CHEM 111-05 – Principles of Chemistry – Spring 2022

Class meeting times: MWF 10:00–10:50 AM "in person over Zoom" online

Instructor Contact Information:
Dr. Jennifer Fox
If you have a question that can be answered over email, please email me at FOXJL@cofc.edu, and I will reply within 48 h. If you want to meet in individual or group office hours, I am available after class MWF 10:50–11:20 AM or email me with your availability, and we will schedule an appointment over Zoom.

Course Description:
CHEM 111 is a foundational course in chemistry designed primarily for students who intend to take additional chemistry courses. One major goal is to discover how atoms interact to form compounds and how compounds react with each other in chemical reactions, which are the basis for many important phenomena in the natural world as well as the collection of biochemical processes necessary for life. (CHEM 111 is 3 credit hours.)

Co-requisite Course:
CHEM 111 and 111L are co-requisites. If you withdraw from one of these courses, you will also be withdrawn from the other. The deadline to withdraw is March 25.

Required Materials:
1. ALEKS 360 access with the e-book Chemistry: Atoms First (4th ed. by Julia Burdge and Jason Overby). The best way to get this learning software and textbook is to go to https://www.aleks.com/sign_up and sign up with our section's class code: 49VC6-KN4PF. Then buy a 52-week access code + e-book so you can use it this semester for CHEM 111 and next semester for CHEM 112.
2. A non-programmable scientific calculator (e.g., TI-30Xa scientific calculator, approx. $15) that can handle scientific notation, log, antilog, exponents, and square roots. Bring this calculator to every class meeting and use it during quizzes and exams.
3. Computer with stable internet access. Your computer must meet CofC’s requirements and be able to stably access Zoom (https://cofc.zoom.us and install the app) and open PDF files (Adobe Acrobat, available through CofC Apps Anywhere https://appsanywhere.cofc.edu/login). You will need LockDown Browser for quizzes/exams (you will download this when you take the first quiz).
4. Webcam
5. Microphone (You can use headphones/ear buds with a built-in mic)

This syllabus is subject to change by the instructor at any time.
Learning Objectives:

Student Learning Outcomes:
- Describe how to employ the scientific method
- Solve chemistry problems by employing mathematical techniques and chemical reasoning
- Understand how atoms interact to form molecules and compounds
- Identify the properties of compounds
- Employ an understanding of chemical reactivity to analyze chemical reactions

General Education Learning Outcomes:
- Students apply physical/natural principles to analyze and solve problems.
- Students will develop an understanding of the impact that science has on society.

(Note: General Education Learning Outcomes will be assessed in the second semester course of the Science Gen Ed Sequence, CHEM 112/CHEM 112L)

Course Topics:

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemistry: The Science of Change</td>
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<tr>
<td>2</td>
<td>Atoms and the Periodic Table</td>
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<tr>
<td>3</td>
<td>Quantum Theory and the Electronic Structure of Atoms</td>
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<td>4</td>
<td>Periodic Trends of the Elements</td>
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<td>5</td>
<td>Ionic and Covalent Compounds</td>
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<tr>
<td>6</td>
<td>Representing Molecules</td>
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<tr>
<td>7</td>
<td>Molecular Geometry, Intermolecular Forces, and Bonding Theories</td>
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<tr>
<td>8</td>
<td>Chemical Reactions</td>
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<td>9</td>
<td>Chemical Reactions in Aqueous Solutions</td>
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<tr>
<td>10</td>
<td>Energy Changes in Chemical Reactions</td>
</tr>
<tr>
<td>11</td>
<td>Gases</td>
</tr>
</tbody>
</table>

Class Format, Etiquette, and Attendance:

1. This class will be the same as a chemistry class occurring in a classroom, except we will meet online from different locations.
   - Treat this class the same as you would an in-person chemistry class. By attending all class meetings, you will be able to participate, ask questions, and avoid falling behind.
2. It should go without saying that you should be equally as respectful of me and your classmates as you would be in a physical classroom setting.
3. Sign into your licensed CofC Zoom account when you join the class Zoom meetings.
   - Please use your preferred first and last name as your display name.
   - The Zoom link (or meeting ID and password) for all class meetings is found in the Announcements area of our OAKS page.
   - Class sessions will be recorded (voice and video). By remaining in this class, you consent to being recorded. Recordings are for instructional use only and may not be shared with anyone who is not enrolled in our class. If you miss class due to hospitalization, a death in the family, a religious holiday, an interview, etc., email me to request access to a recording of the day(s) you missed.
4. Unmute yourself to participate then mute yourself when you are done speaking.
5. Attendance on the days of the exams is mandatory.
- If you foresee you have a conflict with an exam date due to a school-sponsored, family, or religious event, email me ASAP to arrange to take the exam early.
- If you miss an exam for an unforeseeable reason (e.g., illness or a family emergency), email me ASAP to reschedule.

