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SAN DIEGO COMMUNITY COLLEGE DISTRICT
CITY, MESA, AND MIRAMAR COLLEGES
ASSOCIATE DEGREE COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER: Chemistry 100L

COURSE TITLE: Fundamentals of Chemistry Laboratory **Units:** 1
Letter Grade or Pass/No Pass Option

CATALOG COURSE DESCRIPTION:

This laboratory course is designed to illustrate the principles of inorganic and physical chemistry as presented in Chemistry 100 and to familiarize students with common laboratory equipment and data collection methods. Along with Chemistry 100, this course is taken by students majoring in nursing or allied health sciences and provides a foundation for further lab work in chemistry.

REQUISITES:

Corequisite:
CHEM 100

Advisory:

ENGL 049 with a grade of "C" or better, or equivalent or Assessment Skill Level W5
&
ENGL 048 with a grade of "C" or better, or equivalent or Assessment Skill Level R5
&
MATH 046 with a grade of "C" or better, or equivalent or Assessment Skill Level M40

FIELD TRIP REQUIREMENTS: May be required

TRANSFER APPLICABILITY: Associate Degree Credit & transfer to CSU and/or private colleges and universities IGETC UC Transfer Course List CHEM 100, 100L and 152, 152L combined: maximum credit, 4 units. No credit for 100, 100L or 152, 152L if taken after CHEM 200. CSU General Education

TOTAL LECTURE HOURS:

TOTAL LAB HOURS: 48 - 54

STUDENT LEARNING OBJECTIVES:
Upon successful completion of the course the student will be able to:

1. Locate and use safety equipment and follow safety procedures in the chemistry lab.
2. Identify laboratory equipment, supplies and techniques commonly used in the chemistry lab.
3. Use appropriate equipment and instruments to make simple laboratory measurements such as mass, volume, length and temperature.
4. Employ the metric system of measurement when working with measured quantities and use units and significant figures correctly.
5. Explain the differences between elements, compounds, mixtures and solutions.
6. Employ scientific reasoning in the chemistry lab by collecting and organizing data, developing a hypothesis, testing and modifying a model, and by distinguishing between observations and conclusions.

7. Apply a variety of techniques to separate heterogeneous mixtures and solutions into their components.
8. Use common chemical and physical properties of matter to differentiate between a chemical and a physical change.
9. Measure the volume of a solid from dimensions and by water displacement and calculate the density of liquids and solids.
10. Recognize and explain periodic trends in the properties of elements, locate metals on the periodic table and distinguish between metals and nonmetals.
11. Set up experiments to confirm predictions as to whether or not a double replacement reaction will occur spontaneously.
12. Define oxidation and reduction in terms of a transfer of electrons and a change of oxidation number, and identify an element being oxidized and an element being reduced.
13. Analyze a chemical compound to determine the molar relationships of its components and/or its empirical formula.
14. Prepare solutions by dissolving solids and by diluting stock solutions
15. Recognize whether a given pH value represents an acidic, a basic or a neutral solution and identify a given substance as an acid or a base.
16. Use titration to determine the concentration of a solution and a volumetric pipet and/or buret to measure solution volume.

SECTION II

1. COURSE OUTLINE AND SCOPE:

A. **Outline Of Topics:**
The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

I. Safety procedures in the chemistry lab
  A. Proper handling of equipment
  B. Proper handling and disposal of chemicals
  C. Personal protective equipment
II. Introduction to the chemistry lab
  A. Laboratory equipment and supplies
    1. Mass determinations
    2. Volume determinations
    3. Length determinations
    4. Temperature determinations
  B. Selected laboratory techniques
    1. Cleaning glassware
    2. Use of Bunsen burner
    3. Separation of mixtures
    4. Titration
  C. Measurement
    1. System of measurement
      a. Metric/International System (SI)
      b. English
    2. Units
    3. Significant figures
  D. Definitions
    1. Elements
    2. Compounds
    3. Mixtures
    4. Solutions
III. Introduction to scientific reasoning
  A. Data collection and organization
  B. Observations
    1. Qualitative
    2. Quantitative
  C. Hypothesis development

D. Model testing and modifications
E. Observations versus conclusions

IV. Techniques for the separation of heterogeneous mixtures into their components
A. Separating a solution into its components
1. Decantation
2. Filtration
B. Separating a solution
1. Evaporation
2. Distillation

V. Properties of matter
A. Chemical and physical properties of matter
B. Chemical change versus physical change
C. Density
1. Measuring the volume of a solid by water displacement
2. Determining the volume of a solid from dimensions
3. Calculating the volume of a liquid

VI. Periodicity
A. Periodic table terminology
B. Periodic trends in the properties of the elements
C. Locating metals on the periodic table
D. Metal versus nonmetal

