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John T. Moore, EdD
Regents Professor of Chemistry at Stephen F. Austin University

Chemistry II For Dummies®

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John T. Moore, Ed.D

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About the Author

John T. Moore, Ed.D, grew up in the foothills of western North Carolina. He attended the University of North Carolina-Asheville where he received his bachelor's degree in chemistry. He earned his master's degree in chemistry from Furman University in Greenville, South Carolina. After a stint in the United States Army, he decided to try his hand at teaching. In 1971, he joined the chemistry faculty of Stephen F. Austin State University (SFASU) in Nacogdoches, Texas, where he still teaches chemistry. In 1985, he started back to school part-time, and in 1991 received his Doctorate in Education from Texas A&M University.

John's area of specialty is chemical education. He has developed several courses for students planning on teaching chemistry at the high school level. In the early 1990s, he shifted his emphasis to training elementary education majors and in-service elementary teachers in hands-on chemical activities. He has received four Eisenhower grants for professional development of elementary teachers and has served as co-editor (along with one of his former students) of the "Chemistry for Kids" feature of *The Journal of Chemical Education.* He is Director of SFASU's Teaching Excellence Center and is a Co-Director of SFA's Science, Technology, Engineering and Mathematics (STEM) Research Center. He is the author of several books on chemistry and is co-author on several more, including *Chemistry Essentials For Dummies, Biochemistry For Dummies,* and *Organic Chemistry II For Dummies.*

Although teaching has always been foremost in his heart, John found time to work part-time for almost five years in the medical laboratory of the local hospital and has been a

consultant for a textbook publisher. He is active in a number of local, state, and national organizations.

John lives in the Piney Woods of East Texas with his wife Robin and their two dogs and two cats. He enjoys brewing his own beer and mead and making custom knife handles and pens from exotic woods. And he loves to cook. His two boys, Jason and Matt, along with his daughter-in-law Sarah and two grandchildren Zane and Sadie remain in the mountains of North Carolina.

Dedication

This book is dedicated to those children, past, present, and future, who will grow to love chemistry, just as I have done. You may never make a living as a chemist, but I hope that you will remember the thrill of your experiments and will pass that enjoyment on to your children. This book is also dedicated to my family: my wife Robin, who encouraged me and put up with my foul moods close to deadlines; my two sons, Jason and Matthew; Jason's wife Sarah; and to the two most wonderful grandchildren in the world, Sadie and Zane. It is also dedicated to Drs. Dexter Squibb and Lloyd Remington of Asheville-Biltmore College who turned me on to the wonders of chemistry and encourages me to continue my education.

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Publisher's Acknowledgments

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Introduction

Congratulations. You jumped the first hurdle in understanding the basics of chemistry by passing Chemistry I. Perhaps you even used my book, *Chemistry For Dummies, Second Edition* (John Wiley & Sons, Inc.). If you did, thank you. If you didn't, I'm glad you've entrusted me with your Chemistry II endeavors. The very fact that you're at least looking at this book indicates that you feel you may need a little help in your Chemistry II class. Chem I (believe it or not) isn't as mathematical as Chem II. In Chem I you had a lot of descriptive material; Chem II is all about solving problems, so get ready.

About This Book

My goal with this book is not to make you into a chemistry major. My goal is simply to give you a basic understanding of some chemical topics that commonly appear in the second half of a university introductory chemistry course or the second year in a high school chemistry course. If you're taking a course, use this book as a reference in conjunction with your notes and textbook.

Simply watching people play the piano, no matter how intently you watch them, doesn't make you a musical expert. You need to practice. And the same is true with chemistry. It's *not* a spectator sport. You probably figured that out in Chem I; you need to practice and work on problems. Chemistry II adds a lot more math problems, which may be challenging for some people. Sharpen up your calculator skills — you'll need them. I show you how to work certain types of problems in this book — homogeneous equilibrium, for example — but use your textbook for practice problems. It's work, yes, but it really can

be fun. This book is for those of you who want some additional help with Chem II topics.

Foolish Assumptions

When I wrote this book, I made a few assumptions about you. Those assumptions include the following:

- You're taking (or retaking) a second-semester college chemistry course or preparing to take a second-semester college chemistry course.
- You're taking (or retaking) a second-year high school chemistry course or preparing to take a second-year high school chemistry course.
- You at least passed the first-year high school chemistry course and are wondering whether you want to take the next class.
- You at least passed the first-semester college chemistry course and are wondering whether you want to take the next class.
- You feel relatively comfortable with arithmetic and know enough algebra to solve for a single unknown in an equation.
- You have a scientific calculator capable of doing exponents and logarithms.

If you're buying this book just for the thrill of finding out about something different — with no plan of ever taking a chemistry course — I applaud you and hope that you enjoy this adventure. Feel free to skip those topics that don't hold your interest; for

you, there will be no tests, only the thrill of increasing your knowledge about something new.

What Not to Read

I know you're a busy person and want to get just what you need from this book. Although I want you to read every single word I've written, I understand you may be on a time crunch. If so, feel free to skip the sidebars, the gray-shaded boxes that appear here and there. These interesting bits of info aren't essential to understanding the stuff you need to know.

I mark some paragraphs with Technical Stuff icons. What I tell you in these paragraphs is more than you need to know, strictly speaking, but it may give you helpful or interesting detail about the topic at hand. If you want just the facts, you can skip these paragraphs.

How This Book Is Organized

I've organized the topics in a logical progression — basically the same way I organize my courses for science and nonscience majors. Following is an overview of each part of the book.

Part I: A Basic Review of Chemistry I

In this part, I give you a basic review of those topics commonly found in a Chem I course that I feel are critical to your