General Chemistry II
The University of Toledo
College of Natural Sciences and Mathematics
Department of Chemistry and Biochemistry
CHEM1240 – Lecture and Recitations L1 (1) & Hon-L2 (81); R2 – 11, -90
Recitation Sections: 002 – 011, and 091

Instructor: Dr. Cohen
Email: claire.cohen@utoledo.edu
Office Hours: M,Tu,Th: 11:45am – 12:30pm
W: 11:45am – 2:30pm
and by appointment
Office Location: BO2096H
Office Phone: 419-530-4071
Term: Fall, 2019
Lecture Location: RH1520
Lecture Day/Time: MWF 10:20 – 11:15 am
Credit Hours: 4

REQUIRED TEXTS AND ANCILLARY MATERIALS

Required Textbook: Chemistry, 7th Ed, 2015, McMurry /Fay/Robinson, Pearson

Required Online Homework ALEKS: Free for all students this semester

Required Turning Technologies account for in class polling: Free for all students this semester

- You may use your phone, laptop, tablet to answer participation questions in class with an active subscription to TurningPoint Technologies (Free for all students this semester).

Optional Materials:

COURSE/CATALOG DESCRIPTION
An introduction to solutions, equilibrium, acid-base theory, energy relationships and structural concepts. This sequence is for students who major in science, engineering or other fields which require chemistry as a prerequisite subject. Three hours lecture and one hour discussion per week.

COURSE OVERVIEW
CHEM1240 is the second course in the General Chemistry sequence. CHEM 1290 is the appropriate lab course to go with CHEM 1240. This sequence is intended for majors in the natural sciences, science education, pharmacy, chemical engineering or bioengineering, and allied health fields.

TEACHING STRATEGIES
Lecture: Attendance is required, please arrive on time, participation questions for points will be included in lecture. You are responsible for all material covered in class. You will be provided with partial lecture outlines of the course material via Blackboard.

Participation points will be given in lecture or recitation or for out of class work.

Textbook We urge you to read the text before the lecture so you are familiar with concepts before hearing about them during the limited time of each class session.
Homework
One component of the homework for the class is provided with the online system called ALEKS. There will be assignments with deadlines.

The other component of the homework is of the more traditional type. A number of End-of-Chapter (EOC) questions are listed in the syllabus. These should give you an idea of what you are expected to learn in this course and be able to answer on exams. Full solutions of all in chapter and some EOC questions are in the Solutions Manual.

Recitation Homework Problems from the End of Chapter Problems in the Textbook:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Assigned End of Chapter Questions from the Textbook</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>25, 26, 31, 32, 37, 40, 41, 43, 49, 51, 61, 82, 85, 97</td>
</tr>
<tr>
<td>12</td>
<td>31, 51, 57, 59, 61, 73, 75, 77, 81, 91, 95, 97, 103, 109, 124</td>
</tr>
<tr>
<td>13</td>
<td>39, 43, 45, 57, 63, 67, 69, 71, 73, 81, 86, 95, 97, 107, 111</td>
</tr>
<tr>
<td>14</td>
<td>39, 43, 45, 55, 65, 67, 69, 81, 83, 87, 97, 99, 107, 111</td>
</tr>
<tr>
<td>15</td>
<td>37, 49, 51, 57, 63, 71, 73, 77, 85, 91, 103, 105, 107, 113, 116, 121</td>
</tr>
<tr>
<td>16</td>
<td>45, 47, 51, 61, 63, 67, 71, 87, 89, 91, 99, 101, 103, 111, 113</td>
</tr>
<tr>
<td>17</td>
<td>33, 41, 47, 65, 73, 79, 83, 87, 99, 107, 109, 113</td>
</tr>
<tr>
<td>18</td>
<td>39, 45, 49, 57, 65, 77, 89, 93, 95, 99, 103, 109, 133</td>
</tr>
<tr>
<td>20</td>
<td>37, 58, 69, 79, 81, 83, 87, 97</td>
</tr>
</tbody>
</table>

Recitation: These weekly sessions are a required part of the course. Go to recitation prepared, bring your solved homework with you. Your work will be worth 3 points. Each recitation also has 1 attendance point. You must be present for the entire session to earn these points.

