

Periodic table 6 practice problems answer key Document

Periodic Table 6 Practice Problems Answer Key

Understanding the periodic table is a fundamental part of chemistry education. It helps students grasp the organization of elements, their properties, and how they interact in chemical reactions. To reinforce this knowledge, practice problems are an effective tool. In this article, we will explore six practice problems related to the periodic table, complete with detailed answer keys. This will help you test your understanding, identify areas for improvement, and deepen your grasp of key concepts.

Introduction to Periodic Table Practice Problems

Practicing problems related to the periodic table enhances comprehension of element classification, periodic trends, and chemical behaviors. These problems often include identifying elements based on their properties, understanding groups and periods, and interpreting data from the periodic table.

Before diving into the practice problems, it's helpful to review some core concepts:

- Groups and Periods: Vertical columns are called groups or families; horizontal rows are periods.
- Metals, Nonmetals, and Metalloids: Classification based on properties.
- Periodic Trends: Atomic radius, ionization energy, electronegativity, and electron affinity.
- Element Symbols: Abbreviations of element names (e.g., H for Hydrogen, O for Oxygen).

Practice Problems and Answer Key

Problem 1: Identify the Element Based on Atomic Number

Question:

What is the element with atomic number 15?

Answer:

The element with atomic number 15 is Phosphorus (P).

Explanation:

To find the element, locate atomic number 15 on the periodic table. Phosphorus is in Group 15 (also called Group 5A) and period 3.

Problem 2: Determine the Group and Period of an Element

Question:

An element is in group 17 and period 3. What is the element, and what are its key properties?

Answer:

The element is Chlorine (Cl).

Explanation:

- Group 17: Halogens, known for being highly reactive nonmetals.
- Period 3: Located in the third row of the periodic table.
- Properties of Chlorine:
 - Nonmetal
 - Reacts with alkali metals to form salts
 - Gas at room temperature
 - Electronegativity: 3.16

Problem 3: Classify an Element as Metal, Nonmetal, or Metalloid

Question:

Silicon (Si) is an element on the periodic table. Classify it as a metal, nonmetal, or metalloid and justify your answer.

Answer:

Silicon is a metalloid.

Explanation:

- Silicon exhibits properties of both metals and nonmetals.

- It is a brittle, crystalline solid at room temperature.
- Conducts electricity under certain conditions, a typical characteristic of metalloids.
- Located along the "stair-step" line that separates metals and nonmetals on the periodic table.

Problem 4: Predict the Periodic Trend

Question:

How does atomic radius change as you move from left to right across a period? Explain why.

Answer:

Atomic radius decreases across a period.

Explanation:

- As you move across a period, additional protons are added to the nucleus, increasing the positive charge.
- Electrons are added to the same energy level, but the increased nuclear charge pulls electrons closer to the nucleus.
- This results in a smaller atomic radius.

Problem 5: Element with Highest Electronegativity

Question:

Which element in period 2 has the highest electronegativity? Provide its name and value.

Answer:

Fluorine (F) has the highest electronegativity in period 2, with a value of approximately 3.98.

Explanation:

- Electronegativity measures an atom's ability to attract electrons.
- Fluorine is the most electronegative element overall, owing to its small atomic size and high nuclear charge.
- It is located in group 17 (halogens).

Problem 6: Electron Configuration of an Element

Question:

Write the electron configuration for potassium (K).

Answer:

Electron configuration of potassium:

$1s^2 2s^2 2p^6 3s^2 3p^4 4s^1$

Explanation:

- Potassium has an atomic number of 19.
- Its electrons fill the orbitals in order:
 - 1s (2 electrons)
 - 2s (2 electrons)
 - 2p (6 electrons)
 - 3s (2 electrons)
 - 3p (6 electrons)
 - 4s (1 electron)
- The outermost electron is in the 4s orbital, making it an alkali metal.

Additional Tips for Mastering Periodic Table Concepts

- Use Mnemonics: To memorize groups and periods, create mnemonic devices.
- Understand Periodic Trends: Know how properties like atomic radius, ionization energy, and electronegativity change across the table.
- Practice Regularly: Consistent practice enhances recall and understanding.
- Visualize the Table: Use colored periodic tables to distinguish groups, periods, and element classifications.
- Apply Real-World Examples: Think about how elements are used in everyday life to contextualize their properties.

