CHEM 1062  Chemical Principles II  
Syllabus  
Spring 2018, 3 credits, 1/17/18 - 5/4/18  
MWF 1:25 - 2:15 PM, Smith 100  

Instructor Information  
Prof. Doreen Geller Leopold  
211 Smith Hall  
dleopol@umn.edu  
626-2047  
Office hours: Wednesdays 12:00 - 1:00 and Fridays 2:30 - 3:30  
and other times by appointment  

General Course Information  
Chemistry 1061 and 1062 are introductory lecture courses (each 3 credits), accompanied by a separate lab course (Chem 1065, 1066, each 1 credit). These courses are designed to help prepare students for science and engineering majors, including chemistry.  

Each lecture/lab pair fulfills the Diversified Core requirement in Physical Science. A student may ask, “Why is this course considered an important component of my liberal education?” A liberally educated person is one who can understand complex issues, find credible information, analyze that information, problem-solve, and draw reasonable conclusions based on facts. These courses will help to develop the skills of an informed citizen and life-long learner. (For more information on this aspect of Chem 1062/1066, see p. 10.)  

Prerequisites  To register/remain registered in 1062, you must fulfill 2 criteria:  
• You must have passed Chem 1061 or an equivalent course with a grade of C- or better.  
• You must also be registered in the lab, Chem 1066, this semester.  
If you do not meet these requirements, you should report your situation to the staff in Smith 115 (624-0026) immediately. They handle all registration issues pertaining to this course. They must also be informed if you are retaking this course without the lab (having passed it previously).  

For $187.50, a new hard-cover text can be purchased at the Bookstore, packaged with the "ALEKS-360" two-semester access card and e-book.  

Or, ALEKS access can be purchased online (www.aleks.com) for one semester (180 days) for $60, or for $90 including access to the e-book version of the text. In either case, for $60 more, one can order the loose-leaf version of the text.  

(Use of the ALEKS online system is optional in our class.)
Calculators

Calculators will be allowed on all of our Quizzes except for Quiz 3 (on acid-base equilibria, Chapter 18), and they will also be allowed on the Final Exam. For Quiz 3, numerical values in questions will be chosen to be "pencil-and-paper" math friendly, and/or the multiple-choice answers listed will be far enough apart to allow the answer to be estimated.

For Quizzes and Exams on which calculators are allowed, a general policy for the general chemistry courses is that programmable or graphing calculators may not be used. The presence or use of an unacceptable calculator on Quizzes or Exams will be considered as scholastic dishonesty. Calculators may not be shared among students during Quizzes and Exams. One recommended model is the TI-30Xa (one-line display), which is available at the U of M Bookstore in Coffman Union for about $10. Another good model is the two-line display TI-30X IIS. (Many other two-line calculators are programmable so would not be acceptable.) If you have a different non-programmable, non-graphing calculator that you would like to use, please obtain the instructor's approval prior to the exam. It is useful for the calculator to be able to display numbers in scientific notation (e.g., $6.02 \times 10^{23}$) and to have exponential and logarithmic functions, including natural logs (base $e$). If you are concerned about battery failure during the exam, it is a good idea to bring a second calculator or extra batteries with you.

Class Websites

There are 4 websites associated with this course that you will find useful.

1. Lecture Moodle Site   ay17.moodle.umn.edu
   CHEM 1062 Chemical Principles II (sec 001) Spring 2018
   This site includes various resources to help you succeed in this class:
   • PowerPoint lecture slides (with portions omitted - to be filled out in class)
   • Study Guides including reading and end-of-chapter problems
   • Your Quiz and Final Exam grades
   • Answer keys for our Quizzes and Final Exam
   • Old exams, including detailed answer keys with worked problems

2. Lab Information   http://genchem.chem.umn.edu/
   Please note that the Chem 1066 lab is a separately graded course that must be taken during the same semester that you take Chem 1062.

