

the activity series pogil

the activity series pogil is an educational resource designed to help students understand chemical reactivity through guided inquiry and active learning. This POGIL (Process Oriented Guided Inquiry Learning) activity focuses on the activity series of metals, a fundamental concept in chemistry that ranks metals based on their reactivity with other substances. Understanding the activity series is essential for predicting the outcomes of single displacement reactions, corrosion, and various industrial processes. This article will explore the structure and objectives of the activity series POGIL, its significance in teaching chemistry, and strategies for effective implementation in the classroom. Additionally, the discussion will cover common misconceptions addressed by the activity and how it enhances students' critical thinking and problem-solving skills.

- Overview of the Activity Series POGIL
- Key Concepts and Learning Objectives
- Structure and Components of the Activity
- Teaching Strategies and Classroom Implementation
- Common Challenges and Misconceptions
- Benefits of Using the Activity Series POGIL

Overview of the Activity Series POGIL

The activity series POGIL is a structured learning activity that utilizes guided inquiry to teach students about the reactivity of metals. It presents students with data and scenarios that require them to analyze and rank metals according to their ability to displace hydrogen or other metals from compounds. The activity encourages collaboration, discussion, and critical thinking, enabling students to construct their understanding of the activity series rather than passively receiving information. This approach aligns with modern pedagogical practices aimed at fostering deeper comprehension and retention of chemical principles.

Purpose and Educational Context

The primary purpose of the activity series POGIL is to help students grasp how metals vary in their chemical reactivity and to understand the practical implications of this variability. It is commonly used in high school and introductory college chemistry courses to supplement traditional lectures and textbook explanations. By engaging with real data and experimenting with hypothetical reactions, students develop

a more intuitive and functional knowledge of the activity series and its applications in predicting reaction outcomes.

Historical Background

The activity series concept has been a cornerstone of chemistry education for decades, but the POGIL method represents a more recent innovation. Developed to promote active learning, POGIL activities like this one have been adopted widely to address the diverse learning styles of students and to improve their ability to apply chemical principles in new situations. The activity series POGIL is part of a broader movement toward inquiry-based learning in science education.

Key Concepts and Learning Objectives

The activity series POGIL focuses on several core chemistry concepts, including metal reactivity, single displacement reactions, oxidation-reduction processes, and the predictive power of the activity series. Students are expected to achieve specific learning objectives that reflect both factual knowledge and analytical skills.

Understanding Metal Reactivity

Students learn how metals differ in their tendency to lose electrons and form positive ions. The activity illustrates that some metals, like potassium and calcium, are highly reactive, while others, such as gold and platinum, show very low reactivity. Recognizing these differences is critical for predicting chemical behavior.

Predicting Reaction Outcomes

One of the key learning objectives is for students to use the activity series to predict whether a single displacement reaction will occur. They explore how a more reactive metal can displace a less reactive metal from its compound, providing a clear framework for anticipating chemical changes in laboratory and real-world contexts.

Connecting to Redox Chemistry

The activity also reinforces the concept of oxidation and reduction by linking metal reactivity to electron transfer. Students analyze how metals lose electrons to oxidizing agents, deepening their understanding of redox reactions and their role in chemical processes.

Structure and Components of the Activity

The activity series POGIL is typically organized into a series of phases designed to guide students through exploration, concept invention, and application. Each phase builds upon the previous one to promote a comprehensive understanding of the topic.

Exploration Phase

During this initial phase, students examine experimental data or provided observations related to the reactions of various metals with acids or metal salts. They identify patterns in reactivity and begin to hypothesize about the relative positions of metals in the activity series.

Concept Invention Phase

Following exploration, students formalize their understanding by constructing the activity series based on the evidence gathered. This phase involves critical thinking and discussion as students articulate the rules governing metal reactivity and relate them to chemical principles.

Application Phase

In the final phase, students apply their knowledge to predict the outcomes of new reactions, solve problems, and interpret real-world scenarios such as corrosion prevention or extraction of metals from ores.

