

# CHEMISTRY 152B (SLN 12200), WINTER 2023

## SYLLABUS

**Lectures:** M, W, F; 11:30AM –12:20PM in BAG 131

**Course Website:** <https://canvas.uw.edu/>

**Registration Questions:** Chemistry Undergraduate Services | [chemugs@uw.edu](mailto:chemugs@uw.edu)

**Course & Lab Instructor:** Prof. Andrea Carroll | BAG 201A | [ageddes@uw.edu](mailto:ageddes@uw.edu) or direct message via Canvas Inbox  
**Office Hours/Help Sessions:** Mondays 2:00-3:00pm and Fridays 9:00-10:00am in BAG 201A

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## REQUIRED MATERIALS AND CONNECTIVITY

Except where indicated, all items are required and available through the University Bookstore:

- **Chemical Principles**, 7<sup>th</sup> ed., Zumdahl/Decoste (custom-split Chem 152 version contains, in the order of coverage: Chapters 6, 7, 8, 9, 10, & 11, as well as the Student Solutions Manual, but you may purchase a different copy of the Chemical Principles 7<sup>th</sup> ed. text if you choose).
- **Study Guide, Chemical Principles**, 7<sup>th</sup> ed., Zumdahl/Kelter (*optional*).
- **UW General Chemistry 152 Laboratory Manual, Autumn 2022-Summer 2023** (Hayden McNeil).
- **Laboratory Notebook with numbered pages and carbonless duplicate pages.** You may continue to use a notebook from a previous quarter if it meets the stated criteria and has at least 30 pages available.
- **Lab coat and safety goggles** (*NO* safety glasses or any other type of goggles).
- **Scientific calculator.** Graphing/text-entry calculators *WILL NOT* be permitted on exams.
- **ALEKS access.** Purchase online: [www.aleks.com](http://www.aleks.com) (see ALEKS info on the course website for more information). If your financial aid is delayed, contact your instructor for a temporary access code.

### Internet and Instructional Technology:

- **Access to a computer or tablet.** [Student Technology Loan Program](#) funded through Student Technology Fees
- **Internet access.** Students in WA State without broadband internet service: visit [WA State Drive-in wifi hotspots](#).
- **Daily online access** to Canvas ([canvas.uw.edu](https://canvas.uw.edu/)) and ALEKS. **Weekly online access** to Gradescope ([www.gradescope.com](http://www.gradescope.com)). All necessary links are available on the course Canvas site.
- **Ability to convert a sheet of paper and/or file into a pdf.** *Submissions cannot be a group of individual image files.* Free scanning apps are available for smartphones (such as Genius Scan and Scannable) – the Gradescope instructions page of the Labs site has more details for using these apps.

## LEARNING OBJECTIVES

**Students who successfully complete CHEM 152 will be able to**

- Build on their understanding of reaction kinetics to describe a system at equilibrium.
- Determine the equilibrium constant for a chemical system and use it to qualitatively describe the relationship between quantities of reactants and products.
- Predict the equilibrium state of a chemical system in partial pressures or concentrations of reactants and products based on initial conditions.
- Predict the behavior of a chemical system at equilibrium when that system is perturbed by a change in conditions.
- Explain the First, Second, and Third Laws of Thermodynamics in relation to chemical systems.
- Describe the energetics of a chemical system using the state functions enthalpy, entropy, and free energy.
- Predict the tendency of a chemical system to react based on thermodynamic principles.
- Explain the equilibrium state of a chemical system using thermodynamic principles.
- Combine the kinetic and thermodynamic properties of a chemical system to explain whether a reaction will occur.
- Explain electrochemical systems and the work produced in terms of thermodynamic principles.
- Develop skill in visualizing the particulate level as related to the concepts above.
- Relate empirical observations, particularly in the laboratory portion of the course, to concepts listed above.
- Demonstrate laboratory, data analysis, and scientific writing skills.

