



NATIONAL  
SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2020

PHYSICAL SCIENCES P2  
(CHEMISTRY)  
EXEMPLAR

MARKS: 100  
TIME: 1 hour



The question paper consists of 10 pages, including 4 extra sheets.  
Use blue or black ink for writing. Do not use red ink.

# QUESTION 3

## PHYSICAL SCIENCES PAPER 2

## INTERMOLECULAR FORCES

**GRADE 11**

**NOVEMBER 2020**

Examiner's use: \_\_\_\_\_ Physical Sciences P2

QUESTION 3 starts on a NEW page.

3.1 The boiling points in the table below were obtained during an investigation carried out to measure the boiling points of pure 1-hexanol. The table also lists the  $\Delta H_{\text{vap}}$  and  $\Delta H_{\text{fusion}}$  for 1-hexanol in kJ mol<sup>-1</sup> and 1 mol of 1-hexanol.

Compound	Molecular mass (M <sub>r</sub> )	Boiling point (°C)
A	102	16,2
B	102	21

- 3.1.1 Define the term boiling point. (2)
- 3.1.2 Is pure 1-hexanol only composed of A and B? or C? and list one of the reasons. (2)
- 3.1.3 Name the type of intermolecular force that exists between molecules of both compounds A and B and its boiling point of these molecules. (2)
- 3.1.4 What effect, if any, does compound A or B, have on the melting point of pure 1-hexanol? (2)
- 3.1.5 What compound (A or B) will have the higher vapour pressure? (2)
- 3.1.6 What compound (A or B) will have the higher surface tension? (2)

Compound C (M<sub>r</sub> 102) will show in the table, has a smaller molecular mass than both compounds A and B but has a relatively higher boiling point of 16,2 °C.

- 3.1.6 Explain why the boiling point of compound C is 16,2 °C (higher) than that of compound A and B by referring to the  $\Delta H_{\text{vap}}$  and intermolecular or molecular forces involved. (2)

3.2 Substances D and E are shown in the diagram below. The diagram shows the arrangement of particles in the solid state.



- 3.2.1 Is substance D or E, or both, ionic in nature? (2)
- 3.2.2 Explain the process in QUESTION 3.1.1 about the boiling in the intermolecular forces involved. (2)

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# Physical Science Paper Intermolecular Forces Investigation

**R Barnett**



## **Physical Science Paper Intermolecular Forces Investigation:**

**History of Science as a Facilitator for the Study of Physics** Roberto Angeloni, 2019-01-10 This book serves to enhance scientific and technological literacy by promoting STEM Science Technology Engineering and Mathematics education with particular reference to contemporary physics The study is presented in the form of a repertoire and it gives the reader a glimpse of the conceptual structure and development of quantum theory along a rational line of thought whose understanding might be the key to introducing young generations of students to physics The recurrent theme here is that the conceptual extension of the concept of natural radiation symbolized by the constant  $h$  allows an easy method of charting the conceptual development of quantum theory The repertoire focuses on some momentous events of quantum theory including the discovery of the constant  $h$  which is one of the fundamental constants of nature and the key to understanding quantum mechanics the discovery of the photon by Albert Einstein and Niels Bohr's model of the hydrogen atom the experiments which led to disclosing the structure of atomic nuclei in the 1930s and the discovery of quantum mechanics and quantum electrodynamics which constitute the basis of contemporary particle physics Investigating Chemistry Matthew Johll, 2006-03-17 Matthew Johll's book introduces students from a non science background to the fundamentals of chemistry through an array of examples and applications from real life crime scenes Sherlock Holmes stories and authentic accounts of drug deals murders and thefts *Plenary and Invited Lectures* Milton Kerker, Albert C. Zettlemoyer, Robert L. Rowell, 2013-09-11 *Colloid and Interface Science Volume I Plenary and Invited Lectures* contains papers presented at the International Conference on Colloids and Surfaces held in San Juan Puerto Rico 21-25 June 1976 It consists of the plenary and invited papers and a general overview of these papers by A M Schwartz These papers were given during the morning sessions The volume is organized into 10 parts Part I contains papers on surface forces Parts II and III present studies on catalysis and aerosols respectively Part IV examines solid surfaces focusing on newer techniques for exploring surface structure and surface reactions The papers in Part V deal with water at interfaces including a lecture on the behavior and structure of water at inorganic surfaces including metals oxides and silicates Part VI covers the rheology of disperse systems including papers on the effect of inertial forces on the motion of solids through liquids and theoretical studies on diffusive heat flux Part VII takes up stability and instability in disperse systems steric stabilization and colloidal stability Parts VIII and IX examine biological membranes and surface thermodynamics respectively Part X on liquid crystals includes discussion of the structures and properties of this state of matter **Technical News Bulletin of the National Bureau of Standards** United States. National Bureau of Standards, 1968 **Technical News Bulletin**, 1970 *Dimensions*, 1951 **The Chemical News : and Journal of Physical Science**, 1894 **Progress in International Research on Thermodynamic and Transport Properties** Eric F. Lyle, Joseph F. Masi, Roger Eichorn, 2013-10-22 *Progress in International Research on Thermodynamic and Transport Properties* covers the proceedings of the 1962 Second Symposium by the same title held at

