Chapter 2: Atoms, molecules, and Ions

1. State the basic assumptions of Dalton's atomic theory.
2. State and apply the laws of conservation of mass, constant composition (sometimes refered to as the law of definite proportions), and multiple proportions.
3. Describe how Dalton's atomic theory explains these three laws
4. Name and describe the three subatomic particles of importance in chemistry and give their location in the atom
5. Define and describe the different forces: Gravitational, Electromagnetic, strong nuclear forces and weak nuclear forces
6. Describe Thompson's experiment (measured m/e ratio), Millikan's oil drop experiment (measured the charge on the electron), and Rutherford's gold foil experiment (established the existence of the atomic nucleus).
7. State the features of Rutherford's nuclear atom and how it differs from Thompson's model of the atom.
8. Determine the numbers of protons, neutrons, and electrons present in atoms and ions, using the symbolism $^{A}_{Z}X^{C}$, where A is the atomic mass number, Z is the atomic number and C is the charge.
9. Differentiate between atoms, electrons, protons, and neutrons.
10. Differentiate between average atomic masses and the atomic mass number
11. Describe the atomic mass unit scale and the carbon-12 atom standard of the scale
12. Calculate the atomic mass of an element from the known masses and relative abundance of its naturally occurring isotopes.
13. Perform calculations involving the masses and charges of the proton, neutron, and electron.
14. Know the parts of the periodic table and distinguish between the various groups: Metal, non-metals, and metalloids. Alkali metals, alkaline earth metals, noble gases, transition elements, main group or representative elements, the coinage metals, the electrodes metals, the catalyst metals, the noble metals, lanthanides, actinides, halogens
15. Know the 7 diatomic molecules: H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2
16. Draw and interpret a ball and stick model, a space fill model, and a line structure of a compound or molecule
17. Know the names, formulas, and charges of the ions and be able to write formulas and names of the compounds formed from these ions. **These ions are given to you in two handouts. A less complete list can be found in your book.**
18. Determine the numbers of protons and electrons in given monatomic cations and anions
19. Be able to use the formulas for hydrates and other complex compounds in the same ways as those of simpler compounds.
20. Name hydrates
21. Know the common and systematic names of the compounds listed in the chapter
22. Name oxoacids and oxoanions
23. Know the common roots for naming compounds table 2.6, page 62
24. Know the prefixes for chemical names
25. Be able to write formulas and names of simple binary covalent compounds and of binary acids.
26. Differentiate between alkanes, alkenes, alkynes and alcohols.

Definitions and Terms to Know		
Atoms And Chemical Symbols		
John Dalton's atomic theory	Matter is made of indestructible particles called atoms. Atoms of the same element are identical and atoms of different elements are different. Compounds are formed by combinations of atoms	
Meaning of the chemical symbol	Symbol stays for one atom of the element	
Evidence that cathode rays are streams of particles	A fluorescent screen can be shielded from rays by interposing a solid object like a piece of cardboard	
Evidence that the particles carry a negative charge	The particles are repelled by a negatively charged electrode (cathode) and attracted by a positively charged one (anode)	
Evidence that the particles are in all matter	Cathode rays are produced no matter what materials are used to construct a discharge tube	
Electron	Particle with a very small negative electrical charge and a very small mass, a constituent of all atoms.	
John Joseph Thomson	English scientist who showed that cathode rays were negatively charged particles and made measurements of their mass and charge	
Robert Millikan	American scientist who measured accurately the charge on the electron.	
Proton	Particle with a very small positive electrical charge, equal in magnitude but opposite in sign to than on the electron, and with a much larger mass (about 2000 times as great) as the mass of an electron	
Relationship between number of protons and number of electrons in any atom	The number of protons and the number of electrons in any atom are always equal; an atom is always electrically neutral	
Radioactivity	Emissions of α particle, β particles and γ particles from an atom.	
Natural radioactivity	Spontaneous emission of radioactivity	
Evidence that atoms are mostly empty space	Streams of cathode rays or particles pass through metal foils, except for a few particle which are scattered	
Ernest Rutherford	Discoverer of the element radon, named the α and β particles and nuclear structure of atom	
Evidence for nuclear atom	When a stream of particle is directed toward a sheet of metal foil, most of them pass through and a few are scattered. The heavy positively charged particle must be scattered by a heavy positively charged object, the nucleus	
Neutron	Particle with no electrical charge and with about the same mass as the proton	

Composition of nucleus	Contains protons and neutrons., the electrons surround the nucleus at relatively great distances	
Nucleons	Protons and neutrons	
Z	Atomic number , number of protons or electrons in atom	•
A	Mass number, number of protons and neutrons in atom	•
A – Z	Number of neutrons in atom	•
Meaning of $^{19}_{9}F$	Fluorine atom with 9 protons, 9 electrons, and 10 neutrons	
Amu	Atomic mass unit	
Standard for atomic mass	$^{12}_{6}C$ atom, assigned a mass of exactly 12 amu	
Isotopes	Atoms with the same number of protons and electrons but different numbers of neutrons. Atoms with the same Z but different A	
Atomic mass	Average mass of element's naturally occurring isotopes	
Two numbers for each element on periodic table	Atomic number and atomic mass	