

FUNDAMENTALS OF CHEMISTRY

UNIVERSITY OF NEBRASKA - LINCOLN

CHEM113A

FALL 2022

CLASS MEETS:	MWF 11:30 AM – 12:20 PM	HAH 112
RECITATION MEETS:	M 4:30 – 5:20 PM	HAH 133
	W 1:30 – 2:20 PM	AVERY 110
	TH 8:30 – 9:20 AM	BURNETT 121

INSTRUCTOR

Dr. Catherine Eichhorn
Assistant Professor of
Chemistry

HOW TO REACH DR. EICHHORN

Email: ceichhor@unl.edu (include Chem113 in title)

Student drop-in hours: T 11-12 noon HAH 723
TH 12:30 – 2 pm HAH 723

or by appointment



TA

Mary Tess Urbanek
Graduate Student

HOW TO REACH MARY TESS

Email: through Canvas Inbox (include Chem113 in title)

Student drop-in hours: M 2-4 pm HAH 535.1
W 9-11 am HAH 535.1

COURSE DESCRIPTION

At its most fundamental, Chemistry is the study of matter. In this course you will begin to explore and develop an understanding of matter at the atomic and molecular level. This molecular-level understanding will help you make sense of the world and engage with pressing scientific issues.

LEARNING OBJECTIVES

Your study will focus on four main ideas:

- 01 All matter is made up of atoms
- 02 Properties of matter can be explained by atomic and molecular structure and behavior
- 03 Changes in matter involve the rearrangement of particles of matter and/or the transfer of electrons
- 04 Changes in matter are driven by electrostatic forces and accompanied by energy changes

and two main practices:

- 01 Chemists use models to understand atoms, molecules, and their behavior
- 02 Chemists gather data and use theory to make arguments about atoms, molecules, and their behavior

DETAILED COURSE INFORMATION IN CANVAS UNDER CLASS ESSENTIALS

TEXTBOOK

Tro, NJ. Chemistry: A molecular approach
(6th edition)



Register for E-book and Mastering
Chemistry through Canvas

All other required materials will be posted
to the course Canvas page.

REQUIRED TECH



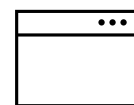
Computer
/Tablet

iClicker
Account



Internet
Access

Mastering
Chemistry



Browser

PDF Reader



COURSE FORMAT

You are encouraged to attend class in person for optimal engagement with the material, peers, and instructor. Classes will be recorded and posted on Canvas.

COURSE POLICIES

ACCESSIBILITY

If you need any accessibility-based accommodations, please let me know so appropriate arrangements can be made. See the University Policy page on Canvas under Class Essentials for more information. If you have trouble acquiring the resources needed for the class, especially textbook and computer, please let me know immediately so accommodations can be made. The UNL Library has laptops 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 page on Canvas under Class Essentials for more information.

HEALTH AND WELL-BEING

These are not normal times. Please be kind to yourself, and to others. If you are struggling, please reach out to me or Mary Tess. See the University Policy on Counseling and psychological services for more information.

FACE COVERINGS

I respectfully request that you join me in wearing a face covering in class. If you have a documented medical need for face coverings in class, please notify me immediately so accommodations can be made.

ATTENDANCE

In person attendance is encouraged but not mandatory. There are many opportunities to meaningfully engage with the TA and instructor, peers, and the material to supplement in-person attendance.

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.

FLEXIBILITY

Life happens! Extra credit assignments will be available throughout the course. The top 10 Homeworks, 30 Knowledge Checks, and 10 Recitation problem sets will count toward your grade. At the end of the semester, your lowest unit exam grade will be replaced with the average of your highest and lowest unit exam grades.

DUE DATES

Assignment due dates are designed to help you progress through the course while engaging in deep learning. Deadline extensions may be permitted on a case-by-case basis. Please contact the instructor as soon as possible if you anticipate missing critical deadlines.

Late policy: Assignments turned in one week late will have a 10% penalty, two weeks late will have a 20% penalty. Exceptions to this policy may be granted on a case by case basis.

ASSIGNMENTS & GRADING

RECITATION WEEKLY

100 POINTS

Recitation is a time to work with the TA and your peers to hone your problem-solving skills and have your questions answered in real time. Practice problem worksheets are due at the end of recitation and are worth 10 points each.

