pogil periodic trends

pogil periodic trends refer to the guided inquiry-based learning activities designed to help students understand the systematic variations in elemental properties across the periodic table. These trends include atomic radius, ionization energy, electronegativity, electron affinity, and metallic character, which are crucial for predicting chemical behavior and reactivity. By exploring pogil periodic trends, students engage actively in discovering the underlying principles that govern element properties, fostering deeper comprehension of atomic structure and electron configurations. This approach aligns with the pedagogical goal of enhancing critical thinking and analytical skills in chemistry education. The discussion will cover key periodic trends, the factors influencing them, and their significance in chemical interactions. Additionally, the article will examine how pogil activities facilitate the learning process and aid in mastering complex concepts through collaborative inquiry.

Understanding Atomic Radius

Atomic radius is a fundamental periodic trend that measures the size of an atom from its nucleus to the outer boundary of its electron cloud. It is critical in understanding how atoms interact in chemical bonds and influences properties such as ionization energy and electronegativity. Across a period from left to right, atomic radius generally decreases due to the increasing positive charge of the nucleus, which pulls electrons closer, reducing the size. Conversely, down a group, atomic radius increases because additional electron shells are added, increasing the distance between the nucleus and the outermost electrons.

Factors Affecting Atomic Radius

Several factors affect atomic radius, including nuclear charge, electron

shielding, and the number of electron shells. Nuclear charge refers to the positive charge of protons in the nucleus, which attracts electrons inward. Electron shielding occurs when inner electron shells reduce the effective nuclear charge felt by outer electrons, allowing them to be further away. The number of electron shells increases down a group, leading to a larger atomic radius despite the increased nuclear charge.

Periodic Trends in Atomic Radius

Atomic radius trends are predictable and consistent across the periodic table, making them a key focus in pogil periodic trends activities. These trends help students understand why elements in the same group exhibit similar chemical properties and why reactivity changes across periods and groups. For example, alkali metals have large atomic radii, contributing to their high reactivity, while noble gases have small radii and exhibit chemical inertness.

Ionization Energy Explained

Ionization energy is the amount of energy required to remove an electron from a neutral atom in its gaseous state. It is a crucial concept in pogil periodic trends as it helps explain the reactivity and bonding tendencies of elements. Generally, ionization energy increases across a period due to stronger nuclear attraction, making it harder to remove electrons. It decreases down a group because the outer electrons are farther from the nucleus and experience more shielding, thus requiring less energy for removal.

First Ionization Energy vs. Successive Ionization Energies

The first ionization energy refers to the energy needed to remove the first electron, while successive ionization energies pertain to removing subsequent electrons. Successive ionization energies increase significantly after removing valence electrons, reflecting the increased difficulty in removing electrons from a positively charged ion. This pattern is essential for understanding the formation of ions and the chemical stability of elements.

Exceptions in Ionization Energy Trends

While ionization energy trends are generally predictable, there are exceptions due to electron configurations and subshell stability. For instance, elements with half-filled or fully filled subshells exhibit slightly higher ionization energies than expected, as these configurations are more stable. Such anomalies are often explored in pogil activities to

deepen students’ grasp of electron arrangements and periodic behavior.

Electronegativity and Its Importance

Electronegativity is the measure of an atom's ability to attract shared electrons in a covalent bond. It plays a significant role in determining bond polarity and molecular properties. In pogil periodic trends, electronegativity is analyzed to understand how elements combine and how bond characteristics influence chemical reactivity. Electronegativity increases across a period due to higher nuclear charge and decreases down a group because of increased atomic radius and electron shielding.

Pauling Scale of Electronegativity

The Pauling scale is the most commonly used quantitative measure of electronegativity, assigning numerical values to elements based on their electron-attracting power. Fluorine has the highest electronegativity on the scale, while cesium and francium have among the lowest. This scale helps predict bond types and the behavior of molecules in chemical reactions.

Impact of Electronegativity on Chemical Bonds

Differences in electronegativity between atoms determine whether a bond is ionic, polar covalent, or nonpolar covalent. Large differences typically result in ionic bonds, moderate differences create polar covalent bonds, and small or no differences lead to nonpolar covalent bonds. Understanding these distinctions is vital in interpreting molecular structures and reactivities, a common focus in pogil periodic trends lessons.

Electron Affinity Trends

Electron affinity refers to the energy change that occurs when an atom gains an electron, typically releasing energy. It indicates an atom’s tendency to accept electrons and form negative ions. Across a period, electron affinity generally becomes more negative, indicating a higher tendency to gain electrons, while down a group, it becomes less negative due to increased atomic size and electron shielding.

Variations and Anomalies in Electron Affinity

Some elements exhibit irregularities in electron affinity trends due to electron-electron repulsions and subshell filling. For example, noble gases have positive or near-zero electron affinities because their electron shells are full, making them stable and reluctant to gain electrons. Such variations

enhance understanding of atomic structure and are often highlighted in pogil exercises.

Significance in Chemical Reactions

Electron affinity influences the formation of anions and the overall reactivity of nonmetals. Elements with high electron affinities, such as halogens, readily gain electrons and participate in various chemical reactions. This concept is critical when predicting reaction products and mechanisms, making it a core topic in pogil periodic trends modules.

