



s-Block Elements (Alkali and Alkaline Earth Metals) Important Questions With Answers

NEET Chemistry 2023

1. A metal salt solution forms a yellow precipitate with potassium chromate in acetic acid, a white precipitate with dilute sulphuric acid but does not give precipitate with sodium chloride or iodide. The white precipitate obtained when sodium carbonate is added to the metal salt solution will consist of
a) lead carbonate b) basic lead carbonate **c) barium carbonate** d) strontium carbonate

Solution : -

Pb and Ba both give yellow ppt. with K_2CrO_4 in acetic acid and white precipitate with dil. H_2SO_4 . But lead salts give precipitate with sodium chloride or iodide also whereas barium does not. It means given salt is barium salts and with sodium carbonate it gives white precipitate of barium carbonate.

2. Sodium is made by the electrolysis of a molten mixture about 40% NaCl and 60% $CaCl_2$ because
a) Ca^{2+} can reduce NaCl to Na b) Ca^{2+} can displace Na from NaCl
c) $CaCl_2$ helps in conduction of electricity **d) This mixture has a lower melting point than NaCl**

Solution : -

The melting point of sodium chloride is high, so to reduce the melting point of NaCl some $CaCl_2$ is added to the electrolytic mixture.

3. Assertion: Alkaline earth metal oxides are quite stable to heat.
Reason: Enthalpies of formation of alkaline earth metal oxides are quite high.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

4. In the replacement reaction



The reaction will be most favourable if M happens to be:

- a) Na b) K **c) Rb** d) Li

Solution : -

Tertiary salt halide can show ionic reaction with MF so, MF should be better ionic for reaction to proceed forward. Hence 'M' should be 'Rb'.

5. A compound of sodium does not give CO_2 when heated but it gives CO_2 when treated with dilute acids. A crystalline compound is found to have 37.1% Na and 14.52% H_2O . Hence, compound is
a) $NaHCO_3 \cdot 10H_2O$ b) $NaHCO_3 \cdot 5H_2O$ c) $Na_2CO_3 \cdot 10H_2O$ **d) $Na_2CO_3 \cdot H_2O$**

Solution : -

CO_2 is obtained only when the compound is decomposed by acid thus, it is Na_2CO_3 . It cannot be $NaHCO_3$ since, it gives CO_2 on heating. Probable compound is $Na_2CO_3 \cdot xH_2O$

85.48% 14.52%

| | | Molar ratio | Ratio |
|------------|-------|-------------|-------|
| Na_2CO_3 | 85.48 | 0.8064 | 1 |

| | | | |
|------------------|-------|--------|---|
| H ₂ O | 14.52 | 0.8064 | 1 |
|------------------|-------|--------|---|

Thus, compound is Na₂CO₃·H₂O

Molecular weight = 124 g mol⁻¹

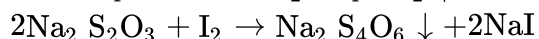
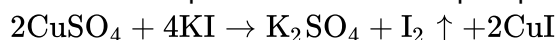
Percentage of sodium = $\frac{2 \times 23}{124} \times 100 = 37.1$

6. A certain compound X when treated with copper sulfate solution yields a brown precipitate. On adding solution, the precipitate turns white. The compound X is:

- a) K₂CO₃ **b) KI** c) KBr d) K₃PO₄

Solution : -

When potassium iodide is reacted with CuSO₄, it gives iodine gas which is brown colour. This iodine reacted with sodium thiosulphate and form white precipitate of sodium tetrathionate.



7. E⁰ for Cl₂/Cl⁻ = +1.36, I₂/I⁻ = +0.53, Ag⁺/Ag = +0.79, Na⁺/Na = -2.71 and Li⁺/Li = -3.04 V. What is the order of decreasing reducing strength for these species?

- a) Li > Cl > Ag > I⁻ > Na **b) Li > Na > I⁻ > Ag > Cl⁻** c) Cl⁻ > Ag > I⁻ > Na > Li d) Na > Li > Ag > Cl⁻ > I⁻

8. Which of the following is not present in portland cement?

- a) Ca₃Al₂O₆ b) Ca₃SiO₅ c) Ca₂SiO₄ **d) Ca₃(PO₄)₂**

Solution : -

Phosphate is not a part of composition of portland cement.

