

# CHEM 0003A - GENERAL CHEMISTRY I - PART 1

## Catalog Description

Prerequisite: Completion of MATH D or MATH G with grade of "C" or better, or placement by matriculation assessment process, or equivalent

Corequisite: Concurrent enrollment in CHEM 3X

Advisory: Eligibility for ENGL 1A strongly recommended

Hours: 90 (36 lecture, 54 laboratory)

Description: The first semester of a two-semester course in general chemistry consisting of that material normally included in one semester of CHEM 1A. Topics covered include the mole concept, chemical nomenclature, gas laws, and stoichiometry. This sequence fulfills the prerequisite for CHEM 1B. Students enrolling in CHEM 1A after having taken CHEM 3A will lose credit for CHEM 3A. (combined with CHEM 3B, C-ID CHEM 110) (combined with CHEM 3B and 1B, C-ID CHEM 120S) (CSU, UC-with unit limitation)

## Course Student Learning Outcomes

- CSLO #1: Demonstrate proficiency in solving problems and analyzing data related to chemical formulas.
- CSLO #2: Demonstrate proficiency in solving problems and analyzing data related to stoichiometry.
- CSLO #3: Demonstrate proficiency in solving problems and analyzing data related to thermodynamics.
- CSLO #4: Demonstrate proficiency in scientific communication.

## Effective Term

Fall 2022

## Course Type

Credit - Degree-applicable

## Contact Hours

90

## Outside of Class Hours

72

## Total Student Learning Hours

162

## Course Objectives

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

Lecture Objectives:

1. decide if a given change is a chemical change or a physical change;
2. convert within the metric system and between English and metric systems;
3. calculate numerical problem answers in proper scientific notation and to the proper number of significant figures using dimensional analysis;
4. calculate the numbers of protons, neutrons, and electrons for given atoms and ions;

5. solve problems involving atomic number, mass number, and numbers of protons, neutrons, and electrons;
6. compute the percent abundance or average atomic mass of an element;
7. solve problems involving grams, moles, and particles;
8. calculate the percent composition of a given compound;
9. determine the empirical and/or molecular formula for a given compound from the given composition;
10. determine chemical formulas for given chemical names, determine chemical names for given chemical formulas;
11. construct balanced chemical equations;
12. construct ionic and net ionic equations;
13. construct balanced oxidation-reduction equations;
14. solve stoichiometry problems involving grams, moles, and particles;
15. solve stoichiometry problems involving a limiting reagent;
16. solve problems using molarity;
17. solve stoichiometry problems involving molarity;
18. solve problems involving specific heat, mass, and temperature;
19. solve stoichiometry problems involving enthalpy;
20. compute enthalpy of reaction by combining other equations;
21. compute enthalpy of reaction by using enthalpy of formations;

Laboratory Objectives:

1. perform laboratory experiments to reinforce the concepts in basic laboratory techniques, and to prepare for more advanced laboratory work in chemistry, if applicable;
  2. determine numerical problem answers in proper scientific notation to the proper number of significant figures;
  3. use appropriate equipment to make measurements in order to determine volume, density, etc;
  4. determine chemical formulas for given chemical names, determine chemical names for given chemical formulas;
  5. determine the percent composition of a given compound by collecting the necessary data;
  6. determine the empirical and/or molecular formula for a given compound by collecting the necessary data through experimentation;
  7. determine the formula of a hydrate by collecting the necessary data through experimentation;
  8. identify strong electrolytes, weak electrolytes, and nonelectrolytes in an aqueous solution; write ionic and net ionic equations;
  9. investigate different types of chemical reactions;
  10. given the equation for an oxidation-reduction reaction, identify the substance oxidized and the substance reduced, as well as the oxidizing agent and the reducing agent;
  11. determine the concentration of a solution through titration;
  12. using a calorimeter, determine the specific heat of a substance;
  13. perform laboratory experiments to make the concepts more concrete and to prepare them for more advanced laboratory work in chemistry.
- NOTE: A minimum of 10 of the 16 (maximum) lab sessions during the semester will be experiments which require the student to obtain, record, and analyze observations and measurements. A range of 10-12 lab sessions of this type is most commonly scheduled.

