CHEM 1120 – General Chemistry II

Syllabus
Instructor: Dr. Shawn M. Miller

Spring Term, 2020
Email: shawn.miller@usu.edu
Office Hours: Monday/Wednesday
1:30 PM – 2:30 PM in Widtsoe 339

Course Lecture Times & Locations:

<table>
<thead>
<tr>
<th>Section (CRN)</th>
<th>Time</th>
<th>Day</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture 001 (10506)</td>
<td>12:30 PM to 1:20 PM</td>
<td>M/W/F</td>
<td>Widtsoe Hall 007</td>
</tr>
<tr>
<td></td>
<td>4:30 PM to 5:20 PM</td>
<td>R</td>
<td>Widtsoe Hall 007</td>
</tr>
</tbody>
</table>

Prerequisite:
CHEM 1110

Required Materials:


Calculator: A non-programmable scientific calculator is recommended for use in Lecture and on Exams. Programmable calculators are permitted during Exams only if their memory is cleared by the Testing Center. Other electronic devices, including phones, are not permitted during Exams.

Online HW: Sapling Learning online homework system (www.saplinglearning.com). Can be purchased through the bookstore or directly through Sapling Learning. You are encouraged to choose the cheapest option.

Optional Materials:

iclicker: iclicker 2s are used during the Lecture period and extra credit is awarded through the use of iclickers. iclickers must be registered by the beginning of class. To register an iclicker, use the link in the navigation sidebar on Canvas.

Supplementary Course Assistance:

SI Information: Raustin Grandy (contact: rausting@gmail.com or Canvas)
Session Times: TBA

UTF Information: Kiaya Parent (contact: kiayadparent@gmail.com or Canvas)
Session Times: TBA
Course Overview

CHEM 1120 is the second in a two-semester series of general chemistry courses that is targeted towards non-science major students that require a more rigorous chemistry curriculum than an introductory chemistry course and builds upon the lessons learned in CHEM 1110. Lectures are held four times a week and will include both presentation of content and practice problems. There will be assigned online Sapling Learning homework sets for each chapter. There will be an online Post-Week Quiz on Canvas at the end of most weeks designed to help prepare students for the Exams. There will be three 90-minute Midterm Exams in addition to a 180-minute Final exam all of which will be proctored on Canvas via the Testing Center.

Course Learning Objectives

CHEM 1120 is a Lecture course designed to continue the education process began in CHEM 1110. By reading the textbook prior to the Lecture period, you will obtain a basic understanding of the upcoming Lectures’ topics. By attending, taking notes during, and asking questions during Lecture periods, you will expand and refine your understanding of the course material. You will demonstrate proficiency of the course material through weekly in-Lecture clicker questions, online Canvas Quizzes, and online Sapling Learning homework problem sets. You will demonstrate mastery of the course material through Midterm Exams and a Final Exam.

By the end of this course, you will be able to...

- ...identify the chemical structures of organic functional groups.
- ...describe the common physical and chemical properties of organic molecules.
- ...predict the outcome of organic chemical reactions.
- ...draw organic and biochemical structures and chemical reaction equations.
- ...describe the common physical and chemical properties of biomolecules such as lipids, carbohydrates, proteins, and nucleic acids.
- ...explain the function of vitamins and enzymes in living systems.
- ...recall the location and function of metabolic pathways for the synthesis and degradation of biomolecules.

A detailed set of Learning Objectives for each chapter is located at the end of this syllabus.

You will prepare for and practice achieving these objectives by...

- ...reading the textbook while taking notes.
- ...attending and taking notes during Lecture periods.
- ...answering clicker questions and solving problems during Lecture periods.
• ...completing Sapling Learning homework sets online.
• ...taking weekly graded online Canvas Post-week Quizzes.
• ...regularly reviewing your performance on the Post-week Quizzes.
• ...asking for help via Office Hours, Piazza, Canvas message, or e-mail.
• ...optionally attending UTF or SI sessions for problem solving and further assistance.

You will be assessed on how you have achieved these objectives using...

• ...one Getting Started Quiz on Canvas.
• ...the aforementioned Sapling Learning homework sets.
• ...the aforementioned Canvas Post-week Quizzes.
• ...three Midterm Exams.
• ...one Final Exam.

