Electron Configurations Worksheet

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Part 1: Foundational Knowledge

What is the maximum number of electrons that can occupy a single orbital?

Hint: Consider the Pauli Exclusion Principle.

- ◯ 1
- ◯ 2
- ◯ 4
- ◯ 6

Which of the following principles are used to determine electron configurations?

Hint: Think about the rules that govern electron arrangement.

- ☐ Aufbau Principle
- ☐ Pauli Exclusion Principle
- ☐ Hund's Rule
- ☐ Heisenberg Uncertainty Principle

Explain the significance of electron configurations in determining the chemical properties of an element.

Hint: Consider how electron arrangement affects reactivity and bonding.

List the subshells in order of increasing energy for the first four principal energy levels.

Hint: Think about the order of subshell filling.

1. 1st energy level

2. 2nd energy level

3. 3rd energy level

4. 4th energy level

Part 2: Understanding and Interpretation

Which element has the electron configuration $1s^2$ $2s^2$ 2 p^6 $3s^2$ 3 p^4?

Hint: Identify the element based on its electron configuration.

- ◯ Oxygen
- ◯ Sulfur
- ◯ Phosphorus
- ◯ Chlorine

Identify the correct statements about the periodic table and electron configurations:

Hint: Consider how groups and periods relate to electron configurations.

- ☐ Elements in the same group have similar valence electron configurations.
- ☐ Elements in the same period have the same number of electron shells.
- ☐ Transition metals have a completely filled d subshell.
- ☐ Noble gases have a full outer electron shell.

Describe how Hund's Rule affects the arrangement of electrons in the p subshell.

Hint: Think about how electrons fill orbitals within a subshell.

Part 3: Applying Knowledge and Analyzing Relationships

Which of the following electron configurations represents an ion of sodium (Na^+)?

Hint: Consider the electron loss in sodium ion formation.

- ◯ $1s^2\ 2s^2\ 2\ p^6\ 3s^1$
- ◯ $1s^2\ 2s^2\ 2\ p^6$
- ◯ $1s^2\ 2s^2\ 2\ p^5$
- ◯ $1s^2\ 2s^2\ 2\ p^6\ 3s^2$

Predict the electron configuration for the ion formed by chlorine (Cl^-):

Hint: Consider the gain of electrons in the formation of the ion.

- ☐ $1s^2\ 2s^2\ 2\ p^5\ 3s^2$
- ☐ $1s^2\ 2s^2\ 2\ p^6\ 3s^2\ 3\ p^6$
- ☐ $1s^2\ 2s^2\ 2\ p^6\ 3s^2\ 3\ p^4$
- ☐ $1s^2\ 2s^2\ 2\ p^6\ 3s^2\ 3\ p^3$

Apply the principles of electron configuration to explain why copper (Cu) has an electron configuration of [Ar] 3 d^{10} 4 s^1 instead of [Ar] 3 d^9 4 s^2.

Hint: Consider the stability of electron configurations.

Which of the following elements would you expect to have the most unpaired electrons in its ground state?

Hint: Consider the electron configurations of the elements listed.

- ◯ Carbon
- ◯ Nitrogen
- ◯ Oxygen
- ◯ Fluorine

Analyze the following electron configurations and identify which are exceptions to the Aufbau Principle:

Hint: Think about the stability of the configurations listed.

- ☐ [Ar] 3 d^{10} 4 s^{1} (Copper)
- ☐ [Ar] 3 d^{5} 4 s^{1} (Chromium)
- ☐ [Ne] 3 s^{2} 3 p^{6} 4 s^{2} 3 d^{10} 4 p^{6} (Krypton)
- ☐ [Kr] 4 d^{10} 5 s^{2} 5 p^{6} (Xenon)

Part 4: Synthesis and Reflection

Which of the following configurations would you expect to be the most stable and why?

Hint: Consider the full outer electron shells.

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

Evaluate the following statements and select those that correctly describe the role of electron configurations in chemical bonding:

Hint: Think about how electron configurations influence bonding behavior.

- ☐ Elements with similar electron configurations tend to form similar types of bonds.
- ☐ Electron configurations determine the number of bonds an atom can form.
- ☐ Atoms with full outer shells tend to be highly reactive.
- ☐ Transition metals can form multiple bonds due to their d orbitals.

Create a hypothetical element with a unique electron configuration. Describe its position on the periodic table and predict its chemical properties based on its configuration.

Hint: Think creatively about the element's characteristics.