Conclusion

Practicing problems related to the periodic table is crucial for developing a solid understanding of chemistry fundamentals. The six problems covered here encompass key areas such as element

identification, classification, periodic trends, and electron configuration. By reviewing the answer key and explanations, students can reinforce their knowledge, prepare for exams, and build confidence in their ability to interpret the periodic table effectively.

Remember, mastering the periodic table requires both memorization and conceptual understanding. Regular practice, combined with a thorough review of concepts, will lead to success in your chemistry studies. Keep exploring, practicing, and applying your knowledge to excel in understanding the building blocks of matter.

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Periodic Table 6 Practice Problems Answer Key: An In-Depth Analysis for Effective Learning

The Periodic Table 6 Practice Problems Answer Key serves as an essential resource for students and educators seeking to deepen their understanding of chemical elements, periodic trends, and the organization of the periodic table. As a foundational tool in chemistry education, practice problems reinforce conceptual knowledge and foster critical thinking. This article provides a comprehensive review of typical problems associated with this topic, elucidates common misconceptions, and discusses strategies for mastering the material.

The Significance of Practice Problems in Learning the Periodic Table

Practice problems are integral to mastering chemistry concepts because they:

- Reinforce conceptual understanding
- Develop problem-solving skills
- Promote retention of key facts
- Prepare students for assessments and exams

In particular, periodic table problems challenge students to apply their knowledge of atomic structure, element properties, and periodic trends. The answer key acts as a vital feedback mechanism, allowing learners to verify their solutions and identify areas needing improvement.

Common Types of Periodic Table Practice Problems

The sixth set of practice problems typically encompasses a range of question types designed to test

different facets of periodic table knowledge. These include:

1. Element Identification and Atomic Number

- Example: "Identify the element with atomic number 20."
- Solution: Calcium (Ca)

2. Electron Configuration and Valence Electrons

- Example: "Write the electron configuration for sulfur and determine its valence electrons."
- Solution: $1s^2 2s^2 2p^6 3s^2 3p^4$; Valence electrons = 6

3. Periodic Trends

- Examples:
- "Which element has the largest atomic radius among oxygen, selenium, and iodine?"
- "Compare electronegativities of fluorine and chlorine."

4. Element Classification

- Examples:
- "Classify cobalt as a metal, nonmetal, or metalloid."
- "Identify which elements are transition metals."

5. Chemical Properties and Reactivity

- Examples:
- "Predict which element is more reactive: sodium or magnesium."
- "Explain why halogens are reactive."

6. Isotope and Atomic Mass Calculations

- Examples:
- "Calculate the average atomic mass given isotopic abundances."
- "Determine the number of neutrons in an isotope."

Each of these problem types tests core knowledge, and their solutions are often included in answer keys to facilitate self-assessment.

Deep Dive into Practice Problem Solutions: Analyzing the Answer Key

Providing detailed answers enhances understanding. Here, we analyze typical problems and their solutions as found in answer keys accompanying the practice set.

Problem 1: Element Identification

Question: "Identify the element with atomic number 15."

Answer Explanation:

- The atomic number corresponds to the number of protons in an atom.
- Atomic number 15 is phosphorus (P).

Key Point:

Recognizing element symbols and atomic numbers is fundamental. The answer key confirms this by listing phosphorus with atomic number 15.

Problem 2: Electron Configuration and Valence Electrons

Question: "Write the electron configuration of magnesium and determine its valence electrons."

Answer:

- Electron configuration: $1s^2 2s^2 2p^6 3s^2$
- Valence electrons: 2

Analysis:

Magnesium (Mg) has an atomic number of 12, and its outermost electrons occupy the 3s orbital, which accounts for its two valence electrons. The answer key emphasizes understanding the Aufbau principle and the periodic trend of valence electrons increasing across periods.

Problem 3: Periodic Trends ? Atomic Radius

Question: "Among nitrogen, phosphorus, and sulfur, which has the largest atomic radius?"

Answer:

- Phosphorus

Explanation:

Atomic radius increases down a group and decreases across a period. Phosphorus is in Group 15 (Period 3), nitrogen is in Period 2, and sulfur is in Period 3 but to the right of phosphorus. Since phosphorus is below nitrogen and to the left of sulfur, it has the largest atomic radius among the three.