9. Which of the following is not true about s-block elements?

- a) They have large atomic sizes b) They have lower ionisation enthalpies
c) They have variable oxidation state **d) They form basic oxides**

10. All alkali halides are soluble in water except LiF. The low solubility of LiF in water is due to its (i) the low solubility of CsI is due to (ii). LiF is soluble in (ii) solvents.

a)

| | | |
|----------------------|--------------------------|----------------|
| (i) | (ii) | (iii) |
| low lattice enthalpy | large hydration enthalpy | polar solvents |

b)

| | | |
|-----------------------|----------------------------|----------------------|
| (i) | (ii) | (iii) |
| high lattice enthalpy | smaller hydration enthalpy | non - polar solvents |

c)

| | | |
|-------------------------|-----------------------|----------------------|
| (i) | (ii) | (iii) |
| high hydration enthalpy | high lattice enthalpy | non - polar solvents |

d)

| | | |
|----------------------------|-----------------------|----------------|
| (i) | (ii) | (iii) |
| smaller hydration enthalpy | high lattice enthalpy | polar solvents |

Solution : -

The low solubility of LiF in water is due to its high lattice enthalpy whereas the low solubility of CsI is due to smaller hydration enthalpy of two large size ions. LiF is soluble in non-polar solvents like ethanol, acetone, etc.

11. The correct order of increasing thermal stability of K₂CO₃, MgCO₃, CaCO₃ and BeCO₃ is:

- a) BeCO₃ < MgCO₃ < K₂CO₃ < CaCO₃ **b) BeCO₃ < MgCO₃ < CaCO₃ < K₂CO₃**
c) MgCO₃ < BeCO₃ < CaCO₃ < K₂CO₃ d) K₂CO₃ < MgCO₃ < CaCO₃ < BeCO₃

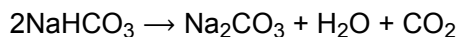
Solution : -

Thermal stability of carbonates increases in a group on moving down the groups and decreases in a period while moving left to right. Therefore, the correct order is BeCO₃ < MgCO₃ < CaCO₃ < K₂CO₃.

12. Which of the following reactions is not a part of Solvay's process for preparation of sodium carbonate:

- a) $2\text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow (\text{NH}_4)_2\text{CO}_3$ b) $(\text{NH}_4)_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow 2\text{NH}_4\text{HCO}_3$
 c) $2\text{NH}_4\text{HCO}_3 \rightarrow (\text{NH}_4)_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$ d) $\text{NH}_4\text{HCO}_3 + \text{NaCl} \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$

Solution : -



13. A white solid X on heating gives a white solid Y and an acidic gas Z. Gas Z is also given out when X reacts with an acid. The compound Y is also formed if caustic soda is left open in the atmosphere. X, Y and Z are

| a) | | | b) | | | c) | | | d) | | |
|------------------|--------------------------|---------------|--------------------------|---------------|---------------|--------------------------|------------------|---------------|---------------|------------------|---------------|
| X | Y | Z | X | Y | Z | X | Y | Z | X | Y | Z |
| NaHCO_3 | Na_2CO_3 | CO_2 | Na_2CO_3 | NaOH | CO_2 | Na_2CO_3 | NaHCO_3 | CO_2 | NaOH | NaHCO_3 | CO_2 |

14. Match List-I with List-II for the compositions of substances and select the correct answer using the code given below the lists:

Plaster of paris

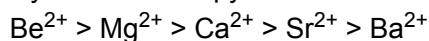
- a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ b) $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ c) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ d) $\text{MgSO}_4 \cdot \text{H}_2\text{O}$

15. One word answers are given for the following. Mark the example which is not correct

- a) Alkali metal with lowest melting point - Cs
 b) **Alkaline earth metal with highest hydration enthalpy - Ba^{2+}**
 c) Alkaline earth metal which imparts brick red colour to the flame - Ca^{2+}
 d) Oxide of alkaline earth metal which is amphoteric in nature - BeO

Solution : -

Hydration enthalpy decreases with increase in ionic size down the group.



