

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
CHM 111 - GENERAL CHEMISTRY I (4 CR)

Course Description

Explores the fundamental laws, theories, and mathematical concepts of chemistry. Designed primarily for science and engineering majors. Requires a strong background in mathematics.

Part I of II. Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week.

General Course Purpose

This is the first half in the two semester College chemistry series. The goal of this course is to become aware of the fundamental concepts and have a general understanding of chemistry. The emphasis will also be on problem solving and critical thinking skills. Topics to be covered include: Chemical Foundations; Atoms; Atomic Structure and Periodicity; Bonding; Molecules and Ions; Gases; Stoichiometry; Chemical Reactions; Thermochemistry

The general purpose of this course is to prepare the student for advanced study in science through development of:

1. Skills in problem solving and in critical thinking.
2. An understanding of the methods of scientific inquiry.
3. Understanding of the general concepts and principles of chemistry

Prerequisites/Corequisites

Satisfactory placement scores for ENG 111 and MTH 161 (or completion of unit 9 of MTT course)

Course Objectives

As a result of the learning experiences provided in this course, the student should be able to:

- Apply the principles of scientific method and measurement.
- Describe atomic structure, emphasizing the electron configuration of atoms and chemical periodicity.
- Name and write formulas for inorganic compounds.
- Perform calculations involving stoichiometry, thermochemistry, unit conversions, molarity, density and percent composition.
- Determine the type of bonding, molecular structure and polarity of given compounds or molecules.
- Predict the properties of substances using the principles of molecular geometry and polarity.
- Complete and balance simple chemical equations.
- Describe properties of ideal and real gases and be able to perform calculations for ideal gases.
- Describe properties of Coffee cup and Bomb calorimeters, and be able to perform calculations involving calorimetry and enthalpy.

Major Topics to be Included**1. Measurement**

- a. SI units
- b. Accuracy and precision
- c. Scientific notation
- d. Significant figures
- e. Dimensional analysis

2. Atomic structure

- a. Subatomic particles
- b. Electron configurations
- c. Periodic relationships of the elements

3. Nomenclature and formula writing**4. Stoichiometry**

- a. Mole concept
- b. Writing balanced chemical equations
- c. Calculations based on balanced equations

5. Thermochemistry

- a. Hess's Law
- b. Heats of reactions
- c. Bond energies
- d. Calorimetry

6. Chemical Bonding

- a. Ionic Bonding
- b. Polar and nonpolar covalent bonding
- c. Metallic bonding
- d. Lewis structures and VSEPR
- e. Valence bond theory including hybrid orbitals
- f. Molecular orbital theory

7. Gases

- a. Kinetic molecular theory of gases
- b. Gas Laws
- c. Calculations based on gas laws
- d. Ideal and real gases

CHM 111 Lab Objectives

As a result of the learning experience provided in the laboratory component of this series, the student should be able to:

1. Practice safe procedures in the laboratory.
 - a. Transferring and dispensing chemicals in laboratory,
 - b. Disposing of chemicals safely in laboratory
 - c. Safety data sheets (SDS)
2. Use basic techniques of:
 - a. Precise weighing
 - b. pH measurement
 - c. Volume measurement and titration techniques
 - d. Quantitative analysis
 - e. Qualitative analysis
 - f. Graphical analysis
 - g. Spectrophotometric techniques
3. Calculate experimental results to correct number of significant figures, including analysis of error.
4. Use statistics to determine validity of data
5. Analyze and interpret the experimental results and draw appropriate conclusions.
6. Prepare written laboratory report including 3-5 above.