

## Chemistry Paper 21 June 2013 Mark Scheme

Since mathematical models express our understanding of how nature behaves, we use them to validate our understanding of the fundamentals about systems (which could be processes, equipment, procedures, devices, or products). Also, when validated, the model is useful for engineering applications related to diagnosis, design, and optimization. First, we postulate a mechanism, then derive a model grounded in that mechanistic understanding. If the model does not fit the data, our understanding of the mechanism was wrong or incomplete. Patterns in the residuals can guide model improvement. Alternately, when the model fits the data, our understanding is sufficient and confidently functional for engineering applications. This book details methods of nonlinear regression, computational algorithms, model validation, interpretation of residuals, and useful experimental design. The focus is on practical applications, with relevant methods supported by fundamental analysis. This book will assist either the academic or industrial practitioner to properly classify the system, choose between the various available modeling options and regression objectives, design experiments to obtain data capturing critical system behaviors, fit the model parameters based on that data, and statistically characterize the resulting model. The author has used the

material in the undergraduate unit operations lab course and in advanced control applications.

Production chemistry issues result from changes in well stream fluids, both liquid and gaseous, during processing. Since crude oil production is characterized by variable production rates and unpredictable changes to the nature of the produced fluids, it is essential for production chemists to have a range of chemical additives available for rectifying issues that would not otherwise be fully resolved. Modern production methods, the need to upgrade crude oils of variable quality, and environmental constraints demand chemical solutions. Thus, oilfield production chemicals are necessary to overcome or minimize the effects of the production chemistry problems. Production Chemicals for the Oil and Gas Industry, Second Edition discusses a wide variety of production chemicals used by the oil and gas industry for down-hole and topside applications both onshore and offshore. Incorporating the large amount of research and applications since the first edition, this new edition reviews all past and present classes of production chemicals, providing numerous difficult-to-obtain references, especially SPE papers and patents. Unlike other texts that focus on how products perform in the field, this book focuses on the specific structures of chemicals that are known to deliver the required or desired performance—information that is very

useful for research and development. Each updated chapter begins by introducing a problem, such as scale or corrosion, for which there is a production chemical. The author then briefly discusses all chemical and nonchemical methods to treat the problem and provides in-depth descriptions of the structural classes of relevant production chemicals. He also mentions, when available, the environmental properties of chemicals and whether the chemical or technique has been successfully used in the field. This edition includes two new chapters and nearly 50 percent more references.

Acids and bases are ubiquitous in chemistry. Our understanding of them, however, is dominated by their behaviour in water. Transfer to non-aqueous solvents leads to profound changes in acid-base strengths and to the rates and equilibria of many processes: for example, synthetic reactions involving acids, bases and nucleophiles; isolation of pharmaceutical actives through salt formation; formation of zwitter-ions in amino acids; and chromatographic separation of substrates. This book seeks to enhance our understanding of acids and bases by reviewing and analysing their behaviour in non-aqueous solvents. The behaviour is related where possible to that in water, but correlations and contrasts between solvents are also presented. Fundamental background material is provided in the initial chapters: quantitative aspects of acid-base

equilibria, including definitions and relationships between solution pH and species distribution; the influence of molecular structure on acid strengths; and acidity in aqueous solution. Solvent properties are reviewed, along with the magnitude of the interaction energies of solvent molecules with (especially) ions; the ability of solvents to participate in hydrogen bonding and to accept or donate electron pairs is seen to be crucial. Experimental methods for determining dissociation constants are described in detail. In the remaining chapters, dissociation constants of a wide range of acids in three distinct classes of solvents are discussed: protic solvents, such as alcohols, which are strong hydrogen-bond donors; basic, polar aprotic solvents, such as dimethylformamide; and low-basicity and low polarity solvents, such as acetonitrile and tetrahydrofuran. Dissociation constants of individual acids vary over more than 20 orders of magnitude among the solvents, and there is a strong differentiation between the response of neutral and charged acids to solvent change. Ion-pairing and hydrogen-bonding equilibria, such as between phenol and phenoxide ions, play an increasingly important role as the solvent polarity decreases, and their influence on acid-base equilibria and salt formation is described. The job interview is probably the most important step you will take in your job search journey. Because it's always important to be prepared to respond

effectively to the questions that employers typically ask at a job interview Petrogav International has prepared this eBooks that will help you to get a job in oil and gas industry. Since these questions are so common, hiring managers will expect you to be able to answer them smoothly and without hesitation. This eBook contains 281 questions and answers for job interview and as a BONUS web addresses to 289 video movies for a better understanding of the technological process. This course covers aspects like HSE, Process, Mechanical, Electrical and Instrumentation & Control that will enable you to apply for any position in the Oil and Gas Industry.

