

General, Organic, & Biological Chemistry I

Lecture MWF 10:00 – 10:53 am, T115 Lab: R 12:00 – 2:53 pm, T115/A105

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Office Hours (ACD 106): TBD I have an open door policy so you are welcome to stop in anytime I am in my office, however, I would suggest an appointment if you want a guaranteed time outside of my office hours. Please do not hesitate to see me with any questions or concerns. **NOTE* The 10 min prior to my class periods is not the appropriate time to see me – it is inconsiderate to both of us to do so.*

Required Items:

- Mastering Chemistry Access Code for *Fundamentals of General, Organic, & Biological Chemistry* **8th ed** by McMurry et. al. - *available in bookstore and online at www.masteringchemistry.com*
- Scientific Calculator – *needed by Wednesday; use of a phone or any internet-connected device as a calculator during tests/quizzes is prohibited*
- Chemistry Lab Notebook, carbonless copy - *available in bookstore*
- Safety Splash Goggles (NOT glasses) - *available in bookstore*
- High speed internet access

Recommended:

- college level GOB textbook, such as *Fundamentals of General, Organic, & Biochemistry*
- 3-ring binder (min 2 inches)
- an open mind and willingness to learn

Course Prerequisite:

- MTH 103 (completed with a C or higher) or test into MTH 104
- High School Chemistry or CHM 099 strongly recommended

Course Description: This course is the first semester of a two semester series, designed for non-science/non-engineering majors and nursing students. This course offers the opportunity to gain a better understanding of the world in which we live by exploring the principles of chemistry and the molecular basis of life. This first semester course emphasizes the qualitative understanding of chemical principles covered in a freshman general chemistry course, as well as a brief introduction to organic chemistry. Application of these principles to quantitatively solving problems will also be incorporated. The accompanying lab offers reinforcement of the lecture topics by providing hands-on experience working with chemicals and scientific instrumentation.

Teaching Philosophy:

- An institute of higher education should be a place to develop and implement critical thinking skills for the *betterment of the individual and society*. Such skills must be cultivated by exercising the brain to make connections based on learned principles, not by solely memorizing facts.
- A transfer course at a community college should cover the same material and uphold the same standards as the same course at a four-year institution. The academic advantage to taking the course at a community college is the extra assistance in the learning process provided by the instructor.
- As the instructor, I am here to assist you in developing your critical thinking skills while learning chemical principles. The extra assistance I offer comes in the form of such things as lectures, worksheets, and labs that I continually refine based on my experience with students at this institution, graded work and lab reports offering specific feedback, opportunities to improve on assessments, an open-door policy for seeking help outside the classroom, etc.
- I am here to set attainable, yet challenging standards and to serve as a facilitator of the material, however, *the responsibility of exercising sincere effort in the learning process and achieving understanding of concepts rests with the student*. If you do not understand the material, it is your duty to use all available resources to develop an understanding. I am always willing to help – just ask!

Course Student Learning Outcomes: This course provides the opportunity for a student to build valuable critical thinking and problem solving skills while developing an appreciation for the relevance of chemistry in his/her everyday life and for the interconnectedness of the world on a microscopic level. *Thus, this course is designed so the student will be able to: (linked institutional outcomes are in italics)*

1. Utilize chemical principles, vocabulary, and symbolism to explain macroscopic physical and life science concepts at the atomic/molecular level. *Communication and Expression, Critical Thinking and Information Competency, Community & Global Consciousness and Responsibility*
2. Construct solutions to both qualitative and quantitative chemistry related problems using a logical, systematic approach. *Critical Thinking and Information Competency, Quantitative and Technological Competence*
3. Formulate chemical principles based on pattern recognition. *Community & Global Consciousness and Responsibility, Critical Thinking and Information Competency*
4. Design and carry out investigations of chemical phenomenon based on the scientific method. *Communication and Expression, Quantitative and Technological Competence*
5. Accurately, precisely, and safely utilize chemistry laboratory techniques to carry out standard operating procedures. *Critical Thinking and Information Competency, Quantitative and Technological Competence*

Major Concept Outcomes: This list does not include every expected outcome for each lesson, but does include the major themes and competencies of the course (thus expect to see these on the final).