KNOWLEDGE CHECKS

BEFORE CLASS

100 POINTS

Knowledge checks prepare you for the next day's class. Before you start, work through the material on Canvas and in the textbook that will be covered in class the next day. KCs take ~10 minutes to complete. KCs are worth 3 points each and are due by midnight the night before each class.

EXAMS

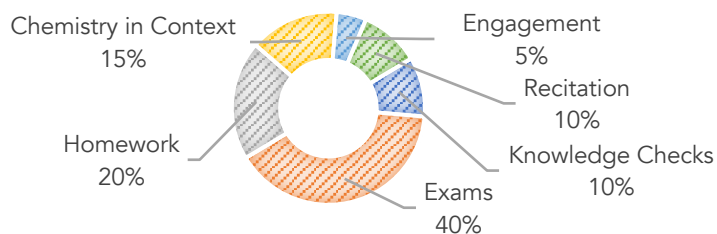
3 UNIT, 1 FINAL

400 POINTS

Exams assess your summative understanding of concepts covered in the unit. You will have 90 minutes to complete each exam. All exams are 100 points each. Exams will take place on the following dates:

- Exam 1: Sept 15 (Ch. 1, 2, 3)
- Exam 2: Oct 6 (Ch. 4, 8, 9.1-9.5)
- Exam 3: Nov 3 (Ch. 9.6-9.9, 10, 11, 7)
- Final exam: Dec 13 (Ch. 1-12)

If you have a conflict or anticipate missing an exam, you **must** notify me before the exam starts. Class and exam policies and procedures are subject to change depending on national, state, or University issued guidance.



POINTS	PERCENT	GRADE
970-1000	97.0+	A+
930-969	93.0+	A
900-929	90.0+	A-
870-899	87.0+	B+
830-869	83.0+	B
800-829	80.0+	B-
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

HOMEWORK

WEEKLY

200 POINTS

Homework gives you the opportunity to practice your problem-solving skills and evaluate your understanding of the material covered during the week. Assignments take ~1-2 hours to complete. Each homework assignment is worth 20 points and is due by midnight on Sundays.

ENGAGEMENT

IN CLASS

50 POINTS

Engagement includes in-class work comprising both individual and group components. *Individual*: you will have the opportunity to practice problems in class to assess your understanding in real time. Responses will be recorded using the iClicker. *Group*: you will engage with one another to solve complex conceptual problems and think about how the Chemistry in class connects with the world around you.

CHEMISTRY IN CONTEXT PROJECT

BIWEEKLY

150 POINTS

You will select a journal article from the list below. Four assignments, focused on different aspects of the paper, will guide you through the process of critical evaluation of scientific literature, culminating in a final creative project.

Materials/Physical/Inorganic: Yoo JJ, Seo G, Chua MR, Park TG, Lu Y, Rotermund F, Kim Y, Moon CS, Jeon NJ, Correa-Baena J, Bulović, V, Shin SS, Bawendi MG, Seo J. Efficient perovskite solar cells via improved carrier management. *Nature* **2021** 590, 587–593.

Synthesis/Organic: Knapp RR, Tona V, Okada T, Sarpong R, Garg NK. Cyanoamidine cyclization approach to remdesivir's nucleobase. *Org. Lett.* **2020** 22 (21), 8430-8435.

Chemical Biology/Biochemistry: Branon TC, Bosch JA, Sanchez AD, Udeshi ND, Svinkina T, Carr SA, Feldman JL, Perrimon N, Ting AY. Efficient proximity labeling in living cells and organisms with TurboID. *Nat Biotechnol.* **2018** 36(9), 880-887.

Chemical Education: Hensen, C & Barbera, J. Assessing affective differences between a virtual general chemistry experiment and a similar hands-on experiment. *J. Chem. Educ.* **2019** 96, 2097–2108.

Environmental: Schartup AT, Thackray CP, Qureshi A, Dassuncao C, Gillespie K, Hanke A, Sunderland, EM. Climate change and overfishing increase neurotoxicant in marine predators. *Nature* 2019.

Analytical/Forensic: Azaldegui C, Aguilar G, Enriquez S, Madonna C, Parish Fisher C, Burks R. Benzoic acid derivatives as luminescent sublimation dyes in cyanoacrylate fuming of latent fingerprints. *J Forensic Sci.* **2021** 66,1085– 1093.