3. ALEKS online learning system - described on the next page

4. General Chemistry Web Site   http://genchem.chem.umn.edu/
   This site also has general information about Chem 1062 and other general chemistry courses, including walk-in tutor hours in Smith 124.
Study Guides and ALEKS Problem Sets

Study Guides  on our class' Moodle site provide recommendations for readings in the text and associated end-of-chapter problems. Doing these problems is very useful to help learn the material and prepare for the Quizzes and for the Final Exam.  All of the topics covered on our Quizzes and on the Final Exam are also included in these Study Guides.

- Answers to assigned problems with black numbers will be posted on Moodle. Answers to problems with red numbers are listed in Appendix E of the text, and also right below that problem in the e-book version.

Online Learning (ALEKS):  For more info, see pp. 4 & 6 and our Moodle site.

ALEKS stands for Assessment and LEarning in Knowledge Spaces. It is a novel, "artificially intelligent" system that uses a method called "adaptive questioning". Seven problem sets ("objectives") are available for our class on ALEKS. For students who use ALEKS, the first 6 are due at 9:00 PM on the same days as our Quizzes, and the last one is due at 9:00 PM on the last day of classes. Together, the 7 ALEKS problem sets can count as 2% of the course grade. The ALEKS grade will be calculated out of a maximum of 10 points total, with full credit given for 100 topics (0.1 point per topic) completed by their due dates, out of 131 topics total for the 7 ALEKS problem sets ("objectives"). No ALEKS "assessments" have been scheduled after the initial one, described below. (In our class, the "pie mastery" percentage will not be used in determining the ALEKS grade.)

Accessing ALEKS:
1. Go to www.aleks.com and log in (or purchase an access code if needed). Free access for 2 weeks can be obtained using this temporary access code: E69EC-6A5C1-A23AD-F85F0
   Enter our class code: QRCX6-DWYF3  This is a unique code for our class. Check that you're in the right class: Chem 1062, Sp 2018, Doreen Leopold
2. Take the Initial Assessment (opens Wed. Jan. 3, and is due Wed. Jan. 24) Its purpose is for ALEKS to figure out the best questions to ask you later. You can log out and log back in, and it will keep your place. Your score on the initial assessment does not count toward your ALEKS grade. This assessment includes material (selected by the ALEKS system) from later in the semester. (ALEKS recommends that it's not a good idea to hurry through the initial assessment and incorrectly answer questions on material that you know, since then it may ask too many questions later that are too easy for you.)
3. Learning Mode After the initial assessment, you'll see your ALEKS "pie." You can begin working on topics by scrolling over the slices, and available topics will be indicated by arrows.
Quizzes and Exams
• There will be 6 Quizzes on alternate Wednesdays at our usual class time on Feb. 7, Feb. 21, March 7, March 28, April 11 and April 25.
   (Rooms to be announced.)
   Each student can drop one Quiz or reduce the weight of the Final by half.
• The Final Exam will be on Tuesday, May 8, 2018 at 10:30 AM - 12:30 PM.
   (Rooms to be announced.)
The Final Exam will be cumulative over the whole semester.
If the Final Exam is not taken at the scheduled time, a score of zero will be given, unless the student has obtained an excused absence (see "Incompletes").
• Our class’ Quizzes and the Final Exam will only be given during the regularly scheduled times.

Grades & Grading Policies
Course grades will be based on the weighted average of Quiz, Final Exam and (optionally) ALEKS scores, according to the following breakdown.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best 7 out of 8 of the following Quiz and Final Exam contributions:</td>
<td></td>
</tr>
<tr>
<td>Quizzes (70 points each for 6 Quizzes) and Final Exam (140 points, equivalent to 2 Quizzes),</td>
<td>490</td>
</tr>
<tr>
<td>(490 points total for best 7 x 70 points*)</td>
<td></td>
</tr>
<tr>
<td>ALEKS Problem Sets (up to 10 points total)**</td>
<td>10</td>
</tr>
<tr>
<td>(Total Possible = 500 points)</td>
<td>500</td>
</tr>
</tbody>
</table>

Example: if a student gets 350 points out of 490 on the 7-out-of-8 best Quiz and Final Exam contributions, and full credit (10 points) on the ALEKS problem sets, the cumulative score is:

(350 + 10) / 500 = 360 / 500 = 72.0 %

According to the grading information on page 6, this score would correspond to a course grade of B- (or better).