Course Communication

Piazza is the recommended venue for asking academic questions about the course. Piazza is a free online system that can be accessed directly through Canvas designed for students to have access to rapid and efficient help from classmates, TAs, and the instructor simultaneously. Piazza is not to be used to convey personal information. Contact the instructor directly if you need to discuss personal information such as grades.

When you post a question on Piazza, the instructor, the UTF, the SI, the TAs, and your fellow students can all answer the question making it more likely for you to receive a rapid response compared to emailing one person and hoping they read it soon. Maybe you'll even get lucky and someone will have already asked the question you were going to ask and got it answered! You have the option of posting anonymously to each other, but the instructor will always be able to see your identity. Enrollment in Piazza is mandatory and five points are assigned to Piazza enrollment. Usage during the semester is optional. Enroll in the course by clicking on the “Piazza” link in the sidebar on Canvas and following the instructions there.

You are always welcome to message the instructor directly with questions. Canvas messages are preferred, but email is fine as well. Please include your full name, A-Number, and the course name in your message. I will attempt to respond to your messages in a timely manner, but I have responsibilities outside of the course that may prevent me from doing so and I ask you to exercise patience after sending your message.

The instructor will hold regular office hours as listed in this syllabus as well as by request. Please feel free to contact the instructor directly to schedule a time to meet outside of listed office hours.

Course announcements will be made using the Canvas Announcements system. You are expected to keep up-to-date on all Canvas Announcements and are responsible for any information in the
Announcements. “But I did not know” is not an acceptable excuse for being unaware of information in course Announcements.

Getting started in the course

Read the course syllabus. Once that is done, your first assessment is a “Getting Started” online quiz located on Canvas that will cover course policy as discussed in the syllabus. This Quiz is due at 11:00 PM on the Friday of Week 1 of the term. The Getting Started quiz will be graded immediately upon completion and may be attempted an unlimited number of times. Correct answers will not be shown upon completion of the Getting Started Quiz, but you will be able to view your responses. If multiple attempts are made, the latest score will be accepted. **If you see no score in your Grades, no attempt was submitted.** The Getting Started Quiz score cannot be dropped.

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn #101, 435-797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Lectures

**It is assumed that you read textbook sections, as outlined in the schedule at the end of this syllabus, prior to discussing them in Lecture.** You are strongly encouraged to take notes while reading the textbook and then supplement those notes with Lecture. You are not expected to understand the material simply by reading the textbook, but reading the chapter will build a foundation that we can expand and refine through our discussions in Lecture. PDF copies of blank Lecture PowerPoint slides will be available on Canvas that can be printed ahead of each Lecture if you wish. Each Lecture will be recorded and available on Canvas for viewing at your pleasure.

iClicker Questions

iClicker questions will be asked through the Lecture period and will be used as a way to assess class understanding of topics by providing immediate feedback to both the instructor and you. These questions must be answered individually, but consulting your notes and discussing with your classmates is allowed and encouraged. It is your responsibility to register your iClicker either through the iClicker service on Canvas or at iclicker.com and to remember to bring your iClicker, in working order, to class each day. iClicker questions will be utilized on Day 1, but student performance will not be recorded until the second Lecture period.

To encourage you to attend, prepare for, and be attentive during lectures, you may earn up to 10 points extra credit via iClicker questions. 5 of those points are allocated to participating in iClicker questions and the remaining 5 points are allocated to answering iClicker questions correctly. The amount of extra credit awarded will be based on the percentage of iClicker questions answered by each student based on the total number of questions asked and the percentage of correct answers to iClicker questions based on the total number of questions asked.

Homework

There will be 10 online homework sets administered through Sapling Learning that must be completed on your own time. Each homework set is worth 10 points. These assignments are designed
to provide additional practice to help you prepare for the quizzes and exams. The assignments will typically be due at 11:00 PM two days after the chapter section is completed in Lecture. The homework sets will involve a variety of interactive questions. You may use your textbook and notes, but it is suggested you attempt the problems alone at first. You can have as many attempts as you are willing to make for each problem, but 5% will be deducted from a problem for each incorrect answer. The lowest Sapling Learning homework score will be dropped at the end of the course.

Follow the instructions for enrolling and setting up your account in Sapling Learning in the Sapling Learning Access module on Canvas. Because of how Sapling and Canvas are connected, you must enroll in Sapling through Canvas.

