

TABLE OF CONTENTS

Licensing

1.1: Introduction

- 1.1.1: The Scope of Chemistry
- 1.1.2: Hypothesis, Theories, and Laws
 - 1.1.2.1: The Scientific Method - How Chemists Think
- 1.1.3: Extensive and Intensive Properties
- 1.1.4: Measurements and Exact Numbers
- 1.1.5: Accuracy and Precision
 - 1.1.5.1: Percent Error
 - 1.1.5.2: Comprehension Check
- 1.1.6: SI Base Units
 - 1.1.6.1: SI Length and Volume Units
 - 1.1.6.2: SI Mass and Weight Units
 - 1.1.6.3: Derived Units
 - 1.1.6.4: SI Kinetic Energy Units

1.2: Numbers and Measurement

- 1.2.1: Significant Figures - Writing Numbers to Reflect Precision
- 1.2.2: Significant Figures in Calculations
 - 1.2.2.1: Practice with Significant Figures
- 1.2.3: Scientific Notation - Writing Large and Small Numbers
- 1.2.4: Scientific Dimensional Analysis
 - 1.2.4.1: 2.4.1 Practice Unit Conversions
 - 1.2.4.1.1: 2.4.1 Practice Dimensional Analysis
- 1.2.5: Metric Unit Conversions
 - 1.2.5.1: Practice Metric Conversions
- 1.2.6: Density
- 1.2.7: Practice with Density

1.3: Matter and Energy

- 1.3.1: The Classification of Matter
- 1.3.2: Practice Classifying Matter
- 1.3.3: Physical Change
 - 1.3.3.1: Practice Classifying Change
- 1.3.4: Heat
 - 1.3.4.1: Exothermic and Endothermic Processes
 - 1.3.4.2: Heat Capacity and Specific Heat
 - 1.3.4.3: Temperature - Random Motion of Molecules and Atoms
- 1.3.5: Energy and Heat Capacity Calculations
 - 1.3.5.1: Specific Heat Calculations
 - 1.3.5.2: Practice with Heat and Temperature Calculations
- 1.3.6: Phase Changes

- 1.3.6.1: Practice Heat to Melt or Boil

1.4: Atoms and Elements

- 1.4.1: Cutting Aluminum until you get Atoms
 - 1.4.1.1: Indivisible - The Atomic Theory
- 1.4.2: The Nuclear Atom
 - 1.4.2.1: The Properties of Protons, Neutrons, and Electrons
 - 1.4.2.2: Isotopes - When the Number of Neutrons Varies
 - 1.4.2.3: Elements- Defined by Their Number of Protons
 - 1.4.2.4: Practice Isotopes
- 1.4.3: Looking for Patterns - The Periodic Table
- 1.4.4: Ions - Losing and Gaining Electrons
 - 1.4.4.1: Practice Ions
- 1.4.5: Electronic Structure and the Periodic Table
 - 1.4.5.1: Practice Electronic Structure
- 1.4.6: Periodic Trends- Atomic Radius
 - 1.4.6.1: Periodic Trends- Ionization Energy
 - 1.4.6.2: Metallic and Nonmetallic Character
 - 1.4.6.3: Practice Trends
- 1.4.7: Calculating Atomic Mass
 - 1.4.7.1: Practice Atomic Mass

1.5: Nuclear Chemistry

- 1.5.1: Radioactivity
- 1.5.2: Nuclear Bombardment Reactions
- 1.5.3: Half-Life
 - 1.5.3.1: Practice Half-Life
- 1.5.4: Units of Radioactivity
- 1.5.5: Uses of Radioactive Isotopes
- 1.5.6: Nuclear Energy
 - 1.5.6.1: Practice Nuclear Chemistry

1.6: Chemical Compounds

- 1.6.1: Ions
- 1.6.2: Formulas for Ionic Compounds
- 1.6.3: Ionic Nomenclature
 - 1.6.3.1: Practice Naming
- 1.6.4: Covalent Compounds - Formulas and Names
- 1.6.5: Acids
 - 1.6.5.1: More Practice Naming
- 1.6.6: Lewis Structures of Ionic Compounds- Electrons Transferred
 - 1.6.6.1: Covalent Lewis Structures- Electrons Shared
 - 1.6.6.2: Writing Lewis Structures for Covalent Compounds
 - 1.6.6.3: Practice Lewis Structures
- 1.6.7: Predicting the Shapes of Molecules
 - 1.6.7.1: Practice Shape
- 1.6.8: Electronegativity and Polarity - Why Oil and Water Don't Mix

