Honors Chemistry **Name** _____

Chapter 4: Electron Configuration WS **Date** _____/_____/_____ **Period** _____

Electron Configurations - Solutions

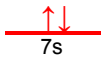
Note: The electron configurations in this worksheet assume that lanthanum (La) is the first element in the 4f block and that actinium (Ac) is the first element in the 5f block. If your periodic table doesn't agree with this, your answers for elements near the f-orbitals may be slightly different.

1. sodium **$1s^2 2s^2 2p^6 3s^1$**
2. iron **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$**
3. bromine **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$**
4. barium **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$**
5. neptunium **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^5$**
6. cobalt **[Ar] $4s^2 3d^7$**

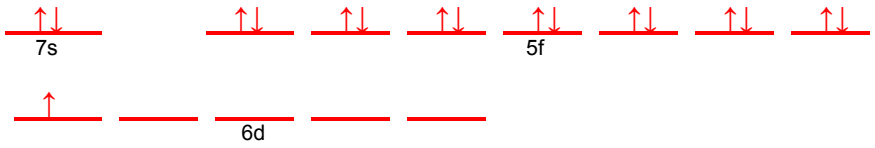
7. silver **[Kr] $5s^2 4d^9$**

8. tellurium **[Kr] $5s^2 4d^{10} 5p^4$**

9. radium **[Rn] $7s^2$**



10. lawrencium **[Rn] $7s^2 5f^{14} 6d^1$**



11. $1s^2 2s^2 2p^6 3s^2 3p^4$ **sulfur**
12. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ **rubidium**
13. [Kr] $5s^2 4d^{10} 5p^3$ **antimony**
14. [Xe] $6s^2 4f^{14} 5d^6$ **osmium**
15. [Rn] $7s^2 5f^{12}$ **fermium**
16. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ **not valid (take a look at "4d")**
17. $1s^2 2s^2 2p^6 3s^3 3d^5$ **not valid (3p comes after 3s and the 3s can only contain 2 electrons)**
18. [Ra] $7s^2 5f^8$ **not valid (radium isn't a noble gas)**
19. [Kr] $5s^2 4d^{10} 5p^5$ **valid**
20. [Xe] **not valid (an element can't be its own electron configuration)**

21. Which element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6\ 4s^2 3d^2$?
    a. zinc anion
    b. copper atom
    c. titanium atom
    d. chromium atom
    e. potassium cation

22. What is the electronic configuration of a specific isotope of an aluminum atom, Al?
    a. $1s^2 2s^2 2p^6 3d^3$
    b. $1s^2 2s^2 2p^6 3s^2 3p^1$
    c. $1s^2 2s^2 2p^6 2d^1 3s^2$
    d. $1s^2 2s^2 2p^6 2d^{10} 3s^2 3p^5$
    e. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$

23. What is the noble gas configuration for Pb atom?
    a. $[Xe]6s^2\ 4f^{14}\ 5d^{10}\ 6p^2$
    b. $[Xe]6s^2\ 4f^{12}\ 5d^{10}\ 6p^2$
    c. $[Xe]6s^2\ 4f^{14}$
    d. $[Rn]6p^4$
    e. $[Rn]\ 6s^2 4f^{14} 5d^{10}$

24. When two electrons occupy the same orbital, they must have
    a. opposite spins.
    b. mutual attraction.
    c. four identical quantum numbers.
    d. different magnetic (m_l) quantum numbers (orientation in space).
    e. different principal quantum numbers.

25. Show the orbital filling diagram with all of its electrons for P?

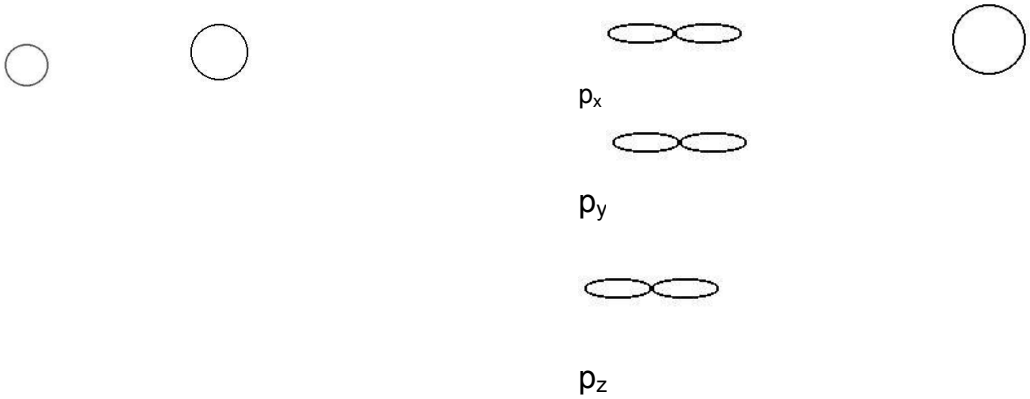
$1s^2$ **$2s^2$** **$2p^6$** **$3s^2$** **$3p^3$**

↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑ ↑ ↑

1s **2s** **2p** **3s** **3p**

26. Draw what the electron clouds would look like for $1s^2 2s^2 2p^6 3s^2$. You might have to explain a little.

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



27. Explain Aufbau principle, Pauli Exclusion Principle, & Hund's Rule. Give an example of each.

Explain Aufbau principle – an electron occupies the lowest-energy orbital that can receive it. (Heavy boxes and shelving)

Pauli Exclusion Principle – no two electrons in the same atom can have the same set of four quantum numbers.

Electrons that are in the same level of an atom can have the same principle quantum number

Electrons that are in the same sublevel of an atom can have the same angular quantum number

Electrons that are in the same orbital of an atom can have the same magnetic quantum number

Electrons that are in the same orbital of an atom can not have the same spin quantum number because electrons in the same orbital have opposite spin (+1/2 or – 1/2)

So even if an electron has the same principle quantum number, angular quantum number, and magnetic quantum number, they can not have the same spin quantum number.

Hund's Rule – orbitals of equal energy are each occupied by one electron before any orbital is occupied by a second electron. (Putting each of my children in their own bedrooms, if I have enough bedrooms for them. If not, them I make them share a room)