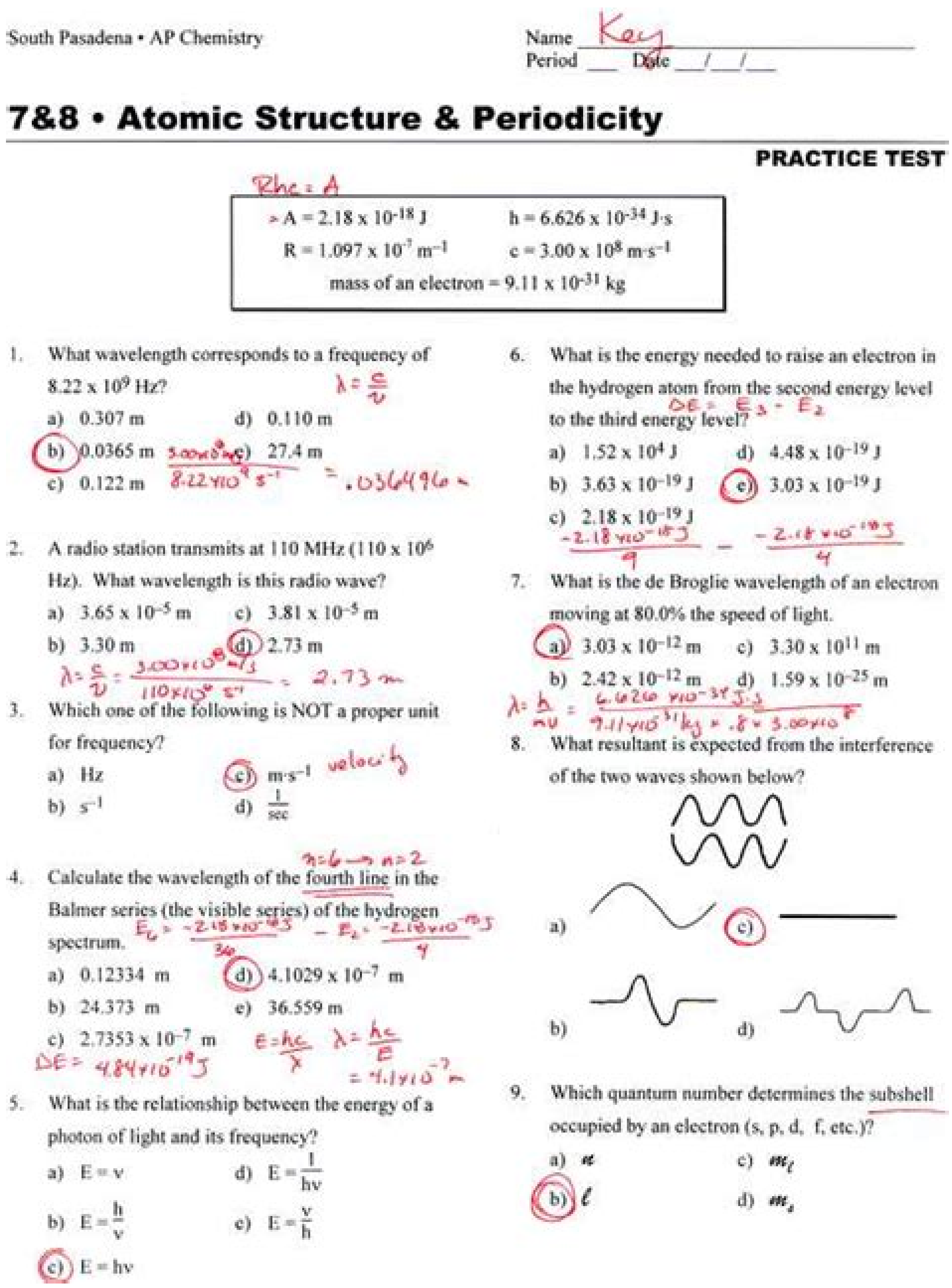
Electron Configuration Chem Worksheet 5 6



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7&8 • Atomic Structure & Periodicity

PRACTICE TEST

$A = 2.18 \times 10^{-18}$ J $h = 6.626 \times 10^{-34}$ J·s
$R = 1.097 \times 10^{7}$ m^{-1} $c = 3.00 \times 10^{8}$ m·s^{-1}
mass of an electron = 9.11×10^{-31} kg