Purdue University and the Thermophysical Properties Research Center This symposium brings together theoretical and experimental research works on the thermodynamic and transport properties of gases liquids and solids This text is organized into nine parts encompassing 68 chapters that cover topics from thixotropy to molecular orbital calculations The first three parts review papers on theoretical experimental and computational studies of the various aspects of thermodynamic properties These parts discuss the principles of phase equilibria throttling volume heat capacity steam volumetric behavior enthalpy and density The subsequent part highlights the theoretical evaluations of transport properties such as viscosity diffusion and conductivity as well as the transport processes These topics are followed by surveys of the theories in intermolecular forces and their applications Other parts consider the measurement of thermal conductivity viscosity and radiation The final parts examine the properties of ionized gases and non Newtonian fluids This book will prove useful to mechanical and chemical engineers

**Nuclear Science Abstracts** ,1976      **Scientific and Technical Aerospace Reports** ,1995      **Geophysical Research Papers** Air Force Cambridge Research Laboratories (U.S.). Geophysics Research Directorate,1955      **New Frontiers in Polymer Research** Robert K. Bregg,2006 Polymers are substances containing a large number of structural units joined by the same type of linkage These substances often form into a chain like structure Starch cellulose and rubber all possess polymeric properties Today the polymer industry has grown to be larger than the aluminium copper and steel industries combined Polymers already have a range of applications that far exceeds that of any other class of material available to man Current applications extend from adhesives coatings foams and packaging materials to textile and industrial fibres elastomers and structural plastics Polymers are also used for most composites electronic devices biomedical devices optical devices and precursors for many newly developed high tech ceramics This new book presents leading edge research in this rapidly changing and evolving field      **Science Abstracts** ,1901      *Proceedings of the Royal Society. Section A, Mathematical and Physical Science* Royal Society (Great Britain),1908      **Applied**

**Mechanics Reviews** ,1970      **The Molecular Vision of Life** Lily E. Kay,1993 This fascinating study examines the rise of American molecular biology to disciplinary dominance focusing on the period between 1930 and the elucidation of DNA structure in the mid 1950s Research undertaken during this period with its focus on genetic structure and function endowed scientists with then unprecedented power over life By viewing the new biology as both a scientific and cultural enterprise Lily E Kay shows that the growth of molecular biology was a result of systematic efforts by key scientists and their sponsors to direct the development of biological research toward a shared vision of science and society She analyzes the motivations and mechanisms empowering this vision by focusing on two key institutions Caltech and its sponsor the Rockefeller Foundation Her study explores a number of vital sometimes controversial topics among them the role of private power centers in shaping scientific agenda and the political dimensions of pure research It also advances a sobering argument the cognitive and social groundwork for genetic engineering and human genome projects was laid by the American architects of

molecular biology during these early decades of the project This book will be of interest to molecular biologists historians sociologists and the general reader alike     *Journal of Scientific & Industrial Research* ,1961     **Mathematical Research in Materials Science** National Research Council,Division on Engineering and Physical Sciences,Commission on Physical Sciences, Mathematics, and Applications,Committee on Mathematical Sciences Applied to Materials Science,1993-02-01 This book describes fruitful past collaborations between the mathematical and materials sciences and indicates future challenges It seeks both to encourage mathematical sciences research that will complement vital research in materials science and to raise awareness of the value of quantitative methods The volume encourages both communities to increase cross disciplinary collaborations emphasizing that each has much to gain from such an increase and it presents recommendations for facilitating such work This book is written for both mathematical and materials science researchers interested in advancing research at this interface for federal and state agency representatives interested in encouraging such collaborations and for anyone wanting information on how such cross disciplinary collaborative efforts can be accomplished successfully

*Reprints of Papers by National Research Fellows in the Biological Sciences ...* National Research Council (U.S.). Fellowship in Biological Sciences,1928     **Energy Research Abstracts** ,1990

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