



## General Chemistry II for Physical Scientists and Engineers

M,W,F 2:30 – 320, Bruininks Hall 230  
3 Credits

Professor K. Leopold  
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612 625-6072  
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Office Hours:  
M, 11:00 – 12:00  
Th, 1:30 – 2:30\*

\*On exam weeks, I will move my Thursday office hour to Tuesday (i.e., the day before the exam), 2:00 – 3:00.

### WELCOME TO CHEM 1072 and 1072H!

Since 1072 and 1072H are combined this year, there will be a **separate honors project** for anyone registered for CHEM 1072H. That is described in a separate document on Canvas. **Information in this syllabus applies to students in both 1072 and 1072H.**

This syllabus is intended to outline how the course works as well as some steps you can take to succeed. Look it over carefully and hang on to it for reference!

#### Prerequisites:

- (a) At least a C- in CHEM 1071 or equivalent (For 1072H, Honors Student, or Univ. Honors Program permission)
- (b) Concurrent registration in CHEM 1066 (Lab)

*Note that 1066 is a separate course and is not covered by this syllabus.*

#### General Course Information:

Chemistry 1072/1072H is an introductory course accompanied by a lab (1066). Together, they fulfill the Liberal Education Core Physical Science requirement (see below). They are designed to prepare students for science majors including chemistry, engineering, and the health sciences, and are the second half of a two-semester sequence.

#### Required Textbook

- We will be using the **10th edition** of *Chemistry: The Molecular Nature of Matter & Change* (Silberberg/Amateis) with access to the “ALEKS” homework platform.
- **eBook and ALEKS:**  
Our ALEKS site will open on **Tuesday, January 21**. Your online textbook (eBook) can be accessed within the ALEKS courseware. The period of access is 18 weeks, starting when the student first registers into ALEKS for our class.

Students who have purchased the ALEKS / eBook package can purchase a printed copy of the Silberberg & Amateis text (10<sup>th</sup> edition) in a loose leaf format from the Bookstore for an additional \$40.00. Since access to the eBook lasts for only one semester, purchasing the loose leaf version at this discounted price is a good option for students who want to keep a copy for future use, e.g., in later courses or to study for the MCAT or other professional or graduate school entrance exams.

- **How to Access the eBook and ALEKS:**

To access ALEKS, click on the “ALEKS” link at the left of our Canvas site.

It will take you directly to the ALEKS site associated with our Chem 1072 and 1072 H classes. ALEKS opens in a separate window.

When you register in ALEKS through our course Canvas site, you will not need to use a separate ALEKS Course Code.

Click on Login (if you have used ALEKS at the U of M before, you have an existing account) or SIGN UP.

Fill out student information if you are creating a new account. **Pay particular note to the next comment:** For ALEKS to keep track of your Homework score, you'll need to **use your U of M email address in both the email AND "Student ID" fields.**

**IN ORDER FOR YOU ALEKS SCORES TO BE RECORDED PROPERLY, USE ONLY YOUR OFFICIAL UNIVERSITY OF MINNESOTA EMAIL ADDRESS. FOR EXAMPLE, I WOULD ENTER [KLEOPOLD@UMN.EDU](mailto:KLEOPOLD@UMN.EDU). DO NOT USE YOUR 7 DIGIT X-500 NUMBER FOR THIS.**

- **ALEKS Support Team:**

**VERY IMPORTANT!**

If needed initially or during the semester, you can contact the *ALEKS support team*:

**Phone:** (800) 258-2374

**Email:** <https://www.aleks.com/support/form>

**Hours (Eastern Standard Time):**

Sunday, 4:00 PM to 1:00 AM

Monday – Thursday, 7:00 AM to 1:00 AM

Friday, 7:00 AM to 9:00 PM

### **Other Items Your Will Need**

- Internet-capable tablet or laptop for access to the ALEKS homework.
- Non-programmable scientific calculator (see details below).

### **Laptop Recommendations:**

You may be interested in CSE's recommendations for laptops, which may be found here:

<https://ccaps.umn.edu/iti-students/laptop-recommendations>

### **Liberal Education Physical Science Core Requirement:**

CHEM 1072/1072H (together with the CHEM 1066) satisfies the U of M Liberal Education Physical Science Core requirement. What does this mean? Core courses are intended to provide an in-depth look at how knowledge is created in a particular discipline. Naturally, they provide content knowledge but just as important, they teach “modes of inquiry”: How do workers in a particular field think? How do they collect and process information? How do they create new knowledge? By taking a distribution of core courses during your time at the U of M, you gain an appreciation for the similarities and differences among disciplines. Much like learning a foreign language helps you to better understand your own language, a distribution of core

courses provides the perspective needed to understand a broad range of complex issues and can ultimately make you a better practitioner of your own chosen field. You learn different approaches to finding credible information, analyzing information, solving problems, and drawing reasonable conclusions based on facts. In doing so, you develop skills needed to be an informed citizen and life-long learner.



