

Southwestern College
Spring 2019

Chem 210: This course is the second semester of the one year sequence of college general chemistry for science, engineering and pre-professional majors like medicine and dentistry. The class consists of three hours of lecture and six hours of lab each week for a total of five units.

Pre-requisites: Chemistry 200 with a grade of C or better, or equivalent. Math 101 or 121, with a grade of C or better, a higher math course, or a satisfactory score on the Math Placement Test. It is further assumed that the student can read, write and understand English at a technical level equal to that found in the texts for the course.

Instructor: David Hecht
Office: Room 60-272
Office hours: MW 2:00-4:00 pm 60-272 or by Appointment
Phone: 421-6700 ext 5461, voice mail
eMail: dhecht@swccd.edu
Lecture: MW 8:30- 10:00 Room 60-134 (**section 01**)

Lab: MW 10:10-1:20 Room 60-277 (**section 01**)

Texts: Chemistry: The Molecular Nature of Matter and Change Edition 6, 7 or 8 by Martin Silberberg (McGraw Hill). Note: older editions are acceptable, please check with me!

As a supplemental text please feel free to use the Chemistry textbook posted at:
<https://openstax.org/>

Lab Protocols and Experiments will be posted on Canvas.

Required supplies: 1 Bound laboratory notebook (dual page), simple, non-graphing scientific calculator, USB flash drive, Safety goggles or glasses, Soap, Towel, nitrile gloves & Lab Coat

Important Dates: Last day to add: February 10
Last day to drop/no grade: February 10
Last day to drop/W grade: April 27
Final Exam: Monday May 20 8:00-10:00 am Section 01

While the instructor may drop a student for non-attendance, it is still the student's responsibility to take care of any administrative paperwork to insure a drop has been recorded.

Enrollment: Students must be in attendance the first 15 minutes of the first lab in order to guarantee enrollment in the class unless prior arrangements have been made with the instructor.

Attendance: Students are expected to attend every class meeting in which they are registered. In case of absence, it is the responsibility of the student to inform the instructor. After the add period of the term, instructors may drop a student from the class if the student's total hours of absence for any reason exceed twice the number of hours the class meets per week (based on semester length classes). It is the student's responsibility to drop their class in a timely manner should they stop attending. Students who fail to drop class in a timely manner risk earning a failing grade in the class.

Excessive Tardiness: A student is considered tardy if they are not present and seated at the beginning of the class session. A tardy becomes an absence if the student misses greater than 15 minutes at the beginning or end of the class session.

STUDENTS MUST BE ON TIME AND PRESENT FOR THE PRE-LAB LECTURE OR THEY WILL NOT BE ALLOWED TO PARTICIPATE IN LAB AND WILL RECEIVE 0 PTS FOR THE DAY'S WORK!

Instructors may drop a student for excessive tardiness. Excessive tardiness is defined as arriving late to class or required class activity more than three times after the first two weeks of the semester or the first week of a fast track or summer session. If the instructor intends to drop the student after the third tardiness, the instructor shall warn the student verbally or in writing. Following the warning, the instructor may drop a student from class upon the next instance of tardiness.

Grading: In order to pass this course you must have a passing grade in both lecture and lab (60% or better). Your grade will be based on the following:

Quizzes (on-line)	10%
Lecture exams (three exams)	45%
Final exam (cumulative)	20%
Laboratory	25%

The overall grade will be based on 90% an A, 80-89% a B, 70-79% a C, and 60-69% a D.

All work must be shown on all assignments. NO work = NO credit. Only simple, non-graphing scientific calculators will be allowed for tests!

On-Line Quizzes: It is up to each student to login on a regular basis and check the due dates. Please note these assignments will represent 10% of your grade!

Laboratory: All safety regulations are strictly enforced in the laboratory. Violation of the rules will constitute grounds for removal from the class. **SAFETY GLASSES, LAB COATS AND CLOSE-TOED SHOES MUST BE WORN AT ALL TIMES IN THE LAB. EATING OR DRINKING DURING LAB IS PROHIBITED.** Students must come to class on time, equipped and prepared. Prelabs will be collected at the beginning of each class. **NO CELL PHONES ARE ALLOWED AT ANY TIME** unless the instructor gives permission for purposes of taking pictures/recording data/videos.

