SOLUTIONS TO THE PROBLEMS
in
TRANSPORT PHENOMENA
Second Edition
(2002)
by
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This solutions manual has been prepared by the
authors of the textbook for use by professors teaching
courses in transport phenomena. It contains the
solutions to 560 of the unsolved problems in the
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Analysis of Transport Phenomena-William Murray Deen 2012 Analysis of Transport Phenomena, Second Edition, provides a unified treatment of momentum, heat, and mass transfer, emphasizing the concepts and analytical techniques that apply to these transport processes. The second edition has been revised to reinforce the progression from simple to complex topics and to better introduce the applied mathematics that is needed both to understand classical results and to model novel systems. A common set of formulation, simplification, and solution methods is applied first to heat or mass transfer in stationary media and then to fluid mechanics, convective heat or mass transfer, and systems involving various kinds of coupled fluxes. FEATURES: * Explains classical methods and results, preparing students for engineering practice and more advanced study or research * Covers everything from heat and mass transfer in stationary media to fluid mechanics, free convection, and turbulence * Improved organization, including the establishment of a more integrative approach * Emphasizes concepts and analytical techniques that apply to all transport processes * Mathematical techniques are introduced more gradually to provide students with a better foundation for more complicated topics discussed in later chapters

Introduction to Chemical Engineering Fluid Mechanics-William M. Deen 2016-08-31 Presents the fundamentals of chemical engineering fluid mechanics with an emphasis on valid and practical approximations in modeling.

Transport Phenomena-R. Byron Bird 2007 This book presents balanced treatment of transport phenomena and equal emphasis on mass transport, momentum transport and energy transport. It include extensive reference to applications of material covered and the addition of appendices on applied mathematics topics, the Boltzmann equation, and a summary of the basic equations in several coordinate systems. 'Transport phenomena' offers literature citations throughout so you and your students know where to find additional material. It contains - Transport properties in two-phase systems; Boundary-layer theory; Heat and mass transfer coefficients; Dimensional analysis and scaling.


Electrokinetic and Colloid Transport Phenomena-Jacob H. Masliyah 2006-05-26 A new, definitive perspective of electrokinetic and colloidtransport processes Responding to renewed interest in the subject of electrokinetics,Electrokinetic and Colloid Transport Phenomena is a timely overviewof the latest research and applications in this field for both thebeginner and the professional. An outgrowth of an earlier text (bycoauthor Jacob Masliyah), this self-contained reference provides anup-to-date summary of the literature on electrokinetic and colloidtransport phenomena as well as direct pedagogical insight into the development of the subject over the past several decades. A distinct departure from standard colloid science monographs,Electrokinetic and Colloid Transport Phenomena presents the mostsalient features of the theory in a simple and direct manner,allowing the book to serve as a stepping-stone for further learning and study. In addition, the book uniquely discusses numerical simulation of electrokinetic problems and demonstrates the use of commercial finite element software for solving these multiphysics problems. Among the topics covered are: * Mathematical preliminaries * Colloidal systems * Electrostatics and application of electrostatics * Electric double layer * Electroosmosis and streaming potential * Electrophoresis and sedimentation potential * London-Van der Waals forces and the DLVO theory * Coagulation and colloid deposition * Numerical simulation of electrokinetic phenomena * Applications of electrokinetic phenomena Because this thorough reference does not require advanced mathematical knowledge, it enables a graduate or a senior undergraduate student approaching the subject for the first time to easily interpret the theories. On the other hand, the application of relevant mathematical principles and the worked examples are extremely useful to established researchers and professionals involved in a wide range of areas, including electroosmosis, streaming potential, electrophoretic separations, industrial practices involving colloids and complex fluids, environmental remediation, suspensions, and microfluidic systems.

