(n+l) 4f 5d

ELECTRONIC CONFIGURATION

DEFINITIONS:- "The knowledge about the distribution of electrons in various energy shells, subshells and orbitals in an atom in the ground state is known as electronic configuration"

OR

"The distribution of e⁻s in different orbitals is known as electronic configuration of the atom"

AUFBAU PRINCIPLE

* Aufbau is a German word which means construction or build up.
* This principle is not based upon scientist name.
* "In the ground state of the atoms, the orbitals are filled, in order of their increasing energies."
* Order in which e⁻s can be filled is given as -

1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s 4f 5d .....

* The energy of an orbital is determined by the quantum numbers n & l with the help of important rule known as (n+l) rule or Bohr Bury's rule.

According to this -

(1) Orbitals are filled in order of increasing value of (n+l)

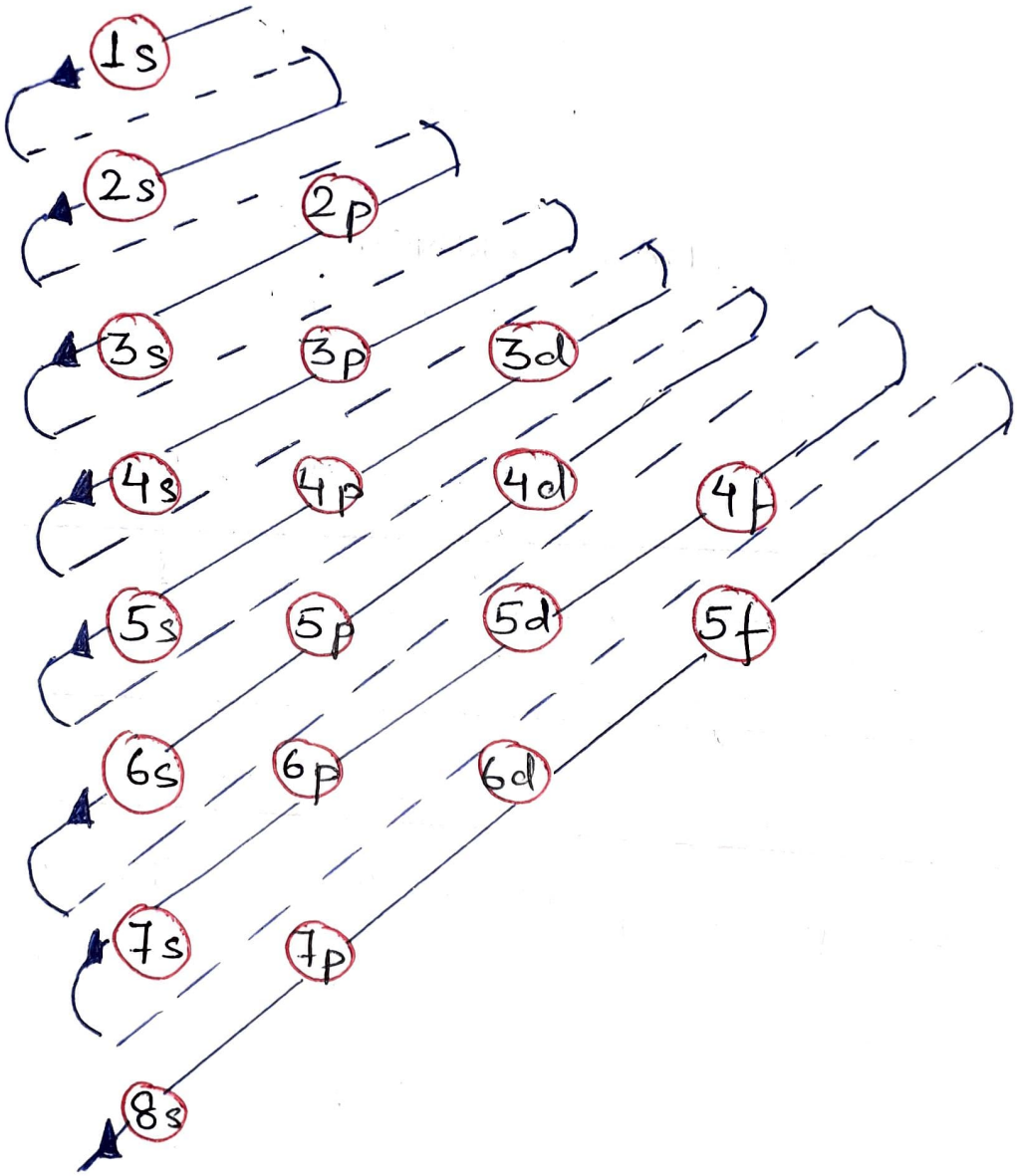
(2) If (n+l) is equal then orbital with lower value of n will be filled first.

for eg:- ① 3s (n+l = 3+0=3) possesses lower energy than 3p (n+l = 3+1=4)

② 2p (n+l=2+1=3) & 3s (n+l=3+0=3) have same

(n+l) value but 2p orbital has lower value of n & therefore is lower in energy than 3s - orbital.

