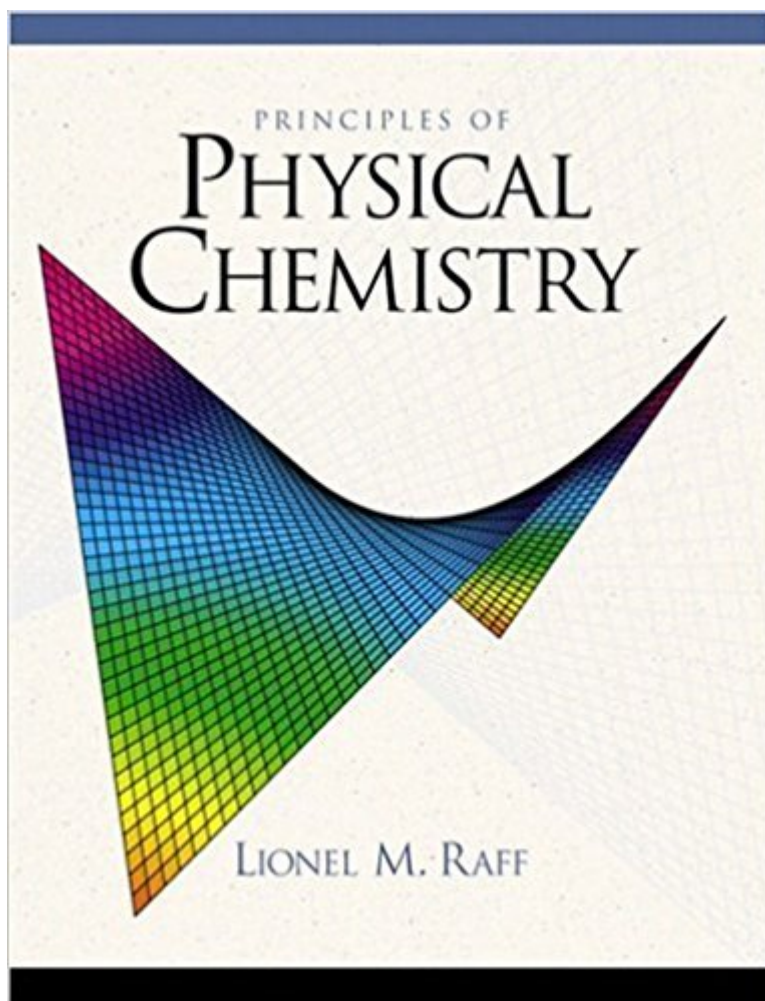




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# Principles Of Physical Chemistry



## Synopsis

This easy-to-read volume, designed to bring users to a functional level of literacy in the use, practice, appreciation and execution of physical chemistry principles and methods is designed to promote understanding. The text presents all the theories and equations relevant to classical thermodynamics, quantum mechanics and bonding, spectroscopy, statistical mechanics, kinetics and dynamics. For individuals interested in mastering the basic principles and methods of physical chemistry, including chemical engineers.

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## Customer Reviews

**INSTRUCTOR'S PREFACE** This textbook is not written for you. It is written for your students. Its purpose is to teach physical chemistry, as opposed to covering the subject. To cover is not to teach. Pursuant to this objective, the narrative is often informal and relaxed. The material is presented using the same language I might employ if a student were to come to my office asking for help. Indeed, it is my intent that, as students read and study Principles of Physical Chemistry, they will feel that I am sitting across the table, providing one-on-one tutorial instruction. The discussion of all of the topics appearing in the text is sufficiently detailed to give the students a reasonable chance of becoming quantitatively competent in the area. The underlying philosophy of the book is that teaching is a joint enterprise between instructor and author, with a common objective: to bring the students to a functional level of literacy in the use, practice, appreciation, and execution of physical chemistry principles and methods. It is my opinion that this task is extremely difficult; so much