* If the dropped contribution is half of the Final Exam (and all 6 Quizzes are counted), we will use half of the total points on the entire Final Exam (that is, the Final Exam will be weighted only half as much as usual).

** Regarding ALEKS: If a student chooses not to do the ALEKS problem sets, then the percentage will be calculated out of 490 points (rather than 500), so there is no penalty. Students who choose not to do the ALEKS problems are strongly encouraged to do the end-of-chapter problems in the Study Guides to learn the material and prepare for the Quizzes and the Final Exam.
Quiz and Exam Format, Missed Quizzes, Incompletes

Exam Format  The 6 Quizzes will each have 14 multiple choice questions, and the Final will have 35 questions. Each Quiz question will be worth 5 points, and each question on the Final Exam will be worth 4 points.

The equation sheet and periodic table at the end of this syllabus will be provided with each of our Quizzes and with the Final Exam. No notes are allowed.

Since the Quizzes and Final will be machine-graded, answers must be given by filling in the appropriate spots in #2 pencil on the "bubble" sheets (scantrons).

Students must bring their I.D. card (U Card) to each Quiz and to the Final Exam, since the proctors will check or spot-check these.

Cell phones or other electronic communication devices may not be used during Quizzes or on the Final Exam.

Excused Absences from Quizzes
Students who are unable to take one Quiz due to illness, a family emergency, etc., can obtain an excused absence from the instructor. In this case, the student's grade on the corresponding portion of the Final Exam will be used to provide a substitute score.

A student requesting an excused absence should contact the instructor (e.g., by e-mail or phone) before the start of the exam to make this request, if possible. It is not necessary to provide a doctor's note for one-time illnesses for which you would not ordinarily be seen by a doctor.

If a student misses a Quiz and does not request an excused absence, we will automatically drop that Quiz and count the other five Quizzes and the full weight of the Final Exam toward the course grade. In this case, it is not necessary for the student to inform the instructor that the student plans to miss that Quiz.

Students on University teams playing out of town (or other U of M activities) may be able to take a Quiz at that location, with the coach or an instructor as proctor. Please see your 1062 instructor about this early so arrangements can be made.

If circumstances require a student to miss more than one of our six Quizzes, the student should communicate as soon as possible with the instructor to discuss the available options.

Incompletes  Students who have an excused absence from the Final Exam, have taken at least 5 Quizzes, and are passing the course based on those scores, may be eligible to receive a grade of "I". The instructor should be notified before the Final Exam begins, if possible. (This option is rarely exercised.)

An "Incomplete" form (available in Smith 115) signed by the student (when they are able to do so) and by the instructor is required. This form must describe the arrangements made to make up the Incomplete, which must be done by the end of the following semester.
Course Grading Curve

Course grades will be determined by a method that combines the absolute grading scale shown below with a curve applied at the end of the semester (if needed) to lower some of the thresholds. That is, if you get the following total scores on the Quizzes, Final Exam and (optionally) ALEKS, then your course grade will be at least as high as is listed below. Grades may be curved in a favorable direction at the end of the semester (for example, a B- might become a B), if needed to adjust the course grades up to the usual department-wide distribution for introductory chemistry classes (in which about half of the students earn course grades in the A or B ranges).

