

# ALKALINE EARTH METALS

## General Properties of IIA Group Elements:

- ◆ Beryllium (Be), Magnesium (Mg), Calcium (Ca), Strontium (Sr), Barium (Ba) and Radium (Ra) are the elements belong to IIA group of the periodic table.
- ◆ Their general electronic configuration is  $ns^2$ . (where  $n = 2, 3\dots$ )
- ◆ Radium is a Radioactive element.
- ◆ Atomic size of elements from Beryllium to Radium increases.
- ◆ Ionization energies and electronegativity of IIA elements decrease from Be to Ra.
- ◆ All elements react with water to form their respective hydroxides and liberate Hydrogen.
- ◆ All elements react with oxygen to form their respective oxides. But Barium forms even peroxides besides oxides.
- ◆ All elements except Beryllium form Hydrides when they react with hydrogen.
- ◆ All elements react with chlorine and form their respective metallic chlorides.

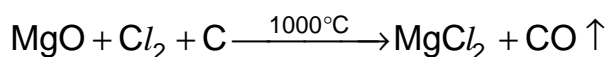
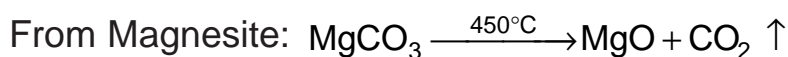
## Extraction Methods of Alkaline Earth Metals

S.No.	Alkaline Earth Metal	Ore of the Metal	Chemical Formula
1.	Beryllium (Be)	Beryl	$Be_3Al_2(SiO_3)_6$
2.	Magnesium (Mg)	Carnolite Magnesite Epsom Salt	$MgCl_2 \cdot 6H_2O$ $MgCO_3$ $(MgSO_4 \cdot 7H_2O)$
3.	Barium (Ba)	Barytes	$BaSO_4$
4.	Calcium (Ca)	Dolomite	$CaCO_3 \cdot MgCO_3$

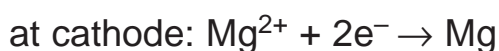
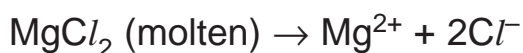
## Extraction of Magnesium:

The electrolytic method of extraction of magnesium from its chloride involves in two steps. They are

1. Preparation of anhydrous magnesium chloride.



2. Electrolysis of anhydrous  $MgCl_2$



- ◆ In this method Graphite acts as anode and Iron trough acts as cathode.
- ◆ In this method  $KCl$  and  $NaCl$  are added to anhydrous  $MgCl_2$  to decrease its melting point.

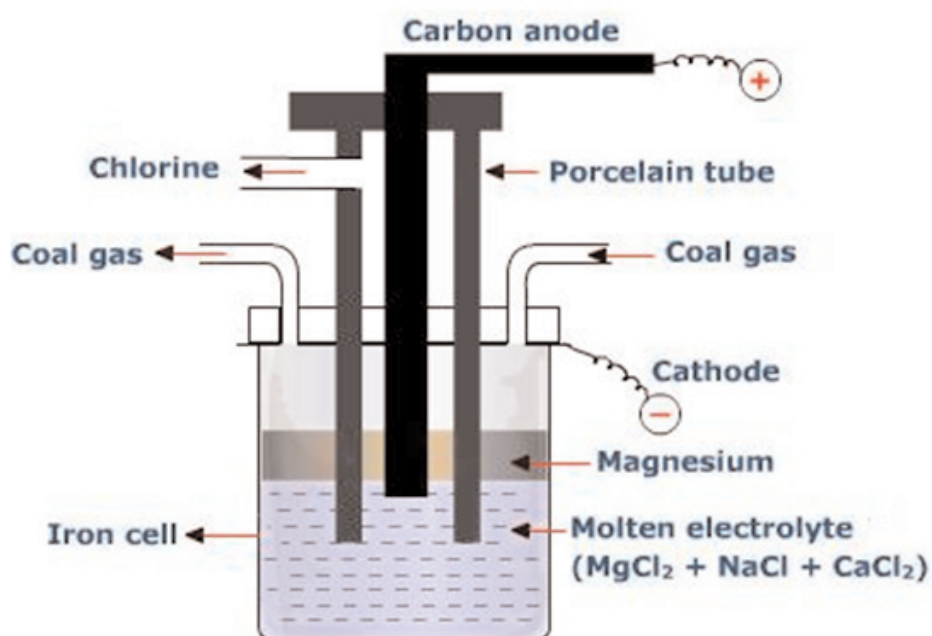
**Important Questions for Examination point of view and as well as for competition exams:**

