

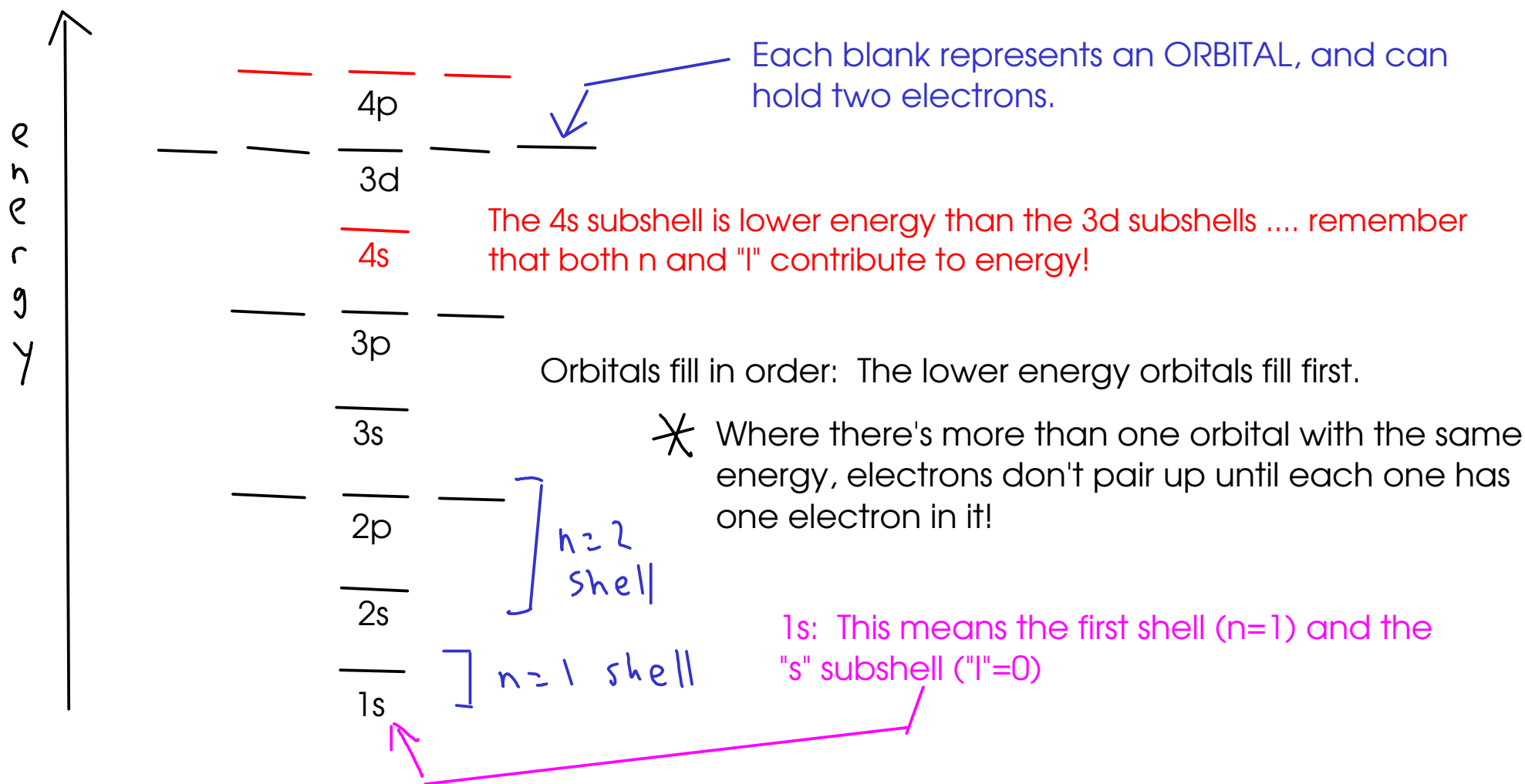
④ (MAGNETIC) SPIN QUANTUM NUMBER: m_s

$$m_s = -\frac{1}{2} \text{ OR } +\frac{1}{2} \quad \text{"spin down" or "spin up"}$$

- An ORBITAL (region with fixed "n", "l" and "ml" values) can hold TWO electrons.

