CHEM 2211: Principles of Chemistry I

A. COURSE DESCRIPTION

Credits: 4
Lecture Hours/Week: 0
Lab Hours/Week: 0
OJT Hours/Week: *
Prerequisites: None
Corequisites: None
MnTC Goals: Goal 03 - Natural Science

Principles of inorganic, physical, solution, and gas phase chemistry. The laboratory component introduces techniques, methods, and instrumentation. Intended for chemistry majors and minors, biology majors, preprofessional students, and open to any student meeting the prerequisites wishing to fulfill their Core Curriculum requirement. [Core Curriculum Goal Area 3 (LC)]

If on-campus student must register for CHEM 2211 (Lecture) and CHEM 2271 (Lab).

B. COURSE EFFECTIVE DATES: 08/02/2010 - Present

C. OUTLINE OF MAJOR CONTENT AREAS

1. Concepts of Central Science: Measurements, significant figures, unit conversions, density
2. Matter: states of matter, pure substances, and mixtures
3. Atoms: Atomic structure, subatomic particles, atomic spectra, quantum numbers, orbitals, electron configurations, periodic table, periodic trends
4. Chemical Bonds the Making of Molecules: ionic, polar covalent, non-polar covalent, electronegativity, naming binary molecular and covalent compounds, Lewis structures, resonance, formal charge, molecular shape, molecular polarity, the mole and molar mass
5. Molecular Interactions: Intermolecular forces, boiling point, solubility, phase diagrams
7. Solutions: Concentrations, dilutions, electrolytes, reactions in aqueous solutions (acid-base, redox, precipitation), titrations
8. Gases: Kinetic molecular theory, effusion and diffusion, gas laws (individual, combined, and ideal), density of gases, gases in chemical reactions, partial pressures, real gases
9. Thermochemistry: enthalpy, phase changes and heat capacity, reaction enthalpy, Hess's Law, enthalpy of formation, bond energies
D. LEARNING OUTCOMES (General)

1. use dimensional analysis with proper attention to units and significant figures. Name and classify inorganic compounds.
2. define the basic concepts of quantum theory, determine the electron configurations of atoms, and use periodic trends to make predictions about atomic properties.
3. explain the intermolecular attractive forces that determine the properties of the states of matter and influence phase behavior.
4. explain chemical bonding schemes in terms of the electronic properties of atoms.
5. correlate the electronic structure of molecules to their molecular geometry using VSEPR theory.
6. apply gas laws and kinetic molecular theory to processes involving gases.
7. balance chemical equations and use stoichiometric relationships to calculate product and reactant amounts, and determine limiting reagents, and calculate percent yields.
8. calculate the molarity of a solution and perform dilution calculations.
9. identify different types of reactions (precipitation, neutralization, oxidation-reduction) and use chemical reactions and equations to predict reaction products.
10. explain the first law of thermodynamics and the role of energy and enthalpy in chemical reactions and perform thermochemical calculations.
11. communicate chemical concepts and experimental conclusions in written and oral forms. (lab)

E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal 03 - Natural Science

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.

F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

G. SPECIAL INFORMATION

None noted