



basic education

Department
Basic Education
REPUBLIC OF SOUTH AFRICA

FULL MEMORANDUM GRADE 12 PHYSICS 2022 FINAL

This question paper consists of 18 pages and 3 data sheets.

(QUESTION 6 (Start on a new page.)

A 12 kg block is initially at rest at point A at the bottom of a ROUGH inclined plane. The block is pulled up the incline by a constant force F acting parallel to the incline. The block reaches point B, which is at a vertical height of 4.0 m above the horizontal, with a speed of 3.00 m/s. See the diagram below.



- 6.1 Define the term non-conservative force.
- 6.2 Draw a labelled free-body diagram for the block when it is pulled up the incline.
- 6.3 Calculate the total work done on the block by the NON-CONSERVATIVE forces when the block moves from point A to point B. (4)

The same constant force F now moves the block at a CONSTANT VELOCITY across a rough horizontal surface from point B to point C, as shown below. Force F acts parallel to the horizontal surface.



The magnitude of the constant frictional force acting on the block while moving from point B to point C is 40 N, 40% less than the magnitude of the constant frictional force acting on the block when it moves from point A to point B.

- 6.4 Calculate the distance from point A to point B. (5)

(14)

Physics Paper 1 September 2013 Memorandum

N. A. Chigier



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Mechanics of Ice Failure Ian Jordaan, 2023-03-02 Featuring real world examples and practical methodology this rigorous text combines mechanical theory with design and modelling

Drawing Futures Bob Sheil, Frédéric Migayrou, Luke Pearson, Laura Allen, 2016-11-11 Drawing Futures brings together international designers and artists for speculations in contemporary drawing for art and architecture Despite numerous developments in technological manufacture and computational design that provide new grounds for designers the act of drawing still plays a central role as a vehicle for speculation There is a rich and long history of drawing tied to innovations in technology as well as to revolutions in our philosophical understanding of the world In reflection of a society now underpinned by computational networks and interfaces allowing hitherto unprecedented views of the world the changing status of the drawing and its representation as a political act demands a platform for reflection and innovation Drawing Futures will present a compendium of projects writings and interviews that critically reassess the act of drawing and where its future may lie Drawing Futures focuses on the discussion of how the field of drawing may expand synchronously alongside technological and computational developments The book coincides with an international conference of the same name taking place at The Bartlett School of Architecture UCL in November 2016 Bringing together practitioners from many creative fields the book discusses how drawing is changing in relation to new technologies for the production and dissemination of ideas

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

Work on Atomic Physics (1912 - 1917) U. Hoyer, 2013-10-22 Work on Atomic Physics 1912 1917

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

Fluid Mechanics and Hydraulics Vedat Batu, 2024-05-27 Fluid Mechanics and Hydraulics Illustrative Worked Examples of Surface and Subsurface Flows presents the basic principles of fluid mechanics through the use of numerous worked examples Some readers may have interest only in the application parts of various principles without paying too much attention to the derivation details of equations Other readers may have interest both in derivation details and their applications As a result this book is designed

to address both needs and most derivation details are included as example problems Therefore those who are not interested in the details of derivations may skip them without interrupting the effective use of the book It serves as an effective learning source for college students and as a teaching tool for instructors with an included solutions manual as well as for practicing professionals in the areas of fluid mechanics and hydraulics

Opening Space Research George H. Ludwig, 2013-05-09

Published by the American Geophysical Union as part of the Special Publications Series Opening Space Research Dreams Technology and Scientific Discovery is George Ludwig's account of the early development of space based electromagnetic physics with a focus on the first U S space launches and the discovery of the Van Allen radiation belts Narrated by the person who developed many of the instruments for the early Explorer spacecraft during the 1950s and participated directly in the scientific research it draws heavily upon the author's voluminous collection of laboratory notes and other papers upon the Van Allen archive and upon a wide array of other sources This book presents very detailed discussions of historic events in a highly readable semitechnical first person form More than that though Opening Space Research brings to the forefront the entire team of scientists who made these accomplishments possible providing an extensive index of names to enhance and complete the historical record Authoritative and unique this book will be of interest to space scientists science historians and anyone interested in space history and the first U S space launches

Half Life Frank Close, 2015-03-05

The memo landed on Kim Philby's desk in Washington DC in July 1950 Three months later Bruno Pontecorvo a physicist at Harwell Britain's atomic energy lab disappeared without a trace When he re surfaced six years later he was on the other side of the Iron Curtain One of the most brilliant scientists of his generation Pontecorvo was privy to many secrets he had worked on the Anglo Canadian arm of the Manhattan Project and quietly discovered a way to find the uranium coveted by nuclear powers Yet when he disappeared MI5 insisted he was not a threat Now based on unprecedented access to archives letters surviving family members and scientists award winning writer and physics professor Frank Close exposes the truth about a man irrevocably marked by the advent of the atomic age and the Cold War

