INTRODUCTION: CH1160—University Chemistry II is the second of a two-semester sequence and is designed to give you an overview of the fundamental chemistry topics and problem solving skills required by most science and engineering disciplines. The prerequisite for this class is CH1150, and builds on the material covered in that class. Some majors are required to take the associated laboratory (CH1161) as a co-requisite. For lab questions, please contact Lorri Reilly (Chem. Sci. 508B, lareilly@mtu.edu, 7-2044). A separate recitation section (CH1163) is also offered, and you may choose to register for CH1163 even if your major does not require you to do so. The recitation sessions will emphasize problem solving, and will be graded as pass/fail based on attendance and class assignments related to the lecture material. To register for recitation, please contact your advisor or Lois Blau (Chem. Sci. 206A, lablau@mtu.edu, 7-2297).

CLASS SCHEDULE: The lecture meets three times per week on Monday, Wednesday and Friday in Fisher-138 at 9:05 am. The lectures only provide you with a guide to the material and you must, therefore, read the relevant textbook chapters prior to the class and again after the class. Unless you have a photographic memory, I also recommend you take notes from the book as you read. Even though I assign online homework, I still encourage you to work through as many of the even-numbered end of chapter problems that you can. These problems have answers in the back of the book and will greatly help you prepare for examinations. There are many ways of approaching chemistry, so by working on as many practice problems as you can, you are maximizing your chances of recognizing and completing the problems you face under exam conditions. Along with the following list of topics (subject to change), are some suggested end-of-chapter problems to get you started.

**Topic 01: Chemical Kinetics II**
Rates of reaction (Section 13.1)  
Rate law (Section 13.2)  
Reaction concentration and time (Section 13.3)  
Temperature dependence (Section 13.4)  
Reaction mechanisms (Section 13.5)  

**Suggested Problems**—  
Chapter 13: 2, 3, 6, 8, 10, 14, 16, 18, 24, 26, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 62, 64, 66, 70, 74, 76, 86, 88, 96, 100, 102, 104.

**Topic 02: Chemical Equilibrium II**
Equilibrium concept (Section 14.1)  
Equilibrium constant (Section 14.2 & 14.3)  
Equilibrium concentrations (Section 14.4)  
Le Châtelier’s principle (Section 14.5)  

**Suggested Problems**—  
Chapter 14: 2, 4, 6, 8, 14, 16, 18, 20, 26, 28, 30, 32, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 62, 64.

**Topic 03: Acids and Bases**
Acid-Base Concepts (Sections 15.1, 15.2, & 15.12)  
pH — A Measure of Acidity (Section 15.3)  
Acid-Base Strength (Section 15.4 & 15.9)  
Acid Ionization Constants (Section 15.5-15.7)  
Diprotic & Polyprotic Acids (Section 15.8)  
Acid-Base Properties of Salts (Section 15.10 & 15.11)  

**Suggested Problems**—  
Chapter 04: 10, 20, 32, 34.  
Chapter 15: 4, 6, 8, 16, 18, 20, 24, 30, 32, 34, 44, 46, 48, 54, 56, 58, 62, 64, 68, 76, 78, 96, 98, 100, 106, 118, 120, 124.
**Topic 04: Aqueous Equilibrium**
The Common Ion Effect (Section 16.2)
Buffer Solutions (Section 16.3)
Acid-Base Titrations (Section 16.4 & 16.5)
Solubility Equilibria (16.6-16.10)

**Suggested Problems**
Chapter 16: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 26, 28, 32, 34, 40, 42, 44, 48, 50, 52, 54, 56, 62, 64, 66, 68.

**Topic 05: Thermochemistry**
Spontaneity and Entropy (Sections 18.1 - 18.4)
Free Energy and Equilibrium (Section 18.5 & 18.6)
Living Systems (Section 18.7)

**Suggested Problems**
Chapter 18: 2, 4, 6, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 38, 42, 44, 48, 54, 60, 62.

**Topic 06: Electrochemistry**
Redox Reactions (Sections 4.4 & 19.1)
Reduction Potentials (Sections 19.3 & 19.4)
Concentration Effects (Section 19.5)
Batteries and Corrosion (Sections 19.6 & 19.7)
Electrolysis (19.8)

**Suggested Problems**
Chapter 4: 36, 38, 40, 44, 46, 48, 50, 54, 56.
Chapter 19: 2, 4, 6, 10, 12, 14, 16, 18, 20, 22, 24, 26, 30, 32, 34, 46, 48, 50, 52, 58.