Upon the completion of this course, students should be able to:

1. Utilize measured quantities in terms of the metric system, and correctly convert b/w measurement units
2. Obtain data from the periodic table as needed and use it to predict elemental properties
3. Utilize significant figures when taking measurements and performing calculations involving measurements
4. Explain what a mole is and utilize it in explaining reactions and performing stoichiometric calculations
5. Apply the rules of nomenclature to binary molecular, organic, and ionic compounds
6. Recognize compounds as molecular or ionic based on formula as well as physical and chemical properties, and explain the similarities and differences between them
7. Indicate if ions or atoms make up a compound and if it is ions, state their identity
8. Describe/draw an atom in accordance with the Quantum Mechanical Atomic Model
9. Utilize and convert between Lewis, Kekulé, condensed, and line structures
10. Conceptualize the geometry (3D nature) of molecules using VSEPR Theory
11. Predict and explain ionic and covalent bonding in terms of valence electron interactions and the octet rule
12. Predict what type of intermolecular forces occur between substances and explain the source of and consequences of these non-bonding interactions on physical properties
13. Write balanced chemical equations and utilize them to perform stoichiometric calculations
14. Explain the molecular differences and similarities between the states of matter
15. Qualitatively explain the relationships expressed in the Gas Laws and use them quantitatively
16. State what a colligative property is and apply the concept to boiling point, melting point, and osmosis
17. Explain what affects the speed of a chemical reaction and why
18. Explain relationships between enthalpy, entropy, free-energy and the non/spontaneity of a process
19. Define equilibrium, predict how an equilibrium system will change due to a disturbance, and relate the position of equilibrium to the thermodynamics of the system
20. Recognize strong and weak acids and bases, explain the differences between them, and write reactions
21. Successfully perform pH calculations
22. Explain in words and chemical equations how buffers work
23. Explain key concepts associated with radioisotopes, nuclear stability, nuclear decay, and half-life
24. Maintain a laboratory notebook consistent with accepted scientific practices

CLASS POLICIES

Attendance

Lecture: If you miss a class, it is your responsibility to get the notes and assignments BEFORE THE NEXT CLASS PERIOD. Check with Moodle as well as classmates. However, chemistry is often challenging for many students and attending class is definitely in your best interest, especially since there will be quizzes and in-class activities designed to develop an understanding of the material and occasionally earn the student points that cannot be made-up. *The instructor reserves the right to take attendance into consideration of your final grade.*

Lab: Attendance is mandatory. **Do NOT schedule appointments** during any part of the three hour block scheduled for lab. You may make up one lab during the last scheduled lab period. If you know you will not be in lab, please notify the instructor the week before so the lab can be planned accordingly. *Occasionally lab time will be used for lecture and lecture time for lab. Advance notice will be given when possible, but may not always occur. Classes and/or labs may be cancelled in cases of emergencies.*

School/Class Cancellations

If school/class is cancelled, **you are expected to check Moodle and complete anything newly assigned before the next class period.** Moodle will be updated that day *by the regular class time.* This allows the course to remain mostly on track and helps prevent the excessive rushing through material due to unexpected closures.

Course Documents

Moodle will be used to post documents from the course, including the instructor's lecture slides, lab handouts, worksheets and answer keys, as well as any class announcements. The lecture slides will typically be available before class for students to fill in. Quizzes may also be given via Moodle. If you are absent, check the site for missed items.

