

UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS
Fall 2016

COURSE: CHEM 209, General Chemistry for Engineers

LEC	DAY	TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	TR	14:00-15:15	SB103	Dr. A. Musgrove Richer	SA 144F	220-2745	amanda.musgroveriche@ucalgary.ca	TBA
L02	TR	12:30-13:45	SB103	Dr. V. Mozol	SA 144E	210-9816	vjmozol@ucalgary.ca	TBA
Course Coordinator:				Dr. A. Musgrove Richer	SA 144F	220-2745	amanda.musgroveriche@ucalgary.ca	TBA
Lab / Tutorial Coordinator:				Dr. R. Jackson	SA 156	220-8274	rjjackso@ucalgary.ca	TBA

TEXTBOOK: *Chemistry: The Molecular Nature of Matter and Change*, 2nd Canadian Ed.; Silberberg M, Amateis P, Lavieri S, Venkateswaran R, 2016, McGraw-Hill Ryerson.

TOPICS INCLUDED AND SUGGESTED READING:

Students are responsible for all material included in the lectures, laboratories, and tutorials. Most of the relevant material for these content areas are in the designated sections from the textbook: Chapters 1-4, 6-10, 14-17 and 19.

Note that some material is regarded as review of high school chemistry and will not be addressed in lectures; however, being fundamental to many other topics in chemistry, will certainly be included in tutorials and exams.

Background knowledge to review before the course begins:

Chapter 1: Keys to the Study of Chemistry

Although all sections are included; the focus will be on sections 1.4–1.6.

Chapter 2: The Components of Matter

Although all sections are included; the focus will be on sections 2.5–2.9.

Chapter 3: Stoichiometry of Formulae and Equations

All sections are included.

Chapter 4: Gases and the Kinetic-Molecular Theory

Sections 4.1–4.4 only are included.

Big Idea 1: How fast is a reaction?

Chapter 14: Kinetics: Rates And Mechanisms Of Chemical Reactions

All sections 14.1–14.7 are included, In 14.5, omit the effect of molecular structure on rate (page 582). In 14.6, omit discussion of reactions with a fast initial step (pg. 589-

591), but include multistep reaction energy diagrams (p. 592). In 14.7, omit biological catalysts (page 595–596).

Big Idea 2: How far does a reaction proceed?

Chapter 15: Equilibrium: The Extent Of Chemical Reactions

All sections are included, but omit Equations 15.4 and 15.5 on page 615.

Chapter 16: Acid–Base Equilibria

Sections 16.1–16.2 should be reviewed before lectures begin on this topic.

Sections 16.3–16.4 and selected topics from 16.6 (pg. 689-690 only) will be included.

Chapter 17: Ionic Equilibria in Aqueous Systems

All sections are included.

Selected topics from Section 17.2 will be included in laboratory but not in lecture, and omitting discussion of polyprotic acids and amino acids, pg. 729-730. From Section 17.3, omit Selective Precipitation (page 741-742). From Section 17.4, omit Complex Ions of Amphoteric Hydroxides (page 749–750).

Chapter 19: Electrochemistry

Section 19.1 should be reviewed before lectures begin on this topic.

All sections are included.

Omit parts of section 19.4 dealing with Gibbs Energy (pages 835-837) and parts of Section 19.7 dealing with overpotential and electrolysis stoichiometry (pages 855-858)

Big Idea 3: What makes a bond?

Chapter 6: Quantum Theory and Atomic Structure

Portions of Chapter 6.4 are included – omit definitions of quantum numbers and radial probability plots.

Chapter 7: Electron Configuration and Chemical Periodicity

All sections are included.

Omit electron configurations of transition elements (pages 283-284 and 295-296).

Chapter 8: Models of Chemical Bonding

Sections 8.1–8.3 and 8.5–8.7 are included.

In Section 8.2, omit the Born-Haber cycle (pages 310-312).

Chapter 9: The Shape of Molecules

All sections are included.

Chapter 10: Theories of Covalent Bonding

Sections 10.1 and 10.2 are included.