In CHEM 1072/1072H, we study chemistry, of course. For example, we discuss chemical reaction rates, equilibrium, and the factors that drives chemical change. We describe how these topics fit together to form a beautiful and coherent picture, allowing us to understand and make useful predictions about the world. To accomplish this, we do what scientists do all the time: We create ideas and then test their validity by applying them to new situations. Moreover, using the language of mathematics, we translate these ideas into quantitatively testable statements. We will pose and solve many problems in this course and, by working through them yourself, you are, in effect, doing what scientists do – you’re taking concepts and their mathematical incarnations and using them to gain understanding and make predictions. You’re *doing the work of the field*. This aspect of the course is particularly emphasized in the co-requisite laboratory course. In the lab, you do experiments. You test hypotheses. You take data, and manipulate those data so as to allow them to provide the clearest possible picture of the phenomenon you are studying. In some cases, you will also *use* the understanding obtained to offer workable solutions to practical problems. This is the way scientists approach the world and, in following suit, you get at the core of one important aspect of human endeavor.

### **Student Learning Outcomes (Some Obvious, Some Less Obvious):**

In this course, you will

***Master a Body of Knowledge and a Mode of Inquiry*** – We will cover a lot of useful principles of chemistry. However, these are not disconnected principles. They are tied together by some common threads and constitute a “body” of knowledge that has applications in many other areas. How to approach and apply this knowledge involves the practicing the “mode of inquiry” used routinely by chemists and, indeed, all scientists.

***Identify, Define, and Solve Problems*** – Aside from the principles themselves, think of this course as a vehicle for practicing problem solving and critical thinking. We will solve lots of problems in this class, but the solutions require conceptual understanding and true synthesis of ideas. This course is a place to step beyond algorithmic thinking.

***Can Locate and Critically Evaluate Information*** – You will have lots of new information in front you in this course. As you solve problems, half the challenge is figuring out what information is pertinent to any particular problem! This learning outcome is significantly strengthened in the companion lab course, where you will be involved in extended, open-ended assignments.

***Understand the Role of Creativity, Innovation and Discovery Across Disciplines*** – Most people don’t think about science as a creative endeavor. But it is! Scientists are always trying to explain what’s around them in terms they can understand and this sometimes takes real creativity! We will be discussing ideas created by some of the great geniuses of all time. As you take this course, think about what it must have taken for people to discover and shape these ideas. Note how physics and math blend seamlessly with chemistry, and how chemistry blends with almost every aspect of our lives and society.

***Acquire Skills for Effective Citizenship and Life-Long Learning*** – Chemistry plays a central role in many societal issues and the knowledge and critical thinking skill developed in this course provide a foundation for informed decision making and effective citizenship. Whenever possible, we will make connections to the “real world”.

### Class Websites:

There are 2 websites that are directly related to this course:

#### *1. Lecture Canvas Site*

This site is where you will find any information associated with the lecture. It will contain this syllabus, practice exams, exam study guides, lecture videos, and other helpful information. Exam grades and grade distributions will also be available here. This site will also link you to the ALEKS homework platform. You can go to [canvas.umn.edu](https://canvas.umn.edu) and locate our class (CHEM 1072/1072H) on your dashboard. Note that the lab course, CHEM 1066, has a separate website.

#### *2. General Information Website*

See <https://sites.google.com/umn.edu/general-chemistry/> for general information about introductory chemistry courses (TAs, exams, lab schedules, etc.).

### Students with Disabilities:

The University views disability as an important aspect of diversity, and is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

- If you have, or think you have, a disability in any area such as, mental health, attention, learning, chronic health, sensory, or physical, please contact the DRC office on your campus (UM Twin Cities - 626.1333) to arrange a confidential discussion regarding equitable access and reasonable accommodations.
- Students with short-term disabilities, such as a broken arm, can often work with instructors to **minimize** classroom barriers. In situations where additional assistance is needed, students should contact the DRC as noted above.
- If you are registered with the DRC and have a disability accommodation letter dated for this semester or this year, please contact your instructor early in the semester to review how the accommodations will be applied in the course.
- If you are registered with the DRC and have questions or concerns about your accommodations please contact your access consultant/disability specialist.

