



## CHEMISTRY

### BOOKS - MODERN PUBLISHERS CHEMISTRY (HINGLISH)

#### S-BLOCK ELEMENTS ( ALKALI AND ALKALINE EARTH METALS )

#### Solved Example

1. What makes lithium to show properties uncommon to rest of the alkali metals?



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2. When is a cation highly polarising? Which alkali metal cation has the highest polarising power?

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3. Arrange the following alkali metal ion in decreasing order of their mobility:  $Li^+$ ,  $Na^+$ ,  $K^+$ ,  $Rb^+$ ,  $Cs^+$

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4. Arrange the following in order of the increasing covalent character:

$MCl$ ,  $MBr$ ,  $MF$ ,  $MI$  (where M = alkali metals)



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5. What is the oxidation state of

(i) Lithium in  $Li_2O$

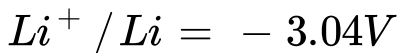
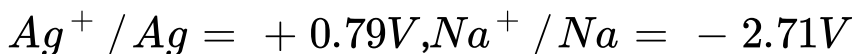
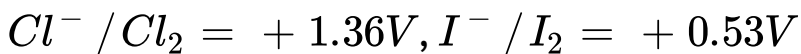
(ii) Sodium in  $Na_2O_2$

(iii) Potassium in  $KO_2$

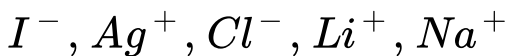


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6. The  $E^\circ$  values are :



Arrange the following ionic species in decreasing order of reducing strength :



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7. Why is  $KO_2$  paramagnetic ?



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8. Why is that on being heated in excess supply of air, K, Rb and Cs form superoxides in preference to oxide and peroxides?

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9. What happens when  $KO_2$  reacts with water? Write the balanced chemical equation for the reaction.

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10. Write balanced equations for reactions between

a.  $Na_2O_2$  and water

b.  $KO_2$  and water

c.  $Na_2O$  and  $CO_2$



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11. The enthalpy of formation of hypothetical  $CaCl(s)$  is found to be  $-180 \text{ kJ mol}^{-1}$  and that of  $CaCl_2(s)$  is  $-800 \text{ kJ mol}^{-1}$ . Calculate  $\Delta_f H^\circ$  for the disproportionation reaction:



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**12.** What happens when

- (i) Magnesium is burnt in air
- (ii) Quicklime is heated with silica
- (iii) Calcium nitrate is heated
- (iv) Chlorine reacts with slaked lime



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**13.** Arrange the followin in the decreasing order of the property mentioned :

(i)  $Li^+$ ,  $Na^+$ ,  $K^+$ ,  $Rb^+$  (Ionic mobility )

(ii)  $Be$ ,  $Mg$ ,  $Ca$ ,  $Sr$  ( Melting point )

(iii)  $\text{BeO}$  ,  $\text{MgO}$  ,  $\text{CaO}$  (Enthalpy of formation )

(iv)  $\text{Be}$  ,  $\text{Mg}$  ,  $\text{Ca}$  ( Metallic radius )

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**14.** Name one reagent or one operation to distinguish between :

(i)  $\text{BeSO}_4$  and  $\text{BaSO}_4$  (ii)  $\text{Be}(\text{OH})_2$  and  $\text{Ba}(\text{OH})_2$

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**15.** Complete the following :

(i)  $\text{Ca} + \text{H}_2\text{O}$  (ii)  $\text{Ca}(\text{OH})_2 + \text{Cl}_2$

(iii)  $\text{BeO} + \text{NaOH}$  (iv)  $\text{BaO}_2 + \text{H}_2\text{SO}_4$





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**16.** Why does the solubility of alkaline earth metal carbonates and sulphates in water decrease down the group ?



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**17.** Why does the solubility of alkaline earth metal hydroxide in water increase down the group?



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**18.** When water is added to compound (A) of calcium, solution of compound (B) is formed. When carbon dioxide is passed into the solution, it turns milky due to the formation of compound (C). If excess of carbon dioxide is passed into the solution milky solution disappears due to the formation of compound (D). Identify the compounds A, B, C and D. Explain why the milky solution disappears in the last step.



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**Practice Problem**

1. Among the alkali metals which element has

(i) highest melting point

(ii) most electropositive character

(iii) lowest size of ion

(iv) strongest reducing character



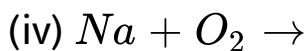
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2. Out of  $\text{LiOH}$  ,  $\text{NaOH}$  and  $\text{KOH}$  , which is the strongest base ?



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3. Complete the following reactions :



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4. Can we store sodium in water or not ?



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5. Lithium compounds are slightly covalent because of its greater ..... . Complete the statement .

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6. What compounds are formed when Li, Na and K combine with oxygen ?

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7. The most abundant alkaline earth metal is \_\_\_\_\_.

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8. Which is the most abundant element among alkali metal ?

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9. Which among the alkali metals form nitride ?

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10. Which of the following alkali metals is most electropositive ?

*Li, Na, K, Rb* or *Cs*.

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11. Which member of the alkaline earth metals family has

(i) least reactivity (ii) lowest density (iii) highest boiling point (iv) maximum reduction potential ?



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12. Compare the first and second ionisation enthalpies of sodium and magnesium .



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13. Arrange the following in the order of property mentioned :

(i)  $BaCl_2$ ,  $MgCl_2$ ,  $BeCl_2$ ,  $CaCl_2$  increasing ionic character

(ii)  $Mg(OH)_2$ ,  $Sr(OH)_2$ ,  $Ba(OH)_2$ ,  $Ca(OH)_2$   
increasing solubility in water

(iii)  $BeO$ ,  $MgO$ ,  $BaO$ ,  $CaO$   
increasing basic character

(iv)  $Mg(OH)_2$ ,  $Ba(OH)_2$ ,  $Ca(OH)_2$  increasing basic character



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14. Answer the following :

(i) What is hydrolith ?

(ii) Which element of alkaline earth metals family do not give characteristic flame colouration ?

(iii) Which out  $\text{NaOH}$  or  $\text{Mg}(\text{OH})_2$  is stronger base ?

(iv) Which element in the group 2 is radioactive ?

(v) Which out of  $\text{Mg}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Ca}^{2+}$  has maximum ionic mobility in water ?



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15. What is (i) dolomite (ii) milk of lime ?



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16. Name any two ores of magnesium.

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17. What is dead burnt plaster ?

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18. What is the formulae of

(i) Plaster of Paris (ii) Gypsum ?

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**19.** What is magnesia?



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**20.** When air is blown from mouth into a test - tube containing lime water, the lime water turned milky due to the presence of



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**21.** Name three forms of calcium carbonate .



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22. What happens when gypsum is heated to 390 K ?



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23. What happens when carbon dioxide is passed through lime water?



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24. Element A burns in nitrogen to give an ionic compound B. Compound B reacts with water to give C and D. A solution to C becomes milky on bubbling carbon dioxide. Identify A, B, C and D.



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## Conceptual Question 1

1. Sodium metal is kept under kerosene. Explain.



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2. All compounds of alkali metals are easily soluble in water but lithium compounds are more soluble in organic solvents. Explain.



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### 3. ANOMALOUS BEHAVIOUR OF LITHIUM

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4. Name the alkali metals which form superoxides when heated in excess of air.

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5. Name the metal which floats on water without any apparent reaction with it.

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6. Predict giving reason, the outcome of the reaction:



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7. Why does the following reaction :



proceed better with KF than with NaF .

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8. What compounds are formed when Li and Na combine with oxygen. Give the hydrolysis reactions of

compounds formed.



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9. Explain why sodium is less reactive than potassium.



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10. Why are potassium and cesium, rather than lithium can be used in photoelectric cells?



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**11.** Why are lithium salts commonly hydrated while those of other alkali metal ions are usually anhydrous?



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**12.** Why is LiF almost insoluble in water while LiCl is soluble not only in water but also in acetone?



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**13.** Lithium is the only alkali metal to form nitride directly. Explain.



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14. An aqueous solution of sodium carbonate gives alkaline tests . Why ?



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15. Why is  $Li_2CO_3$  decomposed at a lower temperature whereas  $Na_2CO_3$  at higher temperature?



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16. LiH, LiF and  $Li_3N$  show exceptional thermal stabilities. Comment.



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17. Which out of Li or Na has greater value for the following properties :

(i) Hydration enthalpy (ii) Stability of hydride

(iii) Stability of carbonate (iv) Basic character of hydroxide

(v) Ionisation enthalpy .



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18. Which out of the following and why can be used to store an alkali metal ?

$H_2O$ ,  $C_2H_5OH$ , Benzene

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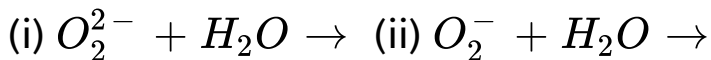
19. Why are alkali metals not found free in nature?

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20. Why caesium can be used in photoelectric cell, while lithium cannot be?

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21. Complete the following reactions :



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22. Can potassium carbonate like sodium carbonate be prepared by Solvay process ? Explain .



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Conceptual Question 2

1.  $Mg^{2+}$  ion more highly hydrated than  $Na^{+}$  ion.



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2. Why are halides of beryllium polymeric?



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3. What is difference between quicklime, slaked lime and lime water?



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4. What is dead burnt plaster ? How is it obtained ?

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5. Magnesium metal burns in air to form a white ash .

On treating the white ash with water, odour of ammonia is detected. Explain.

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6. A piece of burning magnesium continues to burn in

$SO_2$  . Explain .

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7. Give reasons for the following in one or two sentences only :

''  $BeCl_2$  can be easily hydrolysed.



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8. Arrange the alkaline earth metal carbonate in the decreasing order of thermal stability .



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9. Which of the following has highest solubility in each of the following :



(i)  $BaSO_4, MgSO_4, CaSO_4$  (ii)

$Mg(OH)_2, Ba(OH)_2, Ca(OH)_2$

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10. Arrange the following sulphates of alkaline earth metals in order of decreasing thermal stability :

$BaSO_4, MgSO_4, CaSO_4, SrSO_4$ .

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**Ncert File Ncert Textbook Exercises**

1. What are the common physical and chemical features of alkali metals?

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2. Discuss the general characteristics and gradation in properties of alkaline earth metals.

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3. Why are alkali metals not found in nature?

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4. Find out the oxidation state of sodium in  $Na_2O_2$ .

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5. Explain why is sodium less reactive than potassium.

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6. Compare the alkali metals and alkaline earth metals with respect to (a) ionisation enthalpy, (b) basicity of oxides and (c) solubility of hydroxides.

