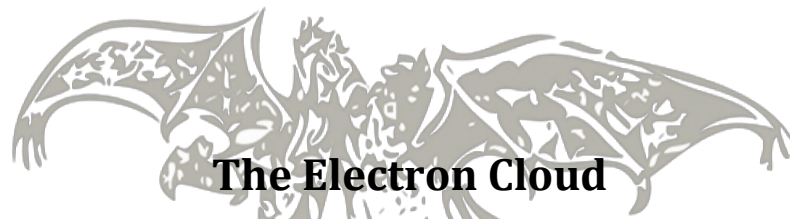


# The Electron Cloud

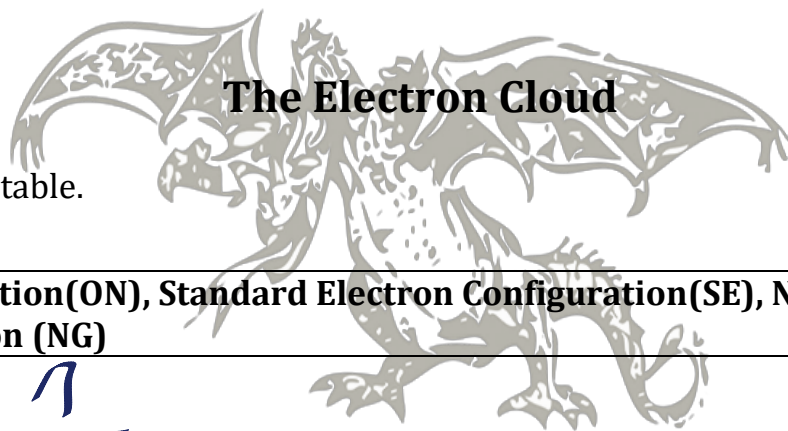
## Guided Practice:

Element	Orbital Notation(ON), Standard Electron Configuration(SE), Noble Gas Configuration (NG)	Quantum Numbers
C	ON: $\begin{array}{ccc} \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow \\ \hline 1s & 2s & 2p \end{array}$	2, 1, 0, $\frac{1}{2}$
	SE: $1s^2 2s^2 2p^2$	
	NG: $[\text{He}] 2s^2 2p^2$	
N	ON: $\begin{array}{ccc} \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow\uparrow \\ \hline 1s & 2s & 2p \end{array}$	2, 1, 1, $\frac{1}{2}$
	SE: $1s^2 2s^2 2p^3$	
	NG: $[\text{He}] 2s^2 2p^3$	
O	ON: $\begin{array}{ccc} \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow\uparrow \\ \hline 1s & 2s & 2p \end{array}$	2, 1, -1, $-\frac{1}{2}$
	SE: $1s^2 2s^2 2p^4$	
	NG: $[\text{He}] 2s^2 2p^4$	
As	ON: $\begin{array}{ccccccc} \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow\uparrow \\ \hline 1s & 2s & 2p & 3s & 3p & 4s & 3d \\ \hline & & & & & & 4p \end{array}$	4, 1, 1, $\frac{1}{2}$
	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$	
	NG: $[\text{Ar}] 4s^2 3d^{10} 4p^3$	
W	ON: $\begin{array}{ccccccc} \uparrow\downarrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow & \uparrow\downarrow & \uparrow\downarrow\uparrow\uparrow\uparrow \\ \hline 1s & 2s & 2p & 3s & 3p & 4s & 3d \\ \hline & & & & & & 4p \\ \hline & & & & & & 5s \\ \hline & & & & & & 4d \\ \hline & & & & & & 5p \\ \hline & & & & & & 6s \\ \hline & & & & & & 4f \\ \hline & & & & & & 5d \end{array}$	5, 2, 1, $\frac{1}{2}$
	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^4$	
	NG: $[\text{Xe}] 6s^2 4f^{14} 5d^4$	



