



CHEM 1411 - General Chemistry I Chem1411.1H1 Course Syllabus

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. The laboratory portion includes basic laboratory experiments supporting theoretical principles presented in as defined above; introduction of the scientific method, experimental design, data collection and analysis, and preparation of laboratory reports.

Prerequisites TSI Math and Reading complete, [MATH 1314](#) or equivalent academic preparation. High School Chemistry is strongly recommended.

Credits 4

Lecture Hours 3

Lab Hours 3

Extended Hours 1

Contact Hours 112

State Approval Code 40.0501.54 03

Instructor Name Dr. John Stuart

Semester/Year Fall 2025

Meeting Time and Location

Tuesday 12:00 pm - 1:40 pm

Alternate Operations During Campus Closure

In the event of an emergency or announced campus closure due to a natural disaster or pandemic, it may be necessary for Panola College to move to altered operations. During this time, Panola College may opt to continue delivery of instruction through methods that include, but are not limited to: online learning management system (CANVAS), online conferencing, email messaging, and/or an alternate schedule. It is the responsibility of the student to monitor Panola College's website (www.panola.edu) for instructions about continuing courses remotely, CANVAS for each class for course-specific communication, and Panola College email for important general information.

Student Basic Needs

Unexpected circumstances may arise, but Panola College offers various resources to support students. If you need mental health services or are facing challenges with transportation, affording class materials and supplies, or accessing food regularly—issues that may impact your class performance—please visit panola.edu/resources.

Class Attendance

Regular and punctual attendance of classes and laboratories is required of all students. When a student has been ill or absent from class for approved extracurricular activities, he or she should be allowed, as far as possible, to make up for the missed work. If a student has not actively participated by the census date, they will be dropped by the instructor for non-attendance. This policy applies to courses that are in-person, online, hybrid, and hybridflex.

Attendance in online courses is determined by submission of an assignment or participation in an activity. According to federal guidelines, simply logging into a distance learning course without participating in an academic assignment does not constitute attendance. Distance learning is defined as when a majority (more than 50%) of instruction occurs when the instructor and students are in separate physical locations. Students must engage in an academic activity prior to the course census date.

When an instructor feels that a student has been absent to such a degree as to invalidate the learning experience, the instructor may recommend to the Vice President of Instruction that the student be withdrawn from the course. Instructors may seek to withdraw students for non-attendance after they have accumulated the following number of absences:

Fall or spring semesters:

3 or more class meeting times per week - 5 absences

2 class meeting times per week - 3 absences

1 class meeting per week - 2 absences

The student is responsible for seeing that he or she has been officially withdrawn from a class. A student who stops attendance in a class without officially withdrawing from that class will be given a failing grade; consequently, the student must follow official withdrawal procedures in the Admissions/Records Office.

Please note: Health Science and Cosmetology courses may require more stringent attendance policies based on their accreditation agencies. Please see the addendum and/or program handbook for further information concerning attendance.

Pregnant/Parenting Policy

Panola College welcomes pregnant and parenting students as a part of the student body. This institution is committed to providing support and adaptations for a successful educational experience for pregnant and parenting students. Students experiencing a need for accommodations related to pregnancy or parenting will find a Pregnancy and Parenting Accommodations Request form in the Student Handbook or may request the form from the course instructor.

Artificial Intelligence (AI) Course Policy

No use of Generative AI permitted.

This option assumes that all work submitted by students will be generated by the students themselves, whether they are working individually or in groups. Students should not have another person or entity do the writing of any portion of an assignment, which includes hiring a person or a company to write assignments and/or using artificial intelligence (AI) tools like ChatGPT. Use of any AI-generated content in this course qualifies as academic dishonesty and violates Panola College's standards of academic integrity.

Instructional Goals and Purposes

The purpose of this course is to provide the first semester of a two semester course in chemistry for science, pre-engineering, pre-professional (pre-med, pre-dental, pre-pharmacy, etc.) majors and any student who would like a general knowledge of chemistry. The course includes mastery of topics in measurement, dimensional analysis, classification of matter, chemical structure, chemical formula and equation writing, stoichiometry, the First Law of Thermodynamics, periodicity, bonding theories, and gases. This first semester covers the first 10 chapters of the text.