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7. In what ways lithium shows similarities to magnesium in its chemical behaviour?

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8. Explain why can alkali and alkaline earth metals not be obtained by chemical reduction methods?

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9. Why are potassium and caesium, rather lithium used in photoelectric cells?

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**10.** When an alkali metal dissolves in liquid ammonia the solution can acquire different colours. Explain the reasons for this type of colour change.



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**11.** Beryllium and magnesium do not give colour to flame whereas other alkaline earth metals do so. Why?



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12. Discuss the various reactions that occur in the Solvay process

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13. Potassium carbonate can be obtained by Solvay's process.

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14. Why is  $Li_2CO_3$  decomposed at a lower temperature whereas  $Na_2CO_3$  at higher temperature?



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**15.** Compare the solubility and thermal stability of the following compounds of the alkali metals with those of the alkaline earth metals. (a) Nitrates (b) Carbonates (c) Sulphates.



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**16.** Starting from sodium chloride, how will you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate.



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**17.** What happens when (a) magnesium is burnt in air, (b) quicklime is heated with silica, (c) chlorine reacts with slaked lime and (d) calcium nitrate is heated?

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**18.** Describe two important uses of each of the following:

(a) caustic soda, (b) sodium carbonate and (c) quicklime.

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19. Draw the structure of (i)  $BeCl_2$  (vapour) and (ii)  $BeCl_2$  (solid).



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20. The hydroxides and carbonates of sodium and potassium are easily soluble in water the corresponding compounds of magnesium and calcium are sparingly soluble. Explain.



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21. Describe the importance of the following: (a) limestone, (b) cement and (c) plaster of paris.

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22. Why are lithium salts commonly hydrated while those of other alkali metal ions are usually anhydrous?

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23. Why is  $\text{LiF}$  almost insoluble in water while  $\text{LiCl}$  is soluble not only in water but also in acetone?

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**24.** Explain the significance of sodium, potassium, magnesium and calcium on biological fluids.



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**25.** What happens when

- a. Sodium metal is dropped in water?
- b. Sodium metal is heated in free supply of air?
- c. Sodium peroxide dissolves in water?



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**26.** Comment on each of the following observation:

a. The mobilities of the alkali metal ions in aqueous solution are  $Li^{\oplus} < Na^{\oplus} < K^{\oplus} < Rb^{\oplus} < Cs^{\oplus}$ .

b. Lithium is the only alkali metal to form a nitride directly.

c.  $E^{\ominus}$  for  $M_{aq}^{2+} + 2e^{-} \rightarrow M_{(s)}$  (where M=Ca,Sr or Ba) is nearly constant.



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**27.** State as to why

(a) a solution of  $Na_2CO_3$  is alkaline ?

(b) alkali metals are prepared by electrolysis of their

fused chlorides?

(c) sodium is found to be more useful than potassium

?



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**28.** Write balanced equations for reaction between

(a)  $Na_2O_2$  and water

(b)  $KO_2$  and water

(c)  $Na_2O$  and  $CO_2$ .



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29. How would you explain the following observations?

(i) BeO is almost insoluble but  $BeSO_4$  is soluble in water

(ii) BaO is soluble but  $BaSO_4$  is insoluble in water

(iii) LiI is more soluble than KI in ethanol



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30. Which of the alkali metal is having least melting point?

A. Na

B. K

C. Rb

D. Cs

**Answer: D**



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**31.** Which one of the following alkali metals gives hydrated salts ?

A. Li

B. Na

C. K

D. Cs

**Answer: A**



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**32.** Which one of the alkaline earth metal carbonates is thermally the most stable?

A.  $MgCO_3$

B.  $CaCO_3$

C.  $SrCO_3$



D.  $BaCO_3$

**Answer: D**



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## Ncert File Ncert Exemplar Problems Multiple Choice Questions I

1. The alkali metals have low melting point. Which of the following alkali metal is expected to melt if the room temperature rises to  $30^{\circ}C$  ?

A. Na

B. K

C. Rb

D. Cs

**Answer: D**



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2. Alkali metals react with water vigorously to form hydroxides and dihydrogen. Which of the following alkali metals reacts with water least vigorously ?

A. Li

B. Na

C. K

D. Cs

**Answer: A**



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**3.** The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution.

A. Sublimation enthalpy

B. Ionisation enthalpy

C. Hydration enthalpy

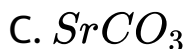
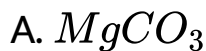
## D. Electron-gain enthalpy

Answer: C



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4. Metal carbonates decompose on heating to give metal oxide and carbon dioxide. Which of the metal carbonates is most stable thermally?

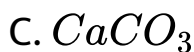
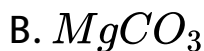


**Answer: D**



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5. Which of the carbonates given below is unstable in air and is kept in  $CO_2$  atmosphere to avoid decomposition ?

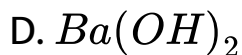
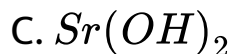
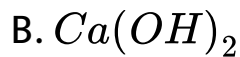
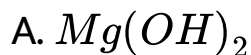


**Answer: A**



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6. Metals form basic hydroxides. Which of the following metal hydroxide is the least basic?

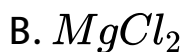


**Answer: A**



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7. Some of the Group 2 metal halides are covalent and soluble in organic solvents. Among the following metal halides, the one which is soluble in ethanol is



**Answer: A**



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8. The order of decreasing ionisation enthalpy in alkali metals is

A.  $Na > Li > K > Rb$

B.  $Rb < Na < K < Li$

C.  $Li > Na > K > Rb$

D.  $Li < Na < K < Rb$

**Answer: C**



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9. The solubility of metal halides depends on their nature, Lattice enthalpy and hydration enthalpy of the individual ions. Amongst fluorides of alkali metals, the lowest solubility of LiF in water is due to

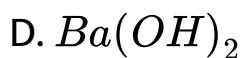
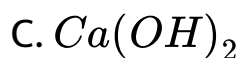
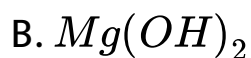
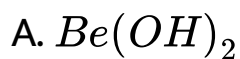
- A. Ionic nature of lithium fluoride
- B. High lattice enthalpy
- C. High hydration enthalpy for lithium ion
- D. Low ionisation enthalpy of lithium atom

**Answer: B**



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10. Amphoteric hydroxides react with both alkalies and acids. Which of the following Group 2 metal hydroxides is soluble in sodium hydroxide?



**Answer: A**



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11. In the synthesis of sodium carbonate, the recovery of ammonia is done by treating  $NH_4Cl$  with  $Ca(OH)_2$ . The by-product obtained in this process is



**Answer: A**



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12. When sodium is dissolved in liquid ammonia, a solution of deep blue colour is obtained. The colour of the solution is due to

- A. ammoniated electron
- B. sodium ion
- C. sodium amide
- D. ammoniated sodium ion

**Answer: A**



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13. By adding gypsum to cement

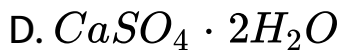
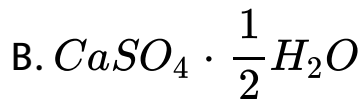
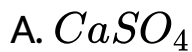
- A. setting time of cement becomes less.
- B. setting time of cement increases.
- C. colour of cement becomes light.
- D. shining surface is obtained.

**Answer: B**



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14. Dead burnt plaster is \_\_\_\_\_.



**Answer: A**



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**15.** Suspension of slaked lime in water is known as

A. lime water

B. quick lime

C. milk of lime

D. aqueous solution of slaked lime

**Answer: C**



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**16.** Which of the following elements does not form hydride by direct heating with dihydrogen ?

A. Be

B. Mg

C. Sr

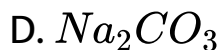
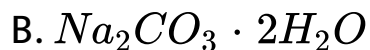
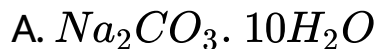
D. Ba

**Answer: A**



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17. The chemical formula of soda ash is



**Answer: D**





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18. A substance which gives a brick red flame and breaks down on heating to give oxygen and a brown gas is

A. Magnesium nitrate

B. Calcium nitrate

C. Barium nitrate

D. Strontium nitrate

**Answer: B**



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19. Which of the following statements is true about  $Ca(OH)_2$ ?

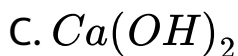
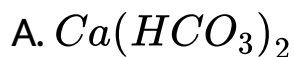
- A. It is used in the preparation of bleaching powder.
- B. It is a light blue solid.
- C. It does not possess disinfectant property.
- D. It is used in the manufacture of cement.

**Answer: A**



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20. A chemical A is used for the preparation of washing soda to recover ammonia. When  $CO_2$  is bubbled through an aqueous solution of A, the solution turns milky. It is used in white washing due to disinfectant nature what is the chemical formula of A?



**Answer: C**



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21. Dehydration of hydrates of halides of calcium, barium and strontium i.e.,  $CaCl_2 \cdot 6H_2O$ ,  $BaCl_2 \cdot 2H_2O$ ,  $SrCl_2 \cdot 2H_2O$ , 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

**Answer: D**



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## **Ncert File Ncert Exemplar Problems Multiple Choice Questions Ii**

1. Metallic elements are described by their standard electrode potential, fusion enthalpy, atomic size, etc.

The alkali metals are characterised by which of the following properties?

A. High boiling point

B. High negative standard electrode potential

C. High density

D. Large atomic size

**Answer: B::D**



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2. Several sodium compounds find use in industries.

Which of the following compounds are used for textile industry?

A.  $Na_2CO_3$

B.  $NaHCO_3$

C.  $NaOH$

D.  $NaCl$

Answer: A::C



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3. Which of the following compounds are readily soluble in water?

A.  $BeSO_4$

B.  $MgSO_4$

C.  $BaSO_4$

D.  $SrSO_4$

**Answer: A::B**



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4. When zeolite which is hydrated sodium aluminium silicate is treated with hard water, the sodium ions are exchanged with which of the following ion (S)?

A.  $H^+$  ions

B.  $Mg^{2+}$  ions

C.  $Ca^{2+}$  ions

D.  $SO_4^{2-}$  ions

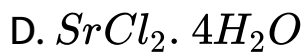
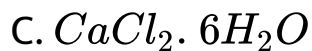
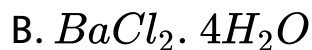
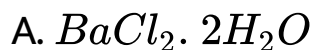
**Answer: B::C**





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5. Identify the correct formula of halides of alkaline earth metals from the following.



**Answer: A::C**



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6. Choose the correct statements from the following.

