



**KWAZULU-NATAL PROVINCE**  
**EDUCATION**  
REPUBLIC OF SOUTH AFRICA



**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**PHYSICAL SCIENCES P1 (PHYSICS)**

**PREPARATORY EXAMINATION**

*Stanmorep* **SEPTEMBER 2022**

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists of 15 pages and 3 data sheets.**



# Physical Science Paper September 2013 Memorandum

**AN Whitehead**



## **Physical Science Paper September 2013 Memorandum:**

**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 Space Studies Board Annual Report 2013 National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, 2014-04-09 The original charter of the Space Science Board was established in June 1958 3 months before the National Aeronautics and Space Administration NASA opened its doors The Space Science Board and its successor the Space Studies Board SSB have provided expert external and independent scientific and programmatic advice to NASA on a continuous basis from NASA's inception until the present The SSB has also provided such advice to other executive branch agencies including the National Oceanic and Atmospheric Administration NOAA the National Science Foundation NSF the U S Geological Survey USGS the Department of Defense as well as to Congress Space Studies Board Annual Report 2013 covers a message from the chair of the SSB Charles F Kennel This report also explains the origins of the Space Science Board how the Space Studies Board functions today the SSB's collaboration with other National Research Council units assures the quality of the SSB reports acknowledges the audience and sponsors and expresses the necessity to enhance the outreach and improve dissemination of SSB reports This report will be relevant to a full range of government audiences in civilian space research including NASA NSF NOAA USGS and the Department of Energy as well members of the SSB policy makers and researchers 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

**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

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

*Breakout* Newt Gingrich, 2013-11-04 It is not between the Left and the Right but between the past and the future America is on the edge of a breakout In fact we are poised for one of the most spectacular leaps in human well being in history Pioneers of the future innovators and entrepreneurs are achieving breakthroughs in medicine transportation energy education and other fields that will make the world a dramatically different and better place Unless the prison guards of the past stop them Every American must choose a side Will you be a champion of the future or a prisoner of the past Every potential breakthrough has to get past a host of individuals and institutions whose power and comfort depend on the status quo These prison guards of the past will strangle every innovation that threatens to change the way things have always been done if we let them

**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

**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

**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     Phased Arrays for Radio Astronomy, Remote Sensing, and Satellite Communications Karl F. Warnick,Rob

Maaskant, Marianna V. Ivashina, David B. Davidson, Brian D. Jeffs, 2018-07-26 Discover a modern approach to the analysis modeling and design of high sensitivity phased arrays Network theory numerical methods and computational electromagnetic simulation techniques are uniquely combined to enable full system analysis and design optimization Beamforming and array signal processing theory are integrated into the treatment from the start Digital signal processing methods such as polyphase filtering and RFI mitigation are described along with technologies for real time hardware implementation Key concepts from interferometric imaging used in radio telescopes are also considered A basic development of theory and modeling techniques is accompanied by problem sets that guide readers in developing modeling codes that retain the simplicity of the classical array factor method while incorporating mutual coupling effects and interactions between elements Combining current research trends with pedagogical material suitable for a first year graduate course this is an invaluable resource for students teachers researchers and practicing RF microwave and antenna design engineers **Ocean Science and the British Cold**

**War State** Samuel A. Robinson, 2018-05-03 This book focuses on the activities of the scientific staff of the British National Institute of Oceanography during the Cold War Revealing how issues such as intelligence gathering environmental surveillance the identification of enemy science along with administrative practice informed and influenced the Institute's Cold War program In turn this program helped shape decisions taken by Government military and the civil service towards science in post war Britain This was not simply a case of government ministers choosing to patronize particular scientists but a relationship between politics and science that profoundly impacted on the future of ocean science in Britain **Polio**

**Wars** Naomi Rogers, 2013-10-18 A study of Australian nurse Sister Elizabeth Kenny and her efforts to have her unorthodox methods of treating polio accepted as mainstream polio care in the United States during the 1940s A case study of changing clinical care and an examination of the hidden politics of philanthropies and medical societies Ethics for Science Policy

Torgny Segerstedt, 2013-10-22 Ethics for Science Policy documents the proceedings of a Nobel Symposium held at S dergarn Sweden on August 20 25 1978 which focuses on the freedom of unrestricted research or investigations This book discusses the rationality and personal element in science policy ethical responsibility of social scientists priorities and control in the organization of research ethical principles of scientific institutions and ethical dilemmas in weapon development The topics on science progress and destruction information and communication in the developing world and limits in the regulation of scientific research are also deliberated in this compilation This publication is valuable to students or researchers intending to acquire knowledge on the extent or restrictions in conducting scientific investigations *Lincoln: The Fire of Genius* David

