



UNIVERSITY OF CALGARY

DEPARTMENT OF CHEMISTRY COURSE OUTLINE

1. COURSE: CHEMISTRY 213, Foundations of Chemistry: Change and Equilibrium

| LEC | DAYS | TIME | ROOM | INSTRUCTOR | OFFICE | PHONE | EMAIL | OFFICE HOURS |
|-----|------|-------------|----------|--------------------|-----------|----------|--|--------------|
| L01 | TR | 11:00-12:15 | EEEL 161 | Dr. Julie Lefebvre | EEEL 237B | 220-6908 | jlefebv@ucalgary.ca | TBA |

Course website via [D2L](#): CHEM 213 (Winter 2015) - Foundations of Chemistry: Change and Equilibrium
Departmental Office: SA 229, 220-5341, chem.undergrad@ucalgary.ca

2. **PREREQUISITES:** *Chemistry 201 or Chemistry 211 or equivalent.* Students are responsible for ensuring that they meet all pre- and co-requisite requirements for each course in which they are registered. Students who do not meet these requirements will be deleted from the course.
3. **Grading:** The University policy on grading and related matters is described sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

| | | |
|----------------------------------|------|--|
| Laboratory – Wet Experiments (5) | 20 % | |
| Laboratory – CTDs (5) | 15 % | |
| Graded in-class activities (3) | 10 % | (January 29 th , March 19 th and April 2 nd) |
| Midterm | 20 % | (February 26 th – in class) |
| Final Examination | 35 % | (To be scheduled by the Registrar) |

Each piece of work (laboratory worksheets and reports, graded in-class activities, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade. The conversion between course percentage and letter grade is given below:

Grading Scale:

| | | | | | |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| A+ | A | A- | B+ | B | B- |
| 92% - 100% | 86% - 91.99% | 81% - 85.99% | 76% - 80.99% | 72% - 75.99% | 68% - 71.99% |
| C+ | C | C- | D+ | D | F |
| 62% - 67.99% | 58% - 61.99% | 54% - 57.99% | 50% - 53.99% | 45% - 49.99% | < 44.99% |

Notes:

- (1) A minimum 50% on the laboratory component (wet experiments and CTDs) AND completion and submission of no less than seven laboratory sessions (including wet experiments and CTDs) is required in order to satisfy prerequisite requirements (i.e. C-) for further Science courses.
- (2) A minimum 50% weighted average on the examinations (quizzes, midterm and final examination) is required in order to satisfy prerequisite requirements (i.e. C-) for further Science courses.
- (3) Notes (1) and (2) mean that if a student scores below 50% in either the laboratory component or the examinations, then the *maximum* grade they can obtain in Chem 213 is a D+.

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar. There are no deferred midterm examinations. The weight of a legitimately missed examination will be pro-rated among the remaining exams.

6. **Course Materials:**

- Textbook: "**Chemical – Human Activity, Chemical Reactivity**", 2nd Edition, by Mahaffy, Bucat, Tasker *et al.*, Nelson, 2014
- A self-duplicating laboratory notebook
- A full length lab coat
- Safety glasses
- A lock for lab drawer (combination preferred)
- A non-programmable scientific calculator (such as Casio FX 260)

OPTIONAL MATERIALS: Students may opt to participate in lecture question activities using TopHat Monocle. This will be described in detail on the first day of class. Though this is not mandatory, students are strongly recommended to participate to build up concepts and problem solving skills. The average mark obtained on TopHat Monocle could be used to replace one low (non-zero) CTD mark.

7. **Examination Policy:** During exams students are allowed to bring only pencils, pens, erasers, their ID card, and **non-programmable calculators (recommended calculator is the CASIO fx-260 solar)**. If in doubt, check your calculator with your instructor prior to the examination (the programmable TI calculators are not acceptable). Students should also read the Calendar, [Section G](#), on Examinations.

Special Needs Students must be registered with Student Accessibility Services (see section 11(c)), and must identify themselves to their instructor as soon as possible.

8. **Approved Mandatory and Optional Course Supplemental Fees:** The Department of Chemistry has a laboratory glassware breakage fee. At the start of the course, each student is assigned a locker and checks-in to establish that they have a complete set of usable glassware. By signing for check-in, a student agrees that they are now responsible for the glassware until check out. Any equipment that is missing, unusable or has been replaced during the semester will be charged to the student. All students, even those who withdraw early from the course must check out of the laboratory before the last day of lectures. Any student who fails to check out before the last day of lectures for the term will be assessed a charge of \$30.00. If this fee is not paid by the last day of the final examination period of the term, an additional \$10.00 administrative fee will be charged and university services (registration, transcripts, etc.) may be withheld. *The last day of withdrawal from any half year course is stated in the [2014-2015 Calendar](#) as Wednesday, April 15th, 2015.*

9. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

10. **Human studies statement:** If you consent, your coursework may be used for educational research purposes once the course is over. Individual responses will remain anonymous and confidential. Grouped data will be used in academic presentations and publications. Participation in such research is voluntary and will not influence grades in this course. Students' signed consent forms will be withheld from course instructors until after final grades are submitted. Interested participants may also be recruited for focus group studies. More information will be provided at the time student participation is requested. See also [Section E.5](#) of the University Calendar.