Homework

Lecture: Homework will be given two primary ways (1) via the Mastering Chemistry website (2) via lecture handouts. Most lecture handouts will only be checked for completion; answer keys are available in Moodle. Late lecture work will be accepted for **50% credit within one class period** of original collection. Late MC work will be accepted with a **1% reduction taken per hour late.** *If you have difficulties with the problems, consult me or a tutor as soon as possible! Even though hwk is a small percentage of your formal grade, it is worth a LOT towards learning the material for tests!!*

Accessing Mastering Chemistry online Homework:

1. Go to www.masteringchemistry.com and in the Register box, click 'Students.'
2. The Course ID is **CHM101FALL1617**
3. Indicate if you already have an access code (purchased in bookstore) or if you need to purchase one during the online registration (a credit card is required).
 - a. If you are purchasing online, be sure to choose the **8th edition of General, Organic, Biological Chemistry by McMurray, et al** (even if using a different text, you must choose the official course edition for MC):
4. Choose to create a new student account and select a personal login name and password that you will use for logging in to MC *or* if you have a Pearson Mastering account from another course, you can use the same account info. *If you use a pseudonym, please let the instructor know what it is so you get credit for your work.*
5. **Use your GCC EMAIL ACCOUNT when registering and check the spelling!!!!****
6. After registering, choose to enroll in the CHM 101 course by entering its unique **Course ID**, which is **CHM101FALL1617**

Lab: Pre-lab work is due at the **start of the lab period** (late pre-labs will be accepted for 50% credit if turned in before the graded prelabs are returned). Notebook pages and/or lab reports will typically be due by 3:00 pm on the Monday following the week's lab. See also "Laboratory Notebook Guidelines" handout.

Quizzes

Quizzes will be given frequently, once a week or more. They may be administered online or in class at the beginning or end of a class period or as take home. Sometimes quizzes will be announced, sometimes they will not. **Two** missed quizzes can be made up, *but only if you ask before the quiz answers are announced (typically the next class period)*. The lowest quiz grade will be dropped.

Exams

Regular Exams: There will be 5 regular exams (see Course Outline for approximate dates, exact dates will be confirmed in class). Each test will focus on the topics covered since the previous test, but due to the nature of chemistry, there will be a hefty comprehensive aspect to each one. Any material previously covered during the semester is fair game for a test.

*ONE missed exam due to severe weather (but college still open) can be made up, but only if the instructor is contacted that day. The test must be taken the next school day. Severe illness, medical emergencies, and family deaths are the only other excuses that will be accepted for the opportunity to take a make-up exam. *Documentation may be requested to substantiate claims for the absence.*

*Tests must be returned to the instructor after reviewing in order to receive a grade.

Final Exam: The final will be comprehensive *i.e.* it will test elements from the entire semester. Start preparing for this test today: study to actually internalize the material instead of simply memorizing for each test. Then start reviewing at least two weeks in advance of the final.

Opportunities to Improve Test Grades

- ✓ A student may choose to make corrections on ONE regular exam and earn up to 65% of the missed points back. Corrections are to be handwritten on a separate sheet of paper and turned in, along with the original test, within two class periods (more time may be given after consulting the instructor). Guidelines for doing the corrections are provided in a separate handout.
- ✓ The lowest grade of the five regular exams will be replaced by the percentage earned on the comprehensive final (but only if the final percent is higher). If you miss an exam that is not excused, that will be your replacement exam.

Miscellaneous

- **Questions** will be vitally important if you and I are to communicate effectively. Please do not be intimidated by my questions -there is no intent to embarrass you. Please do not be intimidated to ask questions –the only ‘stupid’ question is the one not asked. Also, please treat others in the class who ask questions or respond to questions with respect.
- Many chemistry students find that a **tutor** is very helpful. Please visit Student Support Services in the ACES center if you would like the extra assistance in being successful.
- **Laptops/tablets/smart phones** may only be used for taking notes. Surfing the Internet, watching movies, etc. during class time are not permitted –the *laptop will be confiscated for the remainder of the class period*. **Cell Phones** are to be turned off during the class period.
- The use of an **audio recording device** is permitted and encouraged during the instructor’s lecture.
- Extra time to complete a quiz or test due to **tardiness** will be granted only if the cause was truly unavoidable.
- There is a **suggestion/comment box** in the lab. Any positive or critical comments or ideas you have concerning anything in the class or lab that may enhance or hinder your learning experience are appreciated.
- I make **mistakes** –in lecture, in grading, in handouts, on quizzes, and on tests. Please question/correct me when you suspect these errors. If you suspect a “trick question,” it is most likely a typo – but please ask, don’t assume one way or the other.