Metallic Character Across the Periodic Table

Metallic character describes how readily an element exhibits properties typical of metals, such as conductivity, malleability, and tendency to lose electrons. It decreases across a period from left to right as elements become less willing to lose electrons and more nonmetallic in nature. Conversely, metallic character increases down a group due to the ease of electron loss facilitated by larger atomic radii and shielding effects.

Properties Associated with Metallic Character

Elements with high metallic character typically have low ionization energies and electronegativities, enabling them to form positive ions easily. Metals are generally good conductors of heat and electricity, have high melting and boiling points, and are malleable and ductile. These properties are essential in materials science and industrial applications.

Transition Metals and Metallic Character

Transition metals exhibit unique metallic properties, often differing from main group elements. They have variable oxidation states and can form complex ions, contributing to their widespread use in catalysis and alloys. Understanding the metallic character of transition metals is important for comprehending their chemical behavior and applications, a topic frequently explored in pogil periodic trends activities.

Role of POGIL in Teaching Periodic Trends

Process Oriented Guided Inquiry Learning (POGIL) is an instructional strategy that emphasizes student-centered learning through structured activities. In the context of periodic trends, pogil periodic trends activities encourage learners to investigate patterns, analyze data, and construct explanations collaboratively. This method enhances conceptual understanding by engaging

students in active problem-solving rather than passive memorization.

Benefits of POGIL for Understanding Periodic Trends

- Promotes critical thinking and analytical skills
- Encourages collaboration and communication among students
- Facilitates deeper comprehension of abstract concepts
- Allows students to discover relationships independently
- Improves retention of periodic table principles and trends

Implementation in Chemistry Curriculum

Integrating pogil periodic trends activities into the chemistry curriculum provides a structured yet flexible framework for exploring elemental properties. Instructors guide students through inquiry-based tasks that highlight key trends and exceptions, fostering a learning environment where students actively construct knowledge. This approach aligns well with modern educational standards emphasizing inquiry and evidence-based reasoning.

Frequently Asked Questions

What is POGIL and how is it used to teach periodic trends?

POGIL (Process Oriented Guided Inquiry Learning) is an instructional approach that engages students in active learning through guided inquiry activities. It is used to teach periodic trends by having students work collaboratively to explore patterns in the periodic table, leading to a deeper understanding of concepts like atomic radius, ionization energy, and electronegativity.

What are the main periodic trends studied in a POGIL activity?

The main periodic trends studied in a POGIL activity typically include atomic radius, ionization energy, electron affinity, and electronegativity. These trends help students understand how atomic properties change across periods and down groups in the periodic table.

How does POGIL help students understand atomic radius trends?

POGIL helps students understand atomic radius trends by guiding them through data analysis and pattern recognition activities. Students compare atomic sizes across periods and groups, leading to the realization that atomic radius decreases across a period and increases down a group due to changes in nuclear charge and electron shielding.

In a POGIL activity, why does ionization energy generally increase across a period?

In a POGIL activity, students discover that ionization energy increases across a period because the nuclear charge increases while the shielding effect remains relatively constant, making it harder to remove an electron as atoms become smaller and more positively charged.

How are electronegativity trends explained through POGIL?

Through POGIL, students explore electronegativity trends by analyzing data and recognizing that electronegativity generally increases across a period due to increasing nuclear charge and decreases down a group due to increased atomic radius and electron shielding.

What role does electron shielding play in periodic trends discussed in POGIL?

Electron shielding, explored in POGIL activities, refers to the reduction in effective nuclear charge on valence electrons caused by inner electron layers. It explains why atomic radius increases down a group and why ionization energy decreases, as increased shielding reduces the attraction between the nucleus and valence electrons.

How can POGIL activities improve retention of periodic trends concepts?

POGIL activities improve retention of periodic trends concepts by promoting active learning, collaboration, and critical thinking. Students construct their own understanding through guided questions and data analysis, which leads to deeper comprehension and longer-lasting knowledge compared to passive lecture methods.

What challenges might students face during POGIL activities on periodic trends and how can

instructors address them?

Students might struggle with interpreting data or understanding abstract concepts like effective nuclear charge during POGIL activities on periodic trends. Instructors can address these challenges by providing clear guidance, scaffolding questions, encouraging peer discussion, and offering real-world examples to make concepts more relatable.

Additional Resources

1. *Exploring Periodic Trends through POGIL Activities*
This book offers a comprehensive collection of Process Oriented Guided Inquiry Learning (POGIL) activities focused on periodic trends. It guides students through interactive experiments and data analysis to understand atomic radius, ionization energy, and electronegativity. The activities promote critical thinking and collaborative learning, making complex concepts accessible.

2. *POGIL Strategies for Teaching the Periodic Table*
Designed for educators, this resource provides a variety of POGIL-based lesson plans centered on the periodic table and its trends. It includes step-by-step instructions and student worksheets to facilitate active engagement in the classroom. The book emphasizes inquiry learning to help students grasp the underlying principles of element properties.

3. *Understanding Atomic Structure and Periodic Trends with POGIL*
This text delves into atomic structure and its influence on periodic trends using POGIL methodology. Students explore electron configuration, shielding effect, and effective nuclear charge through guided activities. The book encourages a deeper conceptual understanding by linking theory with practical exercises.