Tissue Engineering and Artificial Organs-Joseph D. Bronzino 2016-04-19 Over the last century, medicine has come out of the "black bag" and emerged as one of the most dynamic and advanced fields of development in science and technology. Today, biomedical engineering plays a critical role in patient diagnosis, care, and rehabilitation. As such, the field encompasses a wide range of disciplines, from biology and physiolo
Transport Phenomena in Biomedical Engineering: Robert A. Peattie 2012-11-20 Design, analysis and simulation of tissue constructs is an integral part of the ever-evolving field of biomedical engineering. The study of reaction kinetics, particularly when coupled with complex physical phenomena such as the transport of heat, mass and momentum, is required to determine or predict performance of biologically-based systems whether for research or clinical implementation. Transport Phenomena in Biomedical Engineering: Principles and Practices explores the concepts of transport phenomena alongside chemical reaction kinetics and thermodynamics to introduce the field of reaction engineering as it applies to physiologic systems in health and disease. It emphasizes the role played by these fundamental physical processes. The book first examines elementary concepts such as control volume selection and flow systems. It provides a comprehensive treatment with an overview of major research topics related to transport phenomena pertaining to biomedical engineering. Although each chapter is self-contained, they all bring forth and reinforce similar concepts through applications and discussions. With contributions from world-class experts, the book unmasks the fundamental phenomenological events in engineering devices and explores how to use them to meet the objectives of specific applications. It includes coverage of applications to drug delivery and cell- and tissue-based therapies.

A Modern Course in Transport Phenomena - David C. Venerus 2018-03-15 Integrating nonequilibrium thermodynamics and kinetic theory, this unique text presents a novel approach to the subject of transport phenomena.

Biological and Bioenvironmental Heat and Mass Transfer - Ashim K. Datta 2002-03-21 Providing a foundation in heat and mass transport, this book covers engineering principles of heat and mass transfer. The author discusses biological content, context, and parameter regimes and supplies practical applications for biological and biomedical engineering, industrial food processing, environmental control, and waste management. The book contains end-of-chapter problems and sections highlighting key concepts and important terminology. It offers cross-references for easy access to related areas and relevant formulas, as well as detailed examples of transport phenomena, and descriptions of physical processes. It covers mechanisms of diffusion, capillarity, convection, and dispersion.

Advanced Transport Phenomena - L. Gary Leal 2007-06-18 Advanced Transport Phenomena is ideal as a graduate textbook. It contains a detailed discussion of modern analytic methods for the solution of fluid mechanics and heat and mass transfer problems, focusing on approximations based on scaling and asymptotic methods, beginning with the derivation of basic equations and boundary conditions and concluding with linear stability theory. Also covered are unidirectional flows, lubrication and thin-film theory, creeping flows, boundary layer theory, and convective heat and mass transport at high and low Reynolds numbers. The emphasis is on basic physics, scaling and nondimensionalization, and approximations that can be used to obtain solutions that are due either to geometric simplifications, or large or small values of dimensionless parameters. The author emphasizes setting up problems and extracting as much information as possible short of obtaining detailed solutions of differential equations. The book also focuses on the solutions of representative problems. This reflects the book's goal of teaching readers to think about the solution of transport problems.

Chemical Engineering and Chemical Process Technology - Volume VI - Ryzhard Pohorecki 2010-11-30 Chemical Engineering and Chemical Process Technology is a theme component of Encyclopedia of Chemical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. Chemical engineering is a branch of engineering, dealing with processes in which materials undergo changes in their physical or chemical state. These changes may concern size, energy content, composition and/or other application properties. Chemical engineering deals with many processes belonging to chemical industry or related industries (petrochemical, metallurgical, food, pharmaceutical, fine chemicals, coatings and colors, renewable raw materials, biotechnological, etc.), and finds application in manufacturing of such products as acids, alkalis, salts, fuels, fertilizers, crop protection agents, ceramics, glass, paper, colors, dyestuffs, plastics, cosmetics, vitamins and many others. It also plays significant role in environmental protection, biotechnology, nanotechnology, energy production and sustainable economical development. The Theme on Chemical Engineering and Chemical Process Technology deals, in five volumes and covers several topics such as: Fundamentals of Chemical Engineering; Unit Operations - Fluids; Unit Operations - Solids; Chemical Reaction Engineering; Process Development, Modeling, Optimization and Control; Process Management; The Future of Chemical Engineering; Chemical Engineering Education; Main Products, which are then expanded into multiple subtopics, each as a chapter. These five volumes are aimed at the following five major target audiences: University and College students, Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.
Computational Fluid Dynamics for Engineers and Scientists-Sreenivas Jayanti 2018-01-09 This book offers a practical, application-oriented introduction to computational fluid dynamics (CFD), with a focus on the concepts and principles encountered when using CFD in industry. Presuming no more knowledge than college-level understanding of the core subjects, the book puts together all the necessary topics to give the reader a comprehensive introduction to CFD. It includes discussion of the derivation of equations, grid generation and solution algorithms for compressible, incompressible and hypersonic flows. The final two chapters of the book are intended for the more advanced user. In the penultimate chapter, the special difficulties that arise while solving practical problems are addressed. Distinction is made between complications arising out of geometrical complexity and those arising out of the complexity of the physics (and chemistry) of the problem. The last chapter contains a brief discussion of what can be considered as the Holy Grail of CFD, namely, finding the optimal design of a fluid flow component. A number of problems are given at the end of each chapter to reinforce the concepts and ideas discussed in that chapter. CFD has come of age and is widely used in industry as well as in academia as an analytical tool to investigate a wide range of fluid flow problems. This book is written for two groups: for those students who are encountering CFD for the first time in the form of a taught lecture course, and for those practising engineers and scientists who are already using CFD as an analysis tool in their professions but would like to deepen and broaden their understanding of the subject.