A. Beryllium is not readily attacked by acids because of the presence of an oxide film on the surface of the metal.

B. Beryllium sulphate is readily soluble in water as the greater hydration enthalpy of  $Be^{2+}$  overcomes the lattice enthalpy factor.

C. Beryllium exhibits coordination number more than four.

D. Beryllium oxide is purely acidic in nature.

**Answer: A::C**



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7. Which of the following are the correct reasons for anomalous behaviour of lithium?

- A. Exceptionally small size of its atom.
- B. Its high polarising power.
- C. It has high degree of hydration.
- D. Exceptionally low ionisation enthalpy.

**Answer: A::B::C**



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## Ncert File Ncert Exemplar Problems Short Answer Questions

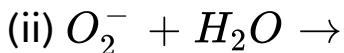
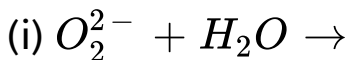
1. How do you account for the strong reducing power of lithium in aqueous solution?

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2. When heated in air, the alkali metals form various oxides. Mention the oxides formed by *Li*, *Na* and K.

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3. Complete the following reactions



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4. Lithium resembles magnesium in some of its properties. Mention two such properties and give reasons for this resemblance.



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5. Name an element from group 2 which forms an amphoteric oxide and a water soluble sulphate.

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6. Discuss the trend of the following

(i) Thermal stability of carbonates of Group 2 elements.

(ii) The solubility and the nature of oxides of Group 2 elements.

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7. Why are  $BeSO_4$  and  $MgSO_4$  readily soluble in water while  $CaSO_4$ ,  $SrSO_4$  and  $BaSO_4$  are insoluble?



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8. All compounds of alkali metals are easily soluble in water but lithium compounds are more soluble in organic solvents. Explain.



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9. In the Solvay process, can we obtain sodium carbonate directly by treating the solution containing  $(NH_4)_2CO_3$  with sodium chloride? Explain.



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10. Write Lewis structure of  $O_2^-$  ion and find out oxidation state of each oxygen atom? What is the average oxidation state of oxygen in this ion?



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11. Why Beryllium and magnesium do not impart colour to the flame?

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12. What is the structure of  $BeCl_2$  molecule in gaseous and solid state?

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Ncert File Ncert Exemplar Problems Matching Type  
Questions

1. Match the elements given in column I with the properties mentioned in Column II.

Column I	Column II
(i) Li	(a) Insoluble sulphate
(ii) Na	(b) Strongest monoacidic base
(iii) Ca	(c) Most negative $E^\circ$ value among alkali metals
(iv) Ba	(d) Insoluble oxalate
	(e) $6s^2$ outer electronic configuration



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2. Match the compounds given in Column I with their uses mentioned in Column II.

Column I	Column II
(i) $\text{CaCO}_3$	(a) Dentistry, ornamental work
(ii) $\text{Ca(OH)}_2$	(b) Manufacture of sodium carbonate from caustic soda
(iii) CaO	(c) Manufacture of high quality paper
(iv) $\text{CaSO}_4$	(d) Used in white washing



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3. Match the elements given in Column I with the colour it imparts to the flame given in Column II .

<i>Column I</i>	<i>Column II</i>
(i) Cs	(a) Apple green
(ii) Na	(b) Violet
(iii) K	(c) Brick red
(iv) Ca	(d) Yellow
(v) Sr	(e) Crimson red
(vi) Ba	(f) Blue



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Ncert File Ncert Exemplar Problems Assertion And Reason Type Questions

1. Assertion (A) The carbonate of lithium decomposes easily on heating to form lithium oxide and  $CO_2$ .

Reason (R) Lithium being very small in size polarises large carbonate ion leading to the formation of more stable  $Li_2O$  and  $CO_2$ .

A. Both A and R are correct and R is the correct explanation of A .

B. Both A and R are correct but R is not the correct explanation of A .

C. Both A and R are not correct .

D. A is not correct but R is correct .

**Answer: A**



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2. Assertion (A) Beryllium carbonate is kept in the atmosphere of carbon dioxide.

Reason (R) Beryllium carbonate is unstable and decomposes to give beryllium oxide and carbon dioxide.

A. Both A and R are correct and R is the correct explanation of A.

B. Both A and R are correct but R is not the correct explanation of A .

C. Both A and R are not correct .

D. A is not correct but R is correct .

**Answer: A**



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**Ncert File Ncert Exemplar Problems Long Answer Questions**

1. The s-block elements are characterised by their larger atomic sizes, lower ionisation enthalpies, invariable +1 oxidation state and solubilities of their oxosalts. In the light of these features describe the nature of their oxides, halides and oxosalts.



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2. Present a comparative account of the alkali and alkaline earth metals with respect to the following characteristics.

(a) Tendency to form ionic/covalent compounds (b)

Nature of oxides and their solubility in water

(c) Formation of oxosalts

(d) Solubility of oxosalts

(e) Thermal stability of oxosalts



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3. When a metal of group 1 was dissolved in liquid ammonia, the following observations were obtained

(a) Blue solution was obtained initially.

On concentrating the solution, blue colour changed to bronze colour. How do you account for the blue colour of the solution? Given the name of the product formed on keeping the solution for some time.



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4. The stability of peroxide and superoxide of alkali metals increase as we go down to group. Explain giving reason.



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5. When water is added to compound (A) of calcium, solution of compound (B) is formed. When carbon dioxide is passed into the solution, it turns milky due to the formation of compound (C). If excess of carbon dioxide is passed into the solution milky disappears due to the formation of compound (D).

Identify the compounds A,B,C and D. Explain why the milkiness disappears in the last step.



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6. Lithium hydride can be used to prepare other useful hydrides. Beryllium hydride is one of them. Suggest a route for the preparation of beryllium hydride starting from lithium hydride. Write chemical equations involved in the process.



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7. An element of group 2 forms covalent oxide which is amphoteric in nature and dissolves in water to give an amphoteric hydroxide. Identify the element and write chemical reactions of the hydroxide of the element with an alkali and an acid.



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8. Ions of an element of group 1 participate in the transmission of nerve signals and transport of sugars and aminoacids into cells. This element imparts yellow colour to the flame in flame test and forms an oxide and a peroxide with oxygen. Identify the

element and write chemical reaction to show the formation of its peroxide. Why does the element impart colour to the flame?



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Revision Exercises Objective Very Short Answer  
Questions Passage Based Questions

1. Lithium and beryllium, the first members of alkali metals group and alkaline earth metals group, show anomalous behaviour due to the small sizes of their atoms and ions, high ionisation enthalpies, high polarizing power and absence of vacant d-orbitals in

their valence shell. Lithium resembles magnesium while beryllium resembles aluminium due to diagonal relationships.

Why is LiCl soluble in organic solvents?



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2. Lithium and beryllium, the first members of alkali metals group and alkaline earth metals group, show anomalous behaviour due to the small sizes of their atoms and ions, high ionisation enthalpies, high polarizing power and absence of vacant d-orbitals in their valence shell. Lithium resembles magnesium while beryllium resembles aluminium due to diagonal

relationships.

Lithium is the only alkali metal which forms nitride directly. Why?



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**3.** Lithium and beryllium, the first members of alkali metals group and alkaline earth metals group, show anomalous behaviour due to the small sizes of their atoms and ions, high ionisation enthalpies, high polarizing power and absence of vacant d-orbitals in their valence shell. Lithium resembles magnesium while beryllium resembles aluminium due to diagonal

relationships.

Complete the reactions:  $BaO + NaOH \rightarrow$



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4. Lithium and beryllium, the first members of alkali metals group and alkaline earth metals group, show anomalous behaviour due to the small sizes of their atoms and ions, high ionisation enthalpies, high polarizing power and absence of vacant d-orbitals in their valence shell. Lithium resembles magnesium while beryllium resembles aluminium due to diagonal relationships.

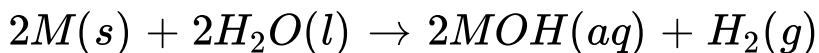
How will you distinguish between

$BaSO_4$  and  $BeSO_4$  ?

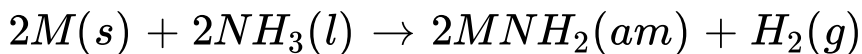


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5. The alkali metals react with most non-metals to form hydrides, oxides, sulphides, carbides, phosphides and other compounds. The binary compounds of all alkali metals are ionic with  $M^+$  cations. The alkali metals easily ionize and readily reduce hydrogen ions. They react with ammonia to evolve hydrogen and form blue coloured solutions.





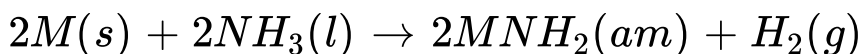
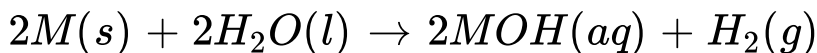


Which alkali metal hydroxide is thermally unstable ?

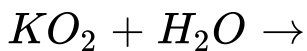


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6. The alkali metals react with most non-metals to form hydrides, oxides, sulphides, carbides, phosphides and other compounds. The binary compounds of all alkali metals are ionic with  $M^+$  cations. The alkali metals easily ionize and readily reduce hydrogen ions. They react with ammonia to evolve hydrogen and form blue coloured solutions.

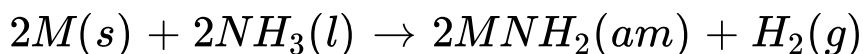
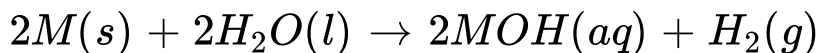


Complete the reaction :

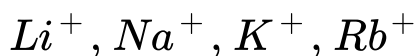


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7. The alkali metals react with most non-metals to form hydrides, oxides, sulphides, carbides, phosphides and other compounds. The binary compounds of all alkali metals are ionic with  $M^+$  cations. The alkali metals easily ionize and readily reduce hydrogen ions. They react with ammonia to evolve hydrogen and form blue coloured solutions.

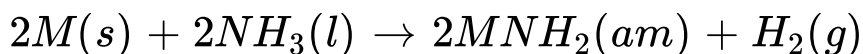
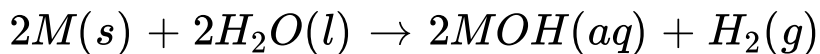


Arrange the following alkali metal ions in the decreasing order of their mobility in aqueous solutions:



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8. The alkali metals react with most non-metals to form hydrides, oxides, sulphides, carbides, phosphides and other compounds. The binary compounds of all alkali metals are ionic with  $M^+$  cations. The alkali metals easily ionize and readily reduce hydrogen ions. They react with ammonia to evolve hydrogen and form blue coloured solutions.