### 5 Marks Questions

1. Draw a neat diagram showing the extraction of magnesium from its ore. Label its parts.

(June 06, 02 March 06, 02)

Ans:

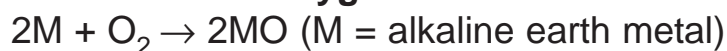


### 4 Marks Questions

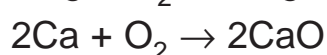
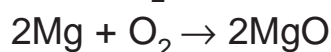
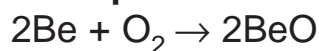
1. Write the reactions of group IIA elements with Oxygen, Hydrogen, Chlorine and Water.

(June 04, 08, 01 March 03, 09)

- a) Reaction with Oxygen:

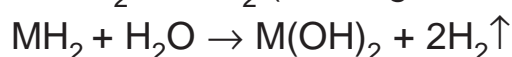
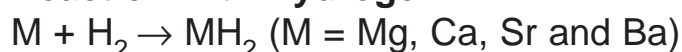


Example:

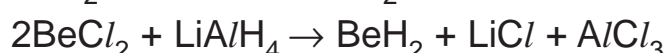


Barium forms peroxide when it reacts with excess of oxygen.  $Ba + O_2 \rightarrow BaO_2$

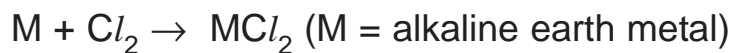
- b) Reaction with Hydrogen:



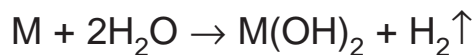
$BeH_2$  is unstable.  $BeH_2$  is obtained by the reaction of  $BeCl_2$  with  $LiAlH_4$



**c) Reaction with Chlorine:**



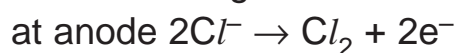
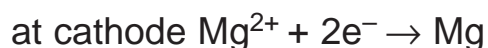
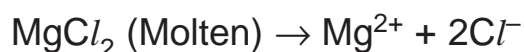
**d) Reaction with Water:**



(M = Ca, Sr, Ba)

## 2 Marks Questions

**1. Write the chemical reactions involved during electrolysis of  $MgCl_2$**



## 1 Mark Questions

**1. Why ionization values decrease from Be to Ra in IIA group of elements.**

A. Atomic size increases from Be to Ra and there by the distance between the nucleus and valency electron increases.

**2. What is the general electronic configuration of alkaline earth metals?**

A.  $ns^2$

**3. Name the radioactive element among IIA group.**

A. Radium

**4. Why  $KCl$  or  $NaCl$  added to  $MgCl_2$  during Mg extraction?**

A. In order to decrease the melting point of  $MgCl_2$  and also to increase the conductivity of electrolyte.

**5. How many water molecules present in Epsom Salt.**

A. Seven water molecules.

**6. Which substance is used to convert  $BeCl_2$  into  $BeH_2$ .**

A.  $LiAlH_4$  (Lithium aluminum hydride).

**7. State the metals present in Dolomite?**

A. Calcium and Magnesium.

**8. Write the chemical formulae of Magnesite and Carnolite.**



## Fill in the Blanks

1. \_\_\_\_\_ is the radioactive element among alkaline earth metals.
2. Oxides of Calcium and Magnesium are \_\_\_\_\_ in nature.
3. \_\_\_\_\_ metal gives peroxide on addition to oxide among IIA group of elements.
4. \_\_\_\_\_ is reagent reduces  $\text{BeCl}_2$  into  $\text{BeH}_2$ .
5. The formula of Epsom salt is \_\_\_\_\_
6. During electrolytic extraction of Mg \_\_\_\_\_ is used as cathode and \_\_\_\_\_ as anode.
7. The number of water molecules present in epsom salt is \_\_\_\_\_
8. The number of water molecules present in Carnolite is \_\_\_\_\_
9. To decrease the melting point of  $\text{MgCl}_2$  \_\_\_\_\_ are added during electrolysis.
10. Element belongs to IIA group and 3<sup>rd</sup> period is \_\_\_\_\_

## Answers

- |                       |          |           |                     |  |
|-----------------------|----------|-----------|---------------------|--|
| 1. Radium             | 2. basic | 3. Barium | 4. $\text{LiAlH}_4$ | 5. $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ |
| 6. iron pot, Graphite |          | 7. seven  | 8. six              | 9. $\text{NaCl}$ & $\text{KCl}$              |
| 10. Magnesium         |          |           |                     |  |