

2013 ap chemistry free response

Deconstructing the 2013 AP Chemistry Free Response: A Comprehensive Analysis

Author: Dr. Anya Sharma, PhD in Chemistry Education, former AP Chemistry Reader and Chief Grader for the College Board.

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Editor: Dr. David Lee, EdD in Curriculum and Instruction, with extensive experience in AP Chemistry curriculum development and assessment.

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Introduction: Navigating the 2013 AP Chemistry Free Response

The 2013 AP Chemistry free response section presented a significant challenge to students, testing their understanding of fundamental concepts across various areas of chemistry. This in-depth analysis of the 2013 AP Chemistry free response questions delves into each question, exploring its intricacies, highlighting common student errors, and offering strategic approaches for success. Understanding the 2013 AP Chemistry free response questions is crucial for current students preparing for the AP Chemistry exam, and also offers valuable insights for educators seeking to improve their instruction.

Question 1: Equilibrium and Acid-Base Chemistry in the 2013 AP Chemistry Free Response

Question 1 of the 2013 AP Chemistry free response focused on equilibrium principles and acid-base chemistry. Students were presented with a scenario involving the reaction of a weak acid with a strong base. This question required a strong understanding of equilibrium constants (K_a and K_b), ICE tables, and pH calculations. Common errors included incorrect assumptions regarding the weak acid approximation and difficulties in handling the stoichiometry of the neutralization reaction. Successful responses demonstrated a clear understanding of the relationships between K_a , K_b , and K_w , and the ability to accurately apply these concepts to the given problem. The 2013 AP Chemistry free response demonstrated the importance of precise calculations and a clear articulation

of chemical principles.

Question 2: Thermochemistry and Thermodynamics in the 2013 AP Chemistry Free Response

Question 2 delved into thermochemistry and thermodynamics. Students were asked to analyze enthalpy changes (ΔH), entropy changes (ΔS), and Gibbs free energy changes (ΔG) for a given chemical reaction. This question required a strong grasp of Hess's Law, the relationship between ΔG , ΔH , and ΔS , and the interpretation of thermodynamic data. Many students struggled with the calculation of ΔS and the application of the Gibbs free energy equation to predict spontaneity. Mastering this section of the 2013 AP Chemistry free response requires a firm understanding of thermodynamic principles and their application to real-world scenarios.

Question 3: Electrochemistry and Redox Reactions in the 2013 AP Chemistry Free Response

The 2013 AP Chemistry free response section also included a question on electrochemistry, a notoriously challenging topic for many students. Question 3 involved constructing a voltaic cell, calculating cell potentials, and understanding the relationship between cell potential and spontaneity. Common errors included incorrectly assigning oxidation states, misinterpreting standard reduction potentials, and failing to account for non-standard conditions. Success on this portion of the 2013 AP Chemistry free response hinged upon a deep understanding of redox reactions, electrochemical principles, and the Nernst equation.

Question 4: Kinetics and Reaction Mechanisms in the 2013 AP Chemistry Free Response

Question 4 tested students' understanding of chemical kinetics, focusing on reaction rates, reaction mechanisms, and activation energy. Students were presented with experimental data and asked to determine the rate law, reaction order, and activation energy. This part of the 2013 AP Chemistry free response required proficiency in graphical analysis and the Arrhenius equation. Many students struggled with interpreting the data and correctly applying the Arrhenius equation. A thorough understanding of integrated rate laws and the relationship between rate constants and activation energy is essential for success on this type of question. Analyzing previous 2013 AP Chemistry free response questions like this highlights the importance of graphical data interpretation.

Question 5 and 6: Organic Chemistry and Descriptive Chemistry in the 2013 AP Chemistry Free Response

Questions 5 and 6 encompassed organic chemistry and descriptive chemistry, respectively. These questions required students to demonstrate a breadth of knowledge, applying principles from various branches of chemistry. Success in these sections of the 2013 AP Chemistry free response demanded a solid foundation in nomenclature, reaction

mechanisms, and the properties of various chemical compounds. Careful attention to detail and a methodical approach were crucial for achieving a high score on these questions.

Analyzing Student Performance on the 2013 AP Chemistry Free Response

Analysis of student performance on the 2013 AP Chemistry free response reveals consistent challenges in specific areas. These include:

Stoichiometric calculations: Many students struggled with applying stoichiometry correctly in equilibrium, acid-base, and redox problems.

Equilibrium calculations: A lack of understanding of equilibrium constants and the ICE table approach hindered student success.