- 1.6.8.1: Practice Polarity

1.7: Chemical Reactions and Quantities

- 1.7.1: The Mole
 - 1.7.1.1: Chemical Formulas as Conversion Factors
 - 1.7.1.2: Practice Mole Calculations
- 1.7.2: Percent Composition
 - 1.7.2.1: Determining Empirical Formulas
 - 1.7.2.2: Determining Molecular Formulas
 - 1.7.2.3: Practice Empirical and Molecular Formulas
- 1.7.3: How to Write Balanced Chemical Equations
 - 1.7.3.1: Practice Balancing Reactions
- 1.7.4: Types of Chemical Reactions - Single and Double Replacement Reactions
 - 1.7.4.1: Composition, Decomposition, and Combustion Reactions
 - 1.7.4.2: Precipitation Reactions
 - 1.7.4.3: Ionic Equations - A Closer Look
 - 1.7.4.4: Oxidation-Reduction (Redox) Reactions
 - 1.7.4.5: Practice Classifying Reactions
- 1.7.5: The Mole in Chemical Reactions
 - 1.7.5.1: Mole-Mass and Mass-Mass Calculations
 - 1.7.5.2: Practice Stoichiometry part 1
- 1.7.6: Limiting Reactant and Theoretical Yield
 - 1.7.6.1: Limiting Reactant, Theoretical Yield, and Percent Yield from Initial Masses of Reactants
 - 1.7.6.2: Practice Stoichiometry part 2
- 1.7.7: Enthalpy Change is a Measure of the Heat Evolved or Absorbed
 - 1.7.7.1: Practice Stoichiometry Part 3

1.8: Gases

- 1.8.1: Kinetic Theory of Gases
- 1.8.2: Pressure- The Result of Constant Molecular Collisions
 - 1.8.2.1: Practice Pressure Units
- 1.8.3: Boyle's Law
- 1.8.4: Charles's Law- Volume and Temperature
- 1.8.5: Combined Gas Law
 - 1.8.5.1: Practice Combined Gas Law
- 1.8.6: Avogadro's Law- Volume and Moles
- 1.8.7: Ideal Gas Law
 - 1.8.7.1: Practice Ideal Gas Law
- 1.8.8: Mixtures of Gases - Why Deep-Sea Divers Breathe a Mixture of Helium and Oxygen
 - 1.8.8.1: Practice Dalton's Law
- 1.8.9: Conversions Between Moles and Gas Volume
 - 1.8.9.1: Practice Gas Stoichiometry

1.9: Solutions

- 1.9.1: Solutions - Homogeneous Mixtures
- 1.9.2: Solutions of Solids Dissolved in Water- How to Make Rock Candy
- 1.9.3: Henry's Law

- 1.9.3.1: Practice Solution Properties
- 1.9.4: Percent Solutions
 - 1.9.4.1: Practice Mass Percent and Volume Percent
- 1.9.5: Molarity
 - 1.9.5.1: Practice Molarity
- 1.9.6: Dilution
 - 1.9.6.1: Practice Dilutions
- 1.9.7: Solution Stoichiometry
 - 1.9.7.1: Concentrations as Conversion Factors
 - 1.9.7.2: Practice Solution Concentration
- 1.9.8: Freezing Point Depression and Boiling Point Elevation
 - 1.9.8.1: Osmosis
 - 1.9.8.2: Practice Colligative Properties

1.10: Equilibrium

- 1.10.1: The Rate of a Chemical Reaction
 - 1.10.1.1: Practice Effects on Rate
- 1.10.2: The Idea of Dynamic Chemical Equilibrium
- 1.10.3: The Equilibrium Constant - A Measure of How Far a Reaction Goes
 - 1.10.3.1: Calculating and Using Equilibrium Constants
 - 1.10.3.2: Practice Equilibrium Constant Expressions
- 1.10.4: Calculations with Equilibrium Constants
 - 1.10.4.1: Practice Equilibrium Constants
- 1.10.5: Disturbing a Reaction at Equilibrium- Le Châtelier's Principle
 - 1.10.5.1: The Effect of a Concentration Change on Equilibrium
 - 1.10.5.2: The Effect of a Volume Change on Equilibrium
 - 1.10.5.3: The Effect of Temperature Changes on Equilibrium
 - 1.10.5.4: The Path of a Reaction and the Effect of a Catalyst
 - 1.10.5.5: Practice Le Chatelier's Principle

1.11: Acids and Bases

- 1.11.1: Acids- Properties and Examples
 - 1.11.1.1: Bases- Properties and Examples
- 1.11.2: Molecular Definitions of Acids and Bases
- 1.11.3: Strong and Weak Acids and Bases
- 1.11.4: Strong and Weak Acids and Acid Ionization Constant $\left(K_{\text{a}} \right)$
 - 1.11.4.1: Practice Acids and Bases
- 1.11.5: Water - Acid and Base in One
- 1.11.6: The pH and pOH Scales - Ways to Express Acidity and Basicity
 - 1.11.6.1: Practice pH
- 1.11.7: Reactions of Acids and Bases
- 1.11.8: Acid–Base Titration
 - 1.11.8.1: Practice Titration Calculations
- 1.11.9: Buffers are Solutions that Resist pH Change
 - 1.11.9.1: Practice Buffer Identification

[Index](#)

[Glossary](#)

[Detailed Licensing](#)