Basic Transport Phenomena In Biomedical Engineering 2nd Edition

Basic Transport Phenomena In Biomedical Engineering 2nd Edition Basic Transport Phenomena in Biomedical Engineering 2nd Edition This book aims to provide a comprehensive understanding of transport phenomena in the context of biomedical engineering The second edition builds upon the success of the first incorporating the latest advances and applications while maintaining a clear and accessible approach Part 1 Fundamentals of Transport Phenomena Chapter 1 to Transport Phenomena What are transport phenomena Importance of transport phenomena in biomedical engineering Overview of different modes of transport heat mass and momentum transfer Fundamental concepts conservation laws constitutive equations and boundary conditions Chapter 2 Fluid Mechanics to fluid properties and fluid statics Fluid dynamics conservation of mass momentum and energy equations Laminar and turbulent flow Flow in pipes and channels Applications in biomedical engineering blood flow artificial organs and microfluidic devices Chapter 3 Heat Transfer Modes of heat transfer conduction convection and radiation Fouriers law of heat conduction Convective heat transfer coefficients Radiation heat transfer Applications in biomedical engineering thermotherapy cryosurgery and tissue engineering Chapter 4 Mass Transfer Ficks law of diffusion Convective mass transfer Mass transfer in multicomponent systems Applications in biomedical engineering drug delivery tissue perfusion and biomaterial design 2 Part 2 Applications in Biomedical Engineering Chapter 5 Transport in the Cardiovascular System Blood flow in arteries and veins Hemodynamics blood pressure flow resistance and shear stress Mass transfer in the cardiovascular system oxygen transport drug delivery and atherosclerosis Applications cardiovascular modeling stent design and artificial heart development Chapter 6 Transport in the Respiratory System Gas exchange in the lungs Diffusion of oxygen and carbon dioxide in the alveoli Convective transport in the airways Applications ventilation strategies lung disease modeling and artificial lung development Chapter 7 Transport in the Kidney Renal physiology glomerular filtration tubular reabsorption and secretion Mass

transfer in the kidney solute and water transport Applications kidney disease modeling dialysis design and drug clearance Chapter 8 Transport in the Nervous System Neuron structure and function Ion channels and membrane transport Signal transduction in neurons Applications neural prosthetics drug development and neurodegenerative disease research Chapter 9 Transport in Tissue Engineering and Biomaterials Cellmaterial interactions Mass transport in biomaterials diffusion permeation and biodegradation Applications biomaterial design tissue engineering and drug delivery systems Part 3 Advanced Topics Chapter 10 Computational Fluid Dynamics CFD to CFD methods Finite element and finite volume methods Applications of CFD in biomedical engineering blood flow analysis drug delivery simulations and tissue engineering Chapter 11 Bioheat Transfer Heat transfer in living tissues Pennes bioheat equation Applications thermotherapy cryosurgery and medical device design 3 Chapter 12 Transport Phenomena in Microfluidics to microfluidics Transport phenomena in microchannels diffusion convection and electrokinetic phenomena Applications labonachip devices cell culture and drug screening Appendices Appendix A Mathematical Background Differential equations calculus and vector analysis Appendix B Physical Properties of Biological Materials Density viscosity thermal conductivity and diffusion coefficients of blood tissue and biomaterials Appendix C Conversion Tables and Units Conversion factors for commonly used units in biomedical engineering Features Clear and concise writing style Emphasizes key concepts and provides a structured approach to understanding transport phenomena Abundant examples and illustrations Reinforces understanding and illustrates the application of concepts in realworld scenarios Endofchapter problems and exercises Provide opportunities for practice and application of learned material Comprehensive index and glossary Enables easy reference and understanding of key terms Target Audience Undergraduate and graduate students in biomedical engineering bioengineering and related disciplines Professionals working in the field of biomedical engineering medical device development and pharmaceutical research Overall Basic Transport Phenomena in Biomedical Engineering 2nd Edition offers a comprehensive and practical introduction to the fundamental principles of transport phenomena and their applications in various biomedical fields It is an essential resource for students and professionals seeking a deeper understanding of this critical area of biomedical engineering 4

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