**Topic 07: Organic and polymer chemistry**
Organic Nomenclature Review (Sections 24.1-24.4)
Polymers (Sections 25.1-25.4)
Organic Materials on Blackboard

**Suggested Problems**
Chapter 24: 12, 14, 16, 20, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 46, 56, 58, 60.
Chapter 25: 2, 4, 6, 8, 10, 12, 32.
Organic Handouts on Blackboard.

**Topic 08: Elements and Compounds II – More Bonding Theories**
Lewis and VSEPR Review (Sections 9.6-9.9, 10.1, & 10.2)
Bond Theory & Orbital Hybridization (Sections 10.3-10.5)
Molecular Orbital Theory (Section 10.6-10.7)
Delocalized Molecular Orbitals (Section 10.8)
Band Theory of Electrical Conductivity (Section 20.3)
Coordination Complexes (Section 22.1-22.4, and 22.7)
Crystal Field Theory (Section 22.5 & 22.6)

**Suggested Problems**
Chapter 09: 44, 46, 48, 95, 102.
Chapter 10: 8, 10, 12, 14, 16, 18, 20, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 46, 48, 50, 52, 54, 56, 58, 60, 64, 66, 68, 74, 76, 84, 88.
Chapter 20: 12, 18, 20, 22.
Chapter 22: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38.

**Topic 09: Nuclear Chemistry**
Nuclear reactions and stability (Sections 23.1 & 23.2)
Radioactivity and Transmutation (Sections 23.3 & 23.4)
Fission and Fusion (Sections 23.5 & 23.6)
Uses and Biological Effects (Sections 23.7 & 23.8)

**Suggested Problems**
Chapter 23: 2, 4, 6, 8, 10, 14, 16, 20, 24, 26, 30, 34.

**Topic 10: Environmental Chemistry**
Earth’s Atmosphere (Section 17.1-17.3)
The Greenhouse Effect (Section 17.5)
Acid Rain, Smog, & Pollution (Section 17.6-17.8)
Green Chemistry on Blackboard

**Suggested Problems**
Chapter 17: 12, 14, 16, 18, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 56, 58, 66, 68, 72, 86.
Green Chemistry Handouts on Blackboard.
GRADING: Your grade will be based upon the percentage of the total points available that you accumulate and are divided between assignments as shown below. The pass mark for this class is provisionally set at 60%, a grade C is set at 70%, a Grade B is set at 80%, and a Grade A is set at 90%. Mixed letter grades will be given at my discretion.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
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<tbody>
<tr>
<td>i&gt;clicker</td>
<td>100</td>
</tr>
<tr>
<td>ARIS Online Homework</td>
<td>200</td>
</tr>
<tr>
<td>Hour Exams</td>
<td>300</td>
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<tr>
<td>Final Exam</td>
<td>200</td>
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<tr>
<td><strong>Total Points</strong></td>
<td>800</td>
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BLACKBOARD: Michigan Tech uses the course management software known as Blackboard to provide you with secure access to grades, class material, homework and so on. Although we are using ARIS for your online homework and quizzes, other useful material will be placed on the Blackboard site. To access Blackboard you go to http://courses.mtu.edu and enter your Michigan Tech ISO username and password. Once logged in, you will be presented with a list of the courses you are currently registered in. Select the one that is labeled “CH1160” for access to class related materials.

REDINOTES: The class PowerPoint slides, known as RediNotes, will be made available on Blackboard for you to download. Copies may also be available during lecture or in the Chemistry Learning Center. These notes are NOT designed to replace taking good notes, but they will reduce your need to copy everything from the slides and will allow you to pay closer attention to classroom discussion, write down any additional information, and participate via the i>clicker system.

i>CLICKER: Studies have shown that it is extremely important for students to be engaged in the classroom experience if they are to maximize their learning. One way of doing this is to ask questions, have discussions, and perform in-class quizzes. In an attempt to get you all thinking about the material and considering the problems, we will use i>clicker remotes (available at the bookstore). The i>clicker is a response system that allows you to respond to questions I pose during class—you will be graded on that feedback and your in-class participation. My goal is that the i>clicker system provides both of us with feedback on your learning (and my teaching) rather than them simply acting as a measure of your attendance. In an attempt to achieve this, I drop 10% of your lowest scores so that you can “have bad days” on some percentage of your classes without penalty.