Minimum Points Required for Letter Grades
(out of 500 points total*)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Minimum Percentage</th>
<th>Points Required</th>
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</thead>
<tbody>
<tr>
<td>A+</td>
<td>95%</td>
<td>475 points minimum (actually would be an A since A+ isn't an official course grade)</td>
</tr>
<tr>
<td>A</td>
<td>90%</td>
<td>450</td>
</tr>
<tr>
<td>A-</td>
<td>85%</td>
<td>425</td>
</tr>
<tr>
<td>B+</td>
<td>80%</td>
<td>400</td>
</tr>
<tr>
<td>B</td>
<td>75%</td>
<td>375</td>
</tr>
<tr>
<td>B-</td>
<td>70%</td>
<td>350</td>
</tr>
<tr>
<td>C+</td>
<td>65%</td>
<td>325</td>
</tr>
<tr>
<td>C</td>
<td>60%</td>
<td>300</td>
</tr>
<tr>
<td>C-</td>
<td>50%</td>
<td>250</td>
</tr>
<tr>
<td>D+</td>
<td>40%</td>
<td>225</td>
</tr>
<tr>
<td>D</td>
<td>35%</td>
<td>175</td>
</tr>
</tbody>
</table>

* Use of the ALEKS online system is optional in this class.

For students who choose not to do the ALEKS problem sets ("objectives"), or whose total ALEKS percentage (out of 10 points total for 100 topics mastered) is lower than their average best-7-out-of-8 Quiz and Final Exam percentage, the percentage out of 490 points (rather than 500) will be used in determining the course grade.

To implement this option, each student's score will be calculated out of 490 points (not including the ALEKS grade) and out of 500 points (including the ALEKS grade of up to 10 points). The higher of the two percentages will be used in determining the student's course grade.
Other Grade-Related Issues

Regrades
Quiz and Final Exam regrades should be requested in writing (directly to the instructor via e-mail) by the end of the week following the posting of those grades. It is very unusual for the bubble sheets (scantrons) to be misread by the scanner. Students are responsible for making sure they have accurately recorded their answers in the correct spaces on the bubble sheet and have completely erased answers which were changed.

S/N Grading (for students not in CSE or CBS)
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”. A grade of D+ or below will receive an “N”. (Many programs do not like S/N grades or will assume that they represent the minimum possible grade.)

Withdrawals
If you are considering withdrawing from the class for academic reasons, it is a good idea to discuss this first with your instructor. Your situation may not be as bad as you think it is. If you do decide to drop the class, you should officially withdraw following the rules for your college. Students who withdraw will not have any records retained for use upon retaking the class.

As noted on the class schedule, "Students who drop CHEM 1062 (lecture) before Monday, March 26, 2018 are REQUIRED to drop CHEM 1066 (lab). No Exceptions!"

Retaking the Course
Students who have completed the lab (Chem 1066) and wish to retake Chem 1062 should speak with the staff in Smith 115.

Scholastic Dishonesty is discussed under CSE's scholastic policies. It is defined in the University Student Conduct Code as follows:

"Scholastic Dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis."

Academic dishonesty in any portion of the academic work for a course shall be grounds for assigning the student a grade of F (or N) for the entire course.
Help

Asking questions during office hours, after class, in the tutor room, etc., can help students overcome conceptual or quantitative problems with the material. It is a good idea to get help early to deal with potential problems before they escalate.

Instructor's Office Hours
These will be regular, drop-in office hours every week (see times on page 1), for which no appointments are needed. Students can also make appointments for us to meet at other times. Students are also welcome to send questions by email (dleopold@umn.edu).

Drop-In Tutorial Hours http://genchem.chem.umn.edu/
Room 124 Smith Hall is the site of regular Chem 1062 drop-in tutorial sessions conducted by general chemistry TAs. Typical hours are Mondays through Fridays, 10 AM through 6 or 7 PM.

Smart Learning Commons http://smart.umn.edu/
This resource, in Walter Library, also provides tutorials, peer-assisted learning sessions, study space, and help with exam preparation.

PAL (Peer Assisted Learning) https://www.lib.umn.edu/smart/about-pal
These meetings are led by trained, experienced undergraduate PAL facilitators. They are intended to reinforce lecture and text material through small group work, with a focus on course concepts and practice solving problems.

