

Chemistry 113A: Fundamentals of Chemistry

University of Nebraska – Lincoln

Fall 2020



Instructor: Dr. Catherine Eichhorn, Assistant Professor of Chemistry

Class meets: MW 11:30 am – 12:20 pm, Hamilton Hall room 112
F 11:30 am – 12:20 pm, Zoom ID 972 3983 4257 pw 112113

How to reach me: email on Canvas or ceichhor@unl.edu *include CHEM113 in subject line*



Virtual student (office) hours: R 5-6 pm, Sun 8-9 pm *or by appointment*

Teaching Assistant: Justin Lawrie, Contact on Canvas

Recitation meets: M 4:30-5:20 pm W 1:30-2:20 pm via Zoom

COURSE DESCRIPTION

A molecular level understanding can help you make sense of the world and engage with pressing scientific issues. In this course you will begin to explore and develop this atomic-molecular level understanding.

Your study will focus on four big ideas:

1. All matter is made of atoms.
2. Properties of matter can be explained by atomic and molecular structure and behavior.
3. Changes in matter involve the rearrangement of the particles of matter and/or the transfer of electrons.
4. Changes in matter are driven by electrostatic forces and accompanied by energy changes.

And two big practices:

1. Chemists use models to understand atoms, molecules, and their behavior
2. Chemists gather data and use theory to make arguments about atoms, molecules, and their behavior

REQUIRED RESOURCES

TEXTBOOK: Pettruci, Herring, Madura, and Bissonnette. General Chemistry: Principles and Modern Applications. (10th or 11th edition).
E-book and access code for Mastering Chemistry (bookstore or through Pearson)
Mastering Chemistry course ID: eichhorn95644



HOMEWORK: Canvas and Pearson Mastering Chemistry online system
Calculator *In CHEM 114, a TI graphing calculator is required (TI-83 or higher)*

PARTICIPATION: i>clicker subscription and download application (iClicker Reef)
Computer or mobile device with internet access
Headphones and quiet environment



EARNING YOUR GRADE

Your course grade is based on your performance on various course assessments, including formative and summative assessments as outlined below:

Formative assessments

- Daily clicker/poll questions during class
 - Daily Knowledge check questions before class
 - Weekly homework assignments
 - Discussion board posts & comments after class
- Due:** Before each class by midnight
Due: Sundays by midnight
Due: Mondays & Fridays by midnight

Summative assessments

- Three unit exams
- Final project

GRADING SCHEME

Assignment	Point Allotment	Points Earned	Percent	Letter Grade
3 Unit Exams (100 pts each)	300	970–1000	97.0+	A+
Final Project	200	930–969	93.0+	A
Homework	200	900–929	90.0+	A–
Knowledge checks	200	870–899	87.0+	B+
Participation & Engagement	100	800–829	80.0+	B–
Total Points Available	1000	770–799	77.0+	C+
		730–769	73.0+	C
		700–729	70.0+	C–
		670–699	67.0+	D+
		630–669	63.0+	D
		600–629	60.0+	D–
		< 600	< 60.0	F

Unit Exams will be given online during the following classes on Friday (11:30 am – 12:20 pm):

- Unit 1 Exam: Sep 25 (Ch. 1, 2, 8, 9)**
Unit 2 Exam: Oct 23 (Ch. 10, 11, 3, 4)

Note the dates for Exam 3 and Final Project deadline:

- Final Project: Nov 13 by midnight**
Unit 3 Exam: Nov 22 (Ch. 5, 6, 7, 12) 10 am-noon

Because life happens:

- Clicker/Poll responses give extra credit
- Lowest 2 homeworks are dropped – only top 10 count toward your final grade
- Lowest 10 Knowledge Checks / Discussion Boards are dropped
- At the end of the semester, your lowest exam grade will be replaced with the average of your highest and lowest grade.
- All late assignments will have maximum late penalty of 20% and can be turned in anytime before 11/20
 - Assignment is turned in between one minute and one week late : 10% penalty
 - Assignment is turned in after one week late: 20% penalty

ASSIGNMENTS

Knowledge checks (KC)

Knowledge checks are low-stakes points to help make sure you have a good understanding of the material before class. To prepare, work through the material on Canvas and in the textbook that will be covered in class the next day. KCs should take approximately 10 minutes to complete and are worth 5 points each. KCs are due by midnight the night before each class and are submitted through Mastering Chemistry.