PREREQUISITES AND COREQUISITES
CHEM 1230 with a minimum grade of C is a prerequisite for CHEM1240.

TECHNOLOGY REQUIREMENTS
Blackboard and ALEKS will be used on a regular basis in this course. Students need to have access to a properly functioning computer throughout the semester. Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware. Updated software is available from the Online Learning Download Center (https://www.utoledo.edu/dl/main/downloads.html).

For exams, students may use an approved calculator. Any calculator that is programmable, whether graphing or non-graphing, and any calculator based on a phone or other device that can receive or transmit data, are prohibited.

Students are required to use a device (phone, laptop, tablet, or a clicker) to respond to participation questions in all lecture classes.

UNIVERSITY POLICIES
Policy Statement on Non-Discrimination on the basis of Disability (ADA): The University is an equal opportunity educational institution. Please read The University’s Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

ACADEMIC ACCOMMODATIONS
The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.
ACADEMIC POLICIES

Examinations Make-up exams will not be given. Excused absences will only be given based on conditions outlined below. If an excuse is acceptable, your missed exam score will be replaced with a score equal to the average of the other hour exams. The final exam cannot be excused. For all exams you must show a photo ID card. You may use a non-programmable calculator. You cannot use a programmable calculator or phone.

Exam Absence Policies: Students who will not be able to take an exam at the scheduled time due to an irresolvable conflict must provide written documentation to verify the conflict. This may occur for students on official university business. The exam will be given at another arranged time before the scheduled test date. Approval must be obtained in advance.

Students who unexpectedly miss an exam due to illness, car accident or similar extreme circumstance should inform their instructor ASAP. Documentation such as a physician’s note, an accident report, etc is required. An email to the instructor and a telephone call within 24 hours is expected. In all other cases a missed exam will result in 0 on the exam.

Academic Dishonesty: Refer to the university’s policy on Academic Dishonesty in the university catalogue and the Academic Honesty Statement posted on Blackboard. Violation of this policy can result in a course grade of F with additional university sanctions possible. You will be required to read and sign the Academic Honesty Statement.

COURSE EXPECTATIONS

1. Attendance is required for the lecture and recitation classes.
2. Read the textbook before the lecture, the schedule is listed below.
3. Print from Blackboard partial lecture outlines and bring them to the lecture class; you are responsible for all material and problems covered in class.
4. Bring your device (phone, laptop, tablet, or a clicker) to respond to participation questions in all lecture classes. Bring a calculator to every lecture and recitation class.
5. You need to come to the recitation class prepared by completing the assigned homework. Each recitation session include is worth 4 WA points: 1 for attendance and 3 for completed homework.
6. ALEKS online homework assignments have to be completed before the deadline
7. If you need extra help, see your instructor during office hours or use email. You will not be graded or judged based on the questions that you ask! Seek help in the LEC (Carlson Library), Chemistry Help Center (BO2043) and/or attend Supplemental Instruction (SI) sessions.

GRADING It is a very high priority to your instructor to ensure fairness and equity in all grading aspects of the course. Anyone who has the prerequisites for this course and effectively studies the material can achieve a reasonable level of achievement and therefore an acceptable grade, i.e., a C or above. There is nothing about this class that requires anyone to get a lower grade.