Why do alkali metals dissolve in liquid ammonia to give blue coloured solutions ?



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[Revision](#) [Exercises](#) [Objective](#) [Very Short](#) [Answer](#)  
[Questions](#) [True Or False](#) [Questions](#)

1. Which of the following is correct ?

(i) Lithium is better reducing agent than sodium

(ii) Sodium is better reducing agent than potassium

(iii) Rubidium is better reducing agent than sodium

(iv) The Rubidium is better reducing agent than lithium

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2. The solubilities of carbonates decreases down the magnesium group due to a decrease in

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3. Chlorophyll is

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4. Potassium has higher density than sodium .

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5. Why Beryllium and magnesium do not impart colour to the flame?

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6. Why it LiF almost insoluble in water while LiCl is soluble not only in water but also in acetone ?

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7. a. Name the alkali metals which form superoxides on heating in excess of air.
- b. Name the alkali metal which floats on water without any apparent reaction with it.
- c. Name the main factor which is responsible for the anomalous behaviour of lithium.
- d. What is the general name for element of group 1 ?
- e. Give the name of the alkali metal which is radioactive.
- f. Name the alkali metal which shows diagonal relationship with magnesium.
- g. Name the alkali metal which acts as the strongest reducing agent in aqueous solution.



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8.  $KO_2$  is diamagnetic oxide.



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9. Sodium nitrate on heating gives nitrogen dioxide and oxygen.



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10. Beryllium resembles Aluminium in properties. This is mainly due to



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Revision Exercises Objective Very Short Answer  
Questions Fill In The Blanks

1. The radioactive alkali metal is .....

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2. Lithium shows diagonal relationship with

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3. Which of the following bicarbonate does not exist in solid state?

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4. Oxidation state of sodium in sodium peroxide is .....

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5. Li reacts directly with nitrogen to form lithium nitride.

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6. Solvay process is used for the manufacturing of

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7. Alkali metals readily dissolve in liquid ammonia to give blue coloured solutions. The blue colour is believed to be due to

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



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9. Which of the following compound(s) will impart a golden yellow colour to the Bunsen flame ?



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10. Plaster of paris is



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11. Assertion (A): Lithium chloride is predominantly covalent compound.

Reason (R ): electronegativity difference between Li and Cl is small.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

Answer: C



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12. Assertion (A):  $Na_2SO_4$  is soluble in water while  $BaSO_4$  is insoluble.

Reason (R ): Lattice enthalpy of  $BaSO_4$  exceeds its hydration enthalpy.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**



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13.  $Al(OH)_3$  is amphoteric in nature.

$Al - O$  and  $O - H$  bonds can be broken with equal ease in  $Al(OH)_3$ .

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.



D. Assertion is wrong statement but reason is correct statement

**Answer: A**

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**14.** Assertion: Barium is not required for normal biological function in human.

Reason: Barium does not show variable oxidation state.

A. Assertion and reason both are correct statements and reason is correct explanation

for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: B**



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**15. Assertion:** *Li* resembles with *Mg* in properties

Reason:  $Li^+$  has almost same polarising power as  $Mg^{2+}$ .

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**



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**16.** Assertion (A): Alkali metals impart colour to the flame.

Reason (R ): The ionisation energies are low.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**



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17. Assertion (A): Sulphur is estimates as  $BaSO_4$  and not as  $MgSO_4$ .

Reason (R ): The ionic radius of  $Mg^{2+}$  is less than that of  $Ba^{2+}$

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: B**

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**18.** Statement -1: Of the chloride of alkaline earth metals  $BeCl_2$  is covalent in nature, where as  $MgCl_2$  and  $CaCl_2$  are ionic compounds.

Statement-2: Be is the first member of Group-II.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: B**



19. Be forms  $[BeF_4]^{2-}$ , but Al forms  $[AlF_6]^{3-}$ .

Reason (R ): Be does not have  $d$ -orbitals in the valence shell but Al has.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

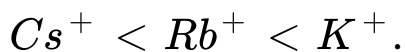
D. Assertion is wrong statement but reason is correct statement

**Answer: A**

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**20.** Assertion : K, Rb and Cs can also form superoxides.

Reason : Their ionic radii increase in the order



A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: C**

21. Assertion (A):  $CuCl$  is more covalent than  $NaCl$ .

Reason (R ):  $Na^{\oplus}$  ion more polarising than  $Cu^{\oplus}$  ion.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**



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**22.** Assertion : Be gives characteristic flame colouration.

Reason : Ionization energy of Be is high.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: D**

23. Assertion (A) Beryllium carbonate is kept in the atmosphere of carbon dioxide.

Reason (R) Beryllium carbonate is unstable and decomposes to give beryllium oxide and carbon dioxide.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct

explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**



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**24.** Assertion (A) The carbonate of lithium decomposes easily on heating to form lithium oxide and  $CO_2$ .



Reason (R) Lithium being very small in size polarises large carbonate ion leading to the formation of more stable  $Li_2O$  and  $CO_2$ .

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement

**Answer: A**

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[Revision](#) [Exercises](#) [Objective](#) [Very Short](#) [Answer](#)  
[Questions](#) [One Word](#) [Very Short Sentence](#) [Answer](#)

1. Name the groups which constitute s-block elements.

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2. Give general electronic configuration of  $s$  – block elements.

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3. The densities of Li, Na and K followed the order

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4. The order of basicity of hydroxides of alkali metals is

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5. Formula of plaster of Paris is

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6. Write the reason behind the diagonal relationship among element.

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7. How do the solubilities of alkaline earth metal sulphate and carbonates vary down the group and why?

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8. Give two main reasons for the differences of properties of Li and Na.

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9. Give the chemical formula of limestone and Plaster of Paris.

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10. Explain why can alkali and alkaline earth metals not be obtained by chemical reduction methods?



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**11.** Potassium carbonate can be obtained by Solvay's process.



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**12.** Why is sodium metal kept under kerosene oil ?



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**13.** What is quicklime? What happens when we add water to quicklime ?



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**14.** What is dead burnt plaster?



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**15.** Why sodium cannot be prepared by electrolysis of its aqueous solution?



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**16.** Lithium forms monoide, sodium gives peroxide while the rest of the alkali form superoxides. Explain



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17. a. How does basic character of oxides and hydroxides vary down the group in alkali metals? Why?

b. How does reducing power of elements vary in group 1?



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18. Compare the action of heat on  $LiNO_3$  and  $NaNO_3$ .



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19. Which of the following form nitride?



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20. Give two uses of  $Na_2CO_3$ .



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21. Name the radioactive element of group 1



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22. The metal ion which does not give any flame colouration is-

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23. What is the most abundant element on earth ?

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24. What is the biological important of  $Na^+$  and  $K^+$  ions in cell fluids like blood plasma?

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25. Which out of  $MgSO_4$  or  $BaSO_4$  is more soluble in water?



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Revision Exercises Objective Very Short Answer Questions Short Answer Questions

1. What are the common physical and chemical features of alkali metals?



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2. Why do not Be and Mg give characteristic flame colouration while others do ?

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3. Discuss the general characteristics and gradation in properties of alkaline earth metals.

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4. How do the following properties vary among alkali metals ?

(i) Atomic radius

(ii) Ionisation energy

(iii) Metallic character.



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5. a. Name the alkali metals which form superoxides on heating in excess of air.

b. Name the alkali metal which floats on water without any apparent reaction with it.

c. Name the main factor which is responsible for the anomalous behaviour of lithium.

d. What is the general name for element of group 1 ?

e. Give the name of the alkali metal which is radioactive.

f. Name the alkali metal which shows diagonal relationship with magnesium.

g. Name the alkali metal which acts as the strongest reducing agent in aqueous solution.

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6. Alkali metals are strong reducing agents.

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7. Certain characteristics lithium differ from those of other alkali metals, the main reason for this is

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8. Compare the alkali metals and alkaline earth metals with respect to (a) ionisation enthalpy, (b) basicity of oxides and (c) solubility of hydroxides.

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9. Sodium can be extracted on a commercial scale by the electrolysis of used sodium chloride. The process is called

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**10.** Give the chemical formulae of the following ores:

(i) Dolomite (ii) Gypsum

(iii) Epsom salt (iv) Carnallite



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**11. a.** Name the alkali metals which form superoxides on heating in excess of air.

b. Name the alkali metal which floats on water without any apparent reaction with it.

c. Name the main factor which is responsible for the anomalous behaviour of lithium.

d. What is the general name for element of group 1 ?

e. Give the name of the alkali metal which is



radioactive.

f. Name the alkali metal which shows diagonal relationship with magnesium.

g. Name the alkali metal which acts as the strongest reducing agent in aqueous solution.

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12. Why is it necessary to add gypsum in the final stages of the preparation of cement ?

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**13.** Describe a method for the preparation of quicklime. What happens when water is poured over quicklime ?

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**14.** What is the difference between quick lime, slaked lime, milk of lime and lime water ?

(ii) How is gypsum prepared in the laboratory? How is it converted into plaster of Paris?

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**15.** Contrast the action of heat on the following and explain your answer

(i)  $Na_2CO_3$  and  $CaCO_3$

(ii)  $MgCl_2 \cdot 6H_2O$  and  $CaCl_2 \cdot 6H_2O$

(iii)  $Ca(NO_3)_2$  and  $NaNO_3$



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**16.** State as to why

(a) a solution of  $Na_2CO_3$  is alkaline ?

(b) alkali metals are prepared by electrolysis of their fused chlorides?

(c) sodium is found to be more useful than potassium

?

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17. In what ways lithium shows similarities to magnesium in its chemical behaviour?

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18. State the effect of heat on

(i) gypsum (ii) limestone (iii) epsom salt.

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## 19. CEMENT



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20. Write three general characteristics of the s-block of the periodic table which distinguish them from the elements of other blocks.



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21. What happens when

a. Sodium metal is dropped in water?

b. Sodium metal is heated in free supply of air?

c. Sodium peroxide dissolves in water?



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**22.** Compare the solubility and thermal stability of the following compounds of the alkali metals with those of the alkaline earth metals. (a) Nitrates (b) Carbonates (c) Sulphates.



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**23.** Give reasons for the following.

a. LiCl is more covalent than KCl.

b.  $\text{LiI}$  has lower melting point than  $\text{LiF}$ .

c. During electrolysis of molten sodium chloride, calcium chloride and potassium fluoride are added.

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**24.** What is the reaction occurring at the anode in Down's process for the extraction of sodium ?