## COURSE COMPONENTS AND GRADING

**The course consists of:**

- 3 lectures per week
- 1 discussion section per week
- 1 three-hour laboratory session certain weeks of the quarter (6 labs total – see the 152 Laboratory Resources page of the course website for details.)
- Daily work in the ALEKS online learning environment
- Online prelab assignments and online submission of post-lab reports
- Periodic quizzes and exams

## GRADING

The point distribution for the evaluative components of the course is as follows:

Quizzes and Final Exam	60%
Participation	10%
ALEKS (Modules & End-of-Quarter Pie Progress)	15%
Laboratory	15%
<b>TOTAL</b>	<b>100%</b>

**Quizzes.** Quizzes will be in-person during the regularly scheduled class session on Fridays in weeks 3, 6 and 9. There will be three quizzes and at the end of the quarter one quiz score will be ignored/dropped before course grades are assigned. (The score dropped will be the lowest, whether that is from an absence or from a low earned score. Zero scores related to cases of academic misconduct in which a student is found responsible for violating the student conduct code will NOT be dropped.) Each quiz will focus mainly on the most recent set of lectures, but chemistry is a cumulative subject by nature, so we will assume that you have a firm

understanding of material from earlier in the quarter and from *previous courses* when we the quiz questions. **The Quizzes represent 40% of your course grade (20% each).**

**Final Exam.** The Final Exam will be in person during the University-assigned final exam session for this course on Wednesday, March 15th. The Final Exam is cumulative. Towards the end of the quarter we will provide details about the coverage of each course unit on the final. **The Final Exam represents 20% of your course grade.**

**Participation.** Discussion section (called Quiz section in the UW Time Schedule) will be weekly on Tuesdays. To earn your participation credit, you must *arrive on time* and *participate* in good faith during the Discussion Section, not simply be in attendance. Three Discussion Section scores will be dropped, allowing you to miss a few without any impact on your course grade. Additional participation-based activities will include the surveys, reflections, and active reading assignments that are part of the “Catalyze Your Success” learning strategies initiative. These additional opportunities will not be “extra-credit” points, so please be sure to complete them when they are available. **The Participation category represents 10% of your course grade.**

**ALEKS.** Your ALEKS grade is constructed from your Module scores and the percent of the Pie you complete by the end of the quarter. The more of the pie you complete, the higher your ALEKS score will be, but **you do not have to complete the entire pie to earn credit for ALEKS.** Similarly, **you do not have to complete all the topics in a Module to earn credit for that Module.** Whatever percentage of topics you complete by the due date will be your score for that Module. The Module and End-of-Quarter Pie Progress (mastered topics *plus* learned topics) portions of your ALEKS grade are weighted equally. They each represent 7.5% of your overall course grade, so altogether the **ALEKS category represents 15% of your course grade.**

**Laboratory.** The Laboratory portion of this course will be conducted in person during the regularly-scheduled 3-hr lab sessions on your schedule. More details about lab can be found on the 152 Labs Canvas page. The lab score is made up of a lab safety orientation session and assignment and six labs (prelab, experiment, and report). **The Laboratory category represents 15% of your course grade.**

**Grade Distribution.** The final median GPA in Chemistry 152 generally falls within the range of 2.6-2.9. It is the Chemistry Department’s policy not to make grade changes of 0.1 after final class grades are submitted to the UW Registrar. Your scores for the various assignments, reports, and exams will be recorded using the online Gradebooks in Canvas (canvas.uw.edu). The lab assignments will be recorded on the Chem 152 Lab Resources page and all of the course component scores from ALEKS, 152 Labs site in Canvas, and/or Gradescope will be migrated to the Chem 152 course gradebook periodically throughout the quarter.

