

UNIVERSITY OF CALGARY
DEPARTMENT OF CHEMISTRY
COURSE SYLLABUS (CONTENT)
Winter 2015

1. COURSE: CHEMISTRY 209, General Chemistry for Engineers

LEC	DAYS	TIME	ROOM	INSTRUCTOR	OFFICE	PHONE	EMAIL	OFFICE HOURS
L01	TR	12:30 – 1:45	SB 103	Dr. M. Parvez	SB 331	220-5348	parvez@ucalgary.ca	TBA
L02	TR	8:00 – 9:15	ICT 102	Dr. S. Hinman	SA 144C	220-6017	ashinman@ucalgary.ca	TBA
Course / Lab / Tutorial Coordinator:				Dr. M. Parvez	SB 331	220-5348	parvez@ucalgary.ca	TBA

TEXTBOOK: Silberberg M, Lavieri S, Venkateswaran R. 2013. Chemistry: The Molecular Nature of Matter and Change. 1st Canadian Ed. 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, 6-11, 14-17 and 19.

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

Previous background knowledge to be reviewed 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, 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.

How fast is a reaction?

CHAPTER 14. KINETICS: RATES AND MECHANISMS OF CHEMICAL REACTIONS

All sections 14.1–14.7, except for the effect of molecular structure on rate (page 571) and biological catalysts (page 583–584)

How far does a reaction proceed?**CHAPTER 15. EQUILIBRIUM: THE EXTENT OF CHEMICAL REACTIONS**

All sections are covered, however equations 15.4 and 15.5 on page 603 are omitted.

CHAPTER 16. ACID–BASE EQUILIBRIA

16.1–16.2 are considered review material.

16.3–16.4 and selected topics within 16.5–16.6 will be covered in lectures.

CHAPTER 17. IONIC EQUILIBRIA IN AQUEOUS SYSTEMS

All sections, 17.1–17.4, are covered, however, Selective Precipitation (page 723–724) and Complex Ions of Amphoteric Hydroxides (page 731–732) are omitted.

CHAPTER 19. ELECTROCHEMISTRY

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

Sections 19.2–19.7 will be covered in lecture except for a part of section 19.4 dealing with Gibbs Free Energy and Electrical Work.

What makes a bond?**CHAPTER 6. QUANTUM THEORY AND ATOMIC STRUCTURE**

Sections 6.1–6.2 should be reviewed before lectures begin on this topic.

Sections 6.3–6.4 to be covered in lecture.

CHAPTER 7. ELECTRON CONFIGURATION AND CHEMICAL PERIODICITY

Sections 7.1–7.3 are included with selected topics in 7.4 (ionic size and magnetic properties).

CHAPTER 8. MODELS OF CHEMICAL BONDING

Sections 8.1, 8.3, 8.5–8.6 are included with selected topics in 8.2.

CHAPTER 9. THE SHAPE OF MOLECULES

All sections, 9.1 and 9.2 are included.

CHAPTER 10. THEORIES OF COVALENT BONDING

Sections 10.1 and 10.2 are included.

LABORATORY EXPERIMENTS:

1. Determination of the Hardness of Tap Water (Previous Background Knowledge)
2. Kinetics of Fading of Phenolphthalein (How fast is a reaction)
3. Equilibrium Constant for the Formation of $\text{Fe}(\text{SCN})^{2+}$ (How far does a reaction proceed)
4. Visual and Potentiometric Acid-Base Titrations, pH and Buffer (How far)
5. A Study of Corrosion of Iron and K_{sp} of Silver Salts (How far)