Chemistry 1411 has a required laboratory component that forms an important portion of this study. Experiment results will be recorded in a bound lab notebook. A typed report will be submitted to the instructor.

Instructional goals: (that will be assessed)

1. Understand and be able to explain the general principles, laws, and theories of chemistry that are discussed and presented throughout the semester
2. Use critical thinking and logic in the solution of problems
3. Apply learned chemistry skills to new situations
4. Demonstrate an understanding of chemistry through technological advancement
5. Apply chemical principles in the laboratory setting

Instructional goals: (not assessed)

1. Develop independent and cooperative learning skills
2. Recognize and acquire attitudes that are characteristic of the successful worker regardless of the major field of study
3. Develop an awareness of the value of chemistry in our daily living

Learning Outcomes

After studying all materials and resources presented in the course, the student will be able to:

Lecture component:

1. Define the fundamental properties of matter.
2. Classify matter, compounds, and chemical reactions.
3. Determine the basic nuclear and electronic structure of atoms.
4. Identify trends in chemical and physical properties of the elements using the Periodic Table.
5. Describe the bonding in and the shape of simple molecules and ions.
6. Solve stoichiometric problems.
7. Write chemical formulas.
8. Write and balance equations.
9. Use the rules of nomenclature to name chemical compounds.
10. Define the types and characteristics of chemical reactions.
11. Use the gas laws and basics of the Kinetic Molecular Theory to solve gas problems.
12. Determine the role of energy in physical changes and chemical reactions.
13. Convert units of measure and demonstrate dimensional analysis skills.

Laboratory component:

1. Use basic apparatus and apply experimental methodologies used in the chemistry laboratory.
2. Demonstrate safe and proper handling of laboratory equipment and chemicals.
3. Conduct basic laboratory experiments with proper laboratory techniques.
4. Make careful and accurate experimental observations.
5. Relate physical observations and measurements to theoretical principles.
6. Interpret laboratory results and experimental data, and reach logical conclusions.
7. Record experimental work completely and accurately in laboratory notebooks and communicate experimental results clearly in written reports.
8. Design fundamental experiments involving principles of chemistry.
9. Identify appropriate sources of information for conducting laboratory experiments involving principles of chemistry.

Course Content

A general description of lecture/discussion topics included in this course are listed in the Learning Outcomes section of this syllabus.

Students in all sections of this course will learn the following content:

1. Define: chemistry, chemist, matter, mass, and energy.
2. Distinguish between kinetic energy and potential energy; give several examples of each.
3. List the branches of chemistry and tell what is included in each.
4.
 - a. State the Law of Conservation of Mass
 - b. State the Law of Conservation of Energy.
 - c. Describe a combined theory of mass-energy conversion.
5. Name and characterize the three states of matter.
6. Identify properties and changes of matter as physical or chemical.
7. Define: substance and mixture; classify a sample of matter as a substance or a mixture.
8. Define: atom and molecule; give examples of each.
9. Show how the terms experiment, hypothesis, theory, and law fit into the scientific method.
10. Perform the objectives of the unit on the metric system and SI units after practicing on the exercises of the unit.

