Atomic Orbitals and Quantum Numbers

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| --- | --- | --- | --- | --- |
| Symbol | Name | Describes | Organizational Level | Possible Values |
| *n* | Principal QN | Size | Shell | 1 to ∞ |
| *l* | Azimuthal QN | Shape | Subshell | 0 to *n*-1  (*s* = 0, *p* = 1, *d* = 2, *f* = 3) |
| *ml* | Magnetic QN | Orientation | Orbital | -*l*  to *l* |
| *ms* | Spin QN | Spin | - | 土½ |

Molecular Orbitals

* Bonding orbital (head to head, or tail-to-tail overlap of atomic orbitals of the same sign, energetically favorable)
* Anti-bonding orbital (opposite signs, energetically unfavorable)
* Single bond = one sigma bond
* Double bonds = one σ bond + one π bond (1 pair of unhybridized side-by-side p-orbitals)
* Triple bonds = one σ bond + 2 π bonds (2 pairs of unhybridized side-by-side p-orbitals)
* Triple bond > double bond > σ bond > π bond

Hybridization

* sp is 50% s character, 50% p character
* Depends on how many substituents bonded
  + For example, CH4 is sp3-hybridized because s(1) + p(3) = 4 → 4 H substituents
  + Lone pair is considered a substituent
  + Double bond is considered two substituents
* Resonance