

Emphasis will be placed on understanding of basic principles and the ability to apply principles to solve problems.

LEARNING OUTCOMES:

Upon successful completion of this course, students will be able to:

Apply the principles of kinetics to find rates of reactions and explore mechanisms of simple chemical changes. Use the principles of equilibrium to interpret behaviors of weak electrolytes, buffer solutions and solubility of sparingly soluble salts. Apply the above principles to evaluate the pH of acids of different strengths. Understand and use the principles of oxidation-reduction reactions, and electrochemistry including voltaic and electrolytic cells. Use concepts in thermodynamics to explain spontaneity of reactions, activation energy associated with chemical changes, and the role of thermodynamic functions in describing equilibrium systems.

Use laboratory techniques related to volumetric analysis, be able to use simple instruments in the laboratory, and understand the difference between qualitative and quantitative analysis

TRANSFERABILITY:

University of Alberta: CHEM105 (3.8 Credits); University of Calgary: CHEM209 (3 Credits);

***Warning:** Although we strive to make the transferability information in this document up-to-date and accurate, **the student has the final responsibility for ensuring the transferability of this course to Alberta Colleges and Universities.** Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at Alberta Transfer Guide main page <http://www.transferalberta.ca> or, if you do not want to navigate through few links, at <http://alis.alberta.ca/ps/tsp/ta/tbi/onlinesearch.html?SearchMode=S&step=2>

****** 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 (Feb 28):	25.0%
Final Examination (April 16):	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 44-46 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:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, 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 <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 (Tutorial)
Jan. 1	No Classes	No Classes	Equilibrium	No Classes
8	Equilibrium	Equilibrium	Acids & Bases	Equilibrium
15	Acids & Bases	Acids & Bases	Acids & Bases	Acids & Bases
22	„	„	Ionic Equilibria	Acids & Bases
29	Ionic Equilibria	Ionic Equilibria	Thermodynamics I	Ionic Equilibria
Feb. 5	Thermodynamics I	Thermodynamics I	Thermodynamics I	Thermodynamics I
12	Thermodynamics I	Thermodynamics I	Thermodynamics II	Thermodynamics I
19	*	Winter Break	*	*
26	Thermodynamics II	CH 1050 Midterm	Thermodynamics II	Thermodynamics II
Mar. 5	„	„	„	„
12	Electrochemistry	Electrochemistry	Electrochemistry	Electrochemistry
19	„	„	„	„
26	Kinetics	Kinetics	No Classes	Kinetics
April 2	Kinetics	„	Kinetics	„
9	„	Review	Review	„
16	*	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 9:00 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 9:00 AM on Fridays. NO LATE LAB REPORTS ARE ACCEPTED.

TENTATIVE LABORATORY SCHEDULE

Date	EXPERIMENT [*]
Jan 10	Check-In
Jan. 17	O. Equilibrium Constant
Jan. 31	P. Titration of a Weak Acid
Feb. 14	T. Enthalpy & Entropy Changes
Mar. 07	V. The Nernst Equation
Mar. 21	M. Effect of Temperature on Reaction Rate
April. 04	L. Lab Exam
April 11	Check-Out

*TEXT: Chemistry 105, Laboratory Experiments, 2017 – 2018 Edition,
University of Alberta, 2017.

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