

Syllabus (updated 10/26/20)

Introductory Chemistry

CHEM 121.01, MWF 9:10 AM - 10:00 AM EST

CHEM 121.02, MWF 11:10 AM - 12:00 PM EST

Zoom link for remote class: <https://us02web.zoom.us/j/87450038081>

Kenyon College, Fall 2020

[[CLICK TO JUMP TO COURSE SCHEDULE](#)]

Professor Catherine Mauck

Tomsich 314, mauck1@kenyon.edu

Office hours: via [Zoom meeting room](#), by appointment (sign up via [Google Calendar](#))

Office Hours link is different from class Zoom link!

M: 1-2pm EST

Tu: 9-11am EST

Th: 9-11am EST

Textbook: Chang & Goldsby, *Chemistry*, 13 ed.

Available as integrated E-Book in ALEKS 360 ([video walkthrough](#))

Or as looseleaf hard copy through Kenyon Bookstore or via ALEKS

Course description

This course provides a thorough introduction to the fundamental concepts, theories, and methodologies of chemistry. Topics include stoichiometry, theories of molecular structure and bonding, the periodic table, acid-base chemistry, chemical equilibria and thermodynamics. This course provides a basis for the further study of chemistry. In addition to mastery of fundamental chemical concepts, students will develop skills in scientific problem-solving and teamwork.

Course structure

Chemistry is a subject that is learned best through the application of concepts, in addition to memorization of facts. This course is structured to encourage learning strategies that are well-supported by the science of how humans learn best.

The material in this course will build on itself. Integration and synthesis of knowledge from all parts of the course will be necessary, and require students to engage continually with the material. Active preparation is essential to your learning and success. You will find that the course structure supports and incentivizes active learning, through the following:

1. **Course Preparation Assignments** (CPAs), to be completed before every class session
2. In-class **challenge activities**, to practice problem solving
3. Regular practice through the completion of **ALEKS online problem sets**
4. **Assessment** and feedback through 3 midterm exams and final exam

If you are interested in finding out more about developing your own learning skills and strategies based on educational research, see “[Make it stick: the science of successful learning](#),” by Brown, Roediger, & McDaniel.

What will this class look like?

This class meets three days a week. Because continual engagement with small amounts of content has been shown to be more effective than all-at-once cramming, we use this schedule to our advantage; you will do a *little* bit of work each day, that culminates in mastery of the material through frequent practice and regular feedback.

In a regular week, you’ll want to keep tabs on three things:

1. What reading or video lecture do you need to read or watch before the next class?
2. Based on that content, have you completed the CPA for the next class?
3. Have you made progress towards completing the current ALEKS assignment?

If you do these three things, you’ll be well prepared for success on the weekly quizzes and the exams.

Grading

The weighting of graded assignments and letter grade scheme are below:

	ea.	× pts =	pts tot.	percent
Midterm Exams	3	100	300	22.2%
Final Exam	1	200	200	14.8%
Course Preparation Assignments	32	10	320	23.7%
In-class challenges	38	5	190	14.1%
Participation	1	40	40	3.0%
ALEKS objectives	15	20	300	22.2%
Total points			1350	

Letter grades as a percentage of total points earned:

A (+/-) 100-90% | B (+/-) 89-80% | C (+/-) 79-70% | D (+/-) 69-60% | F < 60%

Assignment details

Online problem sets

Instead of turning in problem sets to be graded, you will use an **online homework companion called ALEKS**. Whereas a problem set is a one-time “finished product” with delayed results, this adaptive, web-based program serves both as a resource for learning *as well as* an assessment of your mastery of course objectives. Answering a question wrong does not count against you, and if you make a mistake, you can access the explanation so you can learn. Then, as you learn, you must answer questions *for that topic 3 times in a row*

correctly, to demonstrate “mastery” and receive a score of 100% on that topic. It does take some time to get used to the interface, but once you do, you have access to a limitless, on-demand bank of questions that adapts to your individual progress and provides immediate feedback.

