CHEM 1412.102HY
General Chemistry 2
Spring 2023
Fridays from 8:00 AM – 10:50 PM in STEAM 346
Online through D2L Brightspace

Instructor Information:
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Student hours and location:

Monday	09:00 – 10:45	STEAM 325-23 & Virtual
Tuesday	08:00 – 09:15	STEAM 325-23 & Virtual
Wednesday	09:00 – 10:45	STEAM 325-23 & Virtual
Thursday	08:00 – 09:15	STEAM 325-23 & Virtual
Friday	11:00 – 12:30	STEAM 325-23 & Virtual
Saturday	**Virtual Office Hours by Appointment**	
Sunday	**Virtual Office Hours by Appointment**	

Required Textbook/Materials: The textbook and homework system are part of the inclusive access and are available immediately upon access to D2L Brightspace (D2L) at the start of the semester.

Required Textbook: Chemistry Atoms First, 2nd ed. from OpenStax, 2019. Openstax.Org. Print Book [ISBN-13 978-1-947172-64-7, PDF Version ISBN 978-1-947172-63-0, https://openstax.org/details/books/chemistry-atoms-first-2e

Your textbook for this class is immediately available for free online. If you prefer, you can also get a print version at a very low cost. However, before purchasing a hard copy of the textbook, consider that I will only use this resource sparingly as a reference tool. I will also provide links to other FREE resources such as online textbooks, YouTube videos and various other materials (including **ME**) that will be made available to you at no cost.

The only cost you should incur relating to course materials relates to the homework system described below. We will use this homework system routinely in class, outside of class and for assessments (quizzes and exams). You will find that I do not emphasize reading assignments in the textbook, mainly due to the ineffectiveness of passive reading for mastering problem solving skills in science. Since I began teaching in 2006, textbooks (all versions) have served a diminished role in my classes, and this trend continues to this day. Chemistry is all about solving problems

and that's where we will focus our attention. As with any subject, some of the course content involves recitation of terminology, facts, and figures that I will explicitly emphasize to you. I have performed a "literary liposuction" of the textbook in preparation for this course; that is, I weed out the fluff and useless portions of this bloated resource so that you will not be left in the dark trying to figure out what to study. Please pursue any additional reading that interests you or you find helpful, but my reliance on the textbook will be minimal and that is reflected in my sparse references to this resource.

Recommended Homework System: The Aktiv Learning all-in-one platform system is an online homework, assessment, and content management system. Instructions for creating an Aktiv Learning system account and registering for the course are provided in the course information page located in D2L Brightspace (D2L). Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up or throughout the term, if you have any technical problems, go to http://www.aktiv.com/support and access the help docs or select one of the support contact options.

Additional Materials: An inexpensive scientific calculator (e.g., TI-30). I will also have calculators available for you in class and for exams. There are free apps for your mobile devices.

Computer Requirements: You will need to have access to a computer with the following resources:

- Internet access through a wired Ethernet or wireless connection
- A contemporary web browser capable of viewing flash video
- Java installed and updated
- A COM e-mail account (COM provides free e-mail for students)
- Microsoft Office, Microsoft OneNote, and Microsoft Teams (COM offers free Office 365 access for students)
- Vernier Graphical Analysis (Vernier offers free software for students)
- File conversion software for converting image files to PDF files (Microsoft Office Lens, Adobe Scan, and Genius Scan are free for both Android and iOS)
- A PDF reader like Adobe Reader

Course Description: Fundamental principles of chemistry for majors in the sciences, health sciences, and engineering; topics include measurements, fundamental properties of matter, states of matter, chemical reactions, chemical stoichiometry, periodicity of elemental properties, atomic structure, chemical bonding, molecular structure, solutions, properties of gases, and an introduction to thermodynamics and descriptive chemistry. Basic laboratory experiments supporting theoretical principles presented in class; introduction of the scientific method, experimental design, data collection and analysis, and preparation of laboratory reports.

