The electronic configuration of last electron enter in s-subshell it will be the member of s-block element. s-block element classifying into two groups:

Group - I

The general electronic configuration for s-block element is $ns^1$

Group - I

**Study ab Group - I**

H, Li, Na, K, Rb, Cs, Fr

Group - II

Be, Mg, Ca, Sr, Ba, Ra

The general electronic configuration for Group - I element is $ns^1$. 
Oxidation state 1

The oxidation state of Group 1 elements is always +1.

**Note**

Group 1 elements are known as alkali metals because their metal oxides are basic in nature.

**Physical state**

accept Li all other alkali metals are soft easily cut with the help of knife. The softness increases down the group.

**Atomic Radii**

- when we go down the group in Group 1, atomic size continuously increases with increase in the number of shells.

**Ionization energy**

- when we move up or down in Group 1, ionization energy continuously decreases because atomic size increases due to which attraction between the outermost electron and the nucleus decrease.

**Melting Point and boiling point**

- The melting point and boiling point of alkali metals decrease when we move down the group from Li to Cs because of increase in size.
Flame Colours:
Li: Crimson Red
Na: Golden Yellow
K: Pale Violet
Rb: Black
Cs: Violet

Hydration Energy:
The order of hydration energy decrease when we move Li⁺ to Cs of hydration energy down.

Chemical Properties of Alkali metal:
1. Reactivity towards air:
   \[ M + O_2 \rightarrow MO_2 \rightarrow MOH \]
   Where \( M = Na, K, Rb, Cs \)

2. Reactivity towards water:
   \[ 2M + 2H_2O \rightarrow MOH + H_2 \]
   Here \( M = Li \) to \( Cs \)

Li react with water very very slowly while other alkali metal react with water vigorously.

Reactivity with Hydrogen:
\[ 2M + H_2 \rightarrow 2MH \] (metal hydride)

1. \[ 2Na + H_2 \rightarrow 2NaH \] (sodium hydride)
= Reaction with Halogen ⇒ 

\[ 2M + X_2 \rightarrow 2MX \]

**Important**

Solubility of alkali metal with liquid ammonia:

When alkali metal added into liquid ammonia, it will dissociate into ion and free electron:

\[ M + \text{liq NH}_3 \rightarrow M^+ + e^- \]

\( (\text{liq NH}_3) \quad (\text{liq NH}_3) \)

Due to electron dipole force attraction both \( M^+ \) and electron do not join again.

Know this ammoniated electron absorbed the energy from white light source.

Ammoniate \( e^- \)

By absorbing energy this \( e^- \) transmitted blue

Colour. Corresponding wave length there for the solution become apairred blue.
Both Na and K ions are essential for living things (leaving organic) - the cell's requirement of Na and K is about 2 gm each. Both ions are in same in chemical activities, but biological activities there are difference.

1. K ions are present inside the higher concentration shell while Na ions are present in out side the higher concentration shell.
2. Na ions participate in transmission of nerve signals. In regulating flow of water across the cell membrane.
3. Na ions all show responsible for the transportation of amino acid and sugar into difference cells.
4. K ions are responsible to increase the activity of the enzymes. K+ is all show responsible for the oxidation of glucose into ATP.
   (Adenosine triphosphate)
5. Na + K both are responsible for maintaining Na + K pump.
6. K + Cs are use in photo electric cell.
Group II

Be, Mg, Ca, Sr, Ba, Ra

The general electronic configuration of Group II are non-gas alkaline metals. All the metals of Group II are non-gas alkaline in nature and easily available in earth crust.

⇒ Properties of Group II element ⇒

1. Occurrence ⇒
all the alkaline metals are extent in earth surface in the form of oxide.

\[
\text{Magnesite : } \text{MgCO}_3 \\
\text{Epsom salt : } \text{MgSO}_4 \cdot 7\text{H}_2\text{O} \\
\text{Calcite : } \text{CaCO}_3 \\
\text{Zyphusum : } \text{CaSO}_4 \cdot 2\text{H}_2\text{O} \\
\text{Celaslitite : } \text{SrSO}_3 \\
\text{Spar : } \text{BaSO}_4 \\
\text{Ra : Radioactive.}
\]

(i) Electronic Configuration:

- \(\text{Be} (4) \text{He} 2s^2\)
- \(\text{Mg} (12) \text{Ne} 3s^2\)
- \(\text{Ca} (20) \text{Ar} 4s^2\)
- \(\text{Sr} (38) \text{Kr} 5s^2\)
- \(\text{Ba} (56) \text{Xe} 6s^2\)
- \(\text{Ra} (88) \text{Rn} 7s^2\)
Oxidation State:
The oxidation state of Group-II elements always +2.

Atomic & Ionic Radii:
When we move Be to Ba, the no. of cell increase continuously due to which size will also show increase.

Physical State:
All the alkali earth metals are metallic solids in nature - they are harder than alkali metal, but in their group the softness increase from Be to Ba. Because Be to Ba metallic bond strength will decrease with increase in size.

Melting and Boiling Point:
The MP and BP alkali earth metals is greater than the MP and BP of alkali metal. But in its group the MP and BP decrease from Be to Ba. Because of decrease in strength of metallic bond.

Colour frame:
Be
Mg
Ca - brick red
Sr - sea blue
Ba - green
Ra - crimson red.
due to very small size ab Be on Mg it is very difficult to square - the excitation state
due to which no. Colour is absorb.