CHEMISTRY 209 WINTER 2015
LECTURE, LABORATORY, TUTORIAL SCHEDULE

Week Starting Date	Tentative Schedule for Lecture Topics	Lab Schedule	Tutorial Schedule
January 12	Introduction How fast are reactions? Chemical Kinetics (Ch. 14)	Orientation for odd-numbered lab sections	Stoichiometry & Review Material (Chapters 1 – 3) <i>Suggested problems for review:</i> Chapter 1: 27, 34, 45, 52, 54. Chapter 2: 39, 43, 57, 70, 102. Chapter 3: 25, 56, 66, 86, 112, 140.
January 19	How fast are reactions? Chemical Kinetics (Ch. 14 cont.) <i>Suggested problems: 12, 15, 20, 34 & 35</i>	Orientation for even-numbered lab sections	Gases (Chapter 4) <i>Suggested problems for review:</i> Chapter 4: 26, 33, 38, 47, 59, 104 Quiz # 1(Ch 1 – 4)
January 26	How fast are reactions? Chemical Kinetics (Ch. 14 cont.) <i>Suggested problems: 43, 44, 45, 59, 61, 72, 82, 83, 121,125</i> How far does a reaction proceed? Chemical Equilibrium (Ch. 15) <i>Suggested problems: 19, 29, 35, 45, 51, 59, 63, 76, 83, 87, 105, 109</i>	Experiment 1 for odd-numbered lab sections	Quiz # 2 Chemical Kinetics (Chapter 14.1-14.3)
February 2	How far does a reaction proceed? Chemical Equilibrium (Ch. 15 cont.) Chemical Equilibrium: Acids & Bases (Ch. 16) <i>Suggested problems: 18, 24, 35, 37, 44, 56, 58, 69, 75, 81, 97, 102</i>	Experiment 1 for even-numbered lab sections	Quiz # 3 Chemical Kinetics (Chapter 14.4-14.7)
February 9	How far does a reaction proceed? Chemical Equilibrium: Acids & Bases (Ch. 16 cont.) Chemical Equilibrium: Buffers & Solubility (Ch. 17) <i>Suggested problems: 16, 19, 28, 32, 37, 45, 52, 59, 61, 78, 85, 89, 110, 111, 159.</i>	Experiment 2 for odd-numbered lab sections	Quiz # 4 Chemical Equilibrium (Chapter 15)
February 16	Reading week – No lectures	No Lab	No Tutorial
February 23	How far does a reaction proceed? Chemical Equilibrium: Buffers & Solubility (Ch. 17 cont.)	Experiment 2 for even-numbered lab sections	Quiz # 5 Acids & Bases (Chapter 16)
March 2 <i>NOTE: Wednesday March 4 is Midterm from 19:00-21:00.</i>	How far does a reaction proceed? Electrochemistry (Ch 19) <i>Suggested Problems: 10, 12, 21, 30, 38, 42, 51, 70, 81, 87, 101, 105, 109, 154</i>	Experiment 3 for odd-numbered lab sections	Review tutorial No Quiz this week

Week Starting Date	Tentative Schedule for Lecture Topics	Lab Schedule	Tutorial Schedule
March 9	How far does a reaction proceed? <i>Electrochemistry (Ch. 19 cont.)</i>	Experiment 3 for even-numbered lab sections	Quiz # 6 Buffers & Solubility (Chapter 17)
March 16	What makes a bond? <i>Atomic Structure (Ch. 6)</i> <i>Suggested Problems: 7, 16, 48, 51, 53, 59, 75, 92</i>	Experiment 4 for odd-numbered lab sections	Quiz # 7 Electrochemistry (Chapter 19)
March 23	What makes a bond? <i>Electron Configuration (Ch. 7)</i> <i>Suggested Problems: 6, 13, 21, 23, 29, 37, 50, 53, 59, 77, 79, 83</i>	Experiment 4 for even-numbered lab sections	Quiz # 8 Atomic Structure (Chapter 6)
March 30	What makes a bond? <i>Models of Chemical Bonding (Ch. 8)</i> <i>Suggested Problems: 10, 17, 39, 58, 60, 64, 69, 71, 73, 79, 89.</i> <i>The Shapes of Molecules (Ch. 9)</i> <i>Suggested Problems: 6, 8, 14, 16, 20, 25, 31, 45, 46, 47</i>	Experiment 5 for odd-numbered lab sections	Quiz # 9 Electronic Configuration (Chapter 7)
April 6	What makes a bond? <i>Theories of Covalent Bonding (Ch. 10)</i> <i>Suggested Problems: 1, 7, 13, 20, 40 (a & b only), 44</i>	Experiment 5 for even-numbered lab sections	Quiz # 10 Chemical Bonding (Chapter 8)
April 13	What makes a bond? <i>Theories of Covalent Bonding (Ch. 10)</i>	No Lab	Review tutorial (Tentative)

Department Approval: Approved by Department Head

Date: 1 December 2014