Quizzes

There are 12 graded Post-week Quizzes in the course worth 15 points each. The Quizzes will open at 2:00 PM on Friday and will be due the following Monday at 12:00 PM. These Quizzes contain up to 15 questions about material covered in the previous week. You will have 45 minutes to complete the Post-week Quiz and you may use your textbook and notes, but you must work alone. You should treat Post-week Quizzes as practice for the Exam in terms of both format and content and it is strongly recommended that you do not use external resources on your first Quiz attempt so as to more accurately gauge your understanding of the material. You may take each Post-week Quiz twice to account for any technical difficulties you encounter such as losing power or logging out accidentally. After successfully completing the Quiz, you may choose to retake the Quiz to try and maximize your score, but note that only the last attempt will be accepted. Therefore, if your second attempt at the Quiz has a lower score than the first attempt, the second attempt’s score is still what will be counted as your score for the Quiz. Discussion of Quiz details with other students while the Quiz is open is a violation of USU’s academic honesty policy as detailed below. The lowest two Post-week Quiz scores will be dropped at the end of the course.

Examinations

There will be three 90-minute midterm Exams, worth 100 points each, that will contain both an online component and a written paper component. The midterm Exams will be administered in the Testing Center according to the following schedule:

First Exam: Wednesday, February 5 – Friday, February 7
Second Exam: Thursday, February 27 – Friday, February 28
Third Exam: Wednesday, March 1 – Friday, March 3

These dates may change depending on course progress.

These Examinations will consist of 25 questions worth 4 points each. Question formats may include, but are not limited to, multiple choice, multiple answer, matching, short essay, and fill-in (dropdown and text). Students must complete Exams alone. As Exams are open over multiple days, discussion of Exam details with other students while the Exam is open is a violation of USU’s academic honesty policy as detailed below.

Make-up Exams for missed Exams may be granted upon petitioning the instructor only in the following situations: 1) documented and acceptable excuses for illness when verified by a doctor’s note; 2) a family emergency when verified by a note from your academic advisor; 3) a regularly scheduled university-sanctioned conflict, such as a sports competition the student is participating in,
but only when the instructor is notified well in advance of the conflict and verified with a note from the person in charge of the activity containing the specific reasons for the absence. Absences due to reasons not considered by the university to be excused absences, such as weddings, are not eligible for make-up Exams.

The only student materials permitted in the Testing Center are writing utensils and calculators (scientific preferred, graphing only if the Testing Center clears the memory). The Testing Center will provide laptops and authorized auxiliary materials (Useful Information Sheets) as well as scratch paper upon request. Notes, textbooks, internet resources, etc. are not permitted during Exams. Reservations for the Testing Center are made through their website at http://testing.usu.edu/. Ensure you bring a form of ID with you in order to Check-in for your Testing Center appointment.

A 180-minute cumulative Final Examination will be held in the Testing Center on from Thursday, April 23 to Monday, April 27.

**Academic integrity**

All Utah State University academic integrity policies are strictly enforced. All students at Utah State University agree to be bound by the following Honor Pledge "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." See the following for further information: https://studentconduct.usu.edu/studentcode/article5. Students found guilty of academic misconduct on any assignment will, at minimum, be given a zero for the assignment and have the full value of that assignment deducted from their final course grade. Actions up to and including a failing grade for the course are options available to the instructor.

**Course Assessment**

After the first Exam, the instructor will solicit feedback through optional midterm evaluations on Canvas. The purpose of these surveys will be to determine student opinions of the course up to that point and ask for suggestions on what could be done to improve the course for the rest of the semester and in subsequent semesters. The instructor will know who completed the survey, but will be unable to match survey responses to students. Each student who responds to the midterm evaluation will be granted a small quantity of extra credit points. At the end of the course, end-of-term IDEA evaluations administered through University will be sent to students via email. The instructor will know who completed the survey, but will be unable to match survey responses to students. Each student who responds to the end-of-term evaluation will be granted a small quantity of extra credit points.

