

# CH 007: FUNDAMENTALS OF CHEMISTRY

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Date Submitted: Mon, 08 May 2023 18:15:12 GMT

**Formerly known as:**

CH 004 (or if cross-listed - inactivated courses associated with this course)

**Originator**

dmayo

**Justification / Rationale**

Adding disclaimer RE: Change to CH 004.

**Effective Term**

Fall 2023

**Credit Status**

Credit - Degree Applicable

**Subject**

CH - Chemistry

**Course Number**

007

**Full Course Title**

Fundamentals of Chemistry

**Short Title**

FUNDAMENTALS OF CHEMISTRY

**Discipline****Disciplines List**

Chemistry

**Modality**

Face-to-Face  
Hybrid

**Catalog Description**

This course is a survey of basic principles of inorganic, organic and bio-organic chemistry presented on a level for the general student. Note: This course, in conjunction with CH 005, meets the requirements for Bachelor's degrees in nursing, dental hygiene, and allied health programs. Beginning Fall 2023 CH 004 is becoming CH 007. CH 004 will be offered one last time during Summer 2023 before the course transitions to CH 007.

**Schedule Description**

This course covers the basic principles of inorganic, organic and biochemistry. Prerequisite: MATH 054 Advisory: ENG 061

**Lecture Units**

4

**Lecture Semester Hours**

72

**Lab Units**

1

**Lab Semester Hours**

54

**In-class Hours**

126

**Out-of-class Hours**

144

**Total Course Units**

5

**Total Semester Hours**

270

**Prerequisite Course(s)**

MATH 054

Advisory: ENG 061

**Required Text and Other Instructional Materials****Resource Type**

Book

**Author**

Karen C Timberlake

**Title**

Chemistry: An Introduction to General, Organic, and Biological Chemistry

**Edition**

13th/e

**City**

New York, NY

**Publisher**

Pearson Education

**Year**

2018

**College Level**

Yes

**Flesch-Kincaid Level**

12

**ISBN #**

0-13-442135-3

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**Resource Type**

Manual

**Author**

Karen C Timberlake

**Title**

Laboratory Manual for General, Organic, and Biological Chemistry

**Publisher**

Pearson Education

**Year**2014

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**For Text greater than five years old, list rationale:**

The listed lab manual is the most current one available.

**Class Size Maximum**

24

**Entrance Skills**

Develop the real number system: integers, rational and irrational numbers.

**Requisite Course Objectives**

MATH 054-Identify, recognize and classify real numbers, as integers, rationals, or irrationals and locate their approximate positions on the real number line.

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**Entrance Skills**

Demonstrate an understanding of the concept of a variable

**Requisite Course Objectives**

MATH 054-Understand the concepts of variables and how variables can be used to represent an unknown quantity or a range of quantities.

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**Entrance Skills**

Use variables to generate algebraic expressions modeling an application (word) problem

**Requisite Course Objectives**

MATH 054-Use variables to create algebraic expressions that model quantities in an application problem.

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**Entrance Skills**

Demonstrate arithmetic of algebraic expressions, including the use of the commutative, associative, distributive, identity, and inverse properties, the use of the order of operations, and the use of integer exponents and the rules of exponents.

**Requisite Course Objectives**

MATH 054-Use the properties of integer exponents to simplify algebraic expressions, including expressions involving scientific notation.

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**Entrance Skills**

Create equations that model real world situations given in application (word) problems.

**Requisite Course Objectives**

MATH 054-Use variables to create algebraic expressions that model quantities in an application problem.

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**Entrance Skills**

Demonstrate critical thinking skills when reading, composing, and participating in class discussions.

**Requisite Course Objectives**

ENG 061-Demonstrate the ability to think critically and express ideas using various patterns of development.

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**Entrance Skills**

Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

**Requisite Course Objectives**

ENG 061-Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

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**Entrance Skills**

Develop, organize, and express complex ideas in both expository and research papers.

**Requisite Course Objectives**

ENG 061-Use theses to organize paragraphs into coherent analyses.