The Handbook of Membrane Separations: Chemical, Pharmaceutical, Food, and Biotechnological Applications, Second Edition provides detailed information on membrane separation technologies from an international team of experts. The handbook fills an important gap in the current literature by providing a comprehensive discussion of membrane application

This volume includes contributions on the physical and numerical modeling of materials processing, and covers a range of metals and minerals. Authors present models and results related to the basics of processing such as extraction, joining, separation, and casting. The corresponding fundamentals of mass and heat transport as well as physical and thermodynamics properties are

addressed, allowing for a cross-disciplinary vision of the field.

The Importance of Packaging Design for the Chemistry of Food Products Springer

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Advances in Clinical Chemistry, Volume 95, the latest installment in this internationally acclaimed series, contains chapters authored by world-renowned clinical laboratory scientists, physicians and research scientists. The serial discusses the latest and most up-to-date technologies related to the field of clinical chemistry, with this new release including sections on Advances in diagnostic microfluidics, Vascular and valvular calcification biomarkers, Long noncoding RNAs in cancer: From discovery to therapeutic targets, Exosomes of male reproduction, Tryptophan in health and disease, Biochemistry of blood platelet activation, and the beneficial role of plant oils in cardiovascular diseases.

The Special Issue "Industrial and Technological Applications of Power Electronics Systems" focuses on: - new strategies of control for electric machines, including sensorless control and fault diagnosis; - existing and emerging industrial applications of GaN and SiC-based converters; - modern methods for electromagnetic compatibility. The book covers topics such as control systems, fault diagnosis, converters, inverters, and electromagnetic interference in power electronics systems. The Special Issue includes 19 scientific papers by industry experts and worldwide professors in the area of electrical engineering.

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This Brief defines reliable correlations between the food packaging design and its chemical features in terms of an 'integrated food product' (the synergistic union composed of the edible content and its container). A good design, as described in this Brief, implies the best choices from a series of possibilities, taking into account economical and commercial influences or limitations in the production and processing chain and the chemical interactions that can arise between the food containers and the contained edible material. This Brief highlights how the different requirements can be combined, while avoiding dangerous food risks originating from the chemical interaction between the container and the product. Different designs are critically analysed with relation to the effect on contained foods. The influences and resulting consequences of different possible food packaging designs are highlighted and discussed in selected case studies for some every-day products (like potato chips).

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Process, Mechanical, Electrical and Instrumentation & Control that will enable you to apply for any position in the Oil and Gas Industry.

Life cycle assessment (LCA) is an established methodology used to quantify the environmental impacts of products, processes and services. Circular economy (CE) thinking is conceptual way of considering the impacts of consuming resources. By taking a closed loop approach, CE provides a framework for influencing behaviours and practices to minimise this impact. Development of the circular economy is a crucial component in the progression towards future sustainability. This book provides a robust systematic approach to the circular economy concept, using the established methodology of LCA. Including chapters on circular economic thinking, the use of LCA as a metric and linking LCA to the wider circular economy, this book utilises case studies to illustrate the approaches to LCA. With contributions from researchers worldwide, Life Cycle Assessment provides a practical, global guide for those who wish to use LCA as a research tool or to inform policy, process, and product improvement. This is a print on demand edition of a hard to find publication. Contents: (1) Recent Developments: Parliamentary Elections 2009; Lebanon and Israel; Cluster-Bomb Coordinates; Arrests of Alleged Israeli Intelligence Agents; Hariri Tribunal; (2) U.S. Policy Toward Lebanon; (3) Political Profile: Demography; Civil War, Occupation, and Taif Reform; Syrian and Israeli Incursions; Taif Agreement; Syrian Withdrawal and Parliamentary Elections of 2005; U.N. Resolutions and the Tribunal; Sectarianism and Stability; Political Stalemate; Renewed Sectarian Violence; Doha Agreement; Unity Gov;t.; (4) Current Issues in U.S.-Lebanon

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Relations: Confronting Hezbollah; Hezbollah's Al Manar TV; Lebanon-Syria Relations; The Shiba Farms; Extremist Groups in Lebanon; The Lebanese Armed Forces; (5) U.S. Assistance.