### Additional Scheduled Meetings:

Sometimes, you may want to talk with me in a more private setting, e.g., about grades, or other factors that you feel may be influencing your work in the course. For this, I am happy to schedule individual meetings at mutually convenient times. Please note that FERPA (Family Educational Rights and Privacy Act) prohibits anyone other than you (even parents or friends) from participating in discussions about grades and course performance, at least without written permission. So, if we happen to meet via Zoom, please be sure that you're comfortable with your privacy settings and with the environment in which you join these meetings.

### Learning the Material and Preparing for Exams:

- **In addition to the suggestions below, please see the separate file called "How to Study for CHEM 1072 and 1072H".** It is posted on Canvas.
- Reading assignments are taken from Amateis and Silberberg. I suggest reading through the assigned sections once and then starting to work on the suggested practice problems. Use the text (and the lecture notes) as resource material as you work on the problems. Many of these problems appear on the ALEKS homework platform and these will be required as part of your grade. **NOTE:** These are mostly quantitative problems, but be sure to look at all the problems listed at the end of this syllabus, as some also involve conceptual questions that do not lend themselves to online homework.

- **End of Chapter Problems:** Recommended end-of-chapter problems are listed at the end of this syllabus. Doing these problems is the best way to ensure that you understand the material. The problems are assigned solely to help you master the material. The importance of doing them cannot be overemphasized!! Some (but not all) of them will be incorporated into the ALEKS homework and, therefore, those will end up being a part of your course grade (see below).

**Please Remember:** Although these problems are “assigned”, the point is not just to get the right answers in a computer system or on a piece of paper so that I can check off that you did them. The point is to help you learn. Getting someone else to show you how to do the assignments and then writing down the answers is not helpful. Please keep this in mind when studying for this course.

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**Please Note:** One of the most common difficulties concerning exams is that they do not resemble or are harder than the problems worked in class or assigned for homework. There are many types of problems in chemistry, such as calculation of molarity of a solution, that are important, straightforward, and commonly stated in a familiar way. However, to try to determine whether a student understands a concept or is relying on memorization, we need to ask some problems in a different way. To help prepare for this, try the following while working problems and studying for exams:

- (i) Work the problem as written and determine the answer, if possible. Note whether this is one of several very similar problems that were assigned. Determine the underlying concept(s) being applied. Only use the solutions manual as a last resort. There is a big difference between being told how to do the problem and actually figuring it out yourself. This will become especially apparent on exams.
- (ii) Think about the problem and your answer: What does the problem ask? What does the answer mean?
- (iii) Can this problem be worked backwards (i.e., could you, if asked, calculate any one of the given pieces of data from the answer)? Can you work a related problem from those listed under "Comprehensive Problems" at the end of the chapter?
- (iv) Would you be able to explain to someone else how to understand and work this problem? In this respect, studying in a small group is very helpful.
- Note that re-reading the text several times may not be as useful in chemistry as in other subjects. When study time is limited, I suggest
  - (i) Reviewing notes after each lecture,
  - (ii) Reading the text thoroughly once, working problems at the end of the chapters and on Canvas, while re-reading relevant parts of the text and lecture notes as needed to help with the problems.

**MOST OF YOUR STUDY TIME IS BEST USED WORKING PROBLEMS AND STUDYING CONCEPTS.**

### EXAMS

**Dates:**

Midterm exams will be given **in class** on the following dates:

1. Wednesday, February 12, 2:30 – 3:20 PM
2. Wednesday, March 5, 2:30 – 3:20 PM
3. Wednesday, April 2, 2:30 – 3:20 PM
4. Wednesday, April 23 2:30 – 3:20 PM

**THE FINAL EXAM WILL BE ON  
SATURDAY, MAY 10 FROM  
10:30 AM – 12:30 PM**

**IF YOU ARE SICK, PLEASE STAY HOME AND DON'T TAKE THE EXAM. CONTACT ME FOR ALTERNATE ARRANGEMENTS!!**

**Content and Format:**

Exams will cover the material discussed in class or assigned as homework. Material that is included in the text book but has not been touched on in class or in the assigned reading and problems will not be covered on the exams. Exams will be multiple choice. A periodic table and a number of important equations will be provided with each exam. A STUDY GUIDE will be posted on Canvas approximately one week before each exam and will provide specific information about what the exam will cover. As noted above, exams **will be administered in class**.

