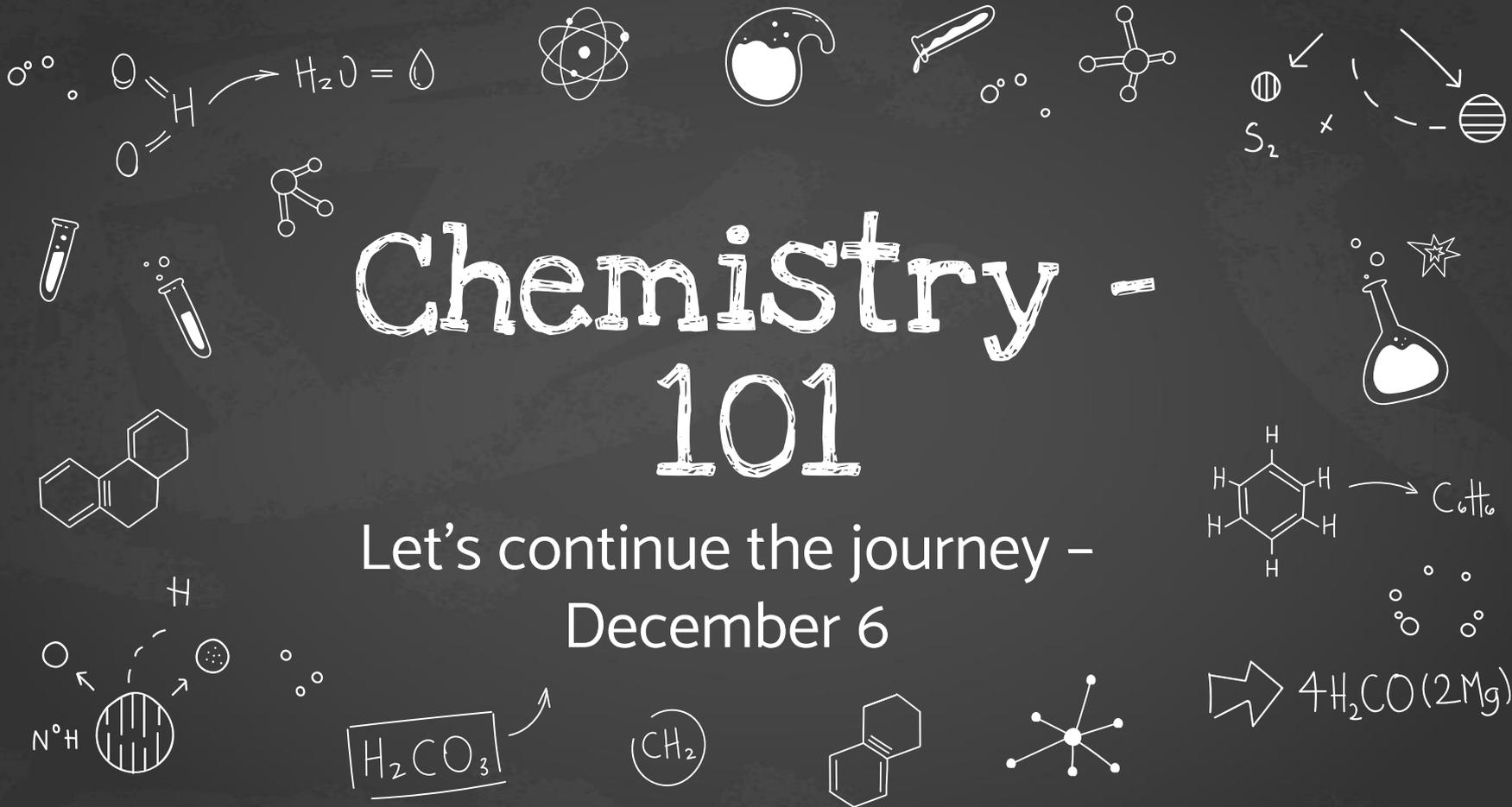


# Chemistry - 101

Let's continue the journey -  
December 6

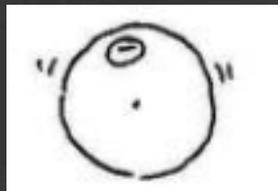


# Atoms' electron configurations and the periodic law of elements

Periodic Table of Elements

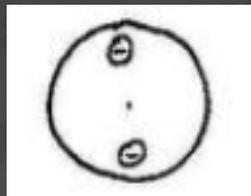
- The chemical properties of elements are defined by their outer shells (valence electrons are responsible for bond formation with other atoms)
- Let's look at the outer shells of different atoms with increasing number of electrons and select similar ones.

