**General Chemistry OWLBook, Vining/Young/Day/Botch Detailed TOC 1/12/2012**

**Chapter 1: Chemistry: Matter on the Atomic Scale**

* 1. What is Chemistry?

1.1a The Scale of Chemistry

Interactive Figure 1.1.1 Understand the scale of science.

1.1b Measuring Matter

Example Problem 1.1.1 Differentiate between the macroscopic and atomic scales.

Tutorial 1.1.1 Differentiate between the macroscopic and atomic scales.

Practice Problem 1.1.1 Differentiate between the macroscopic and atomic scales.

Section 1.1 Mastery

* 1. Classification of Matter

1.2a Classifying Matter on the Atomic Scale

Table 1.1.1 Some Common Elements and Their Symbols

Interactive Figure 1.2.1 Explore the composition of a sample of aluminum.

Example Problem 1.2.1 Classify pure substances as elements or compounds.

Tutorial 1.2.1 Classify pure substances as elements or compounds.

Practice Problem 1.2.1 Classify pure substances as elements or compounds.

1.2b Classifying Pure Substances on the Macroscopic Scale

Interactive Figure 1.2.2 Distinguish the properties of the three states of matter.

Interactive Figure 1.2.3 Investigate the chemical properties of methanol.

Example Problem 1.2.2 Identify physical and chemical properties and physical and chemical changes.

Tutorial 1.2.2 Identify physical and chemical properties and physical and chemical changes.

Practice Problem 1.2.2 Identify physical and chemical properties and physical and chemical changes.

1.2c Classifying Mixtures on the Macroscopic Scale

Interactive Figure 1.2.4 Identify homogeneous and heterogeneous mixtures.

Interactive Figure 1.2.5 Classify matter.

Example Problem 1.2.3 Identify pure substances and mixtures.

Tutorial 1.2.3 Identify pure substances and mixtures.

Practice Problem 1.2.3 Identify pure substances and mixtures.

Section 1.2 Mastery

* 1. Units and Measurement

1.3a Scientific Units

Table 1.3.1 SI Units

Table 1.3.2 Common Prefixes Used in the SI and Metric Systems

1.3b Scientific Notation

Example Problem 1.3.1 Write numbers using scientific notation.

Tutorial 1.3.1 Write numbers using scientific notation.

Practice Problem 1.3.1 Write numbers using scientific notation.

1.3c SI Base Units: Length, Mass, and Temperature

Interactive Figure 1.3.1 Compare different temperature scales.

Example Problem 1.3.2 Interconvert Fahrenheit, Celsius, and Kelvin temperatures.

Tutorial 1.3.2 Interconvert Fahrenheit, Celsius, and Kelvin temperatures.

Practice Problem 1.3.2 Interconvert Fahrenheit, Celsius, and Kelvin temperatures.

1.3d SI-Derived Units: Volume, Density, and Energy

Interactive Table 1.3.3 Densities of Some Common Substances at 25 ºC

Example Problem 1.3.3 Calculate density.

Tutorial 1.3.3 Calculate density.

Practice Problem 1.3.3

1.3e Significant Figures

Interactive Table 1.3.4 Rules for Determining Significant Figures

Example Problem 1.3.4 Identify the significant figures in a number.

Tutorial 1.3.4 Identify the significant figures in a number.

Practice Problem 1.3.4 Identify the significant figures in a number.

1.3f Significant Figures and Calculations

Example Problem 1.3.5 Use significant figures in calculations.

Tutorial 1.3.5 Use significant figures in calculations.

Practice Problem 1.3.5 Use significant figures in calculations.

1.3g Precision and Accuracy

Interactive Figure 1.3.3 Distinguish between precision and accuracy.

Section 1.3 Mastery

* 1. Unit Conversions

1.4a Dimensional Analysis

Example Problem 1.4.1 Use dimensional analysis to convert units.

Tutorial 1.4.1 Use dimensional analysis to convert units.

Practice Problem 1.4.1 Use dimensional analysis to convert units.

Example Problem 1.4.2 Use dimensional analysis with more than one conversion factor.

Tutorial 1.4.2 Use dimensional analysis with more than one conversion factor.

