

Final Course Outline

Analytical Chemistry Lecture

CHEM217, section 01

Gregor Kos

September 15, 2016

1 Course description

Chemistry CHEM217 is an introduction to the theories and concepts of analytical chemistry. Based on your knowledge about Stoichiometry and Acids and Bases, the course material covers basic statistics, acid-base equilibria and associated techniques (e.g., volumetric analysis, gravimetry, introductory spectroscopy) and complex formation. Following a theoretical introduction and background information, a wide range of applications are discussed, as problem sets to be solved mathematically & as lab experiments. Examples have direct relevance for work in professional and academic labs (e.g., statistical evaluation of data, buffer and pH calculations, EDTA titrations).

2 Course administration

Instructor: Gregor Kos, gregor.kos@concordia.ca

Office: SP-275.29

Office hours: Wed, 14:00–16:00 & Fri, 14:00–16:00; and by appointment.

Prerequisites: CHEM205, 206; PHYS204, 206, 224, 226; MATH 203, 205
or equivalents for all prerequisite courses.

Class time: Wed & Fri, 10:15–11:30

Room: HC 155 LOY

Course website: <http://moodle.concordia.ca> (automatic enrolment)

Course text: Daniel C. Harris, Quantitative Chemical Analysis, 9ed, WH Freeman, 2015, ISBN-10: 1-4641-3538-X, ISBN-13: 978-1-4641-3538-5; available in the University Book Store

3 Assessment

Three assignments (two of which will be marked and counted towards your course mark) and two midterm exams will be given during the term. Together with the final exam they will determine the final mark:

- Assignments (2/3, take-home): 12%
- Midterm 1 (in-class): 17%
- Midterm 2 (in-class): 17%

- Final (centrally scheduled): 29%
- Laboratory section: 25%

You need a passing grade (lecture: 50%, lab: 60%) for both, the lecture and lab portion of the course.

Assignments handed in after the posted deadline will receive a 20% deduction. Assignments that are more than a week late will receive a grade of zero. No supplemental exams for the midterms will be scheduled. Please see me before the deadline or after (for medical reasons only) with a doctor's note for extensions without deductions.

4 Attendance

The onus is on the student to meet the demands of the course and I strongly suggest that regular attendance be the norm. To be excused from the midterm (no supplemental) or final examination (as per university regulations), a student must present a doctor's note or other suitable official excuse. Marks for a missed midterm (with official excuse) will be added to the final exam; without excuse a grade of zero will be awarded for missed midterm.

5 Course content

Chemistry CHEM217 is an introduction to the theories and concepts of analytical chemistry. The course will closely follow selected topics from Chap-

ters 0—13 and 27 of the assigned textbook. In preparation for the course, I strongly suggest to review the following chapters from General Chemistry. Do not forget to extensively practice your problem-solving skills.

- Stoichiometry (Zumdahl, Chapters 3 & 4)
- Chemical Equilibrium (Zumdahl, Chapter 13)
- Acids & Bases (Zumdahl, Chapters 14 & 15)
- Redox Chemistry (Zumdahl, Chapter 4)

5.1 Chapters covered in detail

Chapter 0 – The Analytical Process

Chapter 1 – Chemical Measurements

Chapter 2 – Tools of the Trade (required reading)

Chapter 3 – Experimental Error

Chapter 4 – Statistics

Chapter 5 – Quality Assurance and Calibration Methods

Chapter 6 – Chemical Equilibrium

Chapter 7 – Let the Titrations Begin

Chapter 8 – Activity & the Systematic Treatment of Equilibrium

Chapter 9 – Monoprotic Acid-Base Equilibria

Chapter 10 – Polyprotic Acid-Base Equilibria

Chapter 11 – Acid-Base Titrations

Chapter 12 – EDTA Titrations

Chapter 13 – Advanced Topics in Equilibrium

Chapter 27 – Gravimetric Analysis

5.2 Suggested lecture schedule

Dates may change depending on problems solved in class and questions discussed. **Please note:** The recommended sections are preparatory reading before the lecture; they do not constitute the full material covered during the course! Please refer to your lecture notes, assignments, practice problems and this outline for the complete material covered.

