CHEM-103L: FOUNDATIONS OF GENERAL, ORGANIC, AND BIOLOGICAL CHEMISTRY LABORATORY

Cuyahoga Community College

Viewing: CHEM-103L : Foundations of General, Organic, and Biological Chemistry Laboratory

Board of Trustees:
December 2025

Academic Term:
Summer 2026

Subject Code
CHEM - Chemistry

Course Number:
103L

Title:
Foundations of General, Organic, and Biological Chemistry Laboratory

Catalog Description:
Laboratory course providing hands-on experience while reinforcing the principles of general, organic, and biological chemistry. The course will introduce common laboratory practices that complement the lecture materials while teaching proper techniques and safety protocols.

Credit Hour(s):
1

Lab Hour(s):
3

Requisites

Prerequisite and Corequisite
CHEM-1030 Foundations of General, Organic, and Biological Chemistry or concurrent enrollment.

Outcomes

Course Outcome(s):
Apply laboratory safety and fundamental laboratory skills to health careers and other scientific studies.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Demonstrate proper laboratory techniques.
2. Perform experiments in a cooperative group environment.
3. Demonstrate knowledge of the rules of safety in the inorganic, organic, and biochemistry laboratory.
4. Demonstrate a basic understanding of chemical nomenclature.
5. Use the proper techniques to make measurements in the laboratory.
6. Perform basic chemistry and biochemistry laboratory skills and techniques.
7. Use various types of laboratory equipment to acquire data.
8. Collect, organize, and interpret data.
9. Deduce the structures of organic molecules using representative chemical tests and simple spectroscopic techniques.
10. Distinguish between biomolecules such as amino acids, proteins, carbohydrates, lipids, and fatty acids using chemical tests.
11. Analyze experimental results by applying the concepts of chemistry.

12. Report experimental outcomes and conclusions in a written or oral form.
13. Use the acquired data to perform calculations

Course Outcome(s):

Apply fundamental knowledge of chemistry to communicate scientific information in written formats.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Information Literacy: Demonstrate contextual awareness of the research process through the reflective discovery of the production and value of information, the use of information in the creation of new knowledge, and ethical participation in the use of information in communities of learning.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Report experimental results and conclusions in a written form.
2. Describe the purpose of the laboratory as a means of supporting theoretical phenomena.
3. Observe chemical reactions, identify the products, and summarize the change by a chemical equation.
4. Record accurate and detailed data in a laboratory notebook or laboratory report.
5. Use information resources in chemistry, including primary literature, and report in a written form.

Course Outcome(s):

Apply the scientific method to solve a problem, develop experimental procedures, and explain the design of scientific studies.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Information Literacy: Demonstrate contextual awareness of the research process through the reflective discovery of the production and value of information, the use of information in the creation of new knowledge, and ethical participation in the use of information in communities of learning.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Describe the scientific methods including the basic steps of the process.
2. Apply the steps of the scientific method to solve a problem.
3. Describe the purpose of the laboratory as a means of supporting theoretical phenomena.
4. Explain the design of scientific studies to support a chemical concept or principle.

Methods of Evaluation:

1. Laboratory exam(s)
2. Quizzes
3. Written lab reports
4. Evaluation of laboratory skills by the instructor
5. Participation
6. Assignments
7. Research paper/report

Course Content Outline:

1. Safety in the Laboratory
    a. Student Responsibilities
        i. Appropriate Eye and Body Protection
        ii. Follow Instructions