Thermodynamic calculations: The inability to correctly apply thermodynamic principles and equations proved problematic.

Electrochemical calculations: Misinterpretations of standard reduction potentials and difficulties with the Nernst equation were common errors.

Data interpretation: Many students struggled with interpreting graphical data and translating it into chemical information.

Strategies for Success on the AP Chemistry Free Response

To improve performance on the AP Chemistry free response, students should focus on:

Mastering fundamental concepts: A thorough understanding of core chemical principles is paramount.

Practicing problem-solving: Regular practice with a wide variety of problems is essential.

Developing strong problem-solving skills: Students need to develop a structured approach to problem-solving, breaking down complex problems into smaller, manageable steps.

Reviewing past exams: Analyzing previous AP Chemistry free response questions, such as those from 2013, is a highly effective strategy.

Conclusion: The enduring relevance of the 2013 AP Chemistry Free Response

The 2013 AP Chemistry free response questions, while specific to that year, serve as a powerful tool for understanding the enduring challenges and requirements of the AP Chemistry exam. By analyzing these questions and understanding common student errors, both students and educators can develop effective strategies for success. The detailed analysis provided here offers a valuable resource for anyone seeking to improve their understanding and performance on this rigorous examination.

FAQs

1. What is the weighting of the free-response section on the AP Chemistry exam? The free-response section typically accounts for 50% of the total exam score.
1. Are calculators allowed on the free-response section? Yes, calculators are permitted on the AP Chemistry free-response section.
1. How are the free-response questions graded? The free-response questions are graded holistically, with points awarded for correct calculations, explanations, and reasoning.
1. What are the common mistakes students make on the AP Chemistry free response? Common mistakes include incorrect calculations, poor explanations, and a lack of understanding of fundamental concepts.
1. How can I improve my performance on the free-response section? Practice, practice, practice! Work through past free-response questions and focus on understanding the underlying concepts.
1. Are there any resources available to help me prepare for the free-response section? The College Board provides official practice exams and scoring guidelines.
1. What topics are most frequently tested on the free-response section? Topics frequently tested include stoichiometry, equilibrium, thermodynamics, kinetics, electrochemistry, and organic chemistry.
1. How much time should I spend on each free-response question? Allocate your time wisely. The exam provides a suggested time limit for each question.
1. Where can I find the scoring guidelines for the 2013 AP Chemistry free response? The scoring guidelines are typically available through the College Board website

(although accessing past years' specific scoring guidelines can be challenging).

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2013 ap chemistry free response: Developing Assessments for the Next Generation Science Standards National Research Council, Division of Behavioral and Social Sciences and Education, Board on Science Education, Board on Testing and Assessment, Committee on Developing Assessments of Science Proficiency in K-12, 2014-05-29 Assessments, understood as tools for tracking what and how well students have learned, play a critical role in the classroom. Developing Assessments for the Next Generation Science Standards develops an approach to science assessment to meet the vision of science education for the future as it has been elaborated in A Framework for K-12 Science Education (Framework) and Next Generation Science Standards (NGSS). These documents are brand new and the changes they call for are barely under way, but the new assessments will be needed as soon as states and districts begin the process of implementing the NGSS and changing their approach to science education. The new Framework and the NGSS are designed to guide educators in significantly altering the way K-12 science is taught. The Framework is aimed at making science education more closely resemble the way scientists actually work and think, and making instruction reflect research on learning that demonstrates the importance of building coherent understandings over time. It structures science education around three dimensions - the practices through which scientists and engineers do their work, the key crosscutting concepts that cut across disciplines, and the core ideas of the disciplines - and argues that they should be interwoven in every aspect of science education, building in sophistication as

students progress through grades K-12. Developing Assessments for the Next Generation Science Standards recommends strategies for developing assessments that yield valid measures of student proficiency in science as described in the new Framework. This report reviews recent and current work in science assessment to determine which aspects of the Framework's vision can be assessed with available techniques and what additional research and development will be needed to support an assessment system that fully meets that vision. The report offers a systems approach to science assessment, in which a range of assessment strategies are designed to answer different kinds of questions with appropriate degrees of specificity and provide results that complement one another. Developing Assessments for the Next Generation Science Standards makes the case that a science assessment system that meets the Framework's vision should consist of assessments designed to support classroom instruction, assessments designed to monitor science learning on a broader scale, and indicators designed to track opportunity to learn. New standards for science education make clear that new modes of assessment designed to measure the integrated learning they promote are essential. The recommendations of this report will be key to making sure that the dramatic changes in curriculum and instruction signaled by Framework and the NGSS reduce inequities in science education and raise the level of science education for all students.

