

UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS
FALL 2016

COURSE: CHEM 311, ANALYTICAL CHEMISTRY: QUANTITATIVE ANALYSIS

LEC	DAY & TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	Tue & Thu 12:30-1:45	EDC179	Dr. A. Musgrove Richer	SA 144F	220-2745	amanda.musgroveriche @ucalgary.ca	TBA

Formal office hours will be posted; appointments may also be requested by email or via <https://doodle.com/musgrove>

TEXTBOOK

Quantitative Chemical Analysis, 9th Ed.; Daniel C. Harris, 2016, W.H Freeman and Company.

Older editions are acceptable; however it is the students' sole responsibility to ensure that s/he can identify the appropriate chapter readings and practice problems in alternate editions.

TOPICS INCLUDED AND SUGGESTED READINGS

Students are responsible for all material included in lectures *and* laboratories. Some material may not be addressed directly in lecture, but will be discussed in laboratory or assigned readings. All suggested readings below reference the recommended textbook (Harris 9th Ed.).

TOPIC 1: INTRO TO ANALYTICAL CHEMISTRY

Chapter 0: The Analytical Process

Chapter 1: Measurements

Chapter 2: Tools of the Trade

AFTER STUDYING THIS TOPIC, YOU SHOULD BE ABLE TO:

- Explain the general principles of quantitative analysis
- Identify common analytical methods and equipment, and describe their correct usage

TOPIC 2: UNCERTAINTY AND ERROR ANALYSIS

Chapter 3: Experimental Error

Chapter 4: Statistics (4.1-4.6)

AFTER STUDYING THIS TOPIC, YOU SHOULD BE ABLE TO:

- Identify sources of uncertainty in chemical measurements
- Use appropriate statistical techniques to describe and quantify the uncertainty in chemical measurements

TOPIC 3: QUANTITATIVE ANALYSIS: EQUILIBRIUM AND TITRATIONS

Chapter 6: Chemical Equilibrium

Chapter 7: Let the Titrations Begin

Chapter 8: Activity and 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

AFTER STUDYING THIS TOPIC, YOU SHOULD BE ABLE TO:

- Use equilibrium principles to quantitatively describe the composition of solutions:
 - Monoprotic and polyprotic acids and bases
 - Metal ions with chelating reagents
 - Sparingly soluble compounds
- Describe (qualitatively and quantitatively) the changes that occur in these solutions during a titration
- Explain and apply important titration techniques, including: endpoint detection, back titration, masking interferants

LABORATORY EXPERIMENTS

Analysis for Sodium Carbonate

Determination of Soluble Chloride: The Volhard Titration

Analysis of an Acid Mixture

Analysis for Copper in Brass

Determination of Ethylene Glycol by Functional-Group Analysis

Determination of NTA in Detergent by Potentiometric Titration

Analysis of Calcium in Limestone by Compleximetric Titration

WHILE COMPLETING THE LABORATORY COMPONENT, YOU WILL:

- Develop hands-on lab skills and the ability to perform chemical manipulations with high precision and accuracy.
- Determine the most relevant sources of uncertainty/error in analytical techniques.
- Demonstrate appropriate record-keeping by keeping a lab notebook that conforms to professional and ethical standards.

TENTATIVE LECTURE & LABORATORY SCHEDULE

Week Starting:	Schedule for Lecture Topics (Tentative - Subject to Change)	Lab Schedule
September 12	Introduction Analytical Process, Tools of the Trade	No labs
September 19	Experimental Error Statistics	Check-in Training Camp 1
September 26	Statistics	Training Camp 2
October 3	Equilibrium Asst 1 due	Training Camp 3
October 10 <i>Thanksgiving: Oct. 10</i>	Equilibrium Titrations	Carbonate Note: B01 will perform this lab on Nov. 7.
October 17	Activity & Systematic Treatment of Equilibrium Asst 2 due	Volhard
October 24	Activity & Systematic Treatment of Equilibrium Monoprotic Acids & Bases	Acid Mix
October 31	Midterm: Tues Nov 1, 12:30-1:45 (in-class) Monoprotic & Polyprotic Acids and Bases	Brass
November 7 <i>Reading Days: Nov 10-11</i>	Polyprotic Acids and Bases	Labs for section B01 only: Carbonate (Labs B02-B08 off)
November 14	Acid-Base Titrations Asst 3 due	Glycol
November 21	Acid Base Titrations	NTA
November 28	EDTA Titrations Asst 4 due	Limestone
December 5	EDTA Titrations Review	Check-out

*Assignments are due to the dropbox outside SA 116 before 3 PM on the announced due date. Check D2L for details.
Classes End: Dec 9 Exam Period: Dec. 12 - 22*