11. Define: specific gravity and density; solve problems related to specific gravity and density.
12. Define: temperature and heat.
13. Convert between Fahrenheit, Celsius, and Kelvin temperature scales.
14. Give the freezing temperature of water, the boiling point of water, and the lowest possible temperature for the Celsius and Kelvin temperature scales.
15. Define: joule, calorie, BTU, heat capacity, and specific heat; write an equation relating H, M, C, and T, where H is heat in calories, M is mass in grams, C is specific heat in cal/g- C, and T is temperature change in C; solve problems relating to calories, specific heat and calorimetry.
16. Distinguish between the terms symbol, formula, and equation.
17. Distinguish between molecular formula and empirical formula; if given the molecular formula of a compound, stipulate its simplest formula.
 - a. Define: ion, polyatomic ion, isotope.
 - b. Write symbols for common elements and write the names of common elements given their symbols; include simple compounds.
18. Write symbols and correct charges for polyatomic ions.
19. State the definitions of atomic mass and moles of atoms (gram atoms).
20. Calculate the grams of an element represented by a specific number of moles of the element; and the number of moles of atoms (gram atoms) represented by a specified mass of an element.
21. Define molar mass and mole.
22. State what Avogadro's number represents; give the numerical value of Avogadro's number; define mole of atoms in two different ways.
23. Using Avogadro's number, determine the absolute mass of a single atom from its atomic mass; determine the atomic mass of an element from the mass of a single atom of an element; determine the molar mass of a substance from the mass of a single molecule; determine the number of atoms present in a specified mass of an element; determine the number of molecules present in a given mass of a substance.
24. Given the formula of a compound, calculate the molar mass (formula mass) of the compound.
25. Given the formula of a compound or its molar mass, calculate the number of moles represented by a specified mass of the compound; and conversely, the number of grams of a compound represented by a given number of moles of the compound.
26. Given the formula of a compound, determine the per cent of each element present in the compound.
27. State the law of constant composition (definite proportions).
28. Given the percentage composition of a compound, determine the empirical formula of the compound; given also the correct molecular mass of the compound, determine the molecular formula of that compound.
29. Write correct equations for simple reactions, when the reactants and products and their symbols or formulas are known.
30. Balance simple equations by inspection and trial and error.
31. Define and give examples of exothermic and endothermic processes.
32. State three items of information which can be obtained from a correct and balanced equation; state four items of information which an equation does not reveal. Given a correct equation, write the mole relationships that exist between each of the substances shown in the equation; use these mole relationships to solve mass-mass problems.
33. Convert from mass of a substance to moles of a substance and convert from moles of a substance to mass of a substance.
34. Determine the percent of any or all components in a mixture or compound.
35. Using $D = m/V$
 - a. determine density from a given mass and volume.
 - b. determine volume when mass and density are known.
 - c. determine mass from a known density and volume.
36. Using $g/MW = \text{number of moles} = M \times V$ (in liters) have,
 - a. calculate molarity of a solution from grams of a substance and volume of a substance
 - b. calculate volume of a solution if molarity and grams of the solute are known,
 - c. calculate grams of solute present from molarity and volume of a solution.
37. Distinguish between actual yield and theoretical yield; if these two are known, determine percent yield.
38. Explain what a limiting reagent is.

39. Define solution, concentration of a solution, and molarity; solve problems related to concentrations of solution.
40. Calculate the mass of a substance in a solution sample from the weight of the sample, specific gravity of the sample, and percent of substance in the sample.
41. Define: thermochemistry, heat, heat capacity, enthalpy, and heat of reaction.
42. Distinguish between endothermic and exothermic reactions.
43. Give the SI unit for heat; relate this to the calorie; define calorie; compare q_c to Q_c .
44. Discuss calorimetry; draw a simple calorimeter.
45. Solve problems of calorimetry.
46. Discuss thermodynamic and enthalpy changes.
47. Calculate enthalpy changes.
48. State Hess's law; use Hess's law to determine answers to problems.
49. Compare fuel to food.
50. Distinguish between protons, electrons, and neutrons in terms of their relative masses, relative charges, and location in the atom.
51. Define an atomic mass unit.
52. Use the atomic number and mass number of an element to find the number of protons, electrons, and neutrons.
53. Use the concept of isotopes to explain why the atomic weights of elements are not whole numbers.
54. Calculate the average atomic weight of an element from isotope data.
55. Describe the Thompson, Rutherford, and Bohr models of the atom.
56. Summarize Dalton's atomic theory.
57. Distinguish among principal energy level, energy sublevel, and atomic orbital.
58. Describe the shapes of 's', 'p', and 'd' orbitals.
59. Use the Aufbau principle, the Pauli exclusion principle, and Hund's rule to write the electron configuration of representative elements.
60. Explain the origin of the various forms of the periodic table.
61. Distinguish between a period and a group in the periodic table.
62. State the periodic law.
63. Classify the elements into four categories according to the configuration of the outermost electrons.
64. Recognize the demarcation of the periodic table into 's' blocks, 'p' blocks, 'd' blocks, and 'f' blocks.
65. Write the electron configuration of elements by using the periodic table.
66. Rationalize (in terms of the modern model of the atom) trends in the periodic table with respect to atomic radii and ionization energies.
67. Compare the physical properties of metallic and nonmetallic elements.
68. Relate these terms to the periodic table: representative element, noble gas, alkali metal, alkaline earth metal, halogen, transition metal, inner transition metal, and outer transition metal.
69. Describe the chemical behavior of the elements as they appear on the periodic chart.
70. Give the classification of chemical compounds.
71. Distinguish among strong acids, weak acids, strong bases, and weak bases
72. Give the classifications of chemical reactions and an example of each.
73. Define electrolyte; differentiate among strong electrolyte, weak electrolyte, and nonelectrolyte.
74. Distinguish among metals, nonmetals, and semimetals (metalloids); give an example of each.
75. Define amphoteric.
76. Give the periodic variation of oxidation numbers.
77. List the activity or electromotive series of the elements.
78. Predict the products of chemical reactions.
79. Describe and discuss the chemical properties of some of the important industrial chemicals.
80. State the definitions of the following terms and be able to illustrate each:
 - a. valence electron
 - b. inner shell electron
 - c. negative ion
 - d. ionization potential
 - e. ionic bonding
 - f. electron affinity
 - g. covalent bonding
 - h. single bond