Student Solutions Manuals www.lib.umn.edu/course/CHEM/1062
The Student Solutions Manual for the Silberberg and Amateis text (8th Ed.) is available in the Reserve room in the basement of Walter Library. It has detailed solutions to the red-numbered problems, for which short answers are also listed in Appendix E. These materials can be borrowed for 3 hours (or overnight if borrowed after 5 PM - in that case, they must be returned one hour after the library opens the next day). For more information on Walter Library course reserves, contact Tim Engelstad (624-3897 , engel356@umn.edu ).
## Miscellaneous

### Special Needs
Students should contact the Disability Resource Center (DRC) (626-1333, ds@umn.edu, [https://diversity.umn.edu/disability/](https://diversity.umn.edu/disability/) ). If the DRC recommends that extended times (or a private room) are required, students are responsible for making arrangements with the DRC to take their Quizzes and Final Exam under their supervision at the McNamara Alumni Center. Arrangements must be made at least one week prior to each Quiz or the Final Exam.

### Issues with Your Instructor
On occasion you may have a concern or problem regarding this course. You will find your instructor quite willing to discuss this with you. If, however, you wish to discuss it with someone else, please contact Prof. Michelle Driessen, Director of General Chemistry (113 Smith Hall, 624-0062, mdd@umn.edu). She will serve as a mediator in helping to resolve the issue.

### 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 with an average level of preparation who is taking a 3 cr., 3 lecture-per-week course (like Chem 1062) should expect to spend a total of 3 cr. x 3 hours/cr. = 9 hours per week on the class. Subtracting 3 hours for lectures, this corresponds to an additional 6 hours every week on reading and doing problems in the Study Guides and/or the ALEKS problem sets to achieve an average grade.
CHEM 1062 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 as 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 1062, we study chemistry, of course. For example, we learn to understand chemical reaction rates, chemical equilibrium, acid-base reactions, thermodynamics, and electrochemistry. 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 validities by applying them to new situations. Moreover, using the language of math, 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 are taking concepts in their mathematical incarnations and using them to enhance your understanding and to make predictions. You are doing the work of the field.

This aspect of the course is particularly emphasized in the co-requisite laboratory course (Chem 1066). 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

http://www.academic.umn.edu/provost/teaching/cesl_outcomes.html

Succeeding in Chem 1062 and 1066 will help students come closer to achieving 6 of the 7 Student Learning Outcomes that together describe the anticipated capabilities of students who have earned their bachelor's degrees at the U of M:

• **Can identify, define, and solve problems**
  These courses provide a vehicle for practicing quantitative problem solving and for learning to transcend merely algorithmic thinking. Many of the problems we will encounter require the synthesis of both mathematical and conceptual modes of understanding.

• **Can locate and critically evaluate information**
  With the abundant new chemical information introduced in these courses, much of the challenge in solving a particular problem is often figuring out what information is most pertinent. These skills will be further exercised in the lab, where students will work together on extended, open-ended assignments.

• **Have mastered a body of knowledge and a mode of inquiry**
  We will cover many useful principles of chemistry which are tied together by common threads, and together form part of a “body of knowledge”. Learning how to approach and apply this knowledge involves practicing some of the “modes of inquiry” used routinely by chemists and, indeed, by all scientists and engineers.

• **Can communicate effectively**
  In the lab, students will develop their scientific writing skills through keeping laboratory notebooks and writing formal lab reports. Students will also hone their oral communication skills through interactions with their lab team members, and by presenting reports on their experimental results.

• **Understand the role of creativity, innovation, discovery, and expression across disciplines**
  Scientists' efforts to explain the world in new ways often require real creativity, and the discipline to pursue and effectively communicate original ideas despite their initial derision by others. We will see how physics and math blend seamlessly with chemistry, and how chemistry permeates many other disciplines.

