<<统计力学>>

图书基本信息

书名：<<统计力学>>

13位ISBN编号：9787510042805

10位ISBN编号：7510042801

出版时间：2012-3

出版时间：世界图书出版公司

作者：马提斯

页数：335

内容概要

For this new edition, each chapter was revised and improved, typos corrected and figures added, some in response to many helpful comments on the first edition. We especially thank Professor Milton W. Cole for his correction of a factor 2 in the specific heat of a 1D hard-core Bose gas. Additionally, solutions to some representative problems have been included in an Appendix.

But, more t.han mere revision and expansion of the material, it is the wit and knowledge of a new co-author that has greatly improved the present text. Thanks to this couaboration the topics of renormalization group and Monte-Carlo numerical techniques could be treated on a par with more conventional elements of statistical thermodynamics. The addition of these important subjects and the expansion of topics that previously had been just many-body theory and phase transitions. We present this new edition in the hope it will better serve the contemporary student while offering to the instructor a wider, more useful choice of lecture materials.

作者简介

作者：（美国）马提斯（Daniel C.Mattis）

书籍目录

Preface to Second Edition
Preface to First Edition
Introduction: Theories of Thermodynamics, Kinetic Theory and Statistical Mechanics
Chapter 1 Elementary Concepts in Statistics and Probability
1.0.Random Variables and Their Distributions
1.1.The Binomial Distribution
1.2.Length of a Winning Streak
1.3.Brownian Motion and the Random Walk
1.4.Poisson versus Normal （Gaussian） Distributions
1.5.Central Limit Theorem （CLT）
1.6.Multinomial Distributions, Statistical Thermodynamics
1.7.The Barometer Equation
1.8.Other Distributions
Chapter 2 The Ising Model and the Lattice Gas
2.0.Physical Applications of the Binary Model
2.1.Some Background and Motivation
2.2.First-Principles Statistical Theory of Paramagnetism
2.3.More on Entropy and Energy
2.4.Some Other Relevant Thermodynamic Functions
2.5.Mean-Field Theory, Stable and Metastable Solutions
2.6.The Lattice Gas
2.7.The Nearest-Neighbor Chain: Thermodynamics in 1D
2.8.The Disordered Ising Chain
2.9.Other Magnetic Systems in One Dimension
Chapter 3 Elements of Thermodynamics
3.1.The Scope of Thermodynamics
3.2.Equations of State and Some Definitions
3.3.Maxwell Relations
3.4.Three Important Laws of Thermodynamics
3.5.The Second Derivatives of the Free Energy
3.6.Phase Diagrams for the van der Waals Gas
3.7.Clausius-Clapeyron Equation
3.8.Phase Transitions
3.9.The Carnot Cycle
3.10. Superconductivity
Chapter 4 Statistical Mechanics
4.0.An Axiomatic Approach and the Ergodic Hypothesis
4.1.The Formalism - and a False Start
4.2.Gibbs' Paradox and Its Remedy
4.3.The Gibbs Factor
4.4.The Grand Ensemble
4.5.Non-Ideal Gas and the 2-Body Correlation Function
4.6.The Virial Equation of State
4.7.Weakly Non-Ideal Gas

4.8. .Two-body Correlations
4.9.Configurational Partition Function in 1D
4.10. One Dimension versus Two
4.11. Two Dimensions versus Three: The Debye-Waller Factors
4.12. Specific Heat of Quasi-Ideal Dilute Atomic and Diatomic Gases
4.13. Nanophysics and Inhomogeneity
Chapter 5 The World of Bosons
5.0. Quantum "Statistics"
5.1.Two Types of Bosons and Their Operators
5.2.Number Representation and the Many-Body Problem
5.3.The Adiabatic Process and Conservation of Entropy
5.4.Many-Body Perturbations
5.5. Photons
……
Chapter 6 All About Fermions: Theories of Metals,Superconductors, Semiconductors
Chapter 7 Kinetic Theory
Chapter 8 The Transfer Matrix
Chapter 9 Monte Carlo and Other Computer Simulation Methods
Chapter 10 Critical Phenomena and the Renormalization Group
Chapter 11 Some Uses of Quantum Field Theory in Statistical Physics

章节摘录

版权页： 插图： 6.14. Contemporary Developments in Superconductivity The interest surrounding the BCS theory stimulated numerous discoveries,including the pair-breaking effects of magnetic impurities that can significantly decrease the energy gap Δ and to a lesser degree, Tc' The discovery of type Ⅱ superconductors that magnetic fields could penetrate by creating arrays of vortices with nonsuperconducting cores added to the general excitement. Inhomogeneities of this type became understood with the aid of semiphenomenological Landau-Ginsberg equations, once these equations were mated to the BCS theory.o The Josephson effect and numerous other tunneling phenomena soon became major concerns,r although the real push was on to raise Tc to where practical applications might ensue. For a period of 3 decades all known superconducting materials were alloyed and mixed with one another in a futile attempt to raise Tc above some 25 K. In fact, a number of theoretical speculations (too erudite to repeat) purported to show that Tc = 30 K could never be exceeded by the mechanism of the electron-phonon interaction alone. The situation changed dramatically in late 1986 and the Nobel prize was awarded to J. Bednorz and K. M ü ller shortly thereafter for their discovery of the first "high-temperature superconductor" -- doped lanthanum copper oxide, a layered mineral belonging to the perovskite family, exhibiting type Ⅱ superconductivity up to T = 35 K. Numerous other minerals, all containing layers of the two-dimensional spin-1/2 antiferromagnet CuO2, were soon developed in a frantic search for successively higher Tc. Interestingly, the normal conductivity in these materials is highly anisotropic: highly conductive in the ab plane, they are approximately semiconductors along the perpendicular crystallographic c-axis. On the other hand the superconducting phase is quasi-isotropic, possibly owing to Josephson tunneling between planes that is lacking in the normal phase. Critical temperatures upwards of 160 K have already been attained (or at least, reported) and at the date of writing, some hope remains that a room-temperature superconductor will be found. It is not far-fetched to say that such a discovery would soon revolutionize contemporary electronics, electrical engineering and perhaps all of technology.

编辑推荐

《统计力学(第2版)》由世界图书出版公司北京公司出版。