

CHEMISTRY 142/142A ~ SPRING 2013  
Chemistry Fundamentals II  
Sections S13N01/02/03/04

A continuation of first year chemistry covering stoichiometry, thermochemistry, properties of solutions, kinetics, acids and bases, solubility, thermodynamics and electrochemistry. Laboratory work includes inorganic systems, quantitative techniques, and problem solving.

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**Course Website:** [http://web.viu.ca/krogh/chem142/142\\_index.htm](http://web.viu.ca/krogh/chem142/142_index.htm)

**Text:** *Chemistry: The Central Science*, 12<sup>th</sup> Edition, **Brown, LeMay, Bursten and Murphy**  
*Mastering Chemistry* course ID **MCKROGHCHEM142S13**

**Lab Manual:** *Doing Chemistry* 141/142, 5<sup>th</sup> Edition, **Vancouver Island University**

**Prerequisites:** CHEM 12 and CHEM 140 or 150

**Time and Location:** 10:00 - 11:20 **T, Th** and 9:30 - 10:20 **F** B356-Rm109

**Office Hours:** 2:30 - 3:30 **T**  
12:30 - 2:00 **Th** (or by appointment)

**Evaluation:**

<b>Quizzes /Assignments</b>	<b>15%</b>
<i>Tentative Quiz Dates: Jan 18<sup>th</sup>, Feb 1<sup>st</sup>, Mar 1<sup>st</sup>, Mar 15<sup>th</sup>, Apr 5<sup>th</sup></i>	
<b>Term Tests</b> (two one-hour tests; 2 x 10%)	<b>20%</b>
<i>Tentative Test Dates: Feb 15<sup>th</sup> and Mar 22<sup>nd</sup></i>	
<b>Laboratory</b> (pre-labs, experimental results, formal report)	<b>25%</b>
<i>Labs start week of January 14<sup>th</sup>.</i>	
<b>Final Exam</b> (common to all sections)	<b>40%</b>

**Laboratory:** Bring your registration slip to the first lab to confirm that you are properly enrolled. Complete the pre-lab exercise before you enter the lab and submit it to your instructor before you begin the experiment. Eye protection must be worn at all times.

**Assignments:** Problem Sets and other Assignments will be distributed throughout the term. Solutions will be posted online and/or outside my office. Two of these may be collected and used to offset the lowest quiz mark (optional). Supplemental study materials including self-guided problems, tutoring and quizzes are available through the Mastering Chemistry website associated with your textbook at <http://www.masteringchemistry.com/>

**Academic Integrity:** It is expected that students will know and abide by VIU's policy on Student Academic Code of Conduct (Policy 96.01). Please go to <http://www.viu.ca/hhs/AcademicIntegrity.asp> for a description of Academic Misconduct and Disciplinary Actions.

**Disability Services:** Students with a documented disability requiring academic and/or exam accomodation are encouraged to contact Disability Services.

*Students must pass both the classroom and laboratory components independently in order to receive a passing grade in the course.*

# CHEMISTRY 142/142A

## CHEMISTRY in the REAL WORLD

### **TOPIC 1. PROPERTIES OF SOLUTIONS Chap 13 (Sec. 1–5)**

Solutions and the Dissolution Process: the effect of intermolecular forces, energy changes. Saturated solutions and solubility. Factors Affecting Solubility: solute, pressure, temperature. Concentration units: mass ratios, mole fraction, molarity and molality. Colligative Properties: vapour pressure, boiling and freezing points, osmotic pressure.

### **TOPIC 2. CHEMICAL KINETICS Chap 14 (Sec. 1–7)**

Reaction Rates. Differential Rate laws: reaction order, rate constants. Integrated Rate laws: first and second order reactions, half-lives. Temperature: collision model, orientation, activation, Arrhenius Equation. Reaction Mechanisms: elementary reactions, relation to rate laws, rate determining step. Catalysis: homo and heterogeneous catalysis, enzymes.

### **TOPIC 3. CHEMICAL EQUILIBRIUM Chap 15 (Sec. 1-7)**

The Equilibrium Concept: equilibrium constants and units. Applications and Interpretations. Calculating equilibrium constants, predicting direction of change, calculating equilibrium concentrations. Le Chatelier's Principle.

### **TOPIC 4. AQUEOUS EQUILIBRIA Chap 16 (Sec. 1–10) & 17 (Sec. 1-7)**

Acid-base reactions: protons in solution, proton transfer, conjugate acid-base pairs, relative strengths. Auto-ionization of water and the pH scale. Strong acids and bases. Weak acids and bases: calculating  $K_a$  from pH, percent ionization, calculating pH. Acid/base properties of salt solutions. Factors that affect acid strength. Buffers: composition, pH and capacity. Acid/base titrations. Solubility and  $K_{sp}$ : common ions, pH, complexation. Selective precipitation of ions. (Using logarithms and quadratic equation - Appendix A, Acid/Base constants Appendix D).

### **TOPIC 5. ENERGY & THERMODYNAMICS Chap 5 (Sec. 1-5) & Chap 19 (Sec. 1-7)**

Thermochemistry: kinetic and potential energy, units, work and heat. First law of Thermodynamics: endo and exothermic reactions, enthalpy, calorimetry, Hess's law, enthalpies of formation. Second law of Thermodynamics: spontaneous processes, entropy, Gibb's free energy, temperature, chemical reactions and the equilibrium constant. (Thermodynamic data - Appendix C).

### **TOPIC 6. ELECTROCHEMISTRY Chap 20 (Sec. 1-6)**

Oxidation states and recognizing redox reactions. Balancing redox reactions. Cell potentials: dependence on concentration and relationship to free energy. (Standard reduction potentials - Appendix E).

### **TOPIC 7. THE ENVIRONMENT\* Chap 18 (Sec. 1-6)**

Earth's atmosphere: structure, composition, photochemistry, ozone layer, acid rain, smog, climate change. Earth's hydrosphere: water quality and purification, dissolved oxygen and marine acidification.

\* as time permits

A **Review Sheet Handout** will be distributed for each of the topic areas listed above. These handouts review new terminology, summarize core concepts and detail student learning outcomes. Each Review Sheet Handout will assign self-study questions from the textbook.

*Students must read the appropriate sections of the textbook to succeed in this course. Coverage of some topics will be supplemented by additional lecture hand-outs.*