

## WTCS Repository

# 10-806-127 Chemistry 1

## Course Outcome Summary

### Course Information

<b>Description</b>	Fundamental concepts of inorganic chemistry. Emphasizes learning the basic principles and quantitative measurements used in chemistry. Consists of three hours of lecture and one, two-hour laboratory period per week.
<b>Total Credits</b>	4.00

### Pre/Corequisites

**Prerequisite** Each Wisconsin Technical College determines the General Education course prerequisites used by their academic institution. If prerequisites for a course are determined to be appropriate, the final Course Outcome Summary must identify the prerequisites approved for use by the individual Technical College.

### Course Competencies

#### 1. Demonstrate proper laboratory technique and safety procedures using various measuring instruments

##### Assessment Strategies

- 1.1. by completing assigned labs
- 1.2. by completing study guide

##### Criteria

*Performance will be satisfactory when:*

- 1.1. you obtain precise measurements using a variety of laboratory equipment
- 1.2. you express measurements using the proper number of significant digits
- 1.3. you use dimensional analysis and proportion methods to solve conversion problems involving metric to metric, metric to English, mass-volume relationships, and specific gravity
- 1.4. you utilize scientific notation in problem solving
- 1.5. you apply safety rules and proper procedure in performing laboratory work

#### 2. Analyze the concept of matter and its relationship to chemical properties

##### Assessment Strategies

- 2.1. by completing assigned labs
- 2.2. by completing study guide
- 2.3. on an exam

##### Criteria

*Performance will be satisfactory when:*

- 2.1. you use the term atom as it relates to matter
- 2.2. you use the term ion as it relates to matter
- 2.3. you use the term molecule as it relates to matter
- 2.4. you use the term element as it relates to matter

- 2.5. you use the term compound as it relates to matter
- 2.6. you use the term formula unit as it relates to matter
- 2.7. you use the term pure substance as it relates to matter
- 2.8. you use the term solution as it relates to matter
- 2.9. you use the term physical property as it relates to matter
- 2.10. you use the term chemical property as it relates to matter
- 2.11. you use the term homogeneous mixture as it relates to matter
- 2.12. you use the term heterogeneous mixture as it relates to matter
- 2.13. you use the term metallic as it relates to matter
- 2.14. you use the term non-metallic as it relates to matter
- 2.15. you use the term active as it relates to matter
- 2.16. you use the term inactive as it relates to matter
- 2.17. you use the term inert as it relates to matter
- 2.18. you use the periodic table to identify and predict properties of metals
- 2.19. you use the periodic table to identify and predict properties of non-metals
- 2.20. you use the periodic table to identify and predict properties of metalloids
- 2.21. you use the periodic table to identify and predict properties of active
- 2.22. you use the periodic table to identify and predict properties of inactive
- 2.23. you use the periodic table to identify and predict properties of non-reactive elements
- 2.24. you write the names and symbols for elements in the first four periods of the periodic table, as well as other elements commonly used in a laboratory setting
- 2.25. you distinguish between chemical and physical changes
- 2.26. you compare and contrast organic and inorganic substances

### 3. Analyze the concept of matter and its relationship to chemical properties

#### Assessment Strategies

- 3.1. by completing assigned labs
- 3.2. by completing study guide
- 3.3. on an exam

#### Criteria

*Performance will be satisfactory when:*

- 3.1. you use the term atom as it relates to matter
- 3.2. you use the term ion as it relates to matter
- 3.3. you use the term molecule as it relates to matter
- 3.4. you use the term element as it relates to matter
- 3.5. you use the term compound as it relates to matter
- 3.6. you use the term formula unit as it relates to matter
- 3.7. you use the term pure substance as it relates to matter
- 3.8. you use the term solution as it relates to matter
- 3.9. you use the term physical property as it relates to matter
- 3.10. you use the term chemical property as it relates to matter
- 3.11. you use the term homogeneous mixture as it relates to matter
- 3.12. you use the term heterogeneous mixture as it relates to matter
- 3.13. you use the term metallic as it relates to matter
- 3.14. you use the term non-metallic as it relates to matter
- 3.15. you use the term active as it relates to matter
- 3.16. you use the term inactive as it relates to matter
- 3.17. you use the term inert as it relates to matter
- 3.18. you use the periodic table to identify and predict properties of metals
- 3.19. you use the periodic table to identify and predict properties of non-metals
- 3.20. you use the periodic table to identify and predict properties of metalloids
- 3.21. you use the periodic table to identify and predict properties of active
- 3.22. you use the periodic table to identify and predict properties of inactive
- 3.23. you use the periodic table to identify and predict properties of non-reactive elements
- 3.24. you write the names and symbols for elements in the first four periods of the periodic table, as well as other elements commonly used in a laboratory setting
- 3.25. you distinguish between chemical and physical changes
- 3.26. you compare and contrast organic and inorganic substances