Practice Problem 1.4.2 Use dimensional analysis with more than one conversion factor.

1.4b Unit Conversions Using Density

Interactive Figure 1.4.1 Use density in calculations.

Example Problem 1.4.3 Convert units using density.

Tutorial 1.4.3 Convert units using density.

Practice Problem 1.4.3 Convert units using density.

Section 1.4 Mastery

Chapter Summary

Key Concepts

Key Equations

Key Terms

Chapter 1 Review and Challenge Problems

# Chapter 2: Elements and Compounds

2.1 The Structure of the Atom

2.1a Components of an Atom

Interactive Figure 2.1.1 Explore the components of an atom.

Table 2.1.1 Properties of Subatomic Particles

2.1b Atomic Number, Mass Number, and Atomic Symbols

Example Problem 2.1.1 Write atomic symbols.

Tutorial 2.1.1 Write atomic symbols.

Practice Problem 2.1.1 Write atomic symbols.

2.1c Isotopes and Atomic Mass

Interactive Figure 2.1.2 Explore isotopes.

Example Problem 2.1.2 Calculate average atomic mass.

Tutorial 2.1.2 Calculate average atomic mass.

Practice Problem 2.1.2 Calculate average atomic mass.

Section 2.1 Mastery

2.2 Elements and the Periodic Table

2.2a Introduction to the Periodic Table

Interactive Figure 2.2.1 Explore the Periodic Table.

Table 2.2.1 Special Names Given to Groups in the Periodic Table

Interactive Figure 2.2.2 Explore the composition of elements.

Example Problem 2.2.1 Identify the structure of elements.

Tutorial 2.2.1 Identify the structure of elements.

Practice Problem 2.2.1 Identify the structure of elements.

Section 2.2 Mastery

2.3 Covalent Compounds

2.3a Introduction to Covalent Compounds

Interactive Figure 2.3.1 Distinguish between molecular and network covalent compounds.

2.3b Representing Covalent Compounds with Molecular and Empirical Formulas

Example Problem 2.3.1 Write molecular and empirical formulas.

Tutorial 2.3.1 Write molecular and empirical formulas.

Practice Problem 2.3.1 Write molecular and empirical formulas.

2.3c Representing Covalent Compounds with Molecular Models

Interactive Figure 2.3.2 Explore representations of covalent compounds.

2.3d Naming Covalent Compounds

Interactive Table 2.3.1 Rules for Naming Binary Nonmetal Compounds

Table 2.3.2 Prefixes Used in Naming Binary Nonmetal Compounds

Table 2.3.3 Names and Formulas of Some Binary Nonmetals

Table 2.3.4 Selected Hydrocarbons with the Formula C*n*H2*n*+2

Table 2.3.5 Names and Formulas of the Halogen Oxoacids

Table 2.3.6 Names and Formulas of Some Inorganic Acids

Example Problem 2.3.2 Name covalent compounds.

Tutorial 2.3.2 Name covalent compounds.

Practice Problem 2.3.2 Name covalent compounds.

Section 2.3 Mastery

2.4 Ions and Ionic Compounds

2.4a Monoatomic Ions

Interactive Figure 2.4.1 Explore ion formation.

Example Problem 2.4.1 Predict charge on monoatomic ions.

Tutorial 2.4.1 Predict charge on monoatomic ions.

Practice Problem 2.4.1 Predict charge on monoatomic ions.

2.4b Polyatomic Ions

Interactive Table 2.4.1 Names and Formulas of Common Polyatomic Ions

## 2.4c Representing Ionic Compounds with Formulas

Interactive Figure 2.4.3 Write ionic compound formulas.

Example Problem 2.4.2 Write formulas for ionic compounds.

Tutorial 2.4.2 Write formulas for ionic compounds.

Practice Problem 2.4.2 Write formulas for ionic compounds.

## 2.4d Naming Ionic Compounds

Example Problem 2.4.3 Name ionic compounds.

Tutorial 2.4.3 Name ionic compounds.

Practice Problem 2.4.3 Name ionic compounds.