Course Points The following is the distribution of possible points in the course:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exams 3 @ 100 points each</td>
<td>300 pts</td>
<td>43 %</td>
</tr>
<tr>
<td>Final Exam</td>
<td>200 pts</td>
<td>29 %</td>
</tr>
<tr>
<td>ALEKS*</td>
<td>100 pts</td>
<td>14 %</td>
</tr>
<tr>
<td>Participation: polling, recitation, extra credit</td>
<td>100 pts</td>
<td>14 %</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>700 pts</td>
<td></td>
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</tbody>
</table>

*How ALEKS is graded is outlined on p.6 of the syllabus

Grade Scale These are the minimum percentages of total points needed to receive the indicated grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>88%</td>
</tr>
<tr>
<td>A-</td>
<td>85%</td>
</tr>
<tr>
<td>B+</td>
<td>81%</td>
</tr>
<tr>
<td>B</td>
<td>77%</td>
</tr>
<tr>
<td>B-</td>
<td>73%</td>
</tr>
<tr>
<td>C+</td>
<td>69%</td>
</tr>
<tr>
<td>C</td>
<td>64%</td>
</tr>
<tr>
<td>C-</td>
<td>60%</td>
</tr>
<tr>
<td>D+</td>
<td>57%</td>
</tr>
<tr>
<td>D</td>
<td>53%</td>
</tr>
<tr>
<td>D-</td>
<td>50%</td>
</tr>
</tbody>
</table>
Drop, Withdrawal and Incomplete Grades Course drop and withdrawal procedures have been set by the University. Dropped courses do not appear on your transcript. The deadline for dropping is September 9th. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is November 1st. W’s do not affect your GPA. If you drop or withdraw from CHEM 1240, you are to drop/withdraw from the lab course CHEM 1290 because you need to know the lecture material to be in lab.

A course grade of Incomplete is given only to those who have completed all but a small percentage of course requirements for an acceptable reason. The Incomplete must be removed before you take organic chemistry.

Participation points will be updated on Blackboard following each exam including a midterm grade. Although this is not your final grade in the course, a midterm grade should be taken seriously with respect to how well you are doing in the course approximately half-way through the semester.

COMMUNICATION GUIDELINES As your instructor, I am here to help, and will do my best to respond to email within 24 to 48 hours. Students are expected to check their UT email account and blackboard frequently for important course information.

STUDENT SUPPORT SERVICES
Course scheduling assistance: Chemistry Department Secretary, Ms. Samples, is in Room BO 2022, telephone 419-530-2698. If you have further questions or if you need assistance, please talk to her. She takes care of all scheduling changes.

Supplemental Instruction Advanced students provide several structured study sessions on the material each week. Your participation is optional – though very strongly encouraged.

Chemistry Help Center, Room BO 2043, is where the teaching assistants hold their office hours so it is a great place to receive assistance. It is generally open all day Monday through Friday & evenings Monday through Thursday. A schedule will be posted early in the term. No appointment is necessary.

Tutoring support for all UT students is available through the Learning Enhancement Center located in the Carlson Library.

Instructor Office Hours are times when you can stop by my office (no appointment needed) with questions about the course material, grades, and any concerns with the course. My office hour times and location are listed at the top of the syllabus. If you have a scheduling conflict with all of the listed times and want to meet with me we can schedule a different time to meet.