#### **4. Analyze the structure of the atom relating this information to make chemical predictions**

##### **Assessment Strategies**

- 4.1. by completing assigned labs
- 4.2. by completing study guide
- 4.3. on an exam

##### **Criteria**

*Performance will be satisfactory when:*

- 4.1. you explain Dalton's Atomic Theory and how it relates to the basic laws of chemical change
- 4.2. you determine the following for a given element: atomic number, atomic mass, number of neutrons, protons, and electrons
- 4.3. you write Lewis dot structures for atoms using the periodic table
- 4.4. you write electron configurations for atoms and ions using orbital notation
- 4.5. you distinguish the differences of properties for the isotopes of elements
- 4.6. you distinguish the similarities of properties for the isotopes of elements
- 4.7. you determine the number of valence electrons for any A-group elements
- 4.8. you predict trends in electron affinities
- 4.9. you predict trends in electronegativities
- 4.10. you predict trends in ionization potentials
- 4.11. you predict trends in atomic and ionic radii
- 4.12. you predict trends in metallic and non-metallic properties
- 4.13. you classify elements according to their similar chemical properties

#### **5. Analyze the systematic naming of chemicals**

##### **Assessment Strategies**

- 5.1. by completing assigned labs
- 5.2. by completing study guide
- 5.3. on an exam

##### **Criteria**

*Performance will be satisfactory when:*

- 5.1. you identify the names of the commonly used polyatomic ions
- 5.2. you use the names of the commonly used polyatomic ions correctly in formulas
- 5.3. you identify a compound as an acid, a base, an acid salt, a hydroxy salt, and a normal salt
- 5.4. you analyze the distinguishing characteristics of an acid
- 5.5. you analyze the distinguishing characteristics of a base
- 5.6. you analyze the distinguishing characteristics of an acid salt
- 5.7. you analyze the distinguishing characteristics of a hydroxy salt
- 5.8. you analyze the distinguishing characteristics of a normal salt

#### **6. Perform mathematical calculations of elements and compounds**

##### **Assessment Strategies**

- 6.1. by preparing solutions of various concentrations
- 6.2. by completing assigned labs
- 6.3. by completing study guide
- 6.4. on an exam

##### **Criteria**

*Performance will be satisfactory when:*

- 6.1. you distinguish between the mass of a molecule and the mass of a mole of molecules
- 6.2. you distinguish between the number of moles of a compound or element and the mass of that number of moles, moles of atoms, ions, molecules or formula units
- 6.3. you calculate the molecular or formula mass of a substance given the formula
- 6.4. you calculate the number of moles in a given mass of a particular substance
- 6.5. you calculate the actual number of particles in a given mass of an element or a compound of known formula
- 6.6. you calculate the percent composition of a compound from its formula

- 6.7. you determine the empirical or molecular formula of a compound given appropriate information
- 6.8. you use experimental data from laboratory analysis to calculate the percent of a given element present

## **7. Predict chemical events using chemical equations.**

### **Assessment Strategies**

- 7.1. by completing assigned labs
- 7.2. by completing study guide
- 7.3. by participating in a group activity on solubility
- 7.4. on an exam

### **Criteria**

*Performance will be satisfactory when:*

- 7.1. you identify the type of reaction given a chemical equation
- 7.2. you balance various types of chemical equations
- 7.3. you use the "solubility rules" to identify precipitates formed in a given chemical equation
- 7.4. you identify gases formed in a given chemical equation
- 7.5. you write correct word equations for various chemical reactions
- 7.6. you distinguish between acidic and basic