Problem 4: Element Classification

Question: "Classify arsenic as a metal, nonmetal, or metalloid."

Answer:

- Metalloid

Insight:

Arsenic exhibits properties of both metals and nonmetals, fitting the classification of metalloid. The answer key clarifies the criteria for classification based on physical and chemical properties.

Problem 5: Reactivity of Elements

Question: "Which element is more reactive: sodium or magnesium? Explain."

Answer:

- Sodium

Explanation:

Reactivity increases down Group 1 (alkali metals). Sodium, being an alkali metal, reacts more readily with water than magnesium, which is an alkaline earth metal. The answer key reinforces this

trend and emphasizes periodic reactivity patterns.

Problem 6: Isotope Calculations

Question: "An isotope of chlorine has 17 neutrons. Calculate its atomic mass."

Answer:

- Atomic number of chlorine = 17
- Neutrons = 17
- Atomic mass = protons + neutrons = $17 + 17 = 34$ amu

Note:

The atomic mass is approximately 34 amu, matching the isotope chlorine-34. The answer key guides students through isotope mass calculations and the significance of isotopic abundances.

Strategies for Utilizing the Answer Key Effectively

While answer keys are invaluable, students should approach their use strategically:

- Attempt First: Attempt each problem on their own before consulting the answer key to maximize learning.
- Understand Mistakes: Compare solutions to identify misconceptions or errors.
- Analyze Step-by-Step: For complex problems, dissect each step to understand reasoning.
- Supplement with Theory: Use the solutions as a springboard to review relevant concepts, such as periodic trends or electron configurations.
- Practice Repetition: Rework problems multiple times to build confidence and mastery.

Common Challenges and Solutions in Periodic Table Practice Problems

Despite the straightforward nature of many questions, students often encounter challenges:

- Confusing Periodic Trends:

Solution: Study periodic trends systematically, understand the underlying reasons, and practice multiple problems.

- Misidentifying Elements:

Solution: Memorize key element symbols and their atomic numbers, and use the periodic table regularly.

- Electron Configuration Difficulties:

Solution: Practice Aufbau principle rules and use orbital diagrams for visualization.

- Miscalculating Isotopic Masses:

Solution: Review isotope notation and practice mass calculations with various isotopic abundances.

The answer key helps clarify these issues by providing correct solutions and explanations.

Conclusion: The Value of the Periodic Table 6 Practice Problems Answer Key

The Periodic Table 6 Practice Problems Answer Key is more than just a set of solutions; it is an educational tool that consolidates core chemistry concepts through practical application. Its comprehensive coverage of element identification, electron configurations, periodic trends, and reactivity patterns makes it indispensable for learners seeking mastery in chemistry.

By systematically working through practice problems and reviewing the answer key, students develop critical thinking skills, reinforce their conceptual framework, and build confidence for future assessments. Educators, too, benefit from these resources by designing targeted instruction and assessment strategies.

In essence, mastery of the periodic table is foundational to understanding chemistry, and the answer key serves as a guiding beacon on this educational journey. Regular engagement with such practice materials transforms rote memorization into meaningful comprehension, paving the way for success in chemistry and related scientific fields.

Question What is the purpose of a practice problem answer key for the periodic table? It helps students verify their understanding of periodic table concepts and ensures they can correctly identify elements, groups, periods, and other properties. How can practicing with periodic table problems improve my chemistry skills? Practicing these problems enhances your ability to quickly locate elements, understand element trends, and apply periodic table knowledge to solve chemistry questions effectively. What are common types of questions in periodic table practice problems?

Common questions include identifying elements based on properties, determining atomic numbers, classifying elements into groups or periods, and analyzing element trends across the table. How do I interpret the answer key for periodic table practice problems? The answer key provides correct solutions and explanations, helping you understand why certain elements or properties match specific questions, reinforcing your learning. Where can I find reliable practice problems and answer keys for the periodic table? Reliable resources include educational websites, chemistry textbooks, teacher-provided materials, and online platforms like Khan Academy or ChemCollective. Why is it important to practice with multiple periodic table problems regularly? Regular practice helps reinforce your understanding of periodic trends, element properties, and improves your speed and accuracy in solving related questions. Can practicing with answer keys help me prepare for chemistry exams? Yes, practicing with answer keys allows you to check your answers, understand mistakes, and build confidence for exams covering periodic table concepts. What strategies should I use when working through periodic table practice problems? Strategies include reviewing periodic trends, using the table to locate elements quickly, understanding group and period characteristics, and checking your answers against the answer key for feedback.