COURSE SCHEDULE The following table will give you a general idea of our pace throughout the course. Exams will occur on the dates indicated below. Material covered on each exam will be dependent on the pace of the class and will be specified in lecture prior to each exam. Each chapter is consistent with the learning outcomes listed in the syllabus. This material will be assessed through our weekly assigned homework problems due at recitation each week, ALEKS online homework, and Exams.
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Chapter: Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 26 - Aug 30</td>
<td>11: Liquids, Solids and Phase Changes</td>
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<tr>
<td>2</td>
<td>Sept 3 - 6</td>
<td>11: Continued</td>
<td>9/2 is Labor Day. Classes are cancelled.</td>
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<tr>
<td></td>
<td></td>
<td>12: Solutions and Their Properties</td>
<td></td>
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<tr>
<td>3</td>
<td>Sept 9 – 13</td>
<td>12: Continued</td>
<td>Last day to Drop via the web is Mon 9/9</td>
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<tr>
<td>4</td>
<td>Sept 16 – 20</td>
<td>12: Continued</td>
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<tr>
<td></td>
<td></td>
<td>13: Chemical Kinetics</td>
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</tr>
<tr>
<td>5</td>
<td>Sept 23 – 27</td>
<td>13: Continued</td>
<td>Midterm Exam 1, Fri 9/27, Chapters 11, 12, 13</td>
</tr>
<tr>
<td>6</td>
<td>Sept 30 – Oct 4</td>
<td>14: Chemical Equilibrium</td>
<td></td>
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<tr>
<td>7</td>
<td>Oct 7 – 9</td>
<td>14: Continued</td>
<td>10/10 – 10/11 is Fall Break. Classes are cancelled.</td>
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<td></td>
<td></td>
<td>15: Aqueous Equilibria: Acids and Bases</td>
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<tr>
<td>8</td>
<td>Oct 14 – 18</td>
<td>15: Continued</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Oct 21 – 25</td>
<td>15: Continued</td>
<td>Midterm Exam 2, Fri 10/25 Chapters 14 and 15, and review of Exam 1</td>
</tr>
<tr>
<td>10</td>
<td>Oct 28 – Nov 1</td>
<td>16: Applications of Aqueous Equilibria</td>
<td>Last day to Withdraw via the web is Friday 11/1</td>
</tr>
<tr>
<td>11</td>
<td>Nov 4 – Nov 8</td>
<td>16: Continued</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Nov 12 – 15</td>
<td>17: Thermodynamics: Entropy, Free Energy, and Equilibrium</td>
<td>11/11 is Veterans Day. Classes are cancelled</td>
</tr>
<tr>
<td>13</td>
<td>Nov 18 – 22</td>
<td>18: Electrochemistry</td>
<td>Midterm Exam 3, Fri 11/22, Chapters 16, 17, 18 (partial), and review of Exams 1 and 2</td>
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<td></td>
<td></td>
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<tr>
<td>15</td>
<td>Dec 2 – Dec 6</td>
<td>18: Continued</td>
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<td></td>
<td></td>
<td>20: Transition Elements and Coordination Chemistry</td>
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<tr>
<td>Finals Week</td>
<td>Dec 9 – 13</td>
<td></td>
<td>*****Final Exam *****</td>
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<td></td>
<td></td>
<td>Monday, 12/9, 10:15am – 12:15pm</td>
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<td></td>
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<td></td>
<td>You must take the final at this time!</td>
</tr>
</tbody>
</table>
How is my ALEKS grade determined?

There are 100 points set aside for ALEKS this semester.

There are two components to your ALEKS grade: you total objective completion score, and your assessment grade. In order calculate your ALEKS score, your instructor will use 50% of your total objective score, and 50% of your best assessment score.

Example Student: In the grade book screen, Mary’s grades look like this:

Mary’s total grade on all the objectives was a 99%, or 99 out of 100 points. Half of her overall ALEKS grade is based on this score alone; 50% of 99 is 49.5 points out of 50.

Looking at Mary’s assessment scores, it appears that her best assessment score was the Objective #9 completion, where she mastered 91% of the course, and added 5% by working through the objective (together, 91% + 5% = 96%).

Converting Mary’s best assessment score to a whole number (96 / 100 points), her professor will take half of that number to get her assessment component score: 48.

The total ALEKS score is found by adding the two components together: 49.5 + 48 = 97.5.
STUDENT LEARNING OUTCOMES

At the end of this course, students will be able to:

Chapter 11 Liquids, Solids, and Phase Changes
- Predict the properties of substances based on structure.
- Apply the equation for Gibbs free energy and the Clausius–Clapeyron equation to solve for thermodynamic quantities.
- Solve for the amount of heat associated with phase changes and draw heat curves.
- Identify the arrangements in crystalline solids and cubic unit cells.
- Create and interpret a phase diagram.