Procedure for Taking All Quizzes and Exams:
1. Find a quiet location conducive to test-taking; minimally, you may not take the exams while in the same room as another chemistry student in any class.
2. Clear your workspace of all notes.
3. You will need ~3 blank sheets of paper, your non-programmable scientific calculator, and the printed periodic table from the last page of this syllabus.
4. Log into the appropriate OAKS Quiz, launch LockDown Browser using a computer (not a tablet), and complete the guided check of your webcam and mic, which will both remain on during the assignment.
5. All exams are to be completed the same way as though you were in a classroom. Consulting notes, books, the internet, or other people is not allowed and violates the Honor Code.

Learning and Assessment:
Study guide: I will give you a study guide that tells you exactly what will be on the quizzes and exams. This guide is posted under Content on OAKS and will be updated as we reach new chapters.

Class notes: I will give you notes for each chapter (these will be posted under Content on OAKS). We will write on them during class, so you need to print them before class (or put the PDF onto your tablet to write on). Bring your calculator and a printout of the periodic table at the end of this syllabus to every class so you can actively participate.

ALEKS and textbook practice problems: Practicing problems is the best way to learn in Chem 111. ALEKS is software that adapts the practice questions it asks you based on your correct or incorrect answers to help identify the topics you need more practice on.

Log into ALEKS today then do the Initial Knowledge Check (this allows you to potentially earn credit from any chemistry knowledge you have from high school, but if you don't remember anything that's okay). Don't look up answers for this or you'll end up wasting a lot of time (because ALEKS will give you super hard questions then have to re-calibrate once it realizes you don't know them). ALEKS isn't a test; it's an adaptive learning app that makes doing practice problems easier than working problems on your own from a textbook. If you don't know how to do a problem, ALEKS will show you (just click on the explanation). So, it's easy to learn a lot while doing the practice problems. And that's the goal! (ALEKS does occasionally test you in the form of "knowledge checks" but don't get anxious about them. They are not graded; they just tell ALEKS which types of problems you need to review so you know them for our exams.)

The first assignment is a math review, and the rest of the assignments each correspond to a chapter from the book. Click on the explanation for every question you get wrong to learn how to do it so that you get the next question of that type correct and are able to move forward.
ALEKS grades you only on completion. If you answer questions incorrectly and it takes you longer to master a concept, that's okay – you can still get 100% completion once you learn the concept if you get questions correct before the due date. Each assignment takes each student a different amount of time; as soon as you prove to ALEKS you can do all the types of problems in the assignment, it will be 100% complete. Note that the due dates within ALEKS for each chapter of material are set to give you leeway, but you should aim to finish each assignment before the due date and work ahead on the next one(s). Essentially, as soon as we have covered chapter 1, you want to be almost done with the chapter 1 assignment in ALEKS.

ALEKS doesn't cover all the topics for the course, so you should also work textbook problems. Once you are making progress on a particular topic in ALEKS, check out the Worked Example problems found in the textbook. These problems are included at various points throughout each chapter; they begin with a problem that is explained for you and are followed by Practice Problems A and B, which you should use to test whether you understand the concepts. Additional problems at the end of the chapter will help you build on what you have learned.

Quizzes: Instead of four tests that each cover a large amount of material, there will be 23 quizzes that each focus on only a few learning objectives. Breaking down the material into bite-sized pieces should help you focus your studying and be more successful. Additionally, you are allowed to re-take each quiz (as many times as you like prior to a deadline), so that if you don't do as well as you would like on your first (or second or third, etc.) attempt, you can learn the topics you don't know and then be successful on your next attempt. Only your highest grade on each quiz is kept in the gradebook. Use the quizzes and the process of studying for them to help make sure you've learned each topic in the course and are prepared for the final exam.

Exams: There will be two 50-minute exams during the term, a midterm and a final. As mentioned above, for both exams you will need ~3 blank sheets of paper, a non-programmable scientific calculator, and the printed periodic table from the last page of this syllabus. The material in this course is cumulative so the midterm exam will cover everything up to that date, and the final exam will cover everything in the course. There are no opportunities to retake these exams. The date of the midterm exam will be announced one week beforehand. The final exam is Saturday, April 30 from 1:00–3:00 PM. You must take it during this scheduled exam period unless you follow the College’s protocol for re-scheduling a final exam and have all required paperwork processed and approved prior to 5 PM on the last day of class.