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**25.** Describe the preparation of each of the following starting with limestone:

(i) Plaster of paris (ii) Slaked lime.



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**26.** In what ways lithium shows similarities to magnesium in its chemical behaviour?



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**27.** Present a comparative account of the alkali and alkaline earth metals with respect to the following characteristics.

(a) Tendency to form ionic/covalent compounds (b)

Nature of oxides and their solubility in water

(c) Formation of oxosalts



(d) Solubility of oxosalts

(e) Thermal stability of oxosalts

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28. Beryllium exhibits some similarities with aluminium. Point out four such properties.

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29. Explain the trends in the solubility of carbonates, sulphates and hydroxides of alkaline earth metals.

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**30.** Draw the structure of

(i)  $BeCl_2$  (vapour) (ii)  $BeCl_2$  (s)



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**31.** Starting from sodium chloride, how will you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate.



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**32.** "The chemistry of beryllium is not essentially ionic"  
Justify the statement by making a reference to the

nature of oxide, chloride and fluoride of beryllium.

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33. Why does the following reaction:



proceed better with KF than with NaF?

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34. EXTRACTION OF ALKALI METALS

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**35.** Give three uses each of lithium and sodium.

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**36.** Solvay process is used for the manufacturing of

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**37.** Give one method of preparation and two uses of each of the following:

(i) Slaked lime (ii) Limestone (iii) Plaster of Paris.

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**38.** Describe the importance of the following: (a) limestone, (b) cement and (c) plaster of Paris.

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**39.** Comment on each of the following observation:

a. The mobilities of the alkali metal ions in aqueous solution are  $Li^{\oplus} < Na^{\oplus} < K^{\oplus} < Rb^{\oplus} < Cs^{\oplus}$ .

b. Lithium is the only alkali metal to form a nitride directly.

c.  $E^{\ominus}$  for  $M_{aq}^{2+} + 2e^{-} \rightarrow M_{(s)}$  (where M=Ca, Sr or Ba) is nearly constant.

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**40.** What happens when

(i) calcium nitrate is heated

(ii) chlorine reacts with slaked lime

(iii) quicklime is heated with silica

(iv) magnesium is burnt in air.



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**41.** Lime is used for



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**42.** The alkali metals follow the noble gases in their atomic structure. What properties of these metals can be predicted from this information.



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**43.** Give the chemistry of extraction of magnesium by Down's process?



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**44. a.** Describe one method of manufacture of caustic soda.

b. What happens when caustic soda reacts with

i. Al metal , ii.  $CO_2$  , iii.  $SiO_2$

c. Describe four industrial uses of caustic soda.



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**45.** Commercial aluminium always contains some magnesium, name two such alloys of aluminium.

What properties are imparted by the addition of magnesium to these alloys?



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**46.** List four properties of Li in which it differs from rest of the family members.

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**47.** List four properties of Be in which Be differs from rest of the family members.

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**48.** Describe two important uses of each of the following:

(a) caustic soda, (b) sodium carbonate and (c) quicklime.

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49. Lithium forms monoxide, sodium gives peroxide while the rest of the alkali form superoxides. Explain

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50. Discuss the various reactions that occur in the Solvay process

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**51.** How is plaster of paris prepared? Describe its chief property due to which it is widely used.

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**52.** ANOMALOUS BEHAVIOUR OF BERYLLIUM

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**53.** What are  $s$  – block elements?

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**54.** When an alkali metal dissolves in liquid ammonia the solution can acquire different colours. Explain the reasons for this type of colour change.



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**55.** Discuss the trend of the following

(i) Thermal stability of carbonates of Group 2 elements.

(ii) The solubility and the nature of oxides of Group 2 elements.



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56. What is the structure of  $BeCl_2$  molecule in gaseous and solid state?



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57. All compounds of alkali metals are easily soluble in water but lithium compounds are more soluble in organic solvents. Explain.



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Revision Exercises Objective Very Short Answer  
Questions Long Answer Questions

1. The diagonal relationship exists between



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2. The first element of group different from its congeners, i.e. other members of the group in many ways. These differences may be due to the following:

- i. Small size of atom and ion.
- ii. High electronegativity.
- iii. Non-availability of low lying d-orbitals.

The first element of a group shows resemblance with the second element of the adjacent group on the right. This is known as diagonal relationship.

In dry air, lithium and sodium react to give



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3. How sodium carbonate is manufactured by the Solvay process ? State the principles involved.



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4. How does magnesium occur in nature? How is magnesium metal obtained by the electrolysis method?



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5. Name a few important uses of the following compounds:

(i) Sodium carbonate (ii) Epsom salt

(iii) Quick lime (iv) Plaste of Paris



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6. Complete the following :

(i)  $Ca + H_2O$  (ii)  $Ca(OH)_2 + Cl_2$

(iii)  $BeO + NaOH$  (iv)  $BaO_2 + H_2SO_4$



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7. Blue colour of alkali and alkaline earth metals in liquid  $NH_3$  is due to

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8. How would you explain the following observations ?

(i)  $BeO$  is almost insoluble but  $BeSO_4$  is soluble in water

(ii)  $BaO$  is soluble but  $BaSO_4$  is insoluble in water

(iii)  $LiI$  is more soluble than  $KI$  in ethanol

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**9.** Explain why:

(a) Lithium on being heated in air mainly forms the monoxide and not peroxide.

(b) An aqueous solution of sodium carbonate gives alkaline test.



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**10.** Present a comparative account of the alkali and alkaline earth metals with respect to the following characteristics.

(a) Tendency to form ionic/covalent compounds (b)

Nature of oxides and their solubility in water

(c) Formation of oxosalts

(d) Solubility of oxosalts

(e) Thermal stability of oxosalts



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## Higher Order Thinking Skills

1. Name an element which is invariably bivalent and whose oxide is soluble in excess of  $NaOH$  and its dipositive ion has a noble gas core.



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2.  $BeCl_2$  gives an acidic solution when dissolved in water. Why?



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3. Alkali metal ions are colourless as well as diamagnetic. Explain



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4.  $LiI_3$  is less stable than  $CsI_3$ . Why?



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5. Describe the difference in structure between  $CaH_2$  and  $BeH_2$

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6. Why is LiF almost insoluble in water while LiCl is soluble not only in water but also in acetone ?

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7. The alkali metal having low melting point is

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8. LiH, LiF and  $Li_3N$  show exceptional thermal stabilities. Comment.

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9. The combustion of Li, Na, K in excess of air gives major oxides

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10. Which alkali metal carbonate is thermally unstable and why?

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11. Which out of the following and why can be used to store an alkali metal ?

$H_2O$ ,  $C_2H_5OH$ , Benzene



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12.  $Mg^{2+}$  ion more highly hydrated than  $Na^+$  ion.



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13. Explain the following:

(a)  $Be(OH)_2$  dissolves in sodium hydroxide but

$Mg(OH)_2$  does not.

(b) Beryllium halides are polymeric in nature.

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14.  $MgN_2$  when reacted with water gives  $NH_3$  and HCl. However,  $MgCl_2$  does not give HCl when treated with water at room temperature. Assigne reason.

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15. LiH is more stable than NaH. Explain.

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16. Sodium fire in the laboratory should not be extinguished by using water. Why ?

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17. In the reaction of sodium hydride and water:

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18. The crystalline salts of alkaline earth metals contain more water of crystallisation than the corresponding alkali metal salts. Why ?

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## Competition File Multiple Choice Question A

1. Which of the following is most basic ?

A. CsOH

B. KOH

C. LiOH

D. RbOH

**Answer: A**



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2. Lithium shows diagonal relationship with

A. Beryllium

B. Magnesium

C. Calcium

D. Boron

**Answer: B**



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3. Down's process is used for the extraction of

A. Na

B. Li

C. Ba

D. Mg

**Answer: A**

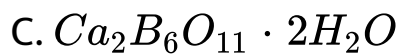


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4. Carnallite is an ore of

A.  $KClMgCl_2 \cdot 6H_2O$

B.  $Na_3AlF_6$

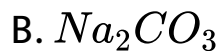


**Answer: A**



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5. Solvay process is used for the manufacture of



**Answer: B**



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**6. Which of the following is not an ore of lithium ?**

A. Petalite

B. Triphylite

C. Albite

D. Spodumene

**Answer: C**



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7. Which of the following is radioactive alkali metal ?

A. Fr

B. Ra

C. At

D. Rn

**Answer: A**



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8. The stability of the following alkali metal chlorides follows the order:

A.  $LiCl > KCl > NaCl > CsCl$

B.  $CsCl > KCl > NaCl > LiCl$

C.  $NaCl \cdot KCl \cdot LiCl \cdot CsCl$

D.  $KCl > CsCl > NaCl > LiCl$

**Answer: A**



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9. The metallic lustre exhibited by sodium is explained by

A. diffusion of sodium ions



B. oscillation of loose electrons

C. excitation of free electrons

D. existence of body centred cubic lattice

**Answer: B**



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**10.** On dissolving moderate amount of sodium metal in liquid ammonia at low temperature, which of the following does not occur ?

A. Blue coloured solution is obtained

B.  $Na^+$  ions are formed in the solution

C. Liquid ammonia becomes good conductor of electricity

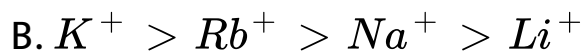
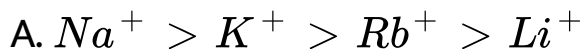
D. liquid ammonia remains diamagnetic.

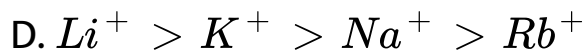
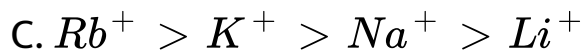
**Answer: D**



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**11.** The correct order of mobility of alkali metal ions in aqueous solution is





**Answer: C**



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**12. Sodium burns in dry air to give**

A. sodium oxide

B. sodium peroxide

C. sodium superoxide

D. sodium oxide and sodium nitrate

**Answer: B**



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**13.** Which of the following alkaline earth metals do not impart any color to the flame?

A. Be

B. Ca

C. Ba

D. Sr

**Answer: A**



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14. Which of the following alkali metal ions has the lowest ionic mobility in aqueous solutions?



**Answer: A**



15. Beryllium shows a diagonal relationship with

A. Boron

B. Aluminium

C. Magnesium

D. Silicon

**Answer: B**



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16. Which of the following is most stable ?