Course Requirements: This course is designed as a nontraditional ***flipped*** class, meaning that we will work problems in class and acquire traditional lecture materials and notes outside of class. For example, I may post notes and a link to an instructional video about a specific topic, which

you would review prior to coming to class, along with some introductory problems. Our class time would then be used as a workshop, to develop and hone our problem-solving skills, as well as address any questions or misconceptions with the associated material.

So why are some instructors, including myself, adopting the "flipped class" approach to learning? The application of lecture as a means of instruction is quite literally an ancient technique. Prominent Greek philosophers practiced the lecture format as an effective means of disseminating information and stoking fruitful debate and discussions. To their credit, in 500 BC, what else were philosophers going to do? In the absence of streaming video, PowerPoint, or even an overhead projector, the best option was to slip on your sandals and head to the lyceum (lecture hall). However, even in 500 BC, the writing was on the wall regarding the limitations of this rather mundane mode of instruction. For example, Pythagoras instructed his students to come to class in a fasted state so that their focus would sharpen for the duration of the lecture. Whilst studies have shown fasting to have promising effects on mental clarity,[1] technology now allows us to forego the lecture format altogether. Abandoning the traditional lecture format that was established by Western European universities over 900 years ago[2] presents a challenging, albeit worthwhile, undertaking. For science, technology, engineering, and mathematics (STEM) courses, this outdated approach is particularly problematic. A prominent research study of STEM instruction focused on supplanting lectures with more active teaching methods reports improved student performance and a 50% reduction in failure rate.[3] Carl Wieman,[4] a Nobel Prize winning physics professor, aptly describes his preference for an active classroom environment in the following statement:

> If a new antibiotic is being tested for effectiveness, its effectiveness at curing patients is compared with the best current antibiotics and not with treatment by bloodletting. However, in undergraduate STEM education, we have the curious situation that, although more effective teaching methods have been overwhelmingly demonstrated, most STEM courses are still taught by lectures – the pedagogical equivalent of bloodletting.

In the same academic spirit, we shall endeavor to pursue the course learning objectives in an active fashion, and not through a lecture-based "bloodletting" approach.

There will be many forms of assessment in this course apart from the required exams. While homework will be assigned to ensure comprehension of the requisite learning objectives, I will not collect and grade these assignments for credit. Chemistry requires a hands-on approach; therefore YOU will be expected to independently investigate suggested homework problems and seek assistance for concepts that are problematic. Many class sessions will consist of group work and

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[1] Mattson, M. P.; Moehl, K.; Ghena, N.; Schmaedick, M.; Cheng, A. *Nat. Rev. Neurosci.* **2018**, *19*, 81–94.
[2] Brockliss, L. Curricula. In *A History of the University in Europe;* De Ridder-Symoens, H., Ed.; Cambridge Univ. Press: Cambridge, U.K., 1996; Vol. 2, pp 565–620.
[3] Freeman, S.; Eddy, S. L.; McDonough, M.; Smith, M. K.; Okoroafor, N.; Jordt, H.; Wenderoth, M. P. *Proc. Natl. Acad. Sci. U. S. A.* **2014**, *111*, 8410 – 8415.
[4] Wieman, C. *Improving How Universities Teach Science: Lessons from the Science Education Initiative;* Harvard Univ. Press: Cambridge, MA, 2017.