A university campus is a place with special resonance: conjuring images of cloistered quadrangles and wood-panelled libraries, often echoing centuries of scholarly tradition. And yet it is also a place of cutting-edge science, interactive learning, youth, vibrancy, and energy. It is this dual nature which makes the physical environment of a university so dynamic as well as a highly challenging landscape to design and manage successfully. Today, the scale of the pressures and the rate of change facing higher education institutions are greater than ever. Squeezed public spending, rising tuition fees and the growing education ambitions of developing nations are set against a backdrop of rapid technological progress and changing pedagogies. What are the repercussions for the physical realities of university planning and architecture? And how are university campuses adapting to contend with these pressures? University Trends introduces the most significant, widespread and thought-provoking trends in campus design today. Part 1 identifies current trends such as starchitecture, large-scale campus extensions, adaptive re-use, and international branch campuses. Part 2 profiles each trend via highly-illustrated, global case studies of well-publicised as well as lesser-known projects. The essential guide to current and future trends in campus design.

This title examines how inhalants and club, prescription, and over-the-counter (OTC) drugs affect individuals and society, investigates how people are working to put an end to drug abuse, and analyzes the controversies and conflicting viewpoints surrounding the issue. Features include a glossary, selected bibliography, websites, source notes, and an index, plus

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a timeline and essential facts. Aligned to Common Core Standards and correlated to state standards. Essential Library is an imprint of Abdo Publishing, a division of ABDO. Winner of the CHOICE Outstanding Academic Title 2017 Award This comprehensive collection of top-level contributions provides a thorough review of the vibrant field of chemistry education. Highly-experienced chemistry professors and education experts cover the latest developments in chemistry learning and teaching, as well as the pivotal role of chemistry for shaping a more sustainable future. Adopting a practice-oriented approach, the current challenges and opportunities posed by chemistry education are critically discussed, highlighting the pitfalls that can occur in teaching chemistry and how to circumvent them. The main topics discussed include best practices, project-based education, blended learning and the role of technology, including e-learning, and science visualization. Hands-on recommendations on how to optimally implement innovative strategies of teaching chemistry at university and high-school levels make this book an essential resource for anybody interested in either teaching or learning chemistry more effectively, from experience chemistry professors to secondary school teachers, from educators with no formal training in didactics to frustrated chemistry students. Computational intelligence is a component of Encyclopedia of Technology, Information, and Systems Management Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. Computational intelligence is a rapidly growing research field including a wide variety of problem-solving techniques inspired by nature. Traditionally computational intelligence consists of three major research areas: Neural Networks, Fuzzy Systems, and Evolutionary Computation. Neural networks are mathematical models inspired by brains. Neural networks have massively parallel

network structures with many neurons and weighted connections. Whereas each neuron has a simple input-output relation, a neural network with many neurons can realize a highly non-linear complicated mapping. Connection weights between neurons can be adjusted in an automated manner by a learning algorithm to realize a non-linear mapping required in a particular application task. Fuzzy systems are mathematical models proposed to handle inherent fuzziness in natural language. For example, it is very difficult to mathematically define the meaning of “cold” in everyday conversations such as “It is cold today” and “Can I have cold water”. The meaning of “cold” may be different in a different situation. Even in the same situation, a different person may have a different meaning. Fuzzy systems offer a mathematical mechanism to handle inherent fuzziness in natural language. As a result, fuzzy systems have been successfully applied to real-world problems by extracting linguistic knowledge from human experts in the form of fuzzy IF-THEN rules. Evolutionary computation includes various population-based search algorithms inspired by evolution in nature. Those algorithms usually have the following three mechanisms: fitness evaluation to measure the quality of each solution, selection to choose good solutions from the current population, and variation operators to generate offspring from parents. Evolutionary computation has high applicability to a wide range of optimization problems with different characteristics since it does not need any explicit mathematical formulations of objective functions. For example, simulation-based fitness evaluation is often used in evolutionary design. Subjective fitness evaluation by a human user is also often used in evolutionary art and music. These 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.