Failure to complete and turn in the appropriate pre-lab, lab report and any other assignment at the beginning of lecture as well as failure to prepare your lab notebook will result in removal from class with 0 points assigned! If you come late and miss the lab prep will also result in removal from class with 0 points assigned!

Pre-labs and Lab reports must be received by beginning of class or it will result in ZERO points for the assignment.

Lab Reports & Lab Notebooks Experimental data must be written **DIRECTLY INTO LABORATORY NOTEBOOKS.** Failure to do so will result in a score of ZERO for the assignment. All pages on lab notebooks must be signed and dated. All blank areas and pages must be crossed out and initialed/dated. Carbon copies of ALL RELEVANT lab notebook pages are due with each lab including formal reports. Formal lab reports must be typed – including equations and tables of data as well as graphs for analyses. Hand written data/equations will result in lost points. Spectra or other experimental output may be attached as supplements. All formal lab reports must include **Title, Investigators' Name(s), Abstract, Introduction, Materials & Protocols, Results & Calculations** (including observations, data in tables, equations & formulas, calculations, graphs, etc.), **Discussion & Conclusion** as well as a **Bibliography/References** sections.

Make-ups/Lates: There are NO make-ups on exams, labs, or quizzes unless arrangements have been made ahead of time. All work is due at the beginning of the class with lab reports turned in generally one week after the lab has been completed. **Labs not turned in at the beginning of the class are late and may NOT be turned in late and 0 points will be awarded.** Although homework is not collected, it is highly recommended that you do all of the assigned problems to be successful in this course. Quizzes may or may not be announced and given in lecture and/or lab. Quizzes and exams may include homework problems. All work turned in for this class must be identified by both your name and the section number at the top right hand corner of the first page.

Lab Fees: It is your responsibility to check out of your lab locker no later than the scheduled locker check-out date on your class syllabus/tentative schedule; even if you drop the class. You will be provided a locker with a specified set of glassware and equipment to use during the semester. It is expected that you will return the locker in the condition you found it - clean and complete as well as to remove your personal belongings. Failure to check out by the deadline and/or loss or breakage of your locker materials will result in

- An academic hold placed in your record. This hold will not allow you to:
 - View grades
 - Register for classes and/or make changes in your class schedule
 - Request transcripts
- You being assessed a minimum of \$20 lab fee.

To check out of your locker before or by the deadline noted below, please contact stockroom personnel to schedule an appointment by

- Coming to Chemistry Stockroom, Room 330
- Or calling at (619) 421-6700 ext 5294

Or email: Maria at mbernal@swccd.edu or Antonio at aromero@swccd.edu

DEADLINE FOR LOCKER CHECK-OUT IS May 17, 2019

Academic Integrity: Southwestern College students are expected to adhere to the fundamental values of honesty, trustworthiness, fairness, and respect for the learning process at all times in their academic endeavors. Violations of academic integrity include, but are not limited to, cheating, plagiarism, lying, stealing, submitting others' work as one's own, or permitting anyone else to do the same. Academic dishonesty of any type by a student provides grounds for disciplinary action by the instructor or college. In written work, no material may be copied from another without proper quotation marks, footnotes, or appropriate documentation. A violation of academic integrity may result in a zero grade and/or removal from the class.

Disabilities: Southwestern College recommends that students with disabilities or specific learning needs contact their professors during the first two weeks of class to discuss academic accommodations. If a student believes that they may have a disability and would like more information, they are encouraged to contact Disability Support Services (DSS) at (619) 482-6512 (voice), (619) 207-4480 (video phone), or email at DSS@swccd.edu. Alternate forms of this syllabus and other course materials are available upon request.

Academic Success Center Referral: To further your success, reinforce concepts, and achieve the stated learning objectives for this course, I refer you to the Academic Success Center learning assistance services. Upon request for tutorial services, you will be automatically enrolled in NC 3: Supervised Tutoring, a free noncredit course that does not appear on your transcripts. Services are located in the ASC (420), the Writing Center (420D), the Reading Center (420), Math Center (426), the Library/LRC Interdisciplinary Tutoring Lab, MESA, specialized on-campus School tutoring labs, the Higher Education Center, and the San Ysidro Education Center. Online learning materials and Online Writing Lab (OWL) are available at www.swccd.edu/~asc.

Tutorial Services: To further your success, reinforce concepts, and achieve the stated learning objectives for this course, you are referred to the Academic Success Center (420) learning assistance services. You will be automatically enrolled in NC 3: Supervised Tutoring, a free noncredit course that does not appear on your

transcripts. The MESA Center, located in Room 396 provides, free tutoring for all transfer-level math and science courses. The tutorial services at Southwestern will serve you best if you attend regularly.

