Lassen Community College Course Outline

CHEM-1A General Chemistry I 5.0 Units

I. Catalog Description

This course introduces atomic structure, bonding, stoichiometry, thermochemistry, gases, matter and energy, oxidation-reduction, chemical equations, liquids and solids, solutions, chemical energetics and equilibrium. The first semester of a one-year course in chemistry intended for majors in the natural sciences (chemistry, biochemistry, biology, and physics, pre-medicine), mathematics, and engineering. This course is web-enhanced and has been approved for online and hybrid delivery.

Prerequisite(s): One year of high school Chemistry, CHEM 45-Introduction to General Chemistry or the equivalent and MATH 60-Intermediate Algebra or equivalent multiple measures placement.

Upon entering the course, the student should be able to:

1. Solve mathematical problems using algebraic equations, significant figures and units correctly
2. Solve unit conversion problems, including metric systems and metric to English, and density problems.
3. Convert between the three temperature scales Celsius, Kelvin and Fahrenheit
4. Perform calculations involving molarity and percent concentrations for solutions.
5. Describe basic atomic structure using simple quantum theory, and Bohr Theory.
6. Define ionic and covalent bonds and give properties of each.
7. Accurately measure liquid volumes using analytical volumetric glassware such as graduated cylinders, burets, and volumetric pipets.
8. Measure temperature
9. Weigh chemicals to 0.001 grams using a top-loading balance

Transfers to both UC/CSU
CSU GE Area: B1 & B3
IGETC GE Area: 5A & 5C
General Education Area: A
C-ID CHEM 110/120S
51 Hours Lecture, 102 Hours Lab, 102 Expected Outside Class Hours, 255 Total Student Learning Hours

Scheduled: Fall

II. Coding Information

Repeatability: Not Repeatable, Take 1 Time
Grading Option: Graded or Pass/No Pass
Credit Type: Credit - Degree Applicable
TOP Code: 190500

III. Course Objectives

A. Course Student Learning Outcomes

Upon completion of the course the student will be able to:

1. Demonstrate knowledge of basic chemical concepts, strength in quantitative problem solving, preparation for higher-level course work, maturation of students' knowledge of chemistry, and application of mathematical skills.
2. Competent in basic laboratory skills, including laboratory safety, keeping a notebook, use of electronic balances and volumetric glassware, preparation of solutions, titrations, data analysis, and report writing.
3. Apply qualitative and quantitative analytical skills to problem solving as related to the study of chemistry
4. Develop effective time management and study strategies to enable mastery in Chemistry

B. Course Objectives

Upon completion of the course the student will be able to:
These topics and skills are expected to be at a level higher than when first introduced in Introductory Chemistry (CHEM 45)

Lecture Objectives

1. Describe the structure of the atom and the characteristics of the particles which make up the atom.
2. Use the periodic table to determine the structure of atoms of any element and of its isotopes.
3. Use the periodic table to determine the electronic configuration of any atom or ion.
4. Describe and discuss ionic bonding.
5. Describe and discuss covalent bonding.
6. Draw Lewis structures and apply VSEPR (Valence shell electron pair repulsion) to determine shape and predict the polarity of molecules.
7. Apply valence bond theory and molecular orbital theory to covalently bonded substances.
8. Write and balance chemical equations and interpret their meaning.
9. Use stoichiometry in determining amounts of reactants and products and in limiting reactant calculations.
10. Describe and discuss the states of matter and their characteristics in terms of kinetic molecular theory.
11. Understand and predict the results of energy changes on various types of matter.
12. Draw qualitative and quantitative conclusions about the effect of various changes in conditions on samples of solids, liquids, and gases.