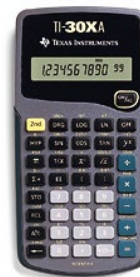
In order to relieve some of the inevitable stress associated with these exams, the following policy will be implemented: Exams will consist of 20 questions, but you will only need to get 18 correct in order to achieve 100%. Therefore, in effect, you can choose to ignore two questions without penalty. Note that the maximum grade will still be 100%, even if you get 19 or 20 questions correct. So, in other words,

- If you get 20 questions correct, your grade will be 100%.
- If you get 19 questions correct, your grade will be 100%.
- If you get 18 questions correct, your grade will be 100%.
- If you get 17 questions correct, your grade will be  $(17/18) \times 100\% = 94.4\%$ .
- Etc.

**CALCULATOR POLICY**

Every student should have a calculator for both homework and exams which calculates all arithmetic and trigonometric functions, logarithms, and exponentiation. The calculator must also be capable of displaying numbers in scientific notation (e.g.  $6.02 \times 10^{23}$  or  $6.02E+23$ ), because many of the numbers we deal with in this course will be too small or too large to input or display any other way.

The TI-30Xa (right) is the suggested calculator for this and all CHEM 1XXX courses, and for most intro Physics courses. The bookstore stocks this calculator for around \$10. Other calculators that are acceptable are the following



Bico 98	Casio fx-250HC	TI-30X IIS
Casio /s-V.P M	Casio fx-300 MS	TI-30XS
Casio fx 300W	Casio fx-82 MS	TI-30XS IIS
Casio fx-115 ES	Casio S-V.P. M	TI-34 II
Casio fx-115 MS	Sentry CA 656	TI-36X
Casio fx-180P Plus	Sharp EL501W	TI-36X-Solar

If you wish to use a calculator on exams which is not on this list, please have it approved by me first. Graphing and programmable calculators are **FORBIDDEN** on exams by Chemistry Department policy. Only calculators that are not programmable will be allowed.

**Regrade Policy:**

All examination regrade requests should be directed to K. Leopold.

**Missed Exams:**

Students are expected to be present and prepared to take all four exams and the final. **Exams will ONLY be given on their regularly scheduled day.** (This is because everyone likes to find out the answers as soon as

possible after the test, so I generally post the key after the exam.) An **unexcused** absence from any of these exams will result in a score of zero being entered in the course record.

In the case of illness or a true emergency, a student may be excused from one midterm exam and have a substitute score recorded for the missed exam at the end of the semester. If circumstances arise such that more than one hour exam is missed, please consult with me. If a substitute score needs to be used, it will be done according to Chemistry Department policy which states,

*“The unweighted average score of all the student’s other exams will replace the zero from the excused midterm exam”*

This procedure will only be applied in special circumstances. If you need an excused absence, note two things:

- (i) Please contact me the day of the exam or as soon as circumstances allow.
- (ii) You don’t need a doctor’s note for one-time illnesses for which you would not ordinarily be seen by a doctor. If you experience health problems which cause multiple absences, please contact me.

**PLEASE NOTE:** This is not a procedure which is to be used to obtain a second chance on an exam, or to put off being tested on a particular subject. This is only to be used in the case of real, legitimate illness or emergencies. **Quarantining due to COVID is a legitimate excuse!**

**→ALSO... If you come to an exam and start it, you cannot get an excused absence, even if you were sick during the test. If you are too sick on an exam day to take the test, don’t take it. Instead, contact me for an excused absence.**

### COURSE GRADES

#### A-F Grading:

Midterm exams, the final, and the ALEKS homework will be counted with the following weights:

Average of the Midterm Exam Scores:	60%
ALEKS Homework:	15%
Final Exam:	25%

Thus, a final score for the course will be calculated according to the following formula:

$$\text{Final Average} = (0.60) * (\text{Midterm Average}) + (0.15) * (\text{HW}) + (0.25) * (\text{Final Exam})$$

where “HW” is the percent of ALEKS problems answered correctly over the semester and “Final Exam” is your score on the final, quoted as a percentage of the total number of possible points.

