

A. CATALOG DESCRIPTION (include prerequisites)

Course Title: Chemical Principles I
Credits: 4
Hours/Week: 3 hours lecture and one 3-hour lab per week
Semesters Offered: Fall, Spring
Prerequisites: MATH 0099 or equivalent, MATH 1115 or concurrent enrollment strongly recommended. High school chemistry with grade of C or better and/or Chemistry 1101.

This course meets the Minnesota Transfer Curriculum in NS (Natural Science) and CT (Critical Thinking).

The first semester of a two-semester study of general chemistry for the science major. The course covers basic terminology, chemical principles and laws relating to chemical changes, present views as to the structure of matter and its influence on chemical changes. Problem solving related to conversion units, stoichiometry, percent composition, formulas of compounds, gas, liquid and solid state relations and solution mixture.

B. DATE LAST REVISED (use current date): December, 2004

C. RECOMMENDED ENTRY SKILLS/KNOWLEDGE:

College-level reading and writing skills and working knowledge of intermediate algebra

D. OUTLINE OF MAJOR CONTENT AREAS:

1. Math and Measurements
 - a. Significant figure and proper round off
 - b. Exponential notation
 - c. Measurement systems
 - d. Conversion units
2. Basic Atomic Structure of Matter
 - a. Elements and atoms
 - b. Molecules and compounds
 - c. Chemical notation and formulas
 - d. Compound nomenclature
 - e. % composition, empirical and molecular formulas
 - f. Equation writing and stoichiometry
 - g. The periodic table
 - h. Electronic structure of the atom
 - i. Bonding (ionic and covalent)
 - j. Shapes and structure of molecules
3. Kinetic Theory and Gas Laws
4. Liquid and Solid State Theory

D. OUTLINE OF MAJOR CONTENT AREAS (continued):

5. Solution Theory
 - a. Solution preparation and concentration expression
 - b. Colligative properties
6. Thermochemistry
7. Environmental Issues

The laboratory activities are used to enhance, correlate and demonstrate a variety of methods and equipment used in scientific inquiry and as verification of various scientific laws and theories. Laboratory measurement are obtained and recorded by students during the lab period. The results are analyzed and certain specified calculations are required to demonstrate and verify related laws and relationships. Reports and/or quizzes are handed in for evaluation.

E. LEARNING OUTCOMES (GENERAL):

1. Be cognizant of the basic chemical vocabulary
2. Be able to solve problems using experimental and/or simulated data and relate them to the chemical principles and laws involved
3. Be reasonably knowledgeable of the basic principles and laws involved in the areas of stoichiometry, gas, liquid and solid states of matter, colligative properties of matter.
4. Be reasonably knowledgeable of present day theories relative to atomic structure and the makeup of matter and how they help explain chemical phenomena
5. Gain a perception of how chemistry relates to one's everyday activities
6. Be cognizant of the uncertainty of collected laboratory data and the calculated values arrived at by analyzing said data relative to known chemical principles and laws.
7. Be knowledgeable and perceptive of how chemical products and processes impact the surrounding environment and its ecosystems.

F. LEARNING OUTCOMES (MNTC):

Critical Thinking

- a. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive and conscious of the bias in the information selected.
- b. Imagine and/or seek out a variety of possible goals, assumptions or perspectives which can give meaning to a given problem.
- c. Analyze the logical connections between facts, goals and assumptions relevant to a problem and evaluate claims which may be said to follow from them.
- d. Recognize and articulate the value of assumptions which underlie and affect decisions, interpretations, analyses and evaluations made by oneself and others.

F. LEARNING OUTCOMES (MNTC): (continued)

Natural Science

- a. Demonstrate understanding of scientific theories and the ways in which scientists develop, express and question said theories in the field of chemistry.
- b. Formulate and test hypotheses by performing laboratory experiments requiring collection of data, its statistical and/or graphical analysis, and an appreciation of uncertainty and sources of error.
- c. Communicate their findings, analysis and interpretations both orally and in writing.

G. METHODS FOR EVALUATION OF STUDENT LEARNING:

Several broad coverage unit tests covering terminology, relationships of various laws and theories and problem solving are given for the major part of the grade. Also, several problem type quizzes are given over smaller but similar areas. Weekly laboratory reports constitute the remainder of the evaluation.

Textbook, laboratory manual and calculator are required. Sometimes a study guide and/or problem solutions manual are available as optional.

H. SPECIAL INFORMATION (fees, directives on hazardous materials, etc.):

The initial lab session explains and familiarizes the student with general safety hazards and safety equipment in the lab. During the pre-lab discussion, the hazardous characteristics of the chemicals used during the lab are discussed. The students will be instructed on the proper disposal of any hazardous products. The instructor will direct all students to wear necessary protective equipment while working with the chemicals. A copy of Material Safety Data Sheets for chemicals used is available in the lab.