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**Course Content**

1. Chemistry in Our Lives
  - a. Chemistry and Chemicals
  - b. The Scientific Method
  - c. Study and Note-taking Skills
  - d. Math Review
  - e. Scientific Notation
2. Measurements
  - a. Units of Measurement
  - b. Measured Numbers and Significant Figures
  - c. Significant Figures in Calculations
  - d. Prefixes and Equalities
  - e. Writing Conversion Factors
  - f. Problem Solving Using Unit Conversion
  - g. Density
3. Matter and Energy
  - a. Classification of Matter
  - b. States and Properties of Matter
  - c. Temperature
  - d. Energy
  - e. Energy in the Context of Nutrition
  - f. Specific Heat
  - g. Changes of State
4. Atoms and Elements
  - a. Elements and Symbols
  - b. The Periodic Table
  - c. The Atom
  - d. Atomic Number and Mass Number
  - e. Isotopes and Atomic Mass
  - f. Electron Energy Levels
  - g. Trends in Periodic Properties
5. Nuclear Chemistry
  - a. Natural Radioactivity
  - b. Nuclear Reactions
  - c. Radiation Measurement
  - d. Half-Life of a Radioisotope
  - e. Medical Applications Using Radioactivity
  - f. Nuclear Fission and Fusion
6. Ionic and Molecular Compounds
  - a. Ions: Transfer of Electrons
  - b. Ionic Compounds
  - c. Naming and Writing Ionic Formulas
  - d. Polyatomic Ions
  - e. Molecular Compounds: Sharing Electrons
  - f. Lewis Structures for Molecules
  - g. Electronegativity
  - h. Bond Polarity
  - i. Shapes of Molecules
  - j. Polarity of Molecules
  - k. Intermolecular Forces
7. Chemical Quantities and Reactions

- a. The Mole
  - b. Molar Mass
  - c. Calculations Using Molar Mass
  - d. Equations for Chemical Reactions
  - e. Types of Chemical Reactions
  - f. Oxidation-Reduction Reactions
  - g. Mole Relationships in Chemical Equations
  - h. Mass Calculations for Chemical Reactions
  - i. Energy in Chemical Reactions
8. Gases
- a. Properties of Gases
  - b. Boyle's Law
  - c. Charles's Law
  - d. Gay-Lussac's Law
  - e. The Combined Gas Law
  - f. Avogadro's Law
  - g. Dalton's Law
9. Solutions
- a. Solutions
  - b. Electrolytes and Nonelectrolytes
  - c. Solubility
  - d. Solution Concentrations
  - e. Dilution of Solutions
  - f. Properties of Solutions
10. Acids, Bases, and Equilibrium
- a. Arrhenius Acids and Bases
  - b. Brønsted-Lowry Acids and Bases
  - c. Strengths of Acids and Bases
  - d. Acid-Base Equilibrium
  - e. Dissociation of Water
  - f. The pH Scale
  - g. Reactions of Acids and Bases
  - h. Buffers
11. Introduction to Organic Chemistry: Hydrocarbons
- a. Organic Compounds
  - b. Alkanes
  - c. Substituted Alkanes
  - d. Properties of Alkanes
  - e. Alkenes and Alkynes
  - f. Cis-Trans Isomers
  - g. Addition Reactions
  - h. Aromatic Compounds
12. Alcohols, Thiols, Ethers, Aldehydes, and Ketones
- a. Alcohols, Phenols, Thiols, and Ethers
  - b. Properties of Alcohols
  - c. Aldehydes and Ketones
  - d. Reactions of Alcohols, Thiols, Aldehydes, and Ketones
13. Carbohydrates
- a. Carbohydrates
  - b. Chiral Molecules
  - c. Fischer Projections of Monosaccharides
  - d. Haworth Structures of Monosaccharides
  - e. Chemical Properties of Monosaccharides
  - f. Disaccharides
  - g. Polysaccharides
14. Carboxylic Acids, Esters, Amines, and Amides

- a. Carboxylic Acids
  - b. Properties of Carboxylic Acids
  - c. Esters
  - d. Ester Hydrolysis
  - e. Amines
  - f. Amides
  - g. Amide Hydrolysis
15. Lipids
- a. Types of Lipids
  - b. Fatty Acids
  - c. Waxes and Triacylglycerols
  - d. Chemical Properties of Triacylglycerols
  - e. Phospholipids
  - f. Steroids: Cholesterol, Bile Salts, and Steroid Hormones
  - g. Cell Membranes
16. Amino Acids, Proteins, and Enzymes
- a. Amino Acids
  - b. Proteins: Primary Structure
  - c. Proteins: Secondary, Tertiary, and Quaternary Structures
  - d. Enzymes
  - e. Factors Affecting Enzyme Activity

