
Goal: To explain the location and behavior of electrons in atoms as described by the quantum model.

BACKGROUND SKILLS:

- A. Review and expand knowledge of the electromagnetic spectrum and color
- B. Use skills in reading a science textbook to process information needed to understand abstract concepts.
- C. Use basic problem-solving skills and conversion factors with the factor-label method.
- D. Basic knowledge of early atomic models devised by Thomson (plum pudding) and Rutherford (solar system), and what their drawbacks were.

Review of models:

Thomson

Problems?

Rutherford

Problems?

I. 4.1 Refinements of the Atomic Models

- A. Discuss evidence that light is a wave - Electromagnetic Spectrum.
 - 1. Define and explain each of the following WRT light and color. Use equations!:
 - a) electromagnetic radiation
 - b) wavelength
 - c) frequency
 - d) velocity ($c = \text{speed of light}$)
 - e) continuous spectrum
 - f) electromagnetic spectrum
 - g) visible light
 - h) energy level (of an electron)
 - 2. Explain the mathematical relationship among velocity, frequency, and wavelength. Use an equation, symbols, and units.
 - 3. Discuss and explain what is meant by the dual wave-particle nature of light
 - a) List and explain properties of light that could not be explained by the wave theory.

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b) Discuss evidence that light is a particle

- (1) glowing wire gauze
- (2) photoelectric effect

4. Explain why it is necessary to know something about light to understand electrons

5. Spectroscopy - define.

a) What is a spectroscope?

b) Describe your use of a diffraction grating in lab.

c) How do spectral lines originate?

B. Bohr Model (Planetary model)

1. Discuss Bohr's contribution to the model of the atom. (see Fig. 4-9)

a) Describe the Bohr model of the hydrogen atom and compare it to Rutherford's model

b) What is an electron energy level diagram, and what does it show?

c) Use one to explain the spectral lines emitted by an excited atom.

2. What was the problem with Bohr's model?

3. Quantum Model of the Atom - ****The one we currently use****

a) What does it look like?

b) Quantum Theory - what does it say (briefly!)

c) Who devised the famous equation?

d) define and explain each of the following WRT electrons in atoms

- (1) quantum theory
- (2) quantum
- (3) photon
- (4) ground state
- (5) excited state

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- e) Explain what a line spectrum is and how it is produced.
- f) What is the significance of the line emission spectrum of hydrogen to the current model of the atom?
- g) Who were Lyman, Balmer, and Paschen and what did they have to do with the electromagnetic spectrum?

II. 4.2 Quantum Numbers and Atomic Orbitals

A. Name each one, and tell its significance, What information can you get from it?

1. List the sublevels in each main energy level
2. List the number of orbitals in each sublevel
3. Explain the significance of the spin quantum number
4. Explain paramagnetism and diamagnetism and their significance.

III. 4.3 Electron Configurations

A. State the rules governing the filling of subshells (electron configuration)

1. Aufbau principal
2. Hund's Rule
3. Pauli Exclusion principle
4. List, explain, and be able to apply all three.

B. Be able to do an electron configuration for any atom