Chapter 12 Solutions and Their Properties
- Describe types of intermolecular forces.
- Solve for the concentration of a solution (mass percent, mole fraction, ppm, ppb, molality, molarity) and convert between units.
- Solve for vapor pressure, boiling point, freezing point, and osmotic pressure of solutions.
- Use colligative properties to calculate the molecular weight of an unknown.

Chapter 13 Chemical Kinetics
- Interpret graphs of concentration versus time.
- Use integrated rate laws to determine the concentrations of reactants remaining at various times for a zeroth, first, and second-order reactions.
- Determine the reaction order and rate constants using rate-laws, integrated rate laws, graphs, and half-lives.
- Solve for rate constants and activation energy using the Arrhenius equation.
- Interpret reaction mechanisms and identify intermediates, catalysts, and the slow step.
- Interpret a potential energy diagram.

Chapter 14 Chemical Equilibrium
- Describe characteristics of a reaction in chemical equilibrium.
- Solve for the value of the equilibrium constant.
- Relate the equilibrium constants K_p and K_c including heterogeneous and homogeneous equilibria.
- Evaluate the extent of a reaction given the equilibrium constant.
- Predict the direction a reaction will shift to reach equilibrium given initial concentrations.
- Solve for concentrations or partial pressures of products and reactants in equilibrium.
- Predict the direction a reaction in equilibrium will shift as a result of changes in concentration, volume, pressure, and temperature.

Chapter 15 Aqueous Equilibria: Acids and Bases
- Identify Arrhenius, Bronsted–Lowry, and Lewis acids and bases and including conjugate acid–base pairs.
- Predict the relative strengths of acids and bases based on chemical structure.
- Solve for [H_3O^+] and [OH^-], pH, percent dissociation, Ka, pKa, pKb, for various aqueous solutions containing weak and strong acids and bases.
- Relate K_a, K_b, pK_a, and pK_b for a conjugate acid–base pair.
- Identify whether a substance is acidic, basic or neutral.
- Identify the Lewis acid and Lewis base and use curved arrow notation in Lewis acid-base reactions.

Chapter 16 Applications of Aqueous Equilibria
- Solve for the pH of buffer solutions and the change in pH on addition of a strong acid or a strong base.
- Solve for the pH at various points in a titration and interpret titration curves.
- Solve for the solubility of an ionic compound.
- Solve for the solubility of a compound in a solution that contains a common ion or acids and bases.
- Determine whether a precipitate will form when various solutions are mixed.

**Chapter 17 Thermodynamics: Entropy, Free Energy, and Equilibrium**
- Define a spontaneous process and classify various physical processes and chemical reactions as spontaneous or nonspontaneous.
- Predict the sign of $\Delta S$ for various physical processes and chemical reactions.
- Solve for values of $\Delta S_{sys}$, $\Delta S_{surr}$, $\Delta S_{\text{total}}$, $K$, and $\Delta G$, and determine if a reaction is spontaneous.

**Chapter 18 Electrochemistry**
- Use the half-reaction method to balance a redox reaction.
- Interpret a galvanic cell and write balanced equations for the electrode and overall cell reactions.
- Use shorthand notations to represent a galvanic cell.
- Solve for the cell potential under standard and nonstandard-state conditions using the Nernst equation.
- Use cell potentials to calculate the equilibrium constant and the standard free-energy changes.
- Describe batteries, fuel cells, corrosion, and electrolytic cells.
- Relate the current, time, and amount of product produced in an electrolytic or galvanic cell.

**Chapter 20 Transition Elements and Coordination Chemistry, selected objectives from this list:**
- Identify Lewis acids, Lewis bases, ligands, and donor atoms in a coordination complex.
- Classify a ligand as mono, bi, tri, tetra, or hexadentate based on its chemical structure.
- Classify isomers of coordination complexes.
- Classify a coordination complex as chiral or achiral and draw enantiomers for chiral compounds.
- Relate the color of a metal complex, and the wavelength of light it absorbs.