### Lab Content

1. Laboratory Safety
2. Measurement
3. Conversion Factors and Problem Solving
4. Density and Specific Gravity
5. Temperature and Specific Heat
6. Energy and Matter
7. Atoms and Elements
8. Electron Configuration and Periodic Properties
9. Compounds and Their Bonds
10. Chemical Reactions and Equations
11. Properties of Solutions
12. Reaction Rates and Chemical Equilibrium
13. Acids, Bases, pH, and Buffers
14. Organic Compounds: Alkanes
15. Reactions of Unsaturated Hydrocarbons
16. Alcohols and Phenols
17. Aldehydes and Ketones
18. Carboxylic Acids and Esters
19. Types of Carbohydrates
20. Tests for Carbohydrates
21. Saponification and Soaps
22. Amino Acids
23. Enzymes

### Course Objectives

	Objectives
Objective 1	Describe the major principles of chemistry.
Objective 2	Identify and distinguish the major categories of inorganic and organic chemical and biochemical reactions.
Objective 3	Balance reactions and perform stoichiometry calculations.
Objective 4	Explain metric measurement and its importance in the physical science domain.
Objective 5	Describe inorganic and organic nomenclature.

Objective 6	Illustrate and name the major functional groups of organic compounds.
Objective 7	Explain oxidation and reduction as it applies to both chemical and biological systems.
Objective 8	Describe the major groups of biological molecules and their essential functions in metabolism.
Objective 9	Collect and interpret data in the laboratory setting.
Objective 10	Collaborate respectfully with fellow students in the laboratory.
Objective 11	Explore the relationship between different types of nuclear decay and their medical applications.

### Student Learning Outcomes

**Upon satisfactory completion of this course, students will be able to:**

Outcome 1	Analyze quantitative data to draw plausible conclusions.
Outcome 2	Relate the macroscale phenomena of human physiological functions to microscale atomic concepts.
Outcome 3	Apply chemical terminology to describe observed scientific phenomena.
Outcome 4	Perform basic allied health laboratory experiments safely and accurately.

### Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Journal	Demonstrate to students how to read and analyze a scientific journal chosen by the faculty which relate to a current lecture/news topic.
Participation	Students will perform chemical experiments.
Observation	Guide and monitor group work in class and lab.
Lecture	Chemical concepts will be explained in a traditional lecture setting.
Discussion	Students will take part in problem-solving activities wherein they will collect data and use it to draw conclusions.
Laboratory	Laboratory consists of manipulation of equipment and conducting exercises for the purpose of making direct findings regarding chemical behavior. Procedures and their findings are followed by drawing conclusions based on interpretation of events and calculations are carried out as appropriate. Students work individually in laboratory for the purpose of receiving the full benefit of the learning experience.

### Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Written homework	Regular homework on lecture material.	In and Out of Class
Mid-term and final evaluations	A comprehensive final examination will be administered covering all previously completed topics for the semester. Questions will require problem solving, short answer and matching.	In Class Only
Tests/Quizzes/Examinations	An examination will be given covering each topic area described in course content. The examinations will consist of statement answers and problem solving. A total of approximately 10 quizzes, 4 exams, 21 lab reports and a comprehensive final exam.	In Class Only
Group activity participation/observation	Online discussion boards, videos, and interactive simulations.	In and Out of Class
Laboratory projects	Analyzing experimental data, performing weekly labs, completing pre-laboratory assignments.	In and Out of Class
Reading reports	Students will read articles from the scientific literature and write a summary.	Out of Class Only

### Assignments

**Other In-class Assignments**

1. Laboratory experiments
2. Laboratory reports

**Other Out-of-class Assignments**

1. Reading assignments

**Grade Methods**

Letter Grade Only

**Distance Education Checklist**

Include the percentage of online and on-campus instruction you anticipate.

**Online %**

40

**On-campus %**

60

**Lab Courses**

**How will the lab component of your course be differentiated from the lecture component of the course?**

Laboratory experiments will remain the same, face-to-face.

**From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?**

Laboratory experiments will remain the same, face-to-face.

**How will you assess the online delivery of lab activities?**

Laboratory experiments will remain the same, face-to-face.

