



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences and Business

COURSE: CHM 1004 Chemistry

Date: Spring 2023

Credit Hours: 4

Complete all that apply or mark "None" where appropriate:

Prerequisite(s): None

Enrollment by assessment or other measure? Yes No

If yes, please describe:

Corequisite(s): None

Pre- or Corequisite(s): MTH 0920

Consent of Instructor: Yes No

Delivery Method:	<input checked="" type="checkbox"/> Lecture	2 Contact Hours (1 contact = 1 credit hour)
	<input checked="" type="checkbox"/> Seminar	1 Contact Hours (1 contact = 1 credit hour)
	<input checked="" type="checkbox"/> Lab	2 Contact Hours (2-3 contact = 1 credit hour)
	<input type="checkbox"/> Clinical	0 Contact Hours (3 contact = 1 credit hour)

Offered: **Fall** **Spring** **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):

This is an introductory course in chemistry suitable as a general education laboratory science course or as a preparatory course for general chemistry. Basic concepts, terminology and mathematical skills are emphasized. Concepts of matter and its classification, energy, atomic structure, periodic table, chemical compounds and their nomenclature, mole concept, chemical reactions, reaction stoichiometry, and introductory organic chemistry are covered. **IAI Equivalent: P1 902L**

ACCREDITATION STATEMENTS AND COURSE NOTES:

None

COURSE TOPICS AND CONTENT REQUIREMENTS:

Topic 1: Chemistry: An Introduction

Students will be able to:

- 1.1. Understand the importance of learning chemistry – a central science
- 1.2. Define Chemistry
- 1.3. Understand Scientific thinking and describe the method scientists use to study nature

Topic 2: Matter & Classification

Students will be able to:

- 2.1. Understand the definition of matter and its classification
- 2.2. Distinguish between Pure Substances and Mixtures
- 2.3. Learn how to separate mixtures
- 2.4. Distinguish between Elements and Compounds
- 2.5. Distinguish between Physical & chemical changes

Topic 3: Measurements and Energy

Students will be able to:

- 3.1. Show how very large or very small numbers can be expressed in scientific notation
- 3.2. Learn the English, metric, and SI systems of measurement
- 3.3. Use the metric system for measuring Length, Volume, Mass & Density
- 3.4. Understand how uncertainty in measurements arises and how it can be indicated using significant figures
- 3.5. Learn how to determine significant figures in a calculated result
- 3.6. Learn how to use Dimensional Analysis (unit analysis) to solve problems
- 3.7. Learn the three temperature scales and how to interconvert between them
- 3.8. Learn about different forms of Energy, energy units and how heat energy can be measured

Topic 4. Chemical Foundations

Students will be able to:

- 4.1. Learn about Atoms and the Dalton's atomic theory
- 4.2. Learn about the particles that make up atoms (subatomic particles) and their discovery
- 4.3. Learn the properties of subatomic particles and their function
- 4.4. Understand Rutherford's Gold Foil experiment to characterize the atom's structure
- 4.5. Learn about isotopy, atomic number and mass number
- 4.6. Learn about the Periodic Table, its classification into columns and rows, and its classification into metals, nonmetals and metalloids
- 4.7. Learn about ions and how the periodic table can be used to predict the ions formed by elements

Ions & Periodic Table

Topic 5: Chemical compounds & Nomenclature

Students will be able to:

- 5.1. Learn the two categories of compounds: Ionic and Molecular compounds

- 5.2. Learn how to determine the Formulae of compounds
- 5.3. Learn how to name Ionic and Molecular compounds
- 5.4. Learn how to name Binary acids and polyatomic acids

Topic 6: Chemical Reactions & Equations

Students will be able to:

- 6.1. Learn the clues that show a chemical reaction has occurred
- 6.2. Learn the characteristics of a chemical reaction and information given by chemical equation writing and balancing chemical Equations
- 6.4. Learn how to write and balance chemical equations
- 6.5. Learn the major categories of reactions: synthesis, decomposition, single displacement, double displacement and combustion reactions

Topic 7: Reactions in Aqueous Solution

Students will be able to:

Learn to describe reactions in solution by writing molecular, complete ionic, and net ionic equations

Topic 8. Chemical Composition

Students will be able to:

- 8.1. Understand the concept of average mass and explore how counting can be done by weighing.
- 8.2. Understand the mole concept and Avogadro Number
- 8.3. Learn how to convert among moles, mass, and number of particles in a given sample
- 8.4. Learn how to find the percent of a given element in a compound
- 8.5. Understand the meaning of empirical formula and learn how to calculate it
- 8.6. Learn how to calculate the molecular formula of a compound if given empirical formula and molar mass

Topic 9. Chemical Quantities

Students will be able to:

- 9.1. Understand the molecular and mass information given in a balanced equation
- 9.2. Use balanced equations to determine the relationships between moles of reactants and products
- 9.3. Understand the meaning of limiting reactant and how to calculate the yield of a reaction

Topic 10. Electron Configuration

Students will be able to:

- 10.1. Learn about the arrangement of electrons in shells
- 10.2. Learn about the shapes of orbitals designated by s, p, and d
- 10.3. Learn about the principal energy levels and how electrons are arranged into orbitals
- 10.4. Electron configuration of elements from atomic number 1 to 30

Topic 11. Chemical Bonding and Intermolecular Forces

Students will be able to:

- 11.1. Learn about ionic and covalent bonds and explain how they are formed

- 11.2. Learn how to write Lewis structures
- 11.3. Understand bond polarity and its relationship to electronegativity
- 11.4. Understand molecular structure and bond angles
- 11.5. Understand Intermolecular forces: hydrogen bonding, dipole-dipole interaction and London dispersion forces
- 11.6. Physical properties influenced by intermolecular forces

Topic 12. Radioactivity

Students will be able to:

- 12.1. Learn the types of radioactive decay
- 12.2. Learn to write nuclear equations that describe radioactive decay
- 12.3. Understand half-life
- 12.4. Understand how objects can be dated by radioactivity

Topic 13. Organic Chemistry

Students will be able to:

- 13.1. Define Organic Chemistry
- 13.2. Learn about alkanes and their structural isomers
- 13.3. Learn how to name hydrocarbons: alkanes,
- 13.4. Recognize simple functional groups in organic compounds
- 13.5. Understand hydrocarbons alkanes, alkenes, alkynes and their reactions
- 13.6. Learn about simple alcohols and carboxylic acid

INSTRUCTIONAL METHODS: Lecture

Lecture demonstrations

Youtube videos (animations of chemical processes, chemical demonstrations)

Laboratory experiments

Laboratory reports

Online Homework and Quizzing system

Examinations

Peer tutoring

EVALUATION OF STUDENT ACHIEVEMENT:

Regular attendance in lecture, seminar and laboratory

Reading assignments

Quizzes

Online homework assignments

Exams

Participation in classroom discussions

Performance of laboratory experiments

A = 90 -100

B = 80 – 89

C = 70 – 79

D = 60 – 69

F = 59 and below

INSTRUCTIONAL MATERIALS:

Textbooks

Introductory Chemistry, Zumdahl/DeCoste, Cengage Learning.
Lab Manual for CHM 1004
Laboratory notebook
Visorgog Safety Goggles

Resources

Chemistry and Chemical Reactivity, Kotz
Handbook of Laboratory Safety, Steere
Chemistry, Chang
www.acs.org
Journal of Chemical Education

LEARNING OUTCOMES AND GOALS:

Institutional Learning Outcomes

- 1) Communication – to communicate effectively;
- 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;
- 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;
- 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

Outcome 1 - Students will be able to perform mathematical calculations and problem solving techniques to utilize interpret and present given chemical data or data collected in the lab

Outcome 2 - Students will be able to demonstrate an understanding of the general introductory concepts of chemistry and chemical reactions

Outcome 3 - Students will be able to demonstrate an understanding of the basic concepts of energy and energy change

Outcome 4 - Students will be able to demonstrate an understanding of atomic theory and bonding

Outcome 5 - Students will be able to demonstrate an understanding of solutions and their role in chemical reactions

Outcome 6 - Students will be able to perform basic laboratory techniques and systematic approaches to laboratory procedures (a "scientific method").

Outcome 7 - Students will be able to demonstrate an understanding of the various principles of nuclear chemistry and the applications that make nuclear chemistry a viable area of research

Outcome 8 - Students will be able to demonstrate an understanding of the various states of matter.

Outcome 9. Students will be able to demonstrate an understanding of the bonding in organic compounds, classification of organic compounds and the identification of organic functional groups.