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DEPARTMENT OF EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

PHYSICAL SCIENCES: PHYSICS (P1) AND CHEMISTRY (P2)

PRE-TRIAL EXAM

22 AUGUST 2022

MARKS: 150

TIME: 3 hours

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This question paper consists of 16 pages and 5 data sheets.

Physcal Science Paper 1 September 2013 Memo

**National Research Council, Division on
Engineering and Physical
Sciences, Computer Science and
Telecommunications Board, Committee
on Responding to Section 5(d) of
Presidential Policy Directive 28: The
Feasibility of Software to Provide
Alternatives to Bulk Signals
Intelligence Collection**

Physical Science Paper 1 September 2013 Memo:

The Secure and the Dispossessed Nick Buxton, Ben Hayes, 2015-11-20 While the world's scientists and many of its inhabitants despair at the impact of climate change corporate and military leaders see nothing but opportunities For them melting ice caps mean newly accessible fossil fuels borders to be secured from climate refugees social conflicts to be managed and more failed states in which to intervene They are securing their assets at the expense of the planet and its inhabitants *The Secure and the Dispossessed* looks at these deadly approaches with a critical eye It also considers the flip side that the legitimacy of the elite is under unprecedented pressure from resistance by communities to resource grabs to those creating new ecological and socially just models for managing our energy food and water Topics covered include geoengineering militarism refugee protection greenwashing and the agricultural crisis among others Adaptation and resilience to a climate changed world is desperately needed but the form it will take will affect all of our futures [This Changes Everything](#) Naomi Klein, 2014-09-16 The most important book yet from the author of the international bestseller *The Shock Doctrine* a brilliant explanation of why the climate crisis challenges us to abandon the core free market ideology of our time restructure the global economy and remake our political systems In short either we embrace radical change ourselves or radical changes will be visited upon our physical world The status quo is no longer an option In *This Changes Everything* Naomi Klein argues that climate change isn't just another issue to be neatly filed between taxes and health care It's an alarm that calls us to fix an economic system that is already failing us in many ways Klein meticulously builds the case for how massively reducing our greenhouse emissions is our best chance to simultaneously reduce gaping inequalities re-imagine our broken democracies and rebuild our gutted local economies She exposes the ideological desperation of the climate change deniers the messianic delusions of the would-be geoengineers and the tragic defeatism of too many mainstream green initiatives And she demonstrates precisely why the market has not and cannot fix the climate crisis but will instead make things worse with ever more extreme and ecologically damaging extraction methods accompanied by rampant disaster capitalism Klein argues that the changes to our relationship with nature and one another that are required to respond to the climate crisis humanely should not be viewed as grim penance but rather as a kind of gift a catalyst to transform broken economic and cultural priorities and to heal long festering historical wounds And she documents the inspiring movements that have already begun this process communities that are not just refusing to be sites of further fossil fuel extraction but are building the next regeneration based economies right now Can we pull off these changes in time Nothing is certain Nothing except that climate change changes everything And for a very brief time the nature of that change is still up to us

Decision Making and Knowledge Decision Support Systems Anna Maria Gil-Lafuente, Constantin Zopounidis, 2014-12-01 This book presents recent advancements of research new methods and techniques applications and projects in decision making and decision support systems It explores expert systems and neural networks knowledge