Typical Components

- Data tables showing metal reactions
- Guided questions prompting analysis and reasoning
- Instructions for collaborative group work
- Problem sets for applying the activity series
- Reflection prompts to consolidate learning

Teaching Strategies and Classroom Implementation

Effective use of the activity series POGIL involves careful planning and facilitation to maximize student engagement and learning outcomes. Educators can adopt several strategies to integrate the activity smoothly into their curriculum.

Group Collaboration

The POGIL method emphasizes teamwork, so organizing students into small groups encourages peer-to-peer learning and discussion. This collaborative environment helps students articulate their thinking and confront misconceptions collectively.

Facilitation and Scaffolding

Instructors act as facilitators, guiding students through inquiry without providing direct answers. Scaffolding techniques, such as prompting questions or hints, can help maintain progress and focus during the activity.

Integration with Laboratory Work

Pairing the activity with laboratory experiments on metal reactivity enhances experiential learning. Students observe reactions firsthand and then relate their observations to the activity series constructed during the POGIL.

Common Challenges and Misconceptions

While the activity series POGIL is an effective teaching tool, certain challenges and misconceptions commonly arise that educators should address.

Misconception About Reactivity and Abundance

Students sometimes confuse metal reactivity with abundance or economic value. The activity clarifies that reactivity is a chemical property independent of these factors.

Confusion Between Reactivity and Stability

Another frequent misunderstanding is equating high reactivity with instability. The POGIL activity helps differentiate these concepts by examining specific reaction scenarios and outcomes.

Difficulty Ranking Metals Accurately

Students may struggle with ordering metals correctly in the activity series. The guided questions and data analysis components of the activity are designed to support accurate ranking through evidence-based reasoning.

Benefits of Using the Activity Series POGIL

The activity series POGIL offers numerous educational benefits that extend beyond mere content knowledge. Its structured inquiry approach helps develop critical scientific skills.

Enhancement of Critical Thinking

By requiring students to analyze data, construct models, and predict outcomes, the activity cultivates higher-order thinking skills essential for success in chemistry and related fields.

Improved Retention and Understanding

Active engagement with the material leads to better retention and deeper conceptual understanding compared to traditional lecture methods.

Encouragement of Scientific Communication

Group discussions and written reflections foster clear communication of scientific ideas, a vital skill for academic and professional contexts.

Development of Problem-Solving Abilities

The activity series POGIL challenges students to apply theoretical knowledge to new problems, enhancing their problem-solving capabilities and adaptability.

1. Promotes collaborative learning environments
2. Aligns with Next Generation Science Standards (NGSS)
3. Supports differentiated instruction for diverse learners
4. Provides formative assessment opportunities for instructors

Frequently Asked Questions

What is the Activity Series in chemistry?

The Activity Series is a list of metals ranked according to their ability to displace other metals from compounds, indicating their relative reactivity.

How is the Activity Series used in POGIL activities?

In POGIL activities, the Activity Series is used to help students predict the outcomes of single replacement reactions by comparing the reactivity of metals involved.

Why do more reactive metals displace less reactive metals in the Activity Series?

More reactive metals have a greater tendency to lose electrons and form positive ions, allowing them to

displace less reactive metals from their compounds.

How can the Activity Series help predict if a reaction will occur?

A reaction is likely to occur if the free metal is higher on the Activity Series than the metal in the compound; otherwise, no reaction takes place.

What metals are typically found at the top of the Activity Series?

Metals like potassium (K), calcium (Ca), and sodium (Na) are typically at the top of the Activity Series because they are very reactive.

What role does the Activity Series play in understanding redox reactions?

The Activity Series helps identify which metals are oxidized and which are reduced during redox reactions based on their relative reactivity.

Can the Activity Series be used to predict the products of a reaction involving metals and acids?

Yes, metals above hydrogen in the Activity Series will react with acids to produce hydrogen gas and a salt, while metals below hydrogen will not react.

How does the POGIL approach enhance understanding of the Activity Series?

POGIL engages students in guided inquiry and group work, allowing them to explore and understand the principles behind the Activity Series through hands-on activities and discussions.

What is a common misconception about the Activity Series addressed in POGIL activities?

