

# Chemistry 201

## Spring 2018

Lecturer:

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Office hours: M,W 2-2:45 pm, 4-5pm; F 2-2:45 pm

Lab Coordinator:

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**Text:** Chapters 12-21 of “Chemistry” by Openstax; a PDF version of this is available for download on the Chem 201 Blackboard site. You can also order an on demand print version at the Book Store. Finally, if you wish, the entire text can be viewed online or downloaded for free from <https://openstax.org/details/books/chemistry>.

**Other Required Materials:** Chem 201 Lab Manual, Lab Notebook, approved lab apron, safety glasses or goggles, and a non-graphing, scientific calculator.

**Reading and Homework Assignments; Additional Study Material:** The reading and homework schedule as well as a large amount of extra study material such as old quizzes and exams will be available in Blackboard under “course documents” for the combined Chem 201 course.

**Grading.** Letter grades will be assigned based on your total points using the following scale:

A:1000-900; A-: 899-870

B+: 869-850; B:849-800; B-: 799-780

C+: 779-750; C: 749-650; C-: 649-600

D: 599-500

F: <500

### Points

3 midterm exams, multiple choice, 100 pt ea.	300
Final, multiple choice, comprehensive	200
Quizzes, best 8 out of 9, 20 pt ea.	160
4 Worksheets	40
Ion Naming Test, required to pass course	0
7 Lab Reports	175
2 Group Unknowns, 20 ea.	40
General Unknown	70
Misc. lab points	<u>15</u>
	1000 pts

Quizzes will be given in the Recitation sections. They will be based on lecture material from the previous week. A homework assignment will be given in lecture (but not collected) to help prepare you for each quiz. The Midterm exams will consist of 20 multiple choice questions. They will be given on Fridays at the regularly scheduled lecture time in various locations depending on lab section. The Final exam will consist of 40 multiple choice questions based primarily on questions from the 3 midterm exams. There will be a few questions based on material covered in lecture after the 3<sup>rd</sup> midterm exam.

**Getting Help.** Starting the third week of the semester, TA's will be available in the Chem 201 Help Room (GMCS 213a) to answer your questions on homework, labs, etc. The schedule for the Help Room will be posted on Blackboard and on the door. Also, don't hesitate to come to Dr. Smith's office hours with any questions or other concerns you may have regarding the course.

**Students with Disabilities.** If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

### **Learning Objectives for Chem 201**

The main goal of Chem 201 is to complete the general introduction to Chemistry begun in Chem 200 in order to prepare you for more advanced courses in science.

More specific goals are to

- (1) Make sure you are completely comfortable with basic chemical “arithmetic”, that is, calculations involving molecular weight, grams to moles, moles to grams, molarity, dilutions, reaction stoichiometry, and so on.
- (2) Make sure you are completely comfortable with drawing and looking at Lewis structures of chemical compounds. To start to get you thinking of molecules as 3-D objects and not just a collection of letters and numbers in a molecular formula.
- (3) Make sure you know the names, formulas, charges and structures of the common ions and the common strong acids and bases.
- (4) To learn to identify and understand what is happening in three fundamental types of chemical reactions: (i) acid-base reactions, (ii) ion dissolution and precipitation reactions and (iii) oxidation/reduction reactions.
- (5) To learn that there are two aspects to all chemical reactions - thermodynamics and kinetics, that thermodynamics determines the final result or equilibrium state of a chemical reaction, and that kinetics determines how long it will take to reach the equilibrium state.
- (6) More specifically, with regard to thermodynamics, to learn how we characterize the equilibrium state using the equilibrium constant expression and equilibrium constant ( $K$ ), how you can use knowledge of  $K$  along with other information (starting concentrations and stoichiometry) to calculate the final concentrations in a reaction, and how you can experimentally determine values of  $K$  by measuring the final concentrations. You should also learn that ultimately the value of  $K$  is determined by the thermodynamic properties (enthalpy, entropy and free energy) of the reactants and products in a chemical reaction and how you can use knowledge of these values to calculate  $K$ 's.
- (7) With regard to kinetics, you should learn how we characterize the kinetics or speeds of chemical reactions with the rate law and rate constant ( $k$ ), how we have to determine both of these quantities by experiment, and what types of experiments can be done to do this. You should also learn that the kinetics are determined by the exact path or mechanism that converts reactants to products, and how knowledge of the rate laws is very useful in determining what are likely mechanisms for a reaction.