engineering and management fuzzy sets and systems and computational methods for optimization data analysis and decision making It presents applications in Economics Finance Management and Engineering The book undertakes to stimulate scientific exchange ideas and experiences in the field of decision making in Economy and Management Researchers and practitioners alike will benefit from this book when they are dealing with imprecision vagueness and uncertainty in the context of decision making **Indigenous Peoples' Governance of Land and Protected Territories in the Arctic** Thora Martina Herrmann, Thibault Martin, 2015-12-22 This book addresses critical questions and analyses key issues regarding Indigenous Aboriginal Peoples and governance of land and protected areas in the Arctic It brings together contributions from scientists indigenous and non indigenous researchers local leaders and members of the policy community that document Indigenous Aboriginal approaches to governance of land and protected areas at the local regional and international level explore new territorial governance models that are emerging as part of the Indigenous Aboriginal governance within Arctic States provinces territories and regions analyse the recognition or lack thereof concerning indigenous rights to self determination in the Arctic and examine how traditional decision making arrangements and practices can be linked with governments in the process of good governance The book highlights essential lessons learned success stories and remaining issues all of which are useful to address issues of Arctic governance of land and protected areas today and which could also be relevant for future governance arrangements Vibrio ecology, pathogenesis and evolution Rita R Colwell, Daniela Ceccarelli, 2014-10-24 Vibrios are Gram negative bacilli that occur naturally in marine estuarine and freshwater systems Some species include human and animal pathogens capable of causing gastroenteritis wound infections cholera and fatal septicemia Over the past decades cutting edge research on Vibrio genomics has promoted a tremendous advance in our knowledge of these pathogens Significant developments include the discovery of emerging epidemic clones tracking the spread of new strain variants and an intensified appreciation of the role of mobile genetic elements in antibiotic resistance spread as well as pathogenesis Furthermore improved understanding of the interaction of Vibrios with a variety of living organisms in the aquatic environment has documented the significant role of environmental reservoirs in their seasonal cycle favoring persistence of the pathogen during inter epidemic periods and enhancing disease transmission This Research Topic is dedicated to our current understanding in these areas and will bring together leading experts in the field to provide a deep overview of Vibrios ecology and evolution and will suggest the pathway of future research in this field Bulk Collection of Signals Intelligence National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on Responding to Section 5(d) of Presidential Policy Directive 28: The Feasibility of Software to Provide Alternatives to Bulk Signals Intelligence Collection, 2015-03-24 The Bulk Collection of Signals Intelligence Technical Options study is a result of an activity called for in Presidential Policy Directive 28 PPD 28 issued by President Obama in January 2014 to evaluate U S signals intelligence practices The directive instructed the Office of the

Director of National Intelligence ODNI to produce a report within one year assessing the feasibility of creating software that would allow the intelligence community more easily to conduct targeted information acquisition rather than bulk collection ODNI asked the National Research Council NRC the operating arm of the National Academy of Sciences and National Academy of Engineering to conduct a study which began in June 2014 to assist in preparing a response to the President Over the ensuing months a committee of experts appointed by the Research Council produced the report **Spacecraft**

Dynamics and Control Enrico Canuto, Carlo Novara, Donato Carlucci, Carlos Perez-Montenegro, Luca Massotti, 2018-03-08
Spacecraft Dynamics and Control The Embedded Model Control Approach provides a uniform and systematic way of approaching space engineering control problems from the standpoint of model based control using state space equations as the key paradigm for simulation design and implementation The book introduces the Embedded Model Control methodology for the design and implementation of attitude and orbit control systems The logic architecture is organized around the embedded model of the spacecraft and its surrounding environment The model is compelled to include disturbance dynamics as a repository of the uncertainty that the control law must reject to meet attitude and orbit requirements within the uncertainty class The source of the real time uncertainty estimation prediction is the model error signal as it encodes the residual discrepancies between spacecraft measurements and model output The embedded model and the uncertainty estimation feedback noise estimator in the book constitute the state predictor feeding the control law Asymptotic pole placement exploiting the asymptotes of closed loop transfer functions is the way to design and tune feedback loops around the embedded model state predictor control law reference generator The design versus the uncertainty class is driven by analytic stability and performance inequalities The method is applied to several attitude and orbit control problems The book begins with an extensive introduction to attitude geometry and algebra and ends with the core themes state space dynamics and Embedded Model Control Fundamentals of orbit attitude and environment dynamics are treated giving emphasis to state space formulation disturbance dynamics state feedback and prediction closed loop stability Sensors and actuators are treated giving emphasis to their dynamics and modelling of measurement errors Numerical tables are included and their data employed for numerical simulations Orbit and attitude control problems of the European GOCE mission are the inspiration of numerical exercises and simulations The suite of the attitude control modes of a GOCE like mission is designed and simulated around the so called mission state predictor Solved and unsolved exercises are included within the text and not separated at the end of chapters for better understanding training and application Simulated results and their graphical plots are developed through MATLAB Simulink code *Biofuels for Aviation* Christopher Chuck, 2016-06-02 Biofuels for Aviation Feedstocks Technology and Implementation presents the issues surrounding the research and use of biofuels for aviation such as policy markets certification and performance requirements life cycle assessment and the economic and technical barriers to their full implementation Readers involved in bioenergy and aviation sectors research planning or policy making

