

San José State University
Department of Chemistry
Chem 10: Chemical Calculations, Fall 2019

Course and Contact Information

Instructor:	Laura Kapitzky, Ph.D.
Office Location:	Science 140
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Email:	laura.kapitzky@sjsu.edu
Office Hours:	Tuesdays and Thursdays 10:30 – 11:30 in SCI 140
Class Days/Time:	Tuesdays and Thursdays 1:30 to 2:20 Friday from 1 – 2:45pm
Classroom:	Tuesdays, Thursdays, and Fridays meet in Duncan Hall 415
Prerequisites:	One year of high school algebra

Course Format

This class is a technology intensive face-to-face class. You will need access to the internet during class meetings, and the ability to take a photograph of your paper and upload it to Canvas. A WIFI-enabled cell phone, tablet, or computer will fulfill this requirement.

MYSJSU Messaging and Canvas Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](http://my.sjsu.edu) at <http://my.sjsu.edu> and keeping track of the course Canvas announcements and Canvas messaging to learn of any updates.

Course Description

Fundamental concepts in chemistry and problems in chemical symbolism and calculations. For students wishing to continue in chemistry, but lacking prerequisites for CHEM 001A. Prerequisite: One year high school algebra. Misc/Lab: Lecture 2 hours/activity 2 hours. Notes: No credit towards chemistry major or minor.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

- 1) apply significant figures rules in all calculations providing the correct number of significant figures and units.
- 2) convert between different units using conversion factors and dimensional analysis
- 3) name elements, provide their symbols and determine the number of protons, neutrons, electrons and nuclei in elements and compounds
- 4) calculate percent composition given a molecular formula and molecular formula given the percent composition
- 5) name salts, acids, bases and covalent compounds and provide formulas for these given a molecular formula
- 6) explain the difference between solubility and dissociation in water and apply this knowledge

- to acids, bases and salts
- 7) identify weak and strong acids and bases and insoluble compounds using dissociation and solubility rules and develop the net ionic representation for these species using the rules.
 - 8) construct molecular, total and net ionic equations for double and single displacement reactions
 - 9) identify redox reactions including identifying the oxidation, reduction, oxidation agent and reducing agent
 - 10) calculate oxidation numbers and balance redox reactions
 - 11) perform stoichiometry calculations for chemical systems whether the limiting reactant is known or unknown
 - 12) calculate molarity of a solution starting with pure solute or with a concentrated solution as well as explain how to prepare a solution of a given molarity
 - 13) provide brief descriptions of the accomplishments of Planck, Einstein, Thompson, Rutherford, Millikan, Rydberg, Bohr, de Broglie and Schrodinger; and how these contributed to understanding the atom
 - 14) convert between wavelength, energy and frequency for light and understand the relationship between absorbed light and color
 - 15) know the spectral lines are the result of transitions of electrons between energy levels; calculate the energy and wavelength of a given electronic transition in hydrogen
 - 16) define what each quantum number represents and how to obtain quantum numbers for any electron in an atom
 - 17) analyze an atom or ion of a given element providing the full electronic configuration, the abbreviated electronic configuration
 - 18) identify the locations of metals (alkali, alkaline earth and transition), nonmetals, semimetals and halogens in the periodic table
 - 19) use the periodic table to identify trends in ionization energy, electronegativity and the relative sizes of ions and atoms
 - 20) use the periodic table to determine the number of electrons available for bonding
 - 21) determine whether a bond is metallic, ionic, covalent or polar covalent
 - 22) represent covalent and ionic bonding using Lewis dot structures
 - 23) evaluate the molecular geometry, hybridization and polarity of a covalent molecule
 - 24) identify the intermolecular forces of attraction found in compounds and its relationship to volatility and boiling/melting point
 - 25) explain the properties of temperature and pressure including how these are measured and convert between different units for these properties, including the use of different liquids in the measurement of pressure
 - 26) derive the relationships between pressure, volume, temperature and moles for ideal gases; perform calculations using these relations, including when they are combined with stoichiometry or percent composition problems
 - 27) calculate the concentration of a solute in terms of grams per liter, molarity, molality, and percent by weight.
 - 28) calculate using the relationship between the molality of a solute in solution, the solutions depressed freezing point or elevated boiling point
 - 29) recognize reversible reactions, and write and apply an equilibrium constant expression
 - 30) apply Le Chatelier's principle to predict the effect of changes in concentration, temperature, and pressure on the chemical equilibrium
 - 31) explain the concept of specific heat and apply the equation to heating or cooling of materials
 - 32) perform heat transfer calculations for systems with and without phase changes
 - 33) calculate heats of reaction using calorimetry, including combining the process with stoichiometry, and identify whether the reaction is exothermic or endothermic

