CHEM 110 - Introduction to Chemistry Course Outline

Approval Date: 11/14/2019
Effective Date: 08/16/2021

SECTION A

Unique ID Number	CCC000558183
Discipline(s)	Chemistry
Division	Science and Engineering
Subject Area	Chemistry
Subject Code	CHEM
Course Number	110
Course Title	Introduction to Chemistry
TOP Code/SAM Code	1905.00 - Chemistry, General / E - Non-Occupational
Rationale for adding this course to the curriculum	Update prerequisites to align with both AB 705 and the restructuring of Math Curriculum. Also added in compatible math options for HEOC students.
Units	4
Cross List	*N/A*
Typical Course Weeks	18

Total Instructional Hours

	Contact Hours
Lecture	54.00
Lab	54.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	108
Total Student Hours	216
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education Mode of Instruction	On-Campus

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description The first course in chemistry for students preparing for biological or health sciences, for more advanced chemistry courses, or for those desiring to learn about chemistry in the everyday world for general education. Laboratory is included.

Schedule Description

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- Intermediate Algebra, MATH 93 or MATH 232 with a minimum grade of C or appropriate placement

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Describe chemical and physical processes at the molecular level and how they relate to the macroscopic environment.
B. Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.
C. Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Perform basic chemically-related mathematical computations, including conversions within the metric system, conversions between English and metric systems, density, temperature conversion, gas laws, exponents, dimensional analysis and proportions, and mole-related problems, including concentration of solutions.
B. Define and appropriately use the terms: atom, ion, charge, atomic number, mass number, atomic mass, isotope, energy states, element, compound, mixture, solution, molecule, and formula unit.
C. Create drawings to explain ionic bonding and covalent bonding, including coordinate covalent bonding.
D. Explain the organization and structure of the Periodic Table.
E. Write ionic and covalent formulas, and name simple ionic and covalent compounds and acids; draw the Lewis (electron dot and dash) structures of simple covalent compounds, including skeletal structures.
F. Explain polar covalent bonds using the concept of electronegativity; determine oxidation numbers and identify oxidation and reduction processes and their agents.
G. Explain hydrogen bonding and their role in the dissolution of solutes.
H. Correctly apply the terms: salts, strong and weak bases, strong and weak acids, hydronium ion, ionize and dissociate.
I. Explain neutralization and bases as proton acceptors.

J. Classify chemical equations, and write balanced chemical equations given only the reactants.
K. Apply the mole concept, and perform mole-equation computations for gas-volume and non-gas-volume problems; calculate mole amounts, molar volumes, and molar masses; determine gas densities from formula masses.
L. Contrast the meanings of "concentrated and dilute" with "strong and weak;" calculate molar concentrations (molarity) and normality.
M. Apply the concept of pH and the factors that influence it.
N. Work in a laboratory setting utilizing appropriate safety and technique procedures and standard laboratory equipment.
O. Perform a variety of experiments following laboratory directions.
P. Develop and test hypotheses, gather and weigh evidence, and make appropriate conclusions.
Q.

3. Course Content

Unit 1: Measurement and Calculations

A. Significant Figures
B. Exponential Notation
C. Metric-metric conversions
D. Metric-English conversions
E. Using units and the dimensional analysis method
F. Using proportions
G. Density

Unit 2: The Mole

A. Definition of a mole and Avogadro's number
B. States of matter
C. Molarity, Percent by mass, Percent by volume
D. Solubility Rules
E. Descriptive chemistry - the chemistry of main group elements
F. Qualitative analysis
G. Strong and weak acids and bases
H. Hydronium ion
I. Definitions of acid and base
J. Reaction Types including but not limited to single and double replacement, neutralization, combustion, combination, decomposition, and oxidation-reduction.
K. Predicting the products of a reaction
L. Writing complete and balanced chemical equations
M. Limiting Reactants in solution
N. Empirical Formulas
O. Electronegativity
P. Oxidation and reduction
Q. Ideal Gas Laws
R. Vapor Pressure
S. Molar volume of a gas, solid and liquid
T. Temperature conversions (Fahrenheit , Celsius, Kelvin)