A Pre-test/Post-test approach will be used to measure comprehension and teaching of important concepts. The Pre-test will be administered online through Canvas. The Pre-test will be comprised of 20 questions with a duration of 90 minutes. The questions of the Pre-test will reappear in the Final Exam, in some form, to assess teaching and learning progress during the semester. If weaknesses are observed in specific subject areas, teaching methods will be reevaluated. An all-or-nothing 10-point reward will be given for completing the Pre-test. The Pre-test is due at 11:00 PM on the Friday of Week 1.
**Grading**

The total score for each type of assignment in the below table represent totals after appropriate lowest scores have been dropped.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>Percentage of Points Earned</th>
<th>Grade</th>
</tr>
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<tbody>
<tr>
<td>Getting Started Quiz</td>
<td>20</td>
<td>89 – 100</td>
<td>A-, A</td>
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<tr>
<td>Piazza Enrollment</td>
<td>5</td>
<td>78 – 88</td>
<td>B-, B, B+</td>
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<td>Pre-Test</td>
<td>10</td>
<td>66 – 77</td>
<td>C-, C, C+</td>
</tr>
<tr>
<td>Chapter Homework Problems</td>
<td>90</td>
<td>53 – 65</td>
<td>D, D+</td>
</tr>
<tr>
<td>Post-Week Quizzes</td>
<td>100</td>
<td>&lt; 53</td>
<td>F</td>
</tr>
<tr>
<td>First Midterm Exam</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second Midterm Exam</td>
<td>100</td>
<td></td>
<td></td>
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<tr>
<td>Third Midterm Exam</td>
<td>100</td>
<td></td>
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<tr>
<td>Final Exam</td>
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<td><strong>Total Points</strong></td>
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</table>

Letter grades are assigned by taking the total numerical score, rounding to the nearest whole number, finding the percentage of total points earned, and then assigning a letter grade according to the table above. The grade thresholds may be lowered depending on course performance, but will never be increased. The administration of CHEM 1120, including the issuing of grades of Incomplete, will adhere to the outlines in the USU General Catalog.
Spring 2020 Schedule

Please look carefully at the following schedule for expected order of topics. Note that this schedule is approximate and may adjust depending on course pace.

Red text denotes the days Exams will be scheduled. Blue text denotes holidays where Lecture will not be held. Quiz due dates may be adjusted as a result of course pace.

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Date</th>
<th>Lecture #</th>
<th>Topic</th>
<th>Chapter</th>
<th>Assignments Due</th>
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<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>1/6</td>
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<td>Course intro, CHEM 1110 review</td>
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<tr>
<td></td>
<td>W</td>
<td>1/8</td>
<td>2</td>
<td>CHEM 110 review, alcohols</td>
<td>13</td>
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<td></td>
<td>R</td>
<td>1/9</td>
<td>3</td>
<td>others, phenols</td>
<td>13</td>
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<td>F</td>
<td>1/10</td>
<td>4</td>
<td>thiois, intermolecular forces</td>
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<td>GS Quiz/Pre-test</td>
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<td>5</td>
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<td>dehydration of alcohols</td>
<td>13</td>
<td>P-Quiz 1</td>
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<td>W</td>
<td>1/15</td>
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<td>oxidation of alcohols</td>
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<td>R</td>
<td>1/16</td>
<td>7</td>
<td>aldehydes, ketones</td>
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<td>F</td>
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<td>reactions of carboxylic, acetics</td>
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<td>M</td>
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<td>R</td>
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<td>10</td>
<td>Fischer projections, carbohydrates</td>
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<td></td>
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<td>R</td>
<td>1/30</td>
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<td>carboxylic acids</td>
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<td></td>
<td>F</td>
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<td>15</td>
<td>esters</td>
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<td>2/3</td>
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<td>R</td>
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<td>RNA translations, mutations</td>
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**Exam Dates:**
- Exam 1 (Ch 14-16) on 1/27
- Exam 2 (Ch 17-19) on 2/27
- Exam 3 (Ch 20-22) on 4/3
- Exam 3 Review on 4/4
- Final Exam (cumulative) on 4/23-4/27
Chapter Learning Objectives

Chapter 13
Name alcohols, phenols, ethers and thiols using the IUPAC system and common names.
Describe the physical properties of alcohols, phenols, ethers and thiols.
Write chemical equations for the dehydration of alcohols and predict the product distribution.
Recognize the oxidation and reduction of alcohols and predict the products from oxidation of primary and secondary alcohols.
Recognize the oxidation and reduction of thiols.

Chapter 14
Identify compounds with aldehydes or ketones.
Name aldehydes and ketones using the IUPAC system and common names.
Describe the differences in physical properties of aldehydes or ketones as compared to alcohols, phenols, and ethers.
Recognize the oxidation and reduction of aldehydes and ketones.
Write chemical equations for the addition of alcohols to aldehydes and ketones.
Recognize chiral objects, including molecules, and identify chiral and achiral carbons in molecules.

