

TABLE OF CONTENTS

Licensing

1: Introduction

- 1.1: Units
- 1.2: Quantity Calculus
- 1.3: Dimensional Analysis
- 1.4: Chapter 1 Problem

2: General Chemistry Review

- 2.1: Gases
 - 2.1.1: Relating Pressure, Volume, Amount, and Temperature - The Ideal Gas Law
 - 2.1.2: Stoichiometry of Gaseous Substances, Mixtures, and Reactions
 - 2.1.3: The Kinetic-Molecular Theory
 - 2.1.4: Non-Ideal Gas Behavior
- 2.2: Thermodynamics
 - 2.2.1: Energy Basics
 - 2.2.2: Enthalpy
 - 2.2.3: Spontaneity
 - 2.2.4: Entropy
 - 2.2.5: The Second and Third Laws of Thermodynamics
 - 2.2.6: Free Energy
- 2.3: Kinetics
 - 2.3.1: Chemical Reaction Rates
 - 2.3.2: Factors Affecting Reaction Rates
 - 2.3.3: Rate Laws
 - 2.3.4: Integrated Rate Laws
 - 2.3.5: Collision Theory
 - 2.3.6: Reaction Mechanisms
 - 2.3.7: Catalysis

3: The First Law of Thermodynamics

- 3.1: Overview of Classical Thermodynamics
- 3.2: Pressure-Volume Work
- 3.3: Work and Heat are not State Functions
- 3.4: Energy is a State Function
- 3.5: An Adiabatic Process is a Process in which No Energy as Heat is Transferred
- 3.6: The Temperature of a Gas Decreases in a Reversible Adiabatic Expansion
- 3.7: Pressure-Volume Work
- 3.8: Heat Capacity is a Path Function
- 3.9: Relative Enthalpies Can Be Determined from Heat Capacity Data and Heats of Transition
- 3.10: Enthalpy Changes for Chemical Equations are Additive
- 3.11: Heats of Reactions Can Be Calculated from Tabulated Heats of Formation
- 3.12: The Temperature Dependence of ΔH
- 3.13: Enthalpy is a State Function
- 3.E: The First Law of Thermodynamics (Exercises)

4: Entropy and The Second Law of Thermodynamics

- 4.1: Energy Does not Determine Spontaneity
- 4.2: Nonequilibrium Isolated Systems Evolve in a Direction That Increases Their Energy Dispersal
- 4.3: Unlike heat, Entropy is a State Function
- 4.4: The Second Law of Thermodynamics
- 4.5: We Must Always Devise a Reversible Process to Calculate Entropy Changes
- 4.E: Entropy and The Second Law of Thermodynamics (Exercises)

5: Entropy and the Third Law of Thermodynamics

- 5.1: Entropy Increases With Increasing Temperature
- 5.2: The 3rd Law of Thermodynamics Puts Entropy on an Absolute Scale
- 5.3: The Entropy of a Phase Transition can be Calculated from the Enthalpy of the Phase Transition
- 5.4: Standard Entropies Can Be Used to Calculate Entropy Changes of Chemical Reactions
- 5.E: Entropy and the Third Law of Thermodynamics (Exercises)

6: Helmholtz and Gibbs Energies

- 6.1: Gibbs Energy Determines the Direction of Spontaneity at Constant Pressure and Temperature
- 6.2: Thermodynamic Functions have Natural Variables
- 6.3: The Standard State for a Gas is an Ideal Gas at 1 Bar
- 6.4: The Gibbs-Helmholtz Equation
- 6.E: Helmholtz and Gibbs Energies (Exercises)

[Index](#)

[Glossary](#)

[Detailed Licensing](#)

[Detailed Licensing](#)