In order to receive credit, you will need to register your i>clicker remote online within the first week of class as follows:

1. Before registering, you must come to class and vote on at least one question in order to complete this registration properly. This should, hopefully, have happened on the first day.
2. Once you have voted on a question in my class, go to [http://www.iclicker.com/registration](http://www.iclicker.com/registration).
3. Complete the fields with your first name, last name, student ID, and remote ID.
   a. *Your student ID must be your Michigan Tech ISO Login (e.g. sarahill) otherwise the i>clicker software will not communicate with Blackboard and you will not get credit.*
   b. Your remote ID is the series of numbers/letters found on the bottom of the back of your i>clicker remote.
   c. i>clicker will be used every day in class, and you are responsible for bringing your remote daily.
ONLINE HOMEWORK: If you were in CH1150 last spring, your ARIS username and password should still be active. If you are new to this class, you will need to buy an access code online, or buy a textbook with and included code card. When registering on ARIS you MUST use your Michigan Tech email address to receive credit for the work you do. The ARIS online homework consists of a number of problem sets (~20) that will become available throughout the semester. Check regularly. Each problem set consists of a series of questions, many of which include help should you have difficulties. In addition to the ARIS problems, there will be review sets on Blackboard that will become available shortly before each examination—these may be completed for extra credit.

If you were in CH1150, you can simply use your existing username and password:

1. Go to www.mharis.com and log in to your account.
2. Scroll to the bottom of the page and enter the section enrollment number (A43-89-ECE) using CAPITAL letters in the box marked “Enroll in Another Course”.
3. Click Go>>
4. You should now see “CH1160 University Chemistry II” listed under Current Courses and Sections.

If you purchase a working code from a friend:

1. Go to www.mharis.com and have your friend log in to their account.
2. At the top of the page, click “Edit Profile” to change passwords. After you have changed passwords, change the email address to your Michigan Tech email address and their name to your name. and email address . If you enter any other address risk not receiving any credit for your online homework because the ARIS software will not be able to communicate with the Michigan Tech Blackboard system and you could potentially lose 25% of your total points.
3. Click Submit>>
4. Follow the steps above to enroll in CH1160.

You can register for access to the online homework as follows:

1. Go to www.mharis.com and click students within the first week of class.
2. Under Join a Course, enter the section enrollment number (A43-89-ECE) using CAPITAL letters.
3. Click Next>>
4. Enter the 20-digit alphanumeric registration code from the card that came with your textbook.
5. Enter your Michigan Tech email address and click Submit. If you enter any other address risk not receiving any credit for your online homework because the ARIS software will not be able to communicate with the Michigan Tech Blackboard system and you could potentially lose 30% of your total points.
6. Create your account by entering your Michigan Tech email address and creating a password (WRITE IT DOWN) that you will use to access your online homework on future visits.
7. Select “Michigan Technological Univ (Houghton)” for your school, create a security question in case you forget your password, and accept the terms of service agreement. Then click the Complete My Registration button.
8. Once registered, you will see a page that shows announcements and assignments. At the start of the class, you should just see one available assignment. You will also receive two email messages from noreply-he@mcgraw-hill.com confirming your registration. They may become caught in your spam filter (mine did), so find and save them somewhere safe.
EXAMINATIONS: There will be three short-answer one-hour exams worth 100 points each, and one multiple-choice final exam worth 200 points. The one-hour examinations will take place in-class on September 26th, October 24th, and December 5th. Final exam dates should be posted by the 7th week of the semester at http://www.admin.mtu.edu/em/students/plan/finalexam.php. There will be NO MAKE-UPS for missed exams. Take the exam at the assigned time. Unexcused absences result in a 0. You will be allowed a calculator (all other electronic devices ie. PDAs, phones, etc. are prohibited), and one 3 x 5-inch note card with hand written notes (5 x 7-inch for the final exam).

EXAM and other ACCOMMODATIONS: If you require accommodations, a quiet place to take exams, recorded textbooks etc., please see the Coordinator of Student Disability Services in the Dean of Students Office, Room 170 Administration, 487-2212.

CHEMISTRY LEARNING CENTER (CLC): The CLC is a free service provided by the Department of Chemistry and the University to provide support for students enrolled in first year chemistry lecture courses. The CLC is located in room 208 of the chemical sciences building and staffed by upper level undergraduates (coaches), who have a good background in chemistry and are familiar with the courses. Services offered include weekly appointments, walk-in assistance, reference library, computer-assisted learning and a comfortable place to study chemistry. Stop by for more information.