4. *Interactive Chemistry: POGIL Activities on Periodic Trends*
Packed with interactive exercises, this book uses POGIL to teach key periodic trends such as ionization energy and electron affinity. It supports differentiated learning by offering various difficulty levels in its activities. Teachers can use it to foster collaborative problem-solving and discussion among students.

5. *POGIL for General Chemistry: Periodic Table Trends Edition*
Tailored for general chemistry courses, this edition focuses on periodic trends using POGIL techniques. It includes real-world applications and examples to contextualize the trends observed in the periodic table. The book also offers assessment tools to evaluate student understanding effectively.

6. *Guided Inquiry into Periodic Trends: A POGIL Approach*
This guide emphasizes the process of inquiry to help students discover periodic trends independently. Through structured group work, learners investigate patterns in atomic size, electronegativity, and ionization energy. The book enhances retention by encouraging active participation and

reflection.

7. *Mastering Periodic Trends with POGIL Activities*
Focused on mastery, this book presents a series of progressively challenging POGIL activities covering all major periodic trends. It provides detailed facilitator notes to help instructors address common misconceptions. Students benefit from clear explanations and hands-on learning experiences.

8. *Periodic Trends and Chemical Properties: POGIL Workbook*
This workbook complements lectures by offering POGIL exercises that link periodic trends to chemical reactivity and properties. It includes practice problems and conceptual questions that reinforce student learning. The format supports both in-class and independent study.

9. *Active Learning in Chemistry: POGIL on Periodic Table Trends*
Focusing on active learning principles, this book integrates POGIL activities to enhance comprehension of periodic trends. It encourages students to collaborate and communicate scientific ideas effectively. The resource is ideal for instructors seeking to implement inquiry-based teaching methods in chemistry.

Pogil Periodic Trends

Unlock the Secrets of the Periodic Table: Mastering POGIL Activities on Periodic Trends

Are you struggling to truly understand periodic trends, not just memorize them? Do POGIL (Process Oriented Guided Inquiry Learning) activities on this topic leave you feeling lost and frustrated? Do you wish there was a clear, concise, and engaging guide to help you master this crucial chemistry concept? You're not alone. Many students find periodic trends challenging, and traditional teaching methods often fall short. This ebook provides the missing link, transforming complex concepts into manageable, understandable steps.

This ebook, "POGIL Periodic Trends: A Student's Guide to Mastering the Periodic Table," will equip you with the tools and strategies you need to conquer POGIL activities and achieve a deep understanding of periodic trends.

What this book covers:

Introduction: Understanding POGIL and its application to periodic trends.
Chapter 1: Atomic Structure and Electron Configuration: Laying the foundation for understanding trends.
Chapter 2: Ionization Energy: Exploring the energy required to remove electrons.

Chapter 3: Electron Affinity: Understanding the energy change upon electron gain.
Chapter 4: Electronegativity: Delving into the ability of an atom to attract electrons in a bond.
Chapter 5: Atomic Radius: Examining the size of atoms and ions.
Chapter 6: Metallic Character: Understanding the properties of metals and their trends.
Chapter 7: Applying POGIL Strategies: Practical tips and examples for tackling POGIL activities.
Conclusion: Reviewing key concepts and next steps for continued learning.

POGIL Periodic Trends: A Student's Guide to Mastering the Periodic Table

Introduction: Understanding POGIL and its Application to Periodic Trends

POGIL (Process Oriented Guided Inquiry Learning) is a student-centered instructional approach designed to promote critical thinking and problem-solving skills. Instead of passively receiving information, students actively construct their understanding through collaborative activities and guided inquiry. In the context of periodic trends, POGIL activities challenge students to analyze data, make predictions, and explain their reasoning. This ebook will equip you with the foundational knowledge and strategic techniques necessary to excel in these activities. We will explore the connection between atomic structure, electron configuration, and the observed trends in various properties of elements. Mastering this connection is key to successfully completing POGIL activities on periodic trends. This introduction sets the stage for the in-depth exploration of each trend in the subsequent chapters.

Chapter 1: Atomic Structure and Electron Configuration: Laying the Foundation for Understanding Trends

Understanding periodic trends begins with a strong grasp of atomic structure and electron configuration. The arrangement of electrons in an atom's energy levels and orbitals directly influences its chemical behavior and properties. This chapter will review fundamental concepts:

Subatomic particles: Protons, neutrons, and electrons and their properties.
Atomic number and mass number: Defining and differentiating these key concepts.
Electron shells and subshells: Understanding energy levels and sublevels within an atom.
Electron configurations: Writing and interpreting electron configurations using the Aufbau principle, Hund's rule, and the Pauli exclusion principle.
Valence electrons: Identifying and understanding the importance of valence electrons in chemical

bonding and reactivity.

A solid understanding of these concepts forms the basis for comprehending why periodic trends exist. The periodic table's organization reflects the repeating patterns in electron configurations, and these patterns directly correlate with observable trends in atomic and ionic properties. Understanding how electrons are arranged is the key to unlocking the mysteries of periodic trends. This lays the crucial foundation for subsequent chapters focusing on specific trends.

Chapter 2: Ionization Energy: Exploring the Energy Required to Remove Electrons

Ionization energy is the energy required to remove an electron from a gaseous atom or ion. This chapter will explore:

First ionization energy vs. subsequent ionization energies: Understanding the increasing energy required to remove successive electrons.
Trends in ionization energy across and down the periodic table: Explaining the increase in ionization energy across a period and the decrease down a group.
Factors affecting ionization energy: Exploring the role of effective nuclear charge, shielding effect, and atomic radius.
Anomalous ionization energies: Addressing exceptions to general trends.