- 34) name unsubstituted and substituted alkanes, alkenes and alkynes given a drawing of a molecule and vice versa
- 35) identify all the isomers associated with simple aliphatic hydrocarbons and predict boiling point and vapor pressure change as a function of the number of carbons
- 36) identify and name the organic functional groups in a molecule

Required Texts/Readings (Required)

Textbook

1. **Foundations of Chemistry: Applying POGIL Principles by Hanson, Goodwin, and Phillips.** Pacific Crest Publishing company, 2018 (ISBN: 978-1-60263-516-6)
This will be our main workbook for the class. You will need to bring this book to every class meeting.
2. **Atoms First by Mark Bishop.** Chiral Publishing Company, 2009 (ISBN: 978-0-9778105-9-8)
An electronic version of this book is available for free at http://preparatorychemistry.com/Bishop_Atoms_First.htm. If you prefer, you can buy a paper copy of this book at the SJSU Bookstore. A paper copy is not required for this class.

Other Readings

There will be a few readings outside of the two textbooks. They will be provided on Canvas at the appropriate time in the semester.

Other technology requirements / equipment / material

You will need to bring with you to class a web-enabled device capable of taking photographs and connecting to Canvas. This can be a computer, tablet, or cell phone.

Course Requirements and Assignments

To pass this class, students are required to demonstrate progression towards understanding of, and ultimately adequate knowledge of, the topics introduced during lecture and activity. Knowledge will be demonstrated on three graded in-class midterms and three graded quizzes scheduled throughout the semester, and progression towards understanding will be demonstrated on in-class activities completed during the activity period. Exam and activity dates can be found on the schedule at the end of this greensheet.

It is your responsibility to keep track of exam and quiz dates, activity due dates, and your own progress in the class. It is your responsibility to assess your understanding as we move through the material and reach out for help if you feel it is necessary. You can contact me via email or Canvas messaging. **Do not wait until the last minute to ask for help!**

Further university-wide information regarding attendance, grading, religious holidays, and more can be found at the Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”

Final Examination or Evaluation

A written final exam of a similar format to the midterm exams will be administered during the scheduled final exam period.

Grading Information

Attendance Policy

Beyond the initial two days of class, roll will not be taken. However, attendance of all class meetings is mandatory. If you miss a class, you are still responsible for all the material discussed on that day. If you miss class meetings, it will be difficult to catch up due to the volume of material we will be covering this semester.

Exams

There will be 3 midterm exams given throughout the semester, each with a maximum score of 100 points. You are required to take any 2 mid-term exams. If you take all 3 midterm exams, the two highest scores will be used in the calculation of your grade. If you do not take one of the midterms, for any reason, your score will be recorded as a zero and will be dropped in calculating your final score. The midterm exams will be given at the start of the activity period. Plan to arrive on time when an exam is scheduled, since all exams will be collected at the same time, no extra time is provided if you start late.

The final exam will be comprehensive for all material covered in Chem 10 and will be worth 200 points. The final exam is required for all students enrolled in Chem 10.

Quizzes

Quizzes will be given at the start of the activity period and will cover the material since the last quiz or exam. Each quiz will be worth 25 points total and will be completed in the first 15 minutes of class. Arrive on time since all quizzes will be collected at the same time, no extra time is provided if you start late. Four quizzes will be given but only three will count towards your grade. The lowest quiz score (or missed quiz) will be not be used in grade calculation.

In Class Activities

We will primarily be working with the Foundations of Chemistry workbook this semester. Every class you will be answering questions in the workbook in order to think your way through new material. At the end of every class period, you will photograph your work and submit it to Canvas before leaving for the day. Activities will be graded on a scale of 0 – 2. You must be present to earn points for the day's activity. Activities missed due to unexcused absences cannot be turned in for points.

Participation

Throughout the course we will use Plicker cards (a low-tech but effective version of clickers) to work through practice problems as a class. Many problems will be graded based on both completion and correctness – some will be graded solely on one criterion or the other. You will often have the opportunity to revise your initial answer after discussion with classmates. Any participation points you miss due to absence cannot be made up.

Regrades

Any request for a regrade or recalculation of any exam or quiz must be made *within one week after the exam is returned in class* (if you are not in class the day it is returned, it is your responsibility to obtain your exam from me). No regrades will be considered beyond this time. The exam must be left with me, and I will review the entire exam or quiz.

Practice Problems

A set of practice problems will be assigned after most class meetings to give you a chance to practice new material. Although you will not turn these problems in for credit, it is highly recommended that you devote a large portion of your study time to working the assigned practice problems. Success in this course largely depends upon the time you put into studying outside of class.

