



# CHEMISTRY

## BOOKS - NAGEEN CHEMISTRY (ENGLISH)

### THE $s$ - BLOCK ELEMENTS

#### Review Exercises

1. What are  $s$ -block elements ? Write their general electronic configurations.



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2. What are the highest oxidation states shown by s-block elements ?



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3. Alkali metals have low ionisation energy. Why is it so?



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4. Alkali metals exhibit only +1 oxidation state.

Explain.



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5. Why is the solution of an alkali metal in ammonia blue?



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6. Arrange the following in the increasing order of ionic character :

$KCl$ ,  $MgCl_2$ ,  $CaCl_2$ ,  $BeCl_2$ .



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7. Among the alkali metals, which element has the largest atomic radius ?



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**8.** Among the alkali metals, which element has the lowest ionic radius ?



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**9.** Among the alkali metals, which element has the most electropositive character ?



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**10.** Among the alkali metals, which element has the highest reducing power ?



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**11.** Arrange  $\text{LiOH}$ ,  $\text{NaOH}$ ,  $\text{KOH}$ ,  $\text{RbOH}$  and  $\text{CsOH}$  in the increasing order of basic strength and give an adequate explanation for the same.



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**12.** Can we store sodium in water ? Explain.



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**13.** What is diagonal relationship?



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**14.** There is a striking similarity between Li and Mg. Account for it.



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**15.** Mention two properties shown by lithium towards magnesium.



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**16.** Write two properties of lithium carbonate in which it differs from other alkali metal carbonates.



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17. Which alkali metal carbonate decomposes on heating to liberate  $CO_2$ ?



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18. What is meant by 'diagonal relationship'? Why do some elements show diagonal relationship? How does lithium resemble magnesium in its chemical behaviour?



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**19.** Which element is the lightest of all other solid elements ?



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**20.** Why do lithium and sodium not occur in free state in nature ?



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**21.** Why is an aqueous solution of sodium carbonate alkaline?



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**22.** Why do alkali metals respond to flame test?



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**23.** What is chlor alkali process?



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24. Can Solvay process be used for the manufacture of  $K_2CO_3$  ? Explain.



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25. What happen when  $Zn(OH)_2$  is treated with excess of NaOH ?



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**26.** What happen when baking soda is heated to 373 K ?



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**27.** What happen when washing soda is heated to 373 K?



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**28.** Explain the following observation:

Beryllium resembles aluminium in several properties.



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**29.** Which alkaline earth metal chloride is most covalent?



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**30.** How is beryllium chloride prepared ?

Discuss its structure both in the solid as well as in the gas phase.



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**31.** Draw the structure of beryllium chloride in vapour state.



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**32.** The second ionisation enthalpy of an alkaline earth metal is higher than its first ionisation enthalpy. Why is it so ?



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**33.** Arrange the following in the order of property mentioned.

*BeO, MgO, CaO, BaO* (increasing basic character)



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**34.** Arrange the following in the order of property mentioned.

$BeCl_2, MgCl_2, CaCl_2, SrCl_2$  (decreasing ionic character)



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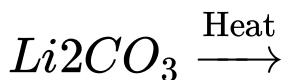
**35.** Arrange the following in the order of property mentioned.

$Be(OH)_2, Mg(OH)_2, Sr(OH)_2, Ba(OH)_2$   
(decreasing solubility in water)



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36. Complete and balance the following reactions



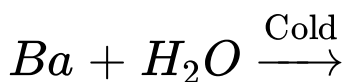
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37. Complete the following equation for the reaction between  $BeO + NaOH$ .



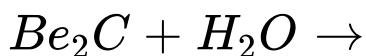
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**38.** Complete and balance the following reactions



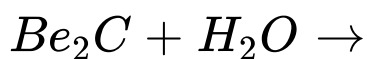
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**39.** Complete and balance the following reactions



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**40.** Complete and balance the following reactions



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**41.** Why are potassium and caesium rather than lithium used in photoelectric cells ?



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



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**43.** Calcium is used for removal of water from alcohol ? Explain.



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**44.** Plaster of Paris is used for making moulds for casting ? Explain.



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**45.** Magnesium cannot be prepared by the electrolysis of fused ? Explain.



**Watch Video Solution**

**46.** The average composition of portland cement is



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**47.** What is the role of silica in the setting of cement?



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**48.** Why is it necessary to mix gypsum with cement clinker?



