Electron Configuration Practice Key Name Mr. Sudbury

Writing the electron for atoms is how we understand where electrons are around the nucleus of atoms. Remember that it is the valence shell electrons that are active in bonding when they are lost, gained, or shared. Electrons can be in energy levels around the nucleus (*the numbers*) and in orbitals within the energy levels (*the s, p, d, f letters*). When you write electron configuration, you must follow three rules (paraphrased here): *1) the Aufbau Principle says that you must fill lower energy levels first before you move to the next higher level, 2) the Pauli exclusion principle says that no two electrons in the same atom can have the same set of four quantum numbers, so something about the energy level, orbital, and spin of each electron must be different from all others, and 3) Hund's Rule states that you must equally distribute electrons within each portion of an orbital before you add a second electron to that orbital and that all singly occupied orbitals must have the same spin (up first, the down).*

Using arrows for electrons draw the electron configuration into the boxes and write the electron configuration on the line.

1. Use arrows to complete the electron configuration for Nitrogen (7 electrons).

$1s$	$2s$	$2p_xp_yp_z$	~~$3s$~~	~~$3p_xp_yp_z$~~	~~$4s$~~
↑↓	↑↓	↑ ↑ ↑			

Write out the configuration for Nitrogen: **$1s^22s^22p^3$**

2. Use arrows to complete the electron configuration for Phosphorus (15 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	~~$4s$~~
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑ ↑ ↑	

Write out the configuration for Phosphorus: **$1s^22s^22p^63s^23p^3$**

3. Use arrows to complete the electron configuration for Potassium (19 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	$4s$
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑

Write out the configuration for K: **$1s^22s^22p^63s^23p^64s^1$**

4. Use arrows to complete the electron configuration for Iron (26 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	$4s$	$3d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	~~$4p_xp_yp_z$~~
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑ ↑ ↑ ↑	

Write out the configuration for Fe: **$1s^22s^22p^63s^23p^64s^23d^6$**

5. Use arrows to complete the electron configuration for Bromine (35 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	$4s$	$3d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	$4p_xp_yp_z$
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑↓ ↑

Write out the configuration for Br: **$1s^22s^22p^63s^23p^64s^23d^{10}4p^5$**

6. Use arrows to complete the electron configuration for Antimony (Sb) (51 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	$4s$	$3d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	$4p_xp_yp_z$
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑↓ ↑↓

$5s$	$4d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	$5p_xp_yp_z$	$\cancel{6s}$	$\cancel{4f_1f_2f_3f_4f_5f_6f_7}$
↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑ ↑ ↑		

Write out the configuration for Sb: **$1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^3$**

7. Use arrows to complete the electron configuration for Tungsten (74 electrons).

$1s$	$2s$	$2p_xp_yp_z$	$3s$	$3p_xp_yp_z$	$4s$	$3d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	$4p_xp_yp_z$
↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑↓ ↑↓

$5s$	$4d_{x^2y^2}d_{xy}d_{yz}d_{xz}d_{y^2}$	$5p_xp_yp_z$	$6s$	$4f_1f_2f_3f_4f_5f_6f_7$	$5d$
↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑ ↑ ↑ ↑

Write out the configuration for W: **$1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^24f^{14}5d^4$**

Write the electron configuration for the following elements. (Use the arrow chart if needed.)

8. Beryllium (**4** electrons): **$1s^22s^2$**

9. Nitrogen (**7** electrons): **$1s^22s^22p^3$**

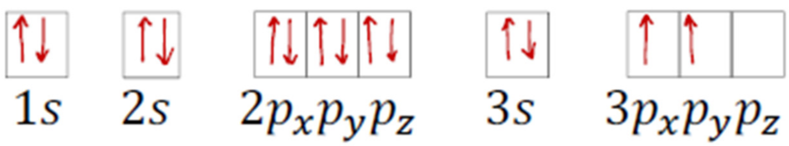
10. Manganese (**25** electrons): **$1s^22s^22p^63s^23p^64s^23d^5$**

11. Zinc (**30** electrons): **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$**

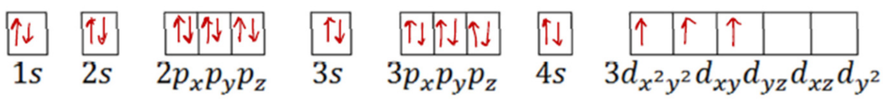
12. Mercury (**80** electrons): **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10}$**

Identify the element for which the electron configuration is shown:

13. $1s^2 2s^2 2p^5$ **Fluorine**
14. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ **Nickel**
15. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$ **Germanium**
16. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1$ **Cesium**
17. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^5$ **Neptunium**

18. 

Silicon



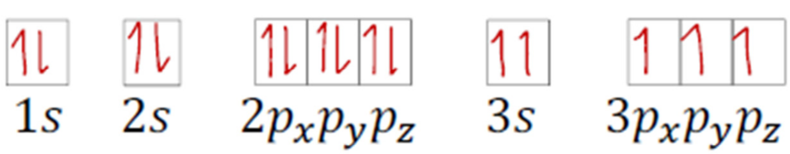
Vanadium

What is wrong with the electron configurations shown below?

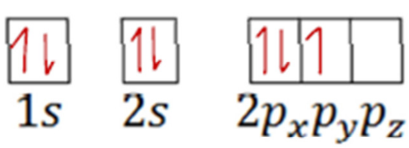
19. $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^8$ **The 3p orbital was not filled before moving on to the 4s. You must fill lower energy orbitals before moving to the next open orbital.**

20. $1s^2 2s^1 2p^6$ **The 2s orbital was not filled before moving on to the 2p. You must fill lower energy orbitals before moving to the next open orbital.**

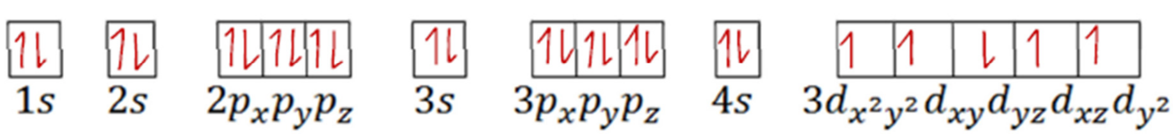
21. $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4p^6 5s^2 4d^{10}$ **The 4s orbital was skipped. You must fill lower energy orbitals before moving to the next open orbital and you cannot skip an orbital.**

22. 

The 3s orbital cannot have 2 electrons with the same spin. Electrons in the same orbital must have opposite spins so that no two electrons in the same atoms have the same set of 4 quantum numbers.

23. 

When filling the 2p orbital, you must put one electron in each box (all with the same spin) before placing a second electron in any box in the 2p orbital.

24. 

When filling the 3d orbital, you must put one electron in each box (all with the same spin) before placing a second electron in any box in the 3d orbital.