The correspondence between your score and your letter grade will be determined in accord with the following historical grade ranges:

85 – 100	A
81 – 85	A–
77 – 81	B+
72 – 77	B
68 – 72	B–
64 – 68	C+
55 – 64	C
46 – 55	C–
41 – 46	D



Note that at the end, I may opt to adjust these cutoffs such that it will be possible to get a particular letter grade with a score that is lower than the range indicated above. But in no case will this adjustment hurt your grade.

**That is to say, any adjustments, if applied, will only be used to improve your grade, not lower it.** In extremely borderline cases, I may also use a strong showing in the final exam to tilt a grade above the border. However, don't count on large adjustments. If you want benchmarks to aim for, these are them!

### **S/N Grading:**

For those in a college outside of CSE, if you are registered for this course on an S/N basis, a grade equivalent to "C-" on the A-F scale will be required to receive an "S".

### **Chemistry Department Policy on Incompletes:**

**Policy:** It is Departmental Policy that **I** grades should, except in the most extraordinary circumstances be awarded only to students who have a documented, acceptable reason for missing a final exam and who are in good standing (**passing with a C-**) in the course up to that point.

In the event that these circumstances *are* met, a contract (available in the undergraduate office, 115 Smith) should be signed by the student and the instructor (and also the instructor of any future course that might be involved) detailing how the student will make up the missed final exam. If an instructor in a future term isn't known, the DUGS should sign the contract.

**Policy on Incomplete (I) grades:** The policy of the Chemistry Department is that a student may request an Incomplete grade only when (a) the student has a University sanctioned excuse for missing the final exam and (b) the student is passing the course based on all other graded components. Assignment of an **I** requires that the instructor and student sign a contract, available in the Departmental undergraduate office, stipulating the procedure by which the **I** grade will be made up (e.g., taking a final exam from another instructor in the next semester). Failure to successfully complete the procedure outlined in the contract will result in the **I** being administratively changed by the University Registrar to an **F** or **N** (depending on the grade base) one semester (excluding summer) from the end of the semester for which the **I** grade was granted.

If you need a blank copy of the form referred to above, you may get it from Nancy Thao in the General Chemistry office ([thao@umn.edu](mailto:thao@umn.edu)).

### **Withdrawals:**

It is hoped that every student will successfully complete this course. If, however, if it becomes necessary to drop the course, you must officially withdraw following the rules for your college.

### **Credits and Workload Expectations:**

One credit is defined as equivalent to an average (over a full semester) of three hours of learning effort per week necessary for an average student to achieve an average grade in the course. For example, a student taking a three credit course that meets for three hours per week should expect to spend an additional six hours per week on coursework outside the classroom in order to achieve an average grade.

### **Policy on Scholastic Dishonesty:**

Scholastic dishonesty is any conduct described as follows (from the "CLA Classroom Grading and Examinations Procedures"):

"Scholastic dishonesty is any act that violates the rights of another student with respect to academic work or that involves misrepresentation of a student's own work. Scholastic dishonesty includes (but is not limited to) cheating on assignments or examinations; plagiarizing (misrepresenting as one's own anything done by

another); submitting the same or substantially similar papers for more than one course without consent of all instructors concerned; depriving another of necessary course materials; sabotaging another's work."

If a student is guilty of scholastic dishonesty, the instructor will at least assign a grade of zero on the work involved and will report the matter to the student's college Scholastic Conduct Committee. An F in the course may also result.

For more information on scholastic dishonesty, see information in the Student Conduct Code:  
[http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)

The office of Community Standards has some good information for students about how to avoid falling into a situation related to scholastic dishonesty: <https://communitystandards.umn.edu/>

### **Policy on Appropriate Use of Course Materials:**

Taking notes is a means of recording information and of personally absorbing and integrating the educational experience. However, broadly disseminating class notes or exams beyond the classroom community or accepting compensation for taking and distributing such items undermines instructor interests. **This means "Don't upload course materials to sites like Chegg, Course Hero, etc.).** Engaging in such actions violates shared norms and standards of the academic community and now carries consequences in the Offices of Community Standards. **It is unethical, so please don't do it.**

### **A Comment on Mental Health:**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, and difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website at <https://cuhcc.umn.edu/patient-care-services/mental-health-care>.