activities will benefit from this thorough overview The aviation industry's commitment to reducing GHG emissions along with increasing oil prices have sparked the need for renewable and affordable energy sources tailored to this sector's very specific needs As jet engines cannot be readily electrified turning to biofuels is the most viable option However aviation is a type of transportation for which traditional biofuels such as bioethanol and biodiesel do not fulfill key fuel requirements Therefore different solutions to this situation are being researched and tested around the globe which makes navigating this scenario particularly challenging This book guides readers through this intricate subject bringing them up to speed with its current status and future prospects both from the academic and the industry point of view Science and technology chapters delve into the technical aspects of the currently tested and the most promising technology in development as well as their respective feedstocks and the use of additives as a way of adapting them to meet certain specifications Conversion processes such as hydrotreatment synthetic biology pyrolysis hydrothermal liquefaction and Fisher Tropsch are explored and their results are assessed for current and future viability Presents the current status of biofuels for the aviation sector including technologies that are currently in use and the most promising future technologies their production processes and viability Explains the requirements for certification and performance of aviation fuels and how that can be achieved by biofuels Explores the economic and policy issues as well as life cycle assessment a comparative techno economic analysis of promising technologies and a roadmap to the future Explores conversion processes such as hydrotreatment synthetic biology pyrolysis hydrothermal liquefaction and Fisher Tropsch

Overcoming Barriers to Deployment of Plug-in Electric Vehicles National Research Council, Transportation Research Board, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems, Committee on Overcoming Barriers to Electric-Vehicle Deployment, 2015-06-26 In the past few years interest in plug in electric vehicles PEVs has grown Advances in battery and other technologies new federal standards for carbon dioxide emissions and fuel economy state zero emission vehicle requirements and the current administration's goal of putting millions of alternative fuel vehicles on the road have all highlighted PEVs as a transportation alternative Consumers are also beginning to recognize the advantages of PEVs over conventional vehicles such as lower operating costs smoother operation and better acceleration the ability to fuel up at home and zero tailpipe emissions when the vehicle operates solely on its battery There are however barriers to PEV deployment including the vehicle cost the short all electric driving range the long battery charging time uncertainties about battery life the few choices of vehicle models and the need for a charging infrastructure to support PEVs What should industry do to improve the performance of PEVs and make them more attractive to consumers At the request of Congress Overcoming Barriers to Deployment of Plug in Electric Vehicles identifies barriers to the introduction of electric vehicles and recommends ways to mitigate these barriers This report examines the characteristics and capabilities of electric vehicle technologies such as cost performance range safety and durability and assesses how these factors might create barriers to widespread deployment Overcoming Barriers to

Deployment of Plug in Electric Vehicles provides an overview of the current status of PEVs and makes recommendations to spur the industry and increase the attractiveness of this promising technology for consumers Through consideration of consumer behaviors tax incentives business models incentive programs and infrastructure needs this book studies the state of the industry and makes recommendations to further its development and acceptance *Native Games* Chris Hallinan,Barry Judd,2013-07-19 Research on Indigenous participation in sport offers many opportunities to better understand the political issues of equality empowerment self determination and protection of culture and identity This volume compares and conceptualises the sociological significance of Indigenous sports in different international contexts **Oceanobs'19: An Ocean of Opportunity. Volume II** Tong Lee,Sabrina Speich,Laura Lorenzoni,Sanae Chiba,Frank E. Muller-Karger,Minhan Dai,Amos T. Kabo-Bah,John Siddorn,Justin Manley,Maria Snoussi,Fei Chai,2020-12-31 This eBook is a collection of articles from a Frontiers Research Topic Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series they are collections of at least ten articles all centered on a particular subject With their unique mix of varied contributions from Original Research to Review Articles Frontiers Research Topics unify the most influential researchers the latest key findings and historical advances in a hot research area Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office frontiersin.org/about/contact The Idea Factory Jon Gertner,2013-02-26 The definitive history of America s greatest incubator of innovation and the birthplace of some of the 20th century s most influential technologies Filled with colorful characters and inspiring lessons The Idea Factory explores one of the most critical issues of our time What causes innovation Walter Isaacson The New York Times Book Review Compelling Gertner s book offers fascinating evidence for those seeking to understand how a society should best invest its research resources The Wall Street Journal From its beginnings in the 1920s until its demise in the 1980s Bell Labs officially the research and development wing of AT T was the biggest and arguably the best laboratory for new ideas in the world From the transistor to the laser from digital communications to cellular telephony it s hard to find an aspect of modern life that hasn t been touched by Bell Labs In The Idea Factory Jon Gertner traces the origins of some of the twentieth century s most important inventions and delivers a riveting and heretofore untold chapter of American history At its heart this is a story about the life and work of a small group of brilliant and eccentric men Mervin Kelly Bill Shockley Claude Shannon John Pierce and Bill Baker who spent their careers at Bell Labs Today when the drive to invent has become a mantra Bell Labs offers us a way to enrich our understanding of the challenges and solutions to technological innovation Here after all was where the foundational ideas on the management of innovation were born **Technological Innovation in Legacy Sectors** William B. Bonvillian,Charles Weiss,2015-08-18 The American economy misses opportunities for innovation growth and job creation because of a neglected problem the resistance to innovation from Legacy sectors like energy manufacturing and health care which constitute most of our economy The book offers systematic strategies to

