



Lakeshore Technical College

10-806-134 General Chemistry

Course Outcome Summary

Course Information

Alternate Title	General Chemistry
Description	Covers the fundamentals of chemistry. Topics include the metric system, problem-solving, atomic structure, chemical bonding, periodic relationships, chemical reactions, chemical equilibrium, properties of water; acids, bases, salts, buffers, oxidation-reduction, solutions, and solution concentrations; and gas laws.
Total Credits	4
Total Hours	90

Types of Instruction

Instruction Type	Credits/Hours
Lecture	54 hours
On-Campus Lab	36 hours
In Person	54 hours

Pre/Corequisites

Prerequisite 10-804-109, Algebra for Chemistry or 10-834-110, Elementary Algebra with Applications, or 10-804-196, Technical Math 1A, with a grade of "C" or better.

Textbooks

McMurray, Castellion and Ballantine, *Fundamentals of General, Organic, and Biological Chemistry*, 6th edition, Pearson Education Inc. 2009. This textbook is required.

Learner Supplies

Safety goggles. . **Manufacturer:** Various. **Quantity:** 1. **Source:** Various. Recommended.

Plastic apron. **Manufacturer:** Various. **Quantity:** 1. **Source:** Various. Recommended.

Texas Instruments TI-30Xa scientific calculator. **Manufacturer:** Texas Instruments. **Quantity:** 1. **Source:** Bookstore. Required.

Computer with internet access. Required

Core Abilities

1. Apply learning

Criteria

- 1.1. Learner transfers academic knowledge and principles to life and work situations
- 1.2. Learner incorporates prior learning
- 1.3. Learner knows when to ask for help
- 1.4. Learner demonstrates appropriate safety precautions
- 1.5. Learner identifies the need for lifelong learning
- 1.6. Learner develops the ability to research beyond the required work
- 1.7. Learner demonstrates a curiosity for learning about cultures, norms, and practices

2. Demonstrate critical thinking

Criteria

- 2.1. Learner determines issues that merit action
- 2.2. Learner takes initiative in the problem solving processes
- 2.3. Learner makes decisions considering alternatives and consequences
- 2.4. Learner refines action plans based on evaluation of feedback
- 2.5. Learner identifies interdependencies of world issues & events

3. Integrate technology

Criteria

- 3.1. Learner determines which tasks can be performed more efficiently by using technology
- 3.2. Learner uses technology to perform tasks more efficiently
- 3.3. Learner adapts to changing/emerging technology
- 3.4. Learner selects culturally appropriate technology/tools to communicate with diverse groups

4. Use mathematics effectively

Criteria

- 4.1. Learner solves real world problems using mathematics
- 4.2. Learner measures accurately
- 4.3. Learner analyzes graphical information
- 4.4. Learner demonstrates an understanding of world measurements and foreign currency exchange

Course Competencies

1. Use accepted standards for safety and hygiene procedures in the chemistry laboratory

Linked Core Abilities

Apply learning
Integrate technology

Assessment Strategies

- 1.1. on a written test
- 1.2. in lab performance

Criteria

Your performance will be successful when:

- 1.1. you identify safety equipment
- 1.2. you identify safety procedures
- 1.3. you identify laboratory equipment
- 1.4. You use Safety Data Sheets
- 1.5. you follow safety procedures when using laboratory equipment
- 1.6. You utilize the proper lab equipment for a specific task

Learning Objectives

- 1.a. Demonstrate proper use of safety equipment
- 1.b. Practice safety procedures
- 1.c. Demonstrate proper use of laboratory equipment
- 1.d. Interpret the information contained on an SDS sheet
- 1.e. Practice standard safety procedures in the lab

2. Utilize the scientific method to solve problems

Linked Core Abilities

Apply learning
Demonstrate critical thinking
Integrate technology
Use mathematics effectively

Assessment Strategies

- 2.1. on homework assignments
- 2.2. in lab assignments

Criteria

Your performance will be successful when:

- 2.1. you apply the steps in the scientific method to problems
- 2.2. you record quantitative observations
- 2.3. you record qualitative observations
- 2.4. you construct models that are supported by observations
- 2.5. you draw conclusions from your observations and model