Determination of Grades

Exams	60%
Quizzes	20%
In Class Activities	10%
Participation	10%

Grades will be assigned on a "+/-" system. The course grades will be assigned according the following ranges:

<i>Grade</i>	<i>Percentage</i>
<i>A plus</i>	<i>96 to 100%</i>
<i>A</i>	<i>93 to 95%</i>
<i>A minus</i>	<i>90 to 92%</i>
<i>B plus</i>	<i>86 to 89 %</i>
<i>B</i>	<i>83 to 85%</i>
<i>B minus</i>	<i>80 to 82%</i>
<i>C plus</i>	<i>76 to 79%</i>
<i>C</i>	<i>73 to 75%</i>
<i>C minus</i>	<i>70 to 72%</i>
<i>D plus</i>	<i>66 to 69%</i>
<i>D</i>	<i>63 to 65%</i>
<i>D minus</i>	<i>60 to 62%</i>

Any modifications will be in your favor, but you should not expect significant changes. Note that the "class average" for a given exam is *not necessarily a "C" grade*. *Grades are assigned by these grade ranges, not by "curves."* In assigning grades, one set of criteria are applied equally to all students in the class - everyone has the same opportunity as everyone else to earn their grade.

Classroom Protocol

I hope that the classroom and will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom is unacceptable. Students exhibiting this behavior will be asked to leave the class. Examples of such behavior include:

- Persistent interruptions or using disrespectful adjectives in response to the comments of others.
- The use of obscene or profane language.
- Yelling at classmates and/or faculty.
- Physical threats, harassing/bullying behavior, or personal insults

Other Class Policies

- IDs may be randomly checked at exams and quizzes so always bring a picture ID.

- Seats will be assigned at my discretion.
- All you need for exams and quizzes are a prepared mind and a pen or pencil. No other materials are allowed at your desk during exams and quizzes.
- Courtesy and respect: treat your fellow classmates and your instructor as you would like to be treated – respectfully and with courtesy.
- Audio Recording: audio (only) recording is allowed. I do not allow video recording. See also University Policies below.
- Cell Phones: Out of courtesy, turn these off during lectures and exams.
- Computers: You may use your laptop only during class lectures, as long as you can do so in a way that is not distracting to other students. Computers or any web-enabled devices are not allowed during exams.

University Policies (Required)

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

In addition to the university policies above, I have additional policies that apply specifically to Chem 10. Please note the following:

- **Consent for Recording of Class and Public Sharing of Instructor Material:** Audio recording of lectures is allowed. I do not allow video recording of lectures. Much of the material I prepare for Canvas is prepared by me and is considered my personal property. It may not be shared with anyone who is not enrolled in Chem 10.
- **Academic integrity:** Your commitment as a student to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy S07-2](http://www.sjsu.edu/senate/docs/S07-2.pdf) at <http://www.sjsu.edu/senate/docs/S07-2.pdf> requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The [Student Conduct and Ethical Development website](http://www.sjsu.edu/studentconduct/) is available at <http://www.sjsu.edu/studentconduct/>. Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified.
- **Campus Policy in Compliance with the American Disabilities Act: If you need course** adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please notify me as soon as possible. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at <http://www.sjsu.edu/drc/> to establish a record of their disability.

Chem 10: Chemical Calculations, Fall 2019

This is our tentative lecture schedule for the semester. Significant changes to the schedule will be announced on Canvas and in class. **Our final exam will be held Monday, December 16 from 12:15 – 2:30 pm in DH 415**

Course Schedule

Date	Day	Reading Assignment (read before class)	Activity	Class Topic	Practice Problems (try after class)
8/22	Th			Syllabus, Active Learning Intro	
8/23	Fri	Bishop: 1.4; Foundations pp. 1-2	01-1	Activity Period 0 - Units of Measurement	Bishop 1.17, 1.19, 1.21, 1.22, 1.25
8/27	Tues	Bishop: 2.1; Foundations pp. 4	01-1, 01-2	Unit Analysis	Bishop 2.36, 2.40, 2.42, 2.44, 2.46, 2.48
8/29	Th		01-2	Unit Analysis	TBA
8/30	Fri	Bishop 1.5, 2.2; Foundations pp. 12; handout	01-3, making measurements activity	Activity Period 1 - Significant Figures, taking measurements	TBA
9/3	Tues	Bishop: 3.4; Foundations pp. 17-19	02-1	Atoms, Isotopes, and Ions	TBA
9/5	Th	Bishop 3.3; Foundations pp. 28 - 29	02-3	The Periodic Table of the Elements	TBA
9/6	Fri	Bishop: 6.1 - 6.4; Foundations pp. 32	03-1	Activity Period 2 - Quiz 1; Nomenclature: Naming Compounds	TBA
9/10	Tues	--	03-2	Representing Molecular Structures	TBA
9/12	Th	Bishop: p. 102 (last paragraph) - p. 105; Foundations p. 44	03-3	Moles and Molar Mass	TBA

