

Elements of General Chemistry**Table of Contents**

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Course Description

This course covers qualitative and quantitative areas of non-organic general chemistry for non-science majors and some health professions. Students will learn and apply principles pertaining, but not limited to, atomic and molecular structure, the periodic table, acids and bases, mass relationships, and solutions. The laboratory component introduces students to techniques for obtaining and analyzing experimental observations pertaining to chemistry using diverse methods and equipment.

Course Format

This is a 16-week, fully online, 4 credit course. Assignments (reading quizzes, homework sets, activities, worksheets, experiments, and discussion postings) will be accessed online through BBLearn and will count for 40% of your grade. Exams will be proctored in person and will count for 60% of your grade.

Course Requirements

- Passing grade in Math1215Z or MATH 1220 or its equivalent.
- Calculator with log/antilog and exponential functions (available for under \$15)
- Access to the Internet: Blackboard Learn and UNM email must be checked regularly.
- Access to a printer and file scanner (there are phone apps that work for scanning).
- Time: Each weekly unit will require 10-15 hours of work.

Instructor Contact Information

Instructor: Dr. Terry

Use any, or all, of the following to contact me throughout the semester. The best method is the method that is most convenient for you.

- **Course Messages:** I will check **Course Messages** in BBLearn each weekday and will respond within 24-48 hours to messages.
- **Zoom office hours:** instructions are posted on the course web page
Mon/Fri Noon-2 pm, Wed 1-2 pm, other times by appointment
- **UNM Email:** tjterry@unm.edu I check my email regularly, but student emails sometimes get buried in other campus emails. If I do not reply within 24 hours, send me a reminder email.

Course Help

- **Instructor:** The course instructor is the main source of information pertaining to the course. See the 'Instructor Contact Information' above to determine how best to contact the instructor.
- **BBLearn Discussion:** You may ask and answer student questions in the **Discussion Forum** on BBLearn.
- **On-Campus Tutoring:** The STEM Resource Center at the UNM-Valencia campus has tutors available for chemistry courses. You can drop-in, or call/email to make appointments. Phone: 505-925-8907 Email: tutor@unm.edu
- **Online Videos:** Each Unit in BBLearn contains links to various web sites that provide videos discussing many of the topics covered in this course. I will also post videos to assist in problem solving.

Time Frame

The course is divided into **16 Units**, one per week. Most units will require approximately 10-15 hours of effort by the student. Plan your schedule accordingly.

Units

Each Unit of new information will contain the following information:

- The Learning Objectives for the Unit.
- A checklist of the required work for the unit.
- A reading assignment from the textbook.
- Informational and problem solving videos.
- A reading quiz due **Monday**.
- A discussion board activity with a posting due by **Wednesday**.
- A problem set and/or an online activity that will be due by **Friday**.
- Some units will contain experiments to be completed at home with common household chemicals.

You may work ahead as units are posted into BBLearn.

The units that include Unit 1, Exams, and university holidays vary from the above schedule.

Textbook

The course textbook is provided on BBLearn for online access or for download by chapter as .pdf files.

Assignments – all late submissions may be subject to point deductions

Reading Quizzes

Reading quizzes will consist of multiple-choice questions covering definitions, concepts, and simple calculations covered in the assigned text sections. They can be accessed in the appropriate Unit Folder and completed within BBLearn for immediate grading and feedback. These quizzes will be due on **Mondays**.

Discussion Board

A Unit Discussion Board prompt will be assigned for each unit. Responses to the Discussion Board prompt will be due on **Wednesdays**.

Discussion Board etiquette:

- Stay on topic.
- Be polite.
I will delete posts if they stray too far off topic or are not polite.
- Posts and responses should be thorough and thoughtful. (Go beyond “I agree”. Use logic and course information to explain why or why not.)
- Use complete sentences.
- Include references. If you are discussing a particular part of the text, please reference the chapter, section, and page number.

Grading note: for most Discussions, you are required to post before you can read other posts. **If your initial post is blank, you will receive no credit for that Discussion.** If you submit an additional post revising your answer after reading other posts, you may earn additional credit.

Problem Sets

Problem sets will be posted in BBLearn. These usually involve submitting answers through the BBLearn system. It has its faults. I will review all answers and make grading corrections before submitting a final grade. These will be due on **Fridays**.

Activities/Worksheets

Activities may be assigned for a unit. These activities may require worksheets that are printed, completed by hand, and submitted as a .pdf file. **Only .pdf file formats will not be graded.** These will be due on **Fridays**.

