NORTHWESTERN CONNECTICUT COMMUNITY COLLEGE

COURSE SYLLABUS

Course Title: Concepts in Chemistry **Course #:** CHE* 111

Course Description: This course is designed to introduce the student to basic principles inorganic chemistry. Concepts covered include: metric measurement and metric system conversions, matter classification, states, properties, and composition, identification of symbols for most commonly used elements, periodic table of the elements, energy, atomic theory, introduction to quantum theory, nomenclature and classification of inorganic compounds, electron dot diagrams, chemical formulas for compounds, chemical reactions, stoichiometry, limiting reagents, empirical formula calculations, solutions, and gas laws. 3 hours lecture and 2 hours laboratory

Prerequisite: Math 135/137 or satisfactory score on the math placement test

Goals:
To understand and apply the principles of scientific methods.
To develop skills in measurement.
To understand the atomic structure of chemical substances and the changes they undergo
To understand the basic processes involved in chemical reactions
To use chemical equations to solve quantitative problems
To understand units of basic solution concentration
To apply gas laws in solving quantitative problems

Outcomes: At the end of this course students should be able to:

METRIC UNITS & MEASUREMENTS	1. Convert units of mass, volume and length from metric to English and from one metric unit to another. 2. Use conversion factors (factor-label) method to solve conversion problems. 3. Apply the rules of significant digits in solving problems. 4. Distinguish between accuracy and precision. 5. Calculate the density of substances and use density to solve quantitative problems.
NATURE OF MATTER	1. Identify and classify different types of matter. 2. Identify the subatomic particles, their charge and location in the atom. 3. Recognize the important contributions to chemistry and to atomic theory including, but not limited to: Joseph Proust, John Dalton, J. J. Thomson, Wilhelm Röntgen, Ernest Rutherford, and James Chadwick.

	4. Distinguish between atomic number, mass number, atomic mass, and differences between isotopes of the same element. 5. Compare and contrast metal and nonmetals, and use the periodic table to classify elements as metal, semi-metal, and nonmetal. 6. Distinguish between atoms, molecules, ions, and compounds. 7. Apply systematic and classical rules of chemical nomenclature to write formulas and name inorganic compounds.
CHEMICAL EQUATIONS & REACTIONS	1. Complete and balance chemical equations. 2. Solve stoichiometry problems: • Mass to mass • Mass to volume of a gas • Volume to volume 3. Determine the empirical formula and molecular formula. 4. Solve stoichiometry problems involving linking reagents and percent yield. 5. Predict products for reactions in aqueous solution including: • Single and double displacement reactions • Neutralization reactions • Oxidation – reduction reactions • Combination reactions • Decomposition reactions
REACTIONS IN SOLUTION	1. Calculate the molarity of solutions and describe how solutions of specified molarity are made. 2. Describe how solutions are made when diluted using a stock solution of specified concentration. 3. Solve acid-base and redox titration problems to determine molarity or volume.
STATES OF MATTER – GASES	1. Distinguish between the physical states of matter. 2. Solve gas law problems using Boyles Law, Charles Law, Dalton's Law, combined law, ideal gas equation. 3. Explain the kinetic molecular theory of a gas. 4. Explain how the ideal gas law deviates from actual behavior under specific conditions.

THERMOCHEMISTRY	1. Define energy and identify different forms of energy. 2. Explain enthalpy of reaction. 3. Calculate enthalpy change, Δ H. 4. Apply concepts of calorimetry to determine specific heat, heat of combustion, and heat of return. 5. Define and apply the first law of thermodynamics.
ELECTRONIC STRUCTURE OF THE ATOM	1. Describe the nature of electromagnetic waves. 2. Apply quantum theory to solve for energy or wavelength using Plancks equation. 3. Apply Bohr's theory of the hydrogen atom. 4. Explain the dual nature of the electron. 5. Apply quantum theory to write the set of quantum numbers for electrons in atoms of elements. 6. Write electron orbital configuration using spdf with orbital detail. 7. Predict whether a metal is diamagnetic or paramagnetic.
PERIODIC TABLE	1. Define ionization energy, electronegativity and electron affinity. 2. Predict period trends in atom radius, ionization energy, and electronegativity across a period and down a group. 3. Discuss historical development of the periodic table and identify individuals who contributed to the modern periodic table. 4. Write electron dot diagrams and structural formulas for molecules and ions.
STRUCTURE OF COMPOUNDS	1. Predict molecular geometry and orbital hybridization. 2. Demonstrate knowledge of expanded octets. 3. Predict enthalpy of reaction when bonds are broken during specific reactions. 4. Explain the significance of dipole moment.

INTERMOLECULAR FORCES FOR LIQUIDS AND SOLIDS	1. Predict how intermolecular forces influence the properties of specific liquids. 2. Explain the nature of crystalline solids vs. amorphous solids. 3. Contrast the different types of crystals: ionic, covalent, molecular, and metallic. 4. Define and use terms associated with phase changes of matter. 5. Calculate energy required to change the temperature and stage of substances.
SOLUTIONS	1. Calculate solution concentration using percent mass, molarity and molality. 2. Explain factors that influence solubility of ionic solids and gases. 3. Predict freezing point depression and boiling point elevation. 4. Define colloid, hydrophobic, and hydrophilic.

College Policies

Plagiarism: Plagiarism and Academic Dishonesty are not tolerated at Northwestern Connecticut Community College. Violators of this policy will be subject to sanction. Please refer to your "Student Handbook" under "Policy on Student Rights," the Section entitled "Student Discipline," or the College catalog for additional information.

Americans with Disabilities Act (ADA): The College will make reasonable accommodations for persons with documented learning, physical, or psychiatric disabilities. Students should notify Roseann Dennerlein, the Counselor for Students with Disabilities. She is located at Green Woods Hall, in the Center for Student Development. Her phone number is 860-738-6307 (V/TTY) and her email is rdennerlein@nwcc.commnet.edu.

School Cancellations: If snowy or icy driving conditions cause the postponement or cancellation of classes, announcements will be made on local radio and television stations. Students may also log onto the College's website at www.nwcc.commnet.edu or call the College directly at (860) 738-6464 to hear a recorded message concerning any inclement weather closings. Students are urged to exercise their own judgment if road conditions in their localities are hazardous.