Extra credit: There are two opportunities to earn extra credit on the final exam. One is participation in class and the other is actively using ALEKS to advance your understanding and practice working chemistry problems. ALEKS keeps track of your progress in two ways: 1) by giving you a completion grade on each chapter assignment that you complete before its due date and 2) by filling in a pie chart. If you fill in ≥ 90% of the pie chart by the day of the final exam (you can do this even if you miss the assignment due dates) OR if you earn ≥ 90% on each of the chapter assignments by their due dates, you will earn extra credit on the final exam.
Grading Policy:
This course uses mastery grading because the goal is to understand and master the material, even if it takes you multiple attempts to do that. You will be given an unlimited number of retakes for each quiz, up until a deadline set to make sure you aren't falling behind. Being able to retake the quizzes allows you to go back and learn concepts you are missing and rewards you for what you know in the end, without penalizing you for lower scores you got during the learning process. You should be aiming to score ≥ 90% on each of the quizzes. Scoring lower indicates you have not yet mastered all the material and you should study further, seek out help on topics you are struggling with, then try again.

Your course grade is determined firstly by your average on these quizzes, secondly by your score on the final exam, and thirdly by your score on the midterm exam. So, start in the first column of the table below, then move to the second column, then move to the third column to see what final grade is earned. Note that you must have a quiz average ≥ 60% to pass the course, even if your exam scores are higher.

<table>
<thead>
<tr>
<th>Quiz Average</th>
<th>Final Exam Score</th>
<th>Midterm Exam Score</th>
<th>Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 90%</td>
<td>≥ 80%</td>
<td>≥ 90%</td>
<td>A</td>
</tr>
<tr>
<td>≥ 90%</td>
<td>≥ 80%</td>
<td>&lt; 90%</td>
<td>A-</td>
</tr>
<tr>
<td>≥ 80%</td>
<td>≥ 70%</td>
<td>≥ 85%</td>
<td>B+</td>
</tr>
<tr>
<td>≥ 80%</td>
<td>≥ 70%</td>
<td>80-84%</td>
<td>B</td>
</tr>
<tr>
<td>≥ 80%</td>
<td>≥ 70%</td>
<td>&lt; 80%</td>
<td>B-</td>
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<tr>
<td>≥ 70%</td>
<td>≥ 60%</td>
<td>≥ 75%</td>
<td>C+</td>
</tr>
<tr>
<td>≥ 70%</td>
<td>≥ 60%</td>
<td>70-74%</td>
<td>C</td>
</tr>
<tr>
<td>≥ 70%</td>
<td>≥ 60%</td>
<td>&lt; 70%</td>
<td>C-</td>
</tr>
<tr>
<td>≥ 60%</td>
<td>≥ 50%</td>
<td>≥ 65%</td>
<td>D+</td>
</tr>
<tr>
<td>≥ 60%</td>
<td>≥ 50%</td>
<td>60-64%</td>
<td>D</td>
</tr>
<tr>
<td>≥ 60%</td>
<td>≥ 50%</td>
<td>&lt; 60%</td>
<td>D-</td>
</tr>
<tr>
<td>&lt; 60%</td>
<td>-</td>
<td>-</td>
<td>F</td>
</tr>
</tbody>
</table>

Doing well on the final exam requires regular, consistent studying throughout the semester rather than cramming. After learning material for each quiz, keep practicing those types of problems throughout the semester so that you can do equally well on the final exam. If you master the early material but never return to studying it, you may lose proficiency by the time you take the final exam, and your grade will lower accordingly. Ex. If you have a 95% quiz average, but you have not maintained that proficiency through regular studying and only know 71% of the material on the final exam; you will make either a B-, B, or B+ in the course, depending on your midterm exam grade.

If you don't put much effort into the course and earn, for example, a 63% quiz average but then cram for the final exam and score 71%, you will make either a D-, D, or D+ (depending on your midterm exam grade) because of your low quiz average. Don't ignore, cram for, or try to game your way through the quizzes. They are designed to help you learn, encourage you to study regularly, and reward you for learning, while giving you crucial preparation for the exams.
The built-in forgiveness in your midterm exam grade allows you to make up for a low midterm exam grade if you learn the material by the time you take the final exam. Ex. If you have a quiz average of 80% and you earn 72% on the final exam, but you made a 45% on the midterm exam, your final grade will be a B-. You are not penalized for the low midterm exam grade, and it doesn't matter how many attempts it took for you to score well on each quiz. You are only rewarded for what you have learned by the end of the semester. Additionally, if you earn a high midterm exam grade, that can benefit your final grade. Ex. If your quiz average is 80%, you earn 70% on the final exam, and you earn 85% on the midterm, your final grade will be a B+.

In mastery grading, your grade reflects how well you know the material by the end of the semester, while giving you the flexibility to make mistakes along the way that don't average into your grade to bring it down. You're not penalized for the process of learning, but instead rewarded for what you've accomplished by the end of the semester.

