

TABLE OF CONTENTS

Licensing

Acknowledgments

Forward

1: Gas Equations of State

- 1.1: Units and the Perfect Gas Law
- 1.2: Van der Waals Equation
- 1.3: The Virial Equation
- 1.4: Phase Transitions
- 1.5: Corresponding States

2: Energy

- 2.1: Work and the Inexact Differential
- 2.2: Reversible and Irreversible Transitions
- 2.3: Exact and Inexact Partial Derivatives and Euler's Test
- 2.4: Internal Energy (U) and the Equipartition Theorem
- 2.5: Heat Transactions, Heat Capacity, and Adiabatic Systems

3: Enthalpy, Legendre Transforms, and Thermodynamic Proofs

- 3.1: Enthalpy and Changing Functions
- 3.2: Heat Capacities
- 3.3: Natural Variables and Legendre Transforms
- 3.4: The Joule and Joule-Thomson Experiments

4: Entropy and the 2nd Law

- 4.1: Introduction to Entropy
- 4.2: Entropy inside and outside- The 2nd Law and the Clausius Inequality
- 4.3: Calculating Entropy Changes
- 4.4: The Car Engine and the Carnot Cycle
- 4.5: Refrigeration
- 4.6: Maxwell Relationships

5: Helmholtz and Gibbs Energy

- 5.1: Helmholtz Energy (and The Clausius Inequality Pt. II)
- 5.2: Gibbs Energy
- 5.3: Calculations- Numerical and Derivations
- 5.4: Advanced Derivations - Maxwell Relationships II

6: Chemical Thermodynamics

- 6.1: Entropy and the 3rd Law
- 6.2: Energy, it's all relative
- 6.3: Enthalpy and Gibbs Energy of Formation- Hess's Law examples
- 6.4: Chemical reactions and chemical potential

- 6.5: Equilibrium Constants

7: Solutions and Colligative Properties

- 7.1: Partial Vapor Pressure
- 7.2: Partial Pressure Measurements and Raoult's Law
- 7.3: Excess Functions and Ideal Solutions
- 7.4: Henry's Law, Activity, and Ideal-Dilute Solutions
- 7.5: Colligative Properties

8: Phase Changes

- 8.1: The Gibbs Phase Rule
- 8.2: Entropy is the Reason Phase Changes Occur
- 8.3: Other Examples of Phase Changes

9: Surfaces, Interfaces and Electrochemistry

- 9.1: Surfaces and Surface Energy
- 9.2: Surface Expansion Work
- 9.3: Electrochemistry and the Nernst Equation

10: The Kinetic Theory of Gas

- 10.1: Probability vs. Probability Distribution
- 10.2: The Boltzmann Distribution
- 10.3: Average and RMS Velocities
- 10.4: Average relative velocity and collision frequency
- 10.5: Appendix - Jacobians

11: Boltzmann Statistics

- 11.1: The Black body Radiator
- 11.2: Heat Capacity of Solids

12: Introduction to the Schrödinger Equation

- 12.1: Einstein's Theory of Relativity
- 12.2: The Schrödinger Equation
- 12.3: Born interpretation
- 12.4: The Eigenvalue Equation and operators
- 12.5: The Freewave Potential

13: Potential Surfaces and the Heisenberg Uncertainty Principle

- 13.1: Potential Energy Surfaces
- 13.2: Complex Potential Energy Surfaces- Vibration
- 13.3: Uncertainty and Superposition- Wavefunctions as Waves

14: Multidimensional Quantum Mechanics and Rotation

- 14.1: Multidimensional Free waves and the Particle in a Cube
- 14.2: Rotational Quantum Mechanics- Introduction
- 14.3: Wavefunctions
- 14.4: Spin Angular Momentum
- 14.5: Angular Momentum Operators

- [14.6: Addition of Angular Momentum and Term Symbols](#)

15: The Hydrogen Atom

- [15.1: The Bohr Model](#)
- [15.2: The Hydrogen Schrödinger Equation](#)
- [15.3: Hydrogen Radial Wavefunctions](#)
- [15.4: Spin-Orbit Coupling](#)
- [15.5: Spectroscopy](#)
- [15.6: Multielectron Atoms and Exchange](#)
- [15.7: Appendix](#)

[Index](#)

[Glossary](#)

[Detailed Licensing](#)