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For the New Century Issue of the journal "Theoretical Chemistry Accounts" the advisory editors identified papers from the first century of theoretical chemistry and discussed their importance for the twentieth century with an eye towards the twenty-first century. Sixty-six such perspectives are published in the New Century Issue. To make this unique collection available to younger scientists for entertaining reading and re-reading of the original publications, the publisher decided to reprint a special edition of the issue.

The chemistry and physico-chemical properties of milk proteins are perhaps the largest and most rapidly evolving major areas in dairy chemistry. *Advanced Dairy Chemistry-1B: Proteins: Applied Aspects* covers the applied, technologically-focused chemical aspects of dairy proteins, the most commercially valuable constituents of milk. This fourth edition contains most chapters in the third edition on applied aspects of dairy proteins. The original chapter on production and utilization of functional milk proteins has been split into two new chapters focusing on casein- and whey-based ingredients separately by new authors. The chapters on denaturation, aggregation and gelation of whey proteins (Chapter 6), heat stability of milk (Chapter 7) and protein stability in sterilised milk (Chapter 10) have been revised and expanded considerably by new authors and new chapters have been included on rehydration properties of dairy protein powders (Chapter 4) and sensory properties of dairy protein ingredients (Chapter 8). This authoritative work describes current knowledge on the applied and technologically-focused chemistry and physico-chemical aspects of milk proteins and will be very valuable to dairy scientists, chemists, technologists and others working in dairy research or in the dairy industry.

Two award-winning journalists offer a "cogent, well-sourced and ambitious analysis of the slow

decline of cannabis prohibition in the United States” (Kirkus Reviews). In November 2012, voters in Colorado and Washington passed landmark measures to legalize the production and sale of cannabis for social use—a first in the United States and the world. Once vilified as a “gateway drug,” cannabis is now legal for medical use in eighteen states and Washington, DC. Yet the federal government refuses to acknowledge these broader societal shifts. 49.5 percent of all drug-related arrests involve the sale, manufacture, or possession of cannabis. In the first book to explore the new landscape of cannabis in the United States, investigative journalists Alyson Martin and Nushin Rashidian demonstrate how recent cultural and legal developments tie into cannabis’s complex history and thorny politics. Reporting from nearly every state with a medical cannabis law, Martin and Rashidian interview patients, growers, doctors, entrepreneurs, politicians, activists, and regulators. A New Leaf moves from the federal cannabis farm at the University of Mississippi to the headquarters of the ACLU to Oregon’s World Famous Cannabis Café. The result is a lucid account of how cannabis legalization is changing the lives of millions of Americans and easing the burden of the “war on drugs” both domestically and internationally.

This book chronicles the revolution in STEM teaching and learning that has arisen from a convergence of educational research, emerging technologies, and innovative ways of structuring both the physical space and classroom activities in STEM higher education. Beginning with a historical overview of US higher education and an overview of diversity in STEM in the US, the book sets a context in which our present-day innovation in science and technology urgently

needs to provide more diversity and inclusion within STEM fields. Research-validated pedagogies using active learning and new types of research-based curriculum is transforming how physics, biology and other fields are taught in leading universities, and the book gives profiles of leading innovators in science education and examples of exciting new research-based courses taking root in US institutions. The book includes interviews with leading scientists and educators, case studies of new courses and new institutions, and descriptions of site visits where new trends in 21st STEM education are being developed. The book also takes the reader into innovative learning environments in engineering where students are empowered by emerging technologies to develop new creative capacity in their STEM education, through new centers for design thinking and liberal arts-based engineering. Equally innovative are new conceptual frameworks for course design and learning, and the book explores the concepts of Scientific Teaching, Backward Course Design, Threshold Concepts and Learning Taxonomies in a systematic way with examples from diverse scientific fields. Finally, the book takes the reader inside the leading centers for online education, including Udacity, Coursera and EdX, interviews the leaders and founders of MOOC technology, and gives a sense of how online education is evolving and what this means for STEM education. This book

provides a broad and deep exploration into the historical context of science education and into some of the cutting-edge innovations that are reshaping how leading universities teach science and engineering. The emergence of exponentially advancing technologies such as synthetic biology, artificial intelligence and materials sciences has been described as the Fourth Industrial Revolution, and the book explores how these technologies will shape our future will bring a transformation of STEM curriculum that can help students solve many the most urgent problems facing our world and society.