A.  $BeCO_3$

B.  $MgCO_3$

C.  $SrCO_3$

D.  $CaCO_3$

**Answer: C**



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**17. Magnesium is present in**

A. Haemoglobin

B. Chlorophyll

C. Vitamin  $B_{12}$

D. Ascorbic acid.

**Answer: B**



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**18. Quicklime is :**

A.  $Ca(OH)_2$

B.  $CaCO_3$

C.  $CaO$

D.  $CaSO_4$

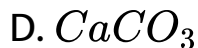
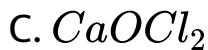


**Answer: C**



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**19.** Slaked lime reacts with chlorine to form



**Answer: C**



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20. Which is a by-product in Solvay's process ?

A. Carbon dioxide

B. Ammonia

C. Calcium chloride

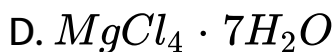
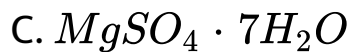
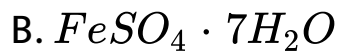
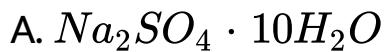
D. Calcium carbonate

**Answer: C**



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21. Epsom salt is

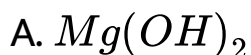


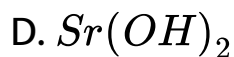
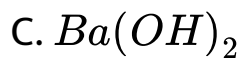
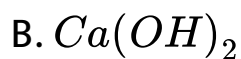
**Answer: C**



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**22.** Which of the following has the lowest solubility in water?





**Answer: C**



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**23.** Which of the following is not an ore of magnesium?

A. Epsom salt

B. Dolomite

C. Asbestos

D. Gypsum

**Answer: D**



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**24. Which of the following readily forms nitride ?**

A. K

B. Mg

C. Ba

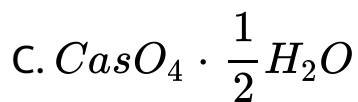
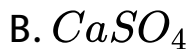
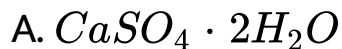
D. Ca

Answer: B



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25. Gypsum on heating to  $390K$  gives



Answer: C



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26. Among the alkaline earth metals, the element forming predominantly covalent compound is

A. Barium

B. Strontium

C. Calcium

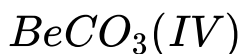
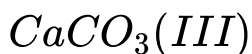
D. Beryllium

**Answer: D**



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27. The following compounds have been arranged in order of their increasing thermal stabilities . Identify the correct order .



A.  $I < II < III < IV$

B.  $IV < II < III < I$

C.  $IV < II < I < III$

D.  $II < IV < III < I$

**Answer: B**



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28. Which of the following statements about alkaline earth metals are correct?

1. Hydration enthalpy of  $Sr^{2+}$  is greater than that of  $Be^{2+}$

2.  $CaCO_3$  decomposes at a higher temperature than  $BeCO_3$

3.  $Ba(OH)_2$  is a stronger base than  $Mg(OH)_2$  4.

$SrSO_4$  is less soluble in water than  $CaSO_4$ .

. Select the correct answer using the codes given below:

A. 4 only

B. 1 and 3

C. 3 and 4

D. 3 and 4

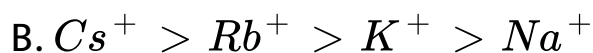
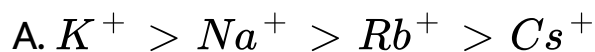
**Answer: D**

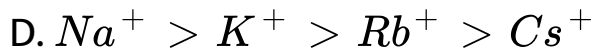
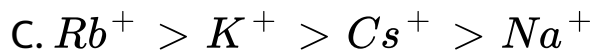


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## Competition File Multiple Choice Question B

1. The sequence of ionic mobility in the aqueous solution is





**Answer: B**



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2. The alkali metals form salt like hydrides by the direct synthesis at elevated temperature. The thermal stability of these hydrides decreases in which of the following orders ?



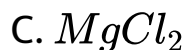


**Answer: D**



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3. Equimolar solution of the following were prepared in water separately. Which one of the solutions will record the highest  $pH$ ?



D.  $\text{CaCl}_2$

Answer: B



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4. In the case of alkali metals, the covalent character decreases in the order.

A.  $MF > MCl > MBr > MI$

B.  $MF > MCl > MI > MBr$

C.  $MI > MBr > MCl > MF$

D.  $MCl > MI > MBr > MF$

**Answer: C**



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

A.  $\text{CaO}$

B.  $\text{SiO}_2$

C.  $\text{BeO}$

D.  $\text{B}_2\text{O}_3$

**Answer: A**



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6. Which of the following does not react with water?

A. Na

B. Be

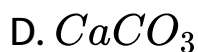
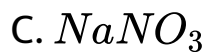
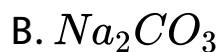
C. Ca

D. Sr

**Answer: D**

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7. Which of the following on thermal decomposition yields a basic as well as acidic oxide?



**Answer: D**



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8. Which among the following is kinetically inert towards water?

A. Na

B. Be

C. Ca

D. K

**Answer: B**



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9. Property of the alkaline earth metals that increases with their atomic number is

- A. Electronegativity
- B. Solubility of their hydroxides in water
- C. Solubility of their sulphates in water
- D. Ionization enthalpy

**Answer: B**



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10. Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy?



**Answer: C**



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11. The increasing order of the density of the alkali metal is



**Answer: A**



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12. The alkali metal halide that is soluble in pyridine is

A. NaCl

B. LiCl

C. KCl

D. CsI

**Answer: B**



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**13.** Which one is the correct observation when  $Br_2$  is treated with NaF, NaCl and NaI taken in three test tubes labelled as (I), (II) and (III) ?

A.  $F_2$ ,  $Cl_2$  and  $I_2$  and liberated

B. only  $F_2$  and  $Cl_2$  are liberated

C. only  $I_2$  is liberated

D. only  $Cl_2$  is liberated

**Answer: C**

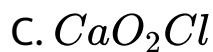


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**14.** Which one of the following is present as an active ingredient in bleaching powder for bleaching action?

A.  $CaOCl_2$

B.  $Ca(Ocl)_2$

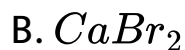


**Answer: B**



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**15.** Which of the following compounds has the lowest melting point ?



D.  $CaF_2$

Answer: C



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16. Choose the incorrect statement in the following

A.  $BeO$  is almost insoluble but  $BeSO_4$  is soluble in water.

B.  $BaO$  is soluble but  $BaSO_4$  is insoluble in water.

C.  $LiI$  is more soluble than  $KI$  in ethanol

D. Both  $Li$  and  $Mg$  form solid hydrogen carbonates.

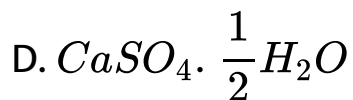
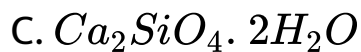


Answer: D



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17. Formula of plaster of Paris is



Answer: D



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18. Which one of the alkali metals forms only the normal oxide,  $M_2O$ , on heating in air ?

A. Rb

B. K

C. Li

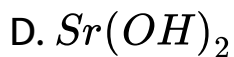
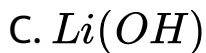
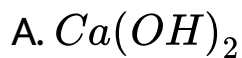
D. Na

**Answer: C**



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19. Which of the following is the weakest base?



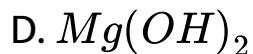
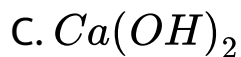
**Answer: C**



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**20. Which one of the following is the strongest base ?**





**Answer: B**



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**21.** The element responsible for the neuromuscular function in the body is

A. calcium

B. magnesium

C. potassium

D. sodium

**Answer: A**



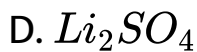
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22. The salt of an alkali metal gives yellow colour in the flame test. Also its aqueous solution gives an insoluble white precipitate with barium chloride in acidic medium. The salt is

A.  $NaCl$

B.  $K_2SO_4$

C.  $Na_2SO_4$



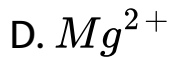
**Answer: C**



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**23.** The function of Sodium pump is a biological process operating in each and every cell of all animals. Which of the following biologically important ions is also constant f this pump ?



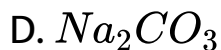
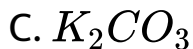
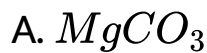


**Answer: A**



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**24.** On heating which of the following release  $CO_2$  most easily ?



Answer: A



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25. Which of the following statement is false?

- A.  $Ca^{2+}$  ions are not important in maintaining the regular beating of the heart.
- B.  $Mg^{2+}$  ions are important in the green parts of the plants.
- C.  $Mg^{2+}$  ions form a complex with ATP.
- D.  $Ca^{2+}$  ions are important in blood clotting.



**Answer: A**



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**26.** In context with beryllium, which one of the following statements is incorrect ?

A. It is rendered passive by nitric acid

B. It forms  $Be_2C$

C. Its salts rarely hydrolyse

D. Its hydride is electron-deficient and polymeric

**Answer: C**



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27. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field ?

A. K

B. Rb

C. Li

D. Na

**Answer: C**



28. Which of the following oxides is most acidic in nature ?

A.  $MgO$

B.  $BeO$

C.  $BaO$

D.  $CaO$

**Answer: B**



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29. Among  $CaH_2$ ,  $BeH_2$ ,  $BaH_2$ , the order of ionic character is

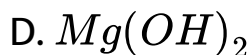
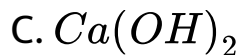
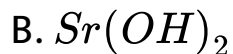
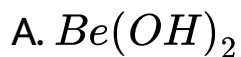


**Answer: A**



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30. Which of the following is an amphoteric hydroxide



**Answer: A**



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**31.** Which of the following is an amphoteric hydroxide

A. one mole of ammonia

B. one mole of nitric acid

C. two moles of ammonia

D. two moles of nitric acid

**Answer: C**



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**32.** Based on lattice energy and other considerations which one of the following alkali metal chlorides is expected to have the highest melting point

A. LiCl

B. NaCl

C. KCl

D. RbCl.

**Answer: B**



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**33.** The ionic mobility of alkali metal ions in aqueous solution is maximum for:

A.  $Rb^+$

B.  $Li^+$

C.  $Na^+$

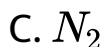
D.  $K^+$

**Answer: A**



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**34.** Which of the following is formed by the action of water on sodium peroxide ?



**Answer: B**



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35. Which one of the following processes is used for the manufacturing of calcium ?

A. Reduction of CaO with carbon

B. Reduction of CaO with hydrogen

C. Electrolysis of a mixture of anhydrous  $CaCl_2$   
and KCl

D. Electrolysis of molten  $Ca(OH)_2$

**Answer: C**



36.  $RbO_2$  is

- A. Peroxide and paramagnetic
- B. Peroxide and diamagnetic
- C. Superoxide and paramagnetic
- D. Superoxide and diamagnetic

**Answer: C**



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37. Which pair of the following chlorides does not impart color to the flame ?