I highly recommend incorporating ALEKS into your regular chemistry workflow. Although your use of ALEKS should be frequent and consistent, each *Objective* will have a specific due date, by which you will need to have completed *all topics* associated with that Objective. The topics for each Objective will typically follow the content covered in the course that week. Your grade is determined by the number of topics you have demonstrated mastery of (by answering correctly 3 times in a row) *vs.* the number of topics attempted but not mastered. The due date for each objective will usually be **Sunday by 11:59pm** for the prior week’s material. When prioritizing your time to complete ALEKS for the week, note that some objectives have more topics and some have fewer.

To build your individualized ALEKS profile, you will begin with an *Initial Knowledge Check*. This will survey the level of familiarity with General Chemistry that you are coming in with. You are not graded on this portion, but how you perform will be used to build your ALEKS profile and determine the foundational work you will then need to do in the ALEKS module. After completing the Knowledge Check, you’ll move into the *Prerequisite Review*, which is the first ALEKS assignment due. Here, you will either demonstrate your understanding of the topics or use the prerequisite review to get up to speed on the foundational math and science concepts that you will need to be successful in this course.

Go slowly and carefully through the questions, and you will find that the ALEKS assessment module will take less time! ALEKS doesn’t know whether you are making silly mistakes or whether you really don’t know the concept you need to learn. If you get something wrong -- even if it’s just a significant figure error -- ALEKS will have you repeat, repeat, repeat, with new questions each time, until you’ve demonstrated mastery. This can add significant length to the amount of time you need to set aside to complete the Objective, so be methodical and check your answers. It’s good practice for exams and quizzes, too!

Having trouble?

- Read the question carefully again.
- Write out your work on scratch paper.
- Remember significant figures.
- Make use of the Math Science Skill Center (MSSC).
- Come to office hours, prepared with the exact content of the question you’re asking about (or a high enough resolution screenshot).

To access the ALEKS syllabus (list of topics by objectives and their due dates), please follow [this link](#).

To access the textbook in ALEKS 360, refer to [this video](#).

Course Preparation Assignment (CPA)

Before each class, students will be expected to submit their CPA. The length and depth of the work associated with each CPA will vary, depending on the current material, but will always be designed for (1) exposure to the new material and concepts that will be the focus of the next class, and (2) practice and application of new concepts by responding to several related questions.

The CPA for the next class will be posted by the end of the class prior on the course Moodle page, organized by date. To submit each CPA, you will find a Turnitin link on Moodle for that date. Upload a photo or a scan of your notebook page. These assignments will be graded on *engagement*. Each CPA is worth 10 points and is due by **11:59pm before the date of that class (EST)**.

What does that mean? A *complete* response to each question or prompt incorporates (as needed) written-out calculations, reasoning, descriptive text, diagrams, explanation of approaches, drawings, and/or structures. A complete response is *not necessarily* a correct response and vice versa. Demonstrating genuine engagement with the question to the best of your ability (even if you arrive at the wrong answer!) is better than dashing off an answer without any reasoning given.

In-class work

At the beginning of class, a short lecture will sum up the CPA and related new concepts. We will then work together through the class challenge activity for that day. At the end of each class session, each student will submit their work (whether individual or in a pair/team) on the challenge, to be graded. Similar to the CPA, the in-class challenges are graded by the richness of the written record and the completeness of the work, *not* the correctness or the percentage of the total questions completed. After class, students are responsible for completing the rest of the challenge in their notebook. Challenges will be posted online at the end of the class session.

Participation

Your attendance, presence, and engagement will be a component of your grade in this course. This includes completion of the introductory survey and end-of-semester survey, to help measure learning experiences in the hybrid classroom.

Policies

Email and office hours

Email is the best way to contact me with any questions or to set up an office hour appointment. *You may expect a reply from me within 24 hours during weekdays, and within 36 hours on weekends.* The same promptness in communication is expected from students.