Sequence of energy level – Systematic diagram



Exception of Aufbau principle

* In a single e^- system we can't apply Aufbau principle.

  Eg:- H atom, He^+, Li^{+++}

* A/c to single e^- system energy can be shown on the basis of 'n'.

$$\text{Energy} \propto n$$

HUND'S RULE OF MAXIMUM MULTIPLICITY

"According to this rule, electron pairing will not take place in orbitals of same energy (same sub-shell) until each orbital is first singly filled with parallel spins."

ELECTRONIC CONFIGURATION OF ATOMS.

At. No(Z)	ELEMENTS	ELECTRONIC CONFN.
1	Hydrogen(H)	$1s^1$
2	Helium(He)	$1s^2$
3	Lithium(Li)	$1s^2\ 2s^1$
4	Beryllium(Be)	$1s^2\ 2s^2$
5	Boron (B)	$1s^2\ 2s^2\ 2p^1$
6	Carbon (C)	$1s^2\ 2s^2\ 2p^2$
7	Nitrogen(N)	$1s^2\ 2s^2\ 2p^3$
8	Oxygen (O)	$1s^2\ 2s^2\ 2p^4$
9	Fluorine(F)	$1s^2\ 2s^2\ 2p^5$
10	Neon (Ne)	$1s^2\ 2s^2\ 2p^6$
11	Sodium (Na)	$1s^2\ 2s^2\ 2p^6\ 3s^1$
12	Magnesium (Mg)	$1s^2\ 2s^2\ 2p^6\ 3s^2$
13	Aluminium (Al)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$
14	Silicon (Si)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^2$
15	Phosphorous (P)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
16	Sulphur (S)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
17	Chlorine (Cl)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
18	Argon (Ar)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
19	Potassium(K)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
20	Calcium. (Ca).	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$

ELECTRONIC CONFIGURATION OF ATOMS. (Sc — Zn):

ATOMIC NO (Z)	ELEMENT	ELECTRONIC CONFIGURATION
21	Scandium (Sc)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^1$ 
22	Titanium (Ti)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^2$ 
23	Vanadium (V)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^3$ 
24	Chromium (Cr)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$ 
25	Manganese (Mn)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^5$ 
26	Iron (Fe)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^6$ 
27	Cobalt (Co)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^7$ 
28	Nickel (Ni)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^8$ 
29	Copper (Cu)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^{10}$ 
30	Zinc (Zn)	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}$ 

ELECTRONIC CONFIGURATION OF IONS.

ELEMENTS	ELECTRONIC CONFIGURATION	NO. OF UNPAIRED e⁻S	MAGNETIC BEHAVIOR
H^+	$1s^0$ ☐	0	
Na^+	$1s^2 2s^2 2p^6$ ⇅ ⇅ ⇅ ⇅ ⇅	0	Diamagnetic
F^-	$1s^2 2s^2 2p^6$ ⇅ ⇅ ⇅ ⇅ ⇅	0	Diamagnetic
Li^{2+}	$1s^1$ ↑	1	Paramagnetic
Be^{3+}	$1s^1$ ↑	1	Paramagnetic
O^{2-}	$1s^2 2s^2 2p^6$ ⇅ ⇅ ⇅ ⇅ ⇅	0	Diamagnetic
N^{3-}	$1s^2 2s^2 2p^6$ ⇅ ⇅ ⇅ ⇅ ⇅	0	Diamagnetic
Cl^-	$1s^2 2s^2 2p^6 3s^2 3p^6$	0	Diamagnetic
K^+	$1s^2 2s^2 2p^6 3s^2 3p^6$	0	"
H^-	$1s^2$	0	"
P^{3-}	$1s^2 2s^2 2p^6 3s^2 3p^6$	0	"
Mg^{2+}	$1s^2 2s^2 2p^6$ ~~$3s^2$ $3p^6$~~	0	"
S^{2-}	$1s^2 2s^2 2p^6 3s^2 3p^6$	0	"
Sc^{2+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$	1	Paramagnetic
Ti^{3+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$	1	"
Ti^{4+}	$1s^2 2s^2 2p^6 3s^2 3p^6$	0	Diamagnetic
V^{3+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^2$	2	Paramagnetic
Cr^{3+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^3$	3	"
Mn^{2+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$	5	"
Mn^{3+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$	4	"
Fe^{2+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$	4	"
Fe^{3+}	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$	5	"