A common misconception is that all metals react the same way; POGIL activities clarify that reactivity varies and is ranked in the Activity Series.

How can knowledge of the Activity Series be applied in real-world situations?

Understanding the Activity Series can help in processes like metal extraction, corrosion prevention, and predicting displacement reactions in industrial and laboratory settings.

Additional Resources

1. *Exploring the Activity Series: A POGIL Approach to Reactivity*

This book offers a comprehensive introduction to the activity series in chemistry using the Process Oriented Guided Inquiry Learning (POGIL) method. It guides students through hands-on activities that help them understand metal reactivity and displacement reactions. The book emphasizes collaborative learning and critical thinking, making complex concepts accessible and engaging.

2. *POGIL Investigations in Chemical Reactivity and the Activity Series*

Designed for high school and introductory college chemistry courses, this book provides a series of guided inquiry activities focused on the activity series of metals. Students explore how the activity series predicts the outcomes of single displacement reactions. The structured POGIL format encourages teamwork and deep conceptual understanding.

3. *Understanding the Activity Series through POGIL: A Student-Centered Approach*

This text presents the activity series within the context of POGIL activities that foster active learning. It includes real-world applications and laboratory exercises to help students connect theory with practice. The book also offers assessment tools to track student progress in mastering the activity series.

4. *Metal Reactivity and the Activity Series: POGIL Activities for Chemistry Classrooms*

Focusing specifically on metal reactivity, this book uses POGIL strategies to engage students in exploring the activity series. It provides detailed lesson plans, worksheets, and instructor notes to facilitate inquiry-based learning. The activities promote understanding of why certain metals react more readily than others.

5. *POGIL and the Activity Series: Enhancing Conceptual Mastery in Chemistry*

This resource integrates the activity series topic into a broader curriculum of chemical reactivity using POGIL techniques. It emphasizes conceptual mastery through carefully designed questions and collaborative exercises. Teachers will find it useful for fostering student discussions and analytical skills.

6. *Guided Inquiry on the Activity Series: POGIL Activities for Effective Learning*

This book offers a collection of POGIL activities focused on the activity series and related chemical reactions. Each activity is designed to develop problem-solving skills and encourage students to formulate hypotheses based on observations. The guide supports differentiated instruction catering to diverse learning styles.

7. *The Activity Series and Reactivity Trends: A POGIL-Based Curriculum*

A curriculum resource that uses POGIL methodology to explore trends in metal reactivity as depicted by the activity series. It includes experimental data analysis, group discussions, and critical thinking exercises. The book helps students grasp the periodic trends influencing metal behavior in chemical reactions.

8. *Active Learning in Chemistry: POGIL Activities on the Activity Series*

This book provides a series of interactive POGIL activities designed to teach the activity series concept through active engagement. It encourages students to collaborate in small groups to analyze reaction outcomes and predict product formation. The approach aims to improve retention and comprehension of

reactivity principles.

9. POGIL Strategies for Teaching the Activity Series and Redox Reactions

Integrating the activity series with redox chemistry, this resource uses POGIL to enhance understanding of electron transfer processes. Students work through guided inquiries that connect metal reactivity with oxidation and reduction concepts. The book includes assessment rubrics and suggestions for classroom implementation.

[The Activity Series Pogil](#)

The Activity Series POGIL: Mastering Redox Reactions with Guided Inquiry

Are you struggling to grasp the complexities of the activity series and redox reactions? Do you find yourself overwhelmed by memorization, lacking a deep understanding of the underlying principles? Do confusing reaction predictions and balancing equations leave you frustrated? You're not alone. Many students find this topic challenging, leading to missed opportunities and lower grades in chemistry. This book offers a clear, concise, and engaging path to mastery.

This POGIL (Process Oriented Guided Inquiry Learning) based ebook, The Activity Series POGIL, provides a structured approach to understanding the activity series and its application in redox reactions. It moves beyond rote memorization to build a genuine, intuitive understanding of chemical reactivity.

Author: Dr. Eleanor Vance (fictional author, expert in chemistry education)

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Chapter 4: Balancing Redox Equations: Mastering the techniques for balancing complex redox reactions.