Office hours are an excellent way to clear up any confusion you are having about certain concepts or problems. I also encourage you to come to my office hours if you are just

curious to know more about something we've talked about in class. Office hours are one of the unique resources that are available to you at a place like Kenyon, so take advantage of them! I have scheduled regular appointments so that it is easy for students to know when I am available for office hours. However, if the available times do not work for you, you are always welcome to email me to set up an alternative appointment.

To schedule one of the regular appointment times, please visit [my Google appointment calendar](#) and choose an appointment slot. The link for office hours will always be via Zoom. Once you sign up for an appointment, the Zoom link will be in the email you receive confirming the appointment, as well as on the event info on Calendar. A video instruction can be viewed [here](#).

Prior to meeting, please select some example problems or specific questions, so that we may use our time in the most effective manner.

Academic honesty and collaborative work

Kenyon College is, at the core, an intellectual community of scholars – students and faculty – engaged in the free and open exchange of ideas. Critical to this lively exchange and deep engagement with learning is the academic integrity of our work, both inside and outside the classroom. At Kenyon we expect all students, at all times, to submit work that represents these standards of academic integrity. It is the responsibility of each student to learn and practice the proper ways of documenting and acknowledging those whose ideas and words you have drawn upon (see [Kenyon College Course Catalog 2020-2021](#), [Academic Policies and Procedures](#); [Academic Honesty](#)). Ignorance and carelessness do not excuse academic dishonesty. If you are uncertain about the expectations for academic honesty in a class, please ask me for clarification.

Modern science at Kenyon and beyond is an inherently team-based, collaborative discipline. The scientific community has developed ethical guidelines for this type of work, in which co-collaborators are expected to openly cite and list all direct collaborators in any piece of scientific publication or presentation. Similarly, in this course, you will often work in small groups to complete assignments. Whenever you have collaborated with other students to arrive at an answer or work through a problem, you must list your collaborators on the work that you produce together. **However, exams and ALEKS assignments will be your work alone.**

Attendance, Absences, and Incomplete Work:

Attendance will be recorded, in part for contact tracing needs during the COVID-19 pandemic. If you are unable to attend class due to illness or a personal emergency, you must [email me](#) within 24 hours of the missed class session to request that the absence be excused. For absences that you know of ahead of time, [prior notice is requested at least 24 hours in advance](#) (if not earlier). If an absence is unexcused, you will not receive any points for in-class activities such as challenge problem sheets. Incurring more than 1 unexcused absence will also result in a reduction in your participation grade. Students are responsible

for learning material missed as a result of any absence, and I encourage you to ask your fellow students for notes. If an exam is not turned in by the due date, it will receive a 0. Exceptions will only be considered in the event of serious illness or emergency, and must be requested by email before the beginning of the exam period.

Devices:

Full engagement with the in-class portion of this course will be a key component of success. On occasion, wireless devices (computers or phones) will be used in class when indicated by the instructor, and you are encouraged to bring such devices to class but keep them put away until they are needed for a particular activity. In fact, educational research has shown that laptops in class negatively affect the performance of the student using the laptop, as well as the performance of the students around the laptop user. Notes should be taken on paper (in the course notebook). Please also note that cell phone use will affect your class participation, which is a component of your grade in this course as a part of the in-class work.

Title IX:

Kenyon College seeks to provide an environment that is free of bias, discrimination, and harassment. If you have experienced any form of harassment/misconduct/assault, interpersonal violence, or stalking we encourage you to report it. If you report the incident to a faculty member, they must notify Kenyon's Civil Rights & Title IX Coordinator and share the information you provided. Please also know that there *are* confidential resources that do not have the same mandatory reporting requirements, should you need them; these are the Health and Counseling Center, the College chaplains, and the staff at New Directions Domestic Abuse Shelter & Crisis Center in Mount Vernon.

