Las Positas College
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Course Outline for CHEM 30A

INTRO AND APPLIED CHEMISTRY I

Effective: Spring 2016

I. CATALOG DESCRIPTION:
CHEM 30A — INTRO AND APPLIED CHEMISTRY I — 4.00 units

Chemistry of inorganic compounds, atomic theory, bonding, equations, gas laws, solutions, acid-base theory and oxidation-reduction. Designed to meet the requirements of certain programs in allied health and technological fields and for general education.

3.00 Units Lecture 1.00 Units Lab

Prerequisite
MATH 110 - Elementary Algebra
with a minimum grade of C
or

MATH 110B - Elementary Algebra B
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	54.00
Lab Hours:	54.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH110
B. MATH110B

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Make unit conversions in the metric system using the prefixes mega, kilo, deci, centi, milli, and micro;
B. Write electron configurations for the first twenty elements in the periodic table using shell and subshell notation;
C. Describe the structure of the atom in terms of proton, neutrons, and electrons;
D. Draw Lewis structures for simple covalent formulas and determine molecular geometry and polarity;
E. Identify and describe effects of intermolecular forces;
F. Perform calculations using the mole concept to relate grams to moles for given formulas and for simple stoichiometry problems;
G. Use standard nomenclature;
H. Identify properties of states of matter;
I. Write balanced equations for chemical reactions including those in aqueous solution and those involving elementary oxidation-reduction (not in acidic or alkaline solution);
J. Describe ideal gas laws qualitatively and quantitatively;
K. Define concentration units of solutions and use these definitions in problem solving—molarity, osmolarity, and percent;
L. Describe properties of solutions, including osmotic pressure and processes such as osmosis and dialysis and their application to biological systems;
M. Interpret reactions according to acid-base theory;
N. Use the pH scale to compare acidity;
O. Describe buffer solutions in terms of their composition and function, especially ones in biological systems;
P. Write balanced net and total ionic equations;
Q. Use Le Châtelier's principle to predict the qualitative effects of changes in concentration, temperature and pH on an equilibrium;
R. Perform laboratory experiments in an efficient, safe and purposeful manner;
S. Describe factors affecting the rates of reactions;
T. Describe types of nuclear radiation, isotopes and their half-life, nuclear reactions, units of radiation, and medical/industrial uses;
U. Collect and analyze scientific data;

V. Use an electronic balance and various pieces of volumetric glassware;
W. Record laboratory observations in a useful, detailed manner;
X. Maintain laboratory records in standard scientific style;
Y. Perform a titration.

V. CONTENT:

A. Safety in the laboratory and proper disposal of waste materials
B. Matter and energy, including the names and symbols for elements 1-38, 47-48, 50-56, 78-80, 82, and 92.
C. Simple atomic theory, excluding quantum mechanics or wave theory
D. Compounds and chemical bonds, Lewis structures, molecular geometry, and polarity
E. Intermolecular forces
F. Measurements and the metric system, including the metric prefixes mega, kilo, deci, centi, milli, and micro
G. Moles and simple stoichiometry
H. States of matter and gas laws
I. Chemical energy, including specific heat problems
J. Water and solutions
    1. Solubility rules
    2. Molarity and osmolarity, including solution preparation and simple stoichimetry calculations
    3. Equivalents/normality—simple calculations
    4. Percent concentration
        a. w/w or m/m
        b. w/v or m/v
        c. v/v
    5. Electrolytes
    6. Net ionic equations
    7. Properties such as surface tension and osmotic pressure and processes such as osmosis, and dialysis and their application to biological systems;
K. Important ionic reactions
L. Acidity, its measurement and control; pH calculations
M. Hydrolysis and buffers
N. Equilibrium
O. Kinetic Molecular Theory
P. Oxidation-reduction
Q. Introduction to radiochemistry
R. Techniques of collecting and recording data
S. Techniques of drawing conclusions from data
T. Qualitative and quantitative experiments in the laboratory, including
    1. Titration
    2. Conductivity of solutions
    3. Direct observation of reactions including precipitation and single replacement reactions
    4. Measurement of density
    5. An experiment investigating gas laws
    6. Empirical formula of a compound or of a hydrate
    7. An experiment on solution preparation including dilution
    8. An experiment with acids and bases

VI. METHODS OF INSTRUCTION:

A. Audio-visual materials which may include any of the following 1. Periodic table, 2. Molecular models, 3. PowerPoint presentations, 4. Computer simulations
B. Demonstrations of chemical reactions and related phenomena
C. Lecture, informal with student questions encouraged
D. Safety and proper respect for chemicals and scientific apparatus are constantly stressed.
E. Proper chemical hygiene is taught and enforced in all laboratories.
F. Laboratory experimentation, including individual and group work

VII. TYPICAL ASSIGNMENTS:

A. Reading
    1. Read the chapter on measurements in your textbook. Be able to answer all the end-of-chapter questions on this topic.
B. Laboratory
    1. Observe what happens when samples of copper, magnesium, zinc, iron, and lead are added to solutions of hydrochloric acid, silver nitrate, and aluminum chloride. Describe what you observe and write balanced complete, total ionic, and net ionic equations for any observed reactions.
    2. Titrate a sample of vinegar with sodium hydroxide to determine the concentration of acetic acid in the vinegar.

VIII. EVALUATION:

A. **Methods**

    1. Other:
        a. Homework
        b. Quizzes
        c. Tests (typically one-hour, consisting of a mixture of multiple-choice and short answer questions)
        d. Written lab reports
        e. Final Examination

B. **Frequency**

    1. Homework is typically assigned by the chapter. It may or may not be collected at the discretion of the instructor.
    2. Quizzes may consist of daily one-question tests or may be administered every one to three weeks.
    3. Tests may be given from 1 to 5 times during the term, depending upon the frequency of quizzes.
    4. A minimum of 10 written laboratory reports based on departmentally approved experiments and graded on criteria that may include the following
        a. Completeness of data collected
        b. Quality of data collected
        c. Computational precision and accuracy
        d. Proper use of symbolic notation
        e. Quality of analysis of scientific principles explored
        f. Quality of narrative explanations and reasoning

IX. TYPICAL TEXTS:

1. Stoker, Stephen. *General, Organic and Biological Chemistry*. 7 ed., Cengage Learning, 2016.

2. Timberlake, Karen. *General, Organic, and Biological Chemistry: Structures of Life*. 5 ed., Prentice Hall, 2016.
3. Bettelheim, Frederick, William Brown, Mary Campbell, Shawn Farrell, and Omar Torres. *Introduction to General, Organic, and Biochemistry*. 11 ed., Cengage Learning, 2016.
4. Las Positas College Faculty. Lab Manual: How Matter Behaves. Las Positas College , 2015.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Safety goggles approved for Chemistry laboratory
B. Scientific calculator