

**2009 AP<sup>®</sup> CHEMISTRY FREE-RESPONSE QUESTIONS**

**CHEMISTRY**

**Section II**

(Total time—95 minutes)

**Part A**

**Time—55 minutes**

**YOU MAY USE YOUR CALCULATOR FOR PART A.**

**CLEARLY SHOW THE METHOD USED AND THE STEPS INVOLVED IN ARRIVING AT YOUR ANSWERS.** It is to your advantage to do this, since you may obtain partial credit if you do and you will receive little or no credit if you do not. Attention should be paid to significant figures.

Be sure to write all your answers to the questions on the lined pages following each question in the booklet with the pink cover. Do NOT write your answers on the green insert.

Answer Questions 1, 2, and 3. The Section II score weighting for each question is 20 percent.

1. Answer the following questions that relate to the chemistry of halogen oxoacids.

(a) Use the information in the table below to answer part (a)(i).

Acid	$K_a$ at 298 K
HOCl	$2.9 \times 10^{-8}$
HOBr	$2.4 \times 10^{-9}$

- (i) Which of the two acids is stronger, HOCl or HOBr? Justify your answer in terms of  $K_a$ .
  - (ii) Draw a complete Lewis electron-dot diagram for the acid that you identified in part (a)(i).
  - (iii) Hypoiodous acid has the formula HOI. Predict whether HOI is a stronger acid or a weaker acid than the acid that you identified in part (a)(i). Justify your prediction in terms of chemical bonding.
- (b) Write the equation for the reaction that occurs between hypochlorous acid and water.
- (c) A 1.2 M NaOCl solution is prepared by dissolving solid NaOCl in distilled water at 298 K. The hydrolysis reaction  $\text{OCl}^-(aq) + \text{H}_2\text{O}(l) \rightleftharpoons \text{HOCl}(aq) + \text{OH}^-(aq)$  occurs.
- (i) Write the equilibrium-constant expression for the hydrolysis reaction that occurs between  $\text{OCl}^-(aq)$  and  $\text{H}_2\text{O}(l)$ .
  - (ii) Calculate the value of the equilibrium constant at 298 K for the hydrolysis reaction.
  - (iii) Calculate the value of  $[\text{OH}^-]$  in the 1.2 M NaOCl solution at 298 K.

# 2009 Ap Chemistry Answers

**Peiyue Li, Xiaodong He, Jianhua  
Wu, Vetrimurugan Elumalai**



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**New Problems** Marianna Kulka,2013-06-19 The medicinal use of plants animals and microorganisms has been a part of human evolution and likely began before recorded history Is it possible that this knowledge can be used to create powerful new drugs and solve some of the human health problems facing us today This book is a collection of an expert team of agronomists chemists biologists and policy makers who discuss some of the processes involved in developing a naturally sourced bioactive compound into a drug therapy These experts define a natural compound and elucidate the processes required to find extract and define a naturally derived bioactive molecule Finally they describe the necessity for understanding the fundamental mechanisms of disease before applying bioactive molecules in bioassay guided drug discovery platforms

**Applied Case Studies and Solutions in Molecular Docking-Based Drug Design** Dastmalchi, Siavoush,2016-05-11 As the pharmaceutical industry continues to advance new techniques in drug design are emerging In order to deliver optimum care to patients the development of innovative pharmacological techniques has become a widely studied topic Applied Case Studies and Solutions in Molecular Docking Based Drug Design is a pivotal reference source for the latest scholarly research on the progress of pharmaceutical design and computational approaches in the field of molecular docking Highlighting innovative research perspectives and real world applications this book is ideally designed for professionals researchers practitioners and medical chemists actively involved in computational chemistry and pharmaceutical sciences

*Multiscale Molecular Methods in Applied Chemistry* Barbara Kirchner,Jadran Vrabec,2012-01-25 First Principles Based Multiscale Multiparadigm Molecular Mechanics and Dynamics Methods for Describing Complex Chemical Processes by A Jaramillo Botero R Nielsen R Abrol J Su T Pascal J Mueller and W A Goddard Dynamic QM MM A Hybrid Approach to Simulating Gas Liquid Interactions by S Yockel and G C Schatz Multiscale Modelling in Computational Heterogeneous Catalysis by F J Keil Real World Predictions from Ab Initio Molecular Dynamics Simulations by B Kirchner P J di Dio and J Hutter Nanoscale Wetting Under Electric Field from Molecular Simulations by C D Daub D Bratko and A Luzar Molecular Simulations of Retention in Chromatographic Systems Use of Biased Monte Carlo Techniques to Access Multiple Time and Length Scales by J L Rafferty J I Siepmann M R Schure Thermodynamic Properties for Applications in Chemical Industry via Classical Force Fields by G Guevara Carrion H Hasse and J Vrabec Multiscale Approaches and Perspectives to Modeling Aqueous Electrolytes and Polyelectrolytes by L Delle Site C Holm and N F A van der Vegt Coarse Grained Modeling for Macromolecular Chemistry by H A Karimi Varzaneh and F M ller Plathe