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**49.** What do you understand by concrete and RCC ?



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**50.** Describe the setting of plaster of Paris.





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51. Describe the industrial uses of lime and limestone.



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## Very Short Answer Type Questions

1. The general electronic configuration of s-block elements is .....



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2. Representative elements are elements of



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3. What are the highest oxidation states shown by s-block elements ?



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4. What type of compounds are formed by s-block elements ?



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5. Name the periods whose elements show diagonal relationship.



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6. How do the following properties vary on moving down the group 1?

Atomic radii



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7. The elements of which group are the biggest in size in respective periods?



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8. The elements of which group are the most electropositive in respective periods?



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9. How does the hydration energy of alkali metal cations vary on moving down the group ?



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**10.** Why is sodium kept immersed in kerosene oil?



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**11.** What is the nature of alkali metal oxides and hydroxides?



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**12.** Among the alkali metals, which element has the highest reducing power ?



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**13.** What is the common name given to the elements of group 2 ?



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**14.** Among groups 1 and 2, the elements of which group have higher ionisation enthalpies ?



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**15.** What is the nature of beryllium oxide ?



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**16.** Arrange the group 2 metal hydroxides in the increasing order of basic strength.



**Watch Video Solution**

**17.** Arrange the group 2 metal hydroxides in the increasing order of solubility in water.



**Watch Video Solution**

**18.** How does beryllium chloride exist in solid state?



**Watch Video Solution**

**19.** How does beryllium chloride exist in vapour phase ?



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20. Among the alkaline earth metal carbonates which one is least stable towards heat ?



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21. Among  $MgSO_4$ ,  $CaSO_4$ ,  $SrSO_4$  and  $BaSO_4$ , which one is most soluble in water ?



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22. Which metal ion is a constituent of chlorophyll



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23. How does beryllium react with NaOH ?



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24. Which group 2 element oxide is amphoteric in nature ?



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25. Which element possesses the highest specific heat?



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26. Is lithium affected by dry air?



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27. Which gas is evolved when lithium is treated with cold water?



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28. How does lithium react with alkalis?



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29. To what extent is sodium present in the earth's crust?



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**30.** Which compound is formed when sodium is heated in oxygen ?



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**31.** What happens when sodium is left exposed to atmosphere?



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**32.** Write the chemical formulae of the following compounds:

washing soda, baking soda, caustic soda.



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**33.** Which of the following are deliquescent?

$NaCl$ ,  $NaOH$ ,  $Na_2CO_3$ ,  $NaHCO_3$



**Watch Video Solution**



**34.** What is the nature of an aqueous solution of sodium carbonate?



**Watch Video Solution**

**35.** Which compound of sodium is used for washing purposes in laundry ?



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**36.** Why is the ionisation enthalpy of magnesium higher than that of potassium ?



**Watch Video Solution**

**37.** What is the formula of hypo?



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**38.** What is the role of hypo in photography?



**Watch Video Solution**

**39.** Write the chemical formulae of the following:

Quick lime, slaked lime, milk of lime, lime water.



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**40.** Name three common forms of  $CaCO_3$ .



**Watch Video Solution**

**41.** Write the chemical formula of plaster of Paris.



**Watch Video Solution**

**42.** Who discovered cement?



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**43.** In what form does magnesium chloride occur in nature?



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**44.** Can anhydrous magnesium chloride be prepared by heating the hydrated salt?



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**45.** Why is magnesium oxide used as a refractory material?



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**46.** What is the chemical composition of Sorel's cement?



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**47.** What are the main chemical constituents of cement?



**Watch Video Solution**

**48.** What do you understand by concrete and RCC ?



**Watch Video Solution**

**49.** What is the temperature in the rotary Kiln used for the manufacture of cement?



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**50.** Name a substance which could be added to cement without affecting its quality.



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



**Watch Video Solution**



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



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**53.** Name the chief factor responsible for the anomalous behaviour of lithium.



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54. 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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## Short Answer Type Questions

1. What are s-block elements ? Write their general electronic configurations.



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2. Why does the first element of a group differ from the other elements of the same group ?



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3. What is diagonal relationship? Mention two diagonally related pairs of elements.



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4. What is the cause of diagonal relationship ?

Explain with examples.



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5. Why are group 1 elements called alkali metals ?



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6. Why is each alkali metal atom largest in its period ?