Omit discussion of sp^3d and sp^3d^2 hybridization (page 380)

LABORATORY EXPERIMENTS:

1. Determination of the Hardness of Tap Water
 - Topic: *Previous background knowledge*
2. Kinetics of Fading of Phenolphthalein
 - Topic: *How fast is a reaction?* (Chapter 14)
3. Equilibrium Constant for the Formation of $\text{Fe}(\text{SCN})^{2+}$
 - Topic: *How far does a reaction proceed?* (Chapter 15)
4. Potentiometric Acid-Base Titrations
 - Topic: *How far does a reaction proceed?* (Chapters 16 & 17)
5. Electrochemical Determination of K_{sp} for Silver Salts
 - Topic: *How far does a reaction proceed?* (Chapter 17)
 - Topic: *What makes a bond?* (Chapters 6 & 7)

CHEMISTRY 209 FALL 2016: LECTURE, LABORATORY, & TUTORIAL SCHEDULE

Week Starting Date	Tentative Schedule for Lecture Topics	Lab Schedule	Tutorial Schedule
September 12	Introduction How fast are reactions? <i>Chemical Kinetics (Chapter 14)</i>	Orientation for odd-numbered lab sections	No Tutorials <i>**Look ahead: next week's tutorial quiz will require reviewing a lot of material.**</i>
September 19	How fast are reactions? <i>Chemical Kinetics (Chapter 14)</i>	Orientation for even-numbered lab sections	Tutorial 1 <i>Quiz</i> Review Material (Ch. 1 – 4) <i>**See "CHEM 209 Preparation" handout**</i>
September 26	How fast are reactions? <i>Chemical Kinetics (Chapter 14)</i> How far does a reaction proceed? <i>Equilibrium (Chapter 15)</i>	Experiment 1 for odd-numbered lab sections	Tutorial 2A <i>In-class Assignment</i> Kinetics (Ch. 14.1-14.3)
October 3	How far does a reaction proceed? <i>Equilibrium (Chapter 15)</i>	Experiment 1 for even-numbered lab sections	Tutorial 2B <i>Quiz</i> Kinetics (Ch. 14.1-14.7)
October 10	How far does a reaction proceed? <i>Acids & Bases (Chapter 16)</i> <i><u>Note:</u> Monday Oct 10 is Thanksgiving. B01 & B03 will perform Expt 2 on Thurs. Oct 13, from 19:00-22:00.</i>	Experiment 2 for odd-numbered lab sections <i>*see note*</i>	Review tutorial <i>**Students in T09 & T10 (Monday) may attend any other section this week**</i>
October 17	How far does a reaction proceed? <i>Buffers & Solubility (Chapter 17)</i>	Experiment 2 for even-numbered lab sections	No Tutorials <i>Midterm: Wed. Oct. 19th From 19:00-21:00.</i>
October 24	How far does a reaction proceed? <i>Buffers & Solubility (Chapter 17)</i> <i>Electrochemistry (Chapter 19)</i>	Experiment 3 for odd-numbered lab sections	Tutorial 3A <i>In-class Assignment</i> Acids & Bases (Chapter 16)
October 31	How far does a reaction proceed? <i>Electrochemistry (Chapter 19)</i>	Experiment 3 for even-numbered lab sections	Tutorial 3B <i>Quiz</i> Acids & Bases and Buffers (Chapters 16 & 17.1 – 17.2)

Week Starting Date	Planned Schedule for Lecture Topics	Lab Schedule	Tutorial Schedule
November 7	How far does a reaction proceed? <i>Electrochemistry (Chapter 19)</i>	No labs	No Tutorials <i>Reading Days: Nov. 10-11</i>
November 14	What makes a bond? <i>Atomic Structure (Chapter 6)</i> What makes a bond? <i>Electron Configuration (Chapter 7)</i>	Experiment 4 for odd-numbered lab sections	Tutorial 4A <i>In-class Assignment</i> Solubility (Chapter 17.3 & 17.4)
November 21	What makes a bond? <i>Models of Chemical Bonding (Ch. 8)</i>	Experiment 4 for even-numbered lab sections	Tutorial 4B <i>Quiz</i> Solubility & Electrochem. (Chapters 17.3, 17.4 & 19)
November 28	What makes a bond? <i>The Shapes of Molecules (Chapter 9)</i>	Experiment 5 for odd-numbered lab sections	Tutorial 5A <i>In-class Assignment</i> Atomic Structure & Electron Configurations (Chapters 6 & 7)
December 5	What makes a bond? <i>Theories of Covalent Bonding (Ch. 10)</i>	Experiment 5 for even-numbered lab sections	Tutorial 5B <i>Quiz</i> Atomic Theories & Bonding (Chapters 6-8)

Department Approval: Approved by Department Head

Date: August 31, 2016