VII. Chemical changes
A. Evidence
B. Classification
1. Double replacement
a. Recognizing a double replacement
b. Predicting whether a double replacement will occur spontaneously
c. Writing a balanced chemical equation for a double replacement
2. Single replacement
a. Recognizing a single replacement
b. Predicting whether a single replacement will occur spontaneously
c. Writing a balanced chemical equation for a single replacement reaction
3. Oxidation-reduction
a. Defining oxidation and reduction in terms of electron transfer
b. Defining oxidation and reduction in terms of change in oxidation number
c. Identifying an element being oxidized
d. Identifying an element being reduced
C. Stoichiometry
1. Mole concept
2. Percentage composition
3. Chemical formulae
4. Molar ratio of reactants and products
5. Titration

VIII. Properties and preparation of solutions
A. Units of concentration
1. Molarity
2. Weight percent
3. Weight/volume percent
B. Concentration calculations
1. Determining the value of a variable in an equation
2. Converting from one concentration unit to another
C. Preparing solutions
1. By dissolving solids
2. By diluting stock solutions

IX. Acids and bases
A. Definition of pH
B. Identifying whether a given pH value represents:
1. An acidic solution
2. A basic solution
3. A neutral solution

C. A strong versus a weak acid
D. Identifying common properties and reactions
    1. Acids
    2. Bases

X. Titration
A. Determining molar ratios of reactants and products in a chemical reaction
B. Determining the concentration of a solution using titration
C. Determining when a reaction is complete
D. Using a volumetric pipet and/or a buret to measure solution volume

B. **Writing Assignments:**
Writing assignments are required and may include, but are not limited to, the following:

I. 1. Laboratory reports that illustrate the student's understanding of the fundamental concepts of inorganic and physical chemistry demonstrated through laboratory experiment
II. 2. Calculations related to measurements, molarity and chemical reactions.

C. **Reading Assignments:**
Reading assignments are required and may include but, are not limited to, the following:

I. 1. The assigned laboratory book
II. 2. Handouts detailing chemistry laboratory procedures and/or experiments
III. 3. Selections from the Science section of the San Diego Union Tribune, The Los Angeles Times and/or other periodicals
IV. 4. Selections from Internet sites such as
V. a. www.chemcenter.org
VI. b. www.chemsoc.org

D. **Appropriate Assignments that Demonstrate Critical Thinking:**
Critical thinking assignments are required and may include, but are not limited to, the following:

I. 1. Apply the principles, concepts and theories of inorganic and physical chemistry to set up a variety of laboratory experiments
II. 2. Interpret, analyze and evaluate inorganic and physical chemistry laboratory experiment results in written form

E. **Appropriate Outside Assignments:**
Outside assignments may include, but are not limited to, the following:

I. 1. Laboratory preparation including reading and writing assignments related to upcoming laboratory experiments in physical and inorganic chemistry
II. 2. Laboratory reports that illustrate the student's understanding of the concepts of physical and inorganic chemistry demonstrated through laboratory experiments
III. 3. Short interpretive essays relating theoretical concepts to practical applications in chemistry

2. METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

I. Performance on written, oral and hands-on quizzes and examinations that test the student's theoretical and practical knowledge of inorganic and physical chemistry in the laboratory Performance on laboratory reports that illustrate the student's understanding of the inorganic and physical chemistry concepts demonstrated through laboratory experiments Laboratory attendance and participation

3. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Lecture
* Laboratory
* Distance Education
* Other (Specify)
* Distance Education
* 1. Lectures and demonstrations dealing with laboratory experiments that illustrate the principles of inorganic and physical chemistry
* 2. Group problem solving, discussion and/or critiques related to problems dealing with balanced chemical equations, measurements, molarity and titration
* 3. Computer-assisted or other self-paced instruction
* 4. Field trips or field assignments related to practical uses of the inorganic and physical chemistry

4. REQUIRED TEXTS AND SUPPLIES:
Textbooks may include, but are not limited to:

TEXTBOOKS:
1. Buell, Phyllis and James Girard. Laboratory Manual for Chemistry Fundamentals, 2nd ed. Jones and Bartlett Publishers, 2002, ISBN: 0763712051
2. Burns, Ralph A.. Fundamentals of Chemistry in the Laboratory, 4th ed. Prentice Hall, 2003, ISBN: 0130337269
3. Corwin, Charles H.. Prentice Hall Laboratory Manual for Introductory Chemistry, 3rd ed. Prentice Hall, 2002, ISBN: 0130623334
4. Gloffke, Wendy and Doris Kimbrough. Laboratory Manual for Introductory Chemistry, 2nd ed. Benjamin Cummings, 2002, ISBN: 0321046390
5. Hein, Morris et al.. Foundations of College Chemistry in the Laboratory, 11th ed. John Wiley & Sons, 2004, ISBN: 0471451959
6. Peller, Julie. Exploring Chemistry Laboratory Experiments in General, Organic and Biological Chemistry, 2nd ed. Prentice Hall, 2003, ISBN: 0130477141

MANUALS:

PERIODICALS:

SOFTWARE:

SUPPLIES:
1. Z-87 chemistry goggles
2. Plastic lab apron or lab coat

ORIGINATOR: Nancy Crispen

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