Unit 3: Atoms and Bonding

A. The atom, protons, neutrons, electrons, isotopes, atomic number, mass number, atomic mass
B. Elements, compounds, molecular mass, mixtures, and solutions
C. Ionic and covalent compounds and their nomenclature
D. Energy and the electron shells
E. Orbital Filling
F. The Periodic Table
G. The Octet Rule and ionic bonding
H. Lewis structures

Lab: Basic safety rules and lab techniques. A variety of experiments including;

A. Synthesis of a compound and calculation of an empirical formula
B. Titrations
C. Analysis of aspirin by titration
D. Calculation of the Ideal Gas Law Constant, R
E. Density of Gases
F. The Percentage of Oxygen in the Air
G. Redox Titration - The percentage of Cobalt in an unknown
H. Spectrophotometric determination of Cobalt
I. Crystal Field Theory and Calculation of octahedral field splitting
J. Covalent Bonding and Molecular Models
K.

4. Methods of Instruction:

Activity:
Experiments:
Individualized Instruction:
Lecture:
Observation and Demonstration:
Other: Chemical demonstrations. Video presentations. Individual and group problem solving in the classroom. Individual and group laboratory experiments. Peer oriented guided instruction where the students help one another under the guidance of an instructor.

5. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests -- Normally, five exams are given including the final exam. Exams will be fill-in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, How many grams of sulfur are there in 10 grams of FeSO4? or How many moles of gas occupy a 10 L container at STP? or perhaps, Please write the complete orbital configuration for Bromine.

Quizzes -- Weekly quizzes will be given. Quizzes will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, What is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or What is the percentage of oxygen in FeSO4? or perhaps, Please write down the complete orbital configuration for bromine.

Lab Activities -- Students are required to attend a weekly lab. Students will work individually and in groups. All labs will be checked off by the instructor prior to the student leaving the lab. Labs are graded and returned to the student upon completion. A typical lab will include the collection of experimental data, data analysis, graphical representations of the data, a report on the results and error analysis as well as a section on objectives, procedure, and conclusions. A sample lab might be, The Titration of an Unknown Acid, or Calculation of the Gas Constant, R.

Final Exam -- A comprehensive final exam will be given. This exam will be fill in, multiple choice, true/false, short answer, and multistep chemical processes where work must be shown. The exam will be graded on a point scale. A sample question may be, How many grams for sulfur are there in 10 grams of FeSO4? or What is pressure of 0.4 mole of gas at STP? or perhaps, Please write down the complete orbital configuration for Sulfur.

Additional assessment information:

Regular attendance in the laboratory is required. All labs will be checked off by the instructor prior to the student leaving the lab.

Letter Grade or P/NP

6. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
   Daily reading of text; weekly reading of lab manual (ex: Read Chapter 2,"Scientific Measurements," Sections 2.1 through 2.9 in your text and read the first lab, "Burning and Breathing.")
B. Writing Assignments
   Lecture homework is assigned at each class period; laboratory homework is assigned weekly.
   Sample tests/study sheets are assigned for each of the five instructional (lecture and lab) units.
C. Other Assignments
   -

7. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	Corwin
Title:	Introductory Chemistry: Concepts and Critical Thinking
Publisher:	Prentice Hall
Date of Publication:	2018
Edition:	8th

Book #2:

Author:	Tro
Title:	Introductory Chemistry Essentials
Publisher:	Prentic Hall
Date of Publication:	2011
Edition:	4th

Manual #1:

Author:	Quinlan
Title:	Chem 110 Laboratory Manual

Publisher: NVC Reproduction Services
Date of Publication: 08-12-2013

B. Other required materials/supplies.