**Introduction to Chemistry**
**(One Semester Course)**

I. The Scientific Method. The student should be able to demonstrate that:

1) Science is a process.
2) Science is based on observations made in the physical world (data).
3) Hypotheses are made based on these observations.
4) Hypotheses are tested creating new data and probably new hypotheses.
5) Laws are summary statements of a large number observations.
6) Theories are statements that explain observations and predict future observations.
7) Theories and Laws are subject to change; that Theories and Laws must be supported by the data.

II. Atoms and the Periodic Table. The student should be able to:

1) Apply appropriate units to express various measurements.
2) Use the method of dimensional analysis to systematically convert from one unit to another.
3) Use the Law of Conversation of Mass and Energy.
4) Quantify the three fundamental particles in any atom, isotope, or ion.
5) Apply the significance of the electron configuration within an atom or ion and the position of an element on the periodic table.

III. Compounds, Formulas, Reactions, and Equations. The student should be able to:

1) Classify elemental, ionic, and covalent substances and relate a systematic name to a formula.
2) Recognize various reaction types and construct a balanced equation describing the formation of products from reactants.
3) Use a periodic table and a balanced chemical equation to convert (reversibly) between mass to moles of a substance and mole to mole conversions for various changes.
4) Apply the concept of limiting reactants and the nature of chemical analysis.
5) Construct working Lewis structures for simple covalent compounds. Classify types of chemical bonding.

IV. Behavior of the States of Matter. The student should be able to:

1) Use the kinetic-molecular theory to explain the behavior of gases.
2) Relate the effect of pressure, volume, temperature, or amount changes as stated by the Ideal Gas Equation.
3) Recognize the nature of intermolecular forces of attraction and their effect on the physical properties of substances.
4) Predict Hydrogen Bonding and the unique physical properties it manifests in water and other biomolecules.
5) Determine the energy transfer involved with varying temperature and changes in state using measured conversion factors.

V. Properties of Solutions. The student should be able to:

1) Use the concept of intermolecular forces to explain the action of solvation of an ionic or covalent solute.
2) Use dimensional analysis to systematically convert from one unit to any other with concentration units as a connection.
3) Use the concepts of mass percent, parts per million, molarity, molality, and mole fraction.
4) Translate a chemical change in a solution into a net ionic equation which discounts the presence of spectator ions.
5) Characterize the simple action of acids and bases and the nature of the pH scale.

VI. Equilibrium, and Oxidation and Reduction. The student should be able to:

1) Predict that chemical reactions go to an equilibrium state.
2) Assign the oxidation states for each element within a formula.
3) Identify oxidation and reduction reactions.
4) Identify oxidizing agents and reducing agents.