J. Kent, 2022-09-01 Abraham Lincoln had a lifelong fascination with science and technology a fascination that would help institutionalize science win the Civil War and propel the nation into the modern age Readers will learn through Lincoln The Fire of Genius how science and technology gradually infiltrated Lincoln's remarkable life and influenced his growing desire to improve the condition of all men The book traces this progression from a simple farm boy to a president who changed the

world Counter to conventional wisdom subsistence farming provides a considerable education in agronomic science forest ecology hydrology and even a little civil engineering Continuing through a lifetime of self study curiosity and hard work Lincoln became the only President with a patent advocated for technological advancement as a legislator in Illinois and in Washington and became the go to western lawyer on technology and patent cases during his legal career During the Civil War Lincoln drew upon his commitment to science and personally encouraged inventors while taking dramatic steps to institutionalize science via the Smithsonian Institution create the National Academy of Sciences and initiate the Department of Agriculture Lincoln s insistence on high tech weaponry balloon surveillance strategic use of telegraphy and railroad deployment positioned the North to achieve Union victory

**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

**Plasma Physics** James E. Drummond,2013-01-01 A historic snapshot of the field of plasma physics this fifty year old volume offers an edited collection of papers by pioneering experts in the field In addition to assisting students in their understanding of the foundations of classical plasma physics it provides a source of historic context for modern physicists Highly successful upon its initial publication this book was the standard text on plasma physics throughout the 1960s and 70s Hailed by Science magazine as a well executed venture the three part treatment ranges from basic plasma theory to magnetohydrodynamics and microwave plasma physics Highlights include Klimontovich s article on quantum plasmas Buneman s writings on how to distinguish between attenuating and amplifying waves and Yoler s clear and cogent review of magnetohydrodynamics Professional atomic and plasma physicists and all students of plasma physics will appreciate this historic resource

**Synthetics, Mineral Oils, and Bio-Based Lubricants** Leslie R. Rudnick,2020-01-29 Highlighting the major economic and industrial changes in the lubrication industry since the first edition Synthetics Mineral



Oils and Bio Based Lubricants Chemistry and Technology Third Edition highlights the major economic and industrial changes in the lubrication industry and outlines the state of the art in each major lubricant application area Chapters cover the use of lubricant fluids growth or decline of market areas and applications potential new applications production capacities and regulatory issues including biodegradability toxicity and food production equipment lubrication The highly anticipated third edition features new and updated chapters including those on automatic and continuously variable transmission fluids fluids for food grade applications oil soluble polyalkylene glycols functional bio based lubricant base stocks farnesene derived polyolefins estolides bio based lubricants from soybean oil and trends in construction equipment lubrication Features include Contains an index of terms acronyms and analytical testing methods Presents the latest conventions for describing upgraded mineral oil base fluids Considers all the major lubrication areas engine oils industrial lubricants food grade applications greases and space age applications Includes individual chapters on lubricant applications such as environmentally friendly disk drive and magnetizable fluids for major market areas around the globe In a single unique volume Synthetics Mineral Oils and Bio Based Lubricants Chemistry and Technology Third Edition offers property and performance information of fluids theoretical and practical background to their current applications and strong indicators for global market trends that will influence the industry for years to come

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

**Re-entry and Planetary Entry Physics and Technology** W.H.T. Loh, 2013-11-11 During the last decade a rapid growth of knowledge in the field of re entry and planetary entry has resulted in many significant advances useful to the student engineer and scientist The purpose of offering this course is to make available to them these recent significant advances in physics and technology Accordingly this course is organized into five parts Part 1 Entry Dynamics Thermodynamics Physics and Radiation Part 2 Entry Ablation and Heat Transfer Part 3 Entry Experimentation Part 4 Entry Concepts and Technology and Part 5 Advanced Entry Programs It is written in such a way so that it may easily be adopted by other universities as a textbook for a two semesters senior or graduate course on the subject In addition to the undersigned who served as the course instructor and wrote Chapters 1 2 3 and 4 guest lecturers included Prof FRANKLIN K MOORE who wrote Chapter 5 Entry Radiative Transfer Prof SHIH I PAI who wrote Chapter 6 Entry Radiation Magnetogas dynamics Dr CARL GAZLEY J r who wrote Chapter 7 Entry Deceleration and Mass Change of

an Ablating Body Dr SINCLAIRE M SCALA who wrote Chapter 8 Entry Heat Transfer and Material Response Mr

**Aerospace Materials and Material Technologies** N. Eswara Prasad,R.J.H. Wanhill,2016-11-07 This book serves as a comprehensive resource on various traditional advanced and futuristic material technologies for aerospace applications encompassing nearly 20 major areas Each of the chapters addresses scientific principles behind processing and production production details equipment and facilities for industrial production and finally aerospace application areas of these material technologies The chapters are authored by pioneers of industrial aerospace material technologies This book has a well planned layout in 4 parts The first part deals with primary metal and material processing including nano manufacturing The second part deals with materials characterization and testing methodologies and technologies The third part addresses structural design Finally several advanced material technologies are covered in the fourth part Some key advanced topics such as Structural Design by ASIP Damage Mechanics Based Life Prediction and Extension and Principles of Structural Health Monitoring are dealt with at equal length as the traditional aerospace materials technology topics This book will be useful to students researchers and professionals working in the domain of aerospace materials

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