# The Electron Cloud

Element	Orbital Notation(ON), Standard Electron Configuration(SE), Noble Gas Configuration (NG)	Quantum Numbers
B	ON: $\frac{1\downarrow}{1s} \quad \frac{1\downarrow}{2s} \quad \frac{1\downarrow}{2p}$	2, 1, 1, 1/2
	SE: $1s^2 2s^2 2p^1$	
	NG: $[He] 2s^2 2p^1$	
F	ON: $\frac{1\downarrow}{1s} \quad \frac{1\downarrow}{2s} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p}$	2, 1, 0, -1/2
	SE: $1s^2 2s^2 2p^5$	
	NG: $[He] 2s^2 2p^5$	
Co	ON: $\frac{1\downarrow}{1s} \quad \frac{1\downarrow}{2s} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{3s} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{4s} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d}$	3, 2, -1, 1/2
	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$	
	NG: $[Ar] 4s^2 3d^7$	
Br	ON: $\frac{1\downarrow}{1s} \quad \frac{1\downarrow}{2s} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{3s} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{4s} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{4p} \quad \frac{1\downarrow}{4p} \quad \frac{1\downarrow}{4p}$	4, 1, 0, -1/2
	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$	
	NG: $[Ar] 4s^2 3d^{10} 4p^5$	
Cs	ON: $\frac{1\downarrow}{1s} \quad \frac{1\downarrow}{2s} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{2p} \quad \frac{1\downarrow}{3s} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{3p} \quad \frac{1\downarrow}{4s} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{3d} \quad \frac{1\downarrow}{4p} \quad \frac{1\downarrow}{4p} \quad \frac{1\downarrow}{4p} \quad \frac{1\downarrow}{5s} \quad \frac{1\downarrow}{4d} \quad \frac{1\downarrow}{4d} \quad \frac{1\downarrow}{4d} \quad \frac{1\downarrow}{5p} \quad \frac{1\downarrow}{5p} \quad \frac{1\downarrow}{5p} \quad \frac{1\downarrow}{6s}$	6, 0, 0, 1/2
	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^1$	
	NG: $[Xe] 6s^1$	



## The Electron Cloud

### Independent Practice:

Fill in the missing parts of the table.

Element	Orbital Notation(ON), Standard Electron Configuration(SE), Noble Gas Configuration (NG)	Quantum Numbers of last electron
Li	ON: $\overline{1s}^2 \overline{2s}^1$	2,0,0,+1/2
Na	SE: $1s^2 2s^2 2p^6 3s^1$	3,0,0,+1/2
K	NG: $[Ar] 4s^1$	4,0,0,+1/2
F	ON: $\overline{1s}^2 \overline{2s}^2 \overline{2p}^5$	2,1,0,-1/2
Cl	NG: $[Ne] 3s^2 3p^5$	3,1,0,-1/2
Br	NG: $[Ar] 4s^2 3d^{10} 4p^5$	4,1,0,-1/2
Fe	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$	3,2,-2,-1/2
Cu	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$	3,2,1,-1/2
Ni	NG: $[Ar] 4s^2 3d^8$	3,2,0,-1/2
At	SE: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^5$	6,1,0,-1/2



## The Electron Cloud

**These questions are important for understanding the concept of quantum numbers and electron configuration.**

**1.** Consider the Quantum Numbers and electron configurations for lithium, sodium, and potassium; what do they have in common? How do they differ?

**2.** Consider the Quantum Numbers and electron configurations for fluorine, chlorine, and bromine; what do they have in common? How do they differ?

**3.** Consider the Quantum Numbers and electron configurations for zinc, copper, and nickel; what do they have in common? How do they differ?

**4.** Write the quantum numbers for all 4 electrons of Beryllium.

**5.** How many electrons in the electron cloud have the quantum numbers  $n=4$   $l=2$ ?

**6.** How many electrons in an atom of Zirconium will have the quantum numbers  $n=4$   $l=2$ ?