

## WTCS Repository

# 10-806-178 Life Science Chemistry

## Course Outcome Summary

### Course Information

**Description** Covers a wide range of topics including inorganic and organic. Topics included during the inorganic portion of the course include measurements and conversions, matter and the kinetic molecular theory, periodic table, chemical bonding, chemical reactions, solubility, gases, problem-solving and solutions, equilibrium and acid-base behavior. The organic chemistry portion introduces chemical structure as well as physical and chemical behavior of organic molecules. Many of these topics are related to the field of animal science.

**Total Credits** 5.00

### 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. Classify matter and energy

##### Assessment Strategies

1.1. on a written evaluation

##### Criteria

*Your performance will be successful when:*

- 1.1. you examine an atom characterizing its subatomic particles
- 1.2. you characterize neutral atoms, ions, and isotopes by type and number of subatomic particles
- 1.3. you compare and contrast elements, isotopes, and atomic mass
- 1.4. you compare and contrast pure substances (elements, compounds) with and mixtures (homogenous and heterogeneous)
- 1.5. you distinguish between kinetic and potential energy
- 1.6. you identify the key aspects of the Kinetic Molecular Theory
- 1.7. you compare and contrast physical forms of matter

#### 2. Use formula, symbols and models to depict matter

##### Assessment Strategies

2.1. on a written evaluation

##### Criteria

*Your performance will be successful when:*

- 2.1. you use standard chemical formulae to depict elements, neutral atoms and ions
- 2.2. you use standard chemical formulae to depict compounds and molecules
- 2.3. you use standard chemical formulae to depict aqueous mixtures

- 2.4. you use standard chemical formulae to depict physical states of matter
- 2.5. you use standard chemical formulae to depict phase changes
- 2.6. you use standard chemical formulae to depict solubility
- 2.7. you use standard chemical formulae to depict chemical reactions and chemical change
- 2.8. you use circle/particle drawings to show pure substances and mixtures
- 2.9. you use circle/particle drawings to show physical phase changes in matter (solid, liquid, gas)
- 2.10. you use circle/particle drawings to show physical phase changes in solubility
- 2.11. you use circle/particle drawings to show physical phase changes in chemical reactions and chemical change
- 2.12. you use specific symbols related to depict isotopic notation
- 2.13. you use specific symbols related to depict bonds in a molecular substance
- 2.14. you use specific symbols related to depict unbonded pairs of electrons in a molecular substance
- 2.15. you use specific symbols related to depict bond dipoles
- 2.16. you use specific symbols related to depict molecular dipoles
- 2.17. you use specific symbols related to depict attraction forces between substances found in pure substances and in mixtures
- 2.18. you use specific symbols related to depict stock system in ionic names
- 2.19. you decipher molecular structure when given molecular formula, condensed, and expanded structural formula
- 2.20. you decipher molecular structure when given symbols to indicate three-dimensional arrangement
- 2.21. you decipher molecular structure when given IUPAC names for organic compounds
- 2.22. you decipher molecular structure when given molecule model kits

### 3. Explore the organization, symbols, and basic trends on the periodic table

#### Assessment Strategies

- 3.1. on a written evaluation

#### Criteria

*Your performance will be successful when:*

- 3.1. you identify periods (rows) and families (columns)
- 3.2. you identify halogens, noble gases, and representative elements
- 3.3. you identify metals and nonmetals
- 3.4. you identify each the symbols on the periodic table (elemental symbol, atomic number, and atomic mass)
- 3.5. you identify periodic table trends or patterns as they relate to chemical bond formation for electronegativity
- 3.6. you identify periodic table trends or patterns as they relate to chemical bond formation for relative location of metals and nonmetals
- 3.7. you identify periodic table trends or patterns as they relate to chemical bond formation for valence electron trend
- 3.8. you identify periodic table trends or patterns as they relate to chemical bond formation for the trend for fixed ionic charge for representative metals
- 3.9. you identify periodic table trends or patterns as they relate to chemical bond formation for the trend for variable ionic charge for nonrepresentative elements (and some exceptions)
- 3.10. you identify periodic table trends or patterns as they relate to chemical bond formation for the trend for bonding capacity of nonmetals in molecules