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7. Why do ionic radii of alkali metals increase on moving down the group ?



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8. Why do alkali metals possess low densities?



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**9.** How do the ionisation enthalpies of alkali metals vary on moving down the group and why?



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**10.** Why are the second ionisation enthalpies of group 1 elements much higher than their first ionisation enthalpies ?



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**11.** 'Each alkali metal is the most electropositive element in its period'.

Comment on the statement and explain.



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**12.** Why do alkali metals not show variable oxidation states ?



**Watch Video Solution**

**13.** Why do alkali metals show characteristic colours in a non luminous flame?



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**14.** Sodium readily forms  $Na^+$  ion but never forms  $Na^{2+}$  ion. Explain.



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**15.** Why are the alkali metal ions colourless and diamagnetic ?



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**16.** What is photoelectric effect? State the result of photoelectric effect experiment that could not be explained on the basis of laws of classical physics. Explain this effect on the basis of quantum theory of electromagnetic radiations.





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**17.** Why are potassium and caesium rather than lithium used in photoelectric cells ?



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**18.** Alkali metals are highly reactive elements. Explain, why?



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**19.** What happens when alkali metals are exposed to air ?



**Watch Video Solution**

**20.** Why are alkali metals not kept under water?



**Watch Video Solution**

**21.** Why are lithium halides partially covalent ?

Explain with examples.



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**22.** Give a reason for each of the following:

Alkali metals are good reducing agents.



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**23.** In spite of very high ionisation energy, lithium is the strongest reducing agent among all the alkali metals. Explain.



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**24.** Why are the solutions of alkali metal atoms in liquid ammonia blue coloured and highly conducting?



**Watch Video Solution**

**25.** Why does the basic strength of the hydroxides of alkali metals increase on moving down the group ?



**Watch Video Solution**

**26.** Name the chief factor responsible for the anomalous behaviour of lithium.



**Watch Video Solution**

**27.** The elements of group 2 are called alkaline earth metals. Give reason.



**Watch Video Solution**

**28.** The atomic radii of alkaline earth metals are smaller than those of the corresponding alkali metals. Explain, why?



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**29.** Why are the second ionisation energies of alkaline earth metals much smaller than those of alkali metals ?



**Watch Video Solution**

**30.** Among alkaline earth metals which element do you expect to be least electronegative and why?



**Watch Video Solution**

**31.** Why do alkaline earth metals have higher melting points than group 1 elements ?



**Watch Video Solution**



**32.** In spite of much higher second ionisation energy as compared to the first ionisation energy, why do group 2 elements prefer to form  $M^{2+}$  ions ?



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**33.** Comment on the colour and magnetic behaviour of dipositive ions of group 2 elements.



**Watch Video Solution**

**34.** Why do alkaline earth metals and their compounds impart characteristic colours to the flame?



**Watch Video Solution**

**35.** Giving suitable reasons, arrange alkaline earth metals in the increasing order of their reactivity with oxygen.



**Watch Video Solution**

**36.** Giving suitable reasons, arrange alkaline earth metal hydroxides in the increasing order of their solubility in water.



**Watch Video Solution**

**37.** How does the basic character of oxides of group 2 elements vary on moving down the group ?



**Watch Video Solution**

**38.** Giving suitable reasons, arrange alkaline earth metal hydroxides in the increasing order of their solubility in water.



**Watch Video Solution**

**39.** How does beryllium react with NaOH ?



**Watch Video Solution**

**40.** What happens when calcium hydride is treated with water ?



**Watch Video Solution**

**41.** What do you observe :

Carbon dioxide is passed through lime water first a little, then in excess.



**Watch Video Solution**

**42.** How does beryllium chloride exist in solid state?



**Watch Video Solution**

**43.** How does beryllium chloride exist in vapour phase ?



**Watch Video Solution**

**44.** Why does the solubility of alkaline earth metal sulphates decrease on moving down the group?



**Watch Video Solution**

**45.** Mention any five properties in which beryllium resembles aluminium.



**Watch Video Solution**

**46.** Why does the solution of sodium in liquid ammonia possess strong reducing nature?



**Watch Video Solution**

**47.** What is the action of air on sodium ?



**Watch Video Solution**

**48.** Describe the principle of Solvay process used for the manufacture of sodium



carbonate.



