

Group I (1A)

Introduction

The study is easy if it's possible to classify elements of the periodic table into groups that are similar in properties because the process of studying each element in single is a difficult and stressful process.

Element		Electronic structure
Lithium	${}^3\text{Li}$	${}^2[\text{He}] 2s^1$
Sodium	${}^{11}\text{Na}$	${}^{10}[\text{Ne}] 3s^1$
Potassium	${}^{19}\text{K}$	${}^{18}[\text{Ar}] 4s^1$
Rubidium	${}^{37}\text{Rb}$	${}^{36}[\text{Kr}] 5s^1$
Cesium	${}^{55}\text{Cs}$	${}^{54}[\text{Xe}] 6s^1$
Francium	${}^{87}\text{Fr}$	${}^{86}[\text{Rn}] 7s^1$

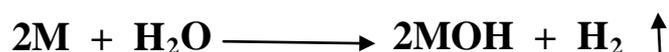
The Alkali Metals

General properties

The element of the first group are called alkaloid metals because they produce alkaline solution when their reaction with water.

1. Contain one electron in their outer shell.
2. Posses highest atomic size so they possess lower I.P.
3. The monovalent cation possess the electronic structure of the noble gas.
4. They possess low density due to their large atomic size , so their m.p. and B.P. are low.
5. Their monovalent cation are diamagnetic and their compounds are colorless.

- Very reactive due to low I.P. and loss their brightness easily. So the chemistry of alkyl metal is the chemistry their ions.
- React with water strong and the reactivity increase down= n the group producing very strong base which are the strongest bases known and they are water soluble except (LiOH) which is low soluble :



M = Alkali metal.

- These element behave in the form of strong reduce agents (Tend to lose the electrons of the outer shell easily) easy to oxidize.
- Increasing the effective of the elements as the atomic number increases, for example the cesium is considered the most effective, while lithium is the least effective.

The diagonal relation ships

The resembles in chemical and physical properties between the 1st element of each group and 2nd element of the neighboring group due to the polarizability power which is expressed as ionic charge divided to ionic radius which is equal between the two elements .

I	II	III	IV
Li	Be	B	C
Na	Mg	Al	Si

Evidences diagonal relation between Li and Mg

- Both react with air formation crystalline red solid compound (Nitrates), therefore Li and Mg are used to purify the gasses from nitrogen. لتنقية الغازات من النيتروجين.



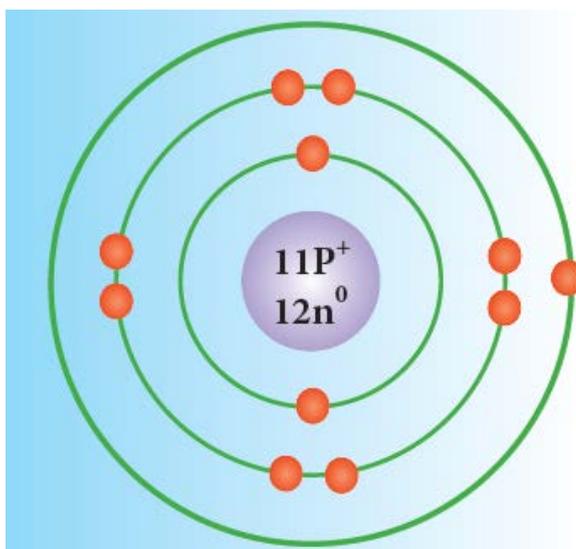
- Due to the covalent nature Li and Mg alkyls are soluble in organic solvent.

Sodium (Na)

Atomic number = 11

Mass number = 23

عدد الالكترونات	رقم الغلاف (n)	رمز الغلاف
2	1	K
8	2	L
1	3	M



Chemical properties

There is no sodium free in nature because of its effectiveness and present united with other elements, consisting of fixed compounds including sodium chloride, sulphates, silicates and others.

Sodium: reactions of elements

1. Reaction of sodium with air

Sodium is burnt in air the result is white sodium peroxide, Na_2O .



2.Reaction of sodium with water

Sodium metal reacts rapidly with water to form a colourless solution of sodium hydroxide (NaOH) and hydrogen gas (H₂).



3.Reaction of sodium with the halogens

Sodium metal reacts with all the halogens to form sodium halides. So, it reacts with fluorine, F₂, chlorine, Cl₂, bromine, Br₂, and iodine, I₂, to form respectively sodium(I) fluoride, NaF, sodium(I) chloride, NaCl, sodium(I) bromide, NaBr, and sodium(I) iodide, NaI.



4.Reaction of sodium with acids

Sodium metal dissolves readily in dilute sulphuric acid to form solutions containing the aquated Na(I) ion together with hydrogen gas, H₂.



5.Reaction of sodium with bases

Sodium metal reacts rapidly with water to form a colourless basic solution of sodium hydroxide (NaOH) and hydrogen gas (H₂).



6.Sodium metal reacts with many oxides and chlorides as the following :