- i. double bond
 - j. triple bond
 - k. coordinate covalent bonding
 - l. polar covalent bonding
 - m. electronegativity
 - n. electropositivity
 - o. polar substance
 - p. metal
 - q. nonmetal
 - r. oxidation number
 - s. positive oxidation state
 - t. negative oxidation state
 - u. polyatomic ion
81. Illustrate with equations and with schematic diagrams how positive ions or negative ions are formed.
 82. Illustrate with schematic diagrams the formation of an ionic compound by combination of a metallic element and a nonmetallic element.
 83. Illustrate with schematic diagrams the formation of a covalent compound by the combination of two nonmetallic elements.
 84. Describe a valence electron structure (a Lewis formula) and give an example of an ionic compound and a covalent compound.
 85. State the rule relating positive oxidation numbers in a compound and apply this rule in writing formulas of compounds when given elements with their oxidation numbers.
 86. Use the rule from #6 to calculate the oxidation numbers of each element in a compound.
 87. Apply the rules of nomenclature to name binary compounds, bases, binary acids, ternary acids, and ternary salts. Also be able to write the formulas if given the names of the above types of compounds.
 88. Define chemical bonding, stating the importance of the noble gas electron configurations.
 89. Draw electron dot structures for simple covalent molecules containing single, double, or triple bonds.
 90. Describe nonpolar and polar covalent bonds.
 91. Use electronegativity values to determine whether a bond is ionic, polar covalent, or nonpolar covalent, and describe the weak attractive forces that hold molecules to each other.
 92. Explain the shapes of simple covalently bonded molecules by using electron repulsion theory.
 93. Define: molecular orbital.
 94. Make a clear distinction between atomic orbitals and molecular orbitals.
 95. Define and give examples of:
 - a. a homonuclear diatomic molecule
 - b. a heteronuclear diatomic molecule
 96. Recognize the difference between bonding orbitals and antibonding orbitals—i.e. the differences in energy, differences in shape, which tends to fill in preference of the other, tendency to stabilize or destabilize the molecule.
 97. State what a sigma-bond is and be able to draw a sigma-bond involving 2 s atomic orbitals, one involving an s and a p orbital, and one involving 2 p atomic orbitals.
 98. State what a pi-bond is and draw a pi-bond involving 2 p orbitals.
 99. Define bond order; determine the bond order for a given bond and be able to state its significance.
 100. Given a molecular orbital diagram be able to explain its meaning.
 101. Describe the Valence Shell Electron-Pair Repulsion Theory (VSEPR).
 102. Draw the following molecular geometrical shapes:
 - a. linear
 - b. trigonal planar
 - c. tetrahedral
 - d. trigonal bipyramidal
 - e. octahedral
 - f. mickey mouse (T-shaped)
 103. Give bond angles and bond distances of each of those listed in 2.
 104. Describe hybridization of atomic orbitals.
 105. Give an example and illustrate sp³, sp², and sp hybridization.
 106. Illustrate pi-bonding in the structures of ethylene and acetylene.
 107. Define: compressibility, expansion, diffusion, permeability.