### **Additional Policies Pertinent to Classes at the U of M (and this Course as Well):**

Student Conduct Code: [http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf)

Sexual Harassment: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>

Equity, Diversity, Equal Opportunity and Affirmative Action:  
[http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf)

Makeup Work for Legitimate Absences: <https://policy.umn.edu/education/makeupwork>

Grading and Transcripts: <https://policy.umn.edu/education/gradingtranscripts>

Academic Freedom and Responsibility:  
[https://regents.umn.edu/sites/regents.umn.edu/files/policies/Academic\\_Freedom.pdf](https://regents.umn.edu/sites/regents.umn.edu/files/policies/Academic_Freedom.pdf)

Disability Accommodations: <https://regents.umn.edu/sites/regents.umn.edu/files/policies/DisabilityServices.pdf>

Equity, Diversity, Equal Employment Opportunity, and Affirmative Action:  
[https://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](https://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf)

Use of Personal Electronic Devices in the Classroom: <https://policy.umn.edu/education/studentresp>

**SCHEDULE OF TOPICS, VIDEOS, AND TEXTBOOK SECTIONS \***

Week	Date	Chapter	Video Titles & Textbook Section(s) to Refer To **
1	1/22-1/24	13 13	Course Mechanics, Intro to Colligative Properties, Measures of Concentration – Sections 13.5 & 13.6 Raoult's Law, Boiling Point Elevation – Sections 13.5 & 13.6
2	1/27-1/31	13 16 16	BP Elevation, FP Depression, Osmotic Pressure – Section 13.6 Intro to Chemical Kinetics, Rate Laws - Sections 16.1 and 16.2 Method of Initial Rates, Integral Rate Laws (Part 1) – Sections 16.3, 16.4
3	2/3-2/7	16 16 16	Integral Rate Laws (Part 2) – Radiocarbon Dating & 2 <sup>nd</sup> Order Kinetics – Sections 16.4 & 24.2 Reaction Mechanisms, Activation Energy Diagrams – Section 16.5, 16.6 Catalysis & Heterogeneous Reactions – Section 16.7
4	2/10-2/14		In Class Review Session, M, 2/10
		17	W, 2/12 – HOUR EXAM 1 IN CLASS: 2:30 – 3:20 PM*** Introduction to Chemical Equilibrium – Sections 17.1-17.3
5	2/17-2/21	17 17 17	Introduction to Equilibrium Problems – Section 17.5 More Equilibrium Problems – Section 17.5 Le Châtelier's Principle – Section 17.6
6	2/24-2/28	17 18 18	Reaction Quotients, Combining Equilibrium Constants – Section 17.4 Introduction to Acids and Bases – Sections 18.1 – 18.3 pH, pOH, and Calculations for Acid Solutions – 18.4, 18.5
7	3/3-3/7		In Class Review Session, M, 3/3
		18	W, 3/5- HOUR EXAM 2 IN CLASS: 2:30 – 3:20 PM*** Strong and Weak Bases – Section 18.7
<b>SPRING BREAK, 3/10 - 3/14</b>			
8	3/17-3/21	18 19 19	Acid – Base Properties of Salts – Section 18.8; Lewis Acids and Bases – Section 18.9 Introduction to Buffers – Section 19.1 Buffer Calculations – Section 19.1
9	3/24-3/28	19 20 20	Titrations – Section 19.2 Entropy and the 2 <sup>nd</sup> Law – Section 20.1 Predicting Entropy Changes – Section 20.1
10	3/31-4/4		M, 3/31 – In Class Review Session
		20	W, 4/2 – HOUR EXAM 3 IN CLASS: 2:30 – 3:20 PM*** Calculating Entropy Changes, 3 <sup>rd</sup> Law & Gibbs Free Energy – Sections 20.1-3
11	4/7- 4/11	20 20 21	Free Energy and Equilibrium – Section 20.4 + van't Hoff Equation, pp. 783-784 More Examples of Free Energy, $\Delta G$ , Free Energy and Useful Work – Sections 20.3,4 Introduction to Electrochemistry – Sections 21.1, 2
12	4/14-4/18	21 21 21	Standard Reduction Potentials (Part 1) – Section 21.3 Standard Reduction Potentials (Part 2 ) – Section 21.3 Nernst Equation and Concentration Cells (Parts 1 and 2) – Section 21.4
13	4/21-4/25		M, 4/21 – In Class Review Session
		21	W, 4/23 – HOUR EXAM 4 IN CLASS: 2:30 – 3:20 PM*** Electrolysis – Section 21.7
14	4/28-5/2	23 23 23	Intro to Transition Metals – Section 23.1 – No Videos Available Coordination Complexes – No Videos Available –Section 23.3 Crystal Field Theory - No Videos Available – Section 23.3
15	5/5		Final Exam Review Session and Fun End-of-Semester Demos
<b>Final Exam – Saturday, May 10 from 10:30 AM – 12:30 PM***</b>			

\* This schedule is only approximate. Please keep tabs on the lecture to better inform you as to where we are in the course.