How to Succeed in this Course:
1. **Be an active learner.** During class, actively take notes and work the example problems. Passively watching class and copying things down blindly is a waste of your valuable time and sets you up to instantly fall behind. Instead, think about the material, ask and answer questions, and jot down notes on concepts and how to tackle the problems.
2. **Come to class prepared.** Read over the notes from the last class and try the example problems we worked on your own (do this immediately after each class if possible). This doesn't take much time and has a huge payoff in allowing you to get more out of the next class because you'll be ready to learn new topics that build on the previous ones.
3. **Practice working problems multiple days per week, every week.** Work problems as soon as we cover a topic, so you don't fall behind. Do this in small sessions by picking a topic (or letting ALEKS pick one) and turning off all distractions.

**Supplemental Instruction (SI) and the Center for Student Learning (CSL):**
Layne Leggett (leggettle@g.cofc.edu) will be leading group study sessions on a weekly basis (she will notify you of the schedule). Take advantage of this excellent opportunity to work practice problems and learn the material with her guidance. Additionally, the CSL offers free walk-in science tutoring (schedule: [http://csl.cofc.edu/labs/science-lab/index.php](http://csl.cofc.edu/labs/science-lab/index.php)).

**OAKS Course Site:**
1. Check your CofC email address, the OAKS course site (particularly Announcements, Content, and Quizzes), and ALEKS regularly.
2. **Course Home: Announcements** – Course info, including details about exams and quizzes.
3. **Content** – Class notes with spaces left for you to annotate them and work practice problems during class will be posted here as PDF files. You should print these files prior to class (or put them onto a tablet) so you can write on them during class. Study guides, suggested practice problems, and this syllabus will also be posted.
5. **Grades: Grades** – Your grades will be here. OAKS cannot handle the grading scheme, so you will need to refer to this syllabus to determine your final grade.
Honor Code and Academic Integrity:
1. It is your responsibility to conform to the College of Charleston Honor Code and Code of Conduct (http://deanofstudents.cofc.edu/policies-and-procedures/honor-code-and-code-of-conduct.php).
2. In this course, collaborative studying is encouraged, but all quizzes and exams are to be completed individually, without the use of notes, unauthorized use of the internet, or the work of other people. Quizzes and exams must be completed and turned in on time following the rules described above, or you will receive a zero on the assignment.
3. Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when suspected, are investigated. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This status indicator will appear on the student’s transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. Students can find the complete Honor Code and all related processes in the Student Handbook (refer to the link in the middle of this webpage for a PDF of the handbook http://deanofstudents.cofc.edu/honor-system/studenthandbook/).

COVID-19 Reminders:
For the health and safety of yourself and those around you, you are required to wear a face-covering over both your nose and mouth while inside all campus buildings (you should do the same inside other public buildings). This mask should fit well; there should not be gaps anywhere between your face and the mask. Students, faculty, and staff should not come to campus when they feel unwell, are in isolation due to illness, or are under quarantine due to close contact with infected people. It is safe for you to attend online classes from home during both isolation and quarantine.

SNAP (Students Needing Access Parity) and Disability Access:
The College will make reasonable accommodations for persons with documented disabilities. Students should apply for accommodations at the Center for Disability Services/SNAP office located on the first floor of the Lightsey Center, Suite 104 (http://disabilityservices.cofc.edu/). Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me at least one week before accommodation is needed.

Support Resources:
Here are links for help with tech issues (https://blogs.cofc.edu/sits/), OAKS (http://blogs.cofc.edu/sits/tutorials/oaks_tutorials/), Zoom (http://blogs.cofc.edu/sits/zoom-video-resources/, https://support.zoom.us/hc/en-us/articles/206175806), your CofC accounts (ITservicedesk@cofc.edu 843-953-3375), Student Health (https://studenthealth.cofc.edu/), the Counseling Center (http://counseling.cofc.edu), food and housing assistance (http://studentaffairs.cofc.edu/student-food-housing-insecurity/index.php), and important CofC updates (https://continuity.cofc.edu/, https://cofc.edu/back-on-the-bricks/)

Periodic Table:
Please print the page below. Bring it (and your calculator) with you to all classes. For quizzes/exams, you will need a printed copy of the page below with nothing else written on it.
List of equations/constans you didn't need to memorize:

\[ \theta_F = \frac{9}{5} \theta_C + 32 \]

\[ \lambda = \frac{h}{mv} \]

\[ \Delta E = -2.18 \times 10^{-18} \text{ J} \left( \frac{1}{n_f^2} - \frac{1}{n_i^2} \right) \]

\[ F \alpha \left( \frac{Q_1 Q_2}{d^2} \right) \]

\[ E_n = -2.18 \times 10^{-18} \text{ J} \left( \frac{1}{n^2} \right) \]

\[ \frac{r_1}{r_2} = \frac{\sqrt{MM_2}}{\sqrt{MM_1}} \]

\[ R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1} \]