### 4. Explore chemical bonding as it relates to matter

#### Assessment Strategies

- 4.1. on a written evaluation

#### Criteria

*Your performance will be successful when:*

- 4.1. you predict ionic bonding between monatomic and polyatomic ions
- 4.2. you predict covalent bonding between nonmetallic elements using electronegativity to determine polar covalent and nonpolar covalent bonding types
- 4.3. you use the octet and duet rules to determine characteristics of matter and its role in determining the formation of fixed ionic charge

- 4.4. you use the octet and duet rules to determine characteristics of matter and its role in determining the bonding capacity for nonmetals in molecules
- 4.5. you use the octet and duet rules to determine characteristics of matter and its role in determining the formation of coordinate covalent bonds

## 5. Explore physical phenomenon as it relates to polarity

### Assessment Strategies

- 5.1. on a written evaluation

### Criteria

*Your performance will be successful when you:*

- 5.1. you investigate the role of noncovalent intermolecular forces in water- and fat- solubility
- 5.2. you investigate the role of ions in water- and fat- solubility
- 5.3. you predict overall polarity or nonpolarity from chemical structure
- 5.4. you predict polarity or nonpolarity given organic functional groups
- 5.5. you predict boiling points from chemical polarity
- 5.6. you predict melting points from chemical polarity

## 6. Explore chemical phenomena related to biochemistry

### Assessment Strategies

- 6.1. on a written evaluation

### Criteria

*Your performance will be successful when:*

- 6.1. you apply chemical bonds to competitive and noncompetitive enzyme binding models
- 6.2. you apply equilibrium concepts in acid/base organic reactions
- 6.3. you use concepts of polarity as it relates hydrophobicity and hydrophilicity
- 6.4. you apply concepts of oxidation/reduction chemical reactions to biological active molecules and their biochemical reactions
- 6.5. you identify of chirality in biologically active molecules

## 7. Use chemical equilibria concepts to describe reversible chemical reactions

### Assessment Strategies

- 7.1. on a written evaluation

### Criteria

*Your performance will be successful when:*

- 7.1. you use the Henderson-Hasselbach equation to predict the equilibrium constant
- 7.2. you determine what factors affect the extent of a chemical reaction
- 7.3. you link the relevance of chemical equilibrium to the role of buffers in biological systems

## 8. Use principles of acid/base chemistry to determine chemical and physical phenomena

### Assessment Strategies

- 8.1. on a written evaluation

### Criteria

*Your performance will be successful when:*

- 8.1. you identify chemical formulae as acids or bases
- 8.2. you describe the properties of acids and bases
- 8.3. you identify at least two classification schemes of acids/bases (Arrhenius, Bronsted/Lowry)
- 8.4. you investigate Acid-Base chemistry applied to inorganic and organic chemical compounds and its role in water solubility
- 8.5. you identify components of a buffer and accurately predict the role that each plays

## 9. Use quantitative skills to perform conversions or calculations

### Assessment Strategies

- 9.1. on a written evaluation

## Criteria

*Your performance will be successful when you:*

- 9.1. you use conversion tables for English and metric systems of measure
- 9.2. you calculate moles
- 9.3. you calculate concentrations
- 9.4. you solve solution problems including molarity, percent concentration, and dilutions, and dose calculations
- 9.5. you use equilibria expressions to predict the extent of a reaction
- 9.6. you calculate the concentration of the hydronium and hydroxide ions in pH solutions
- 9.7. you predict and then verify through calculation various gas laws (Boyles, Charles, etc)
- 9.8. you determine the reasonableness of an answer through estimation

## 10. Use critical thinking skills in chemistry lectures and labs

### Assessment Strategies

- 10.1. on a written evaluation

### Criteria

*Your performance will be successful when you:*

- 10.1. you use the Periodic Table
- 10.2. you use reference tables for water-solubility of inorganic salts
- 10.3. you use reference tables for VSEPR
- 10.4. you use reference tables for electronegativity
- 10.5. you use reference tables for organic functional groups
- 10.6. you use reference tables for organic nomenclature
- 10.7. you use reference tables for a list of polyatomic ions
- 10.8. you use conversion tables for English and metric systems of measure
- 10.9. you use reference tables for significant figure rules
- 10.10. you draw conclusions, given observations and scenarios depicting chemical phenomenon
- 10.11. you apply chemical theory to practical application through analysis of a pharmaceutical drug
- 10.12. you validate answers to word problems