**Watch Video Solution**

**49.** What is flame test and why do alkali metals show characteristic colours in the flame?



**Watch Video Solution**

**50.** Why is Solvay process for the manufacture of sodium carbonate very cheap?



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51. Why can Solvay process not be used for the manufacture of potassium carbonate?



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52. What is the action of heat on  $Na_2CO_3 \cdot 10H_2O$  ?



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**53.** How is baking soda prepared?



**Watch Video Solution**

**54.** What is plaster of Paris and how is it prepared?



**Watch Video Solution**

**55.** Describe the setting of plaster of Paris.



**Watch Video Solution**

**56.** How would you prepare gypsum from calcium chloride ?



**Watch Video Solution**

**57.** How would you prepare lime from limestone ?



**Watch Video Solution**

**58.** What happens when magnesium burns in  $CO_2$  ?



**Watch Video Solution**

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



**Watch Video Solution**

**60.** Slaked lime reacts with chlorine to give



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61. What happen when

plaster of Paris is heated above 473 K ?



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62. What happens when excess of  $CO_2$  is passed in lime water and the solution is heated?



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**63.** Describe the action of chlorine on lime and milk of lime.



**Watch Video Solution**

**64.** What is gypsum and what is the effect of heat on it?



**Watch Video Solution**

**65.** The average composition of portland cement is



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**66.** What are the main chemical constituents of cement?



**Watch Video Solution**



**67.** Give an account of the chemical reactions which take place in the rotary Kiln during the manufacture of cement.



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**68.** Why does cement set to a very hard mass when mixed with water and allowed to stand for some time?



**Watch Video Solution**

**69.** Describe the industrial uses of lime and limestone.



**Watch Video Solution**

**70.** Why is cement clinker obtained from rotary Kiln mixed with gypsum?



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**71.** What do you understand by concrete and RCC ?



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



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**73.** 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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**74.** List three properties of lithium in which it differs from the rest of the alkali metals.



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**75.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of air?

(iii) sodium peroxide dissolves in water?



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**76.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of

air?

(iii) sodium peroxide dissolves in water?



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**77.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of  
air?

(iii) sodium peroxide dissolves in water?



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**78.** 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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**79.** Why does the following reaction



proceed better with KF than with NaF?



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**80.** The average composition of portland cement is



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**81.** Differentiate between quicklime and Slaked lime.



**Watch Video Solution**

**82.** Differentiate between lime and lime-water.





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**83.** Differentiate between slaked lime and lime water



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**84.** Complete the following equation for the reaction between  $Ca + H_2O$



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**85.** Complete the following equation for the reaction between  $Ca(OH)_2 + Cl_2$



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**86.** Complete the following equation for the reaction between  $BeO + NaOH$ .



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**87.** Complete the following equation for the reaction between  $BaO_2 + H_2SO_4$ .



**Watch Video Solution**

**88.** How is magnesium chloride obtained from carnallite?



**Watch Video Solution**

**89.** What happens when  $MgCl_2 \cdot 6H_2O$  is heated ?



**Watch Video Solution**

**90.** What is Sorel's cement and how is it prepared?



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**91.** Name 2 ores of magnesium.



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92. What is the action of heat on  $MgSO_4 \cdot 7H_2O$  ?



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93. What is lime light?



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1. What are s-block elements ? Mention some of their important characteristics.



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2. What do you understand by diagonal relationship? Why do the elements of second and third periods exhibit this type of relationship?



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**3.** What are alkali metals ? Describe their general characteristics.



**Watch Video Solution**

**4.** Name the chief factor responsible for the anomalous behaviour of lithium.



**Watch Video Solution**

5. How do the following properties of group 1 and group 2 elements vary with increase in atomic number?

(i) Atomic and ionic radii

(ii) Density

(iii) Melting and boiling points

(iv) Electropositive character

Give suitable explanation for the variation in each case.



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6. Give the important characteristics of group 2 elements. Why does beryllium show an anomalous behaviour ?



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7. In spite of much higher second ionisation energy as compared to the first ionisation energy, why do group 2 elements prefer to form  $M^{2+}$  ions ?



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8. Discuss the important characteristics of hydroxides & halides of group 2 elements.



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9. Discuss the important characteristics of oxides, hydroxides, and carbonates of group 2 elements.



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**10.** Discuss some important properties in which beryllium differs from the other elements of the group.