    iii. No unauthorized experiments
    iv. Knowledge of safety policies and procedures
  b. Review of physical facilities
    i. First-aid
      1. Eye wash
      2. Fire Extinguisher
      3. Fire Blanket
      4. First aid kits
    ii. Emergency Exits and Procedures
  c. Proper safe laboratory techniques
    i. Safe practices with glassware, including handling of beakers, graduated cylinders, and test tubes
    ii. Proper methods to dispose and handle broken glassware in the laboratory
  d. Proper behavior in the laboratory
    i. Eye protection
    ii. Respectful behavior
    iii. Safe handling of chemicals and volatile compounds
    iv. Proper disposal of materials
      1. Acid/base
      2. Organic materials
2. Measurements in the laboratory
  a. Volume
    i. Graduated Cylinders
    ii. Burettes
    iii. Pipettors
  b. Pressure
  c. Mass
    i. Balance
      1. Analytical
      2. Top load
    ii. Weighing Techniques
      1. Taring
      2. Significant Figures
  d. Temperature
  e. Energy
  f. Time
  g. Graphing and recording measurements in laboratory
3. Metric System
  a. Units
  b. Conversions between units
4. Scientific Notation
  a. Conversion between Scientific and Nonscientific or Standard Notation
  b. Calculations using Scientific Notation
5. Dimensional Analysis
  a. Conversion Factors
  b. Calculations, including percentages
6. Physical and chemical properties
  a. Physical
    i. Observation
    ii. Measurements
    iii. Separation Methods
  b. Chemical
    i. Exothermic
    ii. Endothermic
    iii. Law of Conservation of Mass and Energy
7. Laboratory Work
  a. Work in a collaborative environment
  b. Record results
  c. Perform Calculations

d. Interpret experimental outcomes in written form
e. Apply scientific method

8. Optional exercises in Chemistry (a minimum of 12 experiments should be completed that complement the lecture course with at least 5 experiments covering general/inorganic chemistry, 3 experiments covering organic chemistry, and 3 experiments covering biological chemistry)
   a. Scientific method
   b. Safety and laboratory measurements
   c. Determination of density
   d. Molecular modeling
   e. Gas Laws
   f. Separation of mixtures using evaporation, distillation, filtration, or other techniques
   g. Oxidation/reduction reactions
   h. Conductivity
   i. Polymer Chemistry
   j. Thin Layer Chromatography analysis
   k. Drug identification/analysis
   l. Nutritional content of food or drinks
   m. Spectrophotometric analysis of solutions
   n. Isolation of DNA
   o. Chemical Reactions
   p. Heats of Solutions
   q. Colligative Properties
   r. Reactions of Hydrocarbons
   s. Reactions of Alcohols
   t. NMR Spectroscopy
   u. Reactions of Aldehydes and Ketones
   v. Triglycerides and soaps
   w. Chemistry of antacids
   x. Reactions of Carboxylic Acids, Esters, and Amides
   y. Lipid Classifications
   z. Digestion of lipids and carbohydrates
   aa. Properties of carbohydrates

Religious Accommodation

Before reviewing the course schedule, students should carefully review the following religious accommodation policy and other required instructional policies:

Religious Accommodation:

Students seeking an accommodation for absences permitted under Ohio's Testing Your Faith Act must provide the instructor with written notice of the specific dates for which the student requires an accommodation and must do so not later than fourteen (14) days after the first day of instruction. Please submit requests for accommodations at this link: https://portal2.tri-c.edu/ReligiousAccommodation/ Religious Accommodation Form. Students with questions about their religious accommodations under Ohio's Testing Your Faith Act may contact the College's Office of General Counsel and Legal Services by phone at 216.987.4856 or via email at legal@tri-c.edu.

Other Required Instructional Policies:

https://www.tri-c.edu/student-resources/curriculum/documents/syllabus-part-b.pdf

Weekly Schedule

	Topics
Week 1	Safety and Measurement in the Laboratory
Week 2	Density and Unit Conversions
Week 3	Separations of a Mixture
Week 4	Organic Molecules, Molecular Models, and Isomers
Week 5	Chemical Reactions
Week 6	Reactions of Organic Compounds

Week 7	Carbohydrates
Week 8	Thin Layer Chromatography
Week 9	Gas Laws
Week 10	Conductivity of Aqueous Solutions
Week 11	Acids, Bases, and Buffers
Week 12	Amino Acids, Peptides, and Proteins
Week 13	DNA and RNA
Week 14	Carbohydrate Digestion
Week 15	Enzymes
Week 16	Review of material and Final Exam

The Course Schedule is subject to change due to pedagogical needs, instructor discretion, parts of term, and unexpected events.

Required/Recommended Readings

Deal, T. *Lab Manual to accompany General, Organic, and Biological Chemistry.*

Resources for the Instructor

Deal, Todd. . *Lab Manual to Accompany General, Organic, and Biological Chemistry.* . Pearson, 2014.

Laboratory Experiments for General, Organic, and Biological Chemistry, Open Source.

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS

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