16. Match List-I with List-II for the compositions of substances and select the correct answer using the code given below the lists:

Kieserite

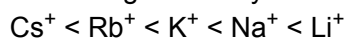
- a) $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ b) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ c) $\text{MgSO}_4 \cdot \text{H}_2\text{O}$ d) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

17. Which of the following increasing orders is not correct as per the property indicated against it?

- a) **$\text{CsCl} < \text{RbCl} < \text{KCl} < \text{NaCl} < \text{LiCl}$ (Lattice energy)** b) $\text{LiOH} < \text{NaOH} < \text{KOH}$ (Solubility in water)
 c) $\text{Li}^+ < \text{Na}^+ < \text{K}^+ < \text{Rb}^+ < \text{Cs}^+$ (Size of hydrated ion) d) $\text{NaI} < \text{NaBr} < \text{NaCl} < \text{NaF}$ (Lattice energy)

Solution : -

Increasing size of hydrated ion



18. K_2CO_3 cannot be prepared by Solvay's process because

- a) KHCO_3 is less soluble than NaHCO_3
 b) **KHCO_3 is more soluble to be precipitated by KCl and NH_4HCO_3**
 c) K_2CO_3 is more soluble to be precipitated by KCl d) K_2CO_3 is less soluble than Na_2CO_3

Solution : -

KHCO_3 is more soluble to be precipitated by the addition of NH_4HCO_3 to the saturated solution of KCl.

19. Which one is the correct statement with reference to the solubility of MgSO_4 in water?

- a) **SO_4^{2-} ions mainly contribute towards hydrator energy** b) Sizes of Mg^{2+} and SO_4^{2-} are similar
 c) Hydration energy of MgSO_4 is higher in comparison to its lattice energy
 d) Ionic potential (charge/radius ratio) of Mg^{2+}

Solution : -

MgSO_4 is soluble in water because it have hydration energy more than lattice energy.

Mg^{2+} ions mainly contributes towards hydration energy.

20. The normal oxide contains _____ ion, peroxide contains _____ ion and superoxide contains _____ ion.
a) O^{2-} , O_2^{2-} , O_2^- b) O^{2-} , O_2^- , O_2^{2-} c) O^- , O_2^- , O_3^- d) O^- , O^{2-} , O_2^{2-}

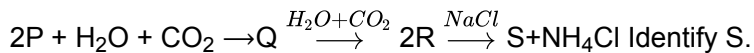
21. Which one of the following has minimum value of size of cation/anion ratio?

- a) NaCl b) KCl c) **MgCl₂** d) CaF₂

Solution : -

The size of M^{2+} is minimum among Na^+ , Ca^{2+} , K^+ and M^{2+} and size of Cl^- is more than F^- . So, the ratio of size of cation and anion are minimum in $MgCl_2$.

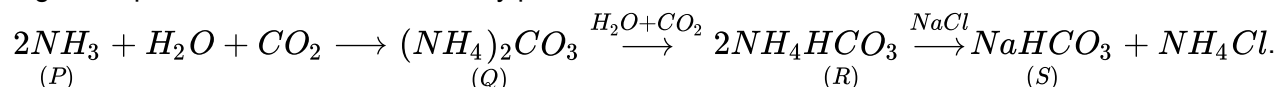
22. In the given chemical reactions,



- a) Na_2CO_3 b) NaOH c) **NaHCO₃** d) NH_3

Solution : -

The given equations are involved in Solvay process.

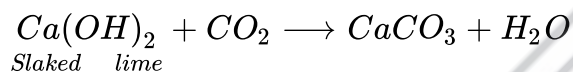


23. Assertion: $CaCO_3$ is prepared by passing carbon dioxide gas through slaked lime.

Reason: Passing excess of CO_2 through slaked lime leads to the formation of quick lime.

- a) **If both assertion and reason are true and reason is the correct explanation of assertion**
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

Solution : -



Excess of CO_2 leads to the formation of water soluble calcium hydrogen carbonate.

24. Assertion: Lithium salts are mostly hydrated.

Reason: The hydration enthalpies of alkali metal ions decrease with increase in ionic size.

- a) **If both assertion and reason are true and reason is the correct explanation of assertion**
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

25. In context with beryllium, which one of the following statements is correct?

- a) It is rendered passive by nitric acid. b) It forms Be_2C . c) **Its salts rarely hydrolyze.**
d) Its hydride is electron-deficient and polymeric.

Solution : -

Beryllium salts are readily hydrolysed.

26. Assertion: Lithium fluoride is most covalent in nature.

Reason: Small anion can be easily distorted.

- a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) **If both assertion and reason are false**

Solution : -

Li^+ ion is very small in size and has high tendency to distort electron cloud around the negative halide ion. Anion with large size can be easily distorted hence among halides, lithium iodide is the most covalent in nature.