By examining the relationship between electron configuration and ionization energy, we can understand why certain elements readily lose electrons while others hold onto them tightly. This understanding is critical for predicting the reactivity of elements and understanding their role in chemical reactions, which is frequently tested in POGIL exercises.

Chapter 3: Electron Affinity: Understanding the Energy Change Upon Electron Gain

Electron affinity is the energy change that occurs when an electron is added to a gaseous atom or ion. This chapter examines:

Trends in electron affinity across and down the periodic table: Understanding the general trends, though less predictable than ionization energy.
Factors affecting electron affinity: The interplay of effective nuclear charge, electron-electron repulsions, and atomic size.
Exceptions to the general trends: Addressing anomalies in electron affinity.
Relationship between electron affinity and electronegativity: Exploring the connection between these two properties.

Chapter 4: Electronegativity: Delving into the Ability of an Atom to Attract Electrons in a Bond

Electronegativity is a measure of an atom's ability to attract electrons in a chemical bond. This chapter will cover:

The Pauling scale: Understanding the common scale used to measure electronegativity.
Trends in electronegativity across and down the periodic table: Analyzing the increase across a period and the decrease down a group.
Relationship between electronegativity and bond polarity: Understanding how electronegativity differences determine the polarity of chemical bonds.
Applications of electronegativity in predicting chemical behavior: Using electronegativity to predict the types of bonds formed and the overall properties of molecules.

Chapter 5: Atomic Radius: Examining the Size of Atoms and Ions

Atomic radius refers to the size of an atom. This chapter focuses on:

Measuring atomic radius: Understanding the challenges and methods used to determine atomic size.
Trends in atomic radius across and down the periodic table: Explaining the decrease in atomic radius across a period and the increase down a group.
Ionic radius vs. atomic radius: Comparing the sizes of atoms and their corresponding ions (cations and anions).
Factors affecting atomic and ionic radii: Analyzing the role of effective nuclear charge, shielding effect, and electron-electron repulsion.

Chapter 6: Metallic Character: Understanding the Properties of Metals and Their Trends

Metallic character refers to the properties associated with metals, such as conductivity, malleability, and ductility. This chapter explores:

Defining metallic character: Understanding the characteristics that define metals.
Trends in metallic character across and down the periodic table: Analyzing the decrease in metallic character across a period and the increase down a group.
Relationship between metallic character and other periodic trends: Connecting metallic character to ionization energy, electron affinity, and electronegativity.
Applications of understanding metallic character: Predicting the physical and chemical properties of metals.

Chapter 7: Applying POGIL Strategies: Practical Tips and Examples for Tackling POGIL Activities

This chapter provides practical strategies for successfully navigating POGIL activities related to periodic trends. This section will include:

Effective group work strategies: Optimizing collaboration for maximum learning.
Analyzing data and interpreting trends: Developing critical analysis skills.
Formulating hypotheses and testing predictions: Building scientific reasoning skills.
Communicating scientific reasoning effectively: Clearly expressing ideas and supporting conclusions.
Examples of POGIL activities and solutions: Providing practical, worked-out examples to illustrate the concepts.

Conclusion: Reviewing Key Concepts and Next Steps for Continued Learning

This concluding chapter summarizes the key concepts covered throughout the ebook and offers suggestions for continued learning and deeper exploration of periodic trends. This section will encourage the reader to reflect on their newfound understanding and provide resources for future study.

FAQs

1. What is the difference between ionization energy and electron affinity? Ionization energy is the energy required to remove an electron, while electron affinity is the energy change associated with adding an electron.

2. How does atomic radius change across a period? Atomic radius generally decreases across a period due to increasing effective nuclear charge.

3. Why does metallic character decrease across a period? Across a period, electronegativity increases, and the ability to lose electrons (metallic character) decreases.

4. What is the relationship between electron configuration and ionization energy? Elements with stable electron configurations (full or half-filled subshells) have higher ionization energies.

5. How can I use electronegativity to predict bond polarity? A large difference in electronegativity

between atoms leads to a polar covalent bond.

6. What are some common exceptions to periodic trends? Some exceptions arise due to electron-electron repulsions or other complex interactions within atoms.

7. How does shielding affect atomic radius? Shielding by inner electrons reduces the effective nuclear charge felt by outer electrons, increasing atomic radius.

8. What is the role of effective nuclear charge in periodic trends? Effective nuclear charge strongly influences most periodic trends, affecting attraction of electrons to the nucleus.

9. How can I improve my performance in POGIL activities? Active participation, clear communication, and a strong grasp of the underlying concepts are essential.

Related Articles:

1. Understanding Electron Configurations and Orbital Filling: This article would delve deeper into the principles governing electron arrangement within atoms.

2. Effective Nuclear Charge and its Impact on Atomic Properties: This article would explore the concept of effective nuclear charge and its influence on various atomic properties.

3. The Aufbau Principle and Hund's Rule: A Detailed Explanation: This article would provide a more in-depth explanation of these rules governing electron configuration.

4. Ionic Radii and Isoelectronic Series: This article would focus specifically on ionic sizes and their relationships.

5. Advanced Concepts in Chemical Bonding: Polarity and Resonance: This article would examine more advanced aspects of chemical bonding related to periodic trends.

