



**Course Name:** Concepts of Chemistry

**Course Number:** CHE\* E111

**Credits:** 4

**Catalog description:** Introduction to the fundamental principles and the concepts of inorganic chemistry. Atomic structure, periodic relationships, chemical bonding, kinetics and equilibria are examined in sufficient detail to permit their use in understanding chemical reactions. Topics are covered in less detail than Chemistry 121 and 122. The laboratory program stresses the acquisition of skills in data gathering and in manipulation of apparatus and materials. There are three hours of lecture and three hours of laboratory per week.

**Prerequisite:** MAT\*137 or MAT\*104 (grade "C" or better) and eligibility of ENG\*101

## **General Education Competencies Satisfied:**

**HCC General Education Requirement Designated Competency Attribute Code(s):**

SCKX      Scientific Knowledge & Understanding

**Additional CSU General Education Requirements for CSU Transfer Degree Programs:**

SCRX      Scientific Reasoning

**Embedded Competency(ies):**

*None*

**Discipline-Specific Attribute Code(s):**

SCI      Science elective

## **Course objectives:**

### **General Education Goals and Outcomes:**

**Scientific Knowledge & Understanding:** Students will gain a broad base of scientific knowledge and methodologies in the natural sciences. This will enable them to develop scientific literacy, the knowledge and



understanding of scientific concepts and processes essential for personal decision making and understanding scientific issues.

☒ **Scientific Reasoning (for CSCU Transfer Degree Programs):** Students will become familiar with science as a method of inquiry. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions.

### **Course Specific Objectives:**

1. Become familiar with the language of chemistry and use it to describe and interpret physical and chemical phenomena.
2. Recognize the basic principles, which underlie change, and apply them in solving problems.
3. Discover the relationships among chemical principles and phenomena and use these to see chemistry as the unified body of knowledge rather than as a disjointed collection of facts.
4. Apply mathematical concepts and methods in the treatment of chemical data obtained in the laboratory as well as in class discussions.
5. Collect and correlate data in order to make intelligent decisions and predictions.
6. Employ basic measuring devices used to gather data in the laboratory.
7. Perform fundamental laboratory operations such as separations, purifications and identifications.
8. Carry out laboratory processes which illustrate and amplify the theoretical concepts examined in lectures.
9. Apply mathematical concepts and methods in the treatment of chemical data obtained in the laboratory as well as in class discussions.
10. Report data and results in a clear, concise and accurate manner.
11. Utilize policies and procedures to maximize safety and minimize environmental impact of laboratory exercises.
12. Interpret the findings of the classical experiments in atomic structure which lead to the development of modern atomic theory using the scientific method.
13. Analyze the results of a chemical experiment for accuracy and/or precision.
14. Demonstrate the ability to correctly use chemical nomenclature to communicate and predict the chemical and physical properties of matter

### **Course Content:**

#### **Lecture:**

Introduction

Definitions

Measurements

Data presentation

Ethical questions

Matter and Properties

Atomic structure



- Atomic theory
- Process of Scientific Inquiry
- Periodicity
  - Periodic Law
  - Electron arrangement
  - Trends
- Chemical Bonding
  - Ionic and covalent bonds
  - Properties
  - Geometry
- Chemical Equations
  - Compounds
  - Mole concept
  - Reaction types
  - Stoichiometry
- States of Matter
  - Gases and gas laws
  - Liquids and their properties
  - Solids and their properties
  - Intermolecular Forces
- Solutions
  - Properties
  - Concentration
  - Calculations
- Chemical and Physical Changes
  - Energy and Entropy
  - Rates
  - Equilibrium
- Charge Transfer Reactions
  - Oxidation-reduction
  - Acids, bases and salts
  - Hydrolysis
  - Buffers
- Radioactivity
  - Particles and Energy
  - Nuclear equations
  - Radioisotopes and medicine
  - Ethical questions



## Laboratory:

Experiments and discussions will be chosen to illustrate the following concepts in the sequence shown.

### INTRODUCTION

1. Measurement techniques
2. Data-gathering, collating, displaying and reporting
3. Unit conversions
4. Dealing with experimental errors. Ethical questions
5. Laboratory safety, waste disposal. Social responsibility.

### Basic Measurement

1. Length
2. Area
3. Volume
4. Mass
5. Density and Specific Gravity
6. Temperature

### Properties of Matter

1. Chemical properties
2. Physical Properties
3. Separations of mixtures and identification of components

### Gas Laws

1. Charles' Law
2. Combined Gas Laws

### Water and Solutions

1. Temperature effects

### Equilibrium

1. Solubility
2. Reactions
3. Factors and directional shifts

### Chemical and Physical Changes

1. Energy and Entropy
2. Rates (as it relates to an explanation of equilibrium)
3. Equilibrium

### Acids, Bases and Salts

1. Identification
2. pH measurement
3. Hydrolysis
4. Buffers
5. Analysis – titrations



### **HCC Safety Standard**

Instruction covering all safety rules and guidelines will be provided by the instructor during the first laboratory session. The safety features of the individual laboratory will also be highlighted by the instructor. Students are expected to read and understand the rules of the HCC Science Laboratory Student Safety Contract. The students will then sign this contract signifying that they have been instructed and understand the requirements for safety pertaining to their course. The student and instructor will each keep a copy of this contract. Students must come to the laboratory prepared for the laboratory activity. Students must abide by the safety rules and guidelines which may include wearing personal protection equipment. Failure to do so may result in removal from the laboratory by the instructor.

Date Course Created:

Date of Last Revision: 02/27/2017