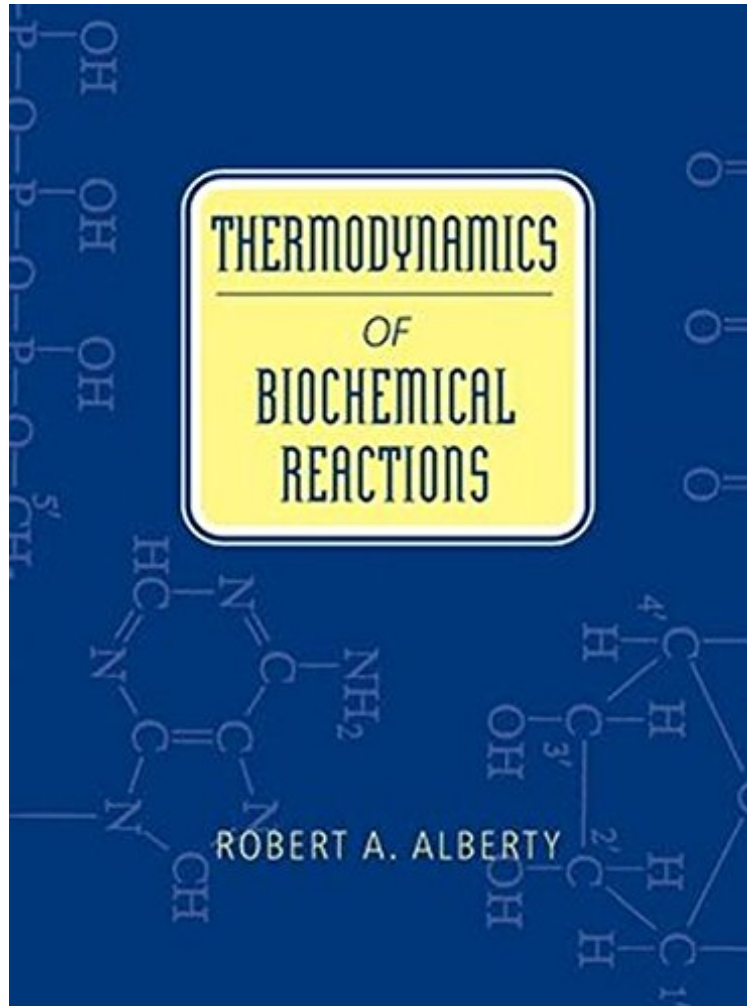


# Thermodynamics of Biochemical Reactions

Robert A. Alberty

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**Robert A. Alberty : Thermodynamics of Biochemical Reactions** before purchasing it in order to gage whether or not it would be worth my time, and all praised Thermodynamics of Biochemical Reactions:

9 of 10 people found the following review helpful. Biochemical Thermodynamics--- Clear at LastBy Dr. Daniel L. PurichWhile some molecular life scientists may regard biochemical thermodynamics as an esoteric field, and while this book may find its way onto more university library shelves than personal bookshelves, an inescapable fact is that the systematic application of thermodynamic principles is a cornerstone of research in the molecular life sciences. Dr. Alberty's new book provides a lucid and valuable account of biochemical thermodynamics, a field that he has personally advanced through the publication of dozens of peer-reviewed scientific papers for over half a century. His major contribution in recent years has been to extend the concept of isomer group thermodynamics and Legendre transforms for calculations of the Gibbs energy as a function of pH, pMg<sup>2+</sup>, pO<sub>2</sub>, etc., an approach that facilitates