6. Predicting Reactivity Using Periodic Trends: This article would showcase how to utilize periodic trends to predict chemical reactivity.

7. Practical Applications of Periodic Trends in Materials Science: This article would explore real-world uses of this knowledge.

8. Solving POGIL Problems: Strategies and Best Practices: This article would provide further guidance and examples of POGIL activities.

9. Common Misconceptions About Periodic Trends and How to Overcome Them: This article will address frequent misunderstandings and provide clarification.

pogil periodic trends: *POGIL Activities for High School Chemistry* High School POGIL Initiative, 2012
pogil periodic trends: The Disappearing Spoon Sam Kean, 2010-07-12 From New York Times

bestselling author Sam Kean comes incredible stories of science, history, finance, mythology, the arts, medicine, and more, as told by the Periodic Table. Why did Gandhi hate iodine (I, 53)? How did radium (Ra, 88) nearly ruin Marie Curie's reputation? And why is gallium (Ga, 31) the go-to element for laboratory pranksters? The Periodic Table is a crowning scientific achievement, but it's also a treasure trove of adventure, betrayal, and obsession. These fascinating tales follow every element on the table as they play out their parts in human history, and in the lives of the (frequently) mad scientists who discovered them. The Disappearing Spoon masterfully fuses science with the classic lore of invention, investigation, and discovery -- from the Big Bang through the end of time. Though solid at room temperature, gallium is a moldable metal that melts at 84 degrees Fahrenheit. A classic science prank is to mold gallium spoons, serve them with tea, and watch guests recoil as their utensils disappear.

pogil periodic trends: Chemistry 2e Paul Flowers, Richard Langely, William R. Robinson, Klaus Hellmut Theopold, 2019-02-14 Chemistry 2e is designed to meet the scope and sequence requirements of the two-semester general chemistry course. The textbook provides an important opportunity for students to learn the core concepts of chemistry and understand how those concepts apply to their lives and the world around them. The book also includes a number of innovative features, including interactive exercises and real-world applications, designed to enhance student learning. The second edition has been revised to incorporate clearer, more current, and more dynamic explanations, while maintaining the same organization as the first edition. Substantial improvements have been made in the figures, illustrations, and example exercises that support the text narrative. Changes made in Chemistry 2e are described in the preface to help instructors transition to the second edition.

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pogil periodic trends: Essential Trends in Inorganic Chemistry D. M. P. Mingos, 1998 The growth of inorganic chemistry during the last 50 years has made it difficult for the student to assimilate all the factual information available. This book is designed to help by showing how a chemist uses the Periodic Table to organize and process this mass of information. It includes a detailed discussion of the important horizontal, vertical, and diagonal trends in the properties of the atoms of the elements and their compounds. These basic principles can then be applied to more detailed problems in modern inorganic chemistry.

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pogil periodic trends: Teaching and Learning STEM Richard M. Felder, Rebecca Brent, 2024-03-19 The widely used STEM education book, updated Teaching and Learning STEM: A Practical Guide covers teaching and learning issues unique to teaching in the science, technology, engineering, and math (STEM) disciplines. Secondary and postsecondary instructors in STEM areas need to master specific skills, such as teaching problem-solving, which are not regularly addressed in other teaching and learning books. This book fills the gap, addressing, topics like learning

objectives, course design, choosing a text, effective instruction, active learning, teaching with technology, and assessment—all from a STEM perspective. You'll also gain the knowledge to implement learner-centered instruction, which has been shown to improve learning outcomes across disciplines. For this edition, chapters have been updated to reflect recent cognitive science and empirical educational research findings that inform STEM pedagogy. You'll also find a new section on actively engaging students in synchronous and asynchronous online courses, and content has been substantially revised to reflect recent developments in instructional technology and online course development and delivery. Plan and deliver lessons that actively engage students—in person or online Assess students' progress and help ensure retention of all concepts learned Help students develop skills in problem-solving, self-directed learning, critical thinking, teamwork, and communication Meet the learning needs of STEM students with diverse backgrounds and identities The strategies presented in Teaching and Learning STEM don't require revolutionary time-intensive changes in your teaching, but rather a gradual integration of traditional and new methods. The result will be a marked improvement in your teaching and your students' learning.

pogil periodic trends: Process Oriented Guided Inquiry Learning (POGIL) Richard Samuel Moog, 2008 POGIL is a student-centered, group learning pedagogy based on current learning theory. This volume describes POGIL's theoretical basis, its implementations in diverse environments, and evaluation of student outcomes.

