

Electron configurations to describe and communicate the arrangement of electrons around the nucleus of atoms.

Steps for determining electron configurations:

1. Identify how many electrons are in the atom or in ion.

Example: Carbon has 6 electrons, Al^{3+} has 10 electrons.

2. Determine the principal energy level (n) of the atom

$n = 2$ for carbon (it is in the second period), $n=3$ aluminum (it is in the third period).

3. Determine the number of sublevels.

- For the principal energy level (n) there are sublevels ($l = 0, 1, 2, 3, n-1$).
- Example: for $n = 4$, $l = 0, 1, 2, 3$
- Each sublevel has a letter name as:

$l = 0$	$l = 1$	$l = 2$	$l = 3$	$l = 4$
S	P	d	f	g

- Maximum electrons in each subshell:

S	P	d	f	g
2	6	10	14	18

4. Assign electrons to the sublevels as: $nl^{\#e}$ follow the order of the subshells (aufbau rule = building-up principle) in the periodic table: **Move from top to the bottom periods (rows) in order & from left to right of each period (row).**

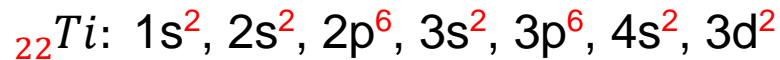
Aufbau Periodic Table																		
n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1S																	1S
2	2S													2p				
3	3S													3p				
4	4S							3d						4p				
5	5S							4d						5p				
6	6S	4f						5d						6p				
7	7S	5f						6d										

In order as: 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p...

- $1s$ will be filled first, with the maximum of 2 electrons.
- $2s$ will be filled next, with the maximum of 2 electrons.
- $2p$ will be filled next, with the maximum of 6 electrons.
- *Continue until no any electrons left.*

Example: write electron configuration for titanium (Ti) atom.

- Look at the periodic table, atomic number is 22. (For a normal atom, atomic number gives number of electrons).
- Follow the subshells order (aufbau rule):
n = 22



Also, an abbreviated method for electron configurations is to use the [Core Electrons](#) (Noble Gas Core) for presentation of electron configuration:

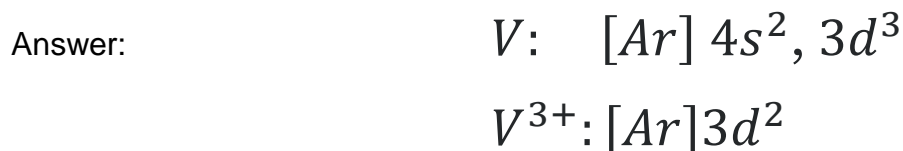
- Choose the nearest noble gas to the element in your question.
- Use square brackets [] around the chemical symbol of the noble gas.
- Continue to write remaining subshell after the noble gas core.

An Example: [Write electron configuration for potassium atom.](#)

Solution:

- The nearest noble gas element to the potassium is argon (Ar).
- The electron configuration for argon is:
Ar: $1s^2 2s^2 2p^6 3s^2 3p^6$
- The electron configuration for potassium is:
K: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
- As we see Potassium has an [argon core](#) plus $4s^1$
- The abbreviated electron configuration for potassium is:
K: $[\text{Ar}] 4s^1$

An Example: [Write electron configurations for vanadium atom and vanadium ion \(\$V^{3+}\$ \).](#)



Special rule:

In general, electrons are removed from the valence-shell **s orbitals** before they are removed from valence **d orbitals** when transition metals are ionized.