Multiscale Simulations of Dilute-solution Macromolecular Dynamics in Macroscopic and Microscopic Geometries-Richard M. Jendrejack 2003

Particle Image Velocimetry-Markus Raffel 2018-04-03 This immensely practical guide to PIV provides a condensed, yet exhaustive guide to most of the information needed for experiments employing the technique. This second edition has updated chapters on the principles and extra information on microscopic, high-speed and three component measurements as well as a description of advanced evaluation techniques. What’s more, the huge increase in the range of possible applications has been taken into account as the chapter describing these applications of the PIV technique has been expanded.

Measurements of Velocity Fields of DNA Solutions in Microfluid Devices-Phyllis Hwe-Teh Chen 2001

Multiphysics in Porous Materials-Zhen (Leo) Liu 2018-07-12 This book summarizes, defines, and contextualizes multiphysics with an emphasis on porous materials. It covers various essential aspects of multiphysics, from history, definition, and scope to mathematical theories, physical mechanisms, and numerical implementations. The emphasis on porous materials maximizes readers’ understanding as these substances are abundant in nature and a common breeding ground of multiphysical phenomena, especially complicated multiphysics. Dr. Liu’s lucid and easy-to-follow presentation serve as a blueprint on the use of multiphysics as a leading edge technique for computer modeling. The contents are organized to facilitate the transition from familiar, monolithic physics such as heat transfer and pore water movement to state-of-the-art applications involving multiphysics, including poroelasticity, thermohydro-mechanical processes, electrokinetics, electromagnetics, fluid dynamics, fluid structure interaction, and electromagnetomechanics. This volume serves as both a general reference and specific treatise for various scientific and engineering disciplines involving multiphysics simulation and porous materials.

Model Elements and Network Solutions of Heat, Mass and Momentum Transport Processes-George L. Danko 2016-10-26 This work provides an enormous contribution to the broad effort of modeling heat, mass and momentum transport in multi-physics problems with the development of new solution approaches. It revisits the time-honored technique of network application using flow network solutions for all transport process components for a coupled modeling task. The book further provides as formulation of the conservation laws for mass, energy and momentum, specifically for the branches and nodes of transport networks using the combination of the Eulerian and Lagrangean modeling methods. With the extension of Bernoulli’s original concept, a new solution is given for the flow field of viscous and compressible fluids as driven by the balance of mechanical energy, coupled to the thermodynamics of the transport system. Applicable to simple or large-scale tasks, the new model elements and methods are built on first principles. Throughout the work, the book provides original formulations, their mathematical derivations as well as applications in a numerical solution scheme.