Date	Lecture	Preparatory Reading
07 Sep	Introduction to the course	Course outline
09 Sep	The analytical process	0-1 & 0-2
14 Sep	Units, conversion, stoichiometry, solution preparation	1-1 to 1-4
	Vote on the final course outline	
16 Sep	Significant figures, error propagation, accuracy, precision	3-1 to 3-5
21 Sep	Distributions, population, sample, t-values, mean, std dev, variance	4-1 to 4-4
23 Sep	Stat. tests: Q-test, F-test, t-test	4-5 & 4-6
28 Sep	In-class practice: Statistics	
	Assignment 1 online	
30 Sep	Regression & calibration, LOD	4-7 & 4-8, 5-3 & 5-4
05 Oct	Chemical equilibrium, solubility product, complex formation	6-1 to 6-4
	Deadline Assignment 1	
07 Oct	Systematic treatment of eq. 1	8-4
12 Oct	Mono & polyprotic acids & bases pH, strong & weak acids	6-5 to 6-7
14 Oct	Midterm 1 (in-class)	
19 Oct	Monoprotic acid-base eq., salts	9-1 to 9-4

Date	Lecture	Preparatory Reading
21 Oct	Henderson-Hasselbalch, buffers Assignment 2 online	9-5
26 Oct	Diprotic acid-base eq. & buffers, principal species	10-1 to 10-4
28 Oct	Fractional composition equations Deadline Assignment 2	10-5 & 10-6
02 Nov	Activity & Systematic treatment of eq. 1	8-1 to 8-3, 13-2
04 Nov	Systematic treatment of eq. 2	8-4 & 8-5
09 Nov	In-class practice: Acid–Base equilibria	
11 Nov	Midterm 2 (in-class)	
16 Nov	Acid-base titrations 1	7-1 to 7-6, 11-1 & 11-2
18 Nov	Acid-base titrations 2	11-3 to 11-6
23 Nov	EDTA titrations 1 Assignment 3 online	12-1 to 12-5
25 Nov	EDTA titrations 2	12-6 & 12-7
30 Nov	Gravimetry Deadline Assignment 3	27-1 to 27-3
02 Dec	Tutorial for final exam	
TBD	Final exam	

6 Plagiarism and other forms of academic dishonesty

The academic code of conduct can be found in section 17.10 of the academic calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The **mandatory seminar** is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.

As part of this course, you are required to

1. attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources
2. pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). **The deadline to take and pass the quiz is Sunday, October 30, 11:55pm.**

Note: This is not the University's quiz you may have been asked to take when you first registered and logged into the myConcordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you cannot take it until after you have attended the

seminar. The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. You are only exempt from repeating the seminar and the quiz if you have done both in Fall 2011 or more recently [*], otherwise you are required to repeat both this term. This short seminar (1 hour) will be held at the following times (note that late-comers will not be admitted):

Date	Time	Place
Mon, Sep 26	16:45-17:45	CC-308
Tue, Sep 27	16:45-17:45	HB-130
Wed, Sep 28	16:45-17:45	CC-308
Wed, Sep 28	20:45-21:45	HC-157
Thu, Sep 29	16:45-17:45	CC-204
Thu, Sep 29	20:45-21:45	HC-157
Fri, Sep 30	16:45-17:45	CC-310

As space for each of the seminars is limited by the room size, please sign up to your preferred time. Sign-up sheets are available outside SP 201.01 (Departmental office).

If you do not complete this course requirement, your final grade for the course will be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the

undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.

[*] You are exempt, if you can locate your ID in the pdf file located on the CHEM 101 Moodle site (for guest login, go to: <http://moodle.concordia.ca/moodle> > Arts and Science > Chemistry and Biochemistry > Specialized Chemistry Sites > CHEM 101; look under FAQ).