Learning Objectives

- 2.a. Identify the steps in the scientific method
- 2.b. Apply the scientific method to real-world problems
- 2.c. Differentiate between qualitative and quantitative observations
- 2.d. Explain the use of models
- 2.e. Draw valid conclusions from observations

3. Solve problems involving measurements and conversions

Linked Core Abilities

Apply learning
Use mathematics effectively

Assessment Strategies

- 3.1. on a written test
- 3.2. on homework assignments
- 3.3. in lab assignments

Criteria

Your performance will be successful when:

- 3.1. you use scientific tools and methods to solve problems
- 3.2. you use the various systems of measurements
- 3.3. you convert within and between systems of measurement
- 3.4. you round off numbers
- 3.5. you write numbers using appropriate significant figures
- 3.6. you use scientific notation
- 3.7. you distinguish between accuracy and precision
- 3.8. you solve word problems
- 3.9. you determine derived properties (such as density, heat capacity, volume, area)

Learning Objectives

- 3.a. Use the metric system to solve problems
- 3.b. Use dimensional analysis to convert between the English and Metric system
- 3.c. Demonstrate how to round numbers
- 3.d. Demonstrate proper use of significant figures
- 3.e. Use scientific notation
- 3.f. Explain the terms "accuracy" and "precision"
- 3.g. Solve word problems
- 3.h. Solve algebraic equations for the unknown

4. Explain the characteristics of matter and the changes it undergoes

Linked Core Abilities

Demonstrate critical thinking

Assessment Strategies

- 4.1. on a written test
- 4.2. on homework assignments
- 4.3. in lab assignments

Criteria

Your performance will be successful when:

- 4.1. you distinguish among the physical states of matter
- 4.2. you identify changes in physical states of matter
- 4.3. You categorize matter based on its physical properties
- 4.4. you distinguish between physical and chemical changes
- 4.5. you relate physical states to intermolecular forces

Learning Objectives

- 4.a. Describe physical states
- 4.b. Explain the properties of mixtures and pure substances
- 4.c. Distinguish between an element and a compound
- 4.d. Explain how inter-molecular forces determine physical states

5. Evaluate the periodic relationships of the elements

Linked Core Abilities

Demonstrate critical thinking

Assessment Strategies

- 5.1. on a written test
- 5.2. on homework assignments
- 5.3. in lab assignments

Criteria

Your performance will be successful when:

- 5.1. you describe the basic structure of the atom
- 5.2. you describe the properties of subatomic particles
- 5.3. you use the periodic table to determine the atomic symbol, atomic number, and atomic mass of an element
- 5.4. you use the periodic table to determine the electronic configuration of an atom
- 5.5. you classify an element based on its location on the periodic table
- 5.6. you compare elemental properties based on their location on the periodic table

Learning Objectives

- 5.a. Describe parts of the atom
- 5.b. Explain the properties of sub-atomic particles
- 5.c. Identify the atomic symbol, number, and mass of an element from the periodic table
- 5.d. Write the electronic configuration for an atom using periodic table
- 5.e. Classify an element as metal or non-metal
- 5.f. Explain trends in the periodic table

6. Explain chemical bonding

Linked Core Abilities

Apply learning

Demonstrate critical thinking

Assessment Strategies

- 6.1. on a written test
- 6.2. on homework assignments
- 6.3. in lab assignments

Criteria

Your performance will be successful when:

- 6.1. you determine valence electrons for main group elements
- 6.2. you relate octet rule to chemical bonding

- 6.3. you explain the formation of an ionic bond
- 6.4. you use the periodic table to determine ionic charge
- 6.5. you explain the formation of a covalent bond
- 6.6. You utilize the periodic table to determine an element's Lewis Dot Structure
- 6.7. you relate electronegativity differences between atoms to the type of bond they form
- 6.8. you create molecular models

Learning Objectives

- 6.a. Determine the valence electrons for a main group of elements
- 6.b. Explain the octet rule
- 6.c. Describe the formation of an ionic bond
- 6.d. Determine the charge on an ion using the periodic table
- 6.e. Describe the formation of a covalent bond
- 6.f. Determine if a compound is ionic or covalent using the the periodic table
- 6.g. Differentiate bond types based on electro-negativity
- 6.h. Make models of molecules

