Common Course Outline
CHEM 131
General Chemistry I
4 Credits

Community College of Baltimore County

Course Description

CHEM 131 – General Chemistry I includes the study of atomic structure, nomenclature, chemical reactions and equations, stoichiometry, thermochemistry, chemical bonds, chemical structures; this course is typically taken by science, health professional and engineering majors. The laboratory experience in this course develops knowledge of chemical concepts, experimentation, and of laboratory instruments and techniques.

4 Credits: 3 lecture hours and 1 recitation hour; 3 laboratory hours

Prerequisites: a) Minimum grade of C in CHEM 107 and CHEM 108; OR
b) a passing grade on the chemistry placement test and (ENGL 052 and RDNG 052) or ACLT 052 or ACLT 053; and MATH 082; OR c) permission of physical science department chair.

Overall Course Objectives

Upon completion of this course students will be able to:

1. describe the process of science including the scientific method;
2. find, evaluate, use and cite appropriate academic resources to present chemical information using effective written and/or oral communications;
3. apply nomenclature rules to construct the formulas of elements, inorganic compounds, binary molecular compounds, and ions;
4. construct balanced chemical equations by using formulas and nomenclature rules;
5. solve quantitative mass-to-mass conversion problems;
6. use the mole concept to solve problems involving stoichiometry;
7. solve problems including the concentrations and dilution of aqueous solutions;
8. solve problems involving precipitation, acid-base, and oxidation-reduction reactions;
9. analyze the physical behavior of gases by applying gas laws and the kinetic molecular theory of gases;
10. evaluate thermodynamic properties of chemical systems with calculations based on the first law of thermodynamics, Hess's law of summation, and enthalpies of formation and reaction;
11. explain the electronic structure of atoms;
12. explain chemical properties applying the organization of the periodic table;
13. determine the structure of simple molecular compounds and polyatomic ions using Lewis structures;

14. apply the valence shell electron pair repulsion (VSEPR) theory and the valence bond theory (orbital hybridization) to determine molecular geometry of simple molecular compounds and polyatomic ions;
15. discriminate between ethical and unethical professional behavior within the scientific community and summarize the ramifications of misconduct.
16. work safely according to US Chemical Society Standards in a chemistry laboratory setting;
17. use chemicals safely and dispose of wastes in a proper manner with particular emphasis on avoidance of environmental pollution;
18. make proper measurements using common laboratory measuring devices such as electronic balances, volumetric glass wares, and spectrophotometers;
19. record data and observations of chemical experiments in a manner consistent with academic standards and ethics in chemistry;
20. complete calculations with data obtained from experiments correctly;
21. present chemistry information in writing by writing formal laboratory reports displaying ethics and academic integrity;
22. experimentally determine selected physical constants such as molar volume of a gas;
23. use physical methods such as chromatography to separate and analyze components of a mixture;
24. synthesize and determine physical properties of an inorganic compound;
25. collect and graph data manually and using Excel;
26. apply quantitative techniques (volumetric, gravimetric, and instrumental) to analyze selected substances;
27. measure the enthalpy changes associated with physical and chemical processes;
28. use molecular models to deduce molecular geometry of simple molecular compounds and polyatomic ions;
29. describe the impact of chemistry on individuals, societies and the environment using specific examples; and
30. evaluate how chemical processes can influence individuals and/or societies and address local and global diversity concerns.

Major Topics

I. Nomenclature – Atoms, Ions, Compounds
II. Stoichiometry
III. Reactions in Solution: Classification including Oxidation-Reduction
IV. Physical Behavior of Gases and the Kinetic Molecular Theory
V. Thermochemistry
VI. The Periodic Table
VII. Atomic and Electronic Structure
VIII. Bonding Theories: VSEPR, Valence Bond, and Molecular Orbital
IX. Chemical Bonding – Ionic, Covalent, Metallic, and Coordinate-Covalent Bonds
X. Molecular Geometry
XI. Safety in the Chemistry Laboratory
XII. Density of Solids and Liquids

XIII. Separation and Identification of Chemicals using Chromatographic or Other Physical Methods
XIV. Synthesis of Compounds/Complexes and Percent Yield Determination
XV. Single and Double Replacement Reactions
XVI. Titration
XVII. Spectroscopy
XVIII. Molar Volume of Gases
XIX. Universality of application of scientific principles

Course Requirements

Grading procedures will be determined by the individual faculty member but will include the following:

Grading/exams

Lecture component (75% of overall grade):
- a minimum of three examinations including a comprehensive final examination (at least 50% of overall grade);
- a minimum of one written assignment consistent with CCBC General Education Program objectives. (at least 5% of overall grade);
- a minimum of three quizzes (at least 5% of overall grade); and
- electronic homework (at least 5% of the overall grade).

Laboratory component (25% of overall grade):
- assessment of experimental results by grading a minimum of 8 informal laboratory reports including pre-lab and post lab questions (at least 10% of overall grade);
- a minimum of three quizzes (at least 2.5% of overall grade);
- a minimum of two formal laboratory reports (at least 2.5% of overall grade); and
- a laboratory final examination that will be given as a closed book examination (at least 5% of the overall grade).

Written Assignments: Writing assignments will infuse CCBC General Education Program objectives; at least one assignment worth a minimum 5% of the total course grade will allow students to demonstrate at least 5 of the 7 General Education Program outcomes. Students will utilize appropriate academic resources.

Other Course Information
This course is an approved 4-credit General Education course in the Biological and Physical Sciences Category that fulfills the laboratory requirement. Please refer to the current CCBC Catalog for General Education course criteria and outcomes.