There are apps that allow you to scan documents with the camera on your phone. Scanner Pro is the one I use and costs \$4.

Home Laboratory Experiments

There are three laboratory experiments planned for you to conduct at home. These experiments will involve household chemicals that you may already have at home, or can be acquired from a grocery or hardware store. The first experiment takes place during week 3 to allow you time to procure the required chemicals.

Exams

Exams must be taken at a pre-determined participating proctoring facility. You may choose a Student Testing Center at any UNM campus or another exam proctoring facility of your choice. Contact your instructor with your preferred testing facility by the end of week 2 of the semester. (This is a Unit 2 assignment.)

The instructor will also proctor exams in a Zimmerman Library study room.

Bonus Points

Participation/Communication

Asking questions during office hours, either online through Zoom, or in person on campus, will count towards bonus points on your final grade of up to 2%.

Sample Weekly Schedule

- Sat/Sun Read the assigned text and take bullet point notes. (2-4 hrs)
- Mon Watch videos to supplement notes from the reading. (30 min – 1 hr)
Complete the reading quiz. (15-30 min)
- Tue Begin the problem set/activity. (2 hrs)
Refer to samples problems in the text and videos for guidance as needed.
- Wed Complete the Discussion Board posting. (10-20 min)
Attend Zoom office hours to get help with problems. (1 hr as needed)
- Thurs Watch videos and complete problem set/activity. (2 hrs)
- Fri Attend Zoom office hours to get help with any problems. (1 hr)
Correct problem set from the previous unit. (1 hr)
Scan and submit problem sets.

General Campus Policies

Academic Honesty

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, including dismissal, against any student who is found responsible for academic dishonesty. Any student who has been judged to have engaged in academic dishonesty in course work may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; and misrepresenting academic or professional qualifications within or outside the University.

Equal Access

If you have a documented disability, please make sure Equal Access Services has contacted me as soon as possible to ensure that your accommodations are provided in a timely manner. It is up to you to obtain documentation of a disability. I will not guarantee accommodation without the appropriate documentation.

Title IX

In an effort to meet obligations under Title IX, UNM faculty, Teaching Assistants, and Graduate Assistants are considered “responsible employees” by the Department of Education (see pg 15 - <http://www2.ed.gov/about/offices/list/ocr/docs/qa-201404-title-ix.pdf>). This designation requires that any report of gender discrimination which includes sexual harassment, sexual misconduct and sexual violence made to a faculty member, TA, or GA must be reported to the Title IX Coordinator at the Office of Equal Opportunity (oeo.unm.edu). For more information on the campus policy regarding sexual misconduct, see: <https://policy.unm.edu/university-policies/2000/2740.html>

Equal Opportunity

Harassment is a form of discrimination. When University faculty, administrators, and supervisors witness or receive a written or oral report or complaint of discrimination or harassment, they are required to engage in appropriate measures to prevent violations of this policy and promptly notify OEO, including notification of any actions taken to achieve informal resolution of the complaint. The University relies on its employees to notify the University’s OEO office of all disclosures of discrimination and harassment as defined in this policy. <https://policy.unm.edu/university-policies/2000/2720.html>

Netiquette

One of the overriding principles in online conversations is to “craft your responses effectively.” It is sometimes difficult to remember that there are real people reading posted messages. This is especially true of online communication where others do not have the opportunity to see body language or hear tone of voice; therefore, misunderstandings are more likely.

Please, follow these guidelines in all of your online responses and discussion postings.

- Honor everyone’s right to an opinion.
- Respect the right of each person to disagree with others.
- Respond honestly but thoughtfully and respectfully; use language which others will not consider foul or abusive. You may also use emoticons to convey a lighter tone.
- Respect your own privacy and the privacy of others by not revealing information which you deem private and which you feel might embarrass you or others
- Be prepared to clarify statements which might be misunderstood or misinterpreted by others.

A Special Note about Anger

- Do not send messages that you have written when you are angry, even anonymous ones. In the online world, angry messages are known as “flaming” and are considered bad behavior. Venting and flaming are two different things. It is possible to vent without becoming “ugly.” Stick to the facts, without name calling, of what is causing you frustration.
- Do not send messages that are written all in upper case; this is the visual equivalent of SHOUTING. It is considered aggressive and is considered bad behavior. If you ever feel like shouting a message, take a deep breath and wait until you have calmed down before responding. Then, respond in a calm and factual manner. Sometimes I type it all out in a Word Document to get it out of my system and then immediately delete it and start over.