The life and chemical sciences are in the midst of a period of rapid and revolutionary transformation that will undoubtedly bring societal benefits but also have potentially malign applications, notably in the development of chemical weapons. Such concerns are exacerbated by the unstable international security environment and the changing nature of armed conflict, which could fuel a desire by certain States to retain and use existing chemical weapons, as well as increase State interest in creating new weapons; whilst a broader range of actors may seek to employ diverse toxic chemicals as improvised weapons. Stark indications of the multi-faceted dangers we face can be seen in the chemical weapons attacks against civilians and combatants in Iraq and Syria, and also in more targeted chemical assassination operations in Malaysia and the UK. Using

a multi-disciplinary approach, and drawing upon an international group of experts, this book analyses current and likely near-future advances in relevant science and technology, assessing the risks of their misuse. The book examines the current capabilities, limitations and failures of the existing international arms control and disarmament architecture – notably the Chemical Weapons Convention – in preventing the development and use of chemical weapons. Through the employment of a novel Holistic Arms Control methodology, the authors also look beyond the bounds of such treaties, to explore the full range of international law, international agreements and regulatory mechanisms potentially applicable to weapons employing toxic chemical agents, in order to develop recommendations for more effective routes to combat their proliferation and misuse. A particular emphasis is given to the roles that chemical and life scientists, health professionals and wider informed activist civil society can play in protecting the prohibition against poison and chemical weapons; and in working with States to build effective and responsive measures to ensure that the rapid scientific and technological advances are safeguarded from hostile use and are instead employed for the benefit of us all.

Mastering a rich repertoire of motor behaviors, as humans and other animals do, is a surprising and still poorly understood outcome of evolution, development,

and learning. Many degrees-of-freedom, non-linear dynamics, and sensory delays provide formidable challenges for controlling even simple actions. Modularity as a functional element, both structural and computational, of a control architecture might be the key organizational principle that the central nervous system employs for achieving versatility and adaptability in motor control. Recent investigations of muscle synergies, motor primitives, compositionality, basic action concepts, and related work in machine learning have contributed to advance, at different levels, our understanding of the modular architecture underlying rich motor behaviors. However, the existence and nature of the modules in the control architecture is far from settled. For instance, regularity and low-dimensionality in the motor output are often taken as an indication of modularity but could they simply be a byproduct of optimization and task constraints? Moreover, what are the relationships between modules at different levels, such as muscle synergies, kinematic invariants, and basic action concepts? One important reason for the new interest in understanding modularity in motor control from different viewpoints is the impressive development in cognitive robotics. In comparison to animals and humans, the motor skills of today's best robots are limited and inflexible. However, robot technology is maturing to the point at which it can start approximating a reasonable spectrum

of isolated perceptual, cognitive, and motor capabilities. These advances allow researchers to explore how these motor, sensory and cognitive functions might be integrated into meaningful architectures and to test their functional limits. Such systems provide a new test bed to explore different concepts of modularity and to address the interaction between motor and cognitive processes experimentally. Thus, the goal of this Research Topic is to review, compare, and debate theoretical and experimental investigations of the modular organization of the motor control system at different levels. By bringing together researchers seeking to understand the building blocks for coordinating many muscles, for planning endpoint and joint trajectories, and for representing motor and behavioral actions in memory we aim at promoting new interactions between often disconnected research areas and approaches and at providing a broad perspective on the idea of modularity in motor control. We welcome original research, methodological, theoretical, review, and perspective contributions from behavioral, system, and computational motor neuroscience research, cognitive psychology, and cognitive robotics.

The job interview is probably the most important step you will take in your job search journey. Because it's always important to be prepared to respond effectively to the questions that employers typically ask at a job interview

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Food proteins are of great interest, not only because of their nutritional importance and their functionality in foods, but also for their detrimental effects.

