**Overall Course Outcomes**

The Objectives of this course is to have students, upon completion of the course, be able to:

* understand and apply the concepts of general inorganic chemistry. These include: basic definitions of matter and chemistry, use of the periodic table, writing, drawing, and naming chemical formulas, performing simple calculations involving dimensional analysis and simple stiochiometry, solubility and solutions, reduction/oxidation, and acid/base chemistry.
* Understanding and applying the basic concepts of Organic Chemistry. These include physical properties, IUPAC naming, and common reactions of the following functional groups: alkanes, alkenes, alcohols, aromatic compounds, aldehydes, ketones, carboxylic acids, esters, amides, and amines.
* Understanding and applying the basic concepts of Biochemistry as it applies to the metabolism of macronutrients (protein, lipid, and carbohydrate) in the formation of ATP, and the relationship of organic chemistry to the formation/break-down of these macronutrients.

**Individual Chapter-Based Objectives**

**Chapter 2**

1. understanding basic definitions of chemistry, matter, and energy
2. identifying Significant Figures in a measured quantity
3. performing calculations using Significant Figures rules
4. reviewing the use of Scientific Notation and Significant Figures
5. memorizing metric system equalities
6. writing a conversion factor from a metric system equality
7. performing unit conversions with metric system conversion factors and correct Significant Figures
8. problem solving requiring the use of multiple conversion factors and correct Significant Figures
9. understanding the definition of density
10. problem solving with density

**Chapter 3**

1. learning the basic definitions of energy, work, heat, and temperature
2. interconverting between Celsius and Fahrenheit using a formula
3. learning the basic definitions of pure substances and mixtures
4. defining the states of matter and the changes between those states
5. identify physical properties and changes as well as chemical properties and changes.

**Chapter 4**

1. memorize the name and symbol relationship between elements 1-40 and Au, Ag, He, Pb, Pd, Sn, Sb, and W
2. identify the regions of the periodic table by group, period, metal, nonmetal, and metalloid and the definitions of these
3. learn of subatomic particles, their charges, masses, locations, and numbers present in an atom
4. be able to interpret and compose isotope notations
5. utilizing the Group Number from the Periodic Table to determine the number of Valence Electrons for any element
6. writing Electron Dot Structures for neutral atoms

**Chapter 6**

1. defining positive and negative ions
2. determining the charge on Main Group Element ions based upon position on the Periodic Table.
3. writing ionic formulas to ensure charge balance
4. naming ionic compounds
5. writing ionic formulas with Transition Metal ions
6. determining the charges on Transition Metal ions in formulas
7. memorizing a list of Polyatomic Ions
8. writing ionic formulas with Polyatomic Ion
9. understanding the difference between ionic and covalent bonding
10. memorizing the bonding patterns of nonmetals
11. learning how to write Electron Dot Structures (Lewis Structures) of covalent compounds
12. applying the VSEPR theory
13. naming covalent compounds
14. understanding the attractive forces between molecules
15. applying attractive forces to boiling point concept

**Chapter 7**

1. Understanding the concept of the mole and Avogadro's Number
2. Utilizing the chemical formula to understand mole relationships of atom to compound
3. Finding the Molar Mass of Elements and Compounds
4. Recognizing the parts of a chemical equation
5. Balancing chemical equations
6. Performing Unit conversion problems with the Molar Mass as a conversion factor.
7. Using the coefficients of a Balanced Equation to perform mole-to-mole conversions
8. Labeling what is being oxidized and reduced a Redox reaction

**Chapter 8**

1. Understanding the Kinetic Molecular Theory, Charles' Law, Boyle's Law, and Gay-Lussac's Law
2. Understanding the concepts of vapor pressure
3. Using Dalton's Law Equation

**Chapter 9**

1. Learning the basic definitions of solutions and solubility
2. Writing equations for the dissolution of strong and weak electrolytes
3. Calculating mass, volume and mass/volume % concentrations of solutions
4. Calculating molarity of a solution
5. Utilizing Molarity as a conversion factor in solution analysis
6. Memorizing and utilizing the dilution equation
7. Defining Isotonic, hypertonic, and hypotonic solutions
8. Differentiating between solutions and colloids
9. Defining osmosis and dialysis

**Chapter 10**

1. Defining reaction rates and equilibrium
2. Defining and applying LeChatelier's Principle

**Chapter 11**

1. Identifying Arrhenius and Bronsted-Lowry Acids and Bases
2. Understanding the behavior of Strong Acids and Bases in solution
3. Understanding the behavior of weak acids and bases in solutions
4. Calculating the concentration of H3O+ and OH- ions in solutions
5. Calculating and interpreting pH values of solutions
6. Completing and balancing neutralization reactions
7. Learning the behavior of buffers with LeChatelier's Principle

**Chapter 12**

1. Defining Organic Chemistry, Hydrocarbons, Isomers, and Alkanes
2. Utilizing IUPAC naming rules for normal and branched alkanes.
3. Memorizing the 10 basic prefixes for carbon chains.
4. Memorizing the common alkyl substituents: methyl, ethyl, propyl, isopropyl, phenyl.
5. Memorizing the halo substituents: bromo, chloro, fluoro, iodo.
6. Utilizing IUPAC naming rules for cycloalkanes.
7. Writing and balancing combustion reactions for alkanes
8. Defining the alkene and alkyne functional groups
9. Utilizing IUPAC naming rules for alkenes and alkynes
10. Identifying cis and trans alkenes
11. Defining Addition Reactions
12. Predicting the products of hydrogenation reactions
13. Predicting the products of hydration reactions
14. Understanding the concept of benzene and delocalized double bonds
15. Naming Aromatic Compounds

**Chapter 13**

1. Recognizing the alcohol, phenol, ether, and thiol functional groups
2. Classifying degrees of alcohols
3. Learning the physical properties of alcohols, ethers, and thiol functional groups
4. Utilizing IUPAC naming rules for Alcohols
5. Predicting the products of acid/base reactions of phenols
6. Predicting the products of the Dehydration Reaction to form Alkenes
7. Predicting the products of Oxidation Reactions of Alcohols.
8. Predicting the disulfides formed from the Oxidation Reactions of Thiols.