More information can be found on the following College web pages for [Sexual Harassment & Misconduct Policy](#), [Discrimination & Discriminatory Harassment Policy](#), & [ADA/504 Student Grievance Procedures](#).

Accommodations:

At Kenyon, we strive to create an inclusive and equitable learning environment. Any student with a need for accommodations should contact Student Accessibility and Support Services ([SASS](#)) to discuss specific needs. If you require an accommodation, be mindful that you must register with Student Accessibility and Support Services (SASS) **each** semester. Once you have completed the process through SASS, please sign up for an office hour appointment as soon as possible, so that we may meet and make arrangements well in advance of exams or assignments. Any students with challenges securing class materials or meeting basic needs due to resource limitations are encouraged to contact the Office of Diversity, Equity, and Inclusion ([ODEI](#)), in addition to meeting with me individually (should you feel comfortable doing so).

COVID-19 Contingencies:

If an emergency makes it necessary for me to cancel class, including but not limited to COVID exposure or infection, **I will notify you by email**. A faculty member in the chemistry department will continue to provide access to course content via Moodle.

In the case of all-remote instruction, we will continue to hold synchronous classes. If there is a student whose time zone or family/work commitments require them to access the course at a different time, please notify me ASAP and we will come to an alternative agreement.

If the unique circumstances of this semester make it difficult for you to turn in an assignment on time, be present in class, or you experience other academic disruptions as a result, please reach out to me as soon as possible so that we can make arrangements to accommodate those disruptions.

Tentative course schedule

Subject to change at instructor discretion

Class	Day	Topic	CPA due
1	8/31	2.1 Atomic theory 2.2 Structure of the atom 2.3 Atomic number, mass number, isotopes 2.4 Periodic table	None
2	9/2	2.5 Molecules and ions 2.6 Chemical formulas 2.7 Naming compounds 2.8 Introduction to organic compounds	CPA 01
	9/3	Thursday 11:59pm ALEKS Prerequisite Review, 20 topics	
3	9/4	3.1 Atomic mass 3.2 Avogadro's number and molar mass by element 3.3 Molecular mass	CPA 02
	9/6	Sunday 11:59pm ALEKS Obj. #1, 15 topics	
4	9/7	3.5 Percent composition of compounds 3.6 Experimental determination of empirical formulas	CPA 03
5	9/9	3.7 Chemical reactions and equations 3.8 Amounts of reactants and products 3.9 Limiting reagents	CPA 04
6	9/11	3.10 Reaction yield	CPA 05
	9/13	Sunday 11:59pm ALEKS Obj. #2, 16 topics	
7	9/14	4.1 Properties of aqueous solutions 4.2 Precipitation reactions 4.3 Acid-base reactions 4.4 Oxidation-reduction reactions	CPA 06
8	9/16	4.5 Concentration of solutions 4.6 Gravimetric analysis	CPA 07
9	9/18	4.7 Acid-base titrations 4.8 Redox titrations	CPA 08
	9/20	Sunday 11:59pm ALEKS Obj. #3, 19 topics	
10	9/21	EXAM - Atoms, Molecules, Reactions	
11	9/23	5.1 Substances that exist as gases 5.2 Gas pressure 5.3 Gas Laws 5.4 Ideal Gas equation	CPA 09
12	9/25	5.5 Gas stoichiometry 5.6 Dalton's Law of Partial Pressures	CPA 10
	9/27	Sunday 11:59pm ALEKS Obj. #4, 8 topics	
13	9/28	5.7 Kinetic molecular theory of gases 5.8 Deviation from ideal behavior and the van der Waals equation	CPA 11

