ELEMENTS OF ENVIRONMENTAL CHEMISTRY

Second Edition

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PREFACE

Many chemistry and environmental science departments now feature a course on environmental chemistry, and several textbooks support these courses. The coverage and quality of these textbooks varies – in some cases dramatically. Although it is obviously a matter of opinion (depending on the instructor's background and skills), it seems to us that a good textbook should be quantitative and should develop students' skills with numerous real-world problems.

This book aims at a quantitative approach to environmental chemistry. In fact, one could think of this book as providing the student with the essence of environmental chemistry *and* with a toolbox for solving problems. These skills are transferable to other fields beyond environmental chemistry. With effort, this book will allow students to understand problem-solving methods in the context of environmental chemistry and provide basic concepts of environmental chemistry such that these problem-solving skills can be used to understand even more complex environmental challenges.

This is a relatively short book. Its goal is to be tutorial and informal; thus, the text features many quantitative story problems (indicated by bold font). For each problem, a strategy is developed, and the solution is provided. Although short, this book is not intended to be read quickly. It is an interactive textbook, and it is intended

to be read with a pencil in hand so that the reader can follow the problem statement, the strategy for solving the problem, and the calculations used in arriving at an answer. "Reading" this book will do the student little good without actually doing the problems. It is not sufficient for the student to say, "I could do that problem if I really had to." The student must work out the problems if he or she is going to learn this material.

In addition to the problems in the text, each chapter ends with a problem set. Besides reinforcing concepts introduced in the chapter, we have tried to incorporate issues from the scientific literature and from the "real world" in these problem-set questions. The answers to these questions are at the back of the book, and full solutions are in a *Solution Manual* available from the authors. Most of the problem sets include a problem that requires a bit more time and the application of simple computing; we have called these "Group Projects" to encourage students to work together on these problems. They could be assigned to small groups of students or held back for the especially competent student.

As a stand-alone text, this book is suitable for a one-semester course (particularly if supplemented with a few lectures on the instructor's favorite environmental topics) aimed at upper-level undergraduate chemistry or chemical engineering majors or at first-year graduate students with only a modest physical science background. Because of its tutorial nature, this book would also make a good self-study text for entry-level professionals. A little calculus will help the reader follow the exposition in a few places, but it is hardly necessary.

The Second Edition has been completely revised and rearranged. The former chapter on atmospheric chemistry has been divided into two new chapters: one on atmospheric chemistry and one on climate change. The sequence of the chapters on chemodynamics and pesticides, lead, and mercury has been reversed. A descriptive chapter on polychlorinated biphenyls and dioxins and polybrominated flame retardants has been added at the end. A tutorial on organic chemistry names and structures has been added as an appendix.

We thank Todd Royer and Jeffery White for their insightful comments on parts of the text. We also thank the hundreds of students who used this material in our classes over the years and who were not shy in explaining to us where the material was deficient. Nevertheless, errors likely remain, and we take full responsibility for them. We also thank Robert Esposito, Executive Editor at John Wiley & Sons, for guiding this project to completion.

We would be happy to hear from you. If we have omitted your favorite topic, been singularly unclear about something, or made an error with a problem set solution, please let us know.

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