## ACADEMIC ETHICS

**Original work performed in good faith is assumed on all assignments and course components.**

The Student Conduct Code prohibits several forms of academic misconduct (see [section 7: Prohibited Conduct](#)), including:

- Cheating
- Falsification
- Plagiarism
- Unauthorized collaboration
- Engaging in behavior specifically prohibited by an instructor
- Recording and/or dissemination of instructional content without express permission of the instructor

You are required to sign and submit an honor code statement for this course, in which you will affirm your acknowledgment of what constitutes academic misconduct in this course as defined below. Failure to adhere to this code of ethics will result in referral for possible disciplinary action as described in the Student Conduct Code.

### General policies for all course assignments

Your submissions for ALL assignments (including but not limited to homework assignments, lab reports, quizzes, and exams) should be your own individual work unless you are explicitly told otherwise by your instructor.

You are strictly prohibited from sharing any content from ANY assignment (including but not limited to homework assignments, lab reports, quizzes, and exams) with any website or app (including but not limited to Discord, Chegg, Course Hero, and Snapchat) or any other course content repository (virtual OR physical) that is not explicitly approved by the instructor. This prohibition applies both during the quarter that you are taking this course and any time after the course ends.

### Specific policies for exams and quizzes

During exams and/or quizzes, you may not seek out or accept any input from ANY other individual, whether or not they are a classmate. Further, you may not provide assistance to other students during the availability window for an exam or quiz unless an instructor explicitly allows for that collaboration.

### Specific policies for lab reports

It is presumed that the data you record and report in laboratory is your work. All data analysis and written/typed calculations and responses that you submit should be yours alone, even if you collected data with a laboratory partner. We often find examples of plagiarism in which lab reports are copied from someone else, or from an earlier quarter and examples of improper collaboration in which lab reports or portions of lab reports are posted or shared for other people to view.

We understand that it can be difficult for students to discern what constitutes good-faith collegial support on lab reports, and what constitutes plagiarism or cheating. While we often find examples of explicit plagiarism in which lab reports are directly copied from a student in the current quarter or an earlier quarter, we also find many cases of students “over collaborating,” resulting in reports that are essentially identical or extremely similar with only minor edits made to achieve minimal differences between the reports. This does not meet our expectation that you are submitting your own independent work. In short, if you have not done something yourself, do not attempt to pass it off as original work. If you have questions about what might cross the line, please do not hesitate to ask your lab or class instructor prior to submitting your work. You will not get in trouble for asking this type of question!

## LECTURES

**Lecture Schedule.** An approximate schedule for the chapters to be covered each week is at the end of this document. ***You are responsible for material covered in class AND in the textbook*** (whether or not it was covered in lecture). Lectures will cover only highlights of the textbook material.

**Lecture and Discussion Section Etiquette.** Out of respect for your classmates, please observe the following rules:

- Arrive on time. If an emergency causes you to arrive late, please enter quietly through the **rear doors** of the lecture hall/classroom.
- Do not pack up your belongings before the end of class.
- Keep side conversations to a minimum.
- Keep your phones and devices on silent.
- Do not browse or read materials that are unrelated to the lecture.

## DISCUSSION SECTION

**Activities in Discussion Sections (“QZ” in the Time Schedule).** The weekly Discussion Section will be facilitated by your TA. The primary activities during Discussion Section will include:

- TA fielding questions about quizzes, general course content, labs, etc.
- Working in small groups with your colleagues on problem sets relevant to current course topics.

The worksheets/problem sets are intended to help you synthesize the material covered in the previous week's lectures, therefore, some will be quite challenging. A blank version of the worksheet will be available in advance of each Discussion Section. You can find the worksheets in the respective Unit page in the Course Topics module. The worksheet key will be available after the last Discussion Section wraps up each week.

## ONLINE LEARNING (ALEKS)

This course uses the internet-based learning program **ALEKS** (Assessment and LEarning in Knowledge Spaces). In ALEKS, you will complete **learning modules** rather than traditional homework assignments. An **ALEKS Module** (formerly called an Objective) contains topics relevant to the class content and discussions. The **ALEKS Pie** is a visual indicator of your progress towards mastering the required course content. Both your % completion of Modules by the posted deadlines and the % completion of the ALEKS Pie by the end of the quarter will contribute to your total % score for the course and course grade. Several resources for understanding ALEKS can be found in the ALEKS module on the course website.