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

Heat Pipes David Reay, Ryan McGlen, Peter Kew, 2013-10-01 *Heat Pipes* Sixth Edition takes a highly practical approach to the design and selection of heat pipes making it an essential guide for practicing engineers and an ideal text for postgraduate students This new edition has been revised to include new information on the underlying theory of heat pipes and heat transfer and features fully updated applications new data sections and updated chapters on design and electronics cooling The book is a useful reference for those with experience and an accessible introduction for those approaching the topic for the first time Contains all information required to design and manufacture a heat pipe Suitable for use as a professional reference and graduate text Revised with greater coverage of key electronic cooling applications

Dalla pirateria dei libri all'editoria predatoria Rossana Morriello, 2023-02-07 opinione diffusa che alcune delle problematiche che caratterizzano l'odierna comunicazione scientifica abbiano radici recenti Non di rado si considerano questioni quali l'editoria predatoria o gli episodi di violazione di etica e integrità della ricerca come conseguenza della diffusione dell'editoria digitale soprattutto ad accesso aperto In realtà sebbene l'open access possa in certe condizioni aumentare il rischio di incorrere in comportamenti illeciti o eticamente scorretti rendere accessibili liberamente i risultati della ricerca accresce la visibilità e la circolazione delle pubblicazioni Non solo si agevola anche il rilevamento dei casi di distorsione che altrimenti sarebbero più difficili da individuare Fenomeni quali le riviste e le conferenze predatorie i paper mills che fabbricano articoli scientifici gli zombie papers che risorgono dalle ceneri della malascienza e le molte altre criticità relative all'etica e all'integrità della ricerca scientifica sono in aumento ma al contempo sono divenute più evidenti grazie alle potenzialità delle tecnologie Il libro traccia e descrive le pratiche dannose nella comunicazione scientifica che oggi ne minano la credibilità ma getta anche lo sguardo indietro per mettere in luce le linee di continuità con quanto accaduto nei secoli passati L'intreccio tra le vicende di storia

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Baker III both renowned experts in their own right plus a colour section featuring the original Admiralty draughts including a spectacular double gatefold For many with an interest in warships this will be the book of the year Law, Death, and Robots Keri Grieman,2024-10-17 Can the law keep up with AI This book examines liability and regulation for artificial intelligence causing serious physical harm both now and in the future While AI moves quickly regulation follows more slowly an increasing problem for an evolutionary fast paced emerging technology AI has the potential to save lives but in doing so will have the potential to take them as well How do we future proof law and regulation to incentivise life saving innovation as safely as possible This book details how to regulate AI in high risk civil applications for example automated vehicles and medicine addressing both liability and regulatory structure It highlights crucial liability themes for technology governance provides tools to bridge the gap between regulators and technologists examines jurisdictional approaches to AI regulation in the EU UK USA and Singapore and ultimately suggests a jurisdiction agnostic blueprint for regulation Creativity in Intelligent Technologies and Data Science Alla Kravets,Maxim Shcherbakov,Marina Kultsova,Olga Shabalina,2015-09-11 This book constitutes the refereed proceedings of the First Conference on Creativity in Intelligent Technologies and Data Science CIT knowledge discovery in patent and open sources for creative tasks software computer aided design and agent based systems conceptual cognitive and qualitative modeling with application in intelligent decision making design creativity in CAD CAM CAE PDM intelligent decision support for continual improvement process data science in energy management transportation and urban development data science in social networks analysis natural language and image processing and analysis game based learning technologies in engineering education and educational games design personalized learning in Web based intelligent educational systems e inclusion development of smart mobile applications for people with disabilities

Proceedings of the Ninth GAMM-Conference on Numerical Methods in Fluid Mechanics Jan B. Vos,Prof. Dr. Arthur Rizzi,Inge L. Ryming,2013-08-31 **Energy and Combustion Science** N. A. Chigier,2013-10-22 Energy and Combustion Science is a collection of papers that covers advancement in the field of energy and combustion science The materials presented in the book are organized thematically into parts The text first covers the issues concerns problems of the contemporary combustion technology The subsequent parts of the book cover various areas in combustions science namely pollution gas oil coal and engines Most of the articles in the book are concerned with the byproduct of fuel combustion The text will be of great use to students researchers and practitioners of disciplines that deal with the energy and combustion technology **Progress in Nuclear Energy** M. M. R. Williams,R. Sher,2013-10-22 Progress in Nuclear Energy Volume 5 covers the significant advances in several aspects of nuclear energy field This book is composed six chapters that describe the progress in nuclear and gas cooled reactors The introductory chapter deals with the development and evolution of decay heat estimates and decay heat Standards and illustrates the use of these estimates through comparison of both the actinide and fission product decay heat levels from typical fuel samples in a variety of reactor systems The succeeding chapters

present different practical methods for handling resonance absorption problem in the case of thermal reactor lattices and review the physics of the different noise phenomena These topics are followed by discussions of the developed methodology for the description of breeding conversion long term fuel logistics and related subjects derived from the detailed mathematical description of the fuel cycle The concluding chapters consider the historical development of heat transfer surfaces for gas cooled reactors These chapters also provide a complete set of differential nuclear data on the three technologically important americium isotopes ^{241}Am ^{242}Am and ^{243}Am suitable for incorporation into the computer based U K Nuclear Data Library This book will prove useful to nuclear physicists and nuclear energy scientists and researchers

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