LABETTE COMMUNITY COLLEGE BRIEF SYLLABUS

SPECIAL NOTE:
This brief syllabus is not intended to be a legal contract. A full syllabus will be distributed to students at the first class session.

TEXT AND SUPPLEMENTARY MATERIALS USED IN THE COURSE (if any):

Please check with the LCC bookstore http://www.labette.edu/bookstore for the required texts for this class.

COURSE NUMBER: CHEM 126

COURSE TITLE: COLLEGE CHEMISTRY II
(formerly Chemistry II)

SEMESTER CREDIT HOUR: 5

DEPARTMENT: Chemistry

DIVISION: General Education

PREREQUISITE: CHEM 124, College Chemistry I and
MATH 115, College Algebra

REVISION DATE: April, 2013

COURSE DESCRIPTION:
A continuation of College Chemistry I, with course content including kinetics, equilibrium thermodynamics, acid-base theories, electrochemistry, and nuclear chemistry.

COURSE OUTCOMES AND COMPETENCIES(LECTURE)
The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.
KRSN CHM1020/CHM1021/CHM1022

Students who successfully complete this course will be able to:

1. Explain intermolecular forces and the properties of liquids and solids (ch. 1); Explain the properties of solutions and solve solution problem (ch. 2);

- List, explain, and compare the intermolecular forces.
- Explain the properties of liquids.
- Explain the properties of solids.
- Describe changes of state and explain phase diagrams.
- Explain ways to express concentrations and be able to convert from one to another.
- Explain the factors that affect solubility.
- Explain the four colligative properties and solve colligative property problems.

2. Explain chemical kinetics and solve kinetics problems. (ch. 3); Explain chemical equilibrium and solve equilibrium problems (ch. 4)

- Explain the factors that determine the speed of reactions.
- Write differential and integrated rate laws.
- Write reaction mechanisms and interrelate mechanisms with rate laws.
- Do problems using Arrhenius equation and explain the energy changes during chemical reactions.
- Explain chemical equilibrium
- Solve equilibrium problems
- Explain the equilibrium position and the Le Chatelier's Principle.

3. Explain acids and bases and solve acid-base problems (ch. 5); Compare and solve equibria problems (ch. 6)

- Define, identify, and compare three definitions of acids and bases.
- Describe and explain the strengths of acids and bases.
- Explain the pH scale.
- Solve acid-base equilibria problems.
- Explain titration curves and buffers and solve additional acid-base equilibria problems.
- Explain solubility equilibria and solve problems.
- Explain complex ion equilibria and solve problems.

4. Explain thermochemistry and solve thermochemistry problems (ch. 7); Explain electrochemistry and solve electrochemistry problems (ch. 8)

- Explain the three laws of thermodynamics.
- Explain, spontaneity, enthalpy, entropy, and free energy.
- Solve thermochemistry problems.
- Explain glavanic cells, standard potentials, batteries and corrosion.
- Solve electrochemistry problems.

5. Explain nuclear chemistry and its applications to medicine. (ch. 9)

- Describe and explain nuclear isotopes.
- Write nuclear equations.
- Apply nuclear chemistry to medicine.

COURSE OUTCOMES AND COMPETENCIES (LABORATORY)

Students who successfully complete this class will be able to:

6. Students will demonstrate competencies in laboratory techniques.

- Students will describe or demonstrate the following laboratory techniques; taking a melting range with a Mel-Temp™, determining the identity of unknowns by qualitative analyses, using a Spectronic-20 spectrophotometer, and using computer simulation program.

7. Students will show greater understanding in concepts that correlate with those in the lecture.

- Students will be able to calculate theoretical and percentage yield; use Beer's Law to determine the concentration of an unknown; calculate Ka of a weak acid; demonstrate Le Chatelier's Principle; determine the Rate Law of a reaction; determining the factors that affect the rate of reactions; use freezing point depression to determine molecular weight.

CORRELATION OF COMPENTENCIES WITH STATE MANDATED CORE INDICATORS

The competencies listed above correlate with the competencies mandated by the Board of Regents for the State of Kansas.

State Core Indicators for College Chemistry II	LCC Competencies for College Chemistry II
Lecture	**Lecture**
Upon completion of College Chemistry II, the student will be able to:	Each student will be able to:
None	1. Explain intermolecular forces and the properties of liquids and solids (ch. 1)
Colligative Properties A. Define the following solution terms: a. Saturated solution b. Unsaturated solution c. Supersaturated solution d. Solubility e. Solute f. Solvent B. Calculate concentration in molality and mole fraction. C. Explain the factors that affect solubility D. Explain and calculate vapor pressure using Raoult's Law. E. Explain and calculate freezing point depression, boiling point elevation, and osmotic pressure.	2. Explain the properties of solutions and solve solution problem (ch. 2)

Kinetics A. Discuss the meaning of the rate of a reaction. B. Explain the factors that affect reaction rates. C. Use the initial rate method to determine reaction order from experimental data D. Describe the relationship between order of reaction and molecularity. E. Use experimental data to determine the rate law for a reaction. F. Compare first and second order rate reactions, G. Discuss the collision theory of a reaction rate. H. Use the Arrhenius equation to illustrate the relationship between energy of activation and rate law constant. I. Describe the relationships among the mechanism, the overall reaction and	3. Explain chemical kinetics and solve kinetics problems. (ch. 3)

elementary steps. J. Draw and interpret energy diagrams and illustrate the effect of a catalyst on the energy diagram.	