so that it cannot be achieved if we bring only half of our weapons to bear. A brilliant textbook coupled with an instructor who devotes little effort to the task of teaching will, at best, produce only poor results. A superb instructor who gives outstanding lectures will also fail to reach many of the students if the textbook he or she uses comprises only pictures, final equations with hand-waving explanations, simplistic examples, and "plug-and-chug" problems that are little more than practice on a calculator. This same superb instructor will also fail to achieve the best possible result if the students cannot or will not read the text. The problem is that once the brilliant lecture is completed, it is gone forever. When the students sit down to study, they have only their incomplete notes that are necessarily flawed because they couldn't listen, understand, and write fast enough to produce accurate notes, and the instructor couldn't speak or write fast enough to cover all the critical points. They need a textbook that makes the same determined effort to teach as the superb instructor does during a lecture and in his or her office in tutorial sessions with the students. I have done everything my ability permits to produce such a textbook. The derivations of virtually all equations are given in complete detail. All algebraic steps are shown and explanations inserted to help the student understand and learn the derivations, and I take pains to point out where key assumptions or simplifications are made. Figures, diagrams, and drawings are employed when they facilitate learning. They are, however, never used in place of a rigorous presentation of the material. Qualitative explanations and analogies to events that are familiar to the students are frequently used, but both are always backed by a quantitative treatment of the subject. The text assumes that the students have had a one-year university-level course in differential and integral calculus, but the critical mathematical methods are always developed and explained in detail before their use. These presentations are incorporated into the body of the text itself. The text tams 243 fully solved examples that are generally at the same level as the problems at the end of the chapter. The solutions to all 815 end-of-chapter problems are given in the Instructor's Guide (ISBN 0-13-026671-X). These solutions are as detailed as the textbook examples, with all steps shown (A student's solutions manual, with answers to only half the problems, is also available; ISBN 0-13-040664-3). An explanation for each step is inserted, and appropriate comments about the importance of the problem are presented. In addition, the Instructor's Guide contains 351 suggested examination questions that can, if desired, be used as additional homework exercises. All chapters conclude with a summary of the key points and equations. Humor is used without apology. The use of this textbook gives the instructor great latitude in deciding what to present during the time available in lecture. Since all derivations are given in complete detail, lecture time can be used to work additional examples or to emphasize the key points in the development of the equations.

Alternative derivations or additional material can be presented, or question-and-answer sessions with the students can emphasize important concepts. Because the instructor need not "write a textbook on the blackboard," there is considerable flexibility in organizing the lecture material. My own experience in using prepublication versions of Principles of Physical Chemistry suggests that the best option is to present the lecture material as if the textbook did not exist. This means that during the lecture I go over material that is already in the text. I have found that this repetition helps the students a great deal. It is much easier for students to understand the spoken word when combined with body language, voice cadence and inflection, and blackboard derivations than it is to glean the material from a written textbook. When this is done, the material in the book becomes much easier to read and understand. In addition, the text now provides excellent "notes" for study that are accurate and complete and that present good examples at the same level as the problems assigned by the instructor. It is my sincere hope that you find Principles of Physical Chemistry helpful in your efforts to bring your students to a truly functional level of knowledge of, and ability to do, physical chemistry. I extend my apologies for any remaining errors or inaccuracies in the text and would appreciate being informed about them. I invite each of you to submit your favorite problems for publication in the second edition. Full credit will be given at the point the problems appear in the text. Details for submission are given in the Instructor's Guide. Suggestions on any and all points are welcome.

**INTRODUCTION TO THE STUDENT** This textbook was written for you. You will find the narrative style informal and relaxed, with frequent use of the first person. Humor is used without apology. It is my intent that as you read and study the text, you will feel that I am sitting across the table, providing one-on-one tutorial instruction. The text assumes that you have had the equivalent of a one-year university-level course in differential and integral calculus. However, the critical mathematical methods are always developed and explained in detail before their use. These presentations are incorporated into the body of the text, rather than being relegated to an appendix. Two hundred forty-three detailed examples are given, and all steps in their solution are presented and explained. Furthermore, they are generally at the same level as the end-of-chapter problems and thus will be very helpful in your efforts to learn how to work the problems and gain an understanding of physical chemistry in the process. Let us now turn to the question that is probably uppermost in your mind: "Can I pass this course with a decent grade and learn something in the process?" The answer is "Yes, if you work and study regularly, diligently, and in the right manner." Since the vast majority of you are juniors, seniors, or graduate students, you are already aware that science and engineering courses require a great deal of effort. This comes as no surprise; the real key is in the last prepositional phrase in the preceding sentence: "in the right

manner." Each time I teach physical chemistry, a minimum of a half-dozen students come to my office in academic difficulty and say, "I don't know what's wrong. I understand the material very well when you present it in class or when you work examples on the board, but I don't seem to be able to do the problems when I'm taking an examination." The number of times I've heard this statement is well into the hundreds&#151;perhaps as high as a thousand. These are students who are working hard. They want to learn. They want to make a good grade, but things are not working well for them, and they do not understand why that is happening. This is the situation you want to avoid. You know that if you don't work, you will not do well in physical chemistry or any other of life's difficult endeavors. If you do invest the time and effort, however, you have a right to expect reasonably good results, and I would like to try to help you obtain them. Let me put the problem these students are having in a different perspective with a simple analogy. For years, I have been a fan of the NBA Chicago Bulls, which is to say Michael Jordan and Company. I have watched them play many, many times on television. I have Jordan's moves memorized: He stands at the top of the key and takes the pass from Pippen. One of the most superb players in the league is assigned to guard this incomparable master of the game. Jordan fakes to his right, then dribbles to his left. The player guarding him is not fooled. He has seen the move many times. He follows Jordan step for step, cuttin

This easy-to-read volume, designed to bring users to a functional level of literacy in the use, practice, appreciation and execution of physical chemistry principles and methods is designed to promote understanding. The text presents all the theories and equations relevant to classical thermodynamics, quantum mechanics and bonding, spectroscopy, statistical mechanics, kinetics and dynamics. For individuals interested in mastering the basic principles and methods of physical chemistry, including chemical engineers.

