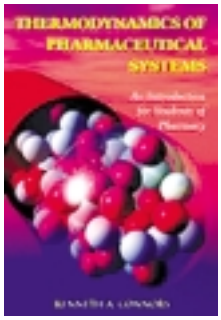

Thermodynamics of Pharmaceutical Systems: An Introduction for Students of Pharmacy

By Kenneth A. Connors, Wiley InterScience, 2002, 360 pages in paperback, €55.50, ISBN 0-471-20241-X

This concise and readable book contains an introductory treatment of thermodynamics aimed specifically at undergraduate students in pharmacy programs. It summarizes the important basic thermodynamic concepts that are required to understand more advanced material in pharmacy programs. Concepts such as those of entropy, energy and chemical potential are discussed essentially phenomenologically. However, the discussion is readable with frequent references to the applicability of these concepts to the pharmacy student.

Thorough treatments are given to the concepts of phase transitions, solubility, acid–base equilibria and binding equilibria. The level of treatment is clearly introductory, and most of this material is usually covered in the second semester of introductory chemistry. Thus, this should be considered an excellent alternative text for the second half of the introductory chemistry curriculum for classes containing only pharmacy students. These students will appreciate the simplicity of the treatment and its emphasis on practical applications in their field.

The thermodynamics of phase transitions and solutions is summarized well, including both electrolytic and non-electrolytic solutions, with a nice treatment of the practical problem of solvent extraction. A simple discussion of ionic strength and the Debye–Hückel theory is given, with just enough information provided to calculate the effects of changing ionic strength on the physical properties of a solution. This level of discussion is consistent throughout the text. For each property or system studied, the author explains qualitatively the physical basis for the relations presented, followed by a simple description of how to calculate all of the necessary variables to describe a given system. For example, there is no derivation of Debye–Hückel theory but the student is given enough information to understand when this theory is applicable and how to apply it to calculate ionic activity coefficients.

The author introduces the concept of solubility early in the text, immediately following the discussion of partitioning and the physical properties of solutions. Ideal solubility, regular solution theory and a phenomenological theory for the prediction of aqueous solubilities are discussed. This prepares the reader nicely to calculate the aqeous solubility of a weak acid or base immediately following a discussion of acid–base equilibria. Pharmacy students will recognize immediately the importance of this topic for their field.

The thorough treatment of acid–base equilibria given in this text is one of its greatest strengths. Almost 50 pages are devoted to a detailed discussion of acid–base theory. The Henderson–Hasselbalch equation is arrived at in an intuitive and straightforward manner, and several calculations of pH conditions for various types of solutions are outlined. A subsequent chapter on electrical work leads nicely to a discussion of pH measurement. Again, the student will appreciate the direct connection to practical laboratory measurements. Having been prepared with discussions of acid–base equilibria and Debye–Hückel theory, the reader is instructed in the measurement of the apparent pK_a of a weak acid, which is subsequently corrected for ionic strength. Thus, the reader is well prepared to calculate the effects of many different types of solution conditions on practical laboratory experiments. An appendix containing a concise review of simple mathematics rounds off the text well. This appendix covers concepts that the students should know, but often do not. Because these concepts are crucial to the understanding of the topics covered in the text, the appendix will be extremely valuable for students who have missed some important mathematical ideas.

It is clear that the author has taught this subject for many years and that he is aware of the problems with which pharmacy students often struggle. This practical treatment could serve as a valuable reference for pharmacy students who need to review this material to prepare for undergraduate classes in biochemistry, medicinal chemistry and pharmaceutics. It would also be well suited as a text for any introductory class for pharmacy students that covers these thermodynamic concepts.

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