Equilibrium Principles A. Explain how the terms reversible reaction and dynamic equilibrium are related. B. Write the general equilibrium constant expression and explain its significance. C. Explain why the concentrations of pure liquids and solids are never used in equilibrium constant expressions. D. Show how the numerical value of the equilibrium constant changes when the stoichiometric coefficients are changed or the reaction is reversed. E. Explain the differences between the terms Kc and Kp and the relation of either to Qc. F. Explain the difference between an equilibrium position and an equilibrium constant. G. Given Keq and initial concentration of reactants and/or products, calculate the final concentrations of reactants and/or products. H. List and explain the external factors that can affect equilibria. I. Using LeChateleir's Principle, explain how changes in temperature, pressure, volume, or concentration affect the equilibrium position for a chemical reaction.	4. Explain chemical equilibrium and solve equilibrium problems (ch. 4)
Equilibrium of Aqueous Solutions A. Name and list the common strong acids and strong bases (i.e., any hydroxide base). B. Describe and recognize Bronsted-Lowry, Lewis, and Arrhenius Acids and Bases. C. Use the definition of acids and bases to distinguish between strong and weak acids and bases, equilibrium relationships among them, and the aqueous properties of their salts. D. Use the concepts of pH, pOH, Ka, and Kb to calculate the pH of aqueous solutions of acids, bases, and their salts. E. Determine the specific species present in an aqueous solution and the concentrations of those species. F. Describe the effect of common ions and calculate concentrations of all species present in solutions of weak acids and bases. G. Describe the ionization of polyprotic acid in aqueous solution. H. Explain the buffer effect, predict the influence of added acids and bases on buffers, and use the	5. Explain acids and bases and solve acid-base problems (ch. 5)

Henderson-Hasselbach equation to calculate the concentration of species in solution. I. Identify titration curves for strong, weak, and polyfunctional acids and bases. J. Understand the use of volumetric methods to determine the concentrations of species in solution. K. Write an equation to express the relationship between a solid solute and its constituent ions in a saturated solution. L. Calculate the Ksp from molar solubility and molar solubility from Ksp. M. Calculate the effect of a common ion on the molar solubility of a salt. N. Predict whether precipitation will occur when salt solutions are mixed and determine the concentration of ions remaining in solution after precipitation.	
Thermodynamics A. Explain the similarities and differences between such terms as enthalpy, entropy, and free energy. B. Explain how the First, Second, and Third Laws of Thermodynamics apply chemical and physical processes. C. Predict whether the entropy change in a given process is positive, negative, or near zero. D. Use data tables to determine enthalpy, entropy, and free energy changes. E. Explain how ΔH°, ΔS°, and ΔG° are related to reaction spontaneity. F. Explain how an knowledge of ΔH°, ΔS°, and ΔG° allows one to predict the conditions under which a reaction will occur. G. Describe the relationship between the standard free energy of reaction and the equilibrium constant. H. Calculate ΔG for a chemical reaction that occurs under nonstandard conditions.	7. Explain thermochemistry and solve thermochemistry problems (ch. 7)

Electrochemistry A. Describe galvanic and electrolytic cells and their operation. B. Calculate cell potentials and determine spontaneity of oxidation/reduction reactions. C. Understand and use Faraday's Law. D. Understand and apply the relationship of thermodynamics to electrochemistry. E. Understand and use the Nernst Equation. F. Give examples of natural and/or commercial applications of electrochemical processes. G. Use the activity series of metals.	8. Explain electrochemistry and solve electrochemistry problems (ch. 8)

State Core Competencies for College Chemistry II	LCC Competencies for College Chemistry II
Laboratory	**Laboratory**
Upon completion of College Chemistry II, the student will be able to:	Each student will be able to:
Work in the laboratory in accordance with good laboratory practices. a. Dress in an appropriate manner as to promote safety in the laboratory, wearing a lab coat* and goggles when anyone is working with chemicals in the laboratory. b. Follow written directions accurately. c. Work safely and effectively, using equipment and chemical carefully and correctly. d. Demonstrate use of required safety and common laboratory techniques. e. Dispose of waste products in a proper manner.	1. Demonstrate competencies in laboratory techniques.
Gather and record qualitative and quantitative data accurately. a. Acquire data using balances and volumetric glassware. b. Make and record visual observations. c. Use computers, when appropriate, as data acquisition tools. d. List or describe experimental assumptions made and any deviations from the written experimental procedures.	1. Demonstrate competencies in laboratory techniques.
Handle and evaluate data in logical, productive, and meaningful ways. a. Create notebooks and laboratory reports that are clear, understandable, and accurately represent the data collected. b. Display computer data in a spreadsheet or graphically, as appropriate. c. Correlate observations with chemical or physical processes. d. Carry out suitable calculations with quantitative data, recognizing when data and calculations are within a reasonable range. e. Use observations of experimental data to present relevant conclusions pertaining to the experimental procedure.	1. Demonstrate competencies in laboratory techniques.
Correlate laboratory work with principal topics in College Chemistry II lecture.	2. Show greater understanding in concepts that correlate with those in the lecture.