CHEM A130: PREPARATION FOR GENERAL CHEMISTRY

Item	Value
Curriculum Committee Approval Date	12/04/2024
Top Code	190500 - Chemistry, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Associate Arts Local General Education (GE)	• Area 5 Physical and Biological Sciences, Scientific Inquiry, Life Science (OB)
Associate Science Local General Education (GE)	• Area 5 Physical and Biological Sciences, Scientific Inquiry, Life (OSB)
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

Introduction to the principles, calculations, and laboratory techniques of chemistry for students planning to take CHEM A180. PREREQUISITE: Successful completion of a course at the level of intermediate algebra or Appropriate OCC math placement. ADVISORY: Eligibility for ESL A060 or ENGL A099. Transfer Credit: CSU; UC: Credit Limitation: CHEM A100, CHEM A110 and CHEM A130 combined: maximum credit, 1 course; No credit for CHEM A100, CHEM A110 and CHEM A130 if taken after CHEM A180.

Course Level Student Learning Outcome(s)

1. Use unit equations and simple algebraic methods to solve computational problems in the areas of unit conversion, specific heat, stoichiometry, gas laws, and solution concentrations.
2. Write and balance total ionic and net ionic equations for chemical reactions, including predicting the products of ionic reactions and writing the correct ionic formulas.
3. Apply the principles of electron configurations, Lewis structural theory, and VSEPR theory to predict the structure and three-dimensional shape of simple inorganic and organic species from the chemical formula.
4. Use inorganic nomenclature rules to provide a systematic name for a chemical formula or a chemical formula from a systematic name.
5. Apply safe and proper laboratory techniques to make accurate, reproducible measurements of masses and volumes, and accurate, reproducible experimental observations.

Course Objectives

- 1. Explain in terms of the principles of chemistry observations which are new to them or from everyday life experiences.
- 2. Know the names and chemical symbols of common elements and common ions.
- 3. Demonstrate a basic understanding of modern atomic theory, including any understanding of the structure of the atom; the relationship between electromagnetic radiation and energy; the Bohr model and the wave mechanical model of the atom; electron configurations for the first eighteen elements, and the relationship of atomic properties and the periodic table.
- 4. Describe the different types of chemical bonds including an ability to discuss the nature of bonding in terms of electronegativity, bond polarity, Lewis structures, VSEPR theory, and molecular structures.
- 5. Relate to formulas of a compound which contain the common ions (including polyatomic ions) to their names and vice versa, and be able to provide either names or formulas for binary compounds that contain only nonmetals, and be able to write formulas and provide names for common acids.
- 6. Derive from the formulas a basic understanding of chemical composition to include the mole concept, the calculations of molar mass, percent composition of compounds, and the calculation of empirical formulas and actual formulas from data or percent composition.
- 7. Format and balance simple chemical equations and use these balanced equations in simple quantitative calculations.
- 8. Recognize the evidence for a chemical reaction and classify chemical reactions by type, be familiar with precipitation, acid-base and redox reactions that occur in aqueous solutions.
- 9. Be familiar with kinetic molecular theory for gases, the empirical gas laws, and gas stoichiometry.
- 10. Be familiar with current models for liquids and solids along with the vocabulary required.
- 11. Understand solubility and use solubility rules in predicting reactions, and be familiar with common methods for expressing the concentration or content of solutions (e.g., mass percent, molarity, etc.) [PROBLEM SOLVING SKILLS]
- 12. Use the basic units of the SI System for length, mass, volume, and derived units such as density and molarity.
- 13. Solve chemistry problems using the unit equation approach..
- 14. Solve word problems requiring the solution of first and second degree equations. [LABORATORY PRACTICE]
- 15. Properly and safely use glassware and other pieces of equipment in performing experiments.
- 16. Follow oral and written directions for experiments new to them.
- 17. Make and record observations using correct chemical terminology in complete sentences.

- 18. Apply the rules regarding the limitations of measurements in calculations when rounding and refining calculated values.

Lecture Content

Lecture Topics (not necessarily covered in this order). Measurements, rounding calculated answers, precision, and accuracy Discussion of Chemical Hygiene Plan (Safety Rules) Metric System of Measurement Significant figures in measurements and calculations Unit equation approach to calculations Density: concept and calculations Temperature scales and temperature conversions Classification of matter: elements and compounds, symbols and formulas Evidence for atoms and molecules Balancing equations Atoms: atomic structure, mass number, atomic number, atomic mass, atomic weight and isotopes Mole concept and mole calculations: Avogadro's number, molar mass Percentage by mass composition and empirical formula calculations Electrical nature of matter: electronic structure, orbital notation, Lewis structures, ionization energy, electronegativity Periodic table relationships Ionic and covalent compounds Writing formulas and naming of ionic compounds Molecular compounds: Lewis structures, shapes and polarities Gas behavior: Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressures, kinetic molecular theory Gas law calculations Calculations based on balanced chemical equation Interparticle forces: solid state and liquid state Liquids: vapor pressure, boiling point, etc. Solutions: nature of, molarity calculations The dissolving process and the species existing in solution Types of chemical reactions: precipitation, acid-base, and redox Precipitation reactions and solubility rules Acid-base reactions: Bronsted-Lowry theory, acid-base table Redox reactions: definitions, principles, oxidation numbers Simple chemistry of certain elements and families of elements

Lab Content

Laboratory Experiments to be Selected from the Following: 1. Classification of matter 2. Measurement in metric system and significant figures 3. Physical properties: density determinations, solubility of substances 4. Phase changes 5. Chemical change and chemical properties 6. Chemical calculations in chemistry: empirical formula determination 7. Periodic table relationships: active metals, active non-metals 8. Ammonia: preparation and properties 9. The dissolving process and solutions 10. Electrolytes and nonelectrolytes: ionization, dissociation, conductivity, major species in solution 11. Some reactions of oxygen 12. Properties of gases 13. Quantitative preparation of hydrogen: gas law problems 14. Models of molecules and Lewis structures 15. Chemical equilibrium and Le Chatelier's principle 16. Precipitation reactions and solubility rules 17. Acid-base reactions 18. Redox reactions and use of oxidation numbers 19. Use of Material Data Safety Sheets 20. Acid-base titration

Method(s) of Instruction

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

Instructional Techniques

Lecture, demonstration, problem assignments, discussion, and laboratory experiments.

Reading Assignments

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Writing Assignments

Experiments and exams will include some questions requiring the writing of sentence explanations and/or descriptions. Students will be expected to analyze questions and generate answers to them. Some answers will be in the language of mathematics and others will, as stated above, be in English. Some questions will require the use of principles to synthesize an answer which was not taught.

Out-of-class Assignments

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Demonstration of Critical Thinking

Skill demonstrations of laboratory procedures; a timed final exam and at least one timed exams involving written explanations and descriptions, and problem solving.

Required Writing, Problem Solving, Skills Demonstration

Experiments and exams will include some questions requiring the writing of sentence explanations and/or descriptions. Students will be expected to analyze questions and generate answers to them. Some answers will be in the language of mathematics and others will, as stated above, be in English. Some questions will require the use of principles to synthesize an answer which was not taught.

Eligible Disciplines

Chemistry: Master's degree in chemistry OR bachelor's degree in chemistry or biochemistry AND master's degree in biochemistry, chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent. Master's degree required.

Textbooks Resources

1. Required Zumdahl, Steven DeCoste,Donald. Introductory Chemistry, 9th ed. Cengage, 2019 Rationale: -