1. Hydrogen, H



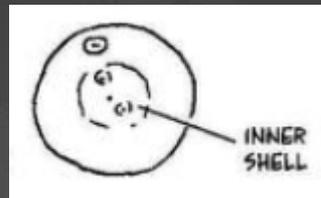
$1s^1$

2. Helium, He



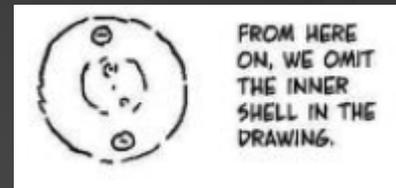
$1s^2$

3. Lithium, Li



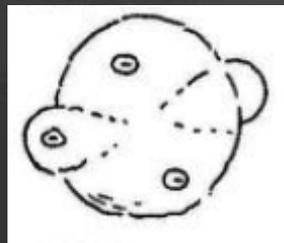
$1s^2 2s^1$

4. Beryllium, Be



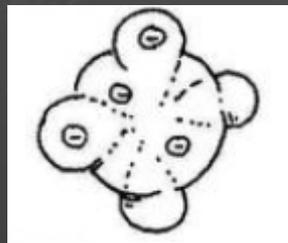
$1s^2 2s^2$

5. Boron, B



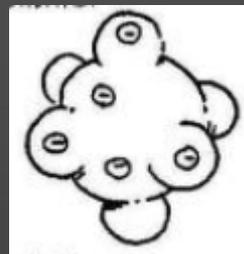
$1s^2 2s^2 2p^1$

6. Carbon, C



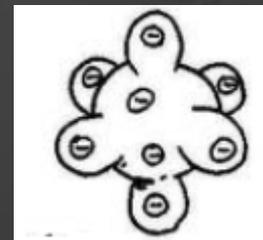
$1s^2 2s^2 2p^2$

7. Nitrogen, N



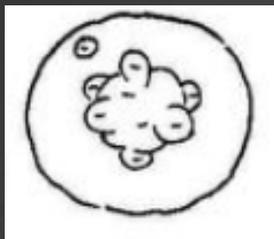
$1s^2 2s^2 2p^3$

... 10. Neon, Ne



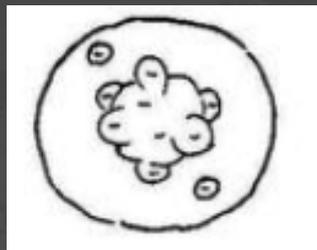
$1s^2 2s^2 2p^6$

11. Sodium, Na



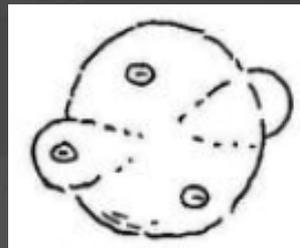
$\text{Ne}3s^1$

12. Magnesium, Mg



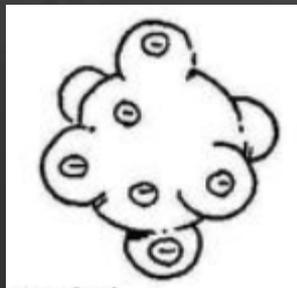
$\text{Ne}3s^2$

13. Aluminum, Al



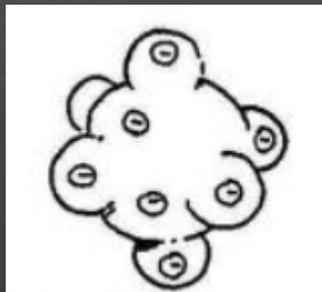
$\text{Ne}3s^2 3p^1$

16. Sulfur, S



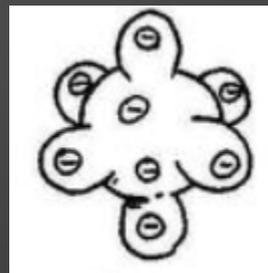
$\text{Ne}3s^2 3p^4$

17. Chlorine, Cl



$\text{Ne}3s^2 3p^5$

18. Argon, Ar



$\text{Ne}3s^2 3p^6$

...  
These elements look like "Big sisters" to the elements on the previous slide, their outer shells of valent electrons are identical

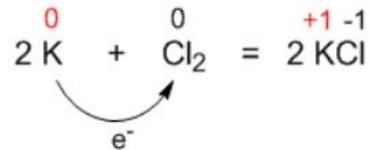
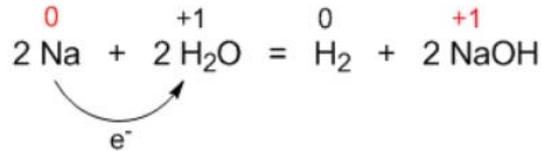
Element	Charge of the nuclei	Outer shell
H	1	...1s <sup>1</sup>
Li	3	...2s <sup>1</sup>
Na	11	...3s <sup>1</sup>
K	19	...4s <sup>1</sup>
Rb	37	...5s <sup>1</sup>
Cs	55	...6s <sup>1</sup>
Fr	87	...7s <sup>1</sup>