Related keywords: periodic table practice problems, periodic table exercises, chemistry practice questions, periodic table answer key, chemistry review, element symbols quiz, atomic structure problems, periodic trends questions, chemistry homework help, chemistry test prep

THE PERIODIC TABLE AND PERIODIC LAW GLENCOE

the periodic table and periodic law glencoe

The periodic table and periodic law are fundamental concepts in the field of chemistry, serving as essential tools for understanding the properties and relationships of chemical elements. The "Glencoe" reference pertains to the widely used educational materials and textbooks published by Glencoe/McGraw-Hill, which have played a significant role in teaching students about the organization and significance of the periodic table. This article explores the historical development, structure, and significance of the periodic table and periodic law, with specific insights drawn from the Glencoe educational approach.

Historical Development of the Periodic Table

Early Attempts and Discoveries

The journey to the modern periodic table began in the 19th century, as scientists sought to organize the rapidly growing list of known elements. Early chemists such as John Newlands proposed the

Law of Octaves in 1864, observing that elements exhibited similar properties every eighth element when arranged by increasing atomic mass. Although this idea was limited, it laid the groundwork for recognizing periodicity in elemental properties.

Mendeleev's Periodic Table

Dmitri Mendeleev is credited with creating the first widely recognized periodic table in 1869. He arranged elements according to increasing atomic mass and grouped elements with similar properties into columns. Notably, Mendeleev left gaps for yet undiscovered elements and predicted their properties accurately, which validated his periodic law. His table was revolutionary in emphasizing periodicity and the relationships among elements.

Refinement and Modernization

As scientific understanding evolved, particularly with the discovery of atomic number by Henry Moseley in 1913, the periodic table was reorganized to reflect atomic number rather than atomic mass. This change resolved inconsistencies and led to the modern periodic table we use today.

The Periodic Law

Definition and Significance

The periodic law states that the properties of elements are periodic functions of their atomic numbers. In simpler terms, when elements are arranged by increasing atomic number, elements with similar properties appear at regular intervals. This law underscores the periodic nature of elemental properties and provides a systematic way to predict the characteristics of elements.

Implications of the Periodic Law

- It explains the recurring patterns in properties such as atomic radius, ionization energy, electronegativity, and chemical reactivity.
- It allows scientists to classify elements into groups (families) with similar behaviors.
- It facilitates the prediction of properties of undiscovered elements based on their position in the table.

The Structure of the Modern Periodic Table

Layout and Organization

The modern periodic table is arranged in a grid format with rows called periods and columns called

groups or families.

- **Periods:** Horizontal rows numbered from 1 to 7, representing increasing energy levels.
- **Groups/Families:** Vertical columns numbered from 1 to 18, indicating elements with similar chemical properties.

Key Features of the Table

- The table is divided into blocks based on electron configurations: s-block, p-block, d-block, and f-block.
- Elements are ordered by increasing atomic number.
- The table highlights element groups with similar valence electron configurations, which determine chemical behavior.

Major Classifications of Elements

- **Metals:** Located on the left and center, conductive, malleable, and ductile.
- **Nonmetals:** Found on the right, generally poor conductors and more likely to gain electrons.
- **Metalloids:** Elements with properties intermediate between metals and nonmetals, found along the zigzag line.

Significance of the Periodic Table in Chemistry Education

Educational Approach in Glencoe Materials

The Glencoe textbooks emphasize a clear understanding of the periodic table's organization and its underlying principles. They focus on:

- Teaching students how to read and interpret the table.
- Understanding periodic trends and their explanations.
- Recognizing the importance of electron configurations in determining element properties.

Teaching Strategies

- Use of visual aids and interactive activities to help memorize groups and periods.
- Connecting periodic trends to real-world applications.

- Encouraging students to predict properties of unknown elements based on their position.

Periodic Trends and Their Explanations

Atomic Radius

- Decreases across a period due to increasing nuclear charge pulling electrons closer.
- Increases down a group as additional electron shells are added.