ADA Accommodation Statement for Students with Disabilities: If you believe that you need academic accommodations for a disability that qualifies under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act, please contact the Office of Disability Services, located in office T105C of the ACES Center, call (906) 932.4231 x 237, or e-mail jessicaln@gogebic.edu. This office is responsible for coordinating disability-related academic accommodations and will issue students with verification letters as appropriate. Accommodations may require early planning and generally are not provided retroactively, so please contact the office as soon as possible.

Grading

Distribution:	5 Exams	50%	Lab	21%
	Quizzes	10%	Hmwk/Misc	6% (65% MC + 35% lecture)
	Final	13%		

Scale:	A ≥90.0%	B+ 88.9 – 85.0%	C+ 78.9 – 75.0%	D 66.9 – 55.0%
	A- 89.9 – 89.0%	B 84.9 – 80.0%	C 74.9 – 68.0%	F < 55.0%
		B- 79.9 – 79.0%	C- 67.9 – 67.0%	

Note about grades: An approximately 15% curve, *i.e.* a **ONE AND A HALF LETTER GRADE curve, is built into the course** through extra points available on tests, quizzes, homework, and labs, thus extra credit for individuals is not available – please don't ask for it.

Academic Honesty

GCC Policy: Dishonesty of any kind, including cheating on examinations or any assigned work, may be dealt with in any manner deemed suitable by the instructor, including the recording of a failing grade for the course. Cheating on examinations may also result in the student appearing before the Student Personnel Committee and possible suspension from school if circumstances warrant.

Instructor Policy: Students are encouraged to work together in the exchange of ideas, discussion of assignments, and when preparing for tests, but **anything turned in for credit must be your own work** unless it is designated to be turned in as group work. First offense -you and the person you copied from fail the assignment/quiz/test. Second offense -you fail the class and will be reported to the administration.

GRADING STANDARDS –WHAT THE LETTERS REPRESENT

The Grade of A – Accomplished A-level work is, on the whole, not only clear, precise, and well-reasoned, but insightful as well. Basic chemistry terms and distinctions are learned at a level which implies insight into chemical concepts and principles. The A-level student analyzes questions and problems clearly and precisely, usually distinguishes the relevant from the irrelevant, generally formulates answers and solutions clearly, often recognizes his/her questionable assumptions, uses language in keeping with educated usage, and demonstrates a commitment to reason carefully and make connections between topics. A-level work displays excellent chemical reasoning and problem-solving skills. The A student's work is consistently at a high level of intellectual excellence.

The Grade of B – Achieving B-level work is similar to the A-level work described above, but differs in that the B-level student's analysis, comprehension, formulation, etc is modified by "usually" and "mostly" and "often but not always" types of distinctions. B-level work achieves sound chemical reasoning and problem-solving skills. The B student's work is consistently at a competent level of intellectual performance.

The Grade of C – Developing C-level work does not display depth of insight or even consistent competence. Basic chemistry terms and distinctions are learned at a level which implies the beginnings of, but inconsistent comprehension of, chemical concepts and principles. The C-level student only occasionally analyzes questions and problems clearly and precisely, often distinguishes the relevant from the irrelevant, sometimes formulates answers and solutions clearly while other times provides circular arguments, may recognize his/her questionable assumptions, inconsistently uses language in keeping with educated usage, but does not demonstrate a clear commitment to reason carefully and search for connections between concepts. Often the C-level student seems to be simply going through the motions of the assignment or problem, attempting to rely on memorization rather than comprehension and understanding. C-level work displays developing but inconsistent chemical reasoning and problem-solving skills.

