

GROUP - 1 THE ALKALI METALS

Group-1 elements are Shiny, Soft, and highly reactive metals, none of them occur as a natural free element

3
Li
Lithium



Li (180.5°C)

11
Na
Sodium



Na (97.7°C)



K (63.4°C)

19
K
Potassium



Rb (39.5°C)



Cs (25.4°C)



Fr (27.0°C)

37
Rb
Rubidium



All of the **Group-1 Metals** have **one** Valence Electron

55
Cs
Caesium

87
Fr
Francium

The reactivity of the **GROUP-1 METALS** increases down the group as the outer electron gets further from the nucleus & becomes easier to remove.

The alkali metals react with water to form
METAL HYDROXIDES



Alkali metals react with **oxygen** to form
METAL OXIDES



Alkali metals react with **halogens** to form
IONIC SALTS

PROPERTIES OF ALKALI METALS



Silver-like lustre



Low melting point



High Ductility



High malleability



Excellent conductor of heat and electricity

Properties of Alkali Metals

FLAME TEST COLORS

Li³ (Red)
 Na¹¹ (Yellow)
 K¹⁹ (Purple)
 Rb³⁷ (Pink)
 Cs⁵⁵ (Blue)
 Fr⁸⁷ (Orange)

VERY SOFT

- Alkali metals can be easily cut with a knife
- Among all alkali metals lithium is hardest.

ELECTRONIC CONFIGURATION

ns¹

- They have one valence shell electron.
- General valence electronic configuration

USES

LITHIUM

- Anti depressants
- Batteries

SODIUM

- Street lamps
- Salt

POTASSIUM

- Fertilizers

CAESIUM

- Atomic Clocks

ATOMIC SIZE

Li Na K Rb

Size increases down the group due to added extra orbit.

ELECTROPOSITIVE

It is the ability to remove an electron

Cs

- Electropositivity increases down the group.
- Caesium** has the highest electropositive character.

STORED IN KEROSENE

Alkali metals react with air easily to form oxide layer therefore they are stored in kerosene.

REACTS WITH WATER

H₂O

- They reacts violently with water and form hydroxides.
- Don't even dare to go near when **caesium** reacts with water.

REACTS WITH AMMONIA

On dissolving NH₃ forms Ammoniated cation and electron. Solution turns blue

$$M^+ + x NH_3 \rightarrow [M (NH_3)_x]^+$$

$$e^- + y NH_3 \rightarrow [e (NH_3)_y]^-$$

ALKALINE EARTH METALS



4 Be Beryllium	12 Mg Magnesium	20 Ca Calcium	38 Sr Strontium	56 Ba Barium	88 Ra Radium
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ELECTRONIC CONFIGURATION



Valence
Electrons
= 2

FLAME COLOUR TEST

Group II Element	Flame Colour
Beryllium	Colourless
Magnesium	Colourless
Calcium	Brick red
Strontium	Crimson red
Barium	Apple green

DO YOU KNOW ?

Kidney stones generally consist of calcium oxalate, $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ which dissolves in dilute strong acids but remains insoluble in bases.



They are commonly called alkaline earth metals because their oxides are alkaline in nature and are found in earth's crust.

ATOMIC SIZE

Size increases down the group due to added extra orbit.

ELECTROPOSITIVITY

Strong electropositive elements due to large size, electropositivity increases down the group.

REACTION WITH WATER

Be does not react even with boiling water and **Ba** react vigorously even with cold water. Thus increasing order of reactivity with water is



REACTION WITH NITROGEN

These metals react with nitrogen to form nitrides of the types M_3N_2 which are hydrolysed with water to evolve NH_3 .



USES

BERYLLIUM

Corrosion resistant alloys

STRONTIUM

Glass for colour television cathode ray tubes

MAGNESIUM

Present in chlorophyll, helps in photosynthesis

CALCIUM

Hydrated CaCl_2 used for melting ice on roads







BIARIUM

Nuclear Medicine

ALKALI METALS

DIFFERENCE ? BETWEEN

ALKALINE EARTH METALS

PROPERTIES	ALKALI METALS	ALKALINE EARTH METALS
Physical properties	Soft, Low melting point, Paramagnetic. 	Comparatively harder. High melting point, Diamagnetic
Valency	Monovalent	Bivalent
Electropositive nature	More electropositive	Less electropositive 
Hydroxides 	Strong base, highly soluble and stable towards heat.	Weak base, less soluble and decomposes on heating.
Bicarbonates	These are known in solid state.	These are not known in free state. Exist only in solution
Carbonates	Soluble in water. Do not decomposes on heating (LiCO_3 is an exception)	Insoluble in water. Decomposes on heating.
Action of carbon	Do not directly combine with carbon 	Directly combine with carbon to form carbides 
Solubility of salts	Sulphates, phosphates, fluorides, chromates, oxides etc are soluble in water.	Sulphates, phosphates, fluorides, chromates, oxalates etc are insoluble in water
Reducing power	Stronger as ionization potential values are low and oxidation potential values are high	Weaker as ionization potential values are high and oxidation potential values are low.
Electronic configuration 	One electron is present in the valence shell. The configuration is ns^1 (monovalent)	Two electrons are present in the valence shell. The configuration is ns^2 (bivalent)