1. What wavelength corresponds to a frequency of 8.22×10^{9} Hz?
a) 0.307 m d) 0.110 m
b) 0.0365 m e) 27.4 m
c) 0.122 m

2. A radio station transmits at 110 MHz (110×10^{6} Hz). What wavelength is this radio wave?
a) 3.65×10^{-5} m c) 3.81×10^{-5} m
b) 3.30 m d) 2.73 m

3. Which one of the following is NOT a proper unit for frequency?
a) Hz c) m·s^{-1}
b) s^{-1} d) $\frac{1}{sec}$

4. Calculate the wavelength of the fourth line in the Balmer series (the visible series) of the hydrogen spectrum.
a) 0.12334 m d) 4.1029×10^{-7} m
b) 24.373 m e) 36.559 m
c) 2.7353×10^{-7} m

5. What is the relationship between the energy of a photon of light and its frequency?
a) $E = \nu$ d) $E = \frac{1}{h\nu}$
b) $E = \frac{h}{\nu}$ e) $E = \frac{\nu}{h}$
c) $E = h\nu$

6. What is the energy needed to raise an electron in the hydrogen atom from the second energy level to the third energy level?
a) 1.52×10^{4} J d) 4.48×10^{-19} J
b) 3.63×10^{-19} J e) 3.03×10^{-19} J
c) 2.18×10^{-19} J

7. What is the de Broglie wavelength of an electron moving at 80.0% the speed of light.
a) 3.03×10^{-12} m c) 3.30×10^{11} m
b) 2.42×10^{-12} m d) 1.59×10^{-25} m

8. What resultant is expected from the interference of the two waves shown below?
a) c)
b) d)

9. Which quantum number determines the subshell occupied by an electron (s, p, d, f, etc.)?
a) n c) m_ℓ
b) ℓ d) m_s

Electron configuration chem worksheet 5 6 is a vital tool in understanding the arrangement of electrons within an atom, which directly influences its chemical properties and behavior. This article aims to provide a comprehensive overview of electron configurations, the significance of worksheets in mastering this concept, and detailed insights into worksheets 5 and 6, including practical exercises and examples.

Understanding Electron Configuration

Electron configuration refers to the distribution of electrons in atomic or molecular orbitals. Each electron occupies a specific energy level, and their arrangement can be described using a notation system that indicates the energy levels and sublevels that electrons fill.

The Basics of Electron Configuration

1. Energy Levels and Sublevels: Electrons are organized into energy levels, which are designated by principal quantum numbers (n = 1, 2, 3, ...). Each energy level can contain one or more sublevels (s, p, d, f):
- s sublevel: Can hold a maximum of 2 electrons.
- p sublevel: Can hold a maximum of 6 electrons.
- d sublevel: Can hold a maximum of 10 electrons.
- f sublevel: Can hold a maximum of 14 electrons.

2. Aufbau Principle: This principle states that electrons occupy the lowest energy orbitals first before moving to higher ones.

3. Pauli Exclusion Principle: No two electrons in the same atom can have identical quantum numbers, meaning an orbital can hold a maximum of 2 electrons with opposite spins.

4. Hund's Rule: When electrons occupy degenerate orbitals (orbitals of the same energy), one electron enters each orbital until all are half-filled before pairing up.

Worksheet 5: Basic Electron Configurations

Worksheet 5 typically focuses on fundamental concepts surrounding electron configurations. It serves as an introduction for students to practice writing the configurations for various elements.

Objectives of Worksheet 5

The key objectives of Worksheet 5 include:
- Learning to write electron configurations for the first 20 elements of the periodic table.
- Understanding the relationship between the periodic table and electron configurations.
- Practicing the notation for electron configurations, including using superscripts to indicate the number of electrons in each subshell.

Example Exercises

Here are some examples of exercises you might find in Worksheet 5:

1. Write the electron configuration for the following elements:
- Hydrogen (H)
- Carbon (C)
- Sodium (Na)

Answers:
- H: $1s^1$
- C: $1s^2 2s^2 2p^2$
- Na: $1s^2 2s^2 2p^6 3s^1$

2. Identify the element based on its electron configuration:
- $1s^2 2s^2 2p^6 3s^2 3p^4$

Answer: Sulfur (S)

Benefits of Worksheet 5

- Reinforcement of Concepts: Practicing electron configurations helps reinforce the understanding of electron arrangement.
- Foundation for Advanced Topics: Mastery of basic configurations lays the groundwork for more advanced topics, such as hybridization and molecular orbital theory.