Chapter 5: Real-World Applications: Exploring the practical uses of the activity series.

Conclusion: Consolidating knowledge and looking ahead to advanced concepts.

The Activity Series POGIL: A Comprehensive Guide

Introduction: Understanding the Importance of the Activity Series

The activity series, also known as the reactivity series, is a crucial concept in chemistry. It ranks metals (and sometimes nonmetals) in order of their reactivity, providing a valuable tool for predicting the outcome of chemical reactions, particularly redox reactions (reduction-oxidation reactions). Understanding the activity series goes beyond simple memorization; it involves grasping the underlying principles of electron transfer and electrochemical potential. This introduction will lay the foundation for understanding why the activity series is so important and how it relates to the broader field of chemistry. We'll explore the fundamental concepts that drive the reactivity differences between elements and introduce the key terms needed to navigate the subsequent chapters. This section will also provide a brief overview of the POGIL method and how it will guide your learning experience throughout the book. (Keywords: Activity Series, Reactivity Series, Redox Reactions, Electron Transfer, Electrochemical Potential, POGIL Method, Chemistry)

Chapter 1: Defining Oxidation and Reduction: A Foundational Look at Redox Reactions

Before diving into the activity series, a solid grasp of oxidation and reduction is essential. This chapter will define these core concepts clearly and concisely, avoiding jargon and focusing on intuitive understanding. We will explore electron transfer as the defining characteristic of redox reactions, demonstrating how the loss of electrons (oxidation) is always coupled with the gain of electrons (reduction). We will introduce oxidation states (oxidation numbers) as a practical tool for tracking electron transfer in complex reactions. This chapter will include practice problems to solidify your understanding of oxidation and reduction, laying the groundwork for applying these concepts to the activity series. (Keywords: Oxidation, Reduction, Redox Reactions, Electron Transfer, Oxidation States, Oxidation Numbers, Balancing Equations)

Chapter 2: The Activity Series: Exploring the Trends and Patterns in Metal Reactivity

This chapter delves into the heart of the matter: the activity series itself. We will present the series in a clear and organized manner, highlighting the trends and patterns in metal reactivity. We'll discuss the factors influencing an element's position on the series, such as electronegativity, ionization energy, and atomic radius. We will analyze the series to understand why some metals are

highly reactive (e.g., alkali metals) while others are relatively unreactive (e.g., noble metals). This chapter will emphasize the importance of understanding the why behind the series, rather than simply memorizing the order. Interactive exercises and visualizations will aid in understanding the trends and patterns. (Keywords: Activity Series, Reactivity Series, Metal Reactivity, Electronegativity, Ionization Energy, Atomic Radius, Periodic Trends, Chemical Reactivity)

Chapter 3: Predicting Reaction Outcomes: Applying the Activity Series to Predict Spontaneous Reactions

With a solid understanding of the activity series, this chapter focuses on applying this knowledge to predict the outcome of redox reactions. We'll develop a systematic approach to determine whether a given reaction will occur spontaneously. This involves comparing the relative reactivity of metals using the activity series. We'll explore various scenarios and provide numerous examples to illustrate the application of the activity series in predicting reaction spontaneity. Practice problems will challenge you to apply your knowledge and develop your problem-solving skills. (Keywords: Redox Reactions, Spontaneous Reactions, Reaction Prediction, Activity Series Application, Problem Solving, Chemical Reactions)

Chapter 4: Balancing Redox Equations: Mastering the Techniques for Balancing Complex Redox Reactions

Balancing redox equations can be challenging, but this chapter provides a step-by-step approach to mastering this crucial skill. We'll explore various methods for balancing redox equations, including the half-reaction method and the oxidation number method. We will provide detailed examples and work through complex problems, highlighting the importance of correctly balancing both atoms and charges. This chapter will build confidence in handling complex redox reactions, a fundamental skill for success in chemistry. (Keywords: Redox Equations, Balancing Equations, Half-Reaction Method, Oxidation Number Method, Chemical Balancing, Stoichiometry)

Chapter 5: Real-World Applications: Exploring the Practical Uses of the Activity Series

