Lassen Community College Course Outline

CHEM-1B General Chemistry II 5.0 Units

I. Catalog Description

A continuation of Chemistry 1A intended for majors in natural sciences, mathematics, and engineering. Topics covered or reinforced in both the lecture and laboratory: Chemical energetics and equilibria, solutions and ionic equilibria, acid-base chemistry, electrochemistry, coordination chemistry, oxidation-reduction, and thermodynamics, kinetics, nuclear chemistry, descriptive chemistry, organic chemistry, the chemistry of family groups of the periodic table, qualitative and quantitative analysis. This course is web-enhanced and has been approved for online and hybrid delivery.

Prerequisite(s): Chemistry 1A or the equivalent. MATH 60-Intermediate Algebra or equivalent multiple measures placement.

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

1. Describe atomic theory and structure.
2. Use standard nomenclature and notation.
3. Describe the bonding in compounds and ions.
4. Draw Lewis dot structures including resonance forms and formal charges for molecules and polyatomic ions.
5. Write balanced chemical equations including net ionic equations.
6. Write balanced chemical equations for oxidation-reduction reactions.
7. Describe the nature of solids, liquids, gases and phase changes.
8. Define all concentration units for solutions and solve solution stoichiometry problems.
9. Collect and analyze scientific data, using statistical and graphical methods.
10. Perform volumetric analyses
11. Use a visible spectrophotometer.

Advisories: Knowledge of Exponential functions and Logarithms is strongly recommended. These are part of the pre-calculus curriculum.

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

Scheduled: Spring

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 spectrophotometry, data analysis, and report writing.
3. Apply critical thinking and analytical skills to approach a research problem as relate to the study of Chemistry
4. Communicate an understanding of the subject matter as related to the study of Chemistry

B. Course Objectives

Upon completion of this 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. Draw qualitative and quantitative conclusions about the effects of various changes in conditions on samples of solutions.
2. Set-up and solve equilibria problems involving single and multiple equilibria.
3. Apply thermodynamic principles to qualitative and quantitative problems involving chemical and physical changes.
4. Understand and discuss the kinetics of chemical and physical changes.
5. Understand and discuss the concept of kinetic versus thermodynamic control of the progress of a reaction.
6. Apply qualitative and quantitative methods to the solution of electrochemical problems.
7. Utilize relationships between equilibrium, thermodynamic, and electrochemical properties.
8. Understand and discuss the relationship between bonding and thermodynamics.
9. Perform complex laboratory manipulations in the gathering of a variety of chemical data.
10. Understand and discuss nuclear changes, and their significance.
11. Apply descriptive chemistry to qualitative analysis.

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. Solutions
2. Equilibrium
3. Acids & Bases
4. Solubility Equilibria
5. Electrochemistry
6. Thermodynamics
7. Kinetics
8. Nuclear Chemistry

Laboratory Content

1. Ideal Gas Law
2. Kinetics of Crystal Violet 1 (Initial Rate Law)
3. Kinetics of Crystal Violet 2 (Integrated Rate Law)
4. Unknown ionic solution determination
5. Chemical Equilibrium and Le Châtlier's principle
6. % copper determination
7. Acid-Base Titration 1 (Standardization)
8. Acid-Base Titration 2 (unknown determination)
9. Thermodynamics and Equilibrium
10. Electrochemistry and Thermodynamics
11. Electrochemistry and the Nernst Equation
12. Electrolytic Etching
13. Dye-Sensitized Solar Cell making
14. Ligand Substitution

V. Assignments

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

B. Writing Assignments
Essay examinations and laboratory reports.

C. Expected Outside Assignments
Readings, problem solving, report writing.

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, and experimental design.

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 102 lecture hours will be instructed online through the technology platform adopted by the District. Traditional class instruction will consist of lectures, visual aids, and 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