108. Discuss the significance of absolute zero, giving its value in degrees Kelvin and degrees Celsius.
109. Define pressure and explain how it may be measured.
110. State and use Avogadro's hypothesis.
111. Define molar gas volume and give the value at STP.
112. State and use Graham's law of diffusion.
113. Define partial pressure, state Dalton's law of partial pressures, and find the partial pressure for a gas in a mixture of gases.
114. Make calculations involving Boyle's law, Charles' law, Gay-Lussac's law and the combined gas law.
115. State the kinetic-molecular theory of the behavior of gases.

Methods of Instruction/Course Format/Delivery

This course is offered in the following format:

Lecture, class discussion, lecture activities, reading assignments, homework, quizzes, research activities, presentations, pre-laboratory activities, laboratory experimentation, laboratory reports

Major Assignments/Assessments

The following items are assigned and assessed during the semester and used to calculate the student's final grade.

Assignments

Assignments

The following items will be assigned and assessed during the semester and used to calculate the student's final grade.

The following components will include, but is not limited to the following items.

1. Homework, Quizzes, Participation, and Lecture Activities: These assignments will vary in points and average together to encompass 20% of the final grade.
 - **Homework** - completed and turned in using the online system called Mastering Chemistry, which is designed to accompany the textbook. This code may be purchased as a bundle with the book in the Panola College Bookstore. It may also be purchased separately in the bookstore or online. This system will be embedded in Canvas.
 - For homework to be most useful in preparing for in class work and exams, it must be submitted by the date due. Late work is not accepted as there is ample time allowed for completion and the homework is available to work on 24/7.
 - **Mastering Chemistry** - Registration instructions are located in Canvas
 - Make sure you have the latest free download of adobe flash player and any other required free software
 - **Application assignments** - There will be mandatory assignments periodically that you will complete and turn in that are separate from mastering chemistry. These assignments are designed to help you see the real world applications of chemistry and understand how to research/present scientific information from an article.
 - **Lecture Activities** - exercises/activities performed in class or online as a participation in the lesson, quizzes in class or online. No late or makeup work will be accepted for lecture activities or quizzes.
 - **Library Literacy Information course** - All chemistry students need to know how to use the library resources for research, tutoring etc. Therefore, all students must enroll and complete the library information literacy course. It will take a total of about 3 hours to complete. Students will have a couple of weeks to complete it. It is provided by the library. If this is required for more than one class, the student only has to do it once and will be allowed to submit the certificate.
 - **Study Groups** - are recommended to encourage peer tutoring and cooperative learning. Groups will form by student choice and meet at times chosen by the group. Reports of study group activity will be turned in to me once a month for extra credit in the homework/

lecture activities grade portion. Report forms may be downloaded from Canvas. Turn in the study group report form to my office during the first week of each month to reflect the previous month's activity. Please combine August and January with the following month.