overcome the structural obstacles to innovation in critically important Legacy sectors *Engineering Vulnerability* Sarah E. Vaughn, 2022-02-07 In *Engineering Vulnerability* Sarah E. Vaughn examines climate adaptation against the backdrop of ongoing processes of settler colonialism and the global climate change initiatives that seek to intervene in the lives of the world's most vulnerable. Her case study is Guyana in the aftermath of the 2005 catastrophic flooding that ravaged the country's Atlantic coastal plain. The country's ensuing engineering projects reveal the contingencies of climate adaptation and the capacity of flooding to shape Guyanese expectations about racial inequality. Analyzing the coproduction of race and vulnerability, Vaughn details why climate adaptation has implications for how we understand the past and the continued human settlement of a place. Such understandings become particularly apparent not only through experts and ordinary citizens' disputes over resources but in their attention to the ethical practice of technoscience over time. Approaching climate adaptation this way, Vaughn exposes the generative openings as well as gaps in racial thinking for theorizing climate action, environmental justice, and more broadly, future life on a warming planet. Duke University Press Scholars of Color First Book Award recipient *Assessment of Advanced Solid-State Lighting* National Research Council, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems, Committee on Assessment of Solid-State Lighting, 2013-04-27 The standard incandescent light bulb, which still works mainly as Thomas Edison invented it, converts more than 90% of the consumed electricity into heat. Given the availability of newer lighting technologies that convert a greater percentage of electricity into useful light, there is potential to decrease the amount of energy used for lighting in both commercial and residential applications. Although technologies such as compact fluorescent lamps (CFLs) have emerged in the past few decades and will help achieve the goal of increased energy efficiency, solid-state lighting (SSL) stands to play a large role in dramatically decreasing U.S. energy consumption for lighting. This report summarizes the current status of SSL technologies and products: light-emitting diodes (LEDs) and organic LEDs (OLEDs), and evaluates barriers to their improved cost and performance. *Assessment of Advanced Solid-State Lighting* also discusses factors involved in achieving widespread deployment and consumer acceptance of SSL products. These factors include the perceived quality of light emitted by SSL devices, ease of use, and the useful lifetime of these devices, issues of initial high cost, and possible benefits of reduced energy consumption *At Sea Against the Soviet Fleet* Bryan H. Leese, 2025-10-14 *At Sea Against the Soviet Fleet* is a history of the evolution of the United States Navy's Operational Intelligence culture that informs great power competition with China today. *At Sea Against the Soviet Fleet* examines the critical transformation of naval intelligence during a pivotal era marked by the Cold War and the Vietnam conflict. Bryan Leese meticulously details how U.S. Navy operational intelligence evolved to meet the complexities of modern naval warfare, particularly in response to the increasing threats posed by the Soviet Navy. Structured into four main parts, this book begins by examining the Vietnam War and the institutionalization of shipboard operational intelligence, or what Navy intelligence calls Opintel. The book highlights the establishment of Integrated

