OUTCOMES BASED LEARNING MATRIX

Course Description: This course is a continuation of General Chemistry I (CHEM151). Major topics covered include thermochemistry, thermodynamics, the states of matter, solutions, chemical kinetics, chemical equilibrium, electrochemistry, acids and bases, and an introduction to organic chemistry. The laboratory includes classical and spectroscopic techniques. Lecture: 3 hours Laboratory: 2 hours

Prerequisite: General Chemistry I (CHEM151), its equivalent, or Permission of Instructor

Course: General Chemistry II CHEM 152 | Department: Physical Science | Revised: Fall 2009

At the end of the course, students will be able to: | **Students will participate in:** | **Faculty will evaluate:**

COURSE OUTCOMES	OUTCOME ACTIVITIES	Assessment Tools
Thermochemistry - explain first law of thermodynamics -differentiate between energy and enthalpy - perform calculations using Hess's law, bond dissociation values, and heat of formation - discuss entropy and state functions	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) - Determination of the molecular mass of a gas lab.. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

Thermodynamics -explain the second law of thermodynamics - identify reactions as spontaneous or nonspontanous - perform standard entropy of reaction and standard free energy of reaction calculation -calculate Gibbs free energy - determine equilibrium constant	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Infrared spectroscopy discussion lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
States of Matter -use VSEPR geometries and electronegativity to determine polarity of a molecule -draw a phase diagram - using a phase diagram, determine the enthalpy and entropy signs, triple point, and phases - describe the intermolecular forces - use the Clausius-Clapeyron equation - calculate radius and density of a metal using unit cell	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) - Determination of molecular mass by freezing point depression lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Solutions: -discuss the intermolecular interactions of a solution -determine heat of vaporization and entropy of vaporization using free energy - calculate molarity, mole fraction, mass percent, and molality of a solution - use Henry's law to calculate solubility	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Solubility of a salt lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

- determine vapor pressures using Raoult's law - explain and calculate vapor pressures -calculate the freezing point and boiling points of solutions -explain the colligative properties and why changes occur		
Chemical Kinetics: -determine rate of reactions - determine order of a reaction - estimate half-life of a reaction - draw an Arrhenius plot -calculate activation energy from an Arrhenius plot -reaction mechanisms -perform calculations using the integrated rate laws for first and second order reactions	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Iodine clock lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Chemical Equilibrium: -write equilibrium equations -calculate equilibrium constants -determine concentrations of reactants and products - explain effect of a catalysis of a system at equilibrium - calculate rate of equilibrium reactions using the quadratic equation and square root	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Determination of the equilibrium constant for a chemical reaction lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

Acids and Bases -define an acid, base, conjugate base, and conjugate base -determine if a compound is an acid, base, conjugate base, or conjugate base -calculate [H_3O^+], [OH^-], pH, pOH -calculate equilibrium values of a weak acid, weak bases -understand titrations -understand the meaning of pKa -calculate pH of buffer systems -use Henderson-Hasselbach equation -calculate solubility equilibrium of solids	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -NMR discussion lab. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Introduction to Organic chemistry: - name alkanes, cyclcoalkanes, alkenes, alkynes, and aromatic compounds - identify organic functional groups - determine reaction products of alkanes with chlorine	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Determination of K_a for a weak acid. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)
Electrochemistry: - identify parts of a galvanic cell - write electrochemical balanced equations - calculate standard cell potentials -use Nerst equation to calculate cell potentials in nonstandard conditions - determine pH of solutions -use cell potentials, calculate equilibrium	- lectures, discussions, and demonstrations. (CT, QS, OC) -reading the text, including sample problems. (CT, R, QS) -solving assigned problems. (CT, R, QS) -Determination of Ka for a weak acid. -organizing and documenting information in lab reports. (CT, W, QS)	-Tests with emphasis on solving problems (CT, W, R, QS) -Lab performance (CT, QS, TS, R, OC) -Lab reports (W, QS, CT)

constants		