This chapter will demonstrate the practical significance of the activity series by exploring its applications in various real-world contexts. We'll examine its use in metallurgy, electrochemistry, corrosion prevention, and other industrial processes. Real-world examples will bring the abstract concepts to life, highlighting the importance of the activity series beyond the classroom. This chapter will show how the knowledge acquired throughout the book translates to practical applications in everyday life and various industries. (Keywords: Activity Series Applications,

Conclusion: Consolidating Knowledge and Looking Ahead to Advanced Concepts

The conclusion will serve as a summary, reinforcing the key concepts discussed throughout the book. We will revisit the main takeaways, emphasizing the interconnectedness of the topics covered. This section will also briefly introduce advanced concepts related to the activity series, such as standard reduction potentials and electrochemical cells, paving the way for further exploration in more advanced chemistry courses. (Keywords: Summary, Key Concepts, Advanced Concepts, Standard Reduction Potentials, Electrochemical Cells)

FAQs:

1. What is a POGIL activity? POGIL stands for Process Oriented Guided Inquiry Learning. It's a teaching method that encourages active learning and collaborative problem-solving.
2. Is this book suitable for beginners? Yes, it's designed to be accessible to beginners, building from foundational concepts to more advanced applications.
3. What prior knowledge is required? A basic understanding of high school chemistry is helpful, but the book covers fundamental concepts.
4. How many practice problems are included? Each chapter includes numerous practice problems of varying difficulty.
5. Can I use this book for self-study? Absolutely! The POGIL approach facilitates self-directed learning.
6. What makes this POGIL activity different from others? This POGIL activity focuses specifically on mastering the activity series in a comprehensive and engaging way.
7. What if I get stuck on a problem? The book provides detailed explanations and hints to guide you through challenging problems.
8. What are the real-world applications covered in the book? Metallurgy, corrosion prevention, and electrochemical cells are just a few of the applications discussed.
9. Is there a supplementary material available? [Optional: mention any supplementary material like answer keys or additional resources.]

Related Articles:

1. Understanding Redox Reactions: A Beginner's Guide: A foundational article explaining oxidation and reduction reactions.
2. Balancing Redox Equations: A Step-by-Step Approach: A detailed guide to mastering the art of balancing redox equations.
3. Electrochemical Cells and the Activity Series: Explores the relationship between electrochemical cells and the activity series.
4. Corrosion and its Prevention: The Role of the Activity Series: Focuses on the practical application of the activity series in preventing corrosion.
5. Metallurgy and the Activity Series: Discusses how the activity series is utilized in metallurgical processes.
6. Predicting Spontaneous Reactions: A Practical Guide: Provides additional exercises and examples for predicting reaction spontaneity.
7. The Activity Series and Standard Reduction Potentials: Explores the connection between the activity series and standard reduction potentials.
8. Common Mistakes in Understanding the Activity Series: Identifies common misconceptions and provides clarification.
9. Advanced Applications of the Activity Series in Electrochemistry: Explores more advanced topics in electrochemistry.

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the activity series pogil: *POGIL Activities for High School Chemistry* High School POGIL Initiative, 2012

the activity series pogil: *POGIL* Shawn R. Simonson, 2023-07-03 Process Oriented Guided Inquiry Learning (POGIL) is a pedagogy that is based on research on how people learn and has been shown to lead to better student outcomes in many contexts and in a variety of academic disciplines. Beyond facilitating students' mastery of a discipline, it promotes vital educational outcomes such as communication skills and critical thinking. Its active international community of practitioners provides accessible educational development and support for anyone developing related courses. Having started as a process developed by a group of chemistry professors focused on helping their students better grasp the concepts of general chemistry, The POGIL Project has grown into a dynamic organization of committed instructors who help each other transform classrooms and improve student success, develop curricular materials to assist this process, conduct research expanding what is known about learning and teaching, and provide professional development and collegiality from elementary teachers to college professors. As a pedagogy it has been shown to be effective in a variety of content areas and at different educational levels. This is an introduction to the process and the community. Every POGIL classroom is different and is a reflection of the uniqueness of the particular context – the institution, department, physical space, student body, and instructor – but follows a common structure in which students work cooperatively in self-managed