Chapter 15
Recognize monosaccharide as aldoses and ketoses with respect to the number of carbon atoms.
Draw the D- and L- configuration of glucose, galactose, and fructose.
Draw and identify the cyclic structures of monosaccharides.
Recognize the products from oxidation and reduction of monosaccharides.
Recognize the monosaccharide units and linkages in oligosaccharides. systems
Calculate acid/base titration curves and predict end-point conditions
Describe and apply Ksp values to determine solubility of inorganic solids
Describe the precipitation and separation of ions utilizing Ksp information

Chapter 16
Name carboxylic acids and esters using the IUPAC system and common names.
Recognize the physical properties of carboxylic acids and esters.
Write the equations for esterification and hydrolysis of esters.

Chapter 17
Describe the classes of lipids.
Write the structures of fatty acids and identify as saturated or unsaturated.
Write the structural formula of a wax, fat or oil produced by the reaction of a fatty acid and an alcohol or glycerol.
Draw the structure of products from hydrogenation, hydrolysis and oxidation of triacylglycerol.
Describe the properties of glycerophospholipids.
Describe the types of lipids that contain sphingosine.
Describe the general structures of steroids.
Describe the composition and function of the lipid bilayer in cell membranes.

Chapter 18
Name amines using the IUPAC system and common names.
Differentiate primary, secondary, and tertiary amines.
Recognize the physical properties of amines.
Recognize heterocyclic amines.
Provide both IUPAC and common names for amides and write the equations for amidation from amines.
Write the equations for the hydrolysis of amides.

**Chapter 19**
Draw the structure for an amino acid and be able to identify nonpolar and polar neutral, acidic, and basic amino acids.
Understand the acid/base properties of amino acids and be able to write the ionic forms of an amino acid at different pHs.
Understand the reactions involved in forming and hydrolyzing peptides.
Describe how to name simple peptides.
Understand different levels of protein structure, i.e., primary secondary, tertiary, and quaternary, and describe what the factors that influence structure.

**Chapter 20**
Describe how enzymes function as biological catalysts, and name and classify them.
Describe the effect of temperature, pH, concentration of enzyme and concentration of substrate on enzyme activity.
Describe reversible and irreversible inhibition.
Describe the role of zymogens, feedback control and allosteric enzymes in regulating enzyme activity.

**Chapter 21**
Describe the components that make up the nucleic acids.
Describe the primary structures of RNA and DNA.
Describe the double helix of DNA.
Describe the process of DNA replication.
Identify the different RNAs and describe the synthesis of mRNA.
Describe the function of codon in genetic code.
Describe the process of protein synthesis from mRNA.
Describe the correlation between altered DNA and the sequential mutation.
Describe the preparation and uses of recombinant DNA.
Describe the methods by which a virus infects a cell.

**Chapter 22**
Describe three stages of metabolism.
Describe the role of catabolic and anabolic reactions.
Describe the components and functions of the coenzymes FAD, NAD+ and coenzyme A.
Give the sites and products of digestion for carbohydrates.
Describe the conversion of glucose to pyruvate in glycolysis.
Give the conditions for the conversion of pyruvate to lactate, ethanol and acetyl coenzyme A.
Describe the breakdown and synthesis of glycogen.
Describe how glucose is synthesized from noncarbohydrate molecules.
Chapter 23
Describe the oxidation of acetyl CoA in the citric acid cycle.
Describe the electron carriers involved in electron transport.
Describe the roles of electron carriers in electron transport.
Describe the process of oxidative phosphorylation in ATP synthesis.
Account the ATP produced by the complete oxidation of glucose.

Chapter 24
Describe the sites and products obtained from digestion of triacylglycerols.
Describe the metabolic pathway of β-oxidation.
Calculate the total ATP produced by the complete oxidation of a fatty acid.
Describe the pathway of ketogenesis.
Describe the biosynthesis of fatty acids from acetyl CoA.
Describe the hydrolysis of dietary protein and absorption of amino acids.
Describe the reaction of transamination and oxidative deamination in the degradation of amino acids.
Describe the formation of urea from ammonium ion.
Describe where carbon atoms from amino acids enter the citric acid cycle or other pathway.
Illustrate how some nonessential amino acids are synthesized from intermediates in the citric acid cycle and other metabolic pathways.