

The s block elements-solutions

SUBJECTIVE PROBLEMS:

Sol 1.

(i) Potassium carbonate cannot be manufactured by Solvay process, since; unlike sodium hydrogen carbonate, potassium hydrogen carbonate is rather too soluble in water to be precipitated like NaHCO_3 .

(ii) H_2O_2 is a better oxidizing agent than H_2O because oxidation number of oxygen in H_2O_2 is -1 and that in water it is -2 . So H_2O easily reduces to -2 oxidation number.

(iii) MgO is used for the lining of steel making furnace because it acts as basic flux and facilitates the removal of acidic impurities of Si, P and S from steel through slag formation.

(iv) The anhydrous magnesium chloride is fused with NaCl to provide conductivity to the electrolyte and to lower the fusion temperature of anhydrous MgCl_2 .

NOTE: NaCl prevents hydrolysis of MgCl_2

(v) The oxidation state of oxygen in H_2O_2 (i.e. -1) can be changed to 0 or -2 i. e oxygen in H_2O_2 exists in an intermediate oxidation state with respect to O_2 and O^{2-} . Hence it acts both as an oxidizing and reducing agent.

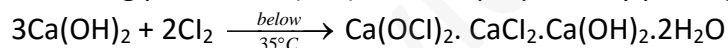
(vi) **NOTE:** Smaller the size of cation, higher will be hydration tendency because hydration energy of cation is inversely proportional to size of cation: The size of alkaline earth metal ions are smaller than the size of alkali metal ions. So in crystalline form the salts of alkaline earth metals have more water molecules than those, of alkali metals.

(vii) BeCl_2 is hydrolysed due to high polarizing power and presence of vacant p-orbitals in Be-atom.

($\text{Be} = 1s^2, 2s^2 2p_x^1 2p_y^0 2p_z^0$)

Sol 2.

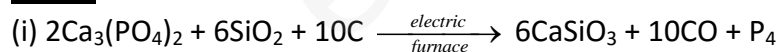
Bleaching powder, Ca(OCl)_2 , can be prepared by passing chlorine through Ca(OH)_2 solution.



Slaked lime

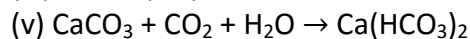
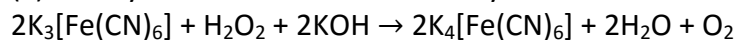
Bleaching Powder

Sol 3.



This is the **electro thermal process** to extract phosphorus from phosphorite or bone ash [$\text{Ca}_3(\text{PO}_4)_2$].

(ii) Ferricyanide is oxidized to Ferro cyanide on treatment with alkali



Calcium bicarbonate

NOTE: Suspension of lime stone is CaCO_3 .

Sol 4.

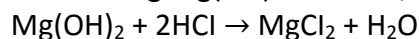
In sea water Mg exists as $MgCl_2$.

On treating sea water with slaked lime $Mg(OH)_2$ is obtained.

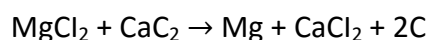
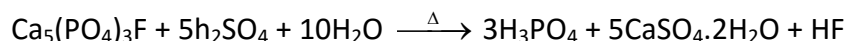
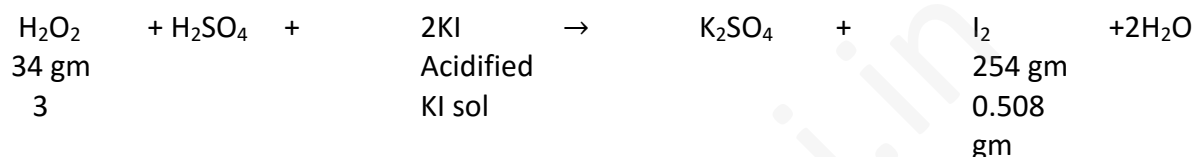


In sea water slaked lime

On reacting $Mg(OH)_2$ with HCl, $MgCl_2$ is obtained.



From $MgCl_2$, Mg is obtained by reduction of $MgCl_2$ with Ca.


Sol 5.

Sol 6.


5 cm³

or ml

i. e. 254 gm of I_2 is released by 34 gm H_2O_2

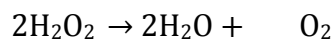
\therefore 0.508 gm of I_2 will be released by

$$= \frac{34}{254} \times 0.508 = 0.608$$

5 ml of H_2O_2 sol. Contains 0.068 gm of H_2O_2

\therefore 1 ml of H_2O_2 contains 0.068/5 gm H_2O_2

NOTE: The strength of H_2O_2 is generally calculated in terms of **volume strength**. According to which 10 volume of H_2O_2 means that 1 ml of H_2O_2 sol gives 10 ml of O_2 at STP.



$$2 \times 34 \text{ gm} \quad \quad \quad 32 \text{ gm or}$$

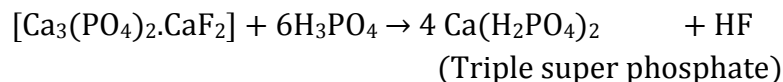
$$22,400 \text{ ml at STP}$$

i.e., 68 gm of H_2O_2 gives 22,400 ml of O_2 at STP or 1 ml of H_2O_2 sol

Or 0.068/5 gm of H_2O_2 sol gives 4.48 ml of O_2 i.e. strength of H_2O_2 sol is **4.48 volumes**

Sol 7.

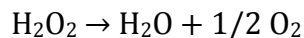
LiF has more ionic character while LiI has more covalent character. The latter is due to the greater polarizability of larger iodide ion than the fluoride ion.

Sol 8.


Sol 9.

Meq. Of H_2O_2 = Meq. Of $\text{Na}_2\text{S}_2\text{O}_3$

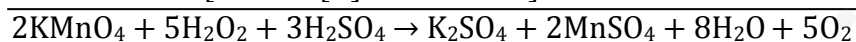
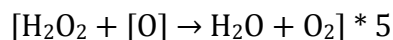
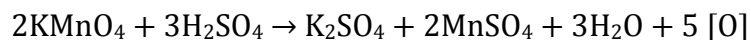
$$W/17 * 1000 = 20 * 0.3 \quad \therefore w = 0.102 \text{ g}$$



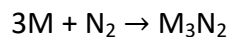
$$\therefore \text{Volume of O}_2 = 11200 * 0.102/34 = 33.6 \text{ mL}$$

$$\therefore \text{Volume strength} = 33.6/25 = 1.344$$

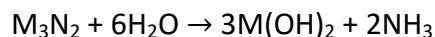
Sol 10.



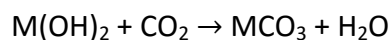
Sol 11.



‘A’ ‘B’



‘B’ ‘C’ ‘D’



‘C’ ‘D’

M may be either Ca or Ba

NOTE: It is not magnesium because $\text{Mg}(\text{OH})_2$ has very low solubility in water.

If we consider Ba as M then A is **Ba**, B is **Ba₃N₂**, C is **Ba(OH)₂**, D is **BaCO₃**.

Sol 12.

$\text{SrSO}_4 > \text{CaSO}_4 > \text{MgSO}_4 > \text{BeSO}_4$ (Based upon size of cation or ionic character)

Sol 13.

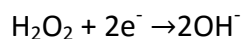


Bleaching powder

(A mixture of $\text{Ca}(\text{OCl})_2$ and basic chloride)

Sol 14.

When H_2O_2 acts as oxidizing agent, following reaction takes place:



While regarding its action as reducing agent, the following reaction takes place:

