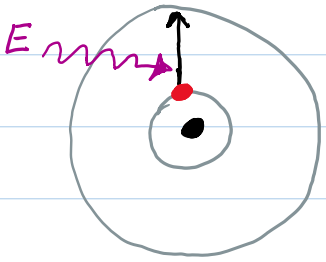
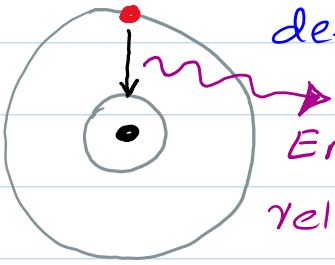
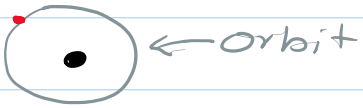
Absorption of energy and excitation



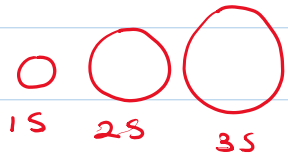
Emission and de-excitation



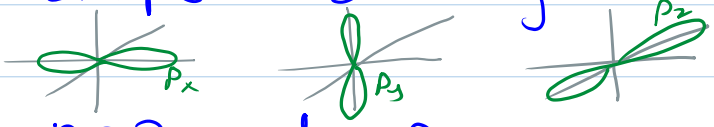
- Orbit: Path electron revolves (shell / energy level / n)



- orbital: Electron's probable location in space. (electron density distribution) (subshell / sublevel)
  - → S orbitals : spherical e⁻ density, $l = 0$, Found in all n levels

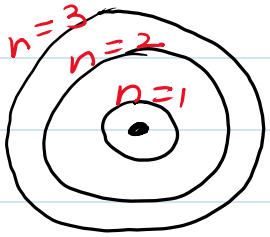


  - → p orbitals : Dumbbell shape e⁻ density, $l = 1$, Found in $n = 2$ and up



    Degenerate (3 orbitals with equal energy)
  - → d orbitals : Complex shapes, $l = 2$, Found in $n = 3$ and up.
    Degenerate (5 orbitals with equal energy)
  - → f orbitals : Complex shapes, $l = 3$, Found in $n = 4$ and up.
    Degenerate (7 orbitals with equal energy)

Quantum numbers: A set of numbers used to describe position and energy of electrons



→ Principal Q.n. (n)
Defines main energy level / shell

→ Angular momentum (Azimuthal) Q.n (l)
Defines shape of orbital $l=0$, s $l=1$, p
l values = 0 to $(n-1)$ $l=2$, d $l=3$, f

→ Magnetic Q.n. (m_l)
Describe orientation of orbitals
$m_l = -l \; 0 \; +l$

s | 0 |

p | -1 | 0 | +1 |

d | -2 | -1 | 0 | +1 | +2 |

f | -3 | -2 | -1 | 0 | +1 | +2 | +3 |

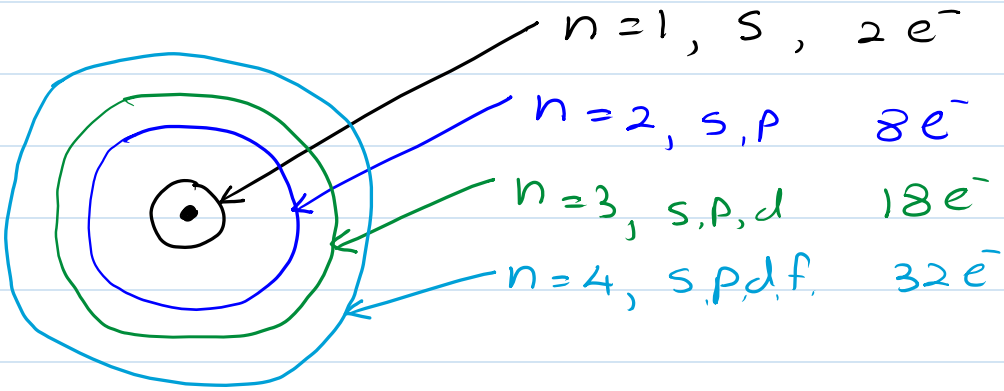
→ Spin Q.n (m_s)
Describe intrinsic angular momentum
$m_s = +\frac{1}{2}$ or $-\frac{1}{2}$ 1↓

- One orbital can hold a maximum of $2e^-$ 1↓
- Pauli Exclusion principle (Spin opposite)
$2e^-$ can not have same 4 Q.n

Hund's rule (single occupancy)

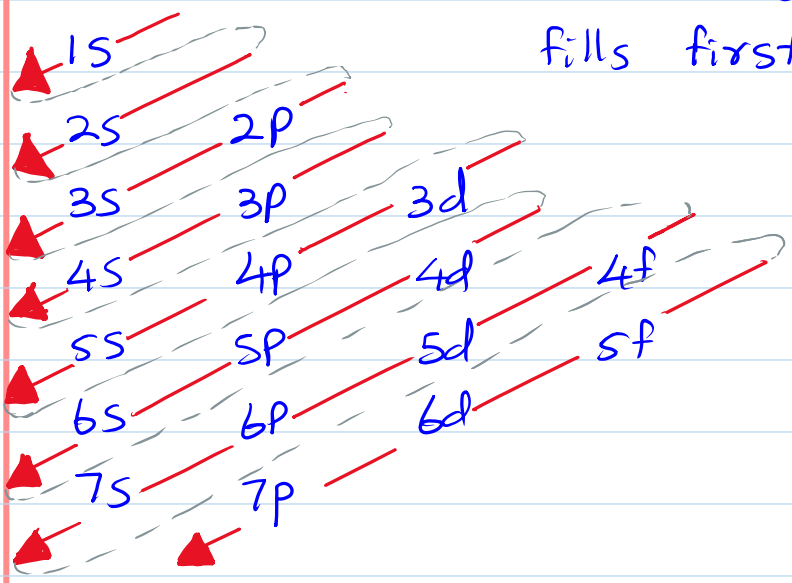
For degenerate orbitals, the lowest energy is attained when the number of e^- having same spin is maximized.

level n	sub level l $0 \to (n-1)$		m_l $(-l \; 0 \; +l)$	# of Orbitals in sublevel	Total # of orbitals in a n Level (n^2)	Total # of e^- $2n^2$
1	0	s	0	1	1	2
2	0	s	0	1	4	8
	1	p	-1 0 +1	3		
3	0	s	0	1		
	1	p	-1 0 +1	3	9	18
	2	d	-2 -1 0 +1 +2	5		
4	0		0	1		
	1		-1 0 +1	3	16	32
	2		-2 -1 0 +1 +2	5		
	3		-3 -2 -1 0 +1 +2 +3	7		



Aufbau Principle

Subshells of lowest energy fills first.



Consider
- Pauli Exclusion Principle
- Hund's rule

Electron configuration

H $1s^1$ ← number of e^- in the orbital
↑ level/shell
← orbital

He $1s^2$

Li $1s^2\ 2s^1$ (underbrace $1s^2$ = [He])

Also [He] $2s^1$ — core e^- / valence/outer shell e^-

condensed e^- configuration

- Anomalies in the filling order

Ex: Cr [Ar] $3d^5\ 4s^1$ not [Ar] $3d^4\ 4s^2$

Cu [Ar] $3d^{10}\ 4s^1$ not [Ar] $3d^9\ 4s^2$

Precisely half filled orbitals result in some stability