**Instructional Materials and Resources****Effective Student/Faculty Contact**

**Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?**

**Within Course Management System:**

Chat room/instant messaging  
Discussion forums with substantive instructor participation  
Regular virtual office hours  
Timely feedback and return of student work as specified in the syllabus  
Weekly announcements

**External to Course Management System:**

Direct e-mail  
Posted audio/video (including YouTube, 3cm mediasolutions, etc.)  
Teleconferencing

**For hybrid courses:**

Library workshops  
Orientation, study, and/or review sessions  
Scheduled Face-to-Face group or individual meetings  
Supplemental seminar or study sessions

**Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.**

Chat rooms and substantive discussion forums will improve student to student interactions. Virtual office, direct e-mail, teleconferencing, and posted audio/video's will improve student to faculty accessibility for students. Library workshops can be used to introduce scientific literature. Online review or study sessions and face-to-face group discussions will improve both student to student and student to faculty interactions.

## Other Information

Provide any other relevant information that will help the Curriculum Committee assess the viability of offering this course in an online or hybrid modality.

All posted content will continue to be accessible to all students.

## Comparable Transfer Course Information

### University System

CSU

### Campus

CSU Channel Islands

### Course Number

110

### Course Title

Chemistry of Life

### Catalog Year

2022-2023

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### University System

CSU

### Campus

CSU Chico

### Course Number

107

### Course Title

General Chemistry for Applied Sciences

### Catalog Year

2022-2023

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### University System

CSU

### Campus

CSU Fullerton

### Course Number

100/100L

### Course Title

Survey of Chemistry

### Catalog Year

2022-2023

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### University System

CSU

### Campus

CSU Los Angeles

### Course Number

1010

### Course Title

Fundamentals of Organic Chemistry

**Catalog Year**

2022-2023

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**University System**

CSU

**Campus**

CSU Northridge

**Course Number**

104/104L

**Course Title**

Introductory Chemistry II

**Catalog Year**

2022-2023

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**University System**

CSU

**Campus**

CSU San Bernardino

**Course Number**

2050/2050L

**Course Title**

Survey of General Chemistry

**Catalog Year**

2022-2023

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**University System**

CSU

**Campus**

San Diego State University

**Course Number**

102

**Course Title**

Introduction to General, Organic, and Biological Chemistry with Laboratory

**Catalog Year**

2020-2021

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**University System**

CSU

**Campus**

California State Polytechnic University, Pomona

**Course Number**

1010/1010L

**Course Title**

Chemistry in Our World

**Catalog Year**

2022-2023

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**University System**

CSU

**Campus**

CSU San Bernardino

**Course Number**

2070/2070L

**Course Title**

Fundamentals of General, Organic, and Biochemistry

**Catalog Year**

2022-2023

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**University System**

CSU

**Campus**

San Francisco State University

**Course Number**

101/102

**Course Title**

Survey of Chemistry

**Catalog Year**

2022-2023

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**University System**

UC

**Campus**

UC Davis

**Course Number**

010

**Course Title**

Concept of Chemistry

**Catalog Year**

2022-2023

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**COD GE**

C1 - Natural Sciences

**CSU GE**

B1 - Physical Science

B3 - Laboratory Activity

**MIS Course Data****CIP Code**

40.0501 - Chemistry, General.

**TOP Code**

190500 - Chemistry, General

**SAM Code**

E - Non-Occupational

**Basic Skills Status**

Not Basic Skills

**Prior College Level**

Not applicable

**Cooperative Work Experience**

Not a Coop Course

**Course Classification Status**

Credit Course

**Approved Special Class**

Not special class

**Noncredit Category**

Not Applicable, Credit Course

**Funding Agency Category**

Not Applicable

**Program Status**

Program Applicable

**Transfer Status**

Transferable to CSU only

**General Education Status**

Y = Not applicable

**Support Course Status**

N = Course is not a support course

**Allow Audit**

Yes

**Repeatability**

No

**Materials Fee**

No

**Additional Fees?**

No

**Approvals****Curriculum Committee Approval Date**

11/01/2022

**Academic Senate Approval Date**

11/10/2022

**Board of Trustees Approval Date**

12/16/2022

**Chancellor's Office Approval Date**

01/08/2023

**Course Control Number**

CCC000635425

**Programs referencing this course**Nutrition and Dietetics AS-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=7>)Liberal Arts: Math and Science AA Degree (<http://catalog.collegeofthedesert.eduundefined/?key=29>)