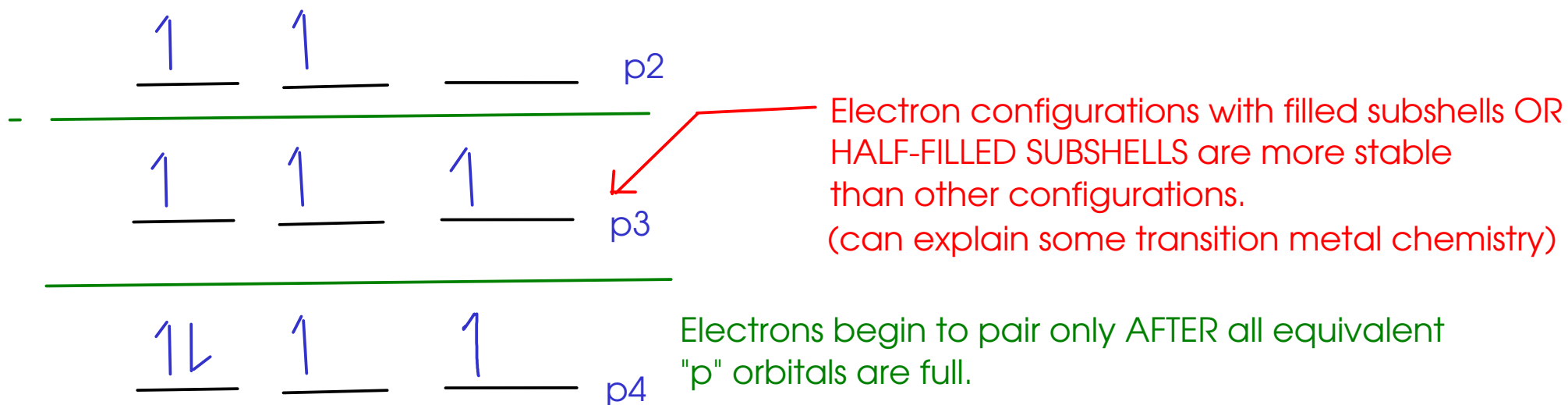
ORBITAL DIAGRAM

- A graphical representation of the quantum number "map" of electrons around an atom.



Hund's Rule

- When you have two or more orbitals with equivalent energy, electrons will go into each equivalent orbital BEFORE pairing. Pairing costs a bit of energy - less than going to a higher-energy orbital, but more than going to another equivalent orbital.

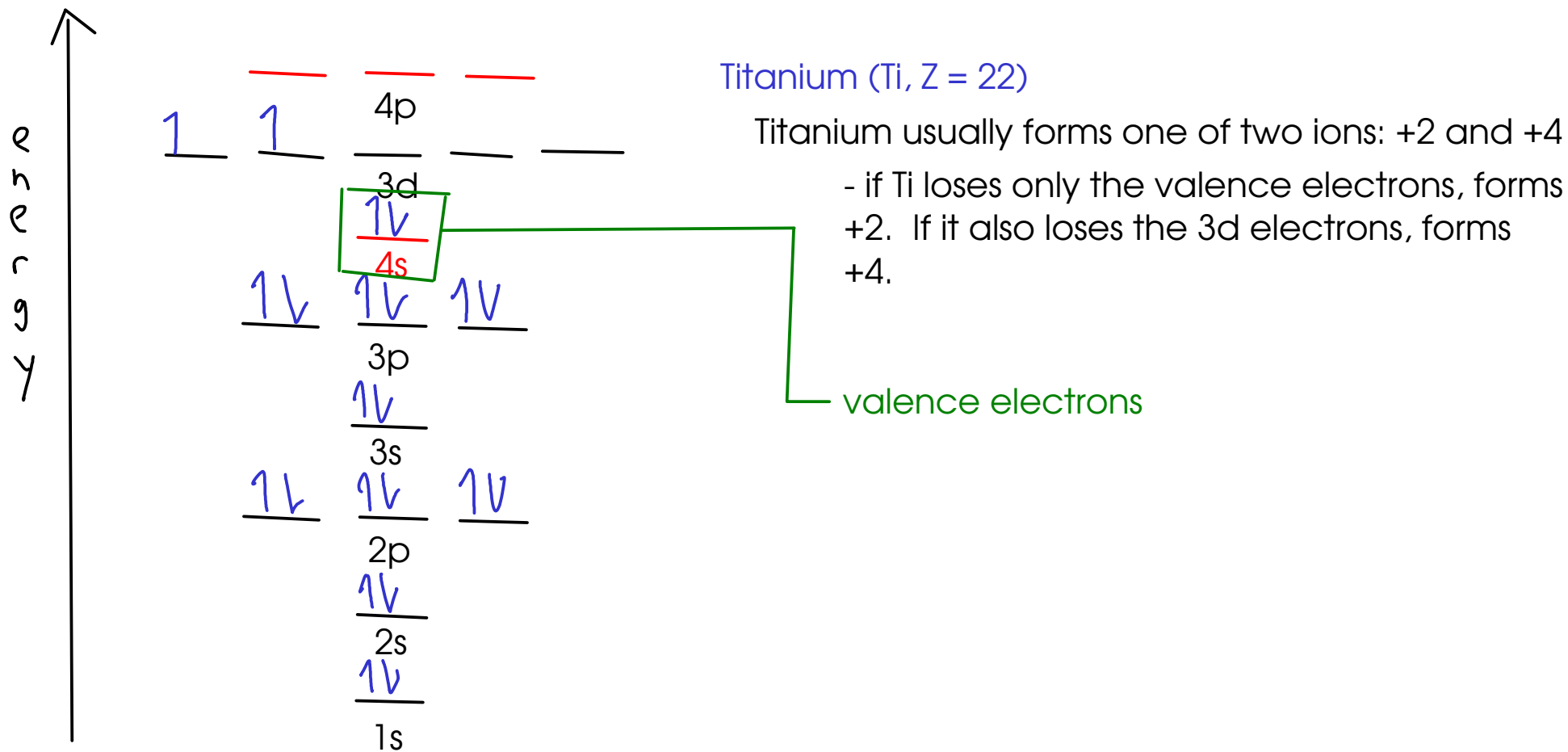


Experimental evidence for Hund's rule:

"Paramagnetism" - attraction of an atom to a magnetic field

- ✖ Spinning electrons are magnetic, but OPPOSITE spins cancel each other out.
- * Atoms with unpaired electrons are paramagnetic, while atoms containing only paired electrons are not.

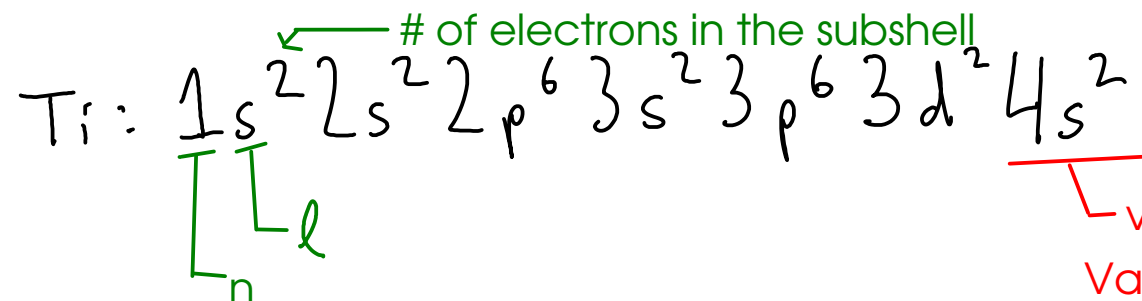
A little bit about transition metals...



- Most transition metals have TWO valence electrons (in an "s" subshell), and the other ions they form come from electron loss in "d" subshells.

ELECTRON CONFIGURATION (SHORT FORM)

- We can represent the electron configuration without drawing a diagram or writing down pages of quantum numbers every time. We write the "electron configuration".



valence electrons

Valence electrons have the largest value for "n"!



valence electrons

"noble gas core". We're saying that titanium has the same electron configuration as argon does, with the addition of the electrons that follow. This is a useful shorthand, since the "core" electrons generally don't get involved in bonding.

ELECTRON CONFIGURATION AND THE PERIODIC TABLE

IA												VIII A					
IIA												VIII A					
H	He																
Li	Be											B	C	N	O	F	Ne
Na	Mg	III B	IV B	V B	V I B	V II B	V III B	I B	I I B								
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	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac*	Rf	Db	Sg	Bh	Hs	Mt	*"inner" transition metals go here								

"s" block: last electron in these atoms is in an "s" orbital!

"p" block: last electron in these atoms is in a "p" orbital!

"d" block: last electron in these atoms is in a "d" orbital

- To write an electron configuration using the periodic table, start at hydrogen, and count up the electrons until you reach your element!

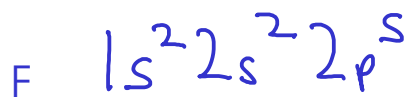
1	IA H											VIIIA He						
2	Li	IIA Be											III A B	IV A C	V A N	VIA O	VII A F	VIIIA Ne
3	Na	Mg	IIIB	IVB	VB	VIB	VIIB	VIIIB	IB	IIB	Al	Si	P	S	Cl	Ar		
4	K _{4s}	Ca	Sc _{3d}	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga _{4p}	Ge	As	Se	Br	Kr
5	Rb	Sr	Y _{4d}	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	La _{5d}	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	Ac _{6d}	Rf	Db	Sg	Bh	Hs	Mt	*"inner" transition metals go here								

"d" block: The d block is shifted DOWN.!

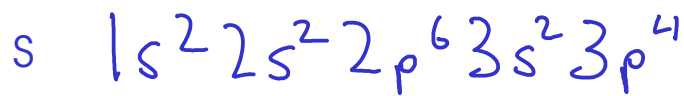
Example: Phosphorus (P): $1s^2 2s^2 2p^6 3s^2 3p^3$

Noble gas core notation for P: $[Ne] 3s^2 3p^3$

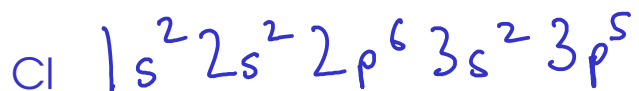
EXAMPLES:



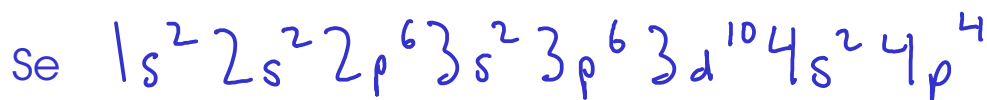
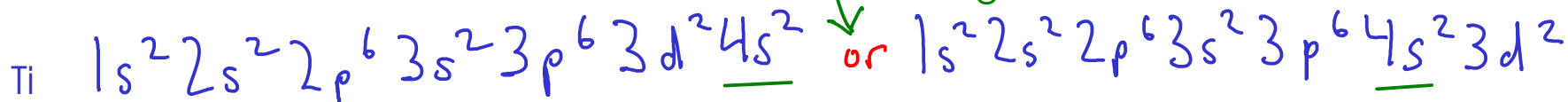
Remember - valence electrons are ALL of the electrons in the outermost SHELL (n)! More than one subshell (l) may be included in the valence electrons



TITANIUM is a transition metal that commonly forms either +2 or +4 cations. The 4s electrons are lost when the +2 ion forms, while the 4s AND 3d electrons are lost to form the +4!



You can order the subshells in numeric order OR in filling order



Noble gas core notation. Use the previous noble gas on the table, then add the electrons that it doesn't have to the end.



Sample f-block element