• **Have acquired skills for effective citizenship and life-long learning.**
  Chemistry plays a central role in many societal issues. The knowledge and critical thinking skills developed in these courses can help form a foundation for informed decision making and effective citizenship.
Additional Links to Recommended U of M Syllabus Policy Statements

http://www.policy.umn.edu/Policies/Education/Education/SYLLABUSREQUIREMENTS.html

1. Grading and transcripts:
   http://www.policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html

2. Student conduct code, scholastic dishonesty:
   If you have additional questions, please clarify with your instructor for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonest in the context of a particular class; e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam. The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty:
   http://www1.umn.edu/oscai/integrity/student/index.html

3. Makeup work for legitimate absences:
   http://www.policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html

4. Academic freedom and responsibility:

5. Teaching and learning, student responsibilities: The materials provided in this course are intended only for the students officially enrolled in this section and are to be used to learn and practice the course material. Disseminating class notes, videos, exams, etc. beyond the classroom community or accepting compensation (in the form of cash or trade, such as access to a study website) violate shared norms and standards of the academic community and are not allowed. For additional information, see:
   http://www.policy.umn.edu/Policies/Education/Education/STUDENTRESP.html

6. Sexual harassment:
   http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf

7. Equity, diversity, equal opportunity, and affirmative action:
   http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf

8. Student Mental Health and Stress Management: Students may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. U of M services are available to assist students with addressing these and other concerns. To learn more about the broad range of confidential mental health services available on campus, see:
   http://www.mentalhealth.umn.edu/
Study Guides #1 through #7 on our Moodle site list pages to read in our text, Silberberg & Amateis' "Chemistry" (8th Ed.), and suggested end-of-chapter problems for each of the 7 chapters we will cover. For students who use the ALEKS learning system, assignments will be due at 9 PM on the indicated dates. Calculators will be allowed on the Final Exam and on all Quizzes except for Quiz #3.

<table>
<thead>
<tr>
<th>Introduction</th>
<th>W 1/17/18</th>
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<tbody>
<tr>
<td>Chap. 16 Kinetics (Study Guide #1)</td>
<td>F 1/19 M 1/22 W 1/24 <strong>(ALEKS initial assessment due)</strong> F 1/26 M 1/29 W 1/31</td>
</tr>
<tr>
<td>Chap. 17 Equilibrium (Study Guide #2)</td>
<td>F 2/2 M 2/5 W 2/7 <strong>Quiz 1 on Chapter 16, Kinetics (ALEKS #1 due)</strong> F 2/9 M 2/12 W 2/14</td>
</tr>
<tr>
<td>Chap. 18 Acid-Base Equilibria in Aqueous Solns (Study Guide #3)</td>
<td>F 2/16 M 2/19 W 2/21 <strong>Quiz 2 on Chapter 17, Equilibrium (ALEKS #2 due)</strong> F 2/23 M 2/26 W 2/28</td>
</tr>
<tr>
<td>Chap. 19 Ionic Equilibria in Aqueous Solutions (Study Guide #4)</td>
<td>F 3/2 M 3/5 W 3/7 <strong>Quiz 3 on Chapter 18, Acid-Base Equilibria - no calculators allowed (ALEKS #3 due)</strong> F 3/9 M 3/19 W 3/21</td>
</tr>
<tr>
<td>Chap. 21 Electrochemistry (Study Guide #6)</td>
<td>F 4/6 M 4/9 W 4/11 <strong>Quiz 5 on Chapter 20, Thermodynamics (ALEKS #5 due)</strong> F 4/13 M 4/16 W 4/18</td>
</tr>
<tr>
<td>Chap. 23 Transition Metals, Coordination Chemistry (Study Guide #7)</td>
<td>F 4/20 M 4/23 W 4/25 <strong>Quiz 6 on Chapter 21, Electrochemistry (ALEKS #6 due)</strong> F 4/27 M 4/30 W 5/2</td>
</tr>
<tr>
<td>Review</td>
<td><strong>ALEKS #7 due</strong></td>
</tr>
<tr>
<td>F 5/4</td>
<td><strong>Final Exam (Cumulative)</strong></td>
</tr>
<tr>
<td>Tues 5/8/18 10:30-12:30</td>
<td></td>
</tr>
</tbody>
</table>
This is the equation sheet that will be provided with all of our quizzes and exams this semester:

rate = \( k \) : \([A]_t = -kt + [A]_o\)

rate = \( k [A] \) : \( \ln([A]/[A]_o) = kt \) \( \rightarrow \) \( [A]_t = [A]_o e^{kt} \)

rate = \( k [A]^2 \) : \( 1/[A]_t = kt + 1/[A]_o \)

