

**COURSE OUTLINE**  
**CHEM-102**  
**General Inorganic Chemistry II**  
**4 Semester Hours**  
**Science Core Course**

**HOWARD COMMUNITY COLLEGE**

**Description**

This course, designed mainly for science majors and pre-professional students, will enable students to solve problems involving chemical thermodynamics, chemical equilibrium, ionic and heterogeneous equilibria in aqueous solutions, electrochemistry, and reaction rates. Independent lab experiments will provide students with data that they can appraise, use, and interpret to identify unknowns in qualitative and quantitative analysis. Prerequisite: CHEM-101. (3 hours lecture, 3 hours lab)

**Statement on General Education and Liberal Learning**

A liberal education prepares students to lead ethical, productive, and creative lives and to understand how the pursuit of lifelong learning and critical thinking fosters good citizenship. General education courses form the core of a liberal education within the higher education curriculum and provide a coherent intellectual experience for all students by introducing the fundamental concepts and methods of inquiry in the areas of mathematics, the physical and natural sciences, the social sciences, the arts and the humanities, and composition. This course is part of the general education core experience at Howard Community College.

**Overall Course Objectives**

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

1. Develop an appreciation for scientific inquiry.
2. Interpret chemistry facts and principles.
3. Interpret the data collected in the laboratory as shown by the correct identification of a series of unknown substances.
4. Observe all safety regulations in the laboratory.
5. Write, using data collection and analysis techniques, a complete formal laboratory report.
6. Define the terminology of chemistry including units, name of equipment and vocabulary.
7. Apply problem-solving techniques, such as dimensional analysis, for conversion to the appropriate units.
8. Apply chemistry principles to solve quantitative and qualitative problems.
9. Apply chemical principles in explaining practical chemistry applications.
10. Define the role of chemistry in one's future and the interrelationship of chemistry and other sciences.

**Major Topics**

- I. Kinetics
  - A. Chemical Reaction Rates
  - B. Rate Expressions
  - C. Reaction Mechanisms
  - D. Activation Energy

- II. Chemical Equilibria
  - A. The Equilibrium Constant
  - B. Equilibrium Calculations
  - C. Factors Affecting Equilibria
  
- III. Ionic Equilibrium: Acids and Bases
  - A. Lewis Concept
  - B. Strong Acids and Bases
  - C. Weak Acids and Bases
  - D. pKa and pKb
  - E. Hydrolysis
  
- IV. Aqueous Equilibria
  - A. Common Ion Effect and Buffer Solutions
  - B. Henderson-Hasselbach Equation
  - C. Acid-Base Titration Curves
  - D. Acid-Base Indicators
  - E. The Solubility Product  $K_{sp}$
  - F. Solubility and the Common Ion Effect
  - G. Solubility and Complex Ions
  
- V. Chemical Thermodynamics
  - A. Spontaneity, Disorder and Entropy
  - B. Entropy and the Second Law
  - C. Gibbs Free Energy
  - D. Equilibrium Constants
  
- VI. Electrochemistry
  - A. Electrochemical Cells and Potentials
  - B. Voltaic Cells at Nonstandard Conditions
  - C. Electrolytic Cells
  - D. Faraday's Law

### **Course Requirements**

Grading/exams: Grading procedures will be determined by the individual faculty member but will be calculated on the basis of exams, lab quizzes, lab experiments and lab notebook. This course includes a final exam. Written lab reports will be required.

Writing: Specific writing assignments will be determined by the individual faculty member, but will include lab reports.

### **Other Course Information**

This course is a Science core course, Science elective, and Arts and Sciences elective.