- **Make sure that you register for the ALEKS course specific to your section of 152** – use only the registration code found on the course website.
- **Make sure you enter your UW Net ID** (first part of your UW email address before the @ symbol) in your account details so your ALEKS scores can be correctly transferred to the course gradebook in Canvas.
- You, alone, are responsible for monitoring the deadlines for all ALEKS Modules. Your daily/weekly work on ALEKS will be on your own schedule outside of class, although there are specific deadlines by which you must complete various Modules.
- Note that it is not possible to open an ALEKS Module a few hours before it's due and be able to complete it successfully while also retaining the information and skills for easy recall later.

## QUIZZES AND EXAMS

**There are three quizzes and one final exam in this course. The dates for these are provided in the course schedule at the end of this document and on the Canvas course site.**

### Exam Protocol

- Bring a few pencils, your non-graphing, non-programmable scientific calculator, and a photo ID to all exams.
- You must sit according to the seating charts that will be posted on the course website.

**Quizzes.** There are three quizzes in this course, delivered in person during our class session on Fridays in weeks 3, 6, and 9. Each quiz will focus mainly on the most recent set of lessons, but chemistry knowledge is cumulative by nature, so the quiz questions will often depend on knowledge from earlier chapters and courses. Information about quiz length and coverage will be posted on the Canvas course site as each quiz date nears. The lowest score among the three quizzes will be dropped.

**Final Exam.** The final exam will be in person during the assigned time slot in Finals Week. The final exam will be cumulative for all content throughout the quarter. You must take the final to earn a grade in the course. Information about length and coverage will be posted on the Canvas course site as the final exam date nears.

## CLASSROOM CLIMATE

The goal of the Department of Chemistry, and of the University of Washington as a whole is help you develop critical thinking skills. Those skills and your training to succeed in professional environments are enhanced when you interact with people with diverse backgrounds, embodiments, and experiences. Therefore, I expect you to follow the UW Student Conduct Code in your interactions with your colleagues and me in this course by respecting the many social and cultural differences among us, which may include, but are not limited to: age, cultural background, disability, ethnicity, family status, gender identity and presentation, citizenship and immigration status, national origin, race, religious and political beliefs, sex, sexual orientation, socioeconomic status, and veteran status. Please talk with me right away if you experience or observe disrespect in this class, and I will work to address it with you.

## ACCESS AND ACCOMMODATIONS

Your experience in this class is important to us, and it is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. Disability Resources for Students (DRS) offers resources and coordinates reasonable accommodations for students with disabilities. If you have not yet established services through DRS, but have a temporary or permanent disability that requires accommodations, you are welcome to contact DRS at 206-543-8924 or [uwdrs@uw.edu](mailto:uwdrs@uw.edu) or visit [disability.uw.edu](http://disability.uw.edu). If you have already established accommodations with DRS, the information for the Alternative Testing Contract will be submitted to DRS via their online system. Students with accommodations are solely responsible for scheduling the exams with DRS well in advance of the quiz/exam dates. Since the testing center has a limited capacity, please be sure to schedule ALL of your chemistry exams (including the final exam!) as early as possible in the quarter so that the DRS office can accommodate you. If you require accommodations in the laboratory (including assistants and/or interpreters), please contact the Undergraduate Services Director (Bagley 303D) *in person in the first week* of the quarter to discuss your accommodations.

## RELIGIOUS ACCOMMODATIONS POLICY

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>). *Accommodations must be requested within the first two weeks* of this course using the Religious Accommodations Request form (<https://registrar.washington.edu/students/religious-accommodations-request/>).

