

CHEM 0101 - FUNDAMENTALS OF CHEMISTRY

Catalog Description

Formerly known as CHEM A

Prerequisite: Intermediate algebra or higher or eligibility for transfer-level mathematics

Advisory: Eligibility for ENGL C1000

Hours: 108 (54 lecture, 54 laboratory)

Description: The course includes basic chemical laboratory techniques and methods, a survey of important chemical principles with an emphasis on problem-solving, and a description of composition, structure, and properties of matter. It is intended for students who wish to meet general education requirements in physical science or build skills for future chemistry courses. (C-ID CHEM 101) (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Solve problems and analyze data related to chemical formulas and stoichiometry.
- CSLO #2: Solve problems and analyze data related to atomic and molecular structure.
- CSLO #3: Solve problems and analyze data related to states of matter, including solids, liquids, gases, and aqueous solutions.
- CSLO #4: Relate chemical concepts to physical phenomena in the environment and everyday life using appropriate nomenclature and chemical vocabulary.
- CSLO #5: Demonstrate proper scientific communication through lab work that shows clear calculations, correct use of significant figures and units, and proper use of chemical nomenclature.
- CSLO #6: Determine significant figures in measurements and how they propagate through calculations to final results.
- CSLO #7: Use the metric system and SI units, especially in dimensional analysis and converting between metric units.

Effective Term

Fall 2026

Course Type

Credit - Degree-applicable

Contact Hours

108

Outside of Class Hours

108

Total Student Learning Hours

216

Course Objectives

Given a periodic chart, an ion chart, a strong and weak electrolyte chart, and a scientific calculator, students will perform the following on written examinations, on laboratory exercises, or in laboratory experiments:

Lecture Objectives:

1. Identify given types of matter as an element, a compound, or a mixture;
2. Identify a given change as a chemical change or a physical change;
3. Convert within the metric system and between English and metric systems;
4. Calculate numerical problem answers in proper scientific notation and to the proper number of significant figures using dimensional analysis;
5. Solve problems involving density, volume, and mass;
6. Draw a diagram of a given type of atom showing protons, neutrons, and electrons;
7. Calculate the numbers of protons, neutrons, and electrons for given atoms and ions;
8. Solve problems involving atomic number, mass number, and numbers of protons, neutrons, and electrons;
9. Write the electron configuration for given elements and ions;
10. Determine the electron configuration for an element from its location on the periodic chart;
11. Calculate the number of each type of atom given a chemical formula;
12. Write chemical formulas for given chemical names, write chemical names for given chemical formulas;
13. Draw the electron dot formulas for given chemical names or formulas;
14. Solve problems using the relationships identified in the periodic chart of the elements;
15. Calculate the molar mass of a given compound;
16. Calculate the percent composition of a given compound;
17. Solve problems involving grams, moles, and particles;
18. Determine the empirical and/or molecular formula for a given compound from the given composition;
19. Write balanced chemical equations;
20. Solve stoichiometry problems involving grams, moles, and particles;
21. Solve stoichiometry problems involving a limiting reagent;
22. Write ionic and net ionic equations;
23. Solve problems using molarity;
24. Solve stoichiometry problems involving molarity;
25. Solve gas problems involving grams, pressure, volume, temperature, and number of moles;
26. Solve stoichiometry problems involving gas volumes;
27. Calculate the energy required for a given phase change or temperature change.

Laboratory Objectives:

1. Perform laboratory experiments to reinforce concepts in basic laboratory techniques, and to prepare for more advanced laboratory work in chemistry, if applicable;
2. Develop techniques for measurement and recording data;
3. Distinguish between physical and chemical properties using experimentation;
4. Use appropriate equipment to measure mass and volume in order to determine density;
5. Use quantitative analysis to determine the composition of a hydrate;
6. Investigate different types of chemical reactions;
7. Using a reaction, determine mass-mass stoichiometry and percent yield;
8. Investigate properties of solutions and determine the mass percent of solute in a solution;
9. Explore properties of acids and bases;
10. Determine the molarity of a solution through titration;
11. Exhibit cooperative and individual skills in the collection and analysis of data;

12. Develop clear, cogent reporting of experimental observations, analysis and conclusions using the scientific method.

used to determine the amount of vitamin C in a vitamin C tablet by titrating a measured mass of vitamin C powder.