Although proteins from milk, meats (including fish and poultry), eggs, cereals, legumes, and oilseeds have been the traditional sources of protein in the human diet, potentially any proteins from a biological source could serve as a food protein. The primary role of protein in the diet is to provide the building materials for the synthesis of muscle and other tissues, and they play a critical role in many biological processes. They are also responsible for food texture, color, and flavor. Today, food proteins are extracted, modified, and incorporated into processed foods to impart specific functional properties. They can also have adverse effects in the diet: proteins, such as walnuts, pecans, almonds, and cashews, soybean, wheat, milk, egg, crustacean, and fish proteins can be powerful allergens for some people. Applied Food Protein Chemistry is an applied reference which reviews the properties of food proteins and provides in-depth information on important plant and animal proteins consumed around the world. The book is grouped into three sections: (1) overview of food proteins, (2) plant proteins, and (3) animal proteins. Each chapter discusses world production, distribution, utilization, physicochemical properties, and the functional properties of each protein, as well as its food applications. The authors for each of the chapters are carefully selected experts in the field. This book will be a valuable reference tool for those who work on food proteins. It will also be an important text on applied

food protein chemistry for upper-level students and graduate students of food science programs.

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This book describes the fundamental concepts, the latest developments and the outlook of the field of nanozymes (i.e., the catalytic nanomaterials with enzymatic characteristics). As one of today's most exciting fields, nanozyme research lies at the interface of chemistry, biology, materials science and nanotechnology. Each of the book's six chapters explores advances in nanozymes. Following an introduction to the rise of nanozymes research in the course of research on

natural enzymes and artificial enzymes in Chapter 1, Chapters 2 through 5 discuss different nanomaterials used to mimic various natural enzymes, from carbon-based and metal-based nanomaterials to metal oxide-based nanomaterials and other nanomaterials. In each of these chapters, the nanomaterials' enzyme mimetic activities, catalytic mechanisms and key applications are covered. In closing, Chapter 6 addresses the current challenges and outlines further directions for nanozymes. Presenting extensive information on nanozymes and supplemented with a wealth of color illustrations and tables, the book offers an ideal guide for readers from disparate areas, including analytical chemistry, materials science, nanoscience and nanotechnology, biomedical and clinical engineering, environmental science and engineering, green chemistry, and novel catalysis.

A memorial number was issued with v.7.

We are all investors. We invest our time, our energy, our money. We invest every single day, as citizens, as consumers, as businesspeople. At its core, investing involves connection, exchange, and mutual benefit. Lately, however, the primary, beneficial function of investing has been overshadowed by ever-more mechanized iterations of finance. We have created funds of funds, securitizations of securitizations, and entire firms whose business is based on harvesting the advantage of microseconds of trading

speed. The Nature of Investing calls for a transformation of the investment process from the roots up. Drawing on the author's twenty-plus years of leadership experience in top investment firms, the book connects real-world finance with the field of biomimicry. Citing real-life examples and discussing principles from the natural world, The Nature of Investing shows how we can create an investment framework that is different from the mechanized one currently employed. Readers will discover an approach that re-aligns investing with the world it was originally meant to serve. An approach that values resiliency over rigidity and elegant simplicity over synthetic complexity. This is the true nature of investing.

This book presents an updated view of the Philippines, focusing on thematic issues rather than a description region by region. Topics include typhoons, population growth, economic difficulties, agrarian reform, migration as an economic strategy, the growth of Manila, the Muslim question in Mindanao, the South China Sea tensions with China and the challenges of risk, vulnerability and sustainable development.

In this innovative book, Arild Vatn presents an overview of the field of environmental governance, from its theoretical foundations, to the major issues and practical applications. While having an interdisciplinary orientation, the main theoretical basis is in institutional theory. The book spans issues from the global to the local level and puts environmental governance within the wider field of economic policy and development. This book is perfect for interdisciplinary masters programs in environmental studies,

environmental policy and management, as well as being of value to practitioners in the field.

Intermedial Shakespeares argues that intermediality has refashioned performances of Shakespeare's plays over the last two decades in Europe. It describes ways in which text and author, time and space, actor and audience have been redefined in Shakespearean productions that incorporate digital media, and it traces transformations in practice.

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