## KEYS TO SUCCESS

1. Participate in ALL available sessions, pay close attention, and take notes – learning is not a passive process.
2. Learning chemistry is a sequential process. You must understand today's material before you can understand tomorrow's. As with all courses at UW, your instructors and TAs will assume that you are studying at least two hours for each hour of lecture and one hour for every hour of lab. Find a place that allows for periods of uninterrupted study. Skim through chapter or sections to be covered in the next class session.
3. Make daily, weekly, and quarterly learning plans and follow those plans.
4. Working in shorter, more frequent sessions in ALEKS will be more efficient than long, marathon sessions.
5. Practice! Work on suggested end-of-the-chapter problems as well as topics in ALEKS - focus on understanding the concepts and general processes, not just memorizing how to solve a specific problem.
6. Talk chemistry with fellow Chem 152 students. You will not only learn more, but you will probably also enjoy the course more. Use the discussion board, conferences, chats, etc. to create study groups for talking about the course content.

WEEK	CLASS	DISC. SECTION	CLASS	CLASS	ALEKS <sup>1</sup>	LAB
	MON	TUES	WED	FRI	SUN 11pm	T, W, TH, F
1	<b>Jan 2</b> NO CLASS	<b>Jan 3</b> Discussion Section 1 <b>WS01:</b> CHEM 142 Review	<b>Jan 4</b> Welcome! Syllabus, course structure TB: none	<b>Jan 6</b> L1.1: Equilibrium; equilibrium constant TB: 6.1-6.4	<b>Jan 8</b> <b>Obj 1:</b> L1.1; Chem Kinetics Review	NO LAB
2	<b>Jan 9</b> L1.2: Kp vs. Kc; Heterogen. Equilibria TB: 6.5-6.6	<b>Jan 10</b> Discussion Section 2 <b>WS02:</b> L1.1-1.2	<b>Jan 11</b> L1.3: Solving equilibrium problems TB: 6.7	<b>Jan 13</b> L1.4: Le Châtelier's Principle TB: 6.8 Pre-Qz1 Ref opens 12a	<b>Jan 15</b> <b>Obj 2:</b> L1.2-1.4; Gas Laws Review	Lab Safety Orientation (in-lab worksheet)
3	<b>Jan 16</b> HOLIDAY - NO CLASS	<b>Jan 17</b> Discussion Section 4 <b>WS03:</b> L1.3-1.4	<b>Jan 18</b> L2.1: Bronsted-Lowry; acid strength TB: 7.1-7.5 Pre-Qz1 Ref due 11p	<b>Jan 20 QUIZ 1</b> Coverage: CHEM 142 Review (Kinetics, Gas Laws), Unit 1	<b>Jan 22</b> <b>Obj 3:</b> More L1.4; L2.1	NO LAB
4	<b>Jan 23</b> L2.2: Calculating pH of acids and bases TB: 7.6	<b>Jan 24</b> Discussion Section 5 <b>WS04:</b> L2.1-2.2 Post-Qz1 Ref opens 6p	<b>Jan 25</b> L2.3: Acid-base properties of salts TB: 7.8, 7.11	<b>Jan 27</b> L2.4: Common ion solutions; buffers TB: 8.1-8.2, 8.4	<b>Jan 29</b> <b>Obj 4:</b> L2.2-2.4 Post-Qz1 Ref due 11p	Lab 1 Kinetics II (take-home report)
