

Practice with Electron Configuration and Quantum Numbers

1. Write the quantum numbers for the last electron placed in each of the following elements:

a. Nb at # 41 $5s^2 4d^3$ $\begin{array}{cccccc} & -2 & -1 & 0 & +1 & +2 \\ \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} \end{array}$ $\begin{array}{l} n=4 \\ l=2 \\ m_l=0 \\ m_s=+\frac{1}{2} \end{array}$

b. I $5p^5$ $\begin{array}{ccc} & -1 & 0 & +1 \\ \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} \end{array}$ $\rightarrow 5, 1, 0, -\frac{1}{2}$ $\begin{array}{l} S=0 \\ P=1 \\ d=2 \\ f=3 \end{array}$

c. Kr $4p^6$ $\begin{array}{ccc} & -1 & 0 & +1 \\ \boxed{1} & \boxed{1} & \boxed{1} & \boxed{1} \end{array}$ $\rightarrow 4, 1, +1, -\frac{1}{2}$

d. Ba $6s^2$ $\begin{array}{c} 0 \\ \boxed{1} \\ 6s \end{array}$ $\rightarrow 6, 0, 0, -\frac{1}{2}$

2. How many electrons in an atom of bromine have $m_l = +1$? **7**

Br at # 35 $\begin{array}{cccccccccc} & 0 & & -1 & 0 & +1 & & 0 & & -1 & 0 & +1 & & 0 & & -2 & -1 & 0 & +1 & +2 & & -1 & 0 & +1 \\ \boxed{1} & \boxed{1} \\ 1s & 2s & 2p & 3s & 3p & 4s & 3d & 4p \end{array}$

* only need to draw this

3. Identify the element whose highest energy electron (the last electron placed) would have the following four quantum numbers:

a. $4, 1, -1, +1/2 \rightarrow 4p^1$ Ga

b. $4, 2, -1, +1/2 \rightarrow 4d^2$ Zr

c. $6, 0, 0, -1/2 \rightarrow 6s^2$ Ba

d. $4, 3, +2, -1/2 \rightarrow 4f^3$ Yb

4. Which type of orbital is not possible?
a. 5p b. 6s **c. 2f** d. 4p

1s
2sp
3spd
4spdf

5. Which set of four quantum numbers is not possible?

a. $n=4, l=2, m_l=-1, m_s=+1/2$

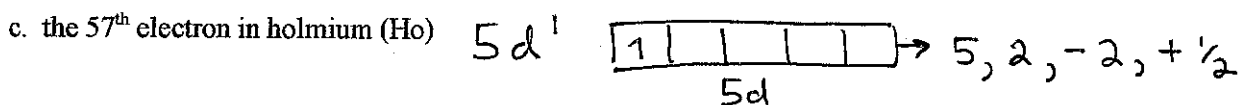
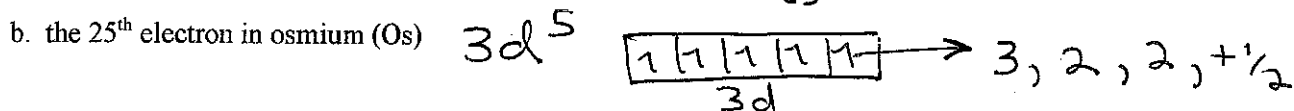
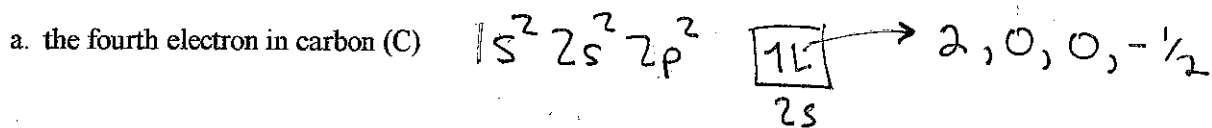
b. $n=2, l=2, m_l=1, m_s=+1/2$

c. $n=3, l=0, m_l=0, m_s=-1/2$

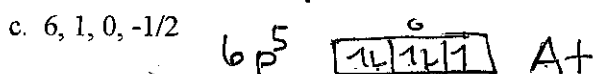
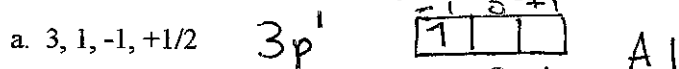
d. $n=5, l=3, m_l=-2, m_s=-1/2$

$\begin{array}{l} S=0 \\ P=1 \\ d=2 \\ f=3 \end{array}$

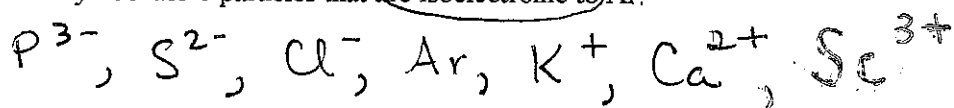
6. Give the four quantum numbers which describe the location of each of the following. You must show part of an orbital diagram for full credit.



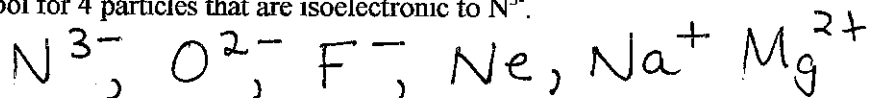
7. Identify the element whose highest energy electron would have the following four quantum numbers:



8. Write the symbol for 6 particles that are isoelectronic to Ar.



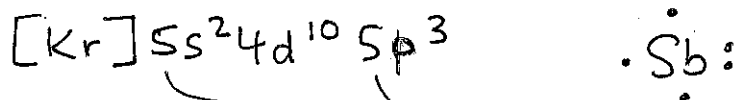
9. Write the symbol for 4 particles that are isoelectronic to N³⁻.



10. For each of the following electron configurations of neutral atoms, determine the name of the element and decide if the configuration as written is in the ground state or the excited state.

- $1s^2 2s^2 2p^6 3s^2 4s^1$ Al, excited
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ V, ground
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^3 5s^1$ V, excited
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 4d^1$ Rb, excited

11. Write the noble gas configuration and the dot structure for antimony (Sb).



12. Write the noble gas configuration for gold (Au).

