



DEPARTMENT OF SCIENCE

COURSE OUTLINE – WINTER 2016

CH1020 INTRODUCTORY CHEMISTRY II – 3 (3-1-3) 105 HOURS OVER 15 WEEKS

INSTRUCTOR:	Dr. Som Pillay	PHONE:	(780) 532-1915
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OFFICE HOURS:	TBA		

CALENDAR DESCRIPTION:

Lectures include chemical kinetics, thermochemistry, thermodynamics, equilibrium, acids and bases, electrochemistry, and coordination chemistry.

PREREQUISITE(S): Chemistry 1010 or equivalent

REQUIRED TEXT/RESOURCE MATERIALS:

Chemistry 9th Edition by Steven S. Zumdahl and Susan A. Zumdahl, Books/Cole, Cengage Learning, 2014.

Introductory University Chemistry Laboratory Manual, Chemistry 102--105, 2015-2016 Edition, Department of Chemistry, University of Alberta, 2015.

DELIVERY MODE(S):

Lecture style presentation of material followed by practice problems/discussion in seminar. Laboratory provides hands-on experience.

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.

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 solubilities 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: CHEM102 (3 Credits); University of Calgary: CHEM203 (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 Examinations:	30.0%
Final Examination (Week of April 14):	38.0%

- Notes:**
1. Mid-term examinations 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:	12.0%
Lab Exam:	10.0%

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:

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:

COURSE SYLLABUS (CONTENT):

- 1. Chemical Kinetics (Chapter 12; Pages 539 – 592) 4 – 5 lectures**
Reaction Rates, Rate laws, Determining rate law form Integrated rate law Arrhenius equation, Reaction mechanisms, Catalysis
- 2. Chemical Equilibrium (Chapter 13; Pages 593 – 637) 3 – 4 lectures**
Equilibrium condition, Mass-action expression and the equilibrium constant Heterogeneous equilibria, Applications of the equilibrium constant Le Chatelier's Principle
- 3. Acids and Bases (Chapters 14 and 15; Pages 638 – 737) 5 – 7 lectures**
The nature of acids and bases Acid strength and the pH scale Calculating pH of strong/weak acids Bases Salts Mixtures of weak acids and bases Effect of structure upon acid strength Common ion effect Buffer systems Acid/base titrations Acid/base indicators
- 4. Solubility Equilibria (Chapter 16; Pages 743 – 771) 2 – 3 lectures**
Slightly soluble salts Complex ion equilibria
- 5. Thermochemistry (Chapter 6; Pages 235 – 283) 2 – 3 lectures**

Types of energy; work and heat, First Law of Thermodynamics, Enthalpy; endothermic and exothermic processes Calorimetry, Hess's Law, Standard enthalpy of formation

6. Thermodynamics (Chapter 17; Pages 772 – 815) 2 –3 lectures

Entropy and The Second Law of Thermodynamics Entropy of the system and the surroundings
Free Energy and Equilibrium

7. Electrochemistry (Chapter 18; Pages 816 – 871) 2 – 3 lectures

Redox reactions and standard electrode potentials Galvanic cells and spontaneous redox reactions Cell potential, electrical work, and free energy Dependence on concentration – the Nernst Equation Batteries, Electrolytic cells

8. Transition Elements and Coordination Compounds (Chapter 21; Pages 953 – 1004) 2 lectures

Properties of the transition metals Coordination compounds, Structure of coordination compounds Crystal field theory

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, Tuesdays, and Thursdays 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 with Pen using the format given in your laboratory manual. Unless instructed otherwise, the lab reports are due at 4:30 PM on Fridays and Mondays. NO LATE LAB REPORTS ARE ACCEPTED.

TENTATIVE LABORATORY SCHEDULE

Date	EXPERIMENT [*]
Jan. 13 & 14	Check-in
Jan. 20 & 21	R. Stoichiometry of a Nickel Coordination Compound
Jan. 27 & 28	M. Effect of Temperature on Reaction Rate
Feb. 03 & 04	N. Spectroscopic Study of the Bleaching of a Food Dye
Feb. 10 & 11	No Lab
Feb. 24 & 25	O. Equilibrium Constant
Mar. 2 & Mar. 3	Q. Buffers
Mar. 9 & 10	P. Titration of a Weak Acid
Mar. 16 & 17	T. Enthalpy & Entropy Changes
Mar. 23 & 24	V. The Nernst Equation
Mar. 30 & 31	L. Lab Exam
April 6 & 7	Check-Out

*TEXT: Chemistry 102-105, Laboratory Experiments, 2015 – 2016 Edition, University of Alberta, 2015.