5	<b>Jan 30</b> L2.3-2.4 (continued) TB: none	<b>Jan 31</b> Discussion Section 5 <b>WS05:</b> L2.3-2.4	<b>Feb 1</b> L2.5: Titrations and pH curves TB: 8.5-8.6	<b>Feb 3</b> L2.6: Solubility equilibria TB: 8.8-8.9 Pre-Qz2 Ref opens 12a	<b>Feb 5</b> <b>Obj 5:</b> More L2.2-2.6	Lab 2 Weak Acid Titration (in-lab report)
6	<b>Feb 6</b> L3.1: Energy TB: 9.1	<b>Feb 7</b> Discussion Section 6 <b>WS06:</b> L2.5-2.6; L3.1	<b>Feb 8</b> L3.2: Enthalpy; Thermo. of ideal gases TB: 9.2-9.3 Pre-Qz2 Ref due 11p	<b>Feb 10 QUIZ 2</b> Coverage: Units 1-2 (NOTE: Unit 3 content will appear on Exam 3)	<b>Feb 12</b> <b>Obj 6:</b> L3.1-3.2; Gas Laws Review	Lab 3 Buffers (in-lab report)
7	<b>Feb 13</b> L3.1-3.2 (continued) TB: none	<b>Feb 14</b> Discussion Section 7 <b>WS07:</b> L3.1-3.2 Post-Qz2 Ref opens 6p	<b>Feb 15</b> L3.3: Hess's Law; Enthalpy of Formation TB: 9.4-9.6	<b>Feb 17</b> L3.4 <sup>2</sup> : Statistical entropy TB: 10.1, 10.3	<b>Feb 19</b> <b>Obj 7:</b> More L3.1-3.4 Post-Qz2 Ref due 11p	Lab 4 Thermo I (take-home report)
8	<b>Feb 20</b> HOLIDAY - NO CLASS	<b>Feb 21</b> Discussion Section 8 <b>WS08:</b> L3.3-3.4	<b>Feb 22</b> L3.6 <sup>2</sup> : $\Delta S$ in system and surroundings TB: 10.4-10.5, 10.8	<b>Feb 24</b> L3.7: Temp & spontaneity; $\Delta G$ TB: 10.6-10.7, 10.9 Pre-Qz3 Ref opens 12a	<b>Feb 26</b> <b>Obj 8:</b> L3.6-3.7	NO LAB
9	<b>Feb 27</b> L3.8: $\Delta G^\circ$ , $\Delta G$ , $K_{eq}$ TB: 10.10-10.11	<b>Feb 28</b> Discussion Section 9 <b>WS09:</b> L3.6-3.8	<b>Mar 1</b> L4.1: Redox review; Galvanic cells TB: 4.10-4.11; 11.1 Pre-Qz3 Ref due 11p	<b>Mar 3 QUIZ 3</b> Coverage: Units 1-3 (NOTE: Unit 4 content will appear on the Final)	<b>Mar 5</b> <b>Obj 9:</b> L3.8; L4.1	Lab 5 Thermo II (take-home report)
10	<b>Mar 6</b> L4.2: Standard reduction potentials TB: 11.2	<b>Mar 7</b> Discussion Section 10 <b>WS10:</b> L4.1-4.3 <sup>3</sup> Post-Qz3 Ref opens 6p	<b>Mar 8</b> L4.3: Cell potential, $\Delta G$ , w, & conc. TB: 10.12; 11.3-11.4	<b>Mar 10</b> L: End-of-Quarter Q&A TB: none	<b>Mar 12</b> <b>Obj 10:</b> L4.2-4.3 Post-Qz3 Ref due 11p	Lab 6 Redox and % Composition (in-lab report)
11	<b>Mar 13</b>	<b>Mar 14</b> See ALEKS column for last deadline.	<b>Mar 15</b> <b>FINAL EXAM</b> Coverage: Units 1-4 2:30-4:20pm, BAG 131	<b>Mar 17</b>	<b>Tues Mar 14</b> End-of-Quarter Pie Progress (mastered plus learned)	NO LAB

**LEGEND:** TB = textbook reading; L = Lesson; Obj = ALEKS Objective; WS = Worksheet; Ref = Reflection

<sup>1</sup> All ALEKS Objectives are due at 11 pm on Sundays. The End-of-Quarter Pie Progress score will be captured at 11 pm on Tues, Mar 14.

<sup>2</sup> Lesson 3.5 will be skipped in Winter 2023.

<sup>3</sup> This worksheet contains content that will be discussed in the last class session on Wed, Mar 8.