9/13	Fri	--	03-3	Activity Period 3 - Moles and Molar Mass	TBA
9/17	Tues	Bishop: 6.8; Foundations pp. 51 - 52	03-4	Determination of Chemical Formulas	TBA
9/19	Th	Bishop: 7.1; Foundations pp. 58 - 59	04-1	Balanced Chemical Reaction Equations	TBA
9/20	Fri	--		Midterm 1 - Chapters 1, 2, 3	TBA
9/24	Tues	Review notes from 9/19	04-1	Balanced Chemical Reaction Equations	TBA
9/26	Th	Bishop p. 423 - 427; Foundations p. 66	04-2	Limiting Reactants	TBA
9/27	Fri	Review notes from 9/26		Activity Period 4 - Limiting Reactants Workshop - Handout Provided	TBA
10/1	Tues	Handout (Poulsen 6.3)	04-3	Solution Concentration and Dilution	TBA
10/3	Th	Bishop 10.3; Foundations: pp. 77 - 79 Models 1 and 2	04-4	Solving Solution Stoichiometry Problems	TBA
10/4	Fri	Bishop: 7.2 - 7.3; Foundations pp. 84 - 86	05-1	Activity Period 5 - Quiz 2; Dissociation and Precipitation Reactions	TBA
10/8	Tues	Review from 10/4; Bishop 8.1; Foundations pp. 89 - 90	05-1, 05-2	Dissociation and Precipitation Reactions; Introduction to Acid-Base Reactions	TBA
10/10	Th	Bishop 8.3; Foundations pp. 89 - 90	05-2	Introduction to Acid-Base Reactions	TBA
10/11	Fri	Handout (Saylor 5.1 - 5.3); Foundations pp 109 - 110	06-1	Activity Period 6 - Thermochemistry and Calorimetry	TBA

10/15	Tues	Bishop 4.1; Foundations pp. 137 - 138	07-1	Electromagnetic Radiation	TBA
10/17	Th	Foundations pp. 142 - 143	07-2	Atomic Spectroscopy and Energy Levels	TBA
10/18	Fri	Bishop 4.2, Foundations pp. 149-151, 153	07-3	Activity Period 7 - The Description of Electrons in Atoms	TBA
10/22	Tues	Bishop 4.3; Foundations pp. 160 - 162, Models and Information	07-4	Multi-electron Atoms, the Aufbau Principle, and the Periodic Table	TBA
10/24	Th	Bishop 4.3; Foundations pp. 160 - 162, Models and Information	07-4	Multi-electron Atoms, the Aufbau Principle, and the Periodic Table	TBA
10/25	Fri	--		Midterm 2 - Chapters 4, 5, 6, 7	TBA
10/29	Tues	Bishop 5.2; Foundations p. 181	08-1; 8-2	The Chemical Bond; The Lewis Model of Electronic Structure	TBA
10/31	Th	Bishop 5.5 - 5.7	08-2	The Lewis Model of Electronic Structure	TBA
11/1	Fri	Bishop 5.5 - 5.7	08-2, 08-3	Activity Period 8 - VSEPR Model Workshop	TBA
11/5	Tues	Foundations p. 210	08-4	Electronegativity and Bond Polarity	TBA
11/7	Th	Bishop 11.1 - 11.2; Foundations p. 238	10-1	Gases introduction; The Ideal Gas Law	TBA
11/8	Fri	Bishop 11.4; Foundations p. 244	10-1, 10-2	Activity Period 9 - Quiz 3; Ideal Gas Law practice, Partial Pressure	TBA
11/12	Tues	Bishop 3.1; Foundations p. 249	10-3	Kinetic Molecular Theory of Gases	TBA
11/14	Th	Bishop 13.1; Foundations p. 282	12-1	Solutions (fill in tables, key questions)	TBA

11/15	Fri	Handout (Poulsen 6.4); p. 287	12-1; 12-2	Activity Period 10 - Solutions (exercises), Colligative Properties	TBA
11/19	Tues	Bishop 14.3, 14.4; Foundations pp. 333, 335	15-1	Dynamic Equilibrium and LeChatelier's Principle	TBA
11/21	Th	Bishop 14.3, 14.4; Foundations pp. 333, 335	15-1, 15-2	Dynamic Equilibrium and LeChatelier's Principle	TBA
11/22	Fri	--		Midterm 3 - Chapters 8, 10, 12	TBA
11/26	Tues	Poulsen 7.8; Foundations p. 339	15-2	The Reaction Quotient & Equilibrium Constant	TBA
11/28	Th			Thanksgiving Break - No Class	TBA
11/29	Fri			Thanksgiving Break - No Class	TBA
12/3	Tues	Bishop 8.2; Foundations pp. 356 - 357	16-1	The pH Scale and Water Autoionization	TBA
12/5	Th	Foundations pp. 363, 364, 367	16-2	Strong and Weak Acids and Bases	TBA
12/6	Fri	Review notes		Quiz 4; Final Exam Review	