thermodynamic analysis of complex biochemical reactions. This approach treats interacting molecular species (such as ATP<sup>4-</sup>, HATP<sup>3-</sup>, MgATP<sup>2-</sup>, MgHATP<sup>1-</sup>, KATP<sup>3-</sup>, KHATP<sup>2-</sup>, etc.) as pseudoisomers that rapidly interconvert by their respective association/dissociation reactions. The method also uses matrix algebra to avoid otherwise cumbersome and frequently approximate treatments based on the algebra of multiple equilibria. Enlightened by Alberty's beautifully presented theoretical treatment of isomer group thermodynamics and enabled by his step-by-step guidance (provided in latter half of his book), those seeking a rigorous understanding of bioenergetics can conveniently use the commercially available Mathematica software to perform all required calculations. Two qualities strongly commend the purchase of "Thermodynamics of Biochemical Reactions" for the personal library. First, at its price, the book is a real bargain (kudos to the publisher: John Wiley Sons). Second, one may be reasonably confident that Alberty's rigorous treatment has now reached a state of timelessness, itself a much appreciated condition for both equilibrium thermodynamics and scientific thought. So, even if you are that biochemist who stubbornly chooses not to add this book to her/his personal library, you should at least borrow the library copy to school yourself in modern thermodynamic principles by using what will surely become a classic. One caveat here: Be prepared to stand in line at the book recall desk; this is one book that will rarely be found resting on a library shelf at most research universities.

Thermodynamics of Biochemical Reactions emphasizes the fundamental equations of thermodynamics and the application of these equations to systems of biochemical reactions. This emphasis leads to new thermodynamic potentials that provide criteria for spontaneous change and equilibrium under the conditions in a living cell.

"Through the writing of his new book, Professor Alberty has performed a great service to future textbook authors and to their readers, as well as to the biochemical community in general. (Biochemistry and Molecular Education, Nov/Dec 2003) "...a useful learning device...through the writing of his new book, Professor Alberty has performed a great service to future textbook authors and their readers, as well as to the biochemical community in general." (Biochemistry and Molecular Biology Education, Vol. 31, No. 6) "...this book will prove useful for students and working biochemists...highly recommended..." (Choice, September 2003) "...emphasizes the application of the fundamental equations of thermodynamics to systems of enzyme-catalyzed reactions making up the metabolism of living organisms." (Pharmaceutical Research, Vol. 20, No. 9, September 2003) "...written by the most experienced authority in this field...well-written and -organized, and nicely produced..." (Angewandte Chemie International Edition, Vol 42(37), 2003) "...the authors are to be congratulated on producing an updated, valuable and comprehensive review of the field..." (ChemPhysChem, Vol 5, 2004) From the Back Cover An innovative text with a focus on metabolism and enzyme-catalyzed reactions An excellent teaching text and resource with modern examples and references to the primary literature, Thermodynamics of Biochemical Reactions emphasizes the fundamental equations of thermodynamics and the application of these equations to systems of biochemical reactions. This emphasis leads to new thermodynamic potentials that provide criteria for spontaneous change and equilibrium under the conditions in a living cell. The theme of the book is that Legendre transforms make the application of thermodynamics more convenient for the users. In Chapter 4, "Thermodynamics of Biochemical Reactions at Specified pH," a Legendre transform is used to introduce pH and pMg as independent intensive variables. In Chapter 6, "Systems of Biochemical Reactions," the steady-state concentrations of various coenzymes are introduced as independent intensive variables in discussing systems of enzyme-catalyzed reactions. In Chapter 8, "Phase Equilibrium in Aqueous Systems," a Legendre transform is used to introduce the electric potential of a phase as an independent intensive variable. Each instance illustrates the author's belief that the choice of variables, while seemingly an innocuous step, often plays a critical role in formulating a solution. Other chapters include: Chemical Equilibrium in One-Phase Systems Thermodynamics of Binding of Ligands by Proteins Redox Reactions Use of Semigrand Partition Functions Practicing researchers in pharmaceutical and biotechnical corporations, as well as graduate and upper level undergraduate students in biophysical chemistry or biochemistry, will find Thermodynamics of Biochemical Reactions to be a peerless resource. About the Author ROBERT A. ALBERTY, PhD, is Professor Emeritus at the Massachusetts Institute of Technology in Cambridge, Massachusetts. He is also a coauthor of Physical Chemistry, Third Edition (2001), also published by Wiley.