



**OBJECTIVES:**

This course enables students to strengthen their understanding of chemistry through the study of energy changes and rates of reactions, equilibrium in chemical systems, principles of thermodynamics, and electrochemistry. Students will further develop their problem-solving and critical thinking skills as they investigate chemical processes, and will refine their ability to communicate scientific information. Emphasis will be placed on understanding of basic principles and the ability to apply principles to solve problems.

**TRANSFERABILITY:**

University of Alberta: CHEM105 (3.8 Credits)

University of Calgary: CHEM209 (3 Credits)

**NOTE:** Grade of D or D+ is not an acceptable Grade for transfer to the above post-secondary institutions. It is the responsibility of the students to contact other receiving institutions to ensure transferability.

**GRADING CRITERIA:**

Descriptor	Grade	Points	Descriptor	Grade	Points
Excellent 84 – 100%	A+	4.0	Satisfactory 60 – 71 %	C+	2.3
	A	4.0		C	2.0
	A-	3.7		C-	1.7
Good 72 – 83 %	B+	3.3	Poor	D+	1.3
	B	3.0		D	1.0
	B-	2.7	Fail	F	0

**EVALUATIONS (THEORY):**

Assignments/Quizzes:	10.0%
Midterm Examination (February):	25.0%
Final Examination (Week of April 14):	50.0%

- Notes:**
1. Mid-term examination may be scheduled in the evenings or weekends.
  2. Students must obtain a minimum of 50 % in the theory Component to pass the course. There will be no supplemental or re-examination.

**EVALUATIONS (LABORATORY):**

General Competence in the Laboratory, Experimental Results, Lab Reports, and Prelab Assignments:	9.0%
Lab Exam:	6.0%

**Notes:** Students must obtain a minimum of 50 % in the Laboratory Component to pass the course.

**STUDENT RESPONSIBILITIES:**

Students are expected to be aware of their academic responsibilities as outlined in the Students' Rights and Responsibilities section in the College Calendar. Please refer to pages 47-50 of the College Calendar.

All electronic equipment (cell phones, pagers, Walkman, A/V recorders etc., except calculators approved by the instructor) is to be turned off during class periods.

Students who in the view of the instructor engage in disruptive behavior during lectures will be asked to leave the classroom.

**EXAMINATION POLICY:**

Students must remain in the exam room for at least 20 minutes from the commencement of the examination. During exams students are allowed to bring only pencils, pens, erasers, and non-programmable calculators. Electronic equipment (iPods, cell phones, etc.) is not allowed to be used during examinations. Permission to use the washroom during exams is at the discretion of the instructor and may require accompaniment.

If you miss a term examination you must provide the instructor with an explanation within 24 hours or a mark of zero may be given. Notification may be provided through email, voice mail, or direct contact with the instructor. Official documentation as to why the examination was missed will be needed to assess whether your absence will be excused or not. If your absence is excused the weight of this examination will be added to the weight of the final examination in the course. Medical excuses must include the date you were examined, the specific dates for the period of the illness, a clear statement indicating that the severity of the illness prevented you from attending school or work, and the signature of the examining physician (a signature by office staff on behalf of the physician is not acceptable). Medical notes obtained subsequent to the date of the examination are generally not accepted. A mark of zero will be given if the instructor considers the excuse inappropriate or inadequately substantiated.

**STATEMENT ON PLAGIARISM AND CHEATING:**

Refer to the Student Conduct section of the College Admission Guide at <http://www.gprc.ab.ca/programs/calendar/> or the College Policy on Student Misconduct: Plagiarism and Cheating at [www.gprc.ab.ca/about/administration/policies/\\*\\*](http://www.gprc.ab.ca/about/administration/policies/**)

\*\*Note: all Academic and Administrative policies are available on the same page.

## COURSE SCHEDULE/TENTATIVE TIMELINE:

Regular attendance of lectures/seminars is essential to achieve a good understanding of the course material. You are encouraged to ask questions and to participate in class discussions. Help is also available outside the classroom. NO APPOINTMENTS ARE NEEDED.

WEEK OF	MONDAY	WEDNESDAY	FRIDAY	Tuesday/Thursday (Tutorial)
Jan. 6	No Classes	Introduction	Equilibrium	Equilibrium
13	Equilibrium	Equilibrium	Acids & Bases	Equilibrium
20	Acids & Bases	Acids & Bases	Acids & Bases	Acids & Bases
27	„	„	Ionic Equilibria	Acids & Bases
Feb. 3	Ionic Equilibria	Ionic Equilibria	Thermodynamics I	Ionic Equilibria
10	Thermodynamics I		Thermodynamics I	Thermodynamics I
17	*	Winter Break	*	*
24	Thermodynamics I	CH 1050 Midterm	Thermodynamics I	Thermodynamics I
Mar. 3	Thermodynamics II	Thermodynamics II	Thermodynamics II	Thermodynamics II
10	„	„	Electrochemistry	„
17	Electrochemistry	Electrochemistry	Electrochemistry	Electrochemistry
24	„	„	„	„
31	Kinetics	Kinetics	Kinetics	Kinetics
April 7	„	„	„	„
14	Review	NO CLASSES	FINAL EXAM	FINAL EXAM
21	*	FINAL EXAM	*	*

## READING AND PROBLEM ASSIGNMENTS

Problem solving is an essential part of this course. It will guide your study in the right direction and also will help you to monitor your performance in the course.