Discussion board

Discussion board posts are designed to help you engage with one another and to think about how the Chemistry you learn in class connects with the world around you. Posting is another way to get low-stakes points toward your final grade, worth 5 points each, and should take about 10 minutes to complete. The topic each week will be posted on the discussion board, and your post is due by midnight on Mondays on Canvas. You will then comment on one peer post by midnight Friday.

Homework (HW)

Homework will give you the opportunity to practice your problem-solving skills and evaluate your understanding of the material covered during the week. Each homework assignment should take about one hour to complete and is submitted through Mastering Chemistry. Each homework assignment is worth 20 points and is due by midnight on Sundays.

EXAMS

Exams are scheduled during regular class time, and you will have 50 minutes to complete the exam. If you have a conflict or anticipate missing an exam, you **must** notify the Professor before the exam start. Class and exam policies and procedures are subject to change depending on national, state, or University issued guidance.

FINAL PROJECT

You will select a journal article from the list below, and work on the paper you select throughout the semester.

Assignments with specific questions for different sections of the paper will be posted on Canvas. You will submit your responses on Canvas according to the schedule on the right. You will also peer review each other's work.

Section	Due date	Points
Paper selection	Aug 28	10
FP1: Research Problem	Sept 4	20
FP1: Peer Review	Sept 11	10
FP2: Methods	Oct 2	20
FP2: Peer Review	Oct 9	10
FP3: Results & Discussion	Oct 30	20
FP3: Peer Review	Nov 6	10
Completed Project	Nov 13	100

Materials: Ji, X., Li, Z., Liu, X., Peng, H.-Q., Song, F., Qi, J., Lam, J. W. Y., Long, L., Sessler, J. L., Tang, B. Z., A Functioning Macroscopic "Rubik's Cube" Assembled via Controllable Dynamic Covalent Interactions. *Adv. Mater.* 2019, 1902365. <https://doi.org/10.1002/adma.201902365>

Synthesis: Kaiser, K., Scriven, L. M., Schulz, F., Gawel, P., Gross, L., & Anderson, H. L. (2019). An sp-hybridized molecular carbon allotrope, cyclo[18]carbon. *Science*. <https://doi.org/10.1126/science.aay1914>

Biochemistry: Callmann, C. E., LeGuyader, C. L. M., Burton, S. T., Thompson, M. P., Hennis, R., Barback, C., ... Gianneschi, N. C. (2019). Antitumor Activity of 1,18-Octadecanedioic Acid-Paclitaxel Complexed with Human Serum Albumin [Rapid-communication]. *Journal of the American Chemical Society*, 141(30), 11765–11769. <https://doi.org/10.1021/jacs.9b04272>

Chemistry education: Hensen, C., & Barbera, J. (2019). Assessing Affective Differences between a Virtual General Chemistry Experiment and a Similar Hands-On Experiment. *Journal of Chemical Education*, acs.jchemed.9b00561. <https://doi.org/10.1021/acs.jchemed.9b00561>

Environmental: Schartup, A. T., Thackray, C. P., Qureshi, A., Dassuncao, C., Gillespie, K., Hanke, A., & Sunderland, E. M. (2019). Climate change and overfishing increase neurotoxicant in marine predators. *Nature*. <https://doi.org/10.1038/s41586-019-1468-9>

CLASSROOM POLICIES & RESOURCES

Class format:

There are two ways for you to engage during the scheduled class meeting times (synchronously): (1) in person on your assigned day or (2) online in live-streamed Zoom meeting. **Classes will be recorded**, and you will be able to engage with the class session outside of scheduled meeting times (asynchronously).