These elements have similar chemical properties:

Valence 1

Electron donors → reducers

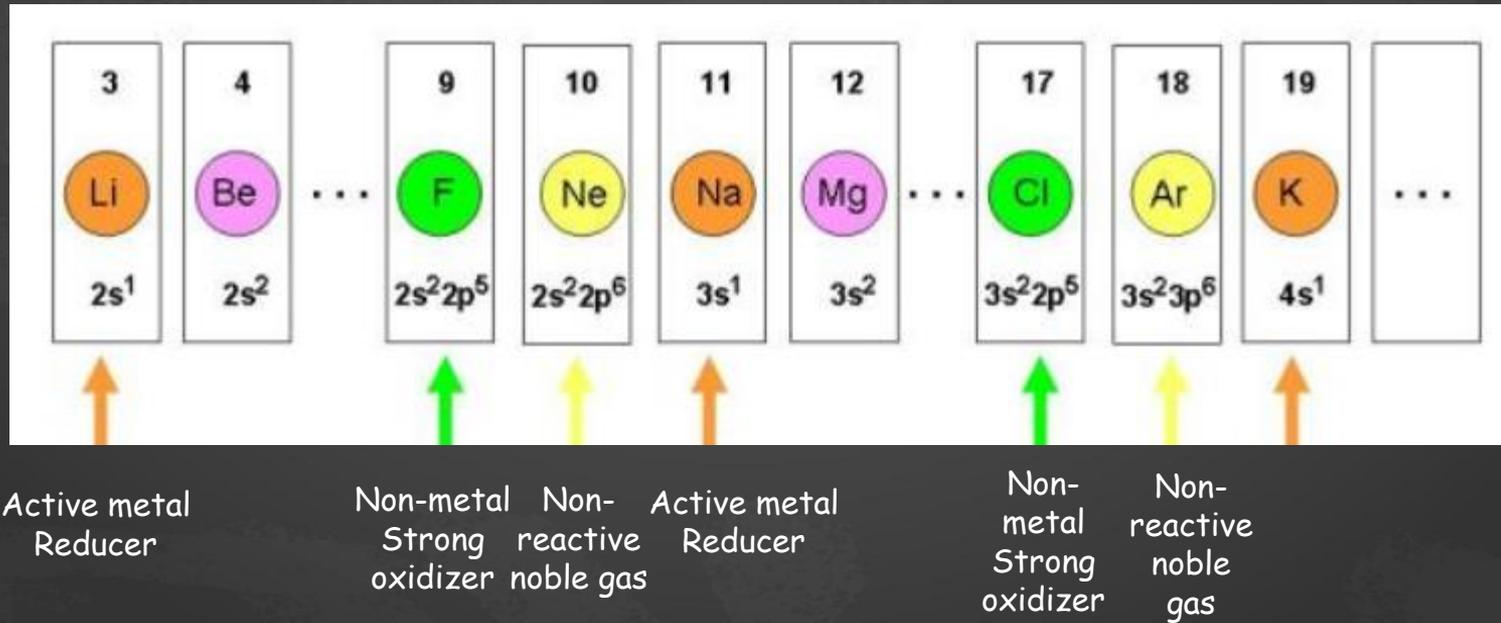
Na (1s<sup>1</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>1</sup>)-1 electron = Na<sup>+</sup> (1s<sup>1</sup>2s<sup>2</sup>2p<sup>6</sup> Ne electron configuration)

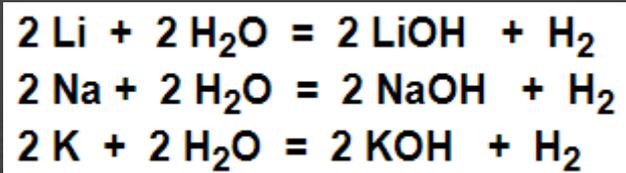


Oxidation state - I

These are metals - to bind each of them have small number of valence electrons so they form ionic framework with electrons moving around the positively charged nuclei (metallic bond)

The elements with similar outer shells will have similar properties and the properties of elements will change gradually as the charge of the nucleus will increase.





Chemical properties of elements change periodically according to the charge of their nuclei

The outer shells of elements have repeated configurations and the elements have repeated properties

1 H							2 He
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar

We write the first 18 elements in a table. In any column, all the atoms have the same outer electron configuration.

Then we fill the 4<sup>th</sup> orbital, next, according to the energy levels electrons begin to occupy the 3d orbitals before we can continue in the fourth shell, ten electrons must go into there inner orbitals. We will write these ten elements on a loop.