Student Learning Objectives

Course Learning Objectives (CLO)

1. Use the different systems of measurements and perform conversions within the same system of measurement and between different systems of measurements
2. Identify elements from their name or symbol, use the periodic table to describe reactivity patterns of elements and to predict compound formation.
3. Describe the basic structure of an atom using subatomic particles, and apply these concepts to nuclear reactions.
4. Describe ion formation and the difference between covalent and ionic compounds. Name and write formulas for ionic and simple molecular compounds.
5. Write and balance chemical reactions. Use balanced reactions in stoichiometric calculations.
6. Describe the differences between the solid, liquid and gas phases. Use the gas laws in calculations, and apply these laws to everyday situations.
7. Explain different types of energy, and how energy is released or absorbed in a reaction.
8. Describe acid and base behavior.
9. Explain the intermolecular attractive forces that determine physical properties; apply this knowledge to qualitatively evaluate these forces and predict the physical properties that result.
10. Practice concepts associated with laboratory safety, including the possible consequences of not adhering to appropriate safety guidelines.
11. Demonstrate the computational skills needed to perform appropriate laboratory-related calculations to include, but not be limited to determining the number of significant figures in numerical value, solving problems using values represented in exponential notation, solving dimensional analysis problems, and manipulating mathematical formulas as needed to determine the value of a variable.
12. Perform laboratory observations (both qualitative and quantitative) using sensory experience and appropriate measurement instrumentation (both analog and digital).
13. Record quantitatively measured values to the correct number of significant figures and assign the correct units.
14. *Master basic laboratory techniques including, but not limited to weighing samples (liquid and solid), determining sample volumes, measuring the temperature of samples, heating and cooling a sample or reaction mixture, decantation, filtration, and titration.*
15. Draw appropriate conclusions based on data and analyses.
16. Present experimental results in laboratory reports of appropriate length, style and depth, or through other modes as required.
17. Determine chemical formulas and classify different types of reactions.
18. Relate laboratory experimental observations, operations, calculations, and findings to theoretical concepts presented in the complementary lecture course.

Learning Objectives by Unit

Unit 1, Ch 3.1-3.5 in Bishop text

1. Describe the differences between **solids, liquids, and gases**. (CLO 6)
2. Use the periodic table to:
 1. Identify elements in the same **group** or **period**. (CLO 2)
 2. Classify an element as being a **metal** (forms **cations**) or **nonmetal** (forms **anions**). (CLO 2)
 3. Classify **main group** elements and **transition elements**. (CLO 2)
 4. Identify the following groups: **alkali metals, alkaline earth metals, and halogens** and recall the ions commonly formed by elements in these groups. (CLO 2)
3. Diagram the structure of an atom in terms of its subatomic particles. (CLO 3)
4. Identify and correctly label elements, isotopes, and ions based on the number of protons, neutrons, and electrons. (CLO 2)

Unit 2, Ch 5.1-5.3, Ch 6.1-6.2,

5. Describe the two different forms of bonding that connect atoms - IONIC or COVALENT. (CLO 4)
6. Use the periodic table to
 1. determine whether a compound is molecular or ionic based on chemical formula. (CLO 4)
 2. predict the charge of common monatomic ions. (CLO 4)
7. Determine formulas of ionic compounds, including the use of common polyatomic ions, and molecules from their systematic names. (CLO 4)
8. Name molecular and ionic compounds using the IUPAC system of nomenclature. (CLO 4)

Unit 3, Ch 7.1-7.3, 9.1

9. Identify and balance precipitation reactions. (CLO 5, CLO 17)
10. Predict products of precipitation reactions using solubility rules and represent the process as a balanced chemical equation. (CLO 5, CLO 17)
11. Use the IUPAC system of nomenclature to describe chemical changes: convert from a descriptive sentence to a balanced chemical equation or from a balanced chemical equation to a descriptive sentence. (CLO 4, CLO 5, CLO 17)
12. Identify and balance oxidation-reduction reactions with ionic compounds. (CLO 5, CLO 17)

Unit 4: Exam 1

Unit 5, Ch 1.4-1.5, 2.1-2.2

1. Use the appropriate SI units and metric prefixes to express numbers in scientific notation. (CLO 11)
2. Express the result of any set of simple mathematical operations on measurements to the appropriate number of significant figures. (CLO 11)

3. Convert between units and prefixed units using dimensional analysis and develop a systematic approach to solving problems involving unit conversions and equations. (CLO 1, CLO 11)

Unit 6, Ch 3.6, 6.6-6.7, 10.1

4. Determine and use molar mass to convert between mass, moles, and numbers of molecules. (CLO 5)

5. Perform stoichiometric calculations for solids (relate the mass of reagents and products in a chemical reaction). (CLO 5)