Ionization Energy

- The energy required to remove an electron.
- Increases across a period as electrons are held more tightly.
- Decreases down a group as outer electrons are farther from the nucleus and less tightly bound.

Electronegativity

- Measures an atom's ability to attract electrons.
- Increases across a period.
- Decreases down a group.

Electron Affinity

- The energy change when an atom gains an electron.
- Trends similar to electronegativity.

Applications of the Periodic Table

Predicting Chemical Behavior

The periodic table allows chemists to predict how elements will react, form bonds, and participate in chemical reactions based on their position.

Discovering New Elements

Understanding periodic trends guides scientists in synthesizing new elements and placing them within the existing table.

Material Science and Industry

Elements' properties inform their applications in technology, medicine, energy, and manufacturing.

Conclusion

The periodic table and periodic law are cornerstones of chemical science, providing a systematic framework for understanding the relationships among elements. The work of early scientists like Mendeleev, combined with modern discoveries such as the atomic number, has led to the sophisticated and comprehensive periodic table used today. Educational resources like Glencoe have played a vital role in imparting this knowledge to students, emphasizing the importance of organization, periodic trends, and the predictive power of the table. As science continues to evolve, the periodic table remains a dynamic and invaluable tool, reflecting the ongoing quest to understand the fundamental building blocks of matter.

The periodic table and periodic law Glencoe represent foundational concepts in modern chemistry, serving as essential tools for understanding the properties, behaviors, and relationships of elements. Their development and organization have profoundly influenced scientific research, education, and technological advancements. This comprehensive review explores the origins, structure, principles, and significance of the periodic table and periodic law as presented in Glencoe chemistry resources, providing an in-depth analysis suitable for students, educators, and enthusiasts alike.

Introduction to the Periodic Table and Periodic Law

The periodic table is often regarded as the blueprint of chemical elements, systematically arranging them based on shared properties and atomic characteristics. Paired with the periodic law—a guiding principle stating that element properties are periodic functions of their atomic numbers—this organizational framework reveals patterns that underpin chemical behavior.

Historical Context

The journey toward the modern periodic table began in the 19th century, as scientists sought to classify the rapidly increasing number of discovered elements. Early efforts by Dmitri Mendeleev laid the groundwork, proposing a table that grouped elements by atomic mass and periodic properties. Although initial versions faced challenges—such as inconsistencies in atomic weights—subsequent discoveries, especially the identification of atomic numbers, solidified the current organization.

Significance in Chemistry

The periodic table facilitates the prediction of element properties, identification of trends across

periods and groups, and understanding of chemical reactions. It acts as both a reference and a predictive tool, enabling chemists to anticipate behaviors of elements and compounds.

Development of the Periodic Law

From Atomic Mass to Atomic Number

Initially, the periodic law was based on atomic masses, with Mendeleev's pioneering work arranging elements in order of increasing atomic weight. However, anomalies in the order—such as the placement of tellurium and iodine—highlighted limitations of atomic mass as the primary organizing principle.

The breakthrough came with the discovery of the proton and the realization that atomic number (number of protons) provides a more accurate basis for organization. This shift led to the modern periodic law:

"The properties of the elements are periodic functions of their atomic numbers."

Implications of the Modern Periodic Law

This law underpins the current periodic table, explaining why elements with similar properties recur periodically when arranged by increasing atomic number. It also accounts for the periodic trends observed in atomic and physical properties, such as ionization energy, electronegativity, and atomic radius.

Structure of the Periodic Table

The periodic table's structure reflects the periodic law, organizing elements into rows and columns that group elements with similar characteristics.

Periods and Groups

- Periods: Horizontal rows numbered 1 through 7. Elements in the same period have the same number of electron shells but vary in their properties across the period.

- Groups (Families): Vertical columns numbered 1 through 18 (or 1-12 in older tables). Elements within a group share similar valence electron configurations, leading to comparable chemical behaviors.

Blocks of the Periodic Table

The table is subdivided into blocks based on the electron subshell being filled:

- s-block: Groups 1 and 2, plus hydrogen and helium.
- p-block: Groups 13-18.
- d-block: Transition metals (Groups 3-10).
- f-block: Lanthanides and actinides, often displayed separately beneath the main table.