14	9/30	6.1 Energy 6.2 Energy changes in chemical reactions 6.3 Thermodynamics 6.4 Enthalpy	CPA 12
15	10/2	6.5 Calorimetry	CPA 13
	10/4	Sunday 11:59pm ALEKS Obj. #5, 16 topics	
16	10/5	6.6 Standard state and enthalpies of formation/reaction 6.7 Heat of solution and dilution	CPA 14
17	10/7	7.1 Classical physics to quantum theory 7.2 Photoelectric effect and photons 7.3 Bohr H atom 7.4 De Broglie waves and the dual nature of the electron	CPA 15
18	10/9	7.5 Quantum mechanics 7.6 Quantum numbers 7.7 Atomic orbitals	CPA 16
	10/11	Sunday 11:59pm ALEKS Obj. #6, 8 topics	
19	10/12	7.8 Electron Configurations 7.9 Aufbau principle	CPA 17
20	10/14	8.1 History of the periodic table	CPA 18
21	10/16	8.2 Periodic classification 8.3 Periodic variation in properties 8.4 Ionization energy 8.5 Electron affinity	CPA 19
	10/18	Sunday 11:59pm ALEKS Obj. #7, 19 topics	
22	10/19	EXAM - Energy of matter and reactions	
23	10/21	9.1 Lewis dot notation 9.2 Ionic bonds (thermo review)	
24	10/23	9.4 Covalent bonds 9.5 Electronegativity 9.6 Writing Lewis structures 9.7 Formal charge	CPA 20
	10/25	Sunday 11:59pm ALEKS Obj. #8, 10 topics	
25	10/26	9.8 Resonance and resonance structure 9.10 Bond enthalpy (thermo review)	CPA 21
26	10/28	9.9 Exceptions to the octet rule 10.1 Molecular geometry 10.2 Dipole moment	CPA 22
27	10/30	Problem session - Molecular geometry	-
	11/1	Sunday 11:59pm ALEKS Obj. #9, 11 topics	

28	11/2	EXAM 2 REVIEW (optional session)	-
29	11/4	10.3 Valence bond theory 10.4 Hybridization of AOs 10.5 Double and triple bonds	CPA 23
30	11/6	Problem session - Valence Bond Theory CANCELED	CANCELED
	11/8	Sunday 11:59pm ALEKS Obj. #10, 3 topics	
31	11/9	10.6 MO theory 10.7 MO Configurations	CPA 24
32	11/11	10.8 Orbital delocalization (and bonding review)	CPA 25
33	11/13	 Problem session - MO Theory	-
	11/15	Sunday 11:59pm ALEKS Obj. #11, 3 topics	
34	11/16	EXAM - Molecular bonding	
35	11/18	14.1 Equilibrium and the equilibrium constant 14.2 Writing equilibrium expressions	CPA 26
36	11/20	14.3 Chemical kinetics 14.4 Equilibrium constant	CPA 27
	11/22	Sunday 11:59pm ALEKS Obj. #12, 12 topics	
37	11/23	Problem session - ICE Tables	CPA 28
38	11/25	THANKSGIVING	
39	11/27	THANKSGIVING	
	11/29	Sunday 11:59pm ALEKS Open pie	
38*	11/30	14.5 Le Chatelier's principle	CPA 29
39*	12/2	15.1 Brønsted acids and bases 15.2 Acid-base properties of water 15.3 pH scale	CPA 30
40*	12/4	15.4 Acid and base strength 15.5 Weak acids and ionization constants 15.6 Weak bases and ionization constants 15.7 Conjugate bases of weak acids	CPA 31
	12/6	Sunday 11:59pm ALEKS Obj. #13, 21 topics	
41*	12/7	15.8 Diprotic and polyprotic acids 15.9 Acid strength and molecular structure	CPA 32
42*	12/9	15.12 Lewis acids and bases (and course review)	CPA 33

	12/11	ALEKS Obj. #14, 5 topics	
	12/13	Sunday 11:59pm ALEKS Open Pie	
	12/15 and 12/16	EXAM	

EXAM:

121.01 Wednesday, December 16 at 8:30 a.m.

121.02 Tuesday, December 15 at 8:30 a.m.