

Contents

Chapter I. Fundamental Concepts	1
A. Introduction	1
B. Definitions	1
C. Postulates	10
Problems	15
Selected Literature	17
 Chapter II. Exergy	 19
A. Introduction	19
B. Exergy of a Closed System	19
C. Exergy Accounting in Flow Systems	26
D. Relationship Between Exergy Disappearance and Entropy Creation	30
E. Exergetic and Thermoeconomic Analyses	33
Problems	38
Selected Literature	39
 Chapter III. Generalized Forces	 43
A. Introduction	43
B. Choice of Driving Forces	43
C. Comparison of Generalized with Conventional Driving Forces	51
Problems	54
Selected Literature	55
 Chapter IV. Isothermal Flow Coupling	 57
A. Introduction	57
B. Mass Transfer in Ionic Membranes	57
C. Linear Phenomenological Relations Between Fluxes and Generalized Driving Forces	60
D. Electrokinetic Flow Equations	69
Problems	73
Selected Literature	74

Chapter V. Conductance Coefficients and Reciprocity Relations .	77
A. Laws About the Magnitude of Conductance Coefficients	77
B. Proofs of the Laws	78
C. Degree of Coupling	80
Problems	80
Selected Literature	81
 Chapter VI. General Energetics of Chemical Reactions	 83
A. Introduction	83
B. Generalized Forces and “Flows” of Chemical Reactions	83
C. Coupled Chemical Reactions	90
Problems	94
Selected Literature	96
 Chapter VII. Interdiffusion of Gases in Porous Media	 97
A. Introduction	97
B. Friction Model	98
C. Diffusion Under Knudsen Conditions	101
D. Interdiffusion at Uniform Pressure	102
E. Summary	106
Selected Literature	106
 Chapter VIII. Molecular Filtration Through Membranes	 109
A. Introduction	109
B. Review of Osmotic-Pressure Equations	109
C. Flow Equations	113
Problems	117
Selected Literature	119
 Chapter IX. Coupled Heat and Mass Flow	 121
A. Introduction	121
B. Adiabatic Gas Flow Through Porous Media	121
C. Flux Equations	123
D. Heat of Transfer of Ideal Gases (Gas-Kinetic Interpretation) .	125
E. Summary	128
Problem	129
Selected Literature	129

Contents	XI
Chapter X. Thermoelectric Phenomena	131
A. Introduction	131
B. Qualitative Discussion of the Coupling Effects	131
C. Flow Equations and Relations Between Thermoelectric Phenomena	134
Problems	138
Selected Literature	140
List of Symbols	141
Appendix I. Carnot's Engine	149
Appendix II. Dependence of Chemical Potential on Concentration	155
Appendix III. Answers to Problems	159
Subject Index	165