

TABLE OF CONTENTS

Part One

The Basic Concepts of Quantum Statistics

1. The Basic Principles of the Statistical Mechanics of Quantum Systems	1
2. The Adiabatic Process: Thermodynamic Functions	13
3. Statistical Operators of Molecular Complexes	17
4. The Application to Systems of Monoatomic Spinless Molecules	31

Part Two

The Method of Second Quantization

1. The Second Quantized Representation for Wave Functions	39
2. Second-quantized Representation for Dynamical Variables; Relation to the Method of Statistical Operators	47
3. The Case of Bose Statistics	56
4. The Case of Fermi Statistics	67

Part Three

The Theory of the Bose-Einstein Gas and its Application to an Investigation of the Phenomenon of Superfluidity

1. The Perfect Bose-Einstein Gas	76
2. Condensation in Momentum Space and Superfluidity	84
3. The Basic Postulates of Landau's Theory of Superfluidity	95
4. Application of Perturbation Theory to an Investigation of the Energy Levels of an Imperfect Bose-Einstein Gas	98
5. The Method of Approximate Second Quantization and the Theory of Superfluidity	107

Part Four

The Theory of the Polar Model of Metals

1. The Secular Equations for the Polar Model in Second Quantized Representation	120
2. The Orthogonalization of the One-electron Atomic Functions	131
3. The Polar Model of Metals and Band Theory	140
4. The Expansion of the Hamiltonian in a Power Series of a Small Parameter	146
5. Perturbation Theory for a Degenerate Level	152
6. Application to the Secular Equations	158
7. The First and Second Approximations	163
8. The Relation to the Heitler-London Method	168
9. The Third Approximation: the Formula for Determining the Electric Current	174
10. Physical Interpretation	191
11. The Method of Approximate Second Quantization	201
12. Application to the Theory of Ferromagnetism	224
Index	235