Nanoscale and Microscale Phenomena-Yogesh M. Joshi 2015-06-04 The book is an outcome of research work in the areas of nanotechnology, interfacial science, nano- and micro-fluidics and manufacturing, soft matter, and transport phenomena at nano- and micro-scales. The contributing authors represent prominent research groups from Indian Institute of Technology Bombay, Indian Institute of Technology Kanpur and Indian Institute of Science, Bangalore. The book has 13 chapters and the entire work presented in the chapters is based on research carried out over past three years. The chapters are designed with number of coloured
Illustrations, figures and tables. The book will be highly beneficial to academicians as well as industrial professionals working in the mentioned areas. Applications of Heat, Mass and Fluid Boundary Layers-R.O. Fagbenle 2020-02 Applications of Heat, Mass and Fluid Boundary Layers brings together the latest research on boundary layers where there has been remarkable advancements in recent years. This book highlights relevant concepts and solutions to energy issues and environmental sustainability by combining fundamental theory on boundary layers with real-world industrial applications from, among others, the thermal, nuclear and chemical industries. The book's editors and their team of expert contributors discuss many core themes, including advanced heat transfer fluids and boundary layer analysis, physics of fluid motion and viscous flow, thermodynamics and transport phenomena, alongside key methods of analysis such as the Merk-Chao-Fagbenle method. This book's multidisciplinary coverage will give engineers, scientists, researchers and graduate students in the areas of heat, mass, fluid flow and transfer a thorough understanding of the technicalities, methods and applications of boundary layers, with a unified approach to energy, climate change and a sustainable future. Presents up-to-date research on boundary layers with very practical applications across a diverse mix of industries Includes mathematical analysis to provide detailed explanation and clarity Provides solutions to global energy issues and environmental sustainability Electrochemical Engineering-Thomas F. Fuller 2018-03-20 A Comprehensive Reference for Electrochemical Engineering Theory and Application From chemical and electronics manufacturing, to hybrid vehicles, energy storage, and beyond, electrochemical engineering touches many industries—any many lives—every day. As energy conservation becomes of central importance, so too does the science that helps us reduce consumption, reduce waste, and lessen our impact on the planet. Electrochemical Engineering provides a reference for scientists and engineers working with electrochemical processes, and a rigorous, thorough text for graduate students and upper-division undergraduates. Merging theoretical concepts with widespread application, this book is designed to provide critical knowledge in a real-world context. Beginning with the fundamental principles underpinning the field, the discussion moves into industrial and manufacturing processes that blend central ideas to provide an advanced understanding while explaining observable results. Fully-worked illustrations simplify complex processes, and end-of-chapter questions help reinforce essential knowledge. With in-depth coverage of both the practical and theoretical, this book is both a thorough introduction to and a useful reference for the field. Rigorous in depth, yet grounded in relevance, Electrochemical Engineering: Introduces basic principles from the standpoint of practical application Explores the kinetics of electrochemical reactions with discussion on thermodynamics, reaction fundamentals, and transport Covers battery and fuel cell characteristics, mechanisms, and system design Delves into the design and mechanics of hybrid and electric vehicles, including regenerative braking, start-stop hybrids, and fuel cell systems Examines electrodeposition, redox-flow batteries, electrolysis, regenerative fuel cells, semiconductors, and other applications of electrochemical engineering principles Overlapping chemical engineering, chemistry, material science, mechanical engineering, and electrical engineering, electrochemical engineering covers a diverse array of phenomena explained by some of the important scientific discoveries of our time. Electrochemical Engineering provides the critical understanding required to work effectively with these processes as they become increasingly central to global sustainability. Principles of Biomedical Engineering, Second Edition-Sundararajan Madihally 2019-12-31 This updated edition of an Artech House classic introduces readers to the importance of engineering in medicine. Bioelectrical phenomena, principles of mass and momentum transport to the analysis of physiological systems, the importance of mechanical analysis in biological tissues/ organs and biomaterial selection are discussed in detail. Readers learn about the concepts of using living cells in various therapeutics and diagnostics, compartmental modeling, and biomedical instrumentation. The book explores fluid mechanics, strength of materials, statics and dynamics, basic thermodynamics, electrical circuits, and material science. A significant number of numerical problems have been generated using data from recent literature and are given as examples as well as exercise problems. These problems provide an opportunity for comprehensive understanding of the basic concepts, cutting edge technologies and emerging challenges. Describing the role of engineering in medicine today, this comprehensive volume covers a wide range of the most important topics in this burgeoning field. Moreover, you find a thorough treatment of the concept of using living cells in various therapeutics and diagnostics. Structured as a complete text for students with some engineering background, the book also makes a valuable reference for professionals new to the bioengineering field. This authoritative textbook features numerous exercises and problems in each chapter to help ensure a solid understanding of the material. Microfiltration and Ultrafiltration-Zeman 1996-07-09 Integrates knowledge on microfiltration and ultrafiltration, membrane chemistry, and characterization methods with the engineering and economic aspects of device performance, device and module design, processes, and applications. The text provides a discussion of
membrane fundamentals and an analytical framework for designing and developing new filtrations systems for a broad range of technologically important functions. It offers information on membrane liquid precursors, fractal and stochastic pore space analysis, novel and advanced module designs, and original process design calculations.