A.  $BeCl_2$  and  $SrCl_2$

B.  $BeCl_2$  and  $MgCl_2$

C.  $CaCl_2$  and  $BaCl_2$

D.  $BaCl_2$  and  $SrCl_2$

**Answer: B**



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**38.** Which of the following oxides is most acidic in nature ?

A.  $BeO$

B. MgO

C. CaO

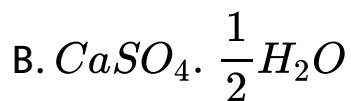
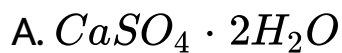
D. BaO

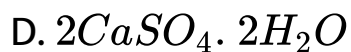
**Answer: A**



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**39.** The molecular formula of gypsum is





**Answer: A**



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**40.** Which one of the following metals has the largest abundance in the earth's crust?

- A. Aluminium
- B. Calcium
- C. Magnesium
- D. Sodium

**Answer: A**



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**41.** The metal that produces red violet colour in the non - luminous flame is

A. Ba

B. Ag

C. Rb

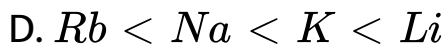
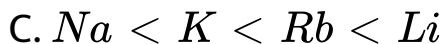
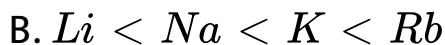
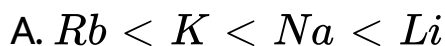
D. Pb

**Answer: C**



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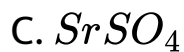
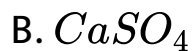
42. The correct order of reducing character of alkali metals is



**Answer: C**



43. Which of the following compounds are readily soluble in water?



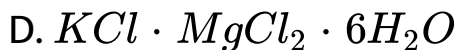
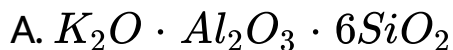
**Answer: A**



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44. which one of the following represents the composition of carnallite mineral?

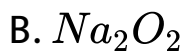
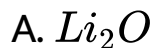


**Answer: D**



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45. Which one of the following on hydrolysis, gives the corresponding metallic hydroxide,  $H_2O_2$  and  $O_2$  ?



**Answer: C**



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46. Be and Al exhibit diagonal relationship . Which of the following statements about them is/are not true ?

(i) Both react with HCl to liberate  $H_2$ .

(ii) They are made passive by  $HNO_3$ .

(iii) Their carbides give acetylene on treatment with water .

(iv) Their oxides are amphoteric .

A. (iii) and (iv)

B. (i) and (iii)

C. (i) only

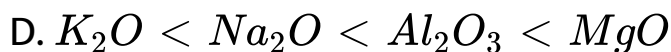
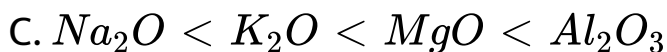
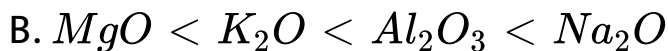
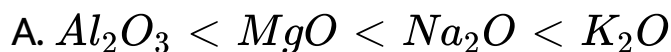
D. (iii) only

**Answer: D**



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**47.** Which one of the following orders presents the correct sequence of the increasing basic nature of the given oxides?

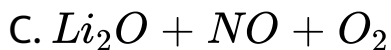
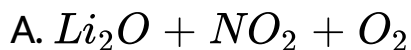


**Answer: A**



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48. The products obtained on heating  $LiNO_3$  will be



Answer: A



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49. The strongest base among the following is

A. NaOH

B. KOH

C. LiOH

D. CsOH

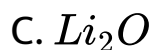
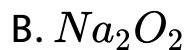
**Answer: D**



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50. Among the following compounds, the one that gets hydrolysed to form metallic hydroxide, hydrogen

peroxide and oxygen is



**Answer: D**



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**51. The alkaline earth metal with least density is**



B. Be

C. Sr

D. Ca

**Answer: D**



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**52.** The reaction between sodium and water can be made less vigorous by

A. lowering the temperature

B. adding a little alcohol



C. amalgamating sodium

D. adding a little acetic acid

**Answer: C**



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**53.** Alkali metals have negative reduction potential and hence they behave as

A. oxidising agents

B. Lewis bases

C. reducing agents

D. electrolytes

**Answer: C**



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**54.** Which of the following statements is false for alkali metals ?

A. Alkali metals are soft and can be cut with the help of a knife.

B. Alkali metals do not occur in free state in nature.

C. Alkali metals are highly electropositive elements.

D. Alkali metal hydrides are covalent in character.

**Answer: D**



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55. The salt of alkali metal gives violet colour in the flame test. Its aqueous solution gives a white precipitate with barium chloride in hydrochloric acid medium. The salt is

A.  $K_2SO_4$

B.  $KCl$

C.  $Na_2SO_4$

D.  $K_2CO_3$

**Answer: A**



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**56.** What is the product of reaction between calcium carbide and water?

A. Ethylene

B. Acetylene

C. Methane

D. Benzene

**Answer: B**



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**57.** The correct statement for the molecule,  $CsI_3$  is

A. It contains  $Cs^+$ ,  $I^-$  and lattice  $I_2$  molecule

B. It is a covalent molecule.

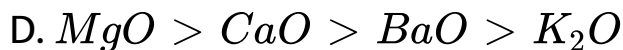
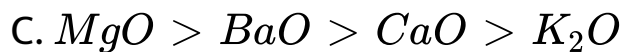
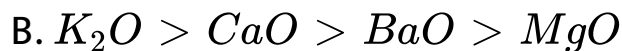
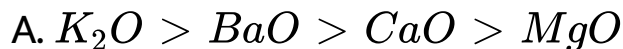
C. It contains  $Cs^+$  and  $I_3^-$  ions

D. It contains  $Cs^{3+}$  and  $I^-$  ions.

**Answer: C**

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**58.** The decreasing order of acidic character is :



**Answer: A**

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59. Match the elements given in Column I with the colour they impart to the flame given in Column II.

*Column I*    *Column II*

- |              |                |
|--------------|----------------|
| A. <i>Cs</i> | 1. Apple green |
| B. <i>Na</i> | 2. Violet      |
| C. <i>K</i>  | 3. Brick red   |
| D. <i>Ca</i> | 4. Yellow      |
| E. <i>Sr</i> | 5. Crimson red |
| F. <i>Ba</i> | 6. Blue        |

A. p-1,q-3,r-2

B. p-3,q-1,r-2

C. p-2,q-3,r-1

D. p-1,q-2,r-3

**Answer: A**



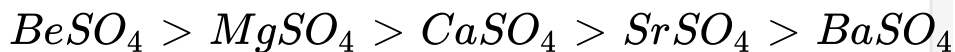
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60. Which of the following are arranged in correct increasing order of solubilities ?

A.



B.



C.





D.



**Answer: B**



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**61.** Which halide of magnesium has highest ionic character?

A. Chloride

B. Bromide

C. Iodide

D. Fluoride

Answer: D



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62. The low solubility of  $\text{LiF}$  and that of  $\text{CsI}$  in water are respectively due to which of the properties of the alkali metal ions?

A. Higher hydration enthalpy of  $\text{Li}^+$ , higher

lattice enthalpy of  $\text{Cs}^+$

B. Smaller hydration enthalpy of  $\text{Li}^+$  higher

lattice enthalpy of  $\text{Cs}^+$

C. Smaller lattice enthalpy of  $Li^+$ , higher hydration enthalpy of  $Cs^+$

D. Higher lattice enthalpy of  $Li^+$ , smaller hydration enthalpy of  $Cs^+$  .

**Answer: D**

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**63.** The second ionization enthalpy of which of the following alkaline earth metals is the highest?

A. Ba

B. Mg

C. Ca

D. Be

**Answer: D**



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**64.** The main oxides formed on combustion of Li, Na and K in excess of air respectively are

A.  $Li_2O$ ,  $Na_2O$  and  $KO_2$

B.  $LiO_2$ ,  $Na_2O_2$  and  $K_2O$

C.  $Li_2O_2$ ,  $Na_2O_2$  and  $KO_2$

D.

**Answer: D**



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**65. Which of the following is covalent?**

A.  $NaCl$

B.  $KCl$

C.  $BeCl_2$

D.  $MgCl_2$

Answer: C

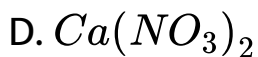
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66. When 1 mole of a substance ( $X$ ) was treated with an excess of water, 2 moles of readily combustible gas were produced along with solution which when reacted with  $CO_2$  gas produced a white turbidity. The substance ( $X$ ) could be

A. Ca

B.  $CaH_2$

C.  $Ca(OH)_2$



**Answer: B**



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**67.** Both lithium and magnesium display several similar properties due to the diagonal relationship , however, the one which is incorrect is

- A. Both form basic carbonates
- B. Both form soluble bicarbonates
- C. Both form nitrides

D. Nitrates of both Li and Mg yield  $NO_2$  and  $O_2$

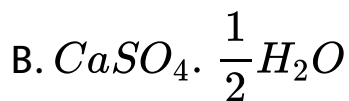
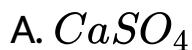
on heating

**Answer: A**



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**68.** Dead burnt plaster is



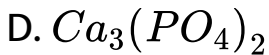
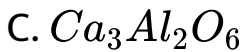


**Answer: A**



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**69.** Portland cement does not contain

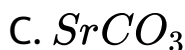
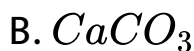
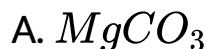


**Answer: D**



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70. Which of the following is least thermally stable ?



**Answer: D**



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71. A metal on combustion in excess air forms  $X_2O_3$  upon hydrolysis with water yields  $H_2O_2$  and  $O_2$

along with another product. The metal is :

A. Rb

B. Li

C. Mg

D. Na

**Answer: A**



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**72.** The correct statement(s) among I to III with respect to potassium ions that are abundant within the cell fluids is/ are :

I. They activate many enzymes

II. They participate in the oxidation of glucose to produce ATP

III. Along with sodium ions, they are responsible for the transmission of nerve signals

A. I,II and III

B. I and III only

C. III only

D. I and II only

**Answer: A**



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73. What is the colour of the flame on heating potassium in the flame of a Bunsen burner?

A. Golden-yellow

B. Gray-white

C. Pale violet

D. Orange-red

**Answer: C**



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74. The metal nitrate that liberates  $NO_2$  on heating

A.  $\text{NaNO}_3$

B.  $\text{LiNO}_3$

C.  $\text{KNO}_3$

D.  $\text{RbNO}_3$

**Answer: B**



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75. Which among the following is correct for electrolysis of brine solution?