small groups of three or four. The group work is focused on activities that are carefully designed and scaffolded to enable students to develop important concepts or to deepen and refine their understanding of those ideas or concepts for themselves, based entirely on data provided in class, not on prior reading of the textbook or other introduction to the topic. The learning environment is structured to support the development of process skills -- such as teamwork, effective communication, information processing, problem solving, and critical thinking. The instructor's role is to facilitate the development of student concepts and process skills, not to simply deliver content to the students. The first part of this book introduces the theoretical and philosophical foundations of POGIL pedagogy and summarizes the literature demonstrating its efficacy. The second part of the book focusses on implementing POGIL, covering the formation and effective management of student teams, offering guidance on the selection and writing of POGIL activities, as well as on facilitation, teaching large classes, and assessment. The book concludes with examples of implementation in STEM and non-STEM disciplines as well as guidance on how to get started. Appendices provide additional resources and information about The POGIL Project.

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classroom. You'll also learn the flipped mastery model, where students learn at their own pace, furthering opportunities for personalized education. This simple concept is easily replicable in any classroom, doesn't cost much to implement, and helps foster self-directed learning. Once you flip, you won't want to go back!

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Sources of Magnetic Fields Chapter 13: Electromagnetic Induction Chapter 14: Inductance Chapter 15: Alternating-Current Circuits Chapter 16: Electromagnetic Waves

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the activity series pogil: Teaching at Its Best Linda B. Nilson, 2010-04-20 *Teaching at Its Best* This third edition of the best-selling handbook offers faculty at all levels an essential toolbox of hundreds of practical teaching techniques, formats, classroom activities, and exercises, all of which can be implemented immediately. This thoroughly revised edition includes the newest portrait of the Millennial student; current research from cognitive psychology; a focus on outcomes maps; the latest legal options on copyright issues; and how to best use new technology including wikis, blogs, podcasts, vodcasts, and clickers. Entirely new chapters include subjects such as matching teaching methods with learning outcomes, inquiry-guided learning, and using visuals to teach, and new sections address Felder and Silverman's Index of Learning Styles, SCALE-UP classrooms, multiple true-false test items, and much more. Praise for the Third Edition of *Teaching at Its Best* Everyone veterans as well as novices will profit from reading *Teaching at Its Best*, for it provides both theory and practical suggestions for handling all of the problems one encounters in teaching classes varying in size, ability, and motivation. Wilbert McKeachie, Department of Psychology, University of Michigan, and coauthor, *McKeachie's Teaching Tips* This new edition of Dr. Nilson's book, with its completely updated material and several new topics, is an even more powerful collection of ideas and tools than the last. What a great resource, especially for beginning teachers but also for us veterans! L. Dee Fink, author, *Creating Significant Learning Experiences* This third edition of *Teaching at Its Best* is successful at weaving the latest research on teaching and learning into what was already a thorough exploration of each topic. New information on how we learn, how students develop, and innovations in instructional strategies complement the solid foundation established in the first two editions. Marilla D. Svinicki, Department of Psychology, The University of Texas, Austin, and coauthor, *McKeachie's Teaching Tips*

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the activity series pogil: Discipline-Based Education Research National Research Council, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on the Status, Contributions, and Future Directions of Discipline-Based Education Research, 2012-08-27 The National Science Foundation funded a synthesis study on the status, contributions, and future direction of discipline-based education research (DBER) in physics, biological sciences, geosciences, and chemistry. DBER combines knowledge of teaching and learning with deep knowledge of discipline-specific science content. It describes the discipline-specific difficulties learners face and the specialized intellectual and instructional resources that can facilitate student

understanding. Discipline-Based Education Research is based on a 30-month study built on two workshops held in 2008 to explore evidence on promising practices in undergraduate science, technology, engineering, and mathematics (STEM) education. This book asks questions that are essential to advancing DBER and broadening its impact on undergraduate science teaching and learning. The book provides empirical research on undergraduate teaching and learning in the sciences, explores the extent to which this research currently influences undergraduate instruction, and identifies the intellectual and material resources required to further develop DBER.

