

4.1 Position in the Periodic Table

H																He	
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg						
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn						

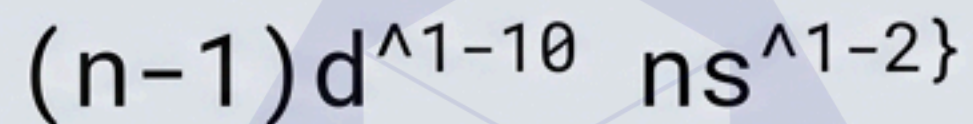
Mapping the Transition and Inner Transition Elements

La	Ce	Pr	Nd	Pm	Eu	Gd	Tb	Dy	
Ac	Th	Pa	U	Np	Pu	Cm	Bk	Cf	

Mapping the Transition and Inner Transition Elements:
An architectural breakdown of Groups 3-12 and the f-block panel.

The d-Block: Core Architecture & IUPAC Definition

Electronic Configuration



The penultimate (n-1) energy level receives electrons.

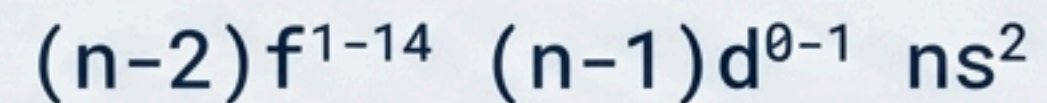
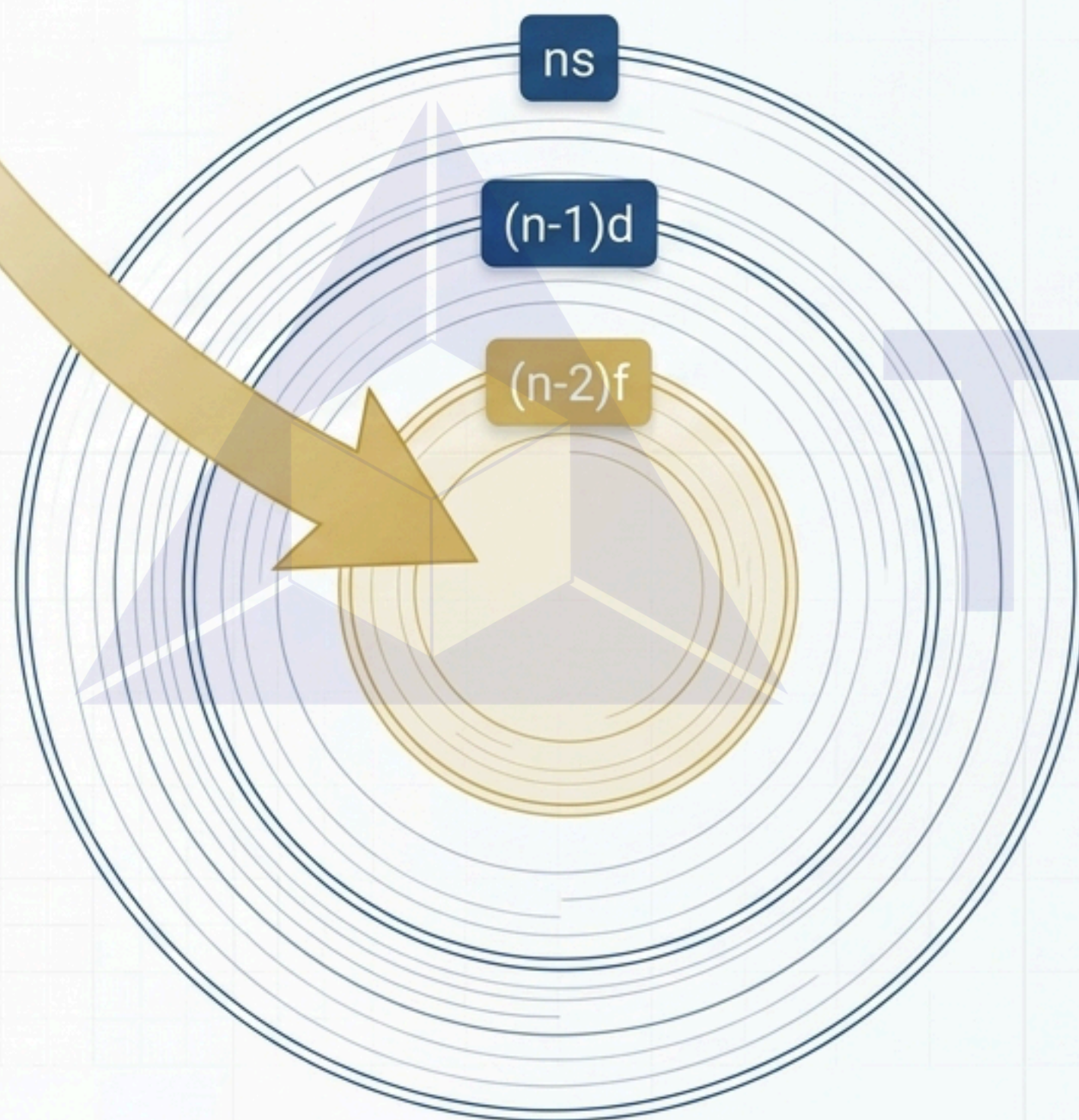
Exception Pd: $4d^{10} 5s^0$

✓ IUPAC Definition

Transition metals are defined as metals which have an incomplete d subshell in either a neutral atom or in their ions.

Note: Originally named transition because their chemical properties transition between the highly electropositive s-block and electronegative p-block.

The *f*-Block: Inner Transition Elements



Positioned in a separate panel at the bottom of the periodic table.

These elements involve the progressive filling of the deeply buried 4f and 5f orbitals, placing them inside the transition framework.



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Mapping the Four Transition Series

3d Series

Sc (Z=21)

100%

Zn (Z=30)

4d Series

Y (Z=39)

80%

Cd (Z=48)

5d Series

La (Z=57)

60%

Hf (Z=72)

Hg (Z=80)

f-block gap

6d Series

Ac (Z=89)

40%

Rf (Z=104)

Cn (Z=112)

f-block gap

The Inner Transition Series: 4f vs 5f

Lanthanoids

4f Series (Ce to Lu)



Follows Lanthanum (La)

- Silvery white soft metals, closely resembling one another.
- Exhibit one primarily stable oxidation state (+3).

Actinoids

5f Series (Th to Lr)



Follows Actinium (Ac)

- All members are radioactive.
- Chemistry is vastly more complicated due to a wide range of oxidation states.
- Short half-lives for heavier members.

Diagnostic Comparison: d-Block vs. f-Block

Feature	d-Block (Transition)	f-Block (Inner Transition)
Position	Large middle section (Groups 3-12)	Separate bottom panel
Orbital Filling	Penultimate shell (n-1)d	Pre-penultimate shell (n-2)f
Series Types	3d, 4d, 5d, 6d	Lanthanoids (4f), Actinoids (5f)
Chemical Behavior	Highly variable between individual elements	Lanthanoids highly similar; Actinoids highly radioactive

Exam Strategy: Mnemonics & NEET Traps

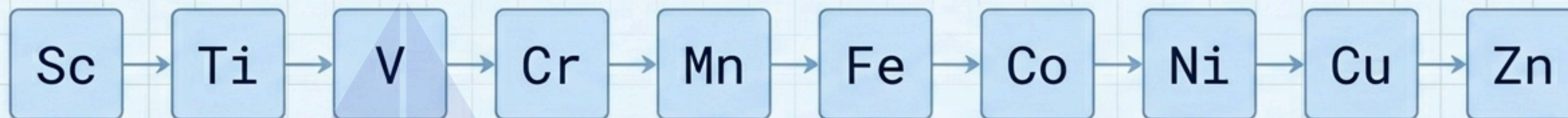
Science Teacher Very Cruel

Mange Fee

Copy Nikale

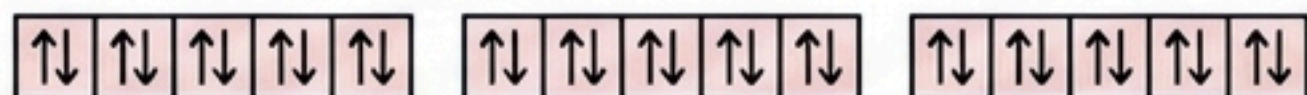
Cu

Zaan



! The Definition Trap

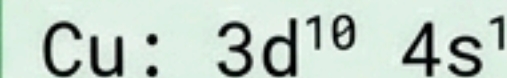
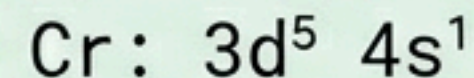
Zn, Cd, and Hg are NOT considered transition metals.



