Degree Applicable

Glendale Community College
January 2010

COURSE OUTLINE

Chemistry 101
General Chemistry

I. Catalog Statement

Chemistry 101 is a course in fundamental chemistry designed to set forth the most important facts and theories with which chemistry is concerned. Basic laws and chemical calculations are stressed.

Units - 5.0
Lecture Hours – 3.0
Laboratory Hours - 6.0

Prerequisites: 1) Eligibility for English 120 or ESL 151. 2) One of the following: (a) Mathematics 141 & 101 or (b) 1 1/2 years of high school algebra with a grade of "C" or better. 3) One of the following: a) Chemistry 110 or one year of high school chemistry which included regularly scheduled lab work with a grade of "C" or better and a satisfactory composite of test scores for the Mathematics and Chemistry Placement Exams.

II. Course Entry Expectations

Skills Expectations: Reading - 5; Writing - 5; Listening/Speaking - 5; Math - 5

III. Course Exit Standards

Upon successful completion of the required course work, the student will be able to:
1. describe the scientific method and apply it to the development of the science of chemistry;
2. evaluate past and present atomic theories with respect to experimental observations;
3. describe chemical processes in terms of chemical equations and be able to use the equations to answer quantitative questions concerning the process described;
4. describe the relationship between matter and energy and the interconversion of the two;
5. analyze modern theories of atomic motion, especially as they apply to gasses;

6. use quantum theory to predict electronic structures of the atom;
7. analyze the properties of the elements and develop algorithms for the classification of the elements into logical groups;
8. utilize bonding theories to describe the chemical nature of ions and molecules;
9. demonstrate an understanding of intermolecular forces and apply those forces to the nature of solids and liquids;
10. demonstrate the proper use of laboratory equipment and the ability to handle chemicals safely.

IV. Course Content

A. Fundamental definitions and conversions of units 16 hours
1. Matter and energy
2. Mass and weight
3. Properties of substances
4. Elements and compounds
5. SI and derived units
6. Temperature scales
7. Significant figures
8. Scientific notation
9. Factor-label method (or dimensional analysis) for problem solving

B. Atomic Structure 16 hours
1. Structure of the atom
2. Atomic mass, atomic number, iostopes
3. The mole
4. Chemical formulas
5. Empirical and molecular formulas
6. The laws of chemical combination
7. Properties of waves and light

C. Periodic Table 16 hours
1. Development
2. Relationship to electron configuration
3. Relationship to periodic properties
4. Relationship to chemical properties

D. Nomenclature 16 hours
1. Assigning oxidation numbers
2. Binary compounds
3. Acids

E. Stoichiometry 16 hours
1. Writing equations
2. Types of reactions

3. Stoichiometric calculations
    4. Limiting reactants
    5. Molarity
    6. Acid/base titrations

F. Thermochemistry 16 hours
    1. Definitions
    2. Calorimetry
    3. Energy changes in chemical reactions
    4. Hess' Law
    5. Enthalpies of solution

G. Gases 16 hours
    1. Pressure
    2. Boyle's, Charles', and Avogadro's Laws
    3. The Kinetic Molecular Theory
    4. The ideal gas law
    5. Stoichiometry involving gasses
    6. Dalton's Law
    7. Diffusion, effusion, and Graham's Law
    8. Deviation from ideal behavior

H. Chemical Bonding 16 hours
    1. Ionic compounds, Born-Haber Cycle, lattice energy
    2. Lewis structures, the octet rule, formal charge
    3. The covalent bond
    4. Resonance
    5. Bond energies
    6. Molecular geometry: VSPER, VP and MO theories
    7. Dipole moments

I. Liquids and solids 16 hours
    1. The hydrogen bond
    2. Bonding in metals
    3. Weak intermolecular forces
    4. The liquid state
    5. Crystal structure
    6. Phase changes and phase diagrams

V. Methods of Presentation

The following instructional methodologies may be used in the course:

1. Traditional white board and lecture format.
2. Laboratory demonstrations

VI. Assignments and Methods of Evaluation

1. Four to six one hour exams
2. Quizzes and laboratory reports
3. Supplementary readings from handouts
4. Library work may be assigned
5. Final Exam of 2 1/2 hours that contains essay questions.

VII. Textbook

Postma. James M., et al, Chemistry in the Laboratory, 7th edition
New York, NY, W.H. Freeman, 2009
13th Grade Textbook Reading Level. ISBN 1429219548

Brown, T.E., LeMay, H.E., Chemistry The Central Science, 11th ed.
Prentice Hall, Pearson, 2009
13th Grade Textbook Reading Level. ISBN 0-13-600617-5

VIII. Student Learning Outcomes

1. Design, construct, and interpret graphs accurately.
2. Solve quantitative chemistry problems and demonstrate reasoning clearly and completely as applied to stoichiometry and molarity, gas laws, and thermodynamics. Integrate multiple ideas in the problem solving process. Check results to make sure they are physically reasonable.
3. Write balanced general chemical and net ionic equations, classify types.
4. Perform laboratory experiments correctly using appropriate techniques and safety procedures. Analyze the results, evaluate sources of error, and express the results in clearly written laboratory reports.
5. Apply knowledge of the electronic structure of the atoms to bonding, shape, and polarity. Apply microscopic properties of matter to macroscopic processes.
6. Use quantum theory to explain electronic structure of atoms. Use electronic properties to predict qualitative concepts and trends in the periodic table.