Computation and Applied Mathematics- 2002

Mass Transport Phenomena in Reactors Containing Entrapped Enzymes Or Bacterial Cells-Peter Michael Salmon 1989

Standard Handbook of Engineering Calculations-Tyler G. Hicks 2004-10-07 NEW IN THIS EDITION Complying with the latest environmental regulations Design code changes LEED design considerations HVAC procedures Mobile and in-the-field methods "A classic compendium of step-by-step calculations for solving the most frequently encountered engineering problems in many engineering disciplines." —dianahacker.com 5000 Essential Calculations for Engineers Packed with new data and methods, this invaluable handbook provides professionals with more than 5000 direct and related calculation procedures for solving common engineering problems quickly and easily. Now thoroughly revised and updated, Standard Handbook of Engineering Calculations, Fourth Edition covers seven engineering disciplines: civil, architectural, mechanical, electrical, chemical and process plant, sanitary, and environmental. Written in the popular "cookbook" format, the handbook describes each problem to be solved; provides numbered calculation procedures to be followed; works out an actual problem; and presents related calculations in most instances. This fourth edition features numerous new topics from design code changes in civil engineering to composite usage in engineering design. Inside, you’ll find new problem-solving coverage of: Anti-terrorism structural building changes Power-plant cost-cutting Efficient compliance with environmental regulations Wind energy systems LEED considerations in building design Developments in pumps and related calculations Freon-replacing refrigerants Computer programs that automate repetitive calculations Finite element analytic methods The fourth edition of Standard Handbook of Engineering Calculations is a reference engineers will thank for answers time after time. Open this book for all the calculations you need in: Civil Engineering * Architectural Engineering * Mechanical Engineering * Electrical Engineering * Chemical and Process Plant Engineering * Sanitary Engineering * Environmental Engineering Fluids, Colloids and Soft Materials-Alberto Fernandez-Nieves 2016-05-09 This book presents a compilation of self-contained chapters covering a wide range of topics within the broad field of soft condensed matter. Each chapter starts with basic definitions to bring the reader up-to-date on the topic at hand, describing how to use fluid flows to generate soft materials of high value either for applications or for basic research. Coverage includes topics related to colloidal suspensions and soft materials and how they differ in behavior, along with a roadmap for researchers on how to use soft materials to study relevant physics questions related to geometrical frustration.

Chemistry in Motion-Bartosz A. Grzybowski 2009-04-03 Change and motion define and constantly reshape the world around us, on scales from the molecular to the global. In particular, the subtle interplay between chemical reactions and molecular transport gives rise to an astounding richness of natural phenomena, and often manifests itself in the emergence of intricate spatial or temporal patterns. The underlying theme of this book is that by “setting chemistry in motion” in a proper way, it is not only possible to discover a variety of new phenomena, in which chemical reactions are coupled with diffusion, but also to build micro-/nanoarchitectures and systems of practical importance. Although reaction and diffusion (RD) processes are essential for the functioning of biological systems, there have been only a few examples of their application in modern micro- and nanotechnology. Part of the problem has been that RD phenomena are hard to bring under experimental control, especially when the system’s dimensions are small. Ultimately this book will guide the reader through all the aspects of these systems – from understanding the basics to practical hints and then to applications and interpretation of results. Topics covered include: An overview and outlook of both biological and man-made reaction-diffusion systems. The fundamentals and mathematics of diffusion and chemical reactions. Reaction-diffusion equations and the methods of solving them. Spatial control of reaction-diffusion at small scales. Micro- and nanofabrication by reaction-diffusion. Chemical clocks and periodic precipitation structures. Reaction-diffusion in soft materials and at solid interfaces. Microstructuring of solids using RD. Reaction-diffusion for chemical amplification and sensing. RD in three dimensions and at the nanoscale, including nanosynthesis. This book is aimed at all those who are interested in chemical processes at small scales, especially physical chemists, chemical engineers, and material scientists. The book can also be used for one-semester, graduate elective courses in chemical engineering, materials science, or chemistry classes.