Week # and Dates	Lecture Monday	Recitation Mon/Tues	Lecture Wednesday	Lab Wed/Thurs	Lecture Friday
#1 Jan. 15 – Jan. 19			Introduction  <i>First day of classes</i>	Introduction Roll call Locker Check –in	Chap. 7 - Review of Lewis Structures
#2 Jan. 22 - Jan. 26	Chap. 7 - Review of VSEPR	Ion test – 1 <sup>st</sup> try	Chap. 7 - Review of Formal Charge and Resonance	<b>Pipet Exercise</b> <b>Experiment 1</b> - Introduction to the Spectrophotometer	Chap. 4 - Review of Basic Reaction Stoichiometry; Limiting Reagents
#3 Jan 29 - Feb. 2	Chap. 13 - Equilibrium	<b>Quiz 1</b> Ion Test - 2 <sup>nd</sup> try	Chap. 14 - Bronsted Acids and Bases; Conjugate Acid/Base Pairs	<b>Experiment 2-</b> Phosphate Analysis  <i>Exp. 1 report due</i>	Chap. 14 - pH
#4 Feb. 5 - Feb. 9	Chap. 14 - Strong Acids and Bases	<b>Quiz 2</b>	Chap. 14 - Weak Molecular Acids	<b>Experiment 3-</b> Ka and Kb  <i>Exp. 2 report due</i>	Chap. 14 - Weak Molecular Bases
#5 Feb. 12 - Feb. 16	Chap. 14 - Weak Ionic Acids and Bases	<b>Quiz 3</b>	Chap. 14 - Buffers	Mg group unknown  <i>Exp. 3 report due</i>	<b>Exam 1</b>

Deadline for adding or dropping classes is January 30.

Week # and Dates	Lecture Monday	Recitation Mon/Tues	Lecture Wednesday	Lab Wed/Thurs	Lecture Friday
#6 Feb. 19 - Feb. 23	Chap. 14 - Buffers	<b>Worksheet 1</b>	Chap. 14 - buffers	Al group unknown	Chap. 14 - pH titrations
#7 Feb. 26 - Mar. 2	Chap. 14 – pH titrations	<b>Quiz 4</b>	Chap. 15 - Solubility Equilibria	<b>Experiment 4</b> - pH titration	Chap. 15 - Factors Affecting Solubility
#8 Mar. 5 - Mar. 9	Chap. 15 - Factors Affecting Solubility; complex ion formation	<b>Quiz 5</b>	Chap. 15 - Precipitation Reactions; Qual. Scheme	<b>Experiment 5</b> - Formation Constants <i>Exp.4 report due</i>	Chap. 16 - Entropy
#9 Mar. 12 - Mar. 16	Chap.16 - 2 <sup>nd</sup> Law of Thermodynamics	<b>Worksheet 2</b>	Chap. 16 - Free Energy	General Unknown  <i>Exp.5 report due</i>	<b>NO CLASSES</b> (NCAA BB tourn)
#10 Mar. 19 - Mar. 23	Chap. 16 - Free Energy and Equilibrium	<b>Quiz 6</b>	Chap. 17 - Balancing Oxidation Reduction Rxns	General Unknown	<b>Exam 2</b>
Mar. 26 – Mar. 30	SPRING BREAK				

Week # and Dates	Lecture Monday	Recitation Mon/Tues	Lecture Wednesday	Lab Wed/Thurs	Lecture Friday
#11 Apr. 2 - Apr. 6	Chap. 17 – Electrochemical Cells	<b>Worksheet 3</b>	Chap. 17 - Standard Electrode Potentials	General Unknown	Chap. 17 – Using standard electrode potentials
#12 Apr. 9 - Apr. 13	Chap. 17 - Nernst Equation Concentration Cells	<b>Quiz 7</b>	Chap. 12 - Rates of Reactions	<b>Experiment 6</b> Echem Cells <i>Gen. Unk. report due</i>	Chap. 12 - Rates Laws
#13 Apr. 16 - Apr. 20	Chap. 12 - Integrated Rate Laws	<b>Quiz 8</b>	Chap. 12 - Collision Theory	<b>Experiment 7</b> Kinetics  <i>Exp.6 report due</i>	Chap. 12 - Transition States
#14 Apr. 23 – Apr. 27	Chap. 12 - Mechanisms	<b>Quiz 9</b>	Chap. 12 - Catalysis	Locker Check Out  <i>Exp.7 report due</i>	<b>Exam 3</b>
#15 Apr. 30 - May 4	Chap. 21 - Nuclear Reactions and Radioactivity	<b>Worksheet 4</b>	Chap. 21 - Energy of Nuclear Reactions	<b>NO LAB</b> <i>Last day of classes is Thursday, May 3</i>	
#16 May 7 - May 11			<b>FINAL EXAM</b> <b>1:00 – 3:00pm</b>		

**FINAL EXAM, May 9 (Wednesday), 1:00 – 3:00 PM**