General Education Information

- Approved College Associate Degree GE Applicability
 - AA/AS - Natural Sciences
 - AA/AS - Natural Sciences Laboratory
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
 - Cal-GETC 5A - Physical Science
 - Cal-GETC 5C - Laboratory Science
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Objective Examinations
 - Example: Students will take quizzes and examinations utilizing a variety of objective questions like true or false and multiple choice on solving problems using relationships identified in the periodic table (lecture course objective 14). Standard grading. Example Questions: 1. Group 6 elements tend to gain 2 electrons. True or False? 2. Group 7 elements tend to form ____ bond(s). a. 0 b. 1 c. 2 d. 3 e. none of the above
- Problem Solving Examinations
 - Example: Students will solve problems utilizing molar masses and stoichiometry (lecture course objectives 12, 15, 17 and 19-21). The calculated results are graded based on work shown to demonstrate the student's problem solving process and arriving at the correct value, units and significant figures. Rubric grading. Example Question: Solid sulfur reacts with oxygen gas to produce sulfur dioxide gas. Calculate the number of grams of the excess reactant remaining when 25.0 grams of sulfur is mixed with 125 grams of oxygen gas.
- Reports
 - Example: In the course lab manual, students will collect data, calculate results and answer additional questions regarding the topics demonstrated in the lab like studying and utilizing density, the relationship between mass and volume of a substance (laboratory course objective 4). Students will be graded on precision of measurements and use of units and significant figures, as well as ability to convert data collected into desired results with correct units and significant figures. Example Lab Report: Write up the lab report for the "Density" lab. Example Question, "Density" lab: Using the mass and initial and final volumes of water displaced by a rubber stopper, calculate the volume and density of the rubber stopper.
- Skill Demonstrations
 - Example: Students will utilize lab equipment to obtain precise and accurate data and results like in the titration lab experiment (laboratory course objectives 1-2, 9-10). Students will be graded on precision and accuracy of data. Example Skill Demonstration: Titration of vitamin C (ascorbic acid) where students use titrations to accurately determine the concentration of a standard sodium hydroxide titrant using weighed masses of potassium hydrogen phthalate and measured volumes of the titrant necessary to neutralize the acid. The standardized titrant is then

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Instructor organizes laboratory experiments and demonstrations that reinforce empirical formula concepts. Instructor guides students in empirical formulas data collection and analysis and preparation of laboratory reports.

Lecture:

1. Instructor utilizes resources such as textbook, online sources, videos, and demonstrations to present the topic of moles. Students are expected to read the text to prepare for the lecture presentation, participate in lecture, and work problems related to the concept of moles during lecture.

Distance Learning

1. Instructor utilizes resources such as textbooks, laboratory manuals, online sources, and other printed to present the topic stoichiometry. Using the LMS the instructor will provide video lectures introducing and working out stoichiometry problems and instructional videos on how to perform stoichiometry related assignments. Students are expected to read the text, watch the video lectures and other resources and work problems related to stoichiometry through the LMS. Assignments may be uploaded in LMS or presented in an LMS discussion board.

Typical Out of Class Assignments Reading Assignments

1. Read a section from the textbook. Be prepared to use the content to participate in the classroom and to complete assigned problems from the textbook. For example: Read the section on stoichiometry from the textbook. Be prepared to use the content to participate in the classroom and to complete the assigned problems related to stoichiometry. 2. Read a laboratory experiment and answer prelaboratory questions. For example: Read the experiment on Scientific Measurement and answer prelaboratory questions.

Writing, Problem Solving or Performance

1. Read an experiment background and procedure. Then write thoughtful answers to prelab questions and perform prelaboratory calculations. For example: Write thoughtful answers to prelaboratory questions for the Scientific Measurement experiment. 2. Solve problems. For example: Read the section of the text on energy, heat and heat capacity. Then, from assigned homework, calculate the energy required to raise the temperature of 50 grams of water by 50#.

Other (Term projects, research papers, portfolios, etc.)

Required Materials

- Introductory Chemistry
 - Author: Tro
 - Publisher: Pearson Education, Inc.
 - Publication Date: 2023
 - Text Edition: 7th
 - Classic Textbook?: No
 - OER Link:
 - OER:
- Chem 101 Lab Manual
 - Author: Instructor Developed
 - Publisher:
 - Publication Date: 2024
 - Text Edition:
 - Classic Textbook?: No
 - OER Link:
 - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.

Scientific calculator and laboratory goggles.