

HINTS & SOLUTIONS

s-Block Elements

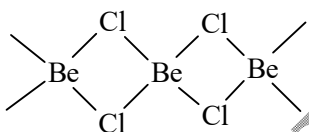
[Set-2]

SECTION-A

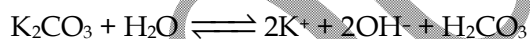
1. (iv): Across the period, ionic size decreases

Li ⁺	Be ²⁺
Na ⁺	Mg ²⁺
K ⁺	Ca ²⁺
Rb ⁺	Be ²⁺
Cs ⁺	Ba ²⁺

2. (iv): In solid BeCl₂, each Be atom is bonded to four Cl atoms, hence the covalency of Be is 4.



3. (iv): K₂CO₃ on hydrolysis gives KOH and H₂CO₃. KOH is a very strong base, hence, the aqueous solution of K₂CO₃ is most basic.



4. (i): Be due to its small size, only combines with O²⁻ ion to give beryllium oxide.

5. (iv): Li only in group 1 form nitride on reaction with N₂

K is used in photoelectric effect due to its large size and low ionization enthalpy

Be form amphoteric oxide and also form nitride, Be₃N₂ on reaction with N₂

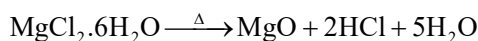
Ba gives an apple green flame.

6. (iii): K reacts with oxygen to form potassium superoxide due to stabilization of large cation by large anion. Assertion is correct.

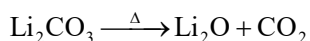
K always shows an oxidation state of +1. Reason is wrong.

7. (iii): All group 2 halides are hygroscopic and exists as hydrated salts. Assertion is correct.

$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ on heating gives MgO and HCl . It gets hydrolysed by its own water molecules of hydration. Reason is wrong.



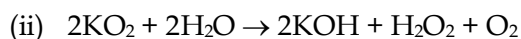
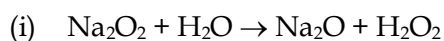
8. (ii): According to Fajan's rules. Covalent bond is favoured by small size of cation, large size of anion and high charge on both the ions.
9. (iv) Sodium ions are found primarily on the outside of cells in blood plasma and in the intestinal fluids which surrounds the cells.
- Potassium ions are the most abundant cations within cell fluids.
10. (iii): The stability of metal carbonates increases down the group 1 due to stabilization of large cation by large anions.
11. (i) Li_2CO_3 is highly unstable due to low electropositive nature of lithium, small size of lithium that Li^+ cannot be stabilized by large size anion CO_3^{2-} .



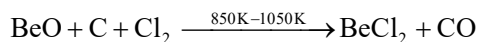
As the electropositive character increases down the group, stability of metal carbonates increases.

- (ii) Lithium salts are commonly hydrated due to its small size and high charge to radius ratio. As a result Li^+ ion easily attract water molecules towards itself and gets hydrated.
12. (i) BeO is almost insoluble in water due to its high lattice enthalpy because of small size of Be^{2+} and O^{2-} ions.
- BeSO_4 is soluble in water because its hydration enthalpy is more than its lattice enthalpy
- (ii) LiI is more covalent due to small size of Li^+ and large size of I^- . Hence, LiI is more soluble in ethanol than KI .

OR



13. BeCl_2 is prepared by reacting beryllium oxide with carbon and chlorine at 850–1050 K.

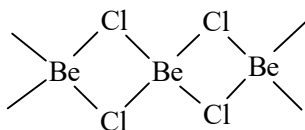


(i) At high temperature, BeCl_2 has a linear structure with Be sp hybridized.



(ii) In the solid state,

BeCl_2 has a polymeric structure with bridged chlorine atoms. Each Be is sp^3 hybridised

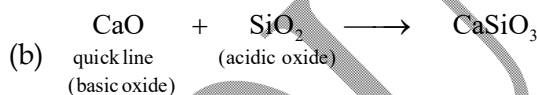
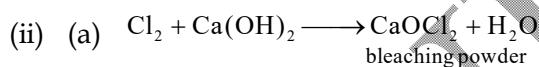


14. (i) Alkaline earth metals cannot be obtained by chemical reduction method because

(a) they are highly electropositive

(b) they have more affinity for oxygen than the chemical reducing agent used

Hence, alkaline earth metals can be obtained by electrolytic reduction method.

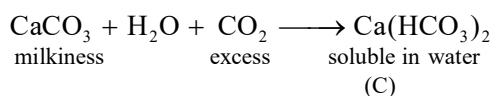
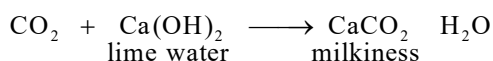


OR

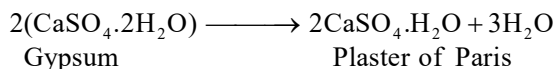
A $\rightarrow \text{CaCO}_3$ (as it gives a brick red colour flame and brisk effervescence of CO_2 with dilute H_2SO_4).

B $\rightarrow \text{CO}_2$ gas

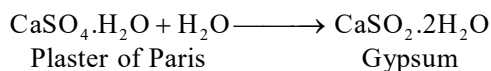
C $\rightarrow \text{Ca}(\text{HCO}_3)_2$



15. (i) Plaster of Paris is a white powder and is obtained when gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is heated to 393 K



When water is added to Plaster of Paris, it sets with expansion into a hard mass of interlocking crystals of gypsum within 5–15 minutes.



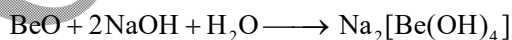
- (ii) Lithium shows anomalous behavior from rest of the members of group 1 due to its small size, high electronegativity. For example:
- (a) Lithium only reacts with nitrogen to form lithium nitride, other alkali metals do not react
 - (b) Lithium carbonate decompose on heating, other alkali metals carbonates are stable towards heat
 - (c) Lithium nitrate on heating gives brown fumes of NO_2 gas, other alkali metals nitrates on heating form metal nitrites.

Lithium show diagonal relationship with magnesium due to their similar charge to radius ratio

- (a) Both Li and Mg reacts with N_2 to form their respective nitrides.
- (b) Both Li_2CO_3 and MgCO_3 decompose on heating to give CO_2 gas.
- (c) Both LiNO_3 and $\text{Mg}(\text{NO}_3)_2$ decompose on heating to give brown fumes of NO_2 gas

OR

- (i) (a) Beryllium form oxoanions due to its small size, high charge and availability of empty atomic orbitals.



$[\text{Be}(\text{OH})_4]^{2-}$ is an oxoanion.

- (b) Sodium is less reactive than potassium due to its small size and high ionization enthalpy.
- (ii) The various reactions involved in the preparation of sodium hydrogen carbonate are