activities that will be assessed for completion and effort, but seldom for accuracy. In addition, alternative assessments will be given as an opportunity to demonstrate content mastery and through nontraditional methods. Apart from completing four out of five exams and 70% of the lab experiments, all other forms of assessment are completely optional; you will not be penalized for failure to complete homework, quizzes, class activities, discussion boards, or other alternative assessments. Under this system, students choose their own assessment criteria. If you elect to only complete the required exams, then your final grade will be determined solely from your performance on these assessments. I will not offer extra credit assignments; instead, I have implemented numerous assessments that, in some instances, will only require participation. By choosing to complete these optional assessments, you will not only benefit from investigating relevant concepts addressed on exams, but you will also diversify your personal assessment portfolio in the course. An unsatisfactory performance on an exam can be offset by your participation in the optional assessments, however if you choose to complete only the minimum course requirements, your assessment "basket" will be heavily weighted by exams. As a college student you are faced with many choices, and the decision to complete optional components of this course is entirely up to you! Please do not approach me in the last quarter of the semester requesting extra credit or grade adjustments. I will provide many opportunities for assessment outside of the five semester exams; however, YOU must take responsibility for their meaningful pursuit and timely completion. Laboratory experiments will be conducted weekly and the lowest three lab submissions will be dropped. Additionally, the exams will include material directly related to laboratory experiments, therefore regular attendance and completion of lab is important.

Assessment	Approximate Point Value	Overall Average	Grade
5 Exams (Drop Lowest)	400 - 600 pts	≥89.5%	A
Class Activities*		79.5-89.4%	B
Quizzes*	0 - 250 pts	69.5-79.4%	C
Homework*		59.5-69.4%	D
Lab (Drop Lowest 3)	100 - 150 pts	≤59.5%	F

*Optional components; no penalty for missed assignments or incomplete submissions.
questions.

Other grade assignments:

FN — An FN may be assigned at the discretion of the instructor in accordance with college policy.

I — An incomplete may be assigned at the discretion of the instructor in accordance with college policy.

W — A withdrawal may be assigned in accordance with college policy.

Late Work, Make-Up, and Extra-Credit Policy: Since this course is designed with a significant portion of content that is optional and penalty-free with flexible deadlines, no make-up or extra credit assignments will be offered. The five scheduled semester exams allow for a dropped score that absorbs a missed testing day. The laboratory schedule also accommodates three absences without impacting grade performance. These "safety rails" are intended to act as buffers against any tumult that can arise during a semester. Situations that exhaust this buffer capacity would likely entail other actions such as a course withdrawal (W), incomplete (I) grade assignment, and/or a retake of the course. Such extenuating circumstances would require individual consideration which cannot be equitably addressed herein.

Attendance Policy: All students registered in this class are expected to attend all face-to-face sessions. This policy follows the attendance policies prescribed in the current College Catalog. (http://coursecatalog.com.edu). Failing to attend class, log into D2L, or to complete your work as scheduled demonstrates poor progress towards obtaining the course goals (objectives) and is detrimental to learning course material. If you fail to attend class or fail to log into D2L Brightspace and are demonstrating poor progress towards obtaining the course goals (objectives), the instructor *may* administratively withdraw you from the course. Examples of insufficient progress include, but are not limited to, failure to log into D2L Brightspace for a one-week period, failure to complete the required exams, failure to attend and complete 70% or more of the labs, failure to maintain a passing average for the class, or demonstrating poor progress towards obtaining the course goals (objectives). An administrative withdrawal for insufficient progress is solely at the discretion of your instructor.

Communicating with your instructor: ALL electronic communication with the instructor must be through your COM email. Due to FERPA restrictions, faculty cannot share any information about performance in the class through other electronic means. The best way to reach your instructor is by email. Please use your @com.edu email address. Expected that mails from other sources will be filtered from my inbox and your will receive no reply. If you prefer to meet with me virtually, please make an appointment. I will strive to reply to emails from @com.edu addresses, which are made on weekdays, within twenty-four hours. Replies to voice messages left on my office telephone will take longer for me to reply than an email. Also, I will most likely reply to a voice message by email.

