

Don DeVault  
 College of the Pacific  
 Stockton, Calif.

# Contents

PREFACE . . . . . iii

CHAPTER . . . . . PAGE

I. GASES . . . . . 1

Calculations based on  $PV = nRT$ , and Molecular Weights . . . . . 2

Calculations of Volume, Pressure, Temperature, and Number of Molecules . . . . . 4

Per Cent of Dissociation in the Gaseous State . . . . . 6

Average Velocity of Molecules . . . . . 8

Heating Gases at Constant Volume and Constant Pressure . . . . . 9

Rates of Effusion . . . . . 10

Van der Waals' Equation . . . . . 11

Special Exercises with Answers . . . . . 13

II. PURE LIQUIDS . . . . . 14

Vapor Pressure as a Function of Temperature . . . . . 14

Dühring's Rule . . . . . 17

Vapor Pressure of a Liquid by the Gas-Saturation Method . . . . . 18

Critical Constants from van der Waals' Equation . . . . . 19

Relative Humidity . . . . . 21

Capillary Rise and Surface Tension . . . . . 22

Relative and Absolute Viscosity . . . . . 23

Surface Tension from Data Based on the Drop Method . . . . . 25

Trouton's Rule . . . . . 27

Critical Temperature from Temperature Coefficient of Surface Tension . . . . . 29

Special Exercises with Answers . . . . . 31

I THE SOLID STATE . . . . . 33

PART I. X Rays and Crystal Structure . . . . . 33

Calculation of Interplanar Distances in Crystals from X-Ray Data . . . . . 34

Calculation of Wave Length of X Rays . . . . . 34

Type of Cubic Lattice from X-Ray Data . . . . . 34

| CHAPTER                                                    | P.         |
|------------------------------------------------------------|------------|
| Collision Frequencies . . . . .                            | 150        |
| Activation Energy . . . . .                                | 151        |
| Special Exercises with Answers . . . . .                   | 152        |
| <b>XIII. THERMODYNAMICS . . . . .</b>                      | <b>153</b> |
| Laws of Thermodynamics . . . . .                           | 159        |
| Calculation of Thermodynamic Entities for Simple Changes   | 160        |
| Compressions and Expansions with Variable Pressure:        |            |
| Isothermal . . . . .                                       | 162        |
| Compressions and Expansions with Variable Pressure:        |            |
| Adiabatic . . . . .                                        | 164        |
| Thermodynamic Efficiency . . . . .                         | 165        |
| The Clapeyron Equation . . . . .                           | 167        |
| Free-Energy Change and Equilibrium Constants . . . . .     | 170        |
| Calculation of Free-energy Change at Different Tempera-    |            |
| from Heats of Reaction and Heat Capacities . . . . .       | 172        |
| Activities and Fugacities . . . . .                        | 176        |
| Absolute Entropies from Specific Heats . . . . .           | 178        |
| Calculation of Equilibrium Constants from Thermal Data     | 180        |
| Special Exercises with Answers . . . . .                   | 182        |
| <b>XIV. ELECTROCHEMISTRY . . . . .</b>                     | <b>184</b> |
| Faraday's Law . . . . .                                    | 186        |
| Transference Numbers . . . . .                             | 188        |
| Specific and Equivalent Conductivity . . . . .             | 192        |
| The Ionic Conductance . . . . .                            | 195        |
| Additivity of Ionic Conductances . . . . .                 | 196        |
| Solubility Product by Conductance . . . . .                | 197        |
| Absolute Rate of Ionic Migration . . . . .                 | 199        |
| Voltage or Electromotive Force of Galvanic Cells . . . . . | 201        |
| The Hydrogen Electrode and <i>pH</i> . . . . .             | 205        |
| Electrolysis . . . . .                                     | 207        |
| Special Exercises with Answers . . . . .                   | 209        |
| INTERNATIONAL ATOMIC WEIGHTS (1941) . . . . .              | 211        |
| LOGARITHMS . . . . .                                       | 212        |
| ANTILOGARITHMS . . . . .                                   | 214        |