Worksheet 6: Advanced Electron Configurations

Worksheet 6 delves deeper into electron configurations, introducing concepts such as noble gas shorthand notation and the application of electron configurations in predicting chemical behavior.

Objectives of Worksheet 6

The goals of Worksheet 6 include:
- Understanding and applying noble gas shorthand notation.
- Learning about exceptions in electron configurations, particularly in transition metals.
- Practicing writing configurations for elements beyond the first 20 in the periodic table.

Noble Gas Notation

Noble gas shorthand notation simplifies the writing of electron configurations by using the electron configuration of the nearest noble gas preceding the element in question. This method is particularly useful for elements with larger atomic numbers.

Example:
- For Chlorine (Cl), which has an electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^5$, the noble gas shorthand would be [Ne] $3s^2 3p^5$.

Exceptions in Electron Configurations

Certain elements, especially transition metals, exhibit exceptions to the expected electron configurations. These deviations typically occur to achieve a more stable electron arrangement, such as half-filled or fully filled subshells.

Examples of Exceptions:
- Chromium (Cr): Expected configuration is [Ar] $4s^2$ $3d^4$, but the actual configuration is [Ar] $4s^1$ $3d^5$.
- Copper (Cu): Expected configuration is [Ar] $4s^2$ $3d^9$, but the actual configuration is [Ar] $4s^1$ $3d^{10}$.

Example Exercises

1. Write the noble gas shorthand for the following elements:
- Selenium (Se)
- Krypton (Kr)

Answers:
- Se: [Ar] $4s^2$ $3d^{10}$ $4p^4$
- Kr: [Ar] $4s^2$ $3d^{10}$ $4p^6$

2. Identify the exceptions in the configurations of the following elements:
- Molybdenum (Mo)
- Gold (Au)

Answers:
- Mo: [Kr] $5s^1$ $4d^5$
- Au: [Xe] $6s^1$ $4f^{14}$ $5d^{10}$

Benefits of Worksheet 6

- Advanced Understanding: Engaging with advanced electron configuration topics enhances comprehension of periodic trends and chemical reactivity.
- Critical Thinking Skills: Working through exceptions and noble gas notation fosters analytical skills, which are crucial for success in chemistry.

Conclusion

The study of electron configurations is integral to the field of chemistry, influencing our understanding of atomic structure and chemical behavior. Worksheets 5 and 6 provide essential practice and insights into this fundamental topic, equipping students with the necessary skills to navigate more advanced concepts in chemistry. By mastering electron configurations, students not only prepare for exams but also gain a deeper appreciation for the intricacies of elements and their interactions in the vast world of chemistry.

Frequently Asked Questions

What is the electron configuration for sodium (Na)?

The electron configuration for sodium (Na) is $1s^2\ 2s^2\ 2p^6\ 3s^1$.

How do you determine the electron configuration for an element?

To determine the electron configuration, you can use the Aufbau principle, Hund's rule, and the Pauli exclusion principle to fill orbitals in order of increasing energy levels.

What are the possible subshells in electron configurations?

The possible subshells are s, p, d, and f, with each having a different maximum number of electrons: s (2), p (6), d (10), and f (14).

What is the electron configuration for chlorine (Cl)?

The electron configuration for chlorine (Cl) is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$.

Why do transition metals have variable oxidation states?

Transition metals have variable oxidation states due to the involvement of d-electrons in bonding, which can be lost or shared in various ways.

What is the significance of noble gas configuration in electron configuration?

Noble gas configuration refers to the electron configuration of noble gases that are particularly stable; elements often achieve this configuration to attain stability via chemical reactions.

How does the electron configuration of an atom relate to its chemical properties?

The electron configuration determines the distribution of electrons in an atom and influences its reactivity, ionization energy, and overall chemical properties.

What are the valence electrons for an element with the electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$?

The valence electrons for this element (aluminum, Al) are 3, which are in the 3s and 3p subshells.

What happens to the electron configuration when an atom forms a cation?

When an atom forms a cation, it loses one or more electrons, typically from the outermost shell, resulting in a new electron configuration with fewer electrons.

How do you write the shorthand electron configuration for an element?

To write the shorthand electron configuration, use the nearest noble gas preceding the element in brackets, followed by the remaining electron configuration. For example, for iodine (I), it is [Kr] $5s^2$ $4d^{10}$ $5p^5$.

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