The Grade of D – Beginning D-level work represents thinking that is typically unclear, imprecise, and poorly reasoned. The student is achieving chemical competence only on the lowest order of performance due to a superficial or mistaken understanding of basic chemical concepts and principles. The student is unable to competently analyze questions and provides solutions and answers that are imprecise or circular while improperly using the chemical language.

The Grade of F – Lacking The student is not displaying chemical competence or general problem-solving ability in his/her academic work.

Course Schedule

Provided below is a general outline of the order in which topics for this course will be discussed and an **approximate** time line. Exact dates for tests will be confirmed in class one week prior to the exam. Depending on the flow of the class, sections may be added, deleted, or moved around. The instructor will indicate if this occurs. Decimal numbers at the start of the line refer to sections in *Fundamentals of General, Organic, and Biochemistry, 8th Ed* by McMurry, et al., those in parentheses refer to the 7th edition.

Week 1

Introduction

Supplement	how to use MC and Bb
1.1	Why study chemistry? (same)
Supplement	scientific method and experiment design

Chemistry and Its Symbols

1.2 – 1.4, 2.4 – 2.5	elements, chemical formulas, periodic table terminology (1.2-1.5, 2.4-2.5)
1.5, 5.1, 5.2, suppl.	law of conservation of mass, balanced equations, coupled rxns (1.6, 5.1, 5.2, 20.6)

Measurements in Chemistry

1.7, 1.12	definition of units of mass, volume, density, length (1.7 – 1.8, 1.13 – 1.14)
1.11, 7.1	types of energy (1.13, 7.1)
1.6 – 1.9, suppl.	metric system, significant figures, precision v. accuracy (1.9, 1.11)

LAB: Scientific notation (1.6 and Appendix A) review due, Scientific Notation and Your Calculator, Critical Thinking, Lab Check-In & Safety, lecture

Week 2 - 3 – NO CLASSES Labor Day, Monday Sept 5

Numerical Interlude

1.10	one step unit conversions and estimation (1.12)
2.1	simple atomic structure (2.1)

Atoms

2.2 – 2.5	atomic and mass number, atomic mass, isotopes, the PT (2.2 – 2.4)
2.6 – 2.8	quantum mechanical atomic model, electronic structure of atoms, and valence (2.6 – 2.8)

LAB: Safety Quiz, Measuring Mass & Volume, Using Statistics in Lab

LAB: Density and Experiment Design, Electronic Structure of Atoms group work

***** TEST 1 - MONDAY, WEEK 4 (?) *****

Week 3/4

Numerical Interlude

1.10	multi-step unit conversions (1.12)
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Compounds

3.1	cations and anions (3.1)
3.2 – 3.4	basis for why ions form: valence & octet rule (3.5 – 3.6)
3.5 – 3.6	nomenclature of ions (3.7 – 3.8)

LAB: Multi-Step Conversions (dry lab)

Week 5

Compounds (con't)

supplement	bonding basics and overview
3.7, 4.1	ionic vs. covalent bonding (3.3, 4.1)
3.10, 4.5	general properties of ionic vs. molecular compounds (3.4, 4.5)
3.8	writing chemical formulas of ionic compounds, polyatomic ions (3.9)
3.9	nomenclature ionic of compounds (3.10)

Numerical Interlude

6.1 - 6.3	introduction to the mole, mass expressions, mass-mole conversions, mole-mole conversions (6.1 – 6.3)
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Compounds (con't)

4.11	nomenclature of binary covalent compounds (4.11)
4.2 – 4.4	the covalent bond types, octet exceptions (4.2 – 4.4)

LAB: Identification of a Substance: MP, Density, Solubility

***** TEST 2 - WED or THURS, WEEK 6 (?) *****

Week 6

Important Properties of Molecular (Covalent) Compounds

12.1 – 12.4, 12.10	organic structures, functional groups (12.1 – 12.4, 12.10)
4.6	Lewis structures (4.6)

