San Bernardino Valley College
Curriculum Approved: September 29, 2003
Last Updated:

I. CATALOG DESCRIPTION

A. Division: Science and Math
Department: Chemistry
Course ID: CHEM 101
Course Title: Introduction to Chemistry
Units: 4
Lecture: 3 hours
Laboratory: 3 hours
Prerequisite: MATH 090 or one year of high school algebra

B. **Course Description**:
A study of the physical and chemical properties of common elements and compounds, the metric system, measurement, atomic structure, the periodic table, chemical equations, gases, solutions, ionization, and an introduction to organic and biochemistry.

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II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS

Upon completion of the course, the student should be able to:
A. Make reliable observations and accurate measurements
B. Use dimensional analysis
C. Perform calculations using the mole concept
D. Analyze the stoichiometry of reactions
E. Categorize energy changes
F. Compare and contrast properties of solids, liquids, and gases
G. Properly handle chemicals
H. Accurately set up and use common lab glassware and lab equipment, like Bunsen burners and balances
I. Perform filtration, evaporation, and titration procedures
J. Execute laboratory experiments in an efficient, safe, and purposeful manner
K. Recognize and identify simple organic compounds
L. Recognize and identify simple biochemical processes
M. Comprehend and recognize atomic structure and electron orbitals
N. Recognize and name inorganic compounds

IV. CONTENT:

A. Standards for measurement:
An overview of the math concepts of scientific notation and significant figures and algebra. Presentation of the metric system, temperature scales and conversions, and density. Demonstration and practice of dimensional analysis.
B. Energy and Heat
The concept of energy is explored and measurements of heat in calories and joules are utilized.
C. Properties and Classification of Matter
Discussion of properties of solids, liquids, and gases
Discussion of physical and chemical changes
Further classification of matter into metals, nonmetals, metalloids
Definitions of elements, compounds, atoms, molecules, and ions

D. Atomic Theory
   Presentation of basic subatomic particles: electron, neutron, proton
   Discussion of the Bohr Atom and presentation of energy levels of electrons
E. Nomenclature of Inorganic Compounds
   Names of elements and ions including common polyatomic ions.
   Writing neutral formulas, including formulas with metals with variable oxidation numbers.
   Nomenclature of binary compounds, acids, and compounds with polyatomic ions.
F. Quantitative Composition
   Discussion and calculations using the mole, Avagadro's number, and molar masses.
   Calculations of percent composition, empirical and molecular formulas
G. Chemical Equations and Stoichiometry
   Writing and balancing equations
   Recognizing types of chemical equations.
   Practicing mole ratios
   Stoichiometric problems that include mole to mole calculations, mole to mass calculations, and mass to mass calculations.
H. Chemical bonds
   Discuss periodic trends in the table
   Decipher valence electrons and write Lewis dot structures
   Ionic bonding and Covalent bonding
   Electronegativity predictions
   Introduction to molecular structure
I. Gas Laws
   The Kinetic Molecular Theory
   Pressure measurements scales and conversions, including standard temperature and pressure
   Boyle's Law, Charles Law, Gay Lussac's law, Combined gas law, Ideal gas law
   Mole, mass, volume relationship of gases
J. Properties of water
   The effects of vapor pressure, boiling and freezing points, water structure, and hydrogen bonding
K. Concentrations of solutions
   Factors effecting solubility
   Methods of expressing and calculating concentrations, including mass percent and molarity
L. Acids, bases, and salts
   An explanation of various definitions of acids and bases
   Acid base reactions and neutralization calculations
   Definition and use of pH
   Discussion of electrolytes and ionic equations
M. Introduction to Organic Chemistry
   Discussion of carbon atom shape and bonding
   Introduction to functional groups of organic compounds
   Nomenclature of simple hydrocarbons and recognition of isomers
N. Introduction to Biochemistry
   Discussion of four major classifications of biochemical compounds: carbohydrates, l lipids, amino acids, and nucleic acids.
O. Optional Topics
   Chemical Equilibria
      Discussion of factors effecting reaction rates
   Oxidation-Reduction reactions
      Balancing oxidation-reduction equations and redox reactions

Nuclear Chemistry
Properties of Alpha and Beta particles, and Gamma rays
Discussion of half life and transmutation

V. METHODS OF INSTRUCTION:

A. Lecture
B. Laboratory
C. Work groups
D. Video
E. Multimedia
F. Discussion
G. Examination
H. Demonstration
I. Computer drills

VI. TYPICAL ASSIGNMENTS:

Lecture

A. Read the chapter on the Gaseous State of Matter
B. Answer all practice problems

Lab

A. Exercise 12 from the Lab Manual on Gas Law problems

VII. EVALUATION(S):

A. Methods of Evaluation

1) Examinations and quizzes

Typical Multiple Choice type of question:

"Which compound does not exhibit hydrogen bonding?"
a.) NH_3 b) CH_4 c) H_2O d) HF

Typical Problem Solving Question:

" How many moles of atoms are in 0.688 g of Mg? Show all math set ups."

2) Laboratory Performance

Criteria:

Attendance
Participation
Safety skills
Lab reports:
Typical question: "Calculate the density of your unknown solid object. (Show Math set up.)" " What is your conclusion about the rate or speed of a chemical reaction with respect to the concentration of the reactants? What evidence did you observe in the burning sulfur to confirm your conclusion?"

Assignments:
Typical questions: "For the reaction given, how many moles of water will be produced when 8.0 mole or $KmnO_4$ are consumed?"
Or
Compare, at the same temperature and pressure, equal volumes of hydrogen and oxygen as to: the number of molecules, mass, number of moles, average kinetic energy, rate of effusion, and density

3) Optional evaluations

Homework collected and checked
Quizzes in lecture and or laboratory
Computer assignments checked

B. Frequency of Evaluations

Exams are given every couple weeks, so about 4 to 5 exams are given during the semester, and a comprehensive final is given during "finals week."
Quizzes (optional) are typically given every week.
Lab work and assignments are on a weekly basis.

VIII. TYPICAL TEXT(S):

Hein & Arena, Foundation of College Chemistry, 9'th ed., San Francisco, CA: Brooks/Cole, 1996.
Hein, Best, & Arena, Foundation of Chemistry in the Laboratory, 9th ed., San Francisco, CA: B Brooks/Cole 1996.
Or

Zumdahl, S, Introductory Chemistry, a Foundation, 3rd ed., Lexington, Mass.;D.C, Heath and Co., 1996

Optional books: Hein & Arena, Solutions Manual, San Francisco, CA: Brooks/Cole, 1996.
Hein & Arena, Study Guide, San Francisco, CA: Brooks/Cole, 1996.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Scientific Calculator, capable of exponential notation and logs
Matches, detergent