Student Learner Outcome	**Maps to Core Objective**	**Assessment(s)**
1. State the characteristics of liquids and solids, including phase diagrams and spectrometry.	Critical Thinking	Selected Exam Questions
2. Articulate the importance of intermolecular interactions and predict trends in physical properties.	Critical Thinking Communication Skills	Selected Exam Questions Presentation
3. Identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships.	Critical Thinking	Selected Exam Questions
4. Identify and balance oxidation-reduction equations and solve redox titration problems.	Critical Thinking	Selected Exam Questions
5. Determine the rate of a reaction and its dependence on concentration, time, and temperature.	Critical Thinking	Selected Exam Questions

6. Apply the principles of equilibrium to aqueous systems using LeChatelier's Principle to predict the effects of concentration, pressure, and temperature changes on equilibrium mixtures.	Empirical and Quantitative Skills	Selected Exam Questions
7. Analyze and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy.	Critical Thinking	Selected Exam Questions
8. Discuss the construction and operation of galvanic and electrolytic electrochemical cells and determine standard and non-standard cell potentials.	Critical Thinking	Selected Exam Questions
9. Define nuclear decay processes.	Critical Thinking	Selected Exam Questions
10. Describe basic principles of organic chemistry and descriptive inorganic chemistry.	Critical Thinking	Selected Exam Questions
11. Use basic apparatus and apply experimental methodologies used in the chemistry laboratory.	Empirical and Quantitative Skills	Selected Exam Questions
12. Demonstrate safe and proper handling of laboratory equipment and chemicals.	Critical Thinking	Selected Exam Questions
13. Conduct basic laboratory experiments with proper laboratory techniques.	Empirical and Quantitative Skills	Selected Exam Questions
14. Make careful and accurate experimental observations.	Team Work	Selected Experiment Grades
15. Relate physical observations and measurements to theoretical principles.	Critical Thinking	Selected Experiment Grades
16. Interpret laboratory results and experimental data and reach logical conclusions.	Team Work	Selected Experiment Grades
17. Record experimental work completely and accurately in laboratory notebooks and communicate experimental results clearly in written reports.	Empirical and Quantitative Skills	Selected Experiment Grades
18. Design fundamental experiments involving principles of chemistry.	Empirical and Quantitative Skills	Selected Experiment Grades
19. Identify appropriate sources of information for conducting laboratory experiments involving principles of chemistry.	Critical Thinking	Selected Experiment Grades
20. Demonstrate the ability to work effectively with others to support and accomplish a shared goal, while recognizing and respecting different viewpoints.	Communication Skills	Laboratory Report Grade

Academic Dishonesty: Any incident of academic dishonesty will be dealt with in accordance with college policy and the Student Handbook. Academic dishonesty, such as cheating on exams, plagiarism, or collusion, is an extremely serious offense and will result in at least a grade of zero on that assignment and the student will be referred to the Office of Student Conduct for the appropriate disciplinary action. Additionally, administrative withdrawal from the course prior to the withdrawal deadline for the semester or being assigned a grade of F after the withdrawal deadline are possible and solely at the discretion of your instructor.

Student Concerns: If you have any questions or concerns about any aspect of this course, please contact me using the contact information previously provided. If, after discussing your concern with me, you continue to have questions, please contact Ms. Sheena Abernathy, Science Department Chair, at 409-933-8330/sabernathy@com.edu.

<u>Tentative</u> Course outline: The course schedule will be updated weekly in D2L and should be your primary resource for accessing learning materials and class scheduling. A tentative outline is tabulated below:

Week	Topics	Reading
1	• Course Introduction • CH 10 Liquids and Solids	• Aktiv Access Directions • CH 10
2	• CH 10 Liquids and Solids • Lab 1 Safety in the Chemistry Lab	• CH 10 • Experiment 1a
3	• CH 11 Solutions & Colloids • SDS Activity	• CH 11 • Experiment 1b
4	• CH 12 Thermodynamics • Lab 2 Freezing & Melting of Water	• CH 12 • Experiment 2
5	• CH 12 Thermodynamics • Lab 3 Thermodynamics	• CH 12 • Experiment 3
6	• CH 13 Fundamental Equilibrium Concepts • Lab 4 Determining an Equilibrium Constant	• CH 13 • Experiment 4
7	• CH 14 Acid-Base Equilibria • Lab 4 Determining an Equilibrium Constant	• CH 14 • Experiment 4
8	• CH 15 Equilibria of Other Reaction Classes • Lab 5 Vinegar Titrations	• CH 15 • Experiment 5
9	• CH 16 Electrochemistry • Lab 6 Buffers	• CH 16 • Experiment 6
10	• CH 16 Electrochemistry • Lab 7 Electrochemistry • Lab 8 Determining the Solubility Constant for Calcium Hydroxide	• CH 16 • Experiment 7 • Experiment 8
11	• CH 17 Kinetics • Lab 8 Determining the Solubility Constant for Calcium Hydroxide	• CH 17 • Experiment 8
12	• CH 17 Kinetics • Lab 9 Rate Law Determination	• CH 17 • CH 20 • Experiment 9
13	• CH 20 Nuclear Chemistry • CH 21 Organic Chemistry • Lab 10 Nuclear Reactions & Radioactivity	• CH 20 • Experiment 10
14	• CH 21: Organic Chemistry • Lab 11 Organic Molecules & Nomenclature	• CH 21 • Experiment 11
15	• *Miscellaneous Topics*	• Supplemental Experiment
16	• *Miscellaneous Topics*	• Supplemental Experiment

Institutional Policies and Guidelines

Grade Appeal Process: Concerns about the accuracy of grades should first be discussed with the instructor. A request for a change of grade is a formal request and must be made within six months of the grade assignment. Directions for filing an appeal can be found in the student handbook Student_Handbook_2022-2023_v4.pdf (com.edu). *An appeal will not be considered because of general dissatisfaction with a grade, penalty, or outcome of a course. Disagreement with the instructor's professional judgment of the quality of the student's work and performance is also not an admissible basis for a grade appeal.*

Academic Success & Support Services: College of the Mainland is committed to providing students the necessary support and tools for success in their college careers. Support is offered through our Tutoring Services, Library, Counseling, and through Student Services. Please discuss any concerns with your faculty or an advisor.

ADA Statement: Any student with a documented disability needing academic accommodations is requested to contact Kimberly Lachney at 409-933-8919 or klachney@com.edu. The Office of Services for Students with Disabilities is located in the Student Success Center.

Textbook Purchasing Statement: A student attending College of the Mainland is not under any obligation to purchase a textbook from the college-affiliated bookstore. The same textbook may also be available from an independent retailer, including an online retailer.

Withdrawal Policy: Students may withdraw from this course for any reason prior to the last eligible day for a "W" grade. Before withdrawing students should speak with the instructor and consult an advisor. Students are permitted to withdraw only six times during their college career by state law. The last date to withdraw from the 1st 8-week session is March 1. The last date to withdraw from the 16-week session is April 24. The last date to withdraw for the 2nd 8-week session is May 3.

FN Grading: The FN grade is issued in cases of *failure due to a lack of attendance*, as determined by the instructor. The FN grade may be issued for cases in which the student ceases or fails to attend class, submit assignments, or participate in required capacities, and for which the student has failed to withdraw. The issuing of the FN grade is at the discretion of the instructor. The last date of attendance should be documented for submission of an FN grade.

Early Alert Program: The Student Success Center at College of the Mainland has implemented an Early Alert Program because student success and retention are very important to us. I have been asked to refer students to the program throughout the semester if they are having difficulty

completing assignments or have poor attendance. If you are referred to the Early Alert Program you will be contacted by someone in the Student Success Center who will schedule a meeting with you to see what assistance they can offer in order for you to meet your academic goals.

Resources to Help with Stress:
If you are experiencing stress or anxiety about your daily living needs including food, housing or just feel you could benefit from free resources to help you through a difficult time, please click here https://www.com.edu/community-resource-center/. College of the Mainland has partnered with free community resources to help you stay on track with your schoolwork, by addressing life issues that get in the way of doing your best in school. All services are private and confidential. You may also contact the Dean of Students office at deanofstudents@com.edu or communityresources@com.edu.