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2013 ap chemistry free response: Regulatory potential of post-translational modifications in bacteria Ivan Mijakovic, Christophe Grangeasse, Jörg Stülke, 2015-07-22 Post-translational modifications (PTMs) are widely employed by all living organisms to control the enzymatic activity, localization or stability of proteins on a much shorter time scale than the transcriptional control. In eukarya, global analyses consistently reveal that proteins are very extensively phosphorylated, acetylated and ubiquitylated. Glycosylation and methylation are also very common, and myriad other PTMs, most with a proven regulatory potential, are being discovered continuously. The emergent picture is that PTM sites on a single protein are not independent; modification of one residue often affects (positively or negatively) modification of other sites on the same protein. The best example of this complex behavior is the histone “bar-code” with very extensive cross-talk between phosphorylation, acetylation and methylation sites. Traditionally it was believed that large networks of PTMs exist only in complex eukaryal cells, which exploit them for coordination and fine-tuning of various cellular functions. PTMs have also been detected in bacteria, but the early examples focused on a few important regulatory events, based mainly on protein phosphorylation. The global importance (and abundance) of PTMs in bacterial physiology was systematically underestimated. In recent years, global studies have reported large datasets of phosphorylated, acetylated and glycosylated proteins in bacteria. Other modifications of bacterial proteins have been recently described: pupylation, methylation, sirtuin acetylation, lipidation, carboxylation and bacillithiolation. As the landscape of PTMs in bacterial cells is rapidly expanding, primarily due to advances of detection methods in mass spectrometry, our research field is adapting to comprehend the potential impact of these modifications on the cellular physiology. The field of protein phosphorylation, especially of the Ser/Thr/Tyr type, has been profoundly transformed. We have become aware that bacterial kinases phosphorylate many protein substrates and thus constitute regulatory nodes with potential for signal integration. They also engage in cross-talk and eukaryal-like mutual activation cascades. The regulatory potential of protein acetylation and glycosylation in bacteria is also rapidly emerging, and the cross-talk between acetylation and phosphorylation has been documented. This topic deals with the complexity of the PTM landscape in bacteria, and focus in particular on the physiological roles that PTMs play and methods to study them. The topic is associated to the 1st International Conference on Post-Translational Modifications in Bacteria (September 9-10, 2014, Göttingen, Germany).

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approaches, which is already established in nanotoxicology, has been given special consideration to unravel the toxicodynamics of nanomaterials. Among these approaches, the high-throughput RNA sequencing (RNA-Seq), which is able to build a complete map of transcriptome across different cell types and perturbations upon NPs exposure has been included. The readers are also introduced to the less studied topic on the adsorption of biomolecules (mainly proteins) on the NPs surface, constituting the so-called “biomolecular corona”. The book has been designed for scientists engaged in NPs toxicity research. Nonetheless, it should be of interest to a variety of scientific disciplines including marine biology, environmental pollution, genetics, pharmacology, medicine, drug and food material sciences, consumer products. Also, the compilations will be of interest to the environmental watchdogs, federal regulators, risk assessors and the policy makers.

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2013 ap chemistry free response: Optogenetic Tools in the Molecular Spotlight Tilo Mathes, John T. M. Kennis, 2016-08-09 The rise of optogenetics as a standard technique to non-invasively probe and monitor biological function created an immense interest in the molecular function of photosensory proteins. These photoreceptors are usually protein/pigment complexes that translate light into biological information and have become essential tools in cell biology and neurobiology as their function is genetically encoded and can be conveniently delivered into a given cell. Like for fluorescent proteins that quickly became invaluable as genetically encodable reporters in microscopy and imaging, variants of photosensory proteins with customized sensitivity and functionality are nowadays in high demand. In this ebook we feature reviews and original research on molecular approaches from synthetic biology and molecular spectroscopy to computational

molecular modelling that all aspire to elucidate the molecular prerequisites for the photosensory function of the given proteins. The principle property of changing activity of biological function simply by application of light is not only very attractive for cell biology, it also offers unique opportunities for molecular studies as excitation can be controlled with high time precision. Especially in spectroscopy the usually fully reversible photoactivation of photosensory proteins allows researchers to perform time resolved studies with up to femtosecond resolution. In addition, functional variants can be investigated and quickly screened in common biochemical experiments. The insights that are obtained by the here presented various yet complementary methods will ultimately allow us write the script for a molecular movie from excitation of the protein by a photon to activation of its biological function. Such deep understanding does not only provide unique insights into the dynamics of protein function, it will also ultimately enable us to rationally design novel optogenetic tools to be used in cell biology and therapy.