Classroom Conduct: Anyone engaged in behavior deemed by the instructor to hinder either the teaching or learning processes will receive a warning. Excessive and/or disruptive use of electronic devices, including (but not limited to) mobile phones, tablets, pagers, personal computers, or mp3 players, will result in a warning from the instructor. Failure to heed any warning may result in the student's removal from class. As noted in the required course materials, only simple, non-graphing scientific calculators will be allowed on quizzes and exams.

Course Topics:

Inter-molecular Forces: liquids, solids, intermolecular forces, phase changes

Solutions: solvation, solubility, concentration, colligative properties

Kinetics: reaction rates, effects of time and concentration of rate, reaction mechanisms, catalysis

Aqueous equilibria: common ion, buffers, titration, K_{sp}

Thermodynamics: entropy, Gibbs Free Energy, ΔG and temperature, ΔG and K

Electrochemistry: redox, voltaic cells, cell EMF, spontaneity, concentration and EMF, batteries, corrosion, electrolysis

Nuclear Chemistry: radioactivity, nuclear stability, transmutations, rates of decay, fission, fusion

Coordination Compounds: structure, chelates, crystal-field theory

Organic and biochem: alkanes, unsaturated hydrocarbons, alcohols, ethers, carbonyl compounds, chiral compounds, proteins, carbohydrates, nucleic acids

For complete course objectives and outline see: swccd.edu/~mse/PhysicalScience/Chemistry

Learning Student Objectives:

1. Student will discuss the solution process and the effects the formation of a solution has on physical properties and calculate freezing point lowering, boiling point elevation, and osmotic pressure.
2. Student will identify intermolecular forces and relate them to boiling point, melting point, vapor pressure, and phase of a substance.
3. Student will use phase diagrams to discuss the relationship between pressure and temperature on a substance.
4. Student will use a heating curve to calculate phase change energy problems.
5. Student will determine the rate law for a chemical reaction from experimental data or a mechanism, calculate the effect of the change in time or concentration on the rate, and discuss the effects of activation energy and a catalysis on the rate.
6. Student will work mathematical problems relating to systems in equilibrium.
7. Student will calculate problems involving titration and buffer solutions.
8. Student will calculate the solubility of a slightly soluble compound from its solubility product constant, or vice versa.
9. Student will explain three laws of thermodynamics, and do calculations relating enthalpy, entropy, free energy, and equilibrium constants.
10. Student will balance redox reactions, calculate E° , E and problems involving electrolytic cells; predict spontaneity; and discuss batteries and corrosion.
11. Student will write balanced nuclear equations, calculate the atomic number and mass number of the product isotope from a nuclear reaction, calculate $1/2$ life, and discuss fission and fusion.
12. Student will name and draw structural formulas for coordination compounds of the transition metals and their isomers, and explain some relationships between structure and physical properties for these compounds using crystal-field theory.
13. Student will draw structural formulas from the names of simple organic compounds, or vice versa.
14. Student will identify by name the functional groups in an organic or biochemical compound from its structural formula.
15. Student will use various laboratory equipment and instruments, including spectrophotometers, AA, FTIR, and multimeters to perform laboratory exercises.
16. Student will carry out laboratory experiments relating to kinetics, equilibrium, electrochemistry, and other important relationships in chemistry and write up their results including an error discussion.
17. Student will work out schemes for the analysis of cations in an aqueous solution, and analyze solutions for which ions are present based upon their schemes.

Student Learning Outcomes:

- 1). Clearly explain qualitative chemical concepts and trends. Describe, explain, and model chemical and physical processes at the molecular level in order to explain macroscopic properties.
- 2). Perform laboratory techniques correctly using appropriate safety procedures. Analyze the results of laboratory experiments, evaluate sources of error, synthesize this information, and express it clearly in written laboratory reports.
- 3). Solve quantitative chemistry problems and demonstrate reasoning clearly and completely. Integrate multiple ideas in the problem solving process. Check results to make sure they are physically reasonable.

Recommended Silberberg Problems

Success in this class is directly related to your commitment to completing and understanding the following problems. Although these problems will not be collected, there's a *very good chance* that similar problems will appear on exams. Answers to select problems are in the back of the textbook. Please ask if you have any questions – especially during office hours- I'll be happy to go over any problem with you.