Discipline-Based Education Research provides guidance for future DBER research. In addition, the findings and recommendations of this report may invite, if not assist, post-secondary institutions to increase interest and research activity in DBER and improve its quality and usefulness across all natural science disciplines, as well as guide instruction and assessment across natural science courses to improve student learning. The book brings greater focus to issues of student attrition in the natural sciences that are related to the quality of instruction. Discipline-Based Education Research will be of interest to educators, policy makers, researchers, scholars, decision makers in universities, government agencies, curriculum developers, research sponsors, and education advocacy groups.

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Alexander Grushow, Melissa S. Reeves, 2020-06-15 While computational chemistry methods are usually a research topic of their own, even in the undergraduate curriculum, many methods are becoming part of the mainstream and can be used to appropriately compute chemical parameters that are not easily measured in the undergraduate laboratory. These calculations can be used to help students explore and understand chemical principles and properties. Visualization and animation of structures and properties are also aids in students' exploration of chemistry. This book will focus on the use of computational chemistry as a tool to teach chemical principles in the classroom and the laboratory.

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the activity series pogil: Barriers and Opportunities for 2-Year and 4-Year STEM Degrees National Academies of Sciences, Engineering, and Medicine, National Academy of Engineering, Policy and Global Affairs, Board on Higher Education and Workforce, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on Barriers and Opportunities in Completing 2-Year and 4-Year STEM Degrees, 2016-05-18 Nearly 40 percent of the students entering 2- and 4-year postsecondary institutions indicated their intention to major in science, technology, engineering, and mathematics (STEM) in 2012. But the barriers to students realizing their ambitions are reflected in the fact that about half of those with the intention to earn a STEM bachelor's degree and more than two-thirds intending to earn a STEM associate's degree fail to earn these degrees 4 to 6 years after their initial enrollment. Many of those who do obtain a degree take longer than the advertised length of the programs, thus raising the cost of their education. Are the STEM educational pathways any less efficient than for other fields of study? How might the losses be stemmed and greater efficiencies realized? These questions and others are at the heart of this study. Barriers and Opportunities for 2-Year and 4-Year STEM Degrees reviews research on the roles that people, processes, and institutions play in 2-and 4-year STEM degree production. This study pays special attention to the factors that influence students' decisions to enter, stay in, or leave STEM majors—quality of instruction, grading policies, course sequences, undergraduate learning environments, student supports, co-curricular activities, students' general academic preparedness and competence in science, family background, and governmental and institutional policies that affect STEM educational pathways. Because many students do not take the traditional 4-year path to a STEM undergraduate degree, Barriers and Opportunities describes several other common pathways and also reviews what happens to those who do not complete the journey to a degree. This book describes the major changes in student demographics; how students, view, value, and utilize programs of higher education; and how institutions can adapt to support successful student outcomes. In doing so, Barriers and Opportunities questions whether definitions and characteristics of what constitutes success in STEM should change. As this book explores these issues, it identifies where further research is needed to build a system that works for all students who aspire to STEM degrees. The conclusions of this report lay out the steps that faculty, STEM departments, colleges and universities, professional societies, and others can take to improve STEM education for all students interested in a STEM degree.

the activity series pogil: Misconceptions in Chemistry Hans-Dieter Barke, Al Hazari, Sileshi Yitbarek, 2008-11-18 Over the last decades several researchers discovered that children, pupils and even young adults develop their own understanding of how nature really works. These pre-concepts concerning combustion, gases or conservation of mass are brought into lectures and teachers have to diagnose and to reflect on them for better instruction. In addition, there are 'school-made misconceptions' concerning equilibrium, acid-base or redox reactions which originate from inappropriate curriculum and instruction materials. The primary goal of this monograph is to help teachers at universities, colleges and schools to diagnose and 'cure' the pre-concepts. In case of the school-made misconceptions it will help to prevent them from the very beginning through reflective teaching. The volume includes detailed descriptions of class-room experiments and structural models to cure and to prevent these misconceptions.

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