Unit 7, Ch 10.3

6. Define molarity and perform calculations involving the composition of solutions, including dilution calculations. (CLO 5)

7. Perform stoichiometric calculations for solutions (relate volumes of reagents to quantities of products). (CLO 5)

Unit 8: Ch 11.1-11.3

8. Recall and use the gas laws (Boyle, Charles and Avogadro) to calculate properties of an ideal gas under changing conditions. (CLO 6)

9. Relate atomic level behavior to macroscopic properties of gases. (CLO 6)

10. Recall and use the ideal gas law, $PV = nRT$ to calculate P, V, n or T given three of the four parameters. (CLO 6, CLO 11)

11. Apply the ideal gas law to find number of moles from P, V and T conditions, and use this information in stoichiometric calculations. (CLO 5, CLO 6, CLO 11)

Unit 9: Spring Break Review – Stoichiometry with Mass, Volumes, and Gases

Unit 10: Exam 2

Unit 11 (TBD)

1. Explain different types of energy, and how energy is released or absorbed in a reaction. (CLO 8)

Unit 12, Ch 12

2. Use structure to classify molecules by their strongest intermolecular force: London Dispersion, Dipole-Dipole, or Hydrogen Bonding. (CLO 8)

3. Use structure and intermolecular attractive forces to qualitatively predict the relative physical properties of molecules: solubility in water, solubility in nonpolar solvents, and boiling point. (CLO 8)

Unit 13 Ch 8

4. Describe the different models of acid-base behavior (Arrhenius & Brønsted-Lowry). (CLO 9)

5. Recognize common acids and bases as strong or weak. (CLO 9)

6. Calculate the pH and species concentrations for strong acid and base solutions. (CLO 9)

Unit 14 Ch 16.1

7. Recognize the basic radioactive decay modes (α , β , and γ). (CLO 3)
8. Compare the penetrating and ionizing power of α , β , and γ radiation. (CLO 3)
9. Fill in missing species in a balanced nuclear equation. (CLO 3)

Unit 15: Exam 3 (Thanksgiving Week)

Unit 16: Final Exam Practice/Final Exam

Unit # Date	Unit Topics	Course Learning Objective (CLO)	Home Experiments (CLO 10, CLO 12, CLO 15, CLO 16, CLO 17, CLO 18)
Unit 1 Jan 20-24	START HERE – Course Introduction Atoms, Ions, Elements, Isotopes, Periodic Table	CLO 2 CLO 3a	None
Unit 2 Jan 27 - 31	Ionic and Covalent Bonds Ionic and Covalent Compounds Nomenclature (Naming)	CLO 4	None
Unit 3 Feb 3-7	Balance Chemical Reactions Classify Chemical Reactions: Precipitation, Acid/Base, Oxidation/Reduction Predict Solubility Products	CLO 5a CLO 17	Precipitation Reactions Lab
Unit 4 Feb 10-14	Exam 1 Practice Exam 1	CLO 2, CLO 3a, CLO 4, CLO 5a, CLO 17	Penny Lab
Unit 5 Feb 17-21	Metric System Unit Conversions Significant Figures Scientific Notation Measurements	CLO 1 CLO 11 CLO 13	None
Unit 6 Feb 24-28	Mole Calculations Using Molar Mass Mass Stoichiometry	CLO 5	None
Unit 7 Mar 2-6	Solid / Liquid / Gas Concentration (Molarity) Volume Stoichiometry	CLO 6 CLO 5	None
Unit 8 Mar 9-13	Gas Equations Gas Stoichiometry	CLO 1, CLO 11, CLO 5	None
Unit 9 Mar 16-20	Calculation Review Spring Break	CLO 6	None
Unit 10 Mar 23-27	Exam 2 Practice Exam 2	CLO 1, CLO 11, CLO 13, CLO 5, CLO 6	None
Unit 11 Mar 30 – Apr 3	Energy in chemical transformations	CLO 7	None
Unit 12 Apr 6-10	Intermolecular attractive forces and phase changes and solubility	CLO 9	None
Unit 13 Apr 13-17	Acid/Base reactions (strong and weak) and pH of solutions	CLO 8	Acid/Base indicator and household chemicals
Unit 14 Apr 20-24	Nuclear reactions	CLO 3	None

Unit 15 Apr 27 - May 1	Exam 3 Practice Exam 3	CLO 3, CLO 7, CLO 8, CLO 9	None
Unit 16 May 4-8	Final Exam Review		None
May 11-15	Final Exam		None