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pogil periodic trends: 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 BestEveryone 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 TipsThis 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 ExperiencesThis 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

pogil periodic trends: An Introduction to Chemistry Mark Bishop, 2002 This book teaches chemistry at an appropriate level of rigor while removing the confusion and insecurity that impair student success. Students are frequently intimidated by prep chem; Bishop's text shows them how to break the material down and master it. The flexible order of topics allows unit conversions to be covered either early in the course (as is traditionally done) or later, allowing for a much earlier than usual description of elements, compounds, and chemical reactions. The text and superb illustrations provide a solid conceptual framework and address misconceptions. The book helps students to develop strategies for working problems in a series of logical steps. The Examples and Exercises give plenty of confidence-building practice; the end-of-chapter problems test the student's mastery. The system of objectives tells the students exactly what they must learn in each chapter and where to find it.

pogil periodic trends: 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 disciples, 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.

pogil periodic trends: The Electron Robert Andrews Millikan, 1917

pogil periodic trends: Chemistry Education Javier García-Martínez, Elena Serrano-Torregrosa, 2015-02-17 Winner of the CHOICE Outstanding Academic Title 2017 Award This comprehensive collection of top-level contributions provides a thorough review of the vibrant field of chemistry education. Highly-experienced chemistry professors and education experts cover the latest developments in chemistry learning and teaching, as well as the pivotal role of chemistry for shaping a more sustainable future. Adopting a practice-oriented approach, the current challenges and opportunities posed by chemistry education are critically discussed, highlighting the pitfalls that can occur in teaching chemistry and how to circumvent them. The main topics discussed include best practices, project-based education, blended learning and the role of technology, including e-learning, and science visualization. Hands-on recommendations on how to optimally implement innovative strategies of teaching chemistry at university and high-school levels make this book an essential resource for anybody interested in either teaching or learning chemistry more effectively, from experience chemistry professors to secondary school teachers, from educators with no formal training in didactics to frustrated chemistry students.

pogil periodic trends: *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 majorsâ€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.

pogil periodic trends: POGIL Activities for High School Biology High School POGIL Initiative, 2012

pogil periodic trends: *The Language of Science Education* William F. McComas, 2013-12-30 The Language of Science Education: An Expanded Glossary of Key Terms and Concepts in Science

Teaching and Learning is written expressly for science education professionals and students of science education to provide the foundation for a shared vocabulary of the field of science teaching and learning. Science education is a part of education studies but has developed a unique vocabulary that is occasionally at odds with the ways some terms are commonly used both in the field of education and in general conversation. Therefore, understanding the specific way that terms are used within science education is vital for those who wish to understand the existing literature or make contributions to it. The Language of Science Education provides definitions for 100 unique terms, but when considering the related terms that are also defined as they relate to the targeted words, almost 150 words are represented in the book. For instance, “laboratory instruction” is accompanied by definitions for openness, wet lab, dry lab, virtual lab and cookbook lab. Each key term is defined both with a short entry designed to provide immediate access following by a more extensive discussion, with extensive references and examples where appropriate. Experienced readers will recognize the majority of terms included, but the developing discipline of science education demands the consideration of new words. For example, the term blended science is offered as a better descriptor for interdisciplinary science and make a distinction between project-based and problem-based instruction. Even a definition for science education is included. The Language of Science Education is designed as a reference book but many readers may find it useful and enlightening to read it as if it were a series of very short stories.

pogil periodic trends: *Track Design Handbook for Light Rail Transit* , 2012 TCRP report 155 provides guidelines and descriptions for the design of various common types of light rail transit (LRT) track. The track structure types include ballasted track, direct fixation (ballastless) track, and embedded track. The report considers the characteristics and interfaces of vehicle wheels and rail, tracks and wheel gauges, rail sections, alignments, speeds, and track moduli. The report includes chapters on vehicles, alignment, track structures, track components, special track work, aerial structures/bridges, corrosion control, noise and vibration, signals, traction power, and the integration of LRT track into urban streets.

pogil periodic trends: POGIL Activities for AP* Chemistry Flinn Scientific, 2014

pogil periodic trends: *Intermolecular and Surface Forces* Jacob N. Israelachvili, 2011-07-22 Intermolecular and Surface Forces describes the role of various intermolecular and interparticle forces in determining the properties of simple systems such as gases, liquids and solids, with a special focus on more complex colloidal, polymeric and biological systems. The book provides a thorough foundation in theories and concepts of intermolecular forces, allowing researchers and students to recognize which forces are important in any particular system, as well as how to control these forces. This third edition is expanded into three sections and contains five new chapters over the previous edition. - Starts from the basics and builds up to more complex systems - Covers all aspects of intermolecular and interparticle forces both at the fundamental and applied levels - Multidisciplinary approach: bringing together and unifying phenomena from different fields - This new edition has an expanded Part III and new chapters on non-equilibrium (dynamic) interactions, and tribology (friction forces)

pogil periodic trends: Biophysical Chemistry James P. Allen, 2009-01-26 Biophysical Chemistry is an outstanding book that delivers both fundamental and complex biophysical principles, along with an excellent overview of the current biophysical research areas, in a manner that makes it accessible for mathematically and non-mathematically inclined readers. (Journal of Chemical Biology, February 2009) This text presents physical chemistry through the use of biological and biochemical topics, examples and applications to biochemistry. It lays out the necessary calculus in a step by step fashion for students who are less mathematically inclined, leading them through fundamental concepts, such as a quantum mechanical description of the hydrogen atom rather than simply stating outcomes. Techniques are presented with an emphasis on learning by analyzing real data. Presents physical chemistry through the use of biological and biochemical topics, examples and applications to biochemistry Lays out the necessary calculus in a step by step fashion for students who are less mathematically inclined Presents techniques with an emphasis on learning by

analyzing real data Features qualitative and quantitative problems at the end of each chapter All art available for download online and on CD-ROM

pogil periodic trends: *Teach Better, Save Time, and Have More Fun* Penny J. Beuning, Dave Z. Besson, Scott A. Snyder, Ingrid DeVries Salgado, 2014-12-15 A must-read for beginning faculty at research universities.

