1. Record Nr. UNINA9910821143503321

Autore	Ford Ian
Titolo	Statistical physics : an entropic approach / / Ian Ford
Pubbl/distr/stampa	Chichester, : Wiley, 2013
ISBN	1-118-59749-4 1-118-59750-8 1-299-44941-7 1-118-59751-6
Edizione	[1st ed.]
Descrizione fisica	1 online resource (282 p.)
Classificazione	SCI065000
Disciplina	536.7015195
Soggetti	Statistical thermodynamics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Title Page; Copyright; Contents; Preface; Chapter 1 Disorder or Uncertainty?; Chapter 2 Classical Thermodynamics; 2.1 The Classical Laws of Thermodynamics; 2.2 Macroscopic State Variables and Thermodynamic Processes; 2.3 Properties of the Ideal Classical Gas; 2.4 Thermodynamic Processing of the Ideal Gas; 2.5 Entropy of the Ideal Gas; 2.6 Entropy Change in Free Expansion of an Ideal Gas; 2.7 Entropy Change due to Nonquasistatic Heat Transfer; 2.8 Cyclic Thermodynamic Processes, the Clausius Inequality and Carnot's Theorem; 2.9 Generality of the Clausius Expression for Entropy Change 2.10 Entropy Change due to Nonquasistatic Work2.11 Fundamental Relation of Thermodynamics; 2.12 Entropy Change due to Nonquasistatic Particle Transfer; 2.13 Entropy Change due to Nonquasistatic Volume Exchange; 2.14 General Thermodynamic Driving; 2.15 Reversible and Irreversible Processes; 2.16 Statements of the Second Law; 2.17 Classical Thermodynamics: the Salient Points; Exercises; Chapter 3 Applications of Classical Thermodynamics; 3.1 Fluid Flow and Throttling Processes; 3.2 Thermodynamic Potentials and Availability; 3.2.1 Helmholtz Free Energy; 3.2.2 Why Free Energy? 3.2.3 Contrast between Equilibria3.2.4 Gibbs Free Energy; 3.2.5 Grand Potential; 3.3 Maxwell Relations; 3.4 Nonideal Classical Gas; 3.5 Relationship between Heat Capacities; 3.6 General Expression for an

Adiabat; 3.7 Determination of Entropy from a Heat Capacity; 3.8 Determination of Entropy from an Equation of State; 3.9 Phase Transitions and Phase Diagrams; 3.9.1 Conditions for Coexistence; 3.9.2 Clausius-Clapeyron Equation; 3.9.3 The Maxwell Equal Areas Construction; 3.9.4 Metastability and Nucleation; 3.10 Work Processes without Volume Change; 3.11 Consequences of the Third Law
3.12 Limitations of Classical ThermodynamicsExercises; Chapter 4 Core Ideas of Statistical Thermodynamics; 4.1 The Nature of Probability; 4.2 Dynamics of Complex Systems; 4.2.1 The Principle of Equal a Priori Probabilities; 4.2.2 Microstate Enumeration; 4.3 Microstates and Macrostates; 4.4 Boltzmann's Principle and the Second Law; 4.5 Statistical Ensembles; 4.6 Statistical Thermodynamics: the Salient Points; Exercises; Chapter 5 Statistical Thermodynamics of a System of Harmonic Oscillators; 5.1 Microstate Enumeration; 5.2 Microcanonical Ensemble; 5.3 Canonical Ensemble
5.4 The Thermodynamic Limit5.5 Temperature and the Zeroth Law of Thermodynamics; 5.6 Generalisation; Exercises; Chapter 6 The Boltzmann Factor and the Canonical Partition Function; 6.1 Simple Applications of the Boltzmann Factor; 6.1.1 Maxwell-Boltzmann Distribution; 6.1.2 Single Classical Oscillator and the Equipartition Theorem; 6.1.3 Isothermal Atmosphere Model; 6.1.4 Escape Problems and Reaction Rates; 6.2 Mathematical Properties of the Canonical Partition Function; 6.3 Two-Level Paramagnet; 6.4 Single Quantum Oscillator; 6.5 Heat Capacity of a Diatomic Molecular Gas
6.6 Einstein Model of the Heat Capacity of Solids

Sommario/riassunto

"This undergraduate textbook provides students with a statistical mechanical foundation to the classical laws of thermodynamics through a comprehensive treatment of the basics of classical thermodynamics, equilibrium statistical mechanics, irreversible thermodynamics, and statistical mechanics of non-equilibrium phenomena. The concept of entropy is studied starting from the ideal gas law, known to every undergraduate. By considering various thermodynamic processes, it then explores the concept's generality. An accessible style enables undergraduates to easily follow the presentation without much prior knowledge. The focus on entropy distinguishes the book from many other treatments of this subject"--
"Focuses from the beginning on entropy as the important quantity and introduces it thoroughly in the context of classical thermodynamics"--