A. Sodium metal is collected at anode

B.  $O_2$  gas is liberated at cathode

C.

D.

**Answer: D**



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**76.** What is diagonal relationship ? Discuss the diagonal relationship between Be and Al giving main similarities.

A. similar ionic size and charge/radius ratio

B. similar metallic character

C. similar ionization enthalpy

D. similar electronegativity

**Answer: A**



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**77.** The metal that forms nitride by reacting directly with  $N_2$  of air , is:

A. K

B. Cs

C. Li



D. Rb

Answer: C



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78. The incorrect statement is :

A. Lithium is least reactive with water among the alkali metals.

B. LiCl crystallises from aqueous solution as  $LiCl \cdot 2H_2O$ .

C. Lithium is the strongest reducing agent among the alkali metals.

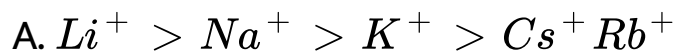
D.  $LiNO_3$  decomposes on heating to give  $LiNO_2$  and  $O_2$

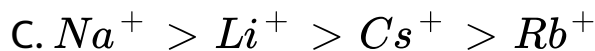
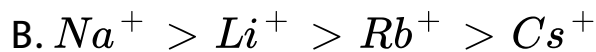
**Answer: D**



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79. The correct order of hydration enthalpies of alkali metal ions is:





**Answer: D**



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**80.** Match the following item in column I with the corresponding items in Column II.

	<b>Column-I</b>		<b>Column-II</b>
(i)	$Na_2CO_3 \cdot 10H_2O$	(A)	Portland cement ingredient
(ii)	$Mg(HCO_3)_2$	(B)	Castner-Kellner process
(iii)	NaOH	(C)	Solvay process
(iv)	$Ca_3Al_2O_6$	(D)	Temporary hardness

A.

$$(i) \rightarrow (R), (ii) \rightarrow (Q), (iii) \rightarrow (S), (iv) \rightarrow (P)$$

B.

$$(i) \rightarrow (R), (ii) \rightarrow (S), (iii) \rightarrow (Q), (iv) \rightarrow (P)$$

C.

$$(i) \rightarrow (S), (ii) \rightarrow (P), (iii) \rightarrow (Q), (iv) \rightarrow (R)$$

D.

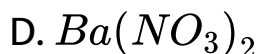
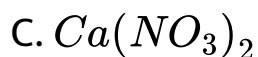
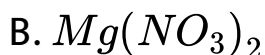
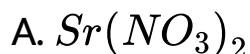
$$(i) \rightarrow (Q), (ii) \rightarrow (R), (iii) \rightarrow (P), (iv) \rightarrow (S)$$

**Answer: B**



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81. The alkaline earth metal nitrate that does not crystallise with water molecules, is :

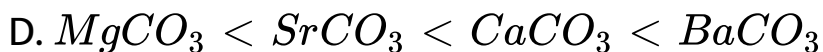
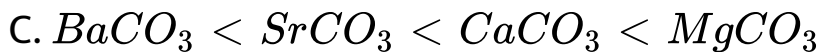
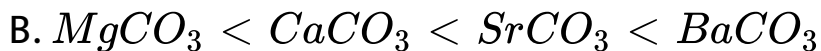
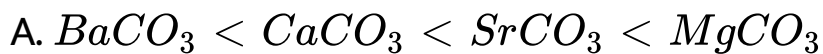


**Answer: D**



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82. The correct sequence of thermal stability of the following carbonates is:

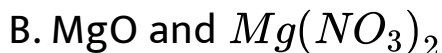


**Answer: B**



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**83.** Magnesium powder burns in air to give :



C.  $MgO$  and  $Mg_3N_2$

D.  $Mg(NO_3)_2$  and  $Mg_3N_2$

**Answer: C**



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**84.** The covalent alkaline earth metal halide ( $X = Cl, Br, I$ ) is :

A.  $CaX_2$

B.  $SrX_2$

C.  $BeX_2$

D.  $MgX_3$

**Answer: C**



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**85.** The structures of beryllium chloride in the solid state and vapour phase, respectively, are:

- A. chain and dimeric
- B. chain and chain
- C. dimeric and dimeric
- D. dimeric and chain



**Answer: A**



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**86.** Which of the following processes is used in the extractive metallurgy of magnesium ?

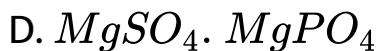
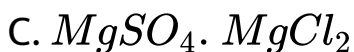
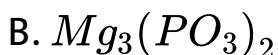
- A. fused salt electrolysis
- B. salt reduction
- C. aqueous solution electrolysis
- D. thermite reduction

**Answer: A**



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87. Ammoniacal solution of  $MgSO_4$  in presence of  $NH_4Cl$  is heated with  $Na_2HPO_4$  , a white precipitate is formed of



**Answer: A**



## Competition File Multiple Choice Question C

1. Highly pure dilute solution of sodium in liquid ammonia

- A. shows blue colour
- B. exhibits electrical conductivity
- C. forms sodium amide
- D. produces  $H_2$  gas

**Answer: A::B**



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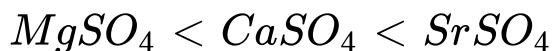
2. Which of the following is not correct order regarding the property indicated?

A. Thermal stability :



B. Reactivity with  $O_2$  :  $Be < Mg < Ca$

C. Solubility in water :



D. Enthalpy of formation :  $CaO < SrO < BeO$

**Answer: C::D**



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3. Which of the following do not impart colour to the flame ?

A. Be

B. Mg

C. Ca

D. Ba

**Answer: A::B**



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4. Calcium oxide can be used for drying of

A.  $H_2$

B.  $NH_3$

C.  $CO_2$

D.  $Cl_2$

**Answer: A::B**



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5. Which of the following statements are correct ?

A. Sodium is most abundant among alkali metals.

B. Among group I elements , radium is the only radioactivity element .

C. Lattice energy of NaI is more than that of NaBr

D. The mobility of  $Li^+$  in water is less than  $Na^+$  .

**Answer: A::D**



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6. Which of the following statements are incorrect ?

A.  $CaH_2$  is also called hydrolith

B.  $BeCl_2$  in vapour phase exist as polymeric

C.  $MgSO_4$  is less soluble than  $CaSO_4$  in water

D.  $MgCO_3$  decomposes at lower temperature than  $BaCO_3$ .

**Answer: B::C**



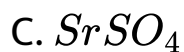
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7. Which of the following compounds are readily soluble in water?

A.  $BeSO_4$

B.  $MgSO_4$





**Answer: A::B**



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**8.** Which of the following statements is/are correct .

A. Beryllium is not readily attacked by acids because of the presence of an oxide film on the surface of the metal.

- B. Beryllium sulphate is readily soluble in water as the greater hydration enthalpy of  $Be^{2+}$  overcomes the lattice enthalpy factor.
- C. Beryllium exhibits coordination number more than four.
- D. Beryllium oxide is purely acidic in nature.

**Answer: A:B**



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9. The alkali metals are characterised by which of the following properties ?

A. High boiling point

B. High density

C. High negative standards electrode potential

D. Large atomic size

**Answer: C::D**



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**10.** Several sodium compounds find use in industries.

Which of the following compounds are used for textile industry?

A.  $Na_2CO_3$

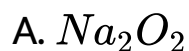


**Answer: A::C**



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**11.** The compounds(s) formed upon combustion of sodium metal in excess air is/are





**Answer: A::B**



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## Competition File Matrix Match Type Questions

1. Match the element in Column I with the properties mentioned in Column II

Column I	Column II
(A) Sodium	(p) belong to third period
(B) Magnesium	(q) form insoluble sulphate
(C) Barium	(r) give characteristic flame colours
(D) Lithium	(s) form stable nitride



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2. Match the compounds given in Column I with their uses in Column II.

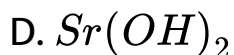
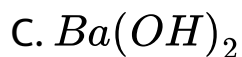
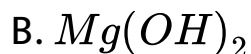
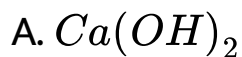
Column I	Column II
(A) $\text{CaCO}_3$	(p) Dentistry, ornamental work
(B) $\text{Ca(OH)}_2$	(q) Manufacture of sodium carbonate from caustic soda
(C) $\text{CaO}$	(r) Manufacture of high quality paper
(D) $\text{CaSO}_4$	(s) Used in white washing



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Unit Practice Test

1. Which of the following metal hydroxide is least basic ?



**Answer: D**



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2. When sodium is dissolved in liquid ammonia, a solution of deep blue colour is obtained. The colour of the solution is due to

- A. sodium ion
- B. sodium amide
- C. ammoniated electron
- D. ammoniated cation

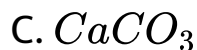
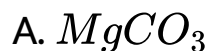
**Answer: A**



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3. Which of the carbonates given below is unstable in air and is kept in  $CO_2$  atmosphere to avoid decomposition?



**Answer: B**



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4. Assertion (A):  $Na_2SO_4$  is soluble in water while  $BaSO_4$  is insoluble.

Reason (R ): Lattice enthalpy of  $BaSO_4$  exceeds its hydration enthalpy.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

**Answer:**



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5. Assertion:  $BeCl_2$  is covalent whereas  $MgCl_2$  is ionic.

Reason: Beryllium is the first member of the group.

A. Assertion and reason both are correct statements and reason is correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

**Answer:**



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6. The radioactive s-block elements are

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7. LiH is more stable than NaH. Explain.

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8. Beryllium and magnesium do not give colour to flame whereas other alkaline earth metals do so. Why?

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9. Draw the structure of (i)  $BeCl_2$  (vapour) and (ii)  $BeCl_2$  (solid).

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10. Compare the solubility and thermal stability of the following compounds of the alkali metals with those of the alkaline earth metals. (a) Nitrates (b) Carbonates (c) Sulphates.

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11. What is diagonal relationship? Why does  $Li$  resemble with  $Mg$ ?

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12. Explain the following:

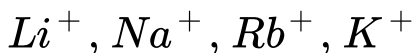
(a)  $KO_2$  is paramagnetic.

(b) Lithium forms oxide, sodium forms peroxide while potassium and rubidium form superoxides.

(c)  $BaO$  is soluble but  $BaSO_4$  is insoluble in water.

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13. (a) Giving reasons arrange the following in the decreasing order of ionic mobility :



(b) Explain the various reactions that occur in the Solvay process for the manufacture of  $Na_2CO_3$

(c) Potassium carbonate cannot be prepared by Solvay process, why?



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