CH0100: Students who would like to have a weekly individual or team learning group should stop by the CLC during the first week of class to sign up for a time. Weekly appointments begin the second week of classes, and are usually staffed with coaches who have successfully completed my class. Students with regular appointments should be enrolled in CH0100. If you are not enrolled when you sign up for a time, you will be automatically enrolled. There is no cost for CH0100. Plan to attend every appointment. However, you are allowed to miss one appointment if an emergency comes up and still receive a satisfactory grade. Walk-in hours are also available in-between appointments or team meetings.

Chemistry Learning Center Walk-In Hours:

<table>
<thead>
<tr>
<th>Day</th>
<th>Time</th>
<th>Room</th>
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<tbody>
<tr>
<td>Sunday</td>
<td>Closed</td>
<td>7:00 – 9:00 pm</td>
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<tr>
<td>Monday</td>
<td>10:00 – 4:00 pm</td>
<td>7:00 – 9:00 pm</td>
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<tr>
<td>Tuesday</td>
<td>10:00 – 4:00 pm</td>
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<tr>
<td>Wednesday</td>
<td>10:00 – 4:00 pm</td>
<td>7:00 – 9:00 pm</td>
</tr>
<tr>
<td>Thursday</td>
<td>10:00 – 4:00 pm</td>
<td>Closed</td>
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ELECTRONIC DEVICES: Turn off and stow unapproved electronic devices (cell phones, laptops, tablets, music players, etc.) for the duration of each class period because they disturb people around you. The only approved devices are calculators and i>clickers because, when you are web surfing or texting (or playing WOW, Angry Birds, or Words with Friends), everyone behind you is watching you. If you need other devices as assistive technology, just ask. Failure to comply may result in punitive action being taken against you, or the whole class. Only dedicated calculators and foreign language translation devices may be used during examinations.
ABSENCE POLICY: For exams, an unexcused absence is an automatic zero for any exam that is missed. The Office of Student Affairs, or your instructor may grant an excused absence. If you know that you will have an official university excused absence on a day that an exam is scheduled (university athletic event, religious holiday, or funeral), you are required to make arrangements as early as possible in advance of the exam date. **Failure to provide at least one weeks notice may result in a grade penalty.** I do not write make up exams, so you will generally be expected to take the exam immediately before leaving. Where this is not feasible we use the score from your next exam. Excused absences will not be given to travel home, or attend “social” events such as weddings. Therefore, you should plan to take your exam at the scheduled time. *If you believe you are too sick to take an exam, you must contact the instructor, or Ms. Blau BEFORE the exam and then have a doctors note stating your illness prevents (or prevented) you from taking the exam, not simply that you visited the doctors office.*

FINANCIAL AID SATISFACTORY ACADEMIC PROGRESS POLICY: Federal financial aid regulations now require students make satisfactory academic progress towards their degree to remain eligible for financial aid, which means we must report whether you failed a class “with effort” or “without effort.” If you obtain less than 60% of the available points (or wherever the pass mark ends up), you will fail. For the purpose of this class, you will be considered to have failed “without effort” if any of the following conditions are not met: complete ALL examinations, attempt 70% of the online homework, and participate in 70% of the lectures (not including excused absences). The definition of “complete” requires that a student provide gradable answers to at least 70% of the questions on an examination.

ACADEMIC INTEGRITY: Both students and faculty are responsible for insuring the academic integrity of the University according to the procedures in “Academic Integrity at Michigan Tech - A Guide for Students and Faculty.” Specific violations in this course would be the intentional use of any unauthorized study aids, equipment, or another’s work during an examination (cheating) or allowing/helping another individual to cheat (facilitating academic dishonesty). Possible sanctions include an academic integrity warning, an “F*” grade indicating failure due to academic dishonesty, suspension or expulsion. Collaboration in the form of discussion is allowed during >clicker questions, and online homework/reviews, but not during exams (obviously).

IMPORTANT NOTICE ABOUT STUDYING: Many of you are enjoying your first true taste of freedom and it is extremely easy to become intoxicated by the knowledge that you can do pretty much what you want. I whole heartedly encourage you to explore what Michigan Tech has to offer, particularly when the snow flies, but do this AFTER you have completed a couple of hours studying each night and you will be much happier in your classes. Remember that you are entirely responsible for your grade in this class, so if you choose not to study the recommended minimum of 9 hours per week you may find your grades are not quite what you expected.

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990 (ADA). If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call Christy Oslund, Student Disability Services (cmoslund@mtu.edu), or Dr. Gloria Melton, Dean of Students (7-2212).