**Watch Video Solution**

**11.** Discuss some important properties to show that beryllium shows diagonal relationship with aluminium.



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**12.** How is sodium carbonate manufactured by Solvay's process? Draw a schematic diagram and explain all the steps involved in the process. What is the action of heat on sodium carbonate ?



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**13.** How does NaOH react with the following?

(i) Al (ii) P



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**14.** Give the preparation, properties and uses of the following compound Lime.



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**15.** Quick Lime and Slaked Lime



**Watch Video Solution**

**16.** Give the preparation, properties and uses of the following compound Lime.



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**17.** Write the chemical name of Plaster of Paris.

Write the chemical equation of its preparation. Why should Plaster of Paris be stored in a dry place ?



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**18.** The average composition of portland cement is





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19. What is diagonal relationship?



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20. Describe one method of manufacture of sodium hydroxide and discuss its three industrial uses. What happens when sodium hydroxide reacts with Al metal ?



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21. Describe one method of manufacture of sodium hydroxide and discuss its three industrial uses. What happens when sodium hydroxide reacts with  $\text{CO}_2$  ?



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22. Describe one method of manufacture of sodium hydroxide and discuss its three industrial uses. What happens when sodium hydroxide reacts with  $\text{CO}_2$  ?







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**23.** Why is it that the s-block elements never occur free in nature? What are their usual modes of occurrence and how are they generally prepared?



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**24.** 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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**25.** 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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**26.** 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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**27.** What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.



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**28.** What happen when :

Sodium amalgam reacts with water?



**Watch Video Solution**

**29.** What happen when :

Fused sodium metal reacts with ammonia?



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**30.** Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate ?



**Watch Video Solution**

**31.** Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate ?





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**32.** Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate ?



[Watch Video Solution](#)

**33.** Starting with sodium chloride how would you proceed to prepare sodium carbonate? Mention the steps only.



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**34.** Mention the general trends in group 1 and group 2 with increasing atomic number with respect to atomic size.



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**35.** Mention the general trends in group 1 and group 2 with increasing atomic number with respect to density.





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**36.** Boiling point and melting point of alkali metals ..... (increase / decrease) with increase in atomic number.



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**37.** Among groups 1 and 2, the elements of which group have higher ionisation enthalpies ?



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



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**39.** Why is an aqueous solution of sodium carbonate alkaline?



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**40.** Aqueous solution of NaCl is not used for electrolytic isolation of sodium metal. Give reason.



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**41.** How do the following properties vary on moving down the group 1?

Atomic radii



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**42.** 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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**43.** Give one word for the following :

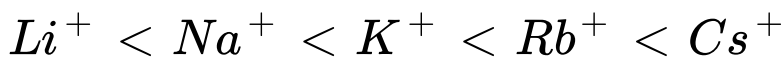
The least soluble alkali



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44. Comment on each of the following observations:

(a) The mobilities of the alkali metal ions in aqueous solution are



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

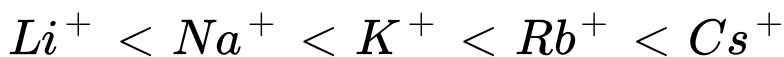
(c)  $E^\ominus$  for  $M^{2+}(\text{aq}) + 2e^- \rightarrow M(\text{s})$  (where  $M = \text{Ca, Sr or Ba}$ ) is nearly constant



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45. Comment on each of the following observations:

(a) The mobilities of the alkali metal ions in aqueous solution are



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

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



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**46.** Compare and contrast the chemistry of alkali metal with that of alkaline earth metal with respect to polarising power of cations.



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**47.** Compare hydrogen with alkali metals on the basis of:

Reducing Power



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**48.** What is the nature of alkali metal oxides and hydroxides?



**Watch Video Solution**

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



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50. Draw the structure of (i)  $BeCl_2$  (vapour)

(ii)  $BeCl_2$  (solid)



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51. 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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52. An aqueous solution of  $Na_2CO_3$  is alkaline ? Explain.



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53. Sodium is found more useful than potassium ? Explain.



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54. Giving a suitable explanation for the contrast in the action of heat on the following:  $Na_2CO_3$  and  $CaCO_3$ .



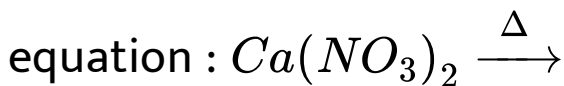
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55. Giving a suitable explanation for the contrast in the action of heat on the following:