Element Categories

- Metals: Located mainly on the left and center; characterized by high electrical conductivity, malleability, and ductility.
- Nonmetals: Found on the right; generally insulators and brittle.
- Metalloids: Positioned along the zigzag line; exhibit mixed properties.

Periodic Trends and Properties

Understanding how element properties vary across the periodic table reveals underlying atomic structure influences and facilitates predictions about element behavior.

Atomic Radius

- Trend: Decreases across a period (left to right), increases down a group.
- Explanation: Increasing nuclear charge pulls electrons closer; additional electron shells appear down a group, enlarging atomic size.

Ionization Energy

- Trend: Increases across a period, decreases down a group.
- Significance: Reflects the energy required to remove an electron; higher in elements with stronger nuclear attraction.

Electronegativity

- Trend: Rises across a period, falls down a group.

- Implication: Indicates an atom's tendency to attract electrons in chemical bonds.

Electron Affinity

- Trend: Generally increases across a period.
- Note: Variations exist based on element type and electronic configuration.

Glencoe Resources and Teaching of the Periodic Table

The Glencoe series provides comprehensive educational materials that elucidate the periodic table's organization, properties, and applications.

Key Features of Glencoe's Approach

- Visual Aids: Color-coded tables, diagrams, and interactive models to help students grasp complex concepts.
- Historical Context: Emphasizes the evolution of the periodic table, fostering a deeper understanding of scientific progress.
- Practice Problems: Exercises that reinforce trends, classifications, and the application of periodic law.
- Real-World Applications: Demonstrates how the periodic table informs fields like medicine, materials science, and environmental science.

Educational Strategies

- Using comparative analysis to highlight periodic trends.
- Incorporating laboratory activities to observe properties such as reactivity.
- Encouraging critical thinking about the periodic law's implications in modern chemistry.

Significance of the Periodic Table and Periodic Law

The periodic table is not merely a catalog of elements; it embodies the fundamental principles governing chemical behavior. Its predictive power allows scientists to:

- Discover new elements by extrapolating periodic trends.
- Understand elemental reactivity and compound formation.
- Develop new materials with desired properties.

- Advance fields like nanotechnology, pharmacology, and energy storage.

Moreover, the periodic law emphasizes the interconnectedness of atomic structure and chemical properties, illustrating nature's inherent order and symmetry.

Future Perspectives and Innovations

Advances in computational chemistry and experimental techniques continue to refine our understanding of the periodic table. Notably:

- Extended Periodic Tables: Efforts to synthesize superheavy elements expand the boundaries of the table, challenging existing theories.
- Periodic Law Revisions: Ongoing research explores whether alternative organizing principles might better capture emerging properties.
- Educational Enhancements: Digital tools and virtual labs enhance comprehension and engagement with periodic concepts.

Conclusion

The periodic table and periodic law, as detailed in Glencoe resources, constitute the backbone of chemical science. They encapsulate the elegant patterns governing elements and serve as powerful frameworks for scientific exploration and innovation. By understanding their development, structure, and significance, students and scientists alike gain insights into the fundamental nature of matter, fostering curiosity and driving future discoveries in chemistry and related disciplines.

Question What is the main purpose of the periodic table according to Glencoe's Periodic Law? The main purpose of the periodic table is to organize elements based on their atomic number and properties, revealing periodic trends and relationships among elements. How does Glencoe's approach explain the periodic law? Glencoe explains the periodic law as the periodic repetition of chemical and physical properties of elements when they are arranged in order of increasing atomic number. What are the key features of the periodic table highlighted in Glencoe's curriculum? Key features include the arrangement of elements into periods and groups, the classification into metals, nonmetals, and metalloids, and the periodic trends such as electronegativity and atomic radius. How does the periodic law help in predicting properties of elements in Glencoe's lessons? The periodic law allows scientists to predict properties of elements based on their position in the table, such as reactivity, atomic size, and ionization energy, by analyzing their periodic trends. What role do atomic numbers play in the organization of the periodic table as per Glencoe's explanation? Atomic numbers serve as the fundamental organizing principle, with elements arranged sequentially by increasing atomic number, which underpins the periodicity of their properties.

Related keywords: periodic table, periodic law, glencoe chemistry, element groups, periodic trends, atomic structure, element symbols, atomic number, chemical elements, periodic table layout

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