

TABLE OF CONTENTS

Licensing

1: Introductory Remarks

- 1.1: Introduction
- 1.2: Caloric, Calories, Heat and Energy
- 1.3: Extensive and Intensive Quantities
- 1.4: Mole
- 1.5: Prepositions
- 1.6: Applicability of Equations

2: Partial Derivatives

- 2.1: Introduction
- 2.2: Partial Derivatives
- 2.3: Implicit Differentiation
- 2.4: Product of Three Partial Derivatives
- 2.5: Second Derivatives and Exact Differentials
- 2.6: Euler's Theorem for Homogeneous Functions
- 2.7: Undetermined Multipliers
- 2.8: Dee and Delta

3: Temperature

- 3.1: Zeroth Law of Thermodynamics
- 3.2: Temperature Scales I
- 3.3: Temperature Scales II

4: Thermal Conduction

- 4.1: Error Function
- 4.2: Introduction
- 4.3: Thermal Conductivity
- 4.4: The Heat Conduction Equation
- 4.5: A Solution of the Heat Conduction Equation

5: Thermodynamic Processes

6: Properties of Gases

- 6.1: The Ideal Gas Equation
- 6.2: Real Gases
- 6.3: Van der Waals and Other Gases
- 6.4: Gas, Vapour, Liquid and Solid
- 6.5: Kinetic Theory of Gases- Pressure
- 6.6: Collisions
- 6.7: Distribution of Speeds
- 6.8: Forces Between Molecules

7: The First and Second Laws of Thermodynamics

- 7.1: The First Law of Thermodynamics, and Internal Energy
- 7.2: Work
- 7.3: Entropy
- 7.4: The Second Law of Thermodynamics

8: Heat Capacity, and the Expansion of Gases

- 8.1: Heat Capacity
- 8.2: Ratio of the Heat Capacities of a Gas
- 8.3: Isothermal Expansion of an Ideal Gas
- 8.4: Reversible Adiabatic Expansion of an Ideal Gas
- 8.5: The Clément-Desormes Experiment
- 8.6: The Slopes of Isotherms and Adiabats
- 8.7: Scale Height in an Isothermal Atmosphere
- 8.8: Adiabatic Lapse Rate
- 8.9: Numerical Values of Specific and Molar Heat Capacities
- 8.10: Heat Capacities of Solids

9: Enthalpy

- 9.1: Enthalpy
- 9.2: Change of State
- 9.3: Latent Heat and Enthalpy

10: The Joule and Joule-Thomson Experiments

- 10.1: Introduction
- 10.2: The Joule Experiment
- 10.3: The Joule-Thomson Experiment
- 10.4: CP Minus CV
- 10.5: Blackbody Radiation

11: Heat Engines

- 11.1: Introduction
- 11.2: The Carnot Cycle
- 11.3: The Stirling Cycle
- 11.4: The Otto Cycle
- 11.5: The Diesel Cycle
- 11.6: The Rankine Cycle (Steam Engine)
- 11.7: A Useful Exercise
- 11.8: Heat Engines and Refrigerators
- 11.9: Entropy is a Function of State

12: Free Energy

- 12.1: Review of Internal Energy and Enthalpy
- 12.2: Free Energy
- 12.3: Helmholtz Free Energy
- 12.4: Gibbs Free Energy
- 12.5: Summary, the Maxwell Relations, and the Gibbs-Helmholtz Relations
- 12.6: The Joule and Joule-Thomson Coefficients
- 12.7: The Thermodynamic Functions for an Ideal Gas

- 12.8: The Thermodynamic Functions for Other Substances
- 12.9: Absolute Entropy
- 12.10: Charging a Battery
- 12.11: Surface Energy
- 12.12: Fugacity

13: Expansion, Compression and the TdS Equations

- 13.1: Coefficient of Expansion
- 13.2: Compression
- 13.3: Pressure and Temperature
- 13.4: The TdS Equations
- 13.5: Expansion, Compression and the TdS Equations
- 13.6: Young's Modulus
- 13.7: Rigidity Modulus (Shear Modulus)
- 13.8: Volume, Temperature and the Grüneisen Parameter

14: The Clausius-Clapeyron Equation

15: Adiabatic Demagnetization

- 15.1: Introduction
- 15.2: Adiabatic Decompression
- 15.3: Adiabatic Demagnetization
- 15.4: Entropy and Temperature

16: Nernst's Heat Theorem and the Third Law of Thermodynamics

- 16.1: Nernst's Heat Theorem
- 16.2: The Third Law of Thermodynamics

17: Chemical Thermodynamics

- 17.1: Equilibrium Constant
- 17.2: Heat of Reaction
- 17.3: The Gibbs Phase Rule
- 17.4: Chemical Potential
- 17.5: Partial and Mean Molar Quantities
- 17.6: The Gibbs-Duhem Relation
- 17.7: Chemical Potential, Pressure, Fugacity
- 17.8: Entropy of Mixing, and Gibbs' Paradox
- 17.9: Binary Alloys
- 17.10: Ternary Alloys

18: Experimental Measurements

- 18.1: Introduction
- 18.2: Thermal Conductivity
- 18.3: The Universal Gas Constant
- 18.4: Avogadro's Number and Boltzmann's Constant
- 18.5: Specific Heat Capacities of Solids and Liquids
- 18.6: Specific Heat Capacities of Gases
- 18.7: Latent Heat of Fusion
- 18.8: Coefficient of Expansion

[Index](#)

[Index](#)

[Glossary](#)

[Detailed Licensing](#)