2. **Laboratory Experiments** – Laboratory experiments will be performed in order to apply the general principles, laws and theories of chemistry learned during lecture. Experimental results will be recorded in the laboratory notebook according to the procedures. The laboratory course information will be provided and discussed in the mandatory laboratory orientation by your lab instructor. **No student will be allowed to begin any experiments in the lab without going through lab orientation.** The lab instructor has the authority to remove 5 points from your laboratory report for each expectation in the laboratory guidelines that is not followed by the student. Removal of points or the student is by instructor discretion based on previous warning or the gravity of the infraction. **NO ONE WILL BE ALLOWED TO PUT YOU OR OTHERS AT RISK IN THE LAB.** Students must follow all expectations as described in the course information document in order to remain in lab class. Safety is most important.
 - The grade of 150 possible points for each laboratory experiment is broken down as follows:
 - 50 points for showing up on time with the pre-lab assignment complete (in the lab manual). This is your ticket in the door and you will not begin an experiment without having met all of the requirements. This also includes conducting the experiment, adhering to all safety and equipment use rules, completing the experiment, cleaning up your lab station, and disposing of all waste, trash according to instructions given. All of these items must be complete before leaving lab. If any of this is incomplete, 30 points will be removed. The instructor initials' in the laboratory notebook is required.
 - In order to receive the above 50 points in the grade book, a typed lab report must be submitted in canvas 100 points for the written report you submit. It must be complete, legible, and information (data tables, calculations, answers, and explanations) must be typed, properly presented, and clearly explained when necessary. All work must be shown when necessary to receive full credit
 - Missing a lab-
 - **No more than 2 missed labs may be made up. No exceptions. . (This is not for Panola College approved activities. These students may make up the lab another day that week.)**
 - A make-up lab schedule will be posted. All make up lab times will be at the convenience of the instructor. It is the student's responsibility to make arrangements to attend make up labs according to the schedule. No additional make up lab times will be available.
 - Cell phones in lab- **NO CELL PHONES IN LAB!!!!** If you have a situation where you may need to take a call, then you will leave the phone at the instructor table to be answered by you when/if it rings. If you have your phone out or are using your phone without permission for any reason, you will lose all 30 points of your participation grade but are required to complete the experiment. This is a violation of safety rules and putting others and or you at risk will not be tolerated.
3. **Unit Exams** – Four unit exams will be given throughout the semester worth 100 points each. These exams will average together to make up 40% of the final grade.
 - **Face to Face Students:** Students will be given ample time to complete the exam. Some exams will be given outside of regular class time at Panola College on the date and time set by the instructor. When paper exams are given you will need a pencil/pen and your calculator for each exam. All other materials will be provided.
 - Absences on exam days are not excused for ANY reason other than approved Panola College activities. Students with excused absences may take a make-up exam similar to the one given at a time convenient to the instructor. **For unexcused absences, one unit exam may be made up at the end of the semester at a time designated by the instructor. At the instructors discretion, the make-up exam may be comprehensive and may be essay/problems.** Exam grades will not be dropped or replaced.
 - The unit break down for exams is as follows (see the lecture schedule for tentative dates):
 - Unit I Chapters E, 1, 2
 - Unit II Chapters 3, 4,5
 - Unit III Chapters 6, 7,8
 - Unit IV Chapters 9,10
4. **Final Exam** – is also comprehensive, all multiple choice, and will be administered according to the posted final exam schedule (not available at this time). Any change to the type of final exam (non-

comprehensive, the addition of essay questions and etc.) and additional information **will be posted in the final exam module on Canvas**, which posts toward the end of the semester. This exam is worth 15% of the final grade.

Course Grade

The grading scale for this course is as follows:

1. Homework and lecture activities 20%
2. Labs 25%
3. Unit Exams 40%
4. Final Exam 15%

Letter Grades are as Follows:

A	90 – 100
B	80 - 89
C	70 – 79
D	60 – 69
F	Below 60

Texts Materials, and Supplies

1. **E-Textbook: Modified Mastering Chemistry w/ etext – Access Card for Chemistry: Structure & Properties – Code Bundle** (Person Publisher - 2th Ed. By Nivaldo J. Tro) ISBN: 9780134565613
2. **Lab Manual:** General Chemistry in the Laboratory – Lab Spiral Notebook, Pearson Publisher. ISBN: 9781323947173 (Laboratory notebook (sold in the Panola College Store)
3. SCIENTIFIC CALCULATOR (no cell phones) (it does NOT need to be graphing)
4. Safety glasses/goggles

Required Readings

may include, but not limited to:

- Textbook, journal articles, and other relevant scientific material

Recommended Readings

may include, but not limited to:

- Textbook, journal articles, and other relevant scientific material

Other

- Courses conducted via video conferencing may be recorded and shared for instructional purposes by the instructor.
- For current texts and materials, use the following link to access bookstore listings: <https://www.panolacollegestore.com>.
- For testing services, use the following link: <https://www.panola.edu/student-services/student-support/academic-testing-center>.
- The Accommodations & Disability Support (A&DS) Office at Panola College provides and facilitates support services and accommodations for students with disabilities. The A&DS office works under the federal guidelines included in Section 503 of the Rehabilitation Act of 1973 and the American with Disabilities Act. Please contact the Accommodations & Disability Support (A&DS) Office located in the Charles C. Matthews Student Center or go to <https://www.panola.edu/disabilitysupport> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook: <https://www.panola.edu/> (located on at the bottom under student)