pogil periodic trends: POGIL Activities for AP Biology , 2012-10

pogil periodic trends: The Periodic Table I D. Michael P. Mingos, 2020-02-05 As 2019 has been declared the International Year of the Periodic Table, it is appropriate that Structure and Bonding marks this anniversary with two special volumes. In 1869 Dmitri Ivanovitch Mendeleev first proposed his periodic table of the elements. He is given the major credit for proposing the conceptual framework used by chemists to systematically inter-relate the chemical properties of the elements. However, the concept of periodicity evolved in distinct stages and was the culmination of work by other chemists over several decades. For example, Newland's Law of Octaves marked an important step in the evolution of the periodic system since it represented the first clear statement that the properties of the elements repeated after intervals of 8. Mendeleev's predictions demonstrated in an impressive manner how the periodic table could be used to predict the occurrence and properties of new elements. Not all of his many predictions proved to be valid, but the discovery of scandium, gallium and germanium represented sufficient vindication of its utility and they cemented its enduring influence. Mendeleev's periodic table was based on the atomic weights of the elements and it was another 50 years before Moseley established that it was the atomic number of the elements, that was the fundamental parameter and this led to the prediction of further elements. Some have suggested that the periodic table is one of the most fruitful ideas in modern science and that it is comparable to Darwin's theory of evolution by natural selection, proposed at approximately the same time. There is no doubt that the periodic table occupies a central position in chemistry. In its modern form it is reproduced in most undergraduate inorganic textbooks and is present in almost every chemistry lecture room and classroom. This first volume provides chemists with an account of the historical development of the Periodic Table and an overview of how the Periodic Table has evolved over the last 150 years. It also illustrates how it has guided the research programmes of some distinguished chemists.

pogil periodic trends: Concepts of Simultaneity Max Jammer, 2006-09-12 Publisher description

pogil periodic trends: Strategic Planning in the Airport Industry Ricondo & Associates, 2009 TRB's Airport Cooperative Research Program (ACRP) Report 20: Strategic Planning in the Airport Industry explores practical guidance on the strategic planning process for airport board members, directors, department leaders, and other employees; aviation industry associations; a variety of airport stakeholders, consultants, and other airport planning professionals; and aviation regulatory agencies. A workbook of tools and sequential steps of the strategic planning process is provided with the report as on a CD. The CD is also available online for download as an ISO image or the workbook can be downloaded in pdf format.

pogil periodic trends: Reaching Students Nancy Kober, National Research Council (U.S.). Board on Science Education, National Research Council (U.S.). Division of Behavioral and Social Sciences and Education, 2015 Reaching Students presents the best thinking to date on teaching and learning undergraduate science and engineering. Focusing on the disciplines of astronomy, biology, chemistry, engineering, geosciences, and physics, this book is an introduction to strategies to try in your classroom or institution. Concrete examples and case studies illustrate how experienced instructors and leaders have applied evidence-based approaches to address student needs, encouraged the use of effective techniques within a department or an institution, and addressed the challenges that arose along the way.--Provided by publisher.

pogil periodic trends: Molecular Structure and Properties Geoffrey Allen, 1972

pogil periodic trends: Tools of Chemistry Education Research Diane M. Bunce, Renèe S. Cole, 2015-02-05 A companion to 'Nuts and Bolts of Chemical Education Research', 'Tools of Chemistry

Education Research' provides a continuation of the dialogue regarding chemistry education research.

pogil periodic trends: Electronic and Photoelectron Spectroscopy Andrew M. Ellis, Miklos Feher, Timothy G. Wright, 2005-01-13 Electronic and photoelectron spectroscopy can provide extraordinarily detailed information on the properties of molecules and are in widespread use in the physical and chemical sciences. Applications extend beyond spectroscopy into important areas such as chemical dynamics, kinetics and atmospheric chemistry. This book aims to provide the reader with a firm grounding of the basic principles and experimental techniques employed. The extensive use of case studies effectively illustrates how spectra are assigned and how information can be extracted, communicating the matter in a compelling and instructive manner. Topics covered include laser-induced fluorescence, resonance-enhanced multiphoton ionization, cavity ringdown and ZEKE spectroscopy. The volume is for advanced undergraduate and graduate students taking courses in spectroscopy and will also be useful to anyone encountering electronic and/or photoelectron spectroscopy during their research.

pogil periodic trends: Electronic Portfolios 2.0 Darren Cambridge, Kathleen Blake Yancey, Barbara Cambridge, 2023-07-03 Higher education institutions of all kinds—across the United States and around the world—have rapidly expanded the use of electronic portfolios in a broad range of applications including general education, the major, personal planning, freshman learning communities, advising, assessing, and career planning.Widespread use creates an urgent need to evaluate the implementation and impact of eportfolios. Using qualitative and quantitative methods, the contributors to this book—all of whom have been engaged with the Inter/National Coalition for Electronic Portfolio Research—have undertaken research on how eportfolios influence learning and the learning environment for students, faculty members, and institutions.This book features emergent results of studies from 20 institutions that have examined effects on student reflection, integrative learning, establishing identity, organizational learning, and designs for learning supported by technology. It also describes how institutions have responded to multiple challenges in eportfolio development, from engaging faculty to going to scale. These studies exemplify how eportfolios can spark disciplinary identity, increase retention, address accountability, improve writing, and contribute to accreditation. The chapters demonstrate the applications of eportfolios at community colleges, small private colleges, comprehensive universities, research universities, and a state system.