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2013 ap chemistry free response: *The Changing Faces of Glutathione, a Cellular Protagonist* Alfonso Pompella, Alessandro Corti, 2015-07-17 Glutathione (GSH) has been described for a long time just as a defensive reagent against the action of toxic xenobiotics (drugs, pollutants, carcinogens), both directly and as a cofactor for GSH transferases. As a prototype antioxidant, it has been involved in cell protection from the noxious effect of excess oxidant stress, both directly and as a cofactor of glutathione peroxidases. In addition, it has long been known that GSH is capable of forming disulfide bonds with cysteine residues of proteins, and the relevance of this mechanism (S-glutathionylation) in regulation of protein function has been well documented in a number of research fields. Rather paradoxically, it has also been highlighted that GSH—and notably its catabolites, as originated by metabolism by gamma-glutamyltransferase—can promote oxidative processes, by participating in metal ion-mediated reactions eventually leading to formation of reactive oxygen species and free radicals. Also, a fundamental role of GSH has been recognized in the storage and transport of nitric oxide (NO), in the form of S-nitrosoglutathione (GSNO). The significance of GSH as a major factor in regulation of cell life, proliferation, and death, can be regarded as the integrated result of all these roles, as well as of more which are emerging in diverse fields of biology and pathophysiology. Against this background, modulation of GSH levels and GSH-related enzyme activities represents a fertile field for experimental pharmacology in numerous and diverse perspectives of animal, plant and microbiologic research. This research topic includes 14 articles, i.e. 4 Opinion Articles, 6 Reviews, and 4 Original Research Articles. The contributions by several distinguished research groups, each from his own standpoint of competence and expertise, provide a comprehensive and updated view over the diverse roles, the changing faces of GSH and GSH-related enzymes in cell's health, disease and death.

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2013 ap chemistry free response: *Advances in the Assessment of Dietary Intake*. Dale A. Schoeller, M. Westerterp, 2017-08-15 Diet is a major factor in health and disease. Controlled, long-term studies in humans are impractical, and investigators have utilized long-term epidemiological investigations to study the contributions of diet to the human condition. Such studies, while valuable, have often been limited by contradictory findings; a limitation secondary to systematic errors in traditional self-reported dietary assessment tools that limit the percentage of

variances in diseases explained by diet. New approaches are available to help overcome these limitations, and *Advances in the Assessment of Dietary Intake* is focused on these advances in an effort to provide more accurate dietary data to understand human health. Chapters cover the benefits and limitations of traditional self-report tools; strategies for improving the validity of dietary recall and food recording methods; objective methods to assess food and nutrient intake; assessment of timing and meal patterns using glucose sensors; and physical activity patterns using validated accelerometers. *Advances in the Assessment of Dietary Intake* describes new avenues to investigate the role of diet in human health and serves as the most up-to-date reference and teaching tool for these methods that will improve the accuracy of dietary assessment and lay the ground work for future studies.

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2013 ap chemistry free response: *America's Lab Report* National Research Council, Division of Behavioral and Social Sciences and Education, Center for Education, Board on Science Education, Committee on High School Laboratories: Role and Vision, 2006-01-20 Laboratory experiences as a part of most U.S. high school science curricula have been taken for granted for decades, but they have rarely been carefully examined. What do they contribute to science learning? What can they contribute to science learning? What is the current status of labs in our nation's high schools as a context for learning science? This book looks at a range of questions about how laboratory experiences fit into U.S. high schools: What is effective laboratory teaching? What does research tell us about learning in high school science labs? How should student learning in laboratory experiences be assessed? Do all student have access to laboratory experiences? What changes need to be made to improve laboratory experiences for high school students? How can school organization contribute to effective laboratory teaching? With increased attention to the U.S. education system and student outcomes, no part of the high school curriculum should escape scrutiny. This timely

book investigates factors that influence a high school laboratory experience, looking closely at what currently takes place and what the goals of those experiences are and should be. Science educators, school administrators, policy makers, and parents will all benefit from a better understanding of the need for laboratory experiences to be an integral part of the science curriculum-and how that can be accomplished.

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