

Electron Orbital Diagram of Subshell/Orbital

The quantum numbers are used to describe completely the movement and trajectories of each electron within an atom. Meaning, it helps narrow the position of an electron within an atom.

- The principal quantum number, n , designates the principal electron shell. Basically, it points out the location of an electron on the rows of the periodic table.

$$n=1,2,3,4\dots$$

- The orbital angular momentum quantum number l determines the shape of an orbital, and, therefore, the angular distribution. Each value of l indicates a specific s, p, d, f subshell (each unique in shape).

$$l=0,1,2,3,4\dots,(n-1)$$

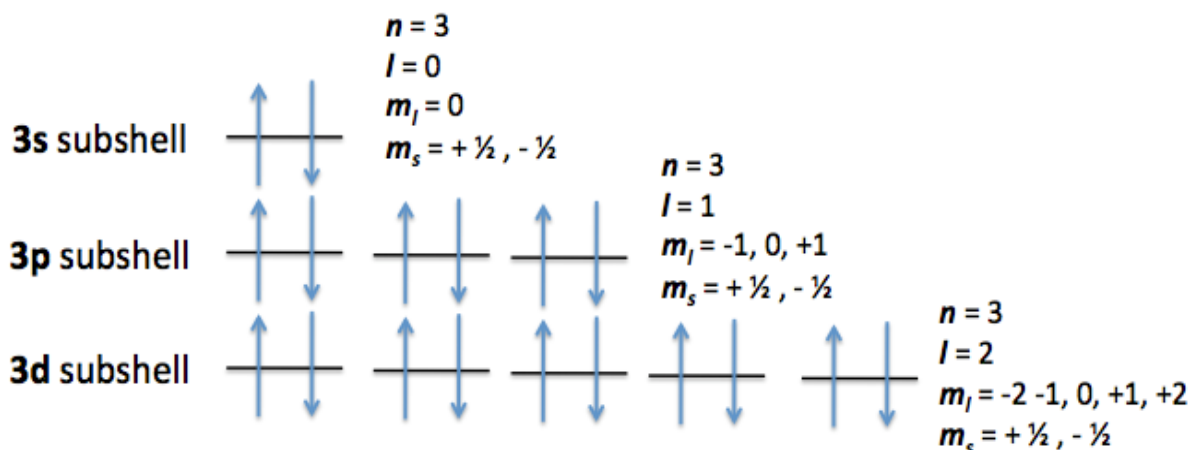
- The magnetic quantum number m_l determines the number of orbitals and their orientation within a subshell. Consequently, its value depends on the orbital angular momentum quantum number l . Given a certain l , m_l is an interval ranging from $-l$ to $+l$, so it can be zero, a negative integer, or a positive integer.

$$m_l = -l, (-l+1), (-l+2), \dots, -2, -1, 0, 1, 2, \dots, (l-1), (l-2), +l$$

- Unlike n , l , and m_l , the electron spin quantum number m_s does not depend on another quantum number. It designates the direction of the electron spin and may have a spin of $+1/2$, represented by \uparrow , or $-1/2$, represented by \downarrow . This means that when m_s is positive, the electron has an upward spin. When it is negative, the electron has a downward spin.

Example:

Electron Orbital Diagram of subshell/orbital combinations when $n = 3$



- The value of l indicates s, p, or d subshell.
- Each black line represents one orbital (value count of m_l .)
- The direction of the arrows represent m_s

References

“Quantum Numbers.” *Physical and Theoretical Chemistry*. Chemistry. *LibreTexts*. Accessed Mar. 9, 2018. https://chem.libretexts.org/Core/Physical_and_Theoretical_Chemistry/Quantum_Mechanics/10%3A_Multi-electron_Atoms/Quantum_Numbers. *

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