pogil periodic trends: Second International Handbook of Science Education Barry J. Fraser, Kenneth Tobin, Campbell J. McRobbie, 2011-12-13 The International Handbook of Science Education is a two volume edition pertaining to the most significant issues in science education. It is a follow-up to the first Handbook, published in 1998, which is seen as the most authoritative resource ever produced in science education. The chapters in this edition are reviews of research in science education and retain the strong international flavor of the project. It covers the diverse theories and methods that have been a foundation for science education and continue to characterize this field. Each section contains a lead chapter that provides an overview and synthesis of the field and related chapters that provide a narrower focus on research and current thinking on the key issues in that field. Leading researchers from around the world have participated as authors and consultants to produce a resource that is comprehensive, detailed and up to date. The chapters provide the most recent and advanced thinking in science education making the Handbook again the most authoritative resource in science education.

pogil periodic trends: *Introduction to Materials Science and Engineering* Elliot Douglas, 2014 This unique book is designed to serve as an active learning tool that uses carefully selected information and guided inquiry questions. Guided inquiry helps readers reach true understanding of concepts as they develop greater ownership over the material presented. First, background information or data is presented. Then, concept invention questions lead the students to construct their own understanding of the fundamental concepts represented. Finally, application questions provide the reader with practice in solving problems using the concepts that they have derived from

their own valid conclusions. KEY TOPICS: What is Guided Inquiry?; What is Materials Science and Engineering?; Bonding; Atomic Arrangements in Solids; The Structure of Polymers; Microstructure: Phase Diagrams; Diffusion; Microstructure: Kinetics; Mechanical Behavior; Materials in the Environment; Electronic Behavior; Thermal Behavior; Materials Selection and Design. MasteringEngineering, the most technologically advanced online tutorial and homework system available, can be packaged with this edition. MasteringEngineering is designed to provide students with customized coaching and individualized feedback to help improve problem-solving skills while providing instructors with rich teaching diagnostics. Note: If you are purchasing the standalone text (ISBN: 0132136422) or electronic version, MasteringEngineering does not come automatically packaged with the text. To purchase MasteringEngineering, please visit: www.masteringengineering.com or you can purchase a package of the physical text + MasteringEngineering by searching the Pearson Higher Education web site. MasteringEngineering is not a self-paced technology and should only be purchased when required by an instructor. MARKET: For students taking the Materials Science course in the Mechanical & Aerospace Engineering department. This book is also suitable for professionals seeking a guided inquiry approach to materials science.

pogil periodic trends: Principles of Biology Lisa Bartee, Walter Shiner, Catherine Creech, 2017 The Principles of Biology sequence (BI 211, 212 and 213) introduces biology as a scientific discipline for students planning to major in biology and other science disciplines. Laboratories and classroom activities introduce techniques used to study biological processes and provide opportunities for students to develop their ability to conduct research.

pogil periodic trends: Advanced Inorganic Chemistry Frank Albert Cotton, Geoffrey Wilikinson, Carlos A. Murillo, Manfred Bochmann, 2021 Advanced inorganic chemistry is a well-established source that students and professional chemists have turned to for the background needed to understand current research literature in inorganic chemistry and aspects of organometallic chemistry. This textbook is organized around the periodic table of elements and provides a systematic treatment of the chemistry of all chemical elements and their compounds. It incorporates important recent developments with an emphasis on advances in the interpretation of structure, bonding, and reactivity. This Indian adaptation of the book is restructured at places and offers new and updated material on chemical elements and their compounds, particularly related to their applications. The introduction section in all the chapters has also been completely updated to reflect current developments. Some of the new topics covered include sections on nomenclature and isomerism in coordination compounds; hydrides, their classification and applications. Useful new inclusions in the book are practice exercise comprising review questions multiple-choice questions (based on various competitive examinations) at the end of each part and appendices on IUPAC nomenclature of complexes and latimer diagram -- Cover.

pogil periodic trends: Christian Kids Explore Chemistry Robert W. Ridlon, Elizabeth J. Ridlon, 2007-03

pogil periodic trends: Peterson's Master AP Chemistry Brett Barker, 2007-02-12 A guide to taking the Advanced Placement Chemistry exam, featuring three full-length practice tests, one diagnostic test, in-depth subject reviews, and a guide to AP credit and placement. Includes CD-ROM with information on financing a college degree.

pogil periodic trends: Understanding the Periodic Table: A Chemistry Guide Cybellium, Welcome to the forefront of knowledge with Cybellium, your trusted partner in mastering the cuttign-edge fields of IT, Artificial Intelligence, Cyber Security, Business, Economics and Science. Designed for professionals, students, and enthusiasts alike, our comprehensive books empower you to stay ahead in a rapidly evolving digital world. * Expert Insights: Our books provide deep, actionable insights that bridge the gap between theory and practical application. * Up-to-Date Content: Stay current with the latest advancements, trends, and best practices in IT, Al, Cybersecurity, Business, Economics and Science. Each guide is regularly updated to reflect the newest developments and challenges. * Comprehensive Coverage: Whether you're a beginner or an

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