CHEM 3A Course Outline as of Fall 2022

CATALOG INFORMATION

Dept and Nbr: CHEM 3A Title: GENERAL CHEMISTRY 1:LEC
Full Title: General Chemistry Part 1: Lecture
Last Reviewed: 5/13/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

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. Lecture portion of the first semester of a one-year program of general chemistry. (Students who have completed one year of high school chemistry should consider petitioning to enroll)

Prerequisites/Corequisites:
Course Completion or Concurrent Enrollment in CHEM 3AL; AND Course Completion of CHEM 42; AND Course Completion of MATH 154 or MATH 155 or MATH 156 or higher (MATH); OR AB705 placement into Math Tier 3 or higher.

Recommended Preparation:
Course Completion of ENGL 1A or equivalent

Limits on Enrollment:

Schedule of Classes Information:
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Recommended: Course Completion of ENGL 1A or equivalent
Limits on Enrollment:
Transfer Credit: CSU;UC.
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 2020	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 2020	
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 2020	

CSU Transfer:	Transferable	Effective:	Fall 2020	Inactive:
UC Transfer:	Transferable	Effective:	Fall 2020	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:
Both Certificate and Major Applicable

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. Interpret and solve problems in a chemical context using quantitative reasoning.

Objectives:
At the conclusion of this course, the student should 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. 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. Stoichiometry
- A. Amount of substance and molar mass
- B. Mass calculations
- C. Limiting reactants and yields
- D. Concentration 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 fraction
  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
A. Properties of the liquid state
B. Uniqueness of water
C. Structure, properties and bonding in the solid state
D. Structure of crystalline solids

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. Midterm exams (3-5 per semester), quizzes (0-4 per semester), final exam
4. Research paper

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.

None, This is a degree applicable course but assessment tools based on writing are not included because this course includes essay exams that fulfil the writing component of the course.	Writing 0 - 0%

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

Homework problems	Problem solving 0 - 40%

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 40 - 100%

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

Research project	Other Category 0 - 20%

Representative Textbooks and Materials:
Chemistry: The Molecular Nature of Matter and Change. 8th ed. Silberberg, Martin and Amateis, Patricia. McGraw-Hill. 2018
Chemistry. 13th ed. Chang, Raymond and Overby, Jason. McGraw-Hil. 2019
General Chemistry. 4th ed. McQuarrie, Donald and Rock, Peter and Gallogly, Ethan. University Science Books. 2010 (classic)
Chemistry: The Science in Context. 5th ed. Gilbert, Thomas and Kirss, Rein and Foster, Natalie. W. W. Norton. 2017
Chemistry: A Molecular Approach. 4th ed. Tro, Nivaldo. Prentice Hall. 2017