Operational Intelligence Centers as part of the RA 5C Vigilante program and the innovative strategies that emerged in air combat and targeting Leese goes on to underscore the necessity of Opintel to the U S Navy s close and distant blockade strategy in the 1960s and 1970s He delves into the decentralization of intelligence processes emphasizing the importance of adaptability and the need to prevent surprise attacks This evolution is framed within the transition to the Navy s Ocean Surveillance Information System a decentralized and responsive operational intelligence system The ongoing developments of shipboard intelligence capabilities are explored demonstrating how these advancements empowered naval commanders In the 1970s the organizations evolved as the revolutionary Opintel adaptations of the 1960s that leveraged cooperation without hierarchy became formalized Leese highlights the revolution to evolution process by introducing Opintel support to shipboard tactical decisions to integrate operational intelligence into comprehensive naval strategies Capturing the essence of this transformative period the author discusses the cultural dynamics within the Navy that fostered innovation and interdepartmental collaboration These developments not only contributed to maintaining a strategic edge over the Soviet Union but also laid the groundwork for future naval operations in the digital age Leese s work reveals the intricate interplay between technology strategy and personnel in creating an effective intelligence framework that allows the U S Navy to assert influence at sea setting conditions for sea control in conflict By blending rich archival research with firsthand accounts this book offers a nuanced understanding of how the Navy adapted to an ever changing operational landscape ultimately preserving peace while navigating the complexities of high stakes maritime conflict

Life Out of Sequence Hallam Stevens,2013-11-04 Thirty years ago the most likely place to find a biologist was standing at a laboratory bench peering down a microscope surrounded by flasks of chemicals and petri dishes full of bacteria Today you are just as likely to find him or her in a room that looks more like an office poring over lines of code on computer screens The use of computers in biology has radically transformed who biologists are what they do and how they understand life In *Life Out of Sequence* Hallam Stevens looks inside this new landscape of digital scientific work Stevens chronicles the emergence of bioinformatics the mode of working across and between biology computing mathematics and statistics from the 1960s to the present seeking to understand how knowledge about life is made in and through virtual spaces He shows how scientific data moves from living organisms into DNA sequencing machines through software and into databases images and scientific publications What he reveals is a biology very different from the one of predigital days a biology that includes not only biologists but also highly interdisciplinary teams of managers and workers a biology that is more centered on DNA sequencing but one that understands sequence in terms of dynamic cascades and highly interconnected networks *Life Out of Sequence* thus offers the computational biology community welcome context for their own work while also giving the public a frontline perspective of what is going on in this rapidly changing field

Scientists at War Sarah Bridger,2015-04-06 Sarah Bridger examines the ethical debates that tested the U S scientific community during the Cold War and scientists contributions to military

technologies and strategic policymaking from the dawning atomic age through the Strategic Defense Initiative Star Wars in the 1980s which sparked cross generational opposition among scientists **Overpowered** Martin Blank, PhD, 2014-09-16 Keys wallet cell phone ready to go Cell phones have become ubiquitous fixtures of twenty first century life suctioned to our ears and stuck in our pockets Yet we ve all heard whispers that these essential little devices give you brain cancer Many of us are left wondering as Maureen Dowd recently asked in the New York Times Are cells the new cigarettes Overpowered brings readers in accessible and fascinating prose through the science indicating biological effects resulting from low non thermal levels of non ionizing electromagnetic radiation levels considered safe by regulatory agencies coming not only from cell phones but many other devices we use in our homes and offices every day Dr Blank arms us with the information we need to lobby government and industry to keep ourselves and our families safe **The John Zink Hamworthy Combustion**

Handbook, Second Edition Charles E. Baukal, Jr., 2013-08-23 Despite the length of time it has been around its importance and vast amounts of research combustion is still far from being completely understood Issues regarding the environment cost and fuel consumption add further complexity particularly in the process and power generation industries Dedicated to advancing the art and science of industrial combustion The John Zink Hamworthy Combustion Handbook Second Edition Volume 3 Applications offers comprehensive up to date coverage of equipment used in the process and power generation industries Under the leadership of Charles E Baukal Jr top engineers and technologists from John Zink Hamworthy Combustion examine industry applications such as process burners boiler burners process flares thermal oxidizers and vapor control This volume builds on the concepts covered in the first two volumes and shows how they are used in combustion applications The book also features a wealth of color illustrations photographs and tables throughout What s New in This Edition Expanded to three volumes with Volume 3 focusing on important industry applications Extensive updates and revisions throughout reflecting new standards energy sources processes and conservation concerns Expanded coverage of flares and new coverage of biogas flares and flare gas recovery Information on vapor combustors Discussion of pollution control equipment Expanded coverage of commercial and utility boiler burners Chapters on process and air heaters More material on thermal oxidizers A new chapter on marine and offshore applications The third of three volumes in the new expanded edition of the bestselling handbook this volume helps you broaden your knowledge of industrial combustion applications to better meet the challenges of this field For the other volumes in the set see The John Zink Hamworthy Combustion Handbook Second Edition Three Volume Set

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