27. The ionisation energy of alkali metals decreases from Li to Cs because

- a) **the atomic size increases from Li to Cs**
b) the distance between nucleus and outermost orbital decreases from Li to Cs
c) electropositive character decreases down the group d) melting point decreases from Li to Cs

28. Which of the following does not show diagonal relationship between beryllium and aluminium?

- a) Both BeO and Al₂O₃ are amphoteric in nature
- b) Both beryllium and aluminium form polymeric covalent hydrides
- c) Both beryllium and aluminium form nitrides with nitrogen which evolve NH₃ with water
- d) Both metal carbonates are highly stable**

Solution : -

The carbonates of both the metals are unstable.

29. The alkali metals are low melting. Which of the following alkali metals is expected to melt if the room temperature rises to 30°C?

- a) Na b) K c) Rb **d) Cs**

Solution : -

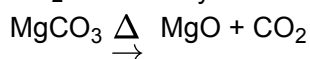
Atomic size increases down the group from Na to Cs so, the strength of metallic bonding decreases and hence, the melting point also decreases.

30. On heating which of the following releases CO₂ most easily?

- a) Na₂CO₃ **b) MgCO₃** c) CaCO₃ d) K₂CO₃

Solution : -

Stability of carbonates increases down the group with increase in the size of metal ion. Also, the alkali metal carbonates are more stable than alkaline earth metal carbonates. Hence, MgCO₃ is least stable and it releases CO₂ most easily.



31. The compound (A) on heating gives a colourless gas and a residue that is dissolved in water to obtain (B).

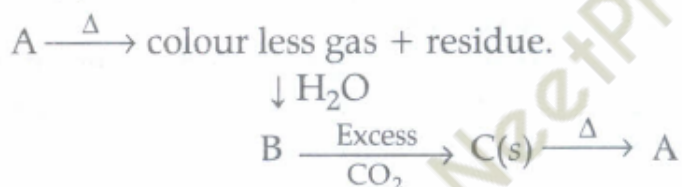
Excess of CO₂ is bubbled through aqueous solution of (B), (C) is formed which is recovered in the solid form.

Solid (C) on gentle heating gives back (A). The compound is:

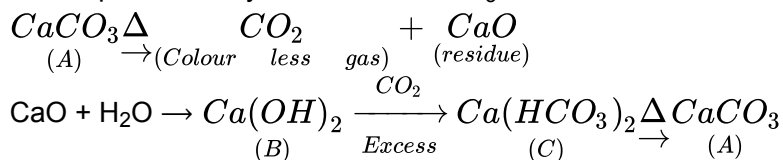
- a) CaCO₃** b) Na₂CO₃ c) K₂CO₃ d) CaSO₄ · 2H₂O

Solution : -

The reaction can be summarized as follows:



This is possible only when 'A' is CaCO₃. The reactions are as follow:



32. On reaction with dihydrogen the alkali metals

- a) form hydrides which are ionic solids with high melting points**
- b) form hydrides which are molecular solids with low melting points
- c) form hydrides which are ionic solids with low melting points
- d) form hydrides which are non-stoichiometric

Solution : -

Alkali metals react with dihydrogen to form hydrides which are ionic solids with high melting points.

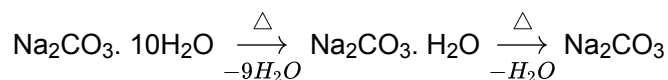
33. Calcium chloride is used as a dehydrating agent because

- a) it has a strong affinity for water**
- b) it has water of crystalline attached to it
- c) it loses water when exposed to air
- d) it has a high melting point

34. When washing soda is heated

- a) CO is released b) CO + CO₂ is released c) CO₂ is released **d) water vapour is released**

Solution : -



35. Which of the carbonates given below is unstable in air and is kept in CO₂ atmosphere to avoid decomposition?
a) BeCO₃ b) MgCO₃ c) CaCO₃ d) BaCO₃
36. Dehydration of hydrates of halides of calcium, barium and strontium i.e., CaCl₂·6H₂O, BaCl₂·2H₂O, SrCl₂·6H₂O, can be achieved by heating. These become wet on keeping in air. Which of the following statements is correct about these halides?
 a) Act as dehydrating agent b) Can absorb moisture from air
 c) Tendency to form hydrate decreases from calcium to barium **d) All of the above**
37. Assertion: Superoxides of alkali metals are paramagnetic.
 Reason: Superoxides contain O₂ ion which has one unpaired electron.
a) If both assertion and reason are true and reason is the correct explanation of assertion
 b) If both assertion and reason are true but reason is not the correct explanation of assertion
 c) If assertion is true but reason is false d) If both assertion and reason are false
38. The right order of the solubility of sulphates of alkaline earth metals in water is
 a) Be > Ca > Mg > Ba > Sr b) Mg > Be > Ba > Ca > Sr **c) Be > Mg > Ca > Sr > Ba**
 d) Mg > Ca > Ba > Be > Sr