It does a good job in introducing you to the crazyness of thermodynamics. Quantum section gets a bit overwhelming but thats quantum for you. As a ChemE the book was very helpful in providing a more in depth look at thermodynamics that a couple of the engineering books hadn't dove into. All this book really needed was a page with a list of symbols used in the book explaining what they mean. For example the greek letter mu was used for chemical potential, joule theorem coefficient, etc. It can get very annoying and cumbersome especially when other books use mu for other physical properties.

As far as PChem texts go, it's not bad. Not amazing in clarity or explanation, but it covers everything a two-semester undergrad class would need and then some. Like nearly all PChem texts (and classes for that matter), it starts with thermodynamics and takes a hard left at quantum mechanics (that's the Part 2). Raff is good about covering the math that you would need outside of three semesters of calculus; he sets them off into their own sections so that they can be skipped if unnecessary. He explains concepts starting from a known point, adding in relevant assumptions, axioms and experimental data, and builds the concept up to its completion. The problems at the end of the chapter start from easy warm-ups to tricky, comprehensive, lateral-thinking, multi-part problems that will keep you up for hours, if not days working on them. But after the smoke clears, you'll have a vastly better understanding of that concept than when you started. Dislikes: Lack of any color makes many plots and figures difficult to understand at a glance. Once you grind through it, you can understand it, but even two-tone helps. Ultimately, if you are looking for a text that explains physical chemistry easily, YMMV with this book. Our prof was a grad student of Raff, so it's no surprise this was the class text.

I am a chemical engineer / physical chemist, and am now searching for a different physical chemistry textbook to use with my undergraduate students when I found this gem. I was fortunate enough to have sat for an undergraduate pchem and two graduate quantum classes with Dr. Raff and had found him to be the best - and by far the most challenging - instructor I have ever had. That being said, I have hoped for years to see him author a textbook - this is it. The approach is fundamental, presenting applications, background, and associated mathematics for the concept. The material is well-organized, and each chapter builds upon the concepts presented in the last. I have just finished skimming through some of the text chapters, and find the material to be as clear, thorough, and detailed as I remember, with challenging examples and problems for practice. I shall be using the text this fall with my students.

Good book! It is really worth for the price! Nice condition!

Lionel Raff has written a wonderful book. He explains in detail the derivations of equations used in both thermodynamics and quantum mechanics, and his explanations of relatively difficult concepts are extraordinary. I have heard that in his lectures he likes to use the phrase "evident since early childhood" to describe concepts that initially seem complex, but when explained properly appear obvious; his book has many instances in which the explanation makes one feel that way. The order

of the book makes sense as well -- the first chapters deal with thermodynamics, which has relatively simple math, to give you a feel for using calculus to describe chemical processes. Quantum mechanics are the topics covered later in the book, after you build up confidence in the mathematics.

I used this textbook in my undergraduate Physical Chemistry course. While Raff had good intentions of showing students all of the necessary derivations, I feel he used some cumbersome methods to get there. Granted, my professor used different means to derive the same equations, but I have to agree with my professor, Raff's terminology goes against the mainstream jargon of most physical chemists. This text is probably suitable for PChem students who have had both vector calculus and some differential equation experience since Raff assumes quite frequently that you know he's skipping ahead 3-6 steps to get the next line of equations. While the "hell questions" are humorous (see Ch. 1-4), a large portion of the questions were not worded in a clear cut manner. I usually had to have my professor "translate" what Raff was asking for in his questions so I could go about determining an answer. I'm thankful that at least where I am at for graduate school, they use the 7th Ed. of P.W. Atkins Physical Chemistry text since it's much better. Atkins has always excelled with his PChem textbooks, and if I had a choice, I'd use Atkins over Raff anyway to teach Physical Chemistry.

The book shipped quickly and was received in great shape; however, the author does not clarify several topics and ideas for this very complex subject (the read almost seems childish- too dumbed down). I recommend Ira N. Levine for any textbooks pertaining to Physical Chemistry. Mr. Levine takes the extra step and provides examples with every topic being fully explained and when needed- to great detail. Go out and use Levine as your go-to guy for help on this subject, I promise he is the best and I am speaking from personal experience of being a student of PCHEM.

Raff's relaxed writing style allows the student of physical chemistry to easily learn the concepts underlying the theory behind them. The worked example problems are explained in explicit detail and give the reader a good understanding of the applications of the subject. The equations are derived in a step-by-step method that anyone can follow and quickly learn. In short, it's a wonderful book that helped me learn a difficult subject!

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