\*\* Videos are located in the playlists found in the Media Gallery (left side bar on the course Canvas site).

\*\*\* Exam details and coverage will be given in the Study Guides, to be posted separately on Canvas about a week before each exam.

<b>ALEKS DUE DATES</b>	
Chapter 13	February 3
Chapter 16	February 17
Chapter 17	March 3
Chapter 18	March 24
Chapter 19	March 31
Chapter 20	April 21
Chapter 21	May 3
Chapter 23	May 10

**SOME USEFUL DETAILS:**

1. The first time you open ALEKS, you will need to complete a single topic. The system needs this to exist, but it will be easy and does not count in your grade. You may need to answer three times. You will also see an ALEKS pie, but **don't pay attention to it**. The grades on your ALEKS homework will appear in the Canvas gradebook, and that's all you need to pay attention to.

2. Within a given session, you will generally have two "attempts" for each question. Each attempt enables you to have three "tries". If, on a particular question, you use up your attempts, **just continue with the chapter's homework assignment and submit it. You will then be able to try the entire assignment again for a better score.** Your old answers will be repopulated so that you don't have to redo the questions you got right. **You get to do this a total of three times.** The gradebook always keeps your best score.

3. Assignments for each chapter will generally be due about a week after we complete a chapter in class (usually on Monday, but refer to the schedule above). Exceptions may occur for exam weeks, in which the deadline will be pushed out an additional week. Assignments must be completed by 11:59 PM on the due date in order to receive full credit. You do not need to complete all the problems in a chapter to receive credit. Partial credit will be awarded based on the number of questions correctly answered. Note that assignments submitted after the indicated due date will incur a 25% per day point penalty. This means that you can still get some credit on a late assignment for a few days, but after four days, the point value goes to zero. After the due date, assignments will remain open in "Review Mode" for the rest of the semester so that you can still use them to practice. In this mode, you can attempt them as many times as you like but no credit is given. Note, however, that Review Mode will only open for you if you've tried at least one question in a given assignment. No homework assignments will be open after the final exam.

4. After you submit an assignment, you will get the following feedback: Individual question scores, correct and incorrect indicators, and the overall assignment score.

**VERY IMPORTANT: DON'T FORGET TO CLICK "SUBMIT" WHEN YOU ARE READY TO SUBMIT AN ASSIGNMENT. IT'S NOT AUTOMATIC!**

## Reading and End-of-Chapter Problem Assignments

Reading assignments and End-of-Chapter Problem assignments are on the following pages. Problem numbers correspond to the 10<sup>th</sup> edition of the textbook.

**Note:** Silberberg has “**red problems**” and “**black problems**” at the end of each chapter (designated by the color of the problem number). The assigned homework below is divided according to these two categories. Answers to the red problems are in the back of the book. Answers to the black problems are not. To the extent possible, the ALEKS homeworks correspond to black end-of-chapter problems. Note, however, that not all of the important problems are available in the ALEKS system, so be sure to look at all of the questions indicated below. **I suggest that you try the assigned red problems first, where you can check your answers and get up to speed on the material. This should make things go more smoothly when you do the ALEKS assignments.**

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### Chapter 13 (Properties of Mixtures: Solutions and Colloids)

Read Sections: 13. 4,5

Problems:

**RED 13. 46, 64, 88, 90, 94, 96, 100 (assume non-electrolyte)**

**BLACK: 47, 49, 71, 91, 103, 105, 124, 125**



**In This Chapter:** Concentration units, colligative properties, vapor pressure of a solution, Raoult’s Law, boiling point elevation, freezing point depression, osmotic pressure, colligative properties of electrolyte solutions, van’t Hoff *i* factor.

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### Chapter 16 (Kinetics: Rates and Mechanisms of Chemical Reactions)

Read Sections: 16.1-7 (Also, Radioisotope Dating on pp. 1099-1101)

End-of-chapter problems:

**RED: 16.12,14,18,21,25,34,45,47,61,63,65,73,76,81,97, and 24.41**

**Black: 16.7,17,31,33,35,37,46,53,64,66,70,71,72,77,101,106,112a, and 24.44**

**In This Chapter:** Why study kinetics? Topics include reaction rates, rate laws, determining the form of the rate law, methods of initial rates, reaction order integrated rate laws, first order kinetics and exponential decay, examples of first order kinetics, <sup>14</sup>C dating, second order kinetics, reaction mechanisms, collisional model, temperature dependence of reaction rates, catalysis, enzymes, free radical reactions and ozone depletion.