2.4e Identifying Covalent and Ionic Compounds

Example Problem 2.4.4 Identify covalent and ionic compounds.

Tutorial 2.4.4 Identify covalent and ionic compounds.

Practice Problem 2.4.4 Identify covalent and ionic compounds.

Section 2.4 Mastery

Chapter Summary

Key Concepts

Key Equations

Key Terms

Chapter 2 Review and Challenge Problems

# Chapter 3: Stoichiometry

3.1 The Mole and Molar Mass

3.1a Avogadro's Number

Interactive Figure 3.1.1 Recognize how the mole connects macroscopic and atomic scales.

Example Problem 3.1.1 Convert between moles and numbers of atoms.

Tutorial 3.1.1 Convert between moles and numbers of atoms.

Practice Problem 3.1.1 Convert between moles and numbers of atoms.

3.1b Molar Mass

Example Problem 3.1.2 Convert between mass and moles of an element.

Tutorial 3.1.2 Convert between mass and moles of an element.

Practice Problem 3.1.2 Convert between mass and moles of an element.

Example Problem 3.1.3 Convert between mass, moles, and atoms of an element.

Tutorial 3.1.3 Convert between mass, moles, and atoms of an element.

Practice Problem 3.1.3 Convert between mass, moles, and atoms of an element.

Example Problem 3.1.4 Determine the molar mass of a compound.

Tutorial 3.1.4 Determine the molar mass of a compound.

Practice Problem 3.1.4 Determine the molar mass of a compound.

Example Problem 3.1.5 Convert between mass and moles of a compound.

Tutorial 3.1.5 Convert between mass and moles of a compound.

Practice Problem 3.1.5 Convert between mass and moles of a compound.

Section 3.1 Mastery

3.2 Stoichiometry and Compound Formulas

3.2a Element Composition

Example Problem 3.2.1 Use compound formulas to determine element composition.

Tutorial 3.2.1 Use compound formulas to determine element composition.

Practice Problem 3.2.1 Use compound formulas to determine element composition.

3.2b Percent Composition

Example Problem 3.2.2 Calculate percent composition from a compound formula.

Tutorial 3.2.2 Calculate percent composition from a compound formula.

Practice Problem 3.2.2 Calculate percent composition from a compound formula.

3.2c Empirical Formulas from Percent Composition

Example Problem 3.2.3 Use percent composition to determine an empirical formula.

Tutorial 3.2.3 Use percent composition to determine an empirical formula.

Practice Problem 3.2.3 Use percent composition to determine an empirical formula.

3.2d Determining Molecular Formulas

Example Problem 3.2.4 Use percent composition and molar mass to determine molecular formula.

Tutorial 3.2.4 Use percent composition and molar mass to determine molecular formula.

Practice Problem 3.2.4 Use percent composition and molar mass to determine molecular formula.

3.2e Hydrated Compounds

Table 3.2.1 Some Common Hydrated Ionic Compounds

Example Problem 3.2.5 Determine the formula of a hydrated compound.

Tutorial 3.2.5 Determine the formula of a hydrated compound.

Practice Problem 3.2.5 Determine the formula of a hydrated compound.

Section 3.2 Mastery

3.3 Stoichiometry and Chemical Reactions

3.3a Chemical Reactions and Chemical Equations

3.3b Balancing Chemical Equations

Interactive Figure 3.3.1 Relate conservation of mass to balanced equations.

Example Problem 3.3.1 Balance equations.

Tutorial 3.3.1 Balance equations.

Practice Problem 3.3.1 Balance equations.

3.3c Reaction Stoichiometry

Example Problem 3.3.2 Use balanced chemical equations to relate amounts of reactants and products.

Tutorial 3.3.2 Use balanced chemical equations to relate amounts of reactants and products.

Practice Problem 3.3.2 Use balanced chemical equations to relate amounts of reactants and products.

Example Problem 3.3.3 Use reaction stoichiometry to calculate amounts of reactants and products.

Tutorial 3.3.3 Use reaction stoichiometry to calculate amounts of reactants and products.

Practice Problem 3.3.3 Use reaction stoichiometry to calculate amounts of reactants and products.

Section 3.3 Mastery