*Pharmacology for Anesthetists* , Monoclonal Antibodies Steven Shire,2015-04-24 Monoclonal antibodies MAbs are currently the major class of protein bio therapeutic being developed by biotechnology and pharmaceutical companies Monoclonal Antibodies discusses the challenges and issues revolving around development of a monoclonal antibody produced by recombinant DNA technology into a therapeutic agent This book covers downstream processing which includes design of processes to manufacture the formulation formulation design fill and finish into closure systems and routes of administration

The characterization of the final drug product is covered where the use of biophysical methods combined with genetic engineering is used to understand the solution properties of the formulation The latter has become very important since many indications such as arthritis and asthma require the development of formulations for subcutaneous delivery SC The development of formulations for IV delivery is also important and comes with a different set of challenges The challenges and strategies that can overcome these limitations are discussed in this book starting with an introduction to these issues followed by chapters detailing strategies to deal with them Subsequent chapters explore the processing and storage of mAbs development of delivery device technologies and conclude with a chapter on the future of mAbs in therapeutic remedies Discusses the challenges to develop MAb for intravenous IV and subcutaneous delivery SC Presents strategies to meet the challenges in development of MAb for SC and IV administration Discusses the use of biophysical analytical tools coupled with MAb engineering to understand what governs MAb properties at high concentration **The Business of**

**Sustainability** Chris Laszlo, Karen Christensen, Daniel S. Fogel, Gernot Wagner, Peter J. Whitehouse, 2010-01-01 The Business of Sustainability is a core resource for policy makers members of the development community entrepreneurs and corporate executives as well as business and economics students and their professors It contains rich analysis of how sustainability is being factored into industries across the globe with enlightening case studies of businesses serving as agents of change Contributing authors provide a groundbreaking body of research based knowledge They explain that the concept of sustainability is being re framed to be positive about business instead of being tied to the old notion of a trade off between business and society that is if business wins society and the environment must lose and they explore how economic development can contribute to building our common future *Sustainable Groundwater and Environment: Challenges and*

*Solutions* Peiyue Li, Xiaodong He, Jianhua Wu, Vetrimurugan Elumalai, 2025-02-17 This book addresses this challenge head on focusing on the intersection of groundwater sustainability and environmental health It explores the complex relationship between groundwater management and environmental integrity delving into topics like the impacts of groundwater extraction on ecosystems the role of groundwater in climate change adaptation and mitigation and the effects of surface water groundwater exchange on groundwater quality The book also highlights the latest scientific research technological advancements in the field of sustainable groundwater management Moreover this book not only identifies the challenges but also proposes viable solutions It presents a range of practices innovative solutions and policy recommendations to manage groundwater resources effectively while minimizing environmental impact These will be drawn from a variety of contexts and case studies making the book a comprehensive guide for researchers policy makers practitioners and students in the field By providing a holistic perspective on sustainable groundwater management this book contributes significantly to our collective efforts toward achieving water security and environmental sustainability **Handbook of Software Solutions for ICME**

Georg J. Schmitz, Ulrich Prahl, 2016-10-31 As one of the results of an ambitious project this handbook provides a well

structured directory of globally available software tools in the area of Integrated Computational Materials Engineering ICME The compilation covers models software tools and numerical methods allowing describing electronic atomistic and mesoscopic phenomena which in their combination determine the microstructure and the properties of materials It reaches out to simulations of component manufacture comprising primary shaping forming joining coating heat treatment and machining processes Models and tools addressing the in service behavior like fatigue corrosion and eventually recycling complete the compilation An introductory overview is provided for each of these different modelling areas highlighting the relevant phenomena and also discussing the current state for the different simulation approaches A must have for researchers application engineers and simulation software providers seeking a holistic overview about the current state of the art in a huge variety of modelling topics This handbook equally serves as a reference manual for academic and commercial software developers and providers for industrial users of simulation software and for decision makers seeking to optimize their production by simulations In view of its sound introductions into the different fields of materials physics materials chemistry materials engineering and materials processing it also serves as a tutorial for students in the emerging discipline of ICME which requires a broad view on things and at least a basic education in adjacent fields     *150 technical questions and answers for job interview Offshore Drilling Rigs* Petrogav International Oil & Gas Training Center,2020-06-28 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 150 questions and answers for job interview and as a BONUS 230 links to video movies 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     **273 technical questions and answers for job interview Offshore Oil & Gas Platforms** Petrogav International Oil & Gas Training Center,2020-06-29 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 273 questions and answers for job interview and as a BONUS web addresses to 218 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     *273 technical questions and answers for job interview Offshore Oil & Gas Rigs* Petrogav International Oil & Gas Training Center,2020-06-30 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 273 questions and answers for job interview and as a BONUS web addresses to 230 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