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### Chapter 17 (Equilibrium: The Extent of Chemical Reactions)



Read Sections: 6. 1-6

End-of-chapter problems:

**RED: 17.1,12,16,23,30,42,50,54,56,66a-c,86,90**

**Black: 17.6,15,19,25,31,33,35,43,47,51,55,67,69,71,85,87,89**

**In This Chapter:** The equilibrium condition, reaction quotient and  $K_p$  and  $K_c$  expressions involving pressures, heterogeneous equilibria, application of the equilibrium constant, solving equilibrium problem Le Châtelier’s principle, effect of temperature on the equilibrium constant.

## Chapter 18 (Acid-Base Equilibria)

Read Sections: 7. 1-5,7,8 (i.e., skip sections 6 and 9; also skip Polyprotic Acids on pp. 815-817)

End-of-chapter problems:

**RED: 18.12,31,34,36,41,42,45,46,51,61,63,65,69,71,73,77,98,102,112,114,117,119,141,177**

**Black: 18.5,13,15,17,30,33,37,47,64,66,70,74,99,105,113,122ab,132**

**In This Chapter:** Nature of acids and bases, household acids and bases, conjugate acid-base pairs, Arrhenius and Brønsted-Lowry definitions, strong acids vs. weak acids, acid dissociation constant, ion product of water, pH, pOH of strong and weak acids and bases. Percent dissociation, acid-base properties of salts, Lewis acids and bases.

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## Chapter 19 (Ionic Equilibria in Aqueous Solution)

Read Sections: 19.1-3 (i.e., omit 19.4 and 19.5) You can also omit pp. 870-874.

End-of-chapter problems:

**RED: 19.13,15,21,25,27,31,50abg,54a,56a**

**Black: 19.1,5,7,10,18,20,22,26,28,32,43, 51abeg,57a**

**In This Chapter:** Common ion acid-base equilibria, Buffered solutions, Henderson-Hasselbalch equation, titrations and pH and  $pK_a$ .

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## Chapter 20 (Thermodynamics: Entropy, Free Energy and the Direction of Chemical Change)

Read Sections: 20.1-4

End-of-chapter problems:

**RED: 20.5,10,12,20,24,33,46,51b,53b,57,77,83**

**Black: 20.3,25ab,34,38,42,47,52b,54b,56,60,70,74,76,84,106**

**In this Chapter:** Spontaneous processes and entropy, entropy change and the 2<sup>nd</sup> law of thermodynamics, effect of temperature on spontaneity, free energy, entropy changes in chemical reactions, 3<sup>rd</sup> law of thermodynamics, standard free energies, predicting the sign of  $\Delta S^\circ$ , relationship between free energy and equilibrium, temperature dependence of equilibrium constant, free energy and work.

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## Chapter 21 (Electrochemistry: Chemical Change and Electrical Work)

Read Sections: 10.1-4,7 (omit pp. 952-956 on balancing redox rxns and pp. 988-990 on electrolysis of aqueous solutions)

End-of-chapter problems:

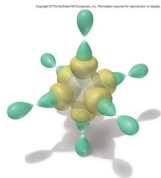
**RED: 21. 8a-e,20,25,27,31,40,51,56,60,68 (assume equal volumes for part b), 99,103,110**

**Black: 21.9a-e,21.26,28,32,52,57,61,63,69,71,80,86,102,112**

**In This Chapter:** Basic electrical units, Voltaic cells, half cells, cell potential, standard reduction potentials, Nernst equation, dependence on concentration, concentration cells, electrical work, electrolysis.

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## **Chapter 23 The Transition Elements and Their Coordination Compounds)**



Read Sections: 23.1,3,4 (ie., Omit 19.2. Also omit pp. 1065-1067 on valence bond theory)

End-of-chapter problems:

**RED:** 23.4,9,14,16,37,39,42,45,47,53,55,74,80,82,86,92,97

**Black:** 23.35,50ac,52,58,62,66,95,98,114

**In This Chapter:** Basic properties of transition metals, electron configurations of ions, nomenclature of coordination complexes, crystal field theory, magnetic and optical properties, spectrochemical series for common ligands.

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