LET US KNOW IF YOU HAVE ANY QUESTIONS!

CHEMISTRY IN CONTEXT

IMPORTANT DATES

ASSIGNMENT 1

ANATOMY OF A PAPER

In this assignment, you will learn how to evaluate sources, break down a piece of scientific writing into composite parts, and connect recent scientific findings with course material.

ASSIGNMENT 2

RESEARCH PROBLEM

In this assignment, you will learn how a single paper, and its findings, fits into a larger body of scientific knowledge. You will identify the key knowledge gap that the paper is addressing, why it is an important problem to be solved, and the research strategy the authors used to solve this problem.

ASSIGNMENT 3

MATERIALS AND METHODS

In this assignment, you will dive into the methods to understand what experiments and instruments were used to perform the research study.

ASSIGNMENT 4

RESULTS AND DISCUSSION

In this assignment, you will learn how the methods were used to collect data, and how this data was analyzed and interpreted to make new scientific findings.

FINAL CREATIVE PROJECT

In the final project, you will make a creative product using your knowledge gained from previous assignments. You are free to choose the format of your project, pending approval from the instructor. Some potential examples: infographic, graphical illustration, social media post (TikTok, Instagram, etc), song and/or dance, or board game. Traditional reports are also acceptable. Projects will be evaluated on scientific accuracy, demonstrated understanding of the selected paper, and overall quality.

PROJECT SECTIONS	DUE DATE	POINTS
PAPER SELECTION	AUG 26	10
ASSIGNMENT 1	SEPT 11	20
ASSIGNMENT 2	SEPT 30	20
ASSIGNMENT 3	OCT 23	20
CREATIVE PROJECT IDEA	NOV 11	10
ASSIGNMENT 4	NOV 18	20
CREATIVE PROJECT	DEC 9	50

STRATEGIES FOR SUCCESS

MANAGE YOUR TIME

At the beginning of the semester, mark a calendar with exam dates, project due dates, etc to keep track of important deadlines. Break larger projects into smaller tasks. Each week, make a list of assignments (and due dates) for all your classes. Plan your week with these due dates in mind to make sure you don't miss any deadlines.

ASK FOR HELP

We want you to succeed! Go to recitation and drop in hours to get help. Study groups are also a great way to study and work through problem sets together to make sure you understand the material. Take advantage of tutoring through CAST – ask your advisor and/or instructor for more information.

STUDY SMARTER

Set aside specific time for class related work. Treat that time like you are actually in class! Follow these steps for more effective studying (known as the Pomodoro method):

- 1) Spend 1-2 minutes setting a goal. Decide what you want to accomplish in that study session. This goal should be specific and reasonable.
- 2) Study for 30-45 minutes with focus. Use a timer or apps (like Forest) to motivate you to focus.
- 3) Times up! Look back at your goal to see if you achieved it. If not, was it a reasonable goal? Reflect to see if you can refine your goal next time to be more achievable.
- 4) Take a 10-15 minute break to refresh and reset.

SELF CARE

College is stressful, especially these days! Make sure you are getting enough rest, getting proper nutrition, and taking care of your health - both mental and physical. If you are struggling, please reach out for help. CAPS is a great resource.

TAKE GREAT NOTES

Before class, review the textbook and course materials, taking notes as you read. During class, write down key concepts and work through problems. After class, re-write your class notes, using the textbook and other resources to fill in gaps.