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

(a) **Academic Misconduct:** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties

(b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).

(c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: [Calendar entry on students with disabilities](#) and [Student Accessibility Services](#).

(d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also: <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 220-3911 Email: suvpaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; [Student Ombudsman](#)
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

12. Additional course information:

LABORATORY SAFETY COURSE: All undergraduate students taking chemistry laboratories are required to complete **once** an introductory course (approx. 50 minutes) on laboratory safety. This course is presented in an online format on D2L. **The Safety Course must be completed before the first lab activity.** Students who do not complete the safety lessons will subsequently be denied admission to the laboratories. While it will not count directly toward the final grade, the material is considered to be part of the course and is therefore appropriate for inclusion into laboratory prelabs and exams.

LABORATORY ACTIVITIES INFORMATION: Along with the lecture component of the course, students are scheduled for Critical Thinking Development (CTD) sessions and wet laboratory experiments in alternating weeks. The schedule is arranged such that in any given week all students in the entire course will perform either a CTD session or a wet laboratory experiment. **All laboratory activities begin January 19th, 2015. During the first week of laboratory activities, you will be checking in and there will be an orientation / information session as well as the first CTD session. Consult your Peoplesoft schedule for exact times.**

CTD sessions and wet laboratory experiments are held in EEEL 249. Students wearing inappropriate laboratory attire or with incomplete pre-laboratory assignments will not be permitted to conduct experiments for safety reasons (see online lab manual for details).

The relevant information for each CTD session will be available online through Desire 2 Learn (D2L). You must bring your self-duplicating notebook to every CTD along with a copy of the additional posted material whenever applicable. The grade for a CTD session will be based on the required write-up.

The Laboratory Manual for the wet experiments is available online through Desire 2 Learn (D2L). **You must consult the online Laboratory Manual, print out the portion of the manual for the wet experiment you will be doing, and complete the pre-laboratory assignment prior to attending any of your scheduled lab periods.** The grade for each experiment will be based on your pre-laboratory assignment, and the required experimental write-up.

LEARNING OUTCOMES: Students will learn about how chemical reactions are explained by equilibrium, kinetics and thermodynamic principles. This course will also focus on critical thinking, problem solving and laboratory skills (including teamwork and communication skills). Specific learning objectives are available in the course syllabus.

| Big Ideas | Enduring Understandings <i>Students will understand.....</i> |
|---------------------|---|
| Critical thinking | Critical thinking is crucial to an experiential science like chemistry. Critical thinking requires constant re-evaluation of results and hypotheses. |
| Chemical equilibria | Chemical reactions can attain a state of dynamic equilibrium. Chemical equilibrium determines the extent of a reaction, i.e. whether the reactants or products are favoured. Chemists can manipulate the extent of a reaction. The extent to which a chemical reaction occurs has a relationship to both kinetic and thermodynamic principles. |
| Chemical kinetics | The rate of any chemical reaction relates to the mechanism of the reaction. A reaction mechanism can be the result of one or several successive and effective collisions. The molecular level understanding of kinetics is linked to the macroscopic observations. Chemists can manipulate experimentally the rate of a reaction. |
| Thermodynamics | A chemical reaction involves an energy change which can result in work being done and heat being absorbed or released. Chemical reactions may or may not occur spontaneously. Chemists can alter the spontaneity of some reactions. |
| Chemical Reactions | Chemical reactions are described by chemical formulae and balanced chemical equations and used to solve stoichiometric problems. All chemical reactions are explained by a combination of kinetic, thermodynamic and equilibrium principles: Chemical reactions that involve gases are good models for studying chemical reactivity due to limited intermolecular interactions. Chemical reactions occurring in solution constitute a major class of reactions: In aqueous solutions, the pH characterizes acid and base. Buffer solutions exploit the properties of weak acids and bases. Quantitative and qualitative studies on acid and base solutions can be accomplished using titration experiments. The forward and reverse processes of dissolution and precipitation for ionic compounds can be equally exploited depending on the desired application. Redox reactions generate a cell potential which can be used to perform electrical work. |