**Chapter 14:**

1. Identifying Aldehyde and Ketone functional groups
2. Utilizing IUPAC Naming Rules for Aldehydes and Ketones
3. Understanding the Physical Properties of Aldehydes and Ketones
4. Predicting the products of Oxidation Reactions of Aldehydes and Ketones
5. Predicting the products of Reduction Reactions of Aldehydes and Ketones
6. Predicting the products of Hemiactal Formation Reactions
7. Predicting the products of Acetal Formation Reactions
8. Recognizing Hemiacetal and Acetal Functional Groups
9. Defining stereoisomers, chirality, and enantiomers.
10. Identifying D- and L- enantiomers on simple Fisher Projections

**Chapter 15:**

1. Introduction of monosaccharides
2. Classifying monosaccharides as aldo-, keto-, and/or by the number of carbons.
3. Identifying D- and L- enantiomers on more complicated Fisher Projections
4. Drawing the Haworth structure of a monosaccharide from a pre-setup structure
5. Identifying alpha and beta anomers on a Haworth Structure
6. Predicting the products in the formation of disaccharides
7. Drawing and labeling the alpha and beta anomers of disaccharides
8. Identifying alpha and beta glycosidic bonds
9. Defining the four common polysaccharides: amylose, amylopectin, glycogen, and cellulose.

**Chapter 22:**

1. Defining metabolism and the stages of metabolism
2. Identifying the locations of metabolism
3. Memorizing the Structure of ATP, ADP, and AMP with the Adenine Portion of the molecule given
4. Learning the buildup (phosphorylation) and breakdown (hydrolysis) of ATP
5. Observing the functions of coenzymes NAD+ and FAD in metabolism
6. Memorizing the abbreviated structure of acetyl CoA
7. Learning the path of digestion of Carbohydrates in the body
8. Learning the key reactions of both Phase I and Phase II of Glycolysis
9. Predicting the products of Glycolysis
10. Learning the regulatory enzymes for Glycolysis
11. Memorizing the structures of Pyruvate and Lactate
12. Understanding both aerobic and anaerobic pathways for Pyruvate
13. Understanding the Glycogenesis and Glycogenolysis reactions
14. Understanding the function of Glucagon, Insulin, and Epinephrine in the body
15. Understanding the definition and sources of Gluconeogenesis

**Chapter 23**

1. Memorizing the following concerning the Citric Acid Cycle: the names of the steps, what chemical reactions occurs in these steps, the regulatory enzymes for the cycle, and the important byproducts of the cycle
2. Learning the pathways of the NADH and FADH2 products of the Citric Acid Cycle to create ATP via the processes Electron Transport Chain and Oxidative Phosphorylation
3. Calculating the ATP yields from the Citric Acid Cycle
4. Calculating the ATP yields and efficiency of the complete metabolism of Glucose

**Chapter 16**

1. Identifying Carboxylic Acid and Ester functional groups
2. Understanding the Physical Properties of Carboxylic Acids and Esters
3. Utilizing the IUPAC Rules to name Carboxylic Acids and Esters.
4. Predicting the products of acid/base reactions of Carboxylic Acids.
5. Predicting the products of the Esterification reaction
6. Predicting the products of Acidic and Basic Hydrolysis of Esters.

**Chapter 17**

1. Identifying the functional groups on a fatty acid
2. Differentiating the structures and properties of saturated, cis/trans monounsaturated, and polyunsaturated fatty acids.
3. Predicting the product of triacylglycerol formation.
4. Predicting the products of hydrogenation reactions of triacylglycerols
5. Predicting the products of both acidic and basic hydrolysis of triacylglycerols
6. Understanding the function of soaps
7. Recognizing the structural elements of glycerophospholipids, sphingolipids, cholesterol, and bile salts.
8. Understanding how lipoproteins function in the bloodstream
9. Demonstrating how lipids function in cell membranes

**Chapter 24**

1. Learning the process of digestion of Lipids in the body
2. Understanding the metabolism pathway of the glycerol backbone
3. Defining the three stages of Fatty Acid Oxidation
4. Predicting the products of the Activation Stage of Fatty Acid Oxidation
5. Memorizing the process of reactions in the Beta Oxidation Stage of Fatty Acid Oxidation
6. Predicting the number and identity of the products of Beta-Oxidation

**Chapter 18**

1. Identifying Amides and Amines and classifying Amines
2. Learning the Physical Properties of Amines and Amides
3. Predicting the products of the Acid/Base reaction of Amines
4. Utilizing IUPAC naming rules for Amides
5. Predicting the products of the Amide formation

**Chapter 19**

1. Identifying the functions of Proteins in the body
2. Interpreting the isoelectric point of an amino acid, and predicting products of the amino acids in acidic and basic solutions
3. Predicting the product formed from joining amino acids into a peptide
4. Identifying the Four Structural Elements of proteins
5. Differentiating between protein Hydrolysis and Denaturation

**Chapter 24 (continued)**

1. Understanding protein digestion, protein turnover, and the amino acid pool
2. Learning the different ways amino acids can be used to produce energy