Attendance policy:

The course has been designed to give you many opportunities to meaningfully engage with the TA and instructor, fellow students, and the material beyond in-person attendance. Attendance will be taken for record-keeping and safety reasons but your attendance in person will not count toward your grade. Synchronous (either in person or online) attendance is encouraged but not mandatory. If you will miss class during class time (in person or online) you must notify the Professor or TA.

If you do not feel well **DO NOT** come to class in person. Students who are sick or who are engaging in self-quarantine in accordance with guidance from the Lincoln-Lancaster County Health Department or their health care professional **should not physically attend in-person classes**. You can receive a free COVID19 test on-campus: <https://covid19.unl.edu/campus-covid-19-testing>

When/If attending class in person:

Classrooms have health & wellness stations by the doors: apply hand sanitizer when entering the room, and use disinfectant to wipe down your desktop surface. Face coverings are required inside any University building, including Hamilton Hall. Students who do not comply with the University policy regarding wearing face coverings will be asked to leave the class. Students who do not wish to comply with this policy, or do not feel comfortable attending class in person, are encouraged to participate during class times remotely through Zoom. See University Policy below regarding face coverings. As you get used to face coverings this semester, you may forget to bring one to class. From August 24 to September 11, you can get a disposable mask at no cost at the following locations:

- City Campus – a self-service wall dispenser in the hall by the west doors of the Nebraska Union
- East Campus – at the member services desk by the east doors of Campus Recreation
- Innovation Campus – at Food Innovation Center, 1901 N 21st Street, Room 232
- Peter Kiewit Institute – at the reception desk in Room 107

Accessibility & Accommodations

There are several resources to ensure you can learn and perform coursework in a safe environment. Please consult <https://covid19.unl.edu/students-and-covid-19-risk> for guidance on how to receive accommodations you may need. Please also let the instructor know privately so reasonable accommodations can be made. See the University Policy below (American Disabilities Act) for more information. If you have trouble acquiring the resources needed for the class, especially textbook and computer, please let the instructor know immediately so accommodations can be made. The UNL Library has laptop to check out (<https://libraries.unl.edu/laptops>).

Academic Integrity

Your intellectual growth depends on responsibility, honesty, and doing your own work. Presenting the work of others as your own by taking ideas from others (plagiarism) or copying other's work is dishonest, hurts your reputation and credibility, and will result in a failing grade on the assignment and potentially disciplinary action. See the University Policy below on Academic honesty for more information.

Health and well-being

These are not normal times, and this is not a normal semester. Everyone has been under a great deal of stress the past several months and for the foreseeable future. Please be kind to yourself, and to others. If you are struggling please reach out to the instructor. Please see the University Policy on Counseling and psychological services for more information.

UNIVERSITY POLICIES & RESOURCES

Academic honesty

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of Conduct addresses academic dishonesty (<https://studentconduct.unl.edu/student-code-conduct>). Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

Incomplete policy

A grade of Incomplete means that some of the coursework was not completed. Therefore, a grade of "I" will be given only if the student has completed over 75% of the course material, earning a B- or better. To make up an incomplete means that you only re-take only the portion of the course that you missed. Incompletes will only be submitted for students who are unable to complete the final 25% of the course because of illness, military service, hardship, a death in the immediate family, or other serious life problem.

American Disabilities Act

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 117 Louise Pound Hall; 402-472-3787.

Counseling and psychological services

UNL offers a variety of options to students to aid them in dealing with stress and adversity.

Counseling and Psychological & Services (CAPS) is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450, or by scheduling an appointment online at caps.unl.edu.

Big Red Resilience & Well-Being (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770, or by scheduling an appointment online at resilience.unl.edu.

Required use of face coverings for on-campus shared learning environments

As of July 17, 2020 and until further notice, all University of Nebraska–Lincoln (UNL) faculty, staff, students, and visitors (including contractors, service providers, and others) are required to use a facial covering at all times when indoors except under specific conditions outlined in the COVID 19 face covering policy found at: <https://covid19.unl.edu/face-covering-policy>. To protect the health and well-being of the University and wider community, UNL has implemented a policy requiring all people, including students, faculty, and staff, to wear a face covering that covers the mouth and nose while on campus. The classroom is a community, and as a community, we seek to maintain the health and safety of all members by wearing face coverings when in the classroom. Failure to comply with this policy is interpreted as a disruption of the classroom and may be a violation of UNL's Student Code of Conduct.

