

Preface to the First Edition

Biochemistry, like chemistry, is a quantitative science. Even though it may be taught in a descriptive manner, the research involved in establishing the descriptive principles, a number of principles themselves, and in today's application of biochemistry to molecular biology, applied biology and biotechnology, the quantitative aspects and approach are important and integral parts of biochemistry. Yet, many students at all levels experience difficulties with biochemical calculations. One reason for this problem may be that students enter certain courses with the notion that they have chosen a biological (descriptive) stream of studies and see the quantitative aspects of biochemistry as something foreign to their expectations. Another is the general decline in numeracy skills in students entering tertiary studies even in the more mathematical streams, such as engineering and physical sciences—a concern expressed by many educators. During my experience with tertiary students, I have tried to identify the reasons why students experience difficulties with chemical/biochemical calculations. Some of the reasons, I believe, relate to over-dependence on memorised formulae, dependence on memorised definitions, and in “formulae-juggling,” all of which result in a lack of feel and the inability to reason logically. This is further discussed in Chapter 1. It is hoped that students may be able to identify their individual problems (if any) and set about remedying them.

Fundamentals of Biochemical Calculations recommends the use of the ratio method in solving biochemical calculations because it is simple, logical, commonsense-based, requires no formula to be memorised and one that provides considerable feel. This approach depends on earlier experiences in chemical calculations. Accordingly, most chapters, particularly Chapters 2 and 3, start with high school or first year chemical calculations and lead the student into biochemical calculations. It is for this reason the word “Fundamentals” is included in the title—this book does not include the more advanced or special technique-oriented calculations. Likewise, no advanced knowledge of mathematics is required beyond the elementary logic behind mathematical operations acquired in junior secondary school. This book is directed at students in their first one or two years of biochemical studies but may also prove useful to laboratory technicians and postgraduate students who are non-majors in biochemistry working in any biological discipline. At the start of each chapter is an introductory discussion. It is hoped that the student will find these discussions challenging; the purpose of these once again is to revise and recall earlier experiences and to see if the student would agree with the logic behind the problems. Important comments relating to practical understanding and situations are also included in these introductions. It is in the practical situations that biochemical calculations have their especial applications. All problems are completely solved, showing detailed calculation steps and including, where appropriate, comments and mathematical hints. The intention is to re-enforce mathematical logic and to provide foundations for the development of reasoning skills. Fully worked-out solutions are designed to show (as opposed to teach or instruct) how to perform biochemical calculations.

I have been fortunate enough to have taught biochemistry to over 2 000 students in more than 25 years as lecturer in various disciplines—applied biology, biotechnology, clinical sciences, food technology, toxicology, medical radiation sciences, and physiotherapy. I am grateful to my students for their interactions with me and in particular for the feedback on the solutions to the calculation questions presented over the years as Problem Sheets. It is their response that prompted me to write this book and submit it for general distribution.

I wish to express my appreciation to two of my colleagues, Dr. Theo Macrides and Dr. Dave Probert, for their advice and review of the original manuscript, and to Professor Andy Sinclair for his support and encouragement.

This book is dedicated to my daughter, Lisa, and my wife, Maria. Lisa, now a graduate in biochemistry, for providing me one further avenue for expressing my love—teaching her biochemical calculations, and Maria for her unending love, support, patience, and faith always and especially during the writing of this book.

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March, 1994