CHEM 1B Course Outline as of Fall 2020

CATALOG INFORMATION

Dept and Nbr: CHEM 1B Title: GENERAL CHEMISTRY
Full Title: General Chemistry
Last Reviewed: 5/13/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	5.00	Lab Scheduled	6.00	8	Lab Scheduled	105.00
		Contact DHR	0		Contact DHR	0
		Contact Total	9.00		Contact Total	157.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 262.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
A continuation of Chemistry 1A. Topics include chemical kinetics, thermodynamics, chemical equilibrium, acids and bases, nuclear chemistry, electrochemistry, coordination compounds and bonding, and selected topics in descriptive chemistry. Laboratory emphasizes methods of analytical chemistry and quantitative work.

Prerequisites/Corequisites:
Chemistry 1A or equivalent with a grade of "C" or better

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: A continuation of Chemistry 1A. Topics include chemical kinetics, thermodynamics, chemical equilibrium, acids and bases, nuclear chemistry, electrochemistry, coordination compounds and bonding, and selected topics in descriptive chemistry. Laboratory emphasizes methods of analytical chemistry and quantitative work. (Grade Only)
Prerequisites/Corequisites: Chemistry 1A or equivalent with a grade of "C" or better

Recommended:
Limits on Enrollment:
Transfer Credit:
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 1981	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 1981	
	5C	Fulfills Lab Requirement		
CSU Transfer:		Effective:	Inactive:	
UC Transfer:		Effective:	Inactive:	

CID:
CID Descriptor:CHEM 120S General Chemistry for Science Majors Sequence A
SRJC Equivalent Course(s): CHEM1A AND CHEM1B OR CHEM4A AND CHEM4B OR CHEM3A AND CHEM3AL AND CHEM3B

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Analyze and solve chemical systems using quantitative models.
2. Relate the concepts of chemical equilibrium and free energy.
3. Apply the principles of quantitative analysis in a laboratory setting.
4. Analyze unknown samples using advanced instrumentation.
5. Write comprehensive laboratory reports to effectively analyze data and communicate results and conclusions.

Objectives:
During this course, students will:
1. Solve for the concentrations or pressures of various species in a chemical equilibrium.
2. Apply the concepts of chemical equilibrium to acids and bases, buffers, titration, solubility, electrochemistry and metal complex formation.
3. Determine the free energy change for a physical or chemical process at nonstandard conditions.
4. Apply the principles of electrochemistry in the construction and analysis of voltaic and electrolytic cells.
5. Use kinetics to describe the rate and possible mechanisms of a reaction.
6. Describe isomerism and bonding in transition metal complexes.
7. Describe the kinetics and other phenomena related to nuclear chemistry and radioactivity.
8. Identify and control factors that influence experimental error in gravimetric and volumetric

analysis.
9. Use advanced instrumentation, such as ultraviolet-visible and infrared (IR) spectroscopy, gas chromatography (GC) and atomic absorption (AA) in analysis of unknowns.
10. Analyze experimental error qualitatively and with statistical methods.
11. Apply chemical principles to real world situations.

Topics and Scope:

I. Colligative Properties
   A. Vapor pressure lowering
   B. Freezing point depression
   C. Boiling point elevation
   D. Osmosis
II. Kinetics
   A. Reaction rates and rate laws
   B. Determining rate laws
   C. Integrated rate laws
   D. Activation energy and the Arrhenius equation
   E. Reaction mechanisms
   F. Catalysis
III. Chemical Equilibrium
   A. Equilibrium constants (K) and quotients (Q)
   B. Le Chatelier's principle
   C. Dependence on temperature
   D. Methods and approximations for solving equilibrium systems
IV. Aqueous Equilibria
   A. Weak acids and bases
   B. pH, pKa, buffers and titration
   C. Polyprotic acids
   D. Solubility equilibria
   E. Common ion effect
   F. Complex ion equilibria
V. Entropy and Free Energy
   A. Second Law of Thermodynamics
   B. Change in Entropy
   C. Free Energy and Work
   D. Free Energy, Equillibrium and Direction of Reaction
VI. Electrochemistry
   A. Balancing oxidation-reduction reactions
   B. Voltaic cells
   C. Standard reduction potentials
   D. Concentration cells and the Nernst equation
   E. Batteries
   F. Electrolysis
VII. Coordination Chemistry of Transition Metals
   A. Coordination compounds
   B. Types of isomerism
   C. Ligand Field Theory
VIII. Nuclear Chemistry
   A. Types of radioactive decay
   B. Kinetics of decay
   C. Applications

D. Fission and fusion

IX. Introduction to Organic Chemistry
A. Basic structures and nomenclature
B. Isomerism
C. Functional groups

Laboratory material:
1. Lab safety and maintaining a lab notebook
2. Colligative properties
3. Determining rate law and activation energy
4. Determining an equilibrium constant
5. Buffers
6. Indicators
7. Potentiometric titration
8. Solubility products
9. Determination of an unknown
10. Voltaic Cells
11. Electrolytic Cells
12. Synthesis and analysis of a metal complex
13. Nuclear chemistry
14. Techniques and skills
a. Use of spreadsheet software
b. Instrumental analysis
c. Use of calibration curves
d. Writing laboratory reports

All sections are covered in the lecture and lab portions of the course.

Assignment:

Lecture-Related Assignments:
1. Specific reading and study assignments from the lecture textbook (10-30 pages per week)
2. Completion of recommended end-of-chapter problems (15-20 per week)
3. Midterm exams (2-5), Quizzes (0-4), Final exam

Lecture-Related Assignments:
1. Laboratory experiments and accompanying reports (13-18)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab reports	Writing 5 - 15%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Lab reports, end-of-chapter homework assignments	Problem solving 15 - 25%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Lab skill technique and accuracy and precision of lab results	Skill Demonstrations 0 - 10%

Exams: All forms of formal testing, other than skill performance exams.

Exams, quizzes and tests	Exams 50 - 80%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
Chemistry: The Molecular Nature of Matter and Change. 8th ed. Silberberg, Martin and Amateis, Patricia. McGraw-Hill. 2017
Chemistry: The Science in Context. 5th ed. Gilbert, Thomas and Kirss, Rein and Foster, Natalie. Norton. 2017
Chemistry: A Molecular Approach. 4th ed. Tro, Nivaldo. Pearson. 2016
Chemistry. 12th ed. Chang, Raymond and Goldsby, Kenneth. McGraw-Hill. 2015
General Chemistry. 4th ed. McQuarrie, Donald and Rock, Peter and Gallogly, Ethan. University Science Books. 2010 (classic)

Lab Manuals
Instructor Prepared Materials
Laboratory Experiments for Chemistry: The Central Science. 14th ed. Brown, Theodore and LeMay, Eugene and Bursten, Bruce. Pearson. 2017
Laboratory Manual for Chemistry: A Molecular Approach. 4th ed. Tro, Nivaldo and Vincent, John and Livingston, Erica. Pearson. 2016