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water and its use

**This Pervasive Day: The Potential And Perils Of Pervasive Computing** Jeremy Pitt, 2012-04-16

Imagine a world where your clothes sense your blood pressure heart rate and body temperature Suppose the sensors transmit this information to the cloud continuously and unobtrusively Suppose artificial intelligence in the cloud detects an anomaly Suppose it tells your doctor sighs of relief all round But then suppose it tells an actuary who tells your insurer who tells your employer This is the world of pervasive adaptation This Pervasive Day explores the potential and perils of daily living with pervasive adaptive computing This is the result of saturating ourselves and our physical environment with sensors cameras and devices all connected to and inter connected by global networks and computers which can run increasingly intelligent machine learning and data fusion algorithms on datasets that could be generated by the entire human population This book takes as its unifying theme Ira Levin's 1970 science fiction novel This Perfect Day to expose both potential innovations and controversial social issues It explores the science and technology of pervasive adaptation through a human centred and socio technical perspective within the cultural ethical and legal context of contemporary life It discusses how pervasive adaptation could provide the foundations for a new range of life enhancing and planet saving applications in health sustainability and assistive living On the other hand with the recording storage and processing of every action emotion and thought there also arise the possibilities for unwarranted surveillance invasions of privacy loss of civil liberties and commercial exploitation This Pervasive Day is an insightful read for anyone concerned with the social impact of technology Written by experienced technologists with a deep interest in computational intelligence human computer interaction and ambient systems This Pervasive Day is a remarkable single source of reference a fusion of several technical disciplines that makes for a broad scope of investigation within the domains of pervasive computing Unifying informative and thought provoking This Pervasive Day takes its place as a landmark title that will challenge the perceptions of the technologists and policy makers the pragmatists and the theorists the doers and the thought leaders



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## **Table of Contents 2009 Ap Chemistry Answers**

1. Understanding the eBook 2009 Ap Chemistry Answers
  - The Rise of Digital Reading 2009 Ap Chemistry Answers
  - Advantages of eBooks Over Traditional Books
2. Identifying 2009 Ap Chemistry Answers
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an 2009 Ap Chemistry Answers
  - User-Friendly Interface
4. Exploring eBook Recommendations from 2009 Ap Chemistry Answers
  - Personalized Recommendations

- 2009 Ap Chemistry Answers User Reviews and Ratings
- 2009 Ap Chemistry Answers and Bestseller Lists
- 5. Accessing 2009 Ap Chemistry Answers Free and Paid eBooks
  - 2009 Ap Chemistry Answers Public Domain eBooks
  - 2009 Ap Chemistry Answers eBook Subscription Services
  - 2009 Ap Chemistry Answers Budget-Friendly Options
- 6. Navigating 2009 Ap Chemistry Answers eBook Formats
  - ePub, PDF, MOBI, and More
  - 2009 Ap Chemistry Answers Compatibility with Devices
  - 2009 Ap Chemistry Answers Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of 2009 Ap Chemistry Answers
  - Highlighting and Note-Taking 2009 Ap Chemistry Answers
  - Interactive Elements 2009 Ap Chemistry Answers
- 8. Staying Engaged with 2009 Ap Chemistry Answers
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers 2009 Ap Chemistry Answers
- 9. Balancing eBooks and Physical Books 2009 Ap Chemistry Answers
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection 2009 Ap Chemistry Answers
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine 2009 Ap Chemistry Answers
  - Setting Reading Goals 2009 Ap Chemistry Answers
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of 2009 Ap Chemistry Answers
  - Fact-Checking eBook Content of 2009 Ap Chemistry Answers

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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including the proper phase labels chemical equations can also be used to represent physical processes write a chemical reaction for the freezing of water including the proper phase labels explain why  $4\text{Na} + \text{S} + 2\text{Cl}_2 \rightarrow 2\text{Na}_2\text{S} + 2\text{NaCl}$

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