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Enzyme kinetics

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Preface

The study of the mechanism of action of enzymes can be undertaken using a multitude of different experimental approaches, only one of which is a study of the kinetics of the enzyme-catalysed reaction. Other important techniques include amino acid sequencing, X-ray crystallography, chemical modification and nuclear magnetic resonance studies. No one method can supply sufficient information to describe adequately the mechanism of action of an enzyme; indeed even the sum of all the information available from a number of different experimental studies is not enough to explain the detailed action of even the simpler enzymes, never mind the more complicated multi-subunit enzymes or enzyme-enzyme complexes. The initial studies of an enzyme-catalysed reaction using kinetic techniques does, however, provide a firm basis upon which to plan other more specific experiments.

The object of this book is to cover in a fairly comprehensive manner the detailed kinetic analysis of a number of different enzyme models. The contents of the book cover not only the enzyme kinetics that would be presented to an honours student in biochemistry as part of a molecular enzymology or physical biochemistry course, but also include topics that would be of more interest to postgraduate students and research workers. In this respect, the book contains sections on coupled enzyme systems, oscillatory kinetics, computer simulation of biochemical systems and statistical analysis of enzyme kinetic data which are not normally found in textbooks of comparable size. The initial plan of the book was based on the various enzyme kinetics courses presented to students at Queen's University of Belfast during their three-year honours course. It was noted that many students with limited mathematical backgrounds had problems with differential equations, determinants, statistics and other mathematical methods used in the course. For this reason, it was decided that in this book there should be sufficient steps in the development of kinetic equations that most readers would be able to follow the derivations. The mathematical equations are, however,

complicated enough to prevent the reader from simply attempting to memorise the algebraic manipulations.

It is a great pleasure to acknowledge my gratitude to a number of friends. In particular, I am indebted to Professor D. T. Elmore of Queen's University of Belfast for his assistance in the initial planning, for many suggestions and helpful criticisms during the preparation of the manuscript; to Professor L. W. Nichol of the Australian National University for his encouragement and helpful suggestions during the period of my Research Fellowship in his department; to Dr P. W. Kuchel for many stimulating discussions and for reading the entire manuscript and suggesting a number of alternative mathematical derivations. Finally I would like to thank my wife, Jeanette, for her patience and to apologise to my son, David, for the lack of attention he received during the writing of the manuscript.