LAB: Test/Lecture

Week 7

4.8	molecular shape and VSEPR theory (4.8)
4.9 – 4.10	electronegativity and polarity (4.9 – 4.10)
12.3, 13.3	isomers (12.3, 13.3)
13.8	benzene – shape and resonance (13.8)
12.4, 12.5, 12.9	alkanes and cyclic structures – shapes, conformers, isomers (12.4, 12.5, 12.9)
13.3	alkenes – shapes, isomers (13.3)

LAB: Part I - Functional Groups, Shape, Polarity; Part II – Isomers (model lab)

Week 8

8.2, 8.14	intermolecular forces and changes of state (8.2, 8.15, 4.5)
9.2 & supplement	intermolecular forces and physical properties (same)

Numerical Interlude

6.3 – 6.4	multi-step stoichiometric conversions (6.3 – 6.4)
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LAB: Part I - Thin Layer Chromatography (wet lab); Part II - Physical Properties of Biomolecules (dry lab)

***** TEST 3 - MON or WED, WEEK 9 (?) *****

Week 9

Gases

8.3	kinetic-molecular theory of gases (8.3)
8.4 – 8.10	Gas Laws (8.4 – 8.10)
8.11 – 8.12	partial pressure, vapor pressure, and boiling point (8.11 – 8.12)

LAB: Gas Laws (demo and group dry lab)

Week 10

Basic Principles of Thermodynamics, Kinetics, and Equilibrium

7.1 – 7.4	enthalpy, entropy, and free-energy changes in chemical rxns (7.1 – 7.4)
8.1, 8.14	parallel to changes of state (physical changes) (8.1, 8.15)
supplement	catabolism v anabolism, coupled rxns (21.4, 21.6)
7.5 – 7.6	reaction rates, activation energy, and enzymes (7.5 – 7.6)

LAB: 5.4 – 5.7 Precipitation, Neutralization, and Redox Reactions; Ionic Equations (5.3 – 5.8)

Week 11

7.7 – 7.8	chemical equilibrium and the equilibrium constant (7.7 – 7.8)
7.9	stressing an equilibrium and Le Châtelier (7.9)

LAB: Chemical Equilibrium

***** TEST 4 - MON OR WED, WEEK 12 (?) *****

Weeks 12 - 14 – Weekly coverage of Test 5 material varies greatly each semester due to breaks and snow days, thus the material is listed in approximate order of coverage only.

NO CLASSES Thurs and Fri Week 14 (Nov 24 – 25) for Thanksgiving Break

Solution Properties

9.1 – 9.2	solutions and terminology (9.1 – 9.2)
9.3 – 9.5	solubility and effects of temperature and pressure (9.4 – 9.6)
9.9 – 9.11	colligative properties of solutions: VP, BP, MP, osmosis (9.11 – 9.13)

Numerical Interlude (*to be covered over 3 week period*)

9.6 – 9.8	concentration expressions and calculations (9.7 – 9.8)
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Acids and Bases

9.8, 5.4, 3.11	electrolytes, names of acids to know (9.9 – 9.10, 5.11)
10.1	definitions of acids and bases and conjugate pairs (10.1, 10.3)
10.2 – 10.4	acid-base strength and equilibrium, K_a (10.5)
10.8 – 10.9	common acid-base reactions (10.4, 10.12, 10.14)
10.5 – 10.6	pH (10.8 – 10.9)
10.10	buffers (10.10)

LABS: Lecture; Determination of Concentration using Spectroscopy;
Determination of Acid Concentration using Titration, Buffers, CO_2 as an Acid

***** TEST 5 - WED & THURS, WEEK 15 (?) *****

Week 15

Nuclear Chemistry

11.1 – 11.4	radioisotopes and nuclear decay (same)
11.5	half-life (same)

LAB: Make-Up; Clean Up & Check Out

***** COMPREHENSIVE FINAL EXAM *****

MON, DEC 12 @ 10 AM or TUE, DEC 13 @ 12 PM