→ Hydration Energy:

Alkaline earth metal have greater hydration energy than alkali metal because ab greater change in
Alkylne earth metal family hydration energy will decrease Be to Ba due to increase the size,

\[
\text{Be}^{2+} > \text{Mg}^+ > \text{Ca}^{2+} > \text{Sr}^{2+} > \text{Ba}^{2+}
\]

# Decreasing order ab hydration energy.
# Chemical properties ab Group-II

(i) Reaction with AIR

\[
\text{(M)} + \text{AIR} \rightarrow \text{M}_0 + \text{M}_3\text{N}_2
\]

Due to large amount ab combustion enthalpy
ab Be it do not react with air.

(ii) Reaction with water

\[
\text{M} + 2\text{H}_2\text{O} \rightarrow \text{M} (\text{OH})_2 + \text{H}_2\text{N}
\]

Ca, Sr, Ba React with cold water.
Mg react with hot water.
Be do not react with water.
(iii) Reaction with Hydrogen:

\[ M + H_2 \rightarrow MH_2 \]

where \( M \) is Be to Ra.

(iv) Reaction with \( O_2 \):

\[ M + O_2 \rightarrow MO \]

where \( M \) is Be to Ra.

Amb: Biological importance of Ca or Mg:

An alternate body contain 25 gm Mg and 1200 gm Ca. Mg is present in the green pigment chlorophyl which is necessary for capturing the energy from sunlight. Mg is more useful in the function of metabolic process.

Ca is more useful for living organisms as it is more helpful manainting the teeth and bones.

1%. Ca is also responsible for clotting the blood stop due to which the problem of hard alegret (beat) and nervous system short out.
Diagonal Relationship

Diagonal Relationship is defined as the similar chemical and physical properties of two elements which are present in different groups separated by one period.

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li</td>
<td>Be</td>
</tr>
<tr>
<td>Na</td>
<td>Mg</td>
</tr>
<tr>
<td>K</td>
<td>Ca</td>
</tr>
<tr>
<td>Rb</td>
<td>Sr</td>
</tr>
<tr>
<td>Cs</td>
<td>Ba</td>
</tr>
<tr>
<td>Fr</td>
<td>Ra</td>
</tr>
</tbody>
</table>

Li and Mg are both are diagonally related which can be proved by the help of following points:

1. Both have almost same electro negativity.
   
   \[ \text{LI} = 2, \quad \text{Mg} = 2.1 \]

2. Both have almost similar size.
   
   \[ \text{Li} = 152 \text{ pm}, \quad \text{Mg} = 158 \text{ pm} \]

3. Li and Mg both are hard metal.

4. Li and Mg both react with water and formed hydrogen gas but the reaction is very very slow.

\[ 2 \text{Li} + 2\text{H}_2\text{O} \rightarrow 2\text{LiOH} + \text{H}_2 \]

\[ \text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2 \]
# Both Li and Mg React with N₂.

\[
\text{Li} + \text{N}_2 \rightarrow \text{Li}_3 \text{N} \quad (\text{Lithium nitride})
\]

\[
\text{Mg} + \text{N}_2 \rightarrow \text{Mg}_2 \text{N}_2 \quad (\text{Magnesium nitride})
\]

Both Li & Mg do not form double salt.

Both Li bi carbonate and Mg bicarbonate not occur in nature in stable form; they are present in solution from only.

Both Li and Mg salt are oleaginous nature.

The hydro oxide of Li and Mg are less basic in nature.

**Imp Diagonal Relationship between Be and Al.**

Both Be and Al metal are chemically and physically same which can be proved by the help of following point:

1. Both Be and Al are not effused by atm.
2. Both are not decompose by water.
3. Both metal oxide are amphoteric in nature.

\[
\text{BeO} + 2\text{NaOH} \rightarrow \text{Be} \text{SO}_4 + \text{H}_2\text{O}
\]

\[
\text{BeO} + 2\text{NaOH} \rightarrow \text{Na}_2 \text{BeO}_2 + \text{H}_2\text{O}
\]

\[
\text{Al}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{AlCl}_3 + 3\text{H}_2\text{O}
\]

\[
\text{Al}_2\text{O}_3 + 3\text{NaOH} \rightarrow 2\text{NaAlO}_2 + \text{H}_2\text{O}
\]
4. Both metal hydroxides are insoluble in water and on direct decomposition it will convert into oxides and water.

\[
\text{Al(OH)}_3 \xrightarrow{\Delta} \text{Al}_2\text{O}_3 + \text{H}_2\text{O}
\]

\[
\text{Be(OH)}_2 \xrightarrow{\Delta} \text{BeO} + \text{H}_2\text{O}
\]

5. Be and Al do not impart any colour flame.

6. Both metal react with \( \text{H}_2 \) with air.

\[
3\text{Be} + \text{H}_2 \rightarrow \text{Be}_3\text{N}_2 \quad \text{(beryllium cyanide)}
\]

\[
2\text{Al} + \text{H}_2 \rightarrow 2\text{AlN} \quad \text{(Aluminium nitrile)}
\]

7. Both metal nitriles liberated ammonia gas when dissolved in water.

\[
\text{Be}_3\text{N}_2 + \text{H}_2\text{O} \rightarrow \text{NH}_3 \uparrow + \text{Be(OH)}_2
\]

\[
\text{AlN} + \text{H}_2\text{O} \rightarrow \text{NH}_3 \uparrow + \text{Al(OH)}_3
\]

8. Both metal carbonates are unstable at room temperature and liberated \( \text{CO}_2 \) gas.

\[
\text{BeCO}_3 \xrightarrow{\text{room temp.}} \text{BeO} + \text{CO}_2 \uparrow
\]

\[
\text{Al}_2(\text{CO}_3)_3 \xrightarrow{\Delta} \text{Al}_2\text{O}_2 + \text{CO}_2 \uparrow
\]
9. Both Be and Al ion can possibly make chelating complex.

10. The compound Be and Al have a tendency to form polymer.