Boundary Element Methods in Transport Phenomena-P. A. Ramachandran 1994 The book will provide the reader with a complete understanding of the basis of the
method and the capability to numerically solve a wide range of transport phenomena problems, especially in heat and mass transfer.

Handbook of Silicon Wafer Cleaning Technology, 2nd Edition-Karen Reinhardt 2008-12-10 The second Edition of the Handbook of Silicon Wafer Cleaning Technology is intended to provide knowledge of wet, plasma, and other surface conditioning techniques used to manufacture integrated circuits. The integration of the clean processes into the device manufacturing flow will be presented with respect to other manufacturing steps such as thermal, implant, etching, and photolithography processes. The Handbook discusses both wet and plasma-based cleaning technologies that are used for removing contamination, particles, residue, and photoresist from wafer surfaces. Both the process and the equipment are covered. A review of the current cleaning technologies is included. Also, advanced cleaning technologies that are under investigation for next generation processing are covered; including supercritical fluid, laser, and cryoaerosol cleaning techniques. Additionally theoretical aspects of the cleaning technologies and how these processes affect the wafer is discussed such as device damage and surface roughening will be discussed. The analysis of the wafers surface is outlined. A discussion of the new materials and the changes required for the surface conditioning process used for manufacturing is also included. Focused on silicon wafer cleaning techniques including wet, plasma, and other surface conditioning techniques used to manufacture integrated circuits As this book covers the major technologies for removing contaminants, it is a reliable reference for anyone that manufactures integrated circuits, or supplies the semiconductor and microelectronics industries Covers processes and equipment, as well as new materials and changes required for the surface conditioning process Editors are two of the top names in the field and are both extensively published Discusses next generation processing techniques including supercritical fluid, laser, and cryoaerosol

Control and Regulation of Transport Phenomena in the Cardiac System, Volume 1123-Samuel Sideman 2008-04-14 Leading researchers in the life sciences and engineers involved in research of transport phenomena in biological systems have contributed chapters that identify, analyze, and modify the control and regulation mechanisms of transport phenomena in biological systems, with particular emphasis on the cardiac system. Included in the contributions to this volume are the following topics: signaling mechanisms and transport phenomena; blood-tissue exchange and inter-tissue transport; cellular membrane transport and endocytosis of ions and metabolites; intracellular transport, energetics, and molecular motors; system biology, uni- and multi-scale transport models, and hierarchical analysis; and clinical considerations -- cardiac protection, metabolic and pharmaceutical augmentation, and interferences. NOTE: Annals volumes are available for sale as individual books or as a journal. For information on institutional journal subscriptions, please visit www.blackwellpublishing.com/nyas. ACADEMY MEMBERS: Please contact the New York Academy of Sciences directly to place your order (www.nyas.org). Members of the New York Academy of Science receive full-text access to the Annals online and discounts on print volumes. Please visit www.nyas.org/membership/main.asp for more information about becoming a member. Batch and Continuous Ultrafiltration of Micellar Solutions-John Hayes Markels 1993


Basic Equations of the Mass Transport Through a Membrane Layer-Endre Nagy 2012 With a detailed analysis of the mass transport through membrane layers and its effect on different separation processes, this book provides a comprehensive look at the theoretical and practical aspects of membrane transport properties and functions. Basic equations for every membrane are provided to predict the mass transfer rate, the concentration distribution, the convective velocity, the separation efficiency, and the effect of chemical or biochemical reaction taking into account the heterogeneity of the membrane layer to help better understand the mechanisms of the separation processes. The reader will be able to describe membrane separation processes and the membrane reactors as well as choose the most suitable membrane structure for separation and for membrane reactor. Containing detailed discussion of the latest results in transport processes and separation processes, this book is essential for chemistry students and practitioners of chemical engineering and process engineering. Detailed survey of the theoretical and practical aspects of every membrane process with specific equations Practical examples discussed in detail with clear steps Will assist in planning and preparation of more efficient membrane structure separation

Characterization and Improvement of Two-dimensional Gel Electrophoresis-Christina M. Bondy 2005

Polymer Induced Drag Reduction in Exact Coherent States of Plane Poiseulle Flow-Wei Li 2007

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