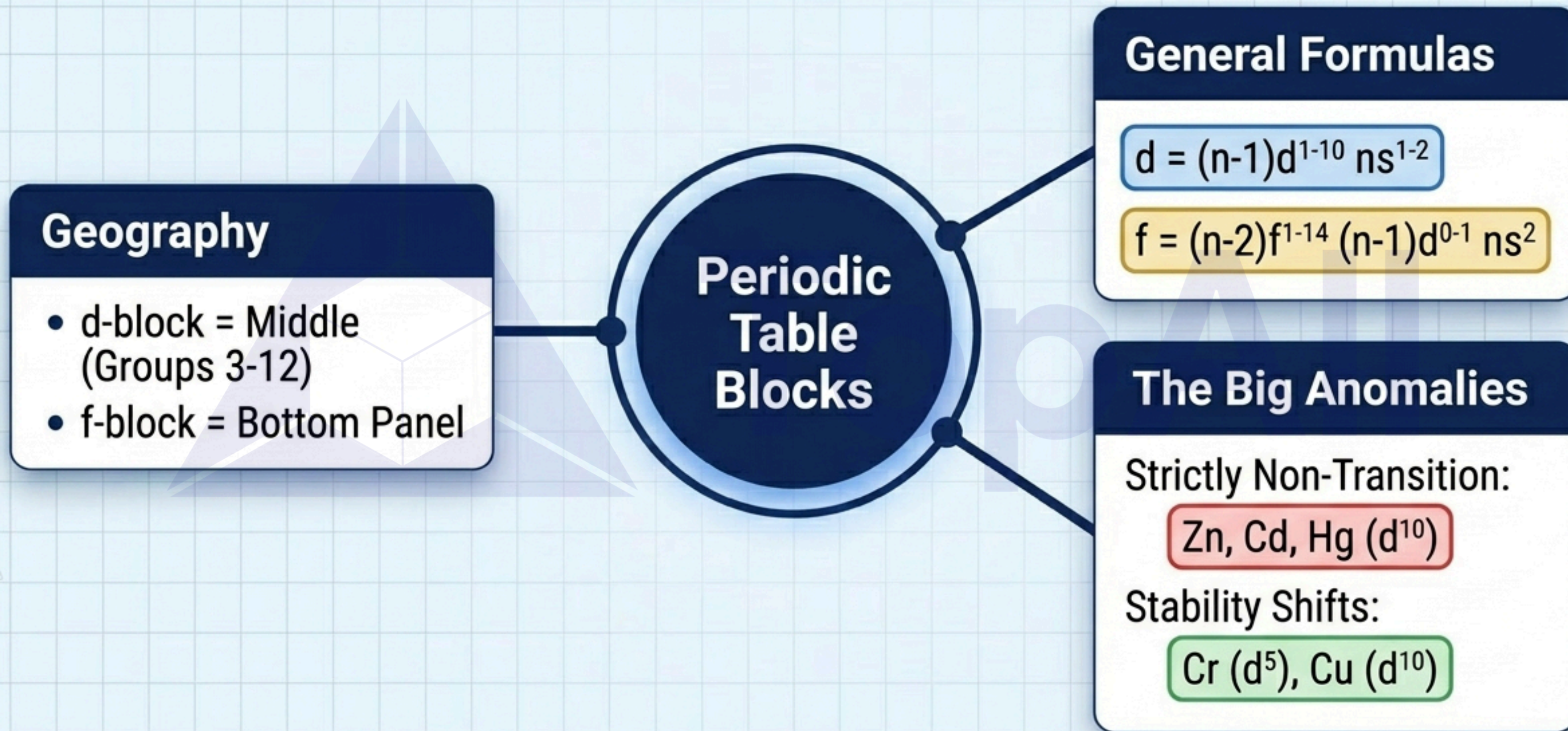
Full d^{10} ground state

✓ The Stability Exceptions

Half-filled and fully-filled orbitals provide extra thermodynamic stability.



Quick Revision: Block Positions at a Glance



Mastering these positions unlocks oxidation states, enthalpies, and coordination chemistry.



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