## General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Physical Sciences
  - AS - Physical Science Lab
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
  - CSUGE - B3 Lab Activity
- Cal-GETC Applicability (Recommended - Requires External Approval)

- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 5A Physical Science
  - IGETC - 5C Laboratory Science

## Articulation Information

- CSU Transferable
- UC Transferable

## Methods of Evaluation

- Objective Examinations
  - Example: Students will be given quizzes and unit examinations throughout the semester, which may include multiple choice, fill in the blank, short answer, essay, and problem-solving questions. For example, "Is the density of aluminum metal a physical property or a chemical property?"
- Problem Solving Examinations
  - Example: Students will be given quizzes and unit examinations throughout the semester, which may include multiple choice, fill in the blank, short answer, essay, and problem-solving questions. For example, "How many atoms are in 255 micrograms of tin?"
- Reports
  - Example: Students will turn in laboratory reports for experiments performed in class. Write the laboratory report for the Formula of a Hydrate experiment.
- Skill Demonstrations
  - Example: Students will be asked to perform laboratory experiments which will require successful completion of tasks after the instructor has clearly demonstrated the activity and has answered student questions concerning the activity. For example, students will be evaluated on accurately determining the formula of a hydrate through experimentation.

## Repeatable

No

## Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. A classroom demonstration is used to illustrate concepts of chemical stoichiometry in action, followed by the students performing an experiment to explore and learn about the topic covered. This is followed up by the students completing a lab report of their lab experiment. In the online modality, students may watch a video of the demonstration and of the experimental procedure through LMS, followed up by students completing a lab report. In the online modality lab reports would be submitted through LMS (Lab Objective 7: chemical stoichiometry).

Lecture:

1. A multimedia slide presentation is used to present the concepts of moles in detail utilizing graphics and video segments for emphasis and clarity. Example problems are demonstrated by the instructor at appropriate times throughout the presentation. Students are always encouraged to ask questions during the lecture. In the online modality, the information is presented to the students through

the LMS using video lectures or a multimedia slide presentation. Students will participate through LMS discussion board. (Lecture Objective 7: moles).

Distance Learning

1. A classroom discussion covering chemical thermodynamics is followed by a worksheet that students will complete working in small groups while the instructor roams the room, offering guidance to facilitate learning. In the online modality, this will be accomplished using breakout groups or discussion boards. The instructor will facilitate problem-solving through the discussion board or the breakout groups (Lecture Objectives 20, 21: chemical thermodynamics).

## 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 assigned problems from the textbook.
2. Read a laboratory and prepare a prelaboratory report. For example: Read the Scientific Measurement laboratory and prepare a prelaboratory report.

## Writing, Problem Solving or Performance

1. Write the pre-laboratory report for a laboratory. For example: The student will complete a pre-laboratory worksheet answering questions pertaining to the lab. For example, how many significant figures does a measurement of 15 g have when the measurement is made with a decigram balance?
2. Solve problems from textbook problems at end of chapter. For example: Calculate the energy required to raise the temperature of 50 grams of water 50 K.
3. Perform laboratory experiments and determine the percent error. For example: Perform the Formula of a Hydrate laboratory, determine the percent error, and write a laboratory report.

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

### Required Materials

- Chemistry a Molecular Approach
  - Author: Tro
  - Publisher: Cengage
  - Publication Date: 2019
  - Text Edition: 5th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Chemistry and Chemical Reactivity
  - Author: Kotz, Treichel, and Townsend
  - Publisher: Thomson
  - Publication Date: 2011
  - Text Edition: 8th
  - Classic Textbook?:
  - OER Link:
  - OER:

- Experiments in General Chemistry
  - Author: Wentworth and Munk
  - Publisher: Cengage Learning
  - Publication Date: 2012
  - Text Edition: 10th
  - Classic Textbook?:
  - OER Link:
  - OER:

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

calculator, laboratory packet, laboratory goggles, and laboratory notebook