Individuals who have health or medical reasons for not wearing face coverings should work with the Office of Services for Students with Disabilities (for students) or the Office of Faculty/Staff Disability Services (for faculty and staff) to establish accommodations to address the health concern. Students who prefer not to wear a face covering should work with the course instructor to arrange a fully online course schedule that does not require their presence on campus.

Students in the classroom:

1. If a student is not properly wearing a face covering, the instructor will remind the student of the policy and ask them to comply with it.

2. If the student will not comply with the face covering policy, the instructor will ask the student to leave the classroom, and the student may only return when they are properly wearing a face covering.
3. If the student refuses to properly wear a face covering or leave the classroom, the instructor will dismiss the class and will report the student to Student Conduct & Community Standards for misconduct, where the student will be subject to disciplinary action.

Instructors in the classroom:

1. If an instructor is not properly wearing a face covering, students will remind the instructor of the policy and ask them to comply with it.
2. If an instructor will not properly wear a face covering, students may leave the classroom and should report the misconduct to the department chair or via the TIPS system for disciplinary action through faculty governance processes.

Tentative Schedule:

Legend In-person Remote sync Remote async Exams/Projects

DATE	IN-CLASS TOPIC	DUE NIGHT BEFORE CLASS	DUE AFTER CLASS
AUG 17	Orientation: Syllabus, Policies, Resources		<ul style="list-style-type: none"> • Review Canvas Module 0 • Discussion board post
AUG 19			
AUG 21	Scientific Method & Matter (Ch. 1: 1.1-1.3)	• KC1	• Complete survey
AUG 24	Measurement & Uncertainty (Ch. 1: 1.4, 1.6)	• KC2	• Discussion board post
AUG 26	Density & Significant Figures (Ch. 1: 1.5,1.7)	• KC3	
AUG 28	Atomic theory and Electrons (Ch. 2: 2.1-2.3), <i>Evaluating sources & Reading scientific articles</i>	• KC4	<ul style="list-style-type: none"> • Submit FP article choice • Comment on Disc. board
AUG 31	Elements, Mass, and the Periodic Table (Ch. 2: 2.4-2.6)	<ul style="list-style-type: none"> • HW1 (Ch. 1) • KC5 	• Discussion board post
SEPT 2	Moles (Ch. 2: 2.7-2.8)	• KC6	
SEPT 4	The nature of light & energy (Ch. 8: 8.1-3), <i>Peer Review & Constructive critique</i>	• KC7	<ul style="list-style-type: none"> • FP1: Research Problem • Comment on Disc. board
SEPT 7	Quantum theory, Wave mechanics (Ch. 8: 8.4-8.5)	<ul style="list-style-type: none"> • HW2 (Ch. 2) • KC8 	• Discussion board post
SEPT 9	The hydrogen atom (Ch. 8: 8.6-8.7)	• KC9	
SEPT 11	Electron spin & Electron configuration (Ch. 8: 8.8-8.11)	• KC10	<ul style="list-style-type: none"> • FP1: Peer Review • Comment on Disc. board
SEPT 14	Periodic table: periodicity, metals, atomic size (Ch. 9: 9.1-9.3)	<ul style="list-style-type: none"> • HW3 (Ch. 8) • KC11 	• Discussion board post
SEPT 16	Ionization, Magnetism, and Polarization (Ch. 9: 9.4-9.7)	• KC12	
SEPT 18	Chemical bonding: covalent bonds (Ch. 10: 10.1-10.3) & <i>evaluating methods</i>	• KC13	• Comment on Disc. board