7. Explain the behavior of matter during a chemical reaction

Linked Core Abilities

Demonstrate critical thinking

Assessment Strategies

- 7.1. on a written test
- 7.2. on homework assignments
- 7.3. in lab assignments

Criteria

Your performance will be successful when:

- 7.1. you differentiate between physical, nuclear and chemical changes
- 7.2. you describe chemical reactions using equations
- 7.3. you classify types of reactions
- 7.4. you relate experimental observations to chemical changes

Learning Objectives

- 7.a. Compare characteristics associated with physical and chemical changes
- 7.b. Write chemical equations
- 7.c. Classify reactions

8. Calculate quantities of reactants and products using balanced chemical equations

Linked Core Abilities

Use mathematics effectively

Assessment Strategies

- 8.1. on a written test
- 8.2. on homework assignments
- 8.3. in lab assignments

Criteria

Your performance will be successful when:

- 8.1. you relate atomic mass to gram molecular weight
- 8.2. you balance chemical equations
- 8.3. you use the mole concept to solve stoichiometry problems

Learning Objectives

- 8.a. Determine atomic masses
- 8.b. Calculate molecular masses
- 8.c. Balance chemical equations
- 8.d. Solve stoichiometry problems

9. Calculate the concentration of aqueous solutions

Linked Core Abilities

Use mathematics effectively

Assessment Strategies

- 9.1. on a written test
- 9.2. on homework assignments
- 9.3. in lab assignments

Criteria

Your performance will be successful when:

- 9.1. you explain the components of a solution
- 9.2. you calculate solution concentrations
- 9.3. you solve concentration problems
- 9.4. you explore factors affecting solubility
- 9.5. you explore colligative properties

Learning Objectives

- 9.a. Identify the components of a solution
- 9.b. Calculate solution concentration using percentage, molarity, and normality units
- 9.c. Solve concentration and dilution problems
- 9.d. Explain factors that affect solubility
- 9.e. Apply colligative properties to solve real-world problems

10. Define chemical equilibrium

Linked Core Abilities

Demonstrate critical thinking

Assessment Strategies

- 10.1. on a written test
- 10.2. on homework assignments
- 10.3. in lab assignments

Criteria

Your performance will be successful when:

- 10.1. you summarize dynamic equilibrium
- 10.2. you apply Le Chatelier's principle
- 10.3. you utilize K_{eq} values to describe relative amounts of reactants and products at equilibrium

Learning Objectives

- 10.a. Explain the concept of equilibrium
- 10.b. Apply LeChatelier's principle to laboratory problems and real world problems

11. Compare the characteristics of acids, bases, salts, and buffers

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

- 11.1. on a written test
- 11.2. on homework assignments
- 11.3. in lab assignments

Criteria

Your performance will be successful when:

- 11.1. you distinguish between the properties of acids and bases
- 11.2. you characterize acid-base reactions
- 11.3. you examine the pH scale
- 11.4. you calculate the pH of a solution
- 11.5. you summarize how a buffer works

Learning Objectives

- 11.a. Explain the properties of acids and bases

- 11.b. Describe acid/base reactions
- 11.c. Explain the use of the pH scale
- 11.d. Calculate the pH of a solution
- 11.e. Explain how a buffer works

12. Solve problems involving gas laws

Linked Core Abilities

Demonstrate critical thinking
Use mathematics effectively

Assessment Strategies

- 12.1. on a written test
- 12.2. on homework assignments

Criteria

Your performance will be successful when:

- 12.1. you utilize the kinetic molecular theory to describe the behavior of gases
- 12.2. you use appropriate units of measure for temperature, pressure and volume
- 12.3. you apply the gas laws to solve problems

Learning Objectives

- 12.a. Apply kinetic molecular theory to the properties of gases
- 12.b. Perform conversions for temperatures, pressures, and volumes needed to describe gases
- 12.c. Apply gas laws to solve problems