Chapter 17

1,2,3,4,5,6,7,9,10,11,12,14,16,18,20,23,25,26,27,29,31,33,35,37,41,43,45,47,49,51,53,55,59,62,63,65,67,69,71,73,76,78,80,83,87,93,99,100,103,105,108,109

Chapter 18

2,4,5,7,9,11,13,15,17,22,23,25,27,29,31,33,36,37,41,43,44,45,47,49,51,53,55,57,59,63,65,67,69,71,73,75,77,79,81,83,86,88,90,92,94,98,103,106,107,110,113,115,147,149,155,158,163,166,178,181

Chapter 19

6,8,9,11,14,16,17,20,21,24,26,28,30,32,34,35,38,40,43,45,49,51,52,55,57,58,61,62,67,71,75,79,85,87,90,94,95,97,100,102,103,105,107,110,113,116,117,120,122,125,127,130,133,136,137,143,146,148,149

Chapter 16

3,5,8,11,12,13,14,15,16,17,18,19,20,22,23,25,26,28,29,30,32,33,34,35,36,37,38,39,41,43,44,45,47,48,50,51,53,54,55,57,59,61,63,64,65,68,70,72,73,74,75,76,79,81,82,83,84,85,87,88,89,90,92,94,96,97,98,99,100,102,103,105,106,108,109,110,111,112,114,117,120,121,125,126

Chapter 20

2,3,4,5,6,7,8,10,12,14,16,18,20,22,24,26,28,30,32,33,35,37,39,41,44,46,47,48,49,50,52,54,56,58,60,62,63,64,66,67,68,70,72,74,76,78,80,82,83,86,87,89,91,93,95,98,100,101,102,103,105

Chapter 21

1,3,6,8,10,12,14,16,18,21,22,25,26,27,29,31,33,34,36,37,38,40,42,44,46,48,50,53,55,56,58,60,62,64,66,68,70,72,74,76,78,81,82,83,85,87,89,91,93,95,97,99,101,103,105,107,109,111,114,115,118,121,123,124,125,127,139,140,141,142,143,145,146,150,152,153,154

Chapter 12

1,3,6,8,9,13,15,17,18,20,22,24,26,28,29,31,33,35,38,40,42,44,46,48,50,52,54,55,57,60,61,62,64,66,67,68,70,72,75,77,78,80,81,82,84,85,86,88,91,92,93,96,98,100,103,105,107

Chapter 13

2,4,7,9,11,13,16,18,21,22,25,26,28,29,30,31,32,34,36,38,40,41,42,44,46,49,52,54,56,58,60,62,64,66,68,70,72,74,77,78,80,82,84,85,87,88,90,92,94,96,98,100,102,104,107,108,110,113,115,118,120,122,124,125,126,129,133,136,138,140,144,146,149,151,154,155,157,158,159,160

Chapter 23

2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,37,39,42,45,46,49,50,51,53,54,55,57,59,61,63,65,67,69,71,72,73,78,80,82,84,86,88,90,92,94,97,99,102,106,107,109,110,111,113,115,116,118,120,122

Chapter 24

1,2,4,6,8,10,12,14,16,18,20,22,24,26,28,31,33,35,37,39,41,43,45,47,50,52,53,55,56,58,60,62,65,67,69,70,73,75,77,79,81,83,85,88,89,91,93,95,98,99,100,101,102,104,106,110,113,115,118,121,124,126,127,130,134,136,137,141

Date: Read BEFORE class/Lecture:

Complete before class:

M	1/28	Ch. 17.1-5 Equilibrium & Problems	
	Lab	Check in, Safety, Lab Notebooks, Lab Reports	
W	1/30	Ch. 17.1-6 Equilibrium Problems & Le Chatelier's Principle	
	Lab	CURE Assessments (Laptops) Lab 1. Glassware Calibration*	
M	2/4	Ch. 18.1-5 Acids & Bases	Due: Quiz #1
	Lab	Lab 1. Glassware Calibration*	
W	2/6	Ch. 18.6-9 Acids & Bases	
	Lab	Lab 2. Homogeneous Equilibrium	
M	2/11	19.1-2: Common ion and buffers Acid/base titration	Due: Quiz #2
	Lab	Lab 2. Homogeneous Equilibrium & Computer Lab (Laptops)	Due: Lab 1 Glassware Calibration*
W	2/13	19.1-2: Common ion and buffers Acid/base titration	
	Lab	Lab 3. Titrations*	
M	2/18	HOLIDAY!	
W	2/20	19.1-2: Common ion and buffers Acid/base titration	
	Lab	Lab 3. Titrations*	Due: Lab 2 Homogeneous Equilibrium (Informal)*
M	2/25	19.3-4: Solubility equilibrium & Complex ions	Due: Quiz #3
	Lab	Lab 4. Buffers*	
W	2/27	19.4 Precipitation and Qualitative Analysis	
	Lab	Lab 3. Calculations and Analysis (need laptops) Lab 2. Formal Lab Workshop	Due: Lab 2 Homogeneous Equilibrium Formal Lab (Rough Draft)
M	3/4	23.1-3: Transition Metals, Complexes, Naming and Isomerism	Due: Quiz #4
	Lab	CURE: Intro, Bkg & Hypotheses	Due: Lab 3 Titrations* & Lab 4 Buffers*
W	3/6	Review	
	Lab	Exam #1. Ch. 17, 18, 19	
M	3/11	23.4 Valance Hybridization & Crystal Field Theory	
	Lab	CURE: (TBD)	Due: Lab 2 Homogeneous Equilibrium Formal Lab (Final Draft)
W	3/13	16.1-5: Reaction rates & Rate laws, Temperature and rate	
	Lab	Lab 5. Ligand Field Spectroscopy	
M	3/18	16.6-8: Reaction Mechanism, Catalysis	Due: Quiz #5
	Lab	Lab 12. Kinetics	
W	3/20	16.6-8: Reaction Mechanism, Catalysis 20.1-3: Spontaneity, entropy, Gibbs Free Energy	
	Lab	Kinetics Lab Workshop (laptops)	Due: Lab 5 Ligand Field Spectra (Informal*)

3/25-3/29 SPRING BREAK!

Date: Read BEFORE class/Lecture:

Complete before class:

M	4/1	HOLIDAY!	Due: Quiz #6
W	4/3	20.1-3: Spontaneity, entropy, Gibbs Free Energy 20.3-4: Free Energy and equilibrium	
	Lab	CURE (TBD)	Due: Lab 12 Kinetics (Informal*)
M	4/8	20.3-4: Free Energy and equilibrium 21.1-3: Redox reactions, Voltaic cells, EMF	
	Lab	CURE (TBD)	
W	4/10	21.3-6: Voltaic cells, EMF, Cell potential, Free energy, work	
	Lab	CURE (TBD)	Due: Lab 12 Kinetics (Formal Lab)
M	4/15	21.3-6: Voltaic cells, EMF, Cell potential, Free energy, work	Due: Quiz #7
	Lab	CURE (TBD)	
W	4/17	21.6-7: Batteries, Corrosion, Electrolysis	
	Lab	Exam #2. Ch. 16, 20, 23	
M	4/22	21.6-7: Batteries, Corrosion, Electrolysis 12.1-4: Phase changes, Intermolecular forces, liquids	
	Lab	Lab 9 & 10. Electrochemistry* & Corrosion*	
W	4/24	12.3-6: Phase changes, Intermolecular forces, liquids, Water	
		Lab 9 & 10. Electrochemistry* & Corrosion*	
M	4/29	12.6-7: Material Science & Solids	Due: Quiz #8
	Lab	Lab 11 Material Science*	
W	5/1	13.1-4: Solutions, Concentrations, Solubility & temp/pressure	Due: Labs 9 Electrochem* & Lab 10 Corrosion*
	Lab	CURE (TBD)	
M	5/6	13.1-4: Solutions, Concentrations, Solubility & temp/pressure 13.5-7: Colligative properties, colloids	Due: Quiz #9
	Lab	CURE (TBD) & Locker Check Out	Due: Lab 11 Material Science*
W	5/8	13.5-7: Colligative properties, colloids	
	Lab	Exam #3. Ch 12, 13, 21	
M	5/13	24.1-3: Radioactivity, stability, Kinetics of decay & Transmutation	Due: Quiz #10
	Lab	CURE Presentations	
W	5/15	24.4-5: Effects and applications of radiation	Due: Quiz #11
	Lab	CUREs assessment & Review (laptops)	
M	5/20	Final Exam: 8:00-10:00 am (section 01)	

*Informal Lab Report