COURSE SCHEDULE

AUG 22

INTRODUCTION

Before class: Complete survey & intro to Mastering Chemistry

After class: Syllabus Quiz and review Canvas Module 0

AUG 24

MATTER & MEASUREMENT

Before class: KC 1

After class: look through Chemistry in Context papers

AUG 26

SIGNIFICANT FIGURES & UNIT CONVERSION

Before class: KC 2

After class: Paper selection due; HW 1 (Ch. 1) due 8/28

AUG 29

ATOMIC THEORY

Before class: KC 3

AUG 31

ELECTRONS AND ATOMS

Before class: KC 4

SEPT 2

PERIODIC TABLE AND ATOMIC MEASUREMENT

Before class: KC 5

After class: HW 2 (Ch. 2) due 9/4

SEPT 5

LABOR DAY, NO CLASS

SEPT 7

CHEMICAL BONDS & FORMULAS

Before class: KC 6

SEPT 9

IONIC COMPOUNDS & NOMENCLATURE

Before class: KC 7

Chemistry in Context Assignment 1 due 9/11

SEPT 12

MOLAR MASS

Before class: KC 8

SEPT 14

ORGANIC COMPOUNDS & FORMULAS

Before class: KC 9

After class: Exam prep

----- Exam 1 Sept 15 -----

SEPT 16

CHEMICAL EQUATIONS

Before class: KC 10

After class: HW 3 (Ch. 3) due 9/18

CHAPTER 1

CHAPTER 2

CHAPTER 3

CHAPTER 4

SEPT 19

STOICHIOMETRY

Before class: KC 11

SEPT 21

CHEMICAL REACTIONS

Before class: KC 12

SEPT 23

LIGHT & ENERGY

Before class: KC 13

After class: HW 4 (Ch. 4) due 9/25

SEPT 26

WAVE MECHANICS & QUANTUM THEORY

Before class: KC 14

SEPT 28

ORBITALS & QUANTUM NUMBERS

Before class: KC 15

SEPT 30

ELECTRON SPIN & CONFIGURATION

Before class: KC 16

After class: HW 5 (Ch. 8) due 10/2

Chemistry in Context Assignment 2 due 9/30

OCT 3

THE PERIODIC TABLE

Before class: KC 17

OCT 5

PERIODIC TRENDS OF ATOMS & IONS

Before class: KC 18

After class: Exam prep

----- Exam 2 Oct 6 -----

OCT 7

ELECTRON AFFINITY

Before class: KC 19

After class: HW 6 (Ch. 9) due 10/9

OCT 10

LEWIS STRUCTURES

Before class: KC 20

OCT 12

COVALENT BONDING

Before class: KC 21

OCT 14

RESONANCE & BONDING

Before class: KC 22

After class: HW 7 (Ch. 10) due 10/16

CHAPTER 8

CHAPTER 9

CHAPTER 10

COURSE SCHEDULE, CONTINUED

OCT 17-18

FALL BREAK, NO CLASS

OCT 19

MOLECULAR GEOMETRY

CHAPTER 11

Before class: KC 23

OCT 21

VALENCE BOND THEORY

Before class: KC 24

Chemistry in Context Assignment 3 due 10/23

OCT 24

HYBRIDIZATION

Before class: KC 25

OCT 26

MOLECULAR ORBITAL THEORY

Before class: KC 26

OCT 28

INTRO TO THERMODYNAMICS

CHAPTER 7

Before class: KC 27

After class: HW 8 (Ch. 11) due 10/30

OCT 31

CALORIMETRY & ENTHALPY

Before class: KC 28

NOV 2

EXAM REVIEW

Before class: KC 29

After class: Exam prep

----- Exam 3 Nov 3 -----

NOV 4

AQUEOUS SOLUTIONS

CHAPTER 5

Before class: KC 30

After class: HW 9 (Ch. 7) due 11/6

NOV 7

AQUEOUS REACTIONS & SOLUBILITY

Before class: KC 31

NOV 9

REDOX REACTIONS

Before class: KC 32

NOV 11

GAS LAWS

CHAPTER 6

Before class: KC 33

After class: HW 10 (Ch. 5) due 11/13

Chemistry in Context final project idea due 11/11

NOV 14

IDEAL GAS LAW & APPLICATIONS

Before class: KC 34

NOV 16

GAS MIXTURES & REACTIONS

Before class: KC 35

NOV 18

GAS KINETICS & PROPERTIES

Before class: KC 36

After class: HW 11 (Ch. 6) due 11/20

Chemistry in Context Assignment 4 due 11/18

NOV 21

PHASES OF MATTER

CHAPTER 12

Before class: KC 37

NOV 23-27

THANKSGIVING BREAK, NO CLASS

NOV 28

INTERMOLECULAR FORCES PART 1

Before class: KC 38

NOV 30

INTERMOLECULAR FORCES PART 2

Before class: KC 39

DEC 2

PHASE TRANSITIONS

Before class: KC 40

DEC 5

CRYSTALS

Before class: KC 41

After class: HW 12 (Ch. 12) due 12/6

DEC 7

REVIEW

DEC 9

REVIEW

LAST DAY OF CLASS

Chemistry in Context final project due 12/9

----- Final Exam Dec 13 -----