CHEM 1A Course Outline as of Fall 2020

CATALOG INFORMATION

Dept and Nbr: CHEM 1A 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	4.00	17.5	Lecture Scheduled	70.00
Minimum	5.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	7.00		Contact Total	122.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 140.00 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:
General principles of chemistry, including atomic theory, bonding, stoichiometry, kinetic molecular theory of gases, properties of mixtures, the periodic table, and thermochemistry. First semester of a one year program of general chemistry.

Prerequisites/Corequisites:
Course Completion of CHEM 42 AND Course Completion of MATH 154 or Course Completion of MATH 155 or higher (MATH);
OR Course Completion of CHEM 42 AND two years of high school algebra or equivalent
Students who think they may be ready for CHEM 1A without completing CHEM 42 should take the Chemistry Diagnostic Test AND complete and return the Chemistry Diagnostic Review form to the Student Success and Assessment Services Office. After Chemistry Department's review and approval, the Admission and Records Office will lift prerequisite block and notify student through the portal

Recommended Preparation:
Course Completion of ENGL 1A

Limits on Enrollment:

Schedule of Classes Information:
Description: General principles of chemistry, including atomic theory, bonding, stoichiometry, kinetic molecular theory of gases, properties of mixtures, the periodic table, and thermochemistry. First semester of a one year program of general chemistry. (Grade Only)
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Recommended: Course Completion of ENGL 1A
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 110	General Chemistry for Science Majors I, with Lab
SRJC Equivalent Course(s):	CHEM1A OR CHEM4A OR CHEM3A AND CHEM3AL
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. Describe matter, its transformations and corresponding energy changes according to prevailing chemical theories.
2. Collect accurate data in the laboratory, and analyze with methods such as graphical and error analysis.
3. Communicate the findings of laboratory work in written laboratory reports.

Objectives:
After successful completion of this course, a student will be able to:

1. Use dimensional analysis and stoichiometry to solve quantitative chemical problems.
2. Apply atomic theory in describing matter, including chemical nomenclature and physical and chemical processes.
3. Summarize the quantum mechanical structure of the hydrogen atom in light of its emission spectrum, and apply it to many-electron systems.
4. Calculate energy changes in calorimetry and chemical reactions.
5. Use the periodic table of elements to recognize trends and patterns, and to perform calculations.
6. Describe the bonding and shapes of simple compounds with a range of models.
7. Apply kinetic-molecular theory to the behavior of ideal and real gases.
8. Relate intermolecular forces to the physical properties of matter.
9. Calculate the effects of solute concentration on the physical properties of solutions.
10. Use appropriate techniques to obtain accurate and precise measurements in the laboratory.
11. Identify the uncertainty and analyze experimental error associated with measurements.
12. Graph (as appropriate), interpret, and communicate the results of laboratory experiments in writing.
13. Apply chemical principles to real world situations.

Topics and Scope:

I. Basic Tools and Problem Solving
   A. Metric system and units
   B. Dimensional analysis and conversions
   C. Significant figures

II. Stoichiometery
   A. Moles and molar mass
   B. Mass calculations
   C. Limiting reactants and yields
   D. Molarity and solution stoichiometry
   E. Gas stoichiometry
   F. Energy calculations

III. Atomic theory
   A. States of matter
   B. Nomenclature of simple compounds
   C. Chemical composition
      1. Mass percent
      2. Empirical formulas
      3. Molecular formulas
   D. Chemical reactions
      1. Balancing
      2. Precipitation
      3. Acid-base
      4. Oxidation-reduction

IV. Structure of the atom
   A. Light and the electromagnetic spectrum

B. Emission spectra
C. Bohr model of hydrogen
D. Quantum mechanical model of the atom
E. Quantum numbers
F. Writing electron configurations

V. Thermochemistry
A. Calorimetry
B. Pressure-Volume (PV) work
C. Energy vs. enthalpy
D. Hess's law
E. Enthalpies of formation
F. Reaction enthalpies
G. Bond energies and reaction enthalpies

VI. Periodic trends
A. Atomic size
B. Ionization energy
C. Electronegativity
D. Ionic radius

VII. Bonding and Molecular Structure
A. Ionic bonding
B. Born-Haber cycle
C. Lewis structures
D. Valence Shell Electron Pair Repulsion (VSEPR) Theory
E. Covalent bond order, polarity, energy and length
F. Hybridization of atomic orbitals
G. Valence Bond (VB) theory
H. Molecular Orbital (MO) theory

VIII. Kinetic Molecular Theory of Gases
A. Molecular scale understanding of gas pressure and temperature
B. Development and applications of the ideal gas law
C. Dalton's law of partial pressures
D. Graham's law of effusion and diffusion
E. Approximating real gases with the van Der Waals equation

IX. Intermolecular Forces (IMF)
A. Molecular polarity
B. Types of intermolecular forces
C. Physical properties and IMF
D. Phases and phase diagrams

X. Liquids and Solids

XI. Colligative Properties
A. Vapor pressure lowering
B. Freezing point depression
C. Boiling point elevation
D. Osmosis

Laboratory material may include:
1. Lab safety and maintaining a lab notebook
2. Measurements
3. Synthesis and limiting reactants
4. Formula of a compound
5. Gas laws
6. Calorimetry
7. Hydrogen emission spectrum
8. Lewis structures and molecular geometry
9. Determination of an unknown
10. Techniques and skills
    a. Determining mass using a balance
    b. Titration
    c. Using volumetric glassware to prepare solutions
    d. Using spreadsheet software to graph data and do calculations
    e. Writing laboratory reports
    f. Visible light spectroscopy

Assignment:

1. Specific reading and study assignments from the textbook (20-30 pages per week)
2. Completion of recommended homework problems (0-30 per week).
3. Lab experiments and reports (approximately 1 per week)
4. Midterm exams (3-5 per semester), quizzes (0-4 per semester), final exam

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 20 - 35%

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

Homework	Problem solving 0 - 20%

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

None	Skill Demonstrations 0 - 0%

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

Midterm exams, quizzes, final exam	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, 6th Ed., Silberberg, M. (McGraw-Hill, 2011)
Chemistry, 11th Ed., Chang, R. and Goldsby, K. (McGraw-Hill, 2012)
General Chemistry 4th Ed., McQuarrie, D., Rock, P. and Gallogly, E. (University Science Books, 2010)
Chemistry: The Science in Context, 3rd Ed., Gilbert, T., Kirss, R., Foster, N., Davies, G. (Norton, 2011)
Chemistry: A Molecular Approach, 3rd Ed., Tro, N. (Prentice Hall, 2013)

Lab Manuals
Instructor Prepared Materials
Laboratory Experiments for Chemistry: The Central Science, 12th Ed., Brown, Nelson, Kemp and Stoltzfus (Pearson, 2011).
Laboratory Manual for Chemistry: A Molecular Approach, 3rd Ed., Tro, Vincent, Livingston (Prentice Hall, 2013).