## **8. Analyze Stoichiometric Principles as they relate to determination of chemical reactions**

### **Assessment Strategies**

- 8.1. by completing assigned labs
- 8.2. by completing study guide
- 8.3. on an exam

### **Criteria**

*Performance will be satisfactory when:*

- 8.1. you calculate the mass or the volume of a particular reactant required to react with an excess of another reactant given a balanced equation
- 8.2. you calculate the mass or the volume of a particular reactant required to react with an excess of another reactant given an unbalanced equation
- 8.3. you calculate the theoretical mass or volume of a product formed in a particular balanced equation given other appropriate information
- 8.4. you calculate the theoretical mass or volume of a product formed in a particular unbalanced equation given other appropriate information
- 8.5. you use a balanced chemical equation to calculate the percent yield given actual yield for a particular reaction
- 8.6. you determine the limiting reactant and the amount of excess reactant given actual yield for a particular reaction
- 8.7. you determine whether a reaction is exothermic or endothermic from the heats of reaction in given equations
- 8.8. you apply the mole concept to balanced equations to understand mass relationships, mass-volume relationships, and volume relationships

## **9. Utilize bonding principles to analyze chemical forces and chemical reactions**

### **Assessment Strategies**

- 9.1. by completing assigned labs
- 9.2. by completing study guide
- 9.3. by participating in a group activity on bond type identification
- 9.4. on an exam

### **Criteria**

*Performance will be satisfactory when:*

- 9.1. you examine the different types of chemical bonds
- 9.2. you examine the relative strengths of chemical bonds
- 9.3. you examine the properties of the different types of chemical bonds
- 9.4. you choose the most likely type of bond formed between various atoms or molecules based on electronegativity difference

- 9.5. you identify which types of bonds are intermolecular and intramolecular
- 9.6. you identify various bond types within a given molecule

## 10. Apply gas law principles

### Assessment Strategies

- 10.1. by completing assigned labs
- 10.2. by completing study guide
- 10.3. by demonstrating Boyle's and Charles' law
- 10.4. on an exam

### Criteria

*Performance will be satisfactory when:*

- 10.1. you distinguish between force and pressure of a gas
- 10.2. you distinguish between absolute and gauge pressure of a gas
- 10.3. you distinguish between a real and ideal gas
- 10.4. you use the gas laws to calculate changes in gas properties
- 10.5. you calculate the partial pressure of a gas in a mixture of gases given appropriate information
- 10.6. you use the assumptions of the Kinetic Molecular Theory and use these to explain characteristic behavior of gases
- 10.7. you calculate changes in pressure, volume, or temperature based on the gas laws (Boyle's, Charles', Gay-Lussac's, Ideal)
- 10.8. you predict changes in pressure, volume, or temperature based on the gas laws (Boyle's, Charles', Gay-Lussac's, Ideal)
- 10.9. you demonstrate a working knowledge of procedures used for collecting and measuring gases

## 11. Analyze properties of liquids and solids

### Assessment Strategies

- 11.1. by completing assigned labs
- 11.2. by completing study guide
- 11.3. on an exam

### Criteria

*Performance will be satisfactory when:*

- 11.1. you distinguish between the liquid, solid, and gas states in terms of the Kinetic Molecular Theory
- 11.2. you apply the factors affecting the vapor pressure and boiling point of liquids to interpret the behavior of various liquids
- 11.3. you identify properties of liquids and solids versus gases
- 11.4. you identify bonding types within liquids and solids

## 12. Analyze the results of alternative solution composition

### Assessment Strategies

- 12.1. by completing assigned labs
- 12.2. by completing study guide
- 12.3. by demonstrating the solution identification and preparation
- 12.4. on an exam

### Criteria

*Performance will be satisfactory when:*

- 12.1. you apply the principles of colligative property to interpolate their effect on solutions
- 12.2. you calculate a solution in concentration units of molarity, percent, molality, equivalents, milliequivalents, and/or osmolality
- 12.3. you prepare a solution in concentration units of molarity, percent, molality, equivalents, milliequivalents, and/or osmolality
- 12.4. you perform multiple part solution problems