum, the line corresponding to $n = 3 \rightarrow n = 2$ or that corresponding to $n = 4 \rightarrow n = 2$?
4. How many electrons may occupy each main energy levels for Ca?
5. Write the electron notation (electronic configuration) for each of the following, in terms of number of electrons in each main energy level. (a) He, (b) P, (c) F, (d) Mg, (e) S, (f) Ar, (g) Na^{+}, (h) O^{2-}.