Solution : -

Solubility of sulphates of alkaline earth metals decreases down the group.

39. Sulphates of Be and Mg are readily soluble in water but sulphates of Ca, Sr and Ba are insoluble. This is due to the fact
a) the greater hydration enthalpies of Be²⁺ and Mg²⁺ overcome the lattice enthalpy
 b) high lattice enthalpy of Be²⁺ and Mg²⁺ makes them soluble in water
 c) solubility decreases from BeSO₄ to BaSO₄ due to increase in ionic size
 d) BeSO₄ and MgSO₄ are ionic in nature while other sulphates are covalent

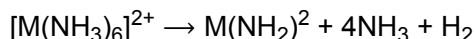
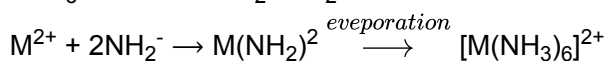
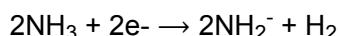
Solution : -

Due to smaller size their lattice enthalpies are high but their greater hydration enthalpies overcome the lattice enthalpies and they become soluble in water. Ca, Sr and Ba sulphates are insoluble in water due to lower hydration enthalpies.

40. The difference of water molecules in gypsum and plaster of Paris is
 a) $\frac{5}{2}$ b) 2 c) $\frac{1}{2}$ **d) $1\frac{1}{2}$**
41. When alkaline earth metals dissolve in ammonia, they form coloured solution like alkali metals. Which of the following observations regarding the reaction are correct?
 (i) Dilute solutions are bright blue in colour due to solvated electrons.
 (ii) These solutions decompose to form amides and hydrogen.
 (iii) From this solution the ammoniates [M(NH₃)₆]²⁺ can be recovered by evaporation.
a) Only (i) and (ii) b) Only (i), (ii) and (iii) c) Only (ii) and (iii) d) Only (i)

Solution : -

All the observations are correct.



42. What is the biological importance of Na^+ and K^+ ions in cell fluids like blood plasma?
- They participate in transmission of nerve signals
 - They regulate the number of red and white blood corpuscles in the cell
 - They can be present in any amount in the blood since they are absorbed by the cells
 - They regulate the viscosity and colour of the blood
43. An element X burns in nitrogen to give a compound Y which on reaction with water gives a compound Z and a gas with a pungent smell. Z can be used during construction and white washing. When excess of CO_2 is bubbled through Z, a compound P is formed which on heating decomposes to give a colourless, odourless gas. Identify X, Y, Z and P.

a)

| X | Y | Z | P |
|----|-------------------------|--------------------------|-----------------------------|
| Ca | Ca_3N_2 | $\text{Ca}(\text{OH})_2$ | $\text{Ca}(\text{HCO}_3)_2$ |

b)

| X | Y | Z | P |
|----|-----|--------------------------|-----------------|
| Mg | MgO | $\text{Mg}(\text{OH})_2$ | MgCO_3 |

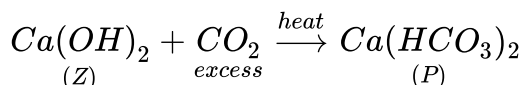
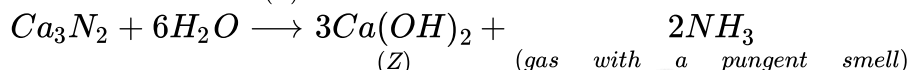
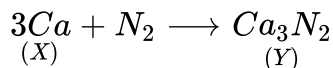
c)

| X | Y | Z | P |
|----|-------------------------|--------------------------|-----------------|
| Ca | Ca_3N_2 | $\text{Ca}(\text{OH})_2$ | CaCO_3 |

d)

| X | Y | Z | P |
|----|-----|--------------------------|-----------------------------|
| Ca | CaO | $\text{Ca}(\text{OH})_2$ | $\text{Ca}(\text{HCO}_3)_2$ |

Solution : -

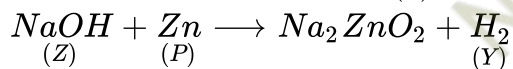
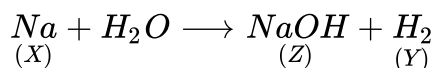


44. A metal X reacts with water to produce a highly combustible gas Y, and a solution Z. Another metal P reacts with Z to give the same gas Y.

