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## Wisconsin Indianhead Technical College

# 10806134 General Chemistry

## Course Outcome Summary

### Course Information

<b>Description</b>	Covers the fundamentals of chemistry. Topics include the metric system, problem solving, periodic relationships, chemical reactions, chemical equilibrium, properties of water; acids, bases, and salts; and gas laws. Students must complete a math placement exam or an Intermediate Algebra course prior to enrollment.
<b>Instructional Level</b>	Associate Degree
<b>Total Credits</b>	4.00
<b>Total Hours</b>	80.00

### Types of Instruction

Instruction Type	Credits/Hours
Classroom Presentation (Lecture/Demonstration/Discussion)	3/48
On Campus Lab and/or Shop Experience	1/32

### Course History

<b>Revised By</b>	Erin Winesburg (15237468)
<b>Last Approval Date</b>	5/16/2013

### Purpose/Goals

This course outcome summary includes the competencies and criteria for General Chemistry. This course is part of the General Studies Core offered throughout the Wisconsin Technical College System (WTCS). The course competencies are consistent among the colleges and are at baccalaureate level to accommodate student success in transfer to four-year colleges.

### Pre/Corequisites

Prerequisite 10804113 College Technical Math 1A or other college-level algebra course

### Course Competencies

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

**Status**    *Active*

**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 material safety data sheets (MSDS)
- 1.5.    you follow safety procedures when using laboratory equipment

**Learning Objectives**

- 1.a.    Investigate safety equipment and procedures for the laboratory
- 1.b.    Identify safety equipment
- 1.c.    Follow prescribed safety procedures in the laboratory
- 1.d.    Recognize material safety data sheets (MSDS)
- 1.e.    Operate laboratory equipment safely

**2. Examine the scientific method and tools to solve problems**

**Status**    *Active*

**Assessment Strategies**

- 2.1.    on a written test
- 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 methods
- 2.b.    Construct hypothesis or model
- 2.c.    Record quantitative results in the laboratory
- 2.d.    Record qualitative laboratory results
- 2.e.    Develop conclusions based on data
- 2.f.    Correlate laboratory results with hypothesis or model

**3. Solve problems using measurements and conversions**

**Status**    *Active*

**Assessment Strategies**

- 3.1.    on a written test
- 3.2.    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. List tools and methods available for problem solving
- 3.b. Compare different types of measurements
- 3.c. Calculate conversions between the different measurement systems
- 3.d. Utilize conversions with mathematical accuracy
- 3.e. Calculate derived properties accurately (properties such as density, heat capacity, volume, area)

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

*Status Active*

#### **Assessment Strategies**

- 4.1. on a written test
- 4.2. 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 distinguish between mixtures and pure substances
- 4.4. you distinguish between compounds and elements
- 4.5. you relate physical states to intermolecular forces

#### **Learning Objectives**

- 4.a. Differentiate between physical and chemical states of matter
- 4.b. Identify changes in the states of matter
- 4.c. Discriminate between compounds and elements
- 4.d. Identify various intramolecular forces and subatomic particles
- 4.e. Correlate physical states with intramolecular forces

### **5. Analyze the periodic relationships of the elements**

*Status Active*

#### **Assessment Strategies**

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

#### **Criteria**

*Your performance will be successful when:*

- 5.1. you explore the basic structure of the atom
- 5.2. you explore 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 as to metal, nonmetal, noble gas
- 5.6. you explain periodic relationships

#### **Learning Objectives**

- 5.a. Define "atom" and "molecule" and Dalton's Atomic Theory
- 5.b. Identify the characteristics of atoms including the charge, location, and function of subatomic particles
- 5.c. Utilize the periodic table to determine the atomic symbol, atomic number, and atomic mass of an element
- 5.d. Utilize the periodic table to determine the electronic configuration of an atom
- 5.e. Classify an element as to metal, nonmetal, noble gas
- 5.f. Characterize the relationships among the elements of the periodic table

### **6. Explore chemical bonding**

*Status Active*

#### **Assessment Strategies**

- 6.1. on a written test
- 6.2. 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 use the periodic table to determine an element's covalence
- 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. Demonstrate the various types of bonding
- 6.b. Identify valence electrons for main group elements
- 6.c. Apply the octet rule to chemical bonding
- 6.d. Utilize the periodic table to determine ionic charge or covalence
- 6.e. Predict formation of ionic or covalent bonds based on acquired information from periodic table
- 6.f. Correlate electronegativity of an atom with bond formation
- 6.g. Develop accurate molecular models

### 7. Explain the behavior of matter during a chemical reaction

*Status Active*

#### Assessment Strategies

- 7.1. on a written test
- 7.2. 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. Differentiate between physical, nuclear, and chemical changes
- 7.b. Predict chemical reactions using equations
- 7.c. Relate experimental observations to chemical changes

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

*Status Active*

#### Assessment Strategies

- 8.1. on a written test
- 8.2. 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. Correspond atomic mass to gram molecular weight
- 8.b. Develop balanced chemical equations given the reactants
- 8.c. Implement the mole concept to solve stoichiometry problems

### 9. Calculate the concentration of aqueous solutions

**Status**    *Active*

**Assessment Strategies**

- 9.1.    on a written test
- 9.2.    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 concentrations
- 9.c.    Solve concentration problems
- 9.d.    Explore factors affecting solubility
- 9.e.    Investigate colligative properties

**10. Explain chemical equilibrium**

**Status**    *Active*

**Assessment Strategies**

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

**Criteria**

*Your performance will be successful when:*

- 10.1.    you summarize dynamic equilibrium
- 10.2.    you apply Le Chatelier's principle

**Learning Objectives**

- 10.a.    Summarize dynamic equilibrium
- 10.b.    Discuss Le Chatelier's principle

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

**Status**    *Active*

**Assessment Strategies**

- 11.1.    on a written test
- 11.2.    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.    Define the terms acid, base, and salt
- 11.b.    Explain the characteristics and function of an indicator
- 11.c.    Distinguish between the properties of acids and bases
- 11.d.    Identify acids and bases using the pH scale
- 11.e.    Calculate the pH of a solution
- 11.f.    Categorize the role of buffers in biological systems
- 11.g.    Identify general reactions of salts

## 12. Solve problems involving gas laws

*Status Active*

### Assessment Strategies

- 12.1. on a written test
- 12.2. in lab assignments

### Criteria

*Your performance will be successful when:*

- 12.1. you explore the kinetic molecular theory
- 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. Explore the kinetic molecular theory
- 12.b. Utilize appropriate units of measure for temperature, pressure, and volume
- 12.c. Characterize gases in terms of volume and shape
- 12.d. Apply gas laws to solve problems