Approximately ten questions will be assigned as homework every week. However, you are encouraged to solve as many additional problems as you can. It is important that you work out these problems independently. Seek help with the ones you cannot solve yourself. Unless instructed otherwise, assignments are due on Mondays, Wednesdays, and Fridays at 10:00 AM. **NO LATE ASSIGNMENTS ARE ACCEPTED. DON'T ASK!**

## LABORATORY SESSION

Laboratory sessions start at 2:30 P.M. sharp. All students are expected to come to the laboratory well prepared for the experiment that is to be performed and on time. Students are expected to attend all laboratory periods. Absences due to illness must be

substantiated by presenting suitable evidence to the Instructor/Lab Technician within one week of missing the lab. An opportunity to make up a lab will be given only for excused absences.

The laboratory experiments are designed to allow a well-prepared student to finish all the work within the allotted time. IT IS YOUR RESPONSIBILITY TO COMPLETE THE LAB ON TIME.

Students are responsible for keeping the lab tidy. Failure to keep the workbench and common areas tidy will result in demerits up to 5 marks each lab period.

## LABORATORY REPORT

You must record everything you do and observe as you carry out your experiment. Use a hardcover laboratory notebook for this purpose. Do not copy the procedure from the laboratory manual. Keep your notebook neat. Your notebook will be checked periodically.

Formal lab reports should be written using the format given in your laboratory manual. Unless instructed otherwise, the lab reports are due at the end of the lab. NO LATE LAB REPORTS ARE ACCEPTED.

## TENTATIVE LABORATORY SCHEDULE

Date	EXPERIMENT <sup>*</sup>
Jan. 17 & 24	1. <a href="#">Equilibrium Constant</a>
Jan. 31 & Feb. 07	2. <a href="#">Titration of a Weak Acid</a>
Feb. 14 & 28	3. <a href="#">Enthalpy &amp; Entropy Changes</a>
Mar. 07 & 14	4. <a href="#">The Nernst Equation</a>
Mar. 21 & 28	5. <a href="#">Effect of Temperature on Reaction Rate</a>
April 4	7. <a href="#">Lab Exam and Check-Out</a>

\*TEXT: Chemistry 105, Laboratory Experiments, 2013 – 20014 Edition,  
University of Alberta, 2013.

## **COURSE SYLLABUS (CONTENT):**

### **1. APPLICATIONS OF EQUILIBRIUM**

**A. GENERAL:** Gas Phase Equilibria, Heterogeneous Equilibria, Le Chatelier's Principle

Chapter: 6; Problem Set: 1

**B. ACID-BASE EQUILIBRIA:** Review of Fundamentals, Bronsted-Lowry Acid-Base Theory, The Lewis Theory, Dissociation Constant, Levelling Effect, pH of Simple and Complex Acids and Bases in Water, Indicators, Titration Curves, Buffer Solutions, Hydrolysis, Polyprotic Acids

Chapters: 7 & 8; Problem Set: 2

**C. IONIC EQUILIBRIA:** Solubility of Ionic Compounds,  $K_{sp}$ , Common-Ion Effect, The Effect of Complexing Ligands, The Effect of pH on Solubility Equilibria, Selective Precipitation of Ions, Extraction and Separation

Chapter: 8; Problem Set: 3

### **2. THERMODYNAMIC PROCESSES AND THERMOCHEMISTRY**

Reversible and Irreversible Processes, Internal Energy, PV Work, The First Law of Thermodynamics, Heat Capacity, Enthalpy, Processes Involving Ideal Gases, Thermochemistry.

Chapter: 9; Problem Set: 4

### **3. SPONTANEOUS CHANGE AND EQUILIBRIUM**

Spontaneous Processes, Entropy, the Second and Third Laws of Thermodynamics, Free Energy and Chemical Equilibrium, Temperature Dependence of K.

Chapter: 10; Problem Set: 5

### **4. ELECTROCHEMISTRY**

Review of Redox Reactions, Chemistry of Electrolytic and Galvanic Cells, Faraday's Law, Electrode Potentials, emf, Free Energy and emf, Concentration Effects, The Nernst Equation, Commercial Cells, Fuel Cells, Corrosion.

Chapters: 4 & 11; Problem Set: 6

### **5. CHEMICAL KINETICS**

Rate Laws, Order of Reactions, Differential and Integrated Rate Equations for Zero, First and Simple Second Order Reactions, Half-life, Reaction Mechanisms, Arrhenius Law, Catalysis.

Chapter: 15; Problem Set: 7