CHEM G110: INTRODUCTION TO CHEMISTRY

Item	Value
Curriculum Committee Approval Date	10/19/2021
Top Code	190500 - Chemistry, General
Units	5 Total Units
Hours	144 Total Hours (Lecture Hours 63; Lab Hours 81)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• GWC Physical Universe*** (GB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5A Physical Science (5A) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5A Physical Science (5A) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B1 Physical Science (B1) • CSU B3 Laboratory Activity (B3)

Course Description

This course provides an introduction to some of the basic principles of inorganic, organic, and biochemistry. Lectures, demonstrations, and laboratories are integrated into a learning system equivalent to three hours of lecture and four hours of lecture-laboratory a week. PREREQUISITE: Course taught at the level of intermediate algebra or appropriate math placement. Transfer Credit: CSU; UC: Credit Limitations: CHEM G110 and CHEM G130 combined: maximum credit, 1 course; No credit for CHEM G110 or CHEM G130 if taken after CHEM G180. C-ID: CHEM 101; CHEM 102. **C-ID:** CHEM 101; CHEM 102.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Apply the atomic theory to create electron configurations, Lewis structures, and three-dimensional drawings of molecules.
3. Interpret the conditions of typical organic chemistry reactions to predict the reaction products.
4. Demonstrate the use of laboratory equipment to make accurate measurements of mass, volume, and temperature.
5. Explain experimental observations by relating them to relevant lecture topics to demonstrate the connection between the two.
6. Analyze laboratory data in such a way as to come to an appropriate conclusion, such as correctly identifying an unknown substance.

Course Objectives

- 1. Recall chemical terminology.
- 2. Demonstrate how to convert units for various types of chemical measurements.
- 3. Demonstrate how to express numbers in scientific notation and to the correct significant figures.
- 4. Explain how the periodic table works and the information it contains.
- 5. Identify the different types of matter and their associated properties.
- 6. Illustrate how to balance equations for inorganic chemical reactions and interpret how these balanced equations are used to solve stoichiometry problems.
- 7. Infer the shape of a molecule using VSEPR theory.
- 8. Solve problems using the mathematical relationships associated with the gas laws, solutions, thermodynamics, kinetics, and equilibrium.
- 9. Demonstrate how to name, draw the structure, and predict the reactions of typical organic compounds.
- 10. Recall the names, structures, and biochemical pathways of important biomolecules.
- 11. Demonstrate proper chemical safety practices.
- 12. Demonstrate how to perform accurate measurements of mass, volume, and temperature.
- 13. Interpret data to draw a conclusion.
- 14. Analyze laboratory observations.

Lecture Content

Measurement, Numbers, and Units Scientific method Key math skills Measurement Metric units Scientific notation Significant figures Unit conversions (dimensional analysis) Metric English Temperature Density Matter, Atomic Structure, and the Periodic Table Types of matter States of matter Elements Compounds Mixtures Physical vs chemical changes Composition of the atom Isotopes Organization of the periodic table Chemical symbols Atomic number Element symbol Mass number Ion charge Bonding, Molecular Shape, and Molecular Polarity Types of compounds Bonding Ionic Covalent Lewis structures Chemical formulas Ionic compounds Covalent compounds Nomenclature Ionic compounds Covalent compounds Molecular shape (VSEPR theory) Molcular polarity Amounts in Chemical Reactions and Gases Chemical equations Writing Balancing Types of chemical reactions Scientific laws The mole Mole conversions Avogadros number Stoichiometry Gases Properties Relationships Laws Matter, Solutions, Energy, Rate, and Equilibrium States of matter Properties Intermolecular forces Ion-ion Hydrogen bonds Dipole-dipole Van der Waals Solutions Solubility Concentration i >Dilution Colligative properties Thermodynamics Exothermic versus endothermic reactions Calorimetry Kinetics Reaction rates Activation energy Kinetic theory of gases Chemical equilibrium Equilibrium constant expressions Le Chateliers Principle Acid-Base and Nuclear Reactions Acid-base definitions Arrhenius Bronsted-Lowry The pH scale Titrations Buffers Types of radioactivity Radioactive particles Equations for nuclear reactions Half-life calculations Organic Chemistry of Common Functional Groups Structural formulas of organic compounds Structural isomers and stereoisomers Saturated and unsaturated hydrocarbons Properties Structure Nomenclature, physical properties, and simple reactions of common functional groups: Alkanes Alkenes Alkynes Alkyl halides Aromatics Alcohols Ethers Aldehydes Ketones Carboxylic acids

Carboxylic acid derivatives Simple reactions of common functional groups Substitution Addition Redox Organic Chemistry, Structure, and Pathways of Important Biomolecules Polymers Carbohydrates Monosaccharides Disaccharides Polysaccharides Lipids Classification Reactions Physical properties Function Cell membrane structure Amino acids and proteins Enzymes Metabolic pathways Anabolism Catabolismi

Lab Content

Physical Properties of Matter Density Chromatography or separations Identification of an unknown substance based on physical property data (e.g., melting point) Molecular geometry modeling activity Chemical Properties of Matter Identification of an unknown substance based on chemical reaction data (e.g., functional group tests) Acid-base titration Chemical Laws Gas laws: Charless, Boyles, or Avogadros Law Thermodynamics: calorimetry Biochemistry Observe biochemical processes (e.g., protein denaturation and enzyme catalysis) Critical Thinking Exercises Essay questions related to lab data

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

Textbook and instructor prepared materials.

Writing Assignments

Lab reports

Out-of-class Assignments

Homework problems

Demonstration of Critical Thinking

Apply chemical theories to novel situations.

Required Writing, Problem Solving, Skills Demonstration

1. Solve mathematical problems related to chemical theories. 2. Demonstrate proper laboratory techniques.

Eligible Disciplines

Chemistry: Masters degree in chemistry OR bachelors degree in chemistry or biochemistry AND masters degree in biochemistry, chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Timberlake, K. C.. Chemistry: An Introduction to General, Organic, and Biological Chemistry, 13th ed. New York: Pearson, 2018 , ISBN: 0-07-246905-6. Rationale: -

Manuals Resources

1. Dutz, K. Grimes, C.. Chem G110 Workbook (Worksheets and Laboratory Assignments for Chemistry G110: Introduction to Chemistry), Golden West College , 05-01-2019