Lab Objectives

1. Apply mathematics to solving Chemistry problems
2. Analyze experimental data
3. Formulate solutions to quantitative problems.
4. Anticipate, recognize, and respond properly to hazards in laboratory procedures and managing chemical waste
5. Keep accurate and complete experimental records

6. Perform accurate quantitative measurements
7. Interpret experimental results and drawing reasonable conclusions
8. Analyze data statistically, assessing the reliability of experimental results, and discussing the sources of systematic and random error in experiments
9. Communicate effectively through oral and written reports

IV. Course Content

Lecture Content

1. Nomenclature
2. Atomic Structure
3. Basic Quantum Theory and Electronic Structure
4. Periodic Properties
5. Chemical Reactions
6. Stoichiometry
7. Gas Laws
8. Molecular Structure and Bonding
9. States of Matter

Laboratory Content

1. Mass, Volume, and Density
2. Nomenclature
3. Double Displacement Reaction
4. Conductivity and Net Ionic Equations
5. Vitamin-C analysis
6. Green Limiting Reagent
7. Volumetric Analysis: The Titration of Acids and Bases
8. Calorimetry – Measuring Heat of Formation
9. Enthalpy Change for the Decomposition of Hydrogen Peroxide
10. Spectroscopy
11. Molecular Structure and Geometry
12. Properties of Gases: Determination of the Molar Mass of a Volatile Liquid
13. Colligative Properties

V. Assignments

A. Appropriate Readings

Standard college level texts, and articles and papers from the chemical literature.

B. Writing Assignments

Essay examinations, laboratory reports.

C. Expected Outside Assignments

Problem solving by application of chemical principles and computation. Preparation of laboratory reports. Reading assigned materials.

D. Specific Assignments that Demonstrate Critical Thinking

Hands-on qualitative and quantitative experiments and analysis of data and error. Concluding the experimental result and present the findings in laboratory reports.

VI. Methods of Evaluation

Traditional Classroom Instruction

Each student will be given a syllabus at the start of the class that indicates the evaluation tools to be used in the course. The course may include but not constrained to evaluation

tools such as homework, quizzes, examinations, essays, laboratory reports, laboratory participation, and presentations.

Hybrid Evaluation
All quizzes and exams will be administered during the in person class time. Students will be expected to complete online assignments and activities equivalent to in class assignments and activities for the online portion of the course. Electronic communication, both synchronous and asynchronous will be evaluated for participation and to maintain effective communication between instructor and students. There will also be assignments and activities that students are required to complete in addition to the online assignments and activities.

Online Evaluation
A variety of methods will be used, such as: research papers, asynchronous and synchronous (chat/forum) discussions, online quizzes and exams, posting to online website and email communications.

Web-enhanced course
Additional information and resources may be made available to students online. ,
and students may be required to do research and complete and/or submit assignments online. Quizzes may be administered online, but exams and summative assessments must be administered face-to-face.

VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee

☒ **Traditional Classroom Delivery** ☐ Correspondence Delivery

☒ Hybrid Delivery ☒ Online Delivery

☒ Web-enhance course

Traditional Classroom Instruction
Lecture, demonstration, multi-media presentation, discussion, hands-on laboratory manipulation

Hybrid Delivery
A combination of traditional classroom and online instruction will be utilized. Each semester 102 hands-on lab hours will be taught face-to face by the instructor and 51 lecture hours will be instructed online through the technology platform adopted by the District. Traditional class instruction will consist of lectures, visual aids, designed experiments/activities. Online delivery will consist of exercises/assignments, lecture posts, discussions, adding extra resources and other media sources as appropriate.

Online Delivery
Participation in forum based discussions. Online exercises/assignments contained on website. Web based video vignettes with discussion paper, email communications, postings to forums, online lecture notes and web links will comprise the method of instruction.

Web-Enhanced Course Delivery
Same as face to face with additional information and resources made available to students online, and students may be required to do research and complete and/or submit assignments online. Quizzes may be administered online, but exams and summative assessments must be administered face-to-face.

VIII. Representative Texts and Supplies

Open Educational Resource Textbook: *Chemistry*, Paul Flowers, Klaus Theopold, Richard Langley. 2nd ed. Openstax (2019). Available in class canvas section (free), online (free at https://openstax.org/details/chemistry) or LCC Bookstore (minimal cost for printing)

A laboratory manual book will be prepared and provided by instructor.

IX. Discipline/s Assignment

Chemistry

X. Course Status

Current Status: Active
Original Approval Date: 5/15/1990
Revised By: Yuting Lin
Curriculum/Academic Standards Committee Revision Date: 01/18/2022