



Magnesium

Q. What are the Ores of Mg? How is Mg extracted by the electrolysis of Carnalite and from Sea-water. Discuss its reaction with ① FeCl_3 ② CO_2 ③ HNO_3 ④ Steam. Mention the uses of Mg.

Q.2 Write notes on ① Two alloys of Mg
② Magnesia.
③ Anhydrous Magnesium chloride.
④ Action of heat on $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
⑤ Epsom Salt.
⑥ Detection of Mg in Salt test.
⑦ MgCO_3

Ores of Magnesium is never obtain in nature in "free state" because of its reactivity towards O_2 , Water, CO_2 etc. So it is always obtained in nature in combined state.

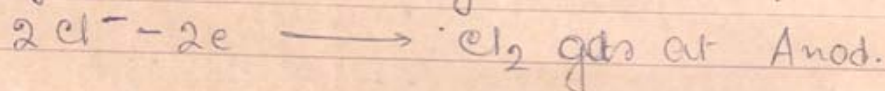
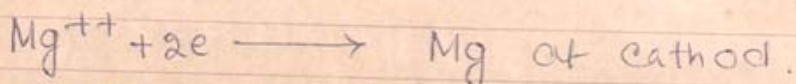
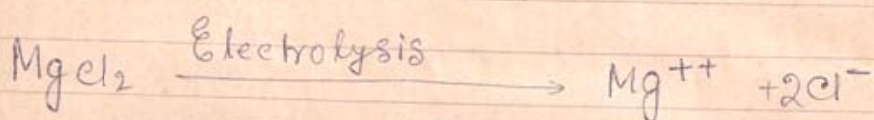
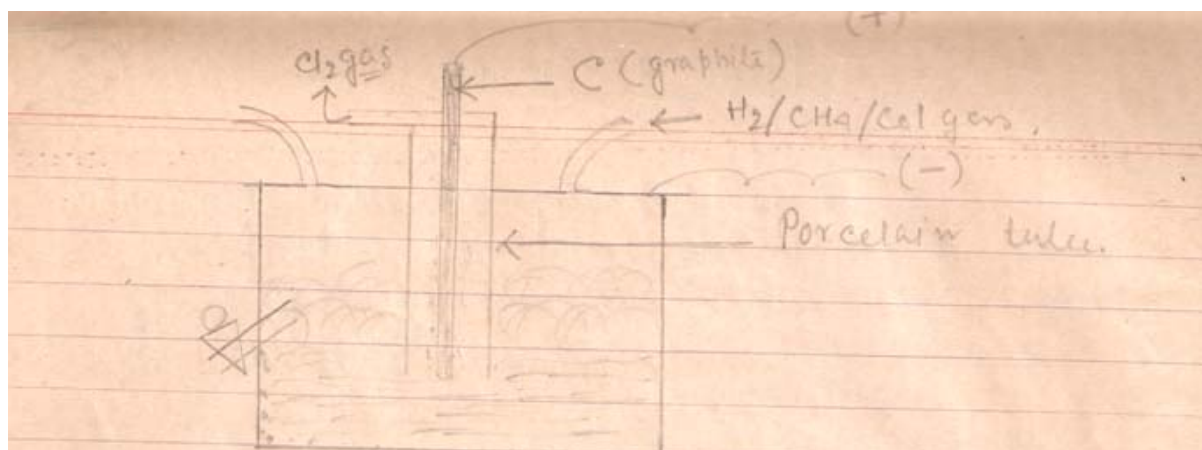
Ores of Magnesium :- ① Carnalite ($\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$)
② Dolomite ($\text{MgCO}_3, \text{CaCO}_3$)
③ Kalinite ($\text{MgSO}_4, \text{KCl}, 3\text{H}_2\text{O}$)

Extraction: Magnesium is extracted in two ways now-a-days.
① by Electrolysis.
② from Sea water.

Electrolytic Method.

Theory: Magnesium is obtained by the electrolysis of fused mixture of anhydrous MgCl_2 and NaCl/KCl , the latter is added to lower the melting point of MgCl_2 .

Magnesium



Procedure:- The electrolysis is carried out in a covered rectangular iron pot as shown in the figure, which acts as the cathode. The anode is a graphite rod enclosed in a porcelain tube and inserted in the centre of the molten mass kept at 700°C .

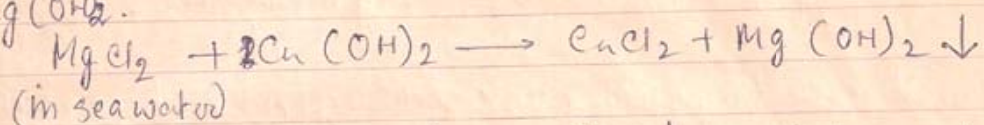
During electrolysis chlorine evolves at anode and is obtained as a by product, which is used for the preparation of bleaching powder.

Magnesium is liberated at cathode (M.P. = 651°C) and is collected / floats at the top of the molten mass. This molten magnesium is tapped out and is allowed to cool in hydrogen atmosphere.

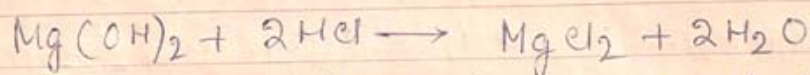
Since Magnesium readily combines with Oxygen and Nitrogen the air within the pot should be displaced by a current of hydrogen or CO gas. The voltage required for electrolysis is only 6 vol.



From Sea-water: Nowadays Magnesium is being extracted from sea water in U.S.A. In sea water which contains $MgCl_2$, $NaCl$ etc. Sea water is added with lime water to get white ppt of $Mg(OH)_2$.



1 ton of Mg is obtained from 800 ton of sea water. The ppt $Mg(OH)_2$ is filtered through gunny-bag and treated with nearly 10% dilute HCl .



The solution of $MgCl_2$ is evaporated to get $MgCl_2 \cdot 6H_2O$ crystals. It is made anhydrous by heating either in vacuum or in HCl gas medium.

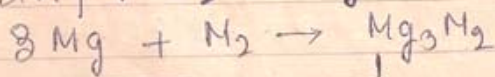
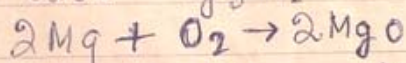
Now this anhydrous $MgCl_2$ is added with a little $NaCl$ to lower the melting point and converted into a molten mass at $700^\circ C$ and then electrolyzed.

Procedure:- The electrolysis is carried out (with figure)

PROPERTIES

It is light white, ^{bright} metal, which becomes dull due to oxide formation.

With air \rightarrow When burnt in air it gives not only MgO but also Mg_3N_2



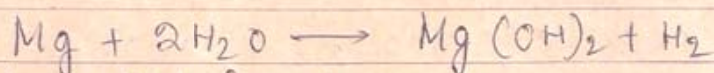
Boiling with water gives ammonia



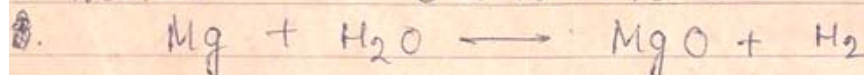
Magnesium



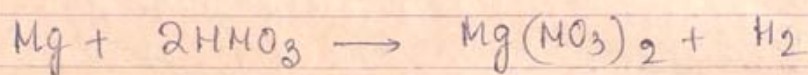
2. Water- It gives H_2 with boiling water



① heated metal burns in steam



3. It reacts with all acids giving hydrogen and respective salts.

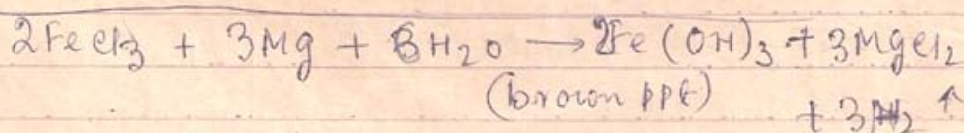
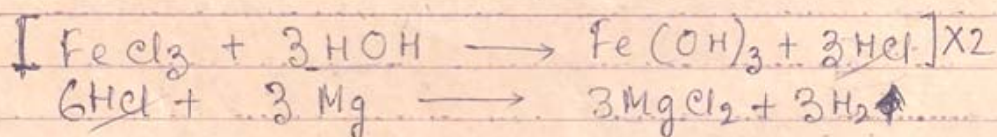


This is the proof that HNO_3 contain H_2

4. With $NaOH$ - NO ACTION.

W.H
Special

5. With $FeCl_3$ → When a piece of Mg is poured in $FeCl_3$ solution, hydrogen gas is evolved.



⑥ When a piece of ^{burning} Mg is put in CO_2 we get black particles of Carbon and white particles of MgO



Magnesium



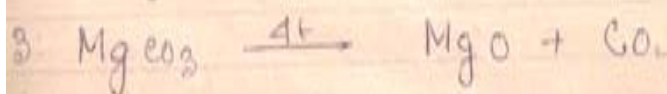
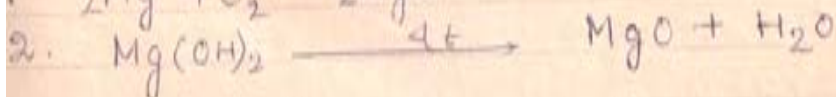
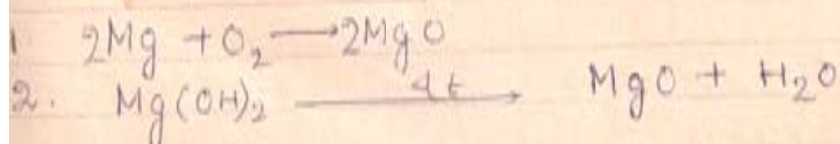
Uses of Magnesium.

1. In fireworks
2. In photoflash light.
3. In military light signals.
4. Two alloys namely Magnesium [98% Al and Mg 2%] density 2 used for car, sputar parts]
5. Electron: Mg 95%, Zn = 4.5%, Cu = .5% density 1.8 used in construction of airships motor car etc.

NOTE

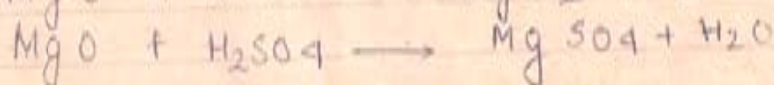
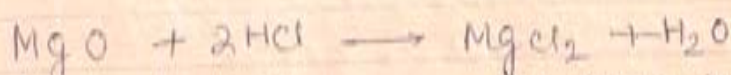
Magnesia: (MgO) It is prepared by heating

- ① Mg in Oxygen.
- (2) $Mg(OH)_2$ in air.
- (3) $MgCO_3$ in air



It is white powder basic in nature. Insoluble in water

Chem



- Uses
1. It is used in medicine as antacid
 2. To prepare fire bricks used in furnaces.
 3. To prepare Sorels cement which is used for cementing glass and dental filling.

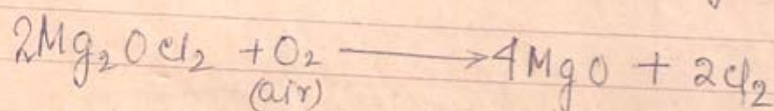
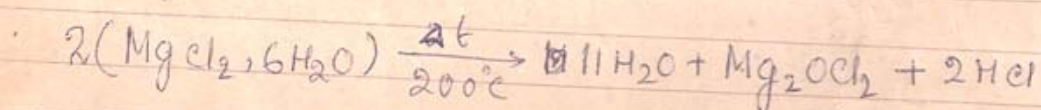


It is a mixture of MgO and $MgCl_2$ to get a paste

B. Anhydrous $MgCl_2$:

① Action of heat on hydrated $MgCl_2$ i.e. $MgCl_2 \cdot 6H_2O$

When the hydrated $MgCl_2$ is heated in air to about $200^\circ C$ it gives steam and HCl and giving Magnesium oxy-chloride which decomposes at $600^\circ C$ to MgO and HCl .

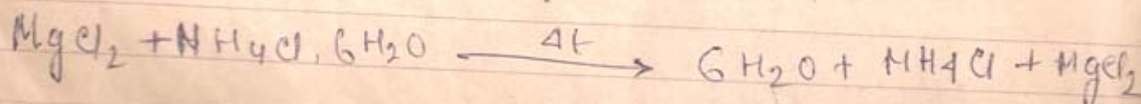


③ Anhydrous $MgCl_2$: Since on heating hydrated salt of $MgCl_2$ we can not get anhydrous salt because of decomposition, we are to follow the following methods to prepare anhydrous $MgCl_2$.

(1) $MgCl_2 \cdot 6H_2O$ becomes anhydrous if the hydrated salt is heated vacuum at -175°

(2) By heating in the atmosphere of HCl gas

(3) By heating Ammonium magnesium chloride $MgCl_2 \cdot NH_4Cl \cdot 6H_2O$, prepared by evaporating to dryness a mixed solution of equimolecular amounts of Magnesium Chloride ($MgCl_2$) and Ammonium Chloride ($NH_4Cl \cdot 6H_2O$)



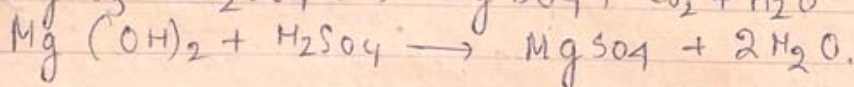
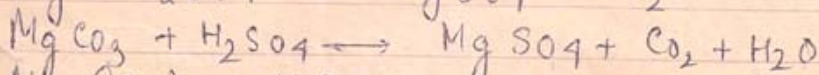
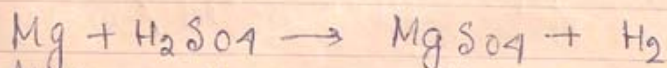
Magnesium



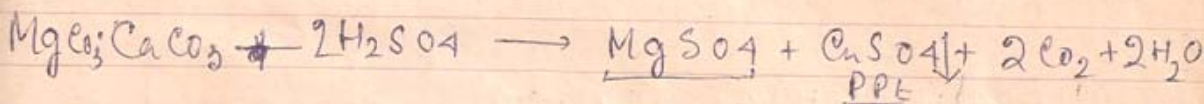
5. Epsom Salt ($MgSO_4 \cdot 7H_2O$)

Preparation \rightarrow It is prepared by

1. Dissolving Mg in dilute H_2SO_4 .
2. $MgCO_3$ with dilute H_2SO_4 .
3. $Mg(OH)_2$ with dilute H_2SO_4 .

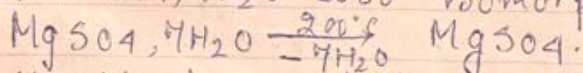


from Dolomite: $CaCO_3 + MgCO_3$



By dissolving dolomite in hot dilute H_2SO_4 and removing insoluble $CaSO_4$ by filtration. The solution is evaporated to get Epsom salt.

Properties: - It is a colourless crystalline solid, soluble in water. It is isomorphous to white vitriol / $ZnSO_4 \cdot 7H_2O$ also isomorphous to $FeSO_4 \cdot 7H_2O$.



On heating it loses all the water of crystallization giving anhydrous salt at $200^\circ C$

Uses: 1. In medicine it is a good purgative.

2. In paper industry it is highly used.

3. In fire proofing

4. Platinised magnesium sulphate is used in contact process for the preparation of H_2SO_4 as a catalyst.

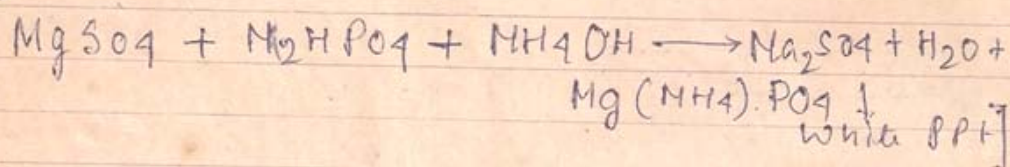


Dry Test.

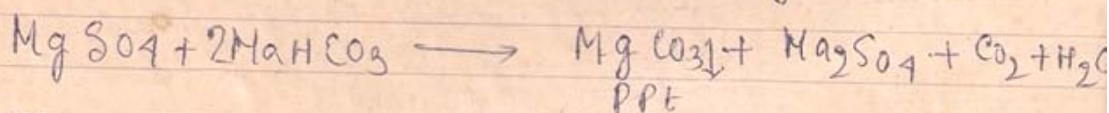
1. Charcoal cavity test: In a charcoal cavity a little salt is taken heated by oxidising flame, allowed to cool added two or three drops of cobalt nitrate solⁿ and heated again by oxidising flame we get a fine solid mass.

2. Wet test: Salt solⁿ is added with a little NH_4OH to make it alkaline then Na_2HPO_4 reagent is added to it, stirred to get white ppt of Magnesium ammonium phosphate.

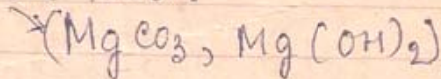
Comp



(4) MgCO_3 (Normal) - It is prepared by adding NaHCO_3 solⁿ to a solⁿ of magnesium salt.



This ppt is filtered out. If we would use Na_2CO_3 we could not get normal salt rather we would get the basic salt.



only salt

