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This book presents new learning materials and applications of engineering sciences in the domain of biology. Its “ground-breaking” chapter contents include: Fluid Mechanics, Mass Transfer, Diffusion, Transport Kinetics, Reaction Systems, and Control Systems. It presents extensive, state-of-the-art knowledge, while at the same time simultaneously introducing new learning materials that illustrate biological applications. The book brings together more than 1,500 references, most of which are organized by topic and are cross-referenced. It includes graduate-level mathematical derivations, and a set of practical applications that illustrate the general theory. The unique feature of this book is its clear presentation of the application of fundamental concepts in engineering sciences. The book emphasizes the development of skills, instead of simply producing information, in the field of biological systems. This book is one of the most innovative books written in the field of undergraduate courses in Biology and Chemical Engineering. The book is written in a manner such that it can be used by the Biological/Chemical Engineering students. This book has been written with the intention to provide an overview of the field of biology. The contents of the book are presented in the form of a number of self-learning modules which include: basic physics, fluid mechanics, and mass transfer. “This book provides a framework for the acquisition of skills in mass transfer processes in living organisms and non-living systems, and provides methodology for experimental analysis of transcellular processes in several organisms. The reader is equipped with tools to practice and develop proficiency in the following: entropy and entropy analysis of transcellular transport mechanisms; Nernst-Planck, Fick and Lamm equations of diffusion transport; the continuum and discrete transport models for solutes in gels; the transport and diffusion coefficients for particles with a single component; complex-ion and colloidal reactions in living systems; chemical reactions within and between cells, mitochondria and the extracellular medium; non-ideal, electro-neutral, pH-dependent and intermediate solvents; the kinetics of transcellular processes; the dissolution of precipitated solids in biofluids; and the application of different mathematical models such as the Routh, Nernst-Planck, and Fick equations.

This book is mostly based on the evolution of the subject from the 7th International Conference on Material Science and the Related Systems, held in Perth, Australia in 2002, to the 2006 8th International Conference on Solid State and Integrated Circuit Technology, Shanghai, China. The main areas covered include the development of analytical techniques, their applications, and the resulting correlation between molecular structure and behaviour. The book also tries to explain the nature of processes which take place at the macro- and micro-scales of biology, and these concepts have to be carefully interpreted and applied in order to understand biological functions. Chapters review: General considerations of physical processes in biology; mechanisms of protein-protein interaction; self-assembly of nucleic acids (and proteins) into dynamic nanostructures; behavior of biological assemblies (cells, viruses and organisms); membrane molecular self-assembly and function; protein and peptide channels, pores and ion channels; principles of catalytic reactions and enzymes in action; enzymes-chemical synthesis and metabolic pathways; protein and gene regulation, and cell-cell signaling; and biological nanomaterials. This text represents an impressive effort from the international community that led to the previous conferences. The 9 chapters addressed are: General Considerations of physical processes in biology; mechanisms of protein-protein interaction; self-assembly of nucleic acids (and proteins) into dynamic nanostructures; behavior of biological assemblies (cells, viruses and organisms); membrane molecular self-assembly and function; protein and peptide channels, pores and ion channels; principles of catalytic reactions and enzymes in action; enzymes-chemical synthesis and metabolic pathways; protein and gene regulation, and cell-cell signaling; and biological nanomaterials. This text represents an impressive effort from the international community that led to the previous conferences. The 9 chapters addressed are: General Considerations of physical processes in biology; mechanisms of protein-protein interaction; self-assembly of nucleic acids (and proteins) into dynamic nanostructures; behavior of biological assemblies (cells, viruses and organisms); membrane molecular self-assembly and function; protein and peptide channels, pores and ion channels; principles of catalytic reactions and enzymes in action; enzymes-chemical synthesis and metabolic pathways; protein and gene regulation, and cell-cell signaling; and biological nanomaterials. 5ec8ef588b

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