Chemistry Worksheet Electron Configuration Questions and Answers PDF

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Part 1: Foundational Knowledge

Which of the following is the correct electron configuration for a carbon atom?

Hint: Consider the number of electrons in a carbon atom.

- ◯ **$1s^2\ 2s^2\ 2\ p^2$ ✓**
- ◯ $1s^2\ 2s^2\ 2\ p^4$
- ◯ $1s^2\ 2s^1\ 2\ p^3$
- ◯ $1s^2\ 2s^2\ 3s^2$

> The correct electron configuration for a carbon atom is $1s^2\ 2s^2\ 2\ p^2$.

Which of the following principles are used to determine electron configuration? (Select all that apply)

Hint: Think about the rules that govern how electrons are arranged in atoms.

- ☐ **Aufbau Principle ✓**
- ☐ **Pauli Exclusion Principle ✓**
- ☐ **Hund's Rule ✓**
- ☐ Dalton's Law

> The principles used to determine electron configuration include the Aufbau Principle, Pauli Exclusion Principle, and Hund's Rule.

Explain the significance of the Pauli Exclusion Principle in electron configuration.

Hint: Consider how this principle affects the arrangement of electrons in orbitals.

The Pauli Exclusion Principle states that no two electrons can have the same set of quantum numbers, which ensures that electrons occupy different states in an atom.

List the four types of atomic orbitals and their maximum electron capacities.

Hint: Think about the shapes and types of orbitals.

1. What are the four types of atomic orbitals?

s, p, d, f

2. What is the maximum electron capacity of s orbitals?

2

3. What is the maximum electron capacity of p orbitals?

6

4. What is the maximum electron capacity of d orbitals?

10

5. What is the maximum electron capacity of f orbitals?

14

The four types of atomic orbitals are s (2), p (6), d (10), and f (14).

Part 2: Understanding Electron Configuration

What is the principal quantum number for the outermost electrons in an oxygen atom?

Hint: Consider the electron configuration of oxygen.

- ◯ 1
- ◯ **2 ✓**
- ◯ 3
- ◯ 4

The principal quantum number for the outermost electrons in an oxygen atom is 2.

Which elements are likely to have electron configurations that deviate from the expected order? (Select all that apply)

Hint: Think about the transition metals and their unique configurations.

- ☐ **Chromium ✓**
- ☐ **Copper ✓**
- ☐ Neon
- ☐ Argon

Chromium and Copper are elements that are likely to have electron configurations that deviate from the expected order.

Describe how the periodic table is organized based on electron configurations.

Hint: Consider the arrangement of elements in rows and columns.

> **The periodic table is organized by increasing atomic number, with elements in the same group having similar electron configurations, particularly in their outermost shells.**

Part 3: Applying and Analyzing Concepts

If an element has the electron configuration [Ne] $3s^2$ 3 p^4, which element is it?

Hint: Identify the element based on its position in the periodic table.

- ◯ **Sulfur ✓**
- ◯ Chlorine
- ◯ Phosphorus
- ◯ Argon

> The element with the electron configuration [Ne] $3s^2$ 3 p^4 is sulfur.

Which of the following electron configurations represent transition metals? (Select all that apply)

Hint: Consider the d-block elements in the periodic table.

- ☐ **[Ar] $4s^2$ 3 d^{10} ✓**
- ☐ [Kr] $5s^2$ 4 d^{10} 5 p^6
- ☐ **[Xe] $6s^2$ 4 f^{14} 5 d^{10} ✓**
- ☐ [Ne] $3s^2$ 3 p^6

> The electron configurations that represent transition metals include [Ar] $4s^2$ 3 d^{10}, [Kr] $5s^2$ 4 d^{10} 5 p^6, and [Xe] $6s^2$ 4 f^{14} 5 d^{10}.

Predict the electron configuration of an ion with a +2 charge that originally has the configuration [Ar] $4s^2$ 3 d^6.

Hint: Consider how the charge affects the electron count.

The electron configuration of the ion with a +2 charge would be [Ar] 3 d^6.

Which of the following statements best describes Hund's Rule?

Hint: Think about how electrons fill orbitals.

- ◯ Electrons fill the lowest energy orbitals first.
- ◯ No two electrons can have the same set of quantum numbers.
- ◯ **Electrons will fill an unoccupied orbital before pairing up. ✓**
- ◯ Electrons in the same orbital must have opposite spins.

Hund's Rule states that electrons will fill an unoccupied orbital before pairing up.

Part 4: Synthesis and Reflection

Which of the following elements would most likely form a +3 ion based on its electron configuration?

Hint: Consider the position of the element in the periodic table.

- ◯ **Aluminum ✓**
- ◯ Silicon
- ◯ Phosphorus
- ◯ Sulfur

Aluminum would most likely form a +3 ion based on its electron configuration.

Evaluate the following statements and select those that correctly describe the relationship between electron configuration and chemical reactivity. (Select all that apply)

Hint: Think about how electron configurations influence reactivity.

- ☐ **Elements with a full outer shell are generally unreactiv. ✓**

- [x] **Elements with one electron in their outer shell are highly reactive. ✓**
- [x] **Elements with half-filled d orbitals are more stable. ✓**
- [x] **Elements with similar electron configurations exhibit similar chemical properties. ✓**

> The statements that correctly describe the relationship include that elements with a full outer shell are generally unreactiv, elements with one electron in their outer shell are highly reactive, and elements with similar electron configurations exhibit similar chemical properties.

Create a hypothetical element with an electron configuration that ends in $4f^{14}\ 5\ d^{10}\ 6s^2$. Describe its potential properties and place in the periodic table.

Hint: Consider the characteristics of elements in the f-block.

> **A hypothetical element with the configuration $4f^{14}\ 5\ d^{10}\ 6s^2$ would likely be a heavy element with properties similar to those of the transition metals and lanthanides, possibly exhibiting unique magnetic or conductive properties.**