\( k = Ae^{-E_a/(RT)} \)

\( \ln \left( \frac{k_2}{k_1} \right) = \left( -\frac{\Delta H}{R} \right) \left( \frac{1}{T_2} - \frac{1}{T_1} \right) \)

\( K_p = K(RT)^{\Delta n} \)

\( \Delta S_{surr} = -\Delta H_{sys}/T \)

\( \Delta G^0 = \Delta H^0 - T\Delta S^0 \)

\( \Delta G^0 = -RT \ln K = -2.303 \text{ RT log } K \)

\( \ln K = -\Delta H^0/RT + \Delta S^0/R \)

\( \Delta G^0 = -nF_E_o^{\text{cell}} \)

\( \log K = nE_o^{\text{cell}}/0.0592V \)  \( \text{ (at } 25^\circ \text{C)} \)

\( E_{cell} = E_o^{\text{cell}} - (0.0592V/n) \log Q \)  \( \text{ (at } 25^\circ \text{C)} \)

Spectrochemical series:  \( \Gamma^- < \text{Cl}^- < \text{F}^- < \text{OH}^- < \text{H}_2\text{O} < \text{SCN}^- < \text{NH}_3 \) ...

\( ... < \text{en (ethylenediamine)} < \text{NO}_2^- (\text{N-bonded}) < \text{CN}^- < \text{CO} \)

\( R = 8.314 \text{ J/(mol·K)} = 0.08206 \text{ (atm·L)/(mol·K)} \)

\( N_A = 6.022 \times 10^{23} \text{ /mol} \)

\( e = 1.602 \times 10^{-19} \text{ C} \)  charge of an electron (or proton)

\( F = 9.649 \times 10^4 \text{ C/mole} \)

1. amu = 1.661 \times 10^{-27} \text{ kg} \)

1. atm = 760 \text{ torr} \)

0°C C = 273.15 K;  \( T(\text{°C}) = (5/9) [T(\text{°F}) - 32] \)

1. cm³ = 1. mL \)

1. Å = 1. \times 10^{-8} \text{ cm} = 1. \times 10^{-10} \text{ m} \)

1. nm = 1. \times 10^{-9} \text{ m} \)

1. pm = 1. \times 10^{-12} \text{ m} \)

\( \sqrt{2} \approx 1.4, \sqrt{3} \approx 1.7, \sqrt{5} \approx 2.2, \sqrt{6} \approx 2.4, \sqrt{7} \approx 2.6, \sqrt{8} \approx 2.8 \)

Logarithms: we use "ln" for base e and "log" for base 10.

\( \log(a \times b) = \log(a) + \log(b); \log(a/b) = \log(a) - \log(b); \log(a^n) = n \log(a) \)  \( \leftarrow \) same three relations hold for ln

\( \log 1 = 0; \ln 1 = 0; \ln 2 \approx 0.693; \ln 10 \approx 2.30; \ln a \approx 2.30 \log a; e^a \approx 10^{a/2.30} \)

\( \log e = 1/\ln(10) \approx 0.43; e \approx 2.7 \)

\( \log 2 \approx 0.30; \log 3 \approx 0.48; \log 4 \approx 0.60; \log 5 \approx 0.70; \log 6 \approx 0.78; \log 7 \approx 0.85; \log 8 \approx 0.90; \log 9 \approx 0.95; \log 10 = 1. \)