SEPT 21	Lewis structures & Resonance (Ch. 10: 10.4-10.6)	<ul style="list-style-type: none"> • HW4 (Ch. 9) • KC14 	<ul style="list-style-type: none"> • Discussion board post
SEPT 23	Shapes of molecules and bonds (Ch. 10: 10.7-10.9)	<ul style="list-style-type: none"> • KC15 	
SEPT 25	EXAM 1 (Ch. 1, 2, 8, 9)		
SEPT 28	Chemical bonds: valence bonds (Ch. 11: 11.1-11.2)	<ul style="list-style-type: none"> • HW5 (Ch. 10) • KC16 	<ul style="list-style-type: none"> • Discussion board post
SEPT 30	Hybridization; Multiple covalent bonds (Ch. 11: 11.3-11.4)	<ul style="list-style-type: none"> • KC17 	
OCT 2	Molecular Orbital Theory (Ch. 11: 11.5-11.7)	<ul style="list-style-type: none"> • KC18 	<ul style="list-style-type: none"> • FP2: Methods • Comment on Disc. board
OCT 5	Types and compositions of chemical compounds (Ch. 3: 3.1-3.3)	<ul style="list-style-type: none"> • HW6 (Ch. 11) • KC19 	<ul style="list-style-type: none"> • Discussion board post
OCT 7	Oxidation states, naming compounds (Ch. 3: 3.4-3.5)	<ul style="list-style-type: none"> • KC20 	
OCT 9	Naming organic & inorganic compounds (Ch. 3: 3.6-3.7)	<ul style="list-style-type: none"> • KC21 	<ul style="list-style-type: none"> • FP2: Peer Review • Comment on Disc. board
OCT 12	Chemical reactions (Ch. 4: 4.1-4.2)	<ul style="list-style-type: none"> • HW7 (Ch. 3) • KC22 	<ul style="list-style-type: none"> • Discussion board post
OCT 14	Chemical reactions (Ch. 4: 4.3-4.4)	<ul style="list-style-type: none"> • KC23 	
OCT 16	Chemical reactions (Ch. 4: 4.5-4.6) & <i>exam prep</i>	<ul style="list-style-type: none"> • KC24 	<ul style="list-style-type: none"> • Comment on Disc. board
OCT 19	Aqueous solutions, Precipitation, Acid-Base (Ch. 5: 5.1-5.3)	<ul style="list-style-type: none"> • HW8 (Ch. 4) • KC25 	<ul style="list-style-type: none"> • Discussion board post
OCT 21	Redox reactions (Ch. 5: 5.4-5.7)	<ul style="list-style-type: none"> • KC26 	
OCT 23	EXAM 2: Ch. 10, 11, 3, 4		
OCT 26	Gas Law: pressure, simple laws, equations (Ch. 6: 6.1-6.3)	<ul style="list-style-type: none"> • HW9 (Ch. 5) • KC27 	<ul style="list-style-type: none"> • Discussion board post

OCT 28	Gas Law: Ideal gas, chemical reactions, mixtures (Ch. 6: 6.4-6.6)	• KC28	
OCT 30	Gas Law: kinetics, properties, real gases (Ch. 6: 6.7-6.9)	• KC29	• FP3: Results & Discussion • Comment on Disc. board
NOV 2	Thermochemistry: Heat & Work (Ch. 7: 7.1-7.4)	• HW10 (Ch. 6) • KC30	• Discussion board post
NOV 4	Thermodynamic Laws (Ch. 7: 7.5-7.7)	• KC31	
NOV 6	Enthalpy, Fuels (Ch. 7: 7.8-7.10)	• KC32	• FP3: Peer review • Comment on Disc. board
NOV 9	Intermolecular forces, liquids, solids, phase diagrams (Ch. 12: 12.1-12.4)	• HW11 (Ch. 7) • KC33	• Discussion board post
NOV 11	bonding in solids, Crystal structures, ionic crystals (Ch. 12: 12.5-12.7)	• KC34	
NOV 13	Review		• Completed FP due • Comment on Disc. board
NOV 16	Review	• HW12 (Ch. 12)	
NOV 18	Review		
NOV 20	Review		• Complete survey
NOV 22	10-noon EXAM 3: Ch 5, 6, 7, 12		