Name STURMAN KEY Date 1 27 19 Class _____

5.2 ELECTRON ARRANGEMENT IN ATOMS

Section Review

Objectives

- Describe how to write the electron configuration for an atom
- Explain why the actual electron configurations for some elements differ from those predicted by the Aufbau principle

Vocabulary

- electron configurations
- Aufbau principle
- Pauli exclusion principle
- Hund's rule

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

The ways in which electrons are arranged around the nuclei of atoms are called __1__. The __2__ describes the sequence in which orbitals are filled. The various orbitals within a sublevel of a principle energy level are always of __3__ energy. The __4__ principle states that a maximum of only __5__ electrons can occupy each orbital. To occupy the same orbital, two electrons must have __6__ spins. Hund's rule states that the electrons pair up only after each orbital in a sublevel is occupied by __7__. When using the shorthand method for showing the electron configuration of an atom, __8__ are used to indicate the number of __9__ occupying each sublevel.

Correct electron configurations can be obtained by using the Aufbau diagram for the elements up to and including vanadium. __10__ and copper are exceptions to the Aufbau principle.

1. e⁻ Config. or orbital diagram
2. Aufbau princ
3. equal (same)
4. Pauli exclusion
5. 2
6. opposite
7. a single e⁻
8. superscripts
9. electrons
10. Chromium

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Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

ST 11. The orbitals of a principal energy level are lower in energy than the orbitals in the next higher principal energy level.

ST ⇒ Cr. 12. The configuration $3d^4 4s^2$ is more stable than the configuration $3d^5 4s^1$.

NT 13. As many as four electrons can occupy the same orbital.

AT 14. The Pauli exclusion principle states that an atomic orbital may describe at most two electrons.

AT 15. The electron configuration for potassium is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$.

NT 16. The electron configuration for copper is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A		Column B
E	17. electron configuration	a. When electrons occupy orbitals of equal energy, one electron enters each orbital until all the orbitals contain one electron with parallel spins.
D	18. Aufbau principle	b. An atomic orbital may describe at most two electrons.
B	19. Pauli exclusion principle	c. $1s^2 2s^2 2p^6$
A	20. Hund's rule	d. Electrons enter orbitals of lowest energy first.
C	21. neon	e. the most stable arrangement of electrons around the nucleus of an atom

Part D Questions and Problems

Answer the following in the space provided.

22. Write the electron configurations for the following atoms. [Ar] $4s^1$

a. C $1s^2 2s^2 2p^2$ = [He] $2s^2 p^2$

b. S $1s^2 2s^2 2p^6 3s^2 3p^4$ [Ne] $3s^2 p^4$

c. K $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

d. Ar $1s^2 2s^2 2p^6 3s^2 3p^6$ [Ne] $3s^2 p^6$

23. Identify the elements described below:

★ a. Contains a full third energy level.

Argon

★ b. Contains the first *p* electron.

Boron