X, Y, Z and P respectively are

- a) Zn, H_2 , $\text{Zn}(\text{OH})_2$, Al b) Na, H_2 , NaOH, Zn c) K, H_2 , KOH, Al d) Li, H_2 , LiOH, K

Solution : -



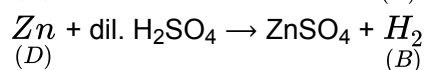
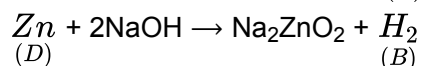
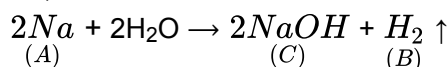
45. When a substance (A) reacts with water it produces a combustible gas (B) and a solution of substance (C) in water. When another substance (D) reacts with this solution of (C), it also produces the same gas (B) on warming but (D) can also produce gas (B) on reaction with dilute sulphuric acid at room temperature. (A) imparts a deep golden yellow colour to a smokeless flame of Bunsen burner. Then, A, B, C and D, respectively are:

- a) Na, H_2 , NaOH, Zn b) K, H_2 , KOH, Al c) Ca, H_2 , $\text{Ca}(\text{OH})_2$, Sn d) CaC_2 , C_2H_2 , $\text{Ca}(\text{OH})_2$, Fe

Solution : -

Only Na gives golden yellow colour to Bunsen flame.

So, A is Na.



46. Which one of the following is present as an active ingredient in bleaching powder for bleaching action?

- a) CaOCl_2 b) $\text{Ca}(\text{OCl})_2$ c) CaO_2Cl d) CaCl_2

Solution : -



47. The increasing order of basic character of oxides MgO , SrO , K_2O , and Cs_2O is

- a) $\text{MgO} < \text{SrO} < \text{K}_2\text{O} < \text{Cs}_2\text{O}$ b) $\text{SrO} < \text{MgO} < \text{Cs}_2\text{O} < \text{K}_2\text{O}$ c) $\text{Cs}_2\text{O} < \text{K}_2\text{O} < \text{SrO} < \text{MgO}$
 d) $\text{K}_2\text{O} < \text{Cs}_2\text{O} < \text{SrO} < \text{MgO}$

Solution : -

Basic character of oxides increases down the group while decreases in a period.

48. Match the column I with column II and mark the appropriate choice:

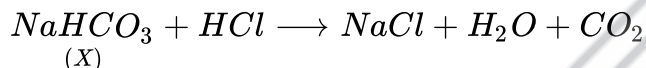
| Column I | Column II |
|------------------|--------------------------------|
| (A) Quick lime | (i) CaH_2 |
| (B) Slaked lime | (ii) $\text{Ba}(\text{OH})_2$ |
| (C) Baryta water | (iii) $\text{Ca}(\text{OH})_2$ |
| (D) Hydrolith | (iv) CaO |

- a) (A) \rightarrow (i), (B) \rightarrow (ii), (C) \rightarrow (iii), (D) \rightarrow (iv) b) (A) \rightarrow (iii), (B) \rightarrow (ii), (C) \rightarrow (i), (D) \rightarrow (iv)
 c) (A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (iv), (D) \rightarrow (ii) d) (A) \rightarrow (iv), (B) \rightarrow (iii), (C) \rightarrow (ii), (D) \rightarrow (i)

49. A white solid X reacts with dil. HCl to give colourless gas which is used in fire extinguishers. The solid X is

- a) NaCl b) CH_3COONa c) Na_2CO_3 d) Na_2CO_3

Solution : -



50. Which of the following oxides is not expected to react with sodium hydroxide

- a) CaO b) SiO_2 c) BeO d) B_2O_3

Solution : -

NaOH is a strong alkali. Reacts with acidic and amphoteric oxides to form salts. Since CaO is a basic oxide thus does not reacts with NaOH .