

# Unit 3: Atomic Structure & Quantum Mechanics

## Objectives

1. Trace the general development of atomic theory from the ancient Greeks through Dalton, Thomson, Rutherford and Bohr.
2. State Dalton's atomic theory.
3. Describe Thomson's cathode-ray experiment; state the significance and conclusions of this experiment.
4. Describe Rutherford's "scattering" experiment; state the significance and conclusions of this experiment.
5. Draw the atomic models based on Thomson's and Rutherford's theories
6. Identify the atomic number and mass number for a given isotope; use these numbers to determine the number of subatomic particles in an atom of that isotope.
7. Distinguish between mass number and atomic mass.
8. Differentiate between atoms and ions; identify the different number of electrons in an ion.
9. Determine the average mass of an element from relative abundance data.
10. Describe properties of waves (wavelength, frequency, energy) and the units in which they are measured.
11. Compare/contrast different regions of the electromagnetic spectrum.
12. Correlate the implications of the bright-line emission spectra to the energy levels within an atom.
13. Describe Bohr's concept of the atom.
14. Describe Planck's relationship between energy and frequency of light.
15. Compare the quantum mechanical model of the atom with previous models.
16. Describe the contributions of Bohr and Schrödinger to modern atomic theory.
17. List the four quantum numbers and tell the meaning of each.
18. List the types and shapes of the atomic orbitals.
19. Compare the relative energies of the sublevels and the levels in the electron cloud.
20. Determine the maximum number of electrons possible on a given sublevel or energy level.
21. Distinguish among energy level, energy sublevel, and atomic orbital.
22. State the Aufbau principle, Pauli Exclusion Principle, Heisenberg's Uncertainty Principle and Hund's Rule. Apply these principles to electron configurations.
23. Write the electron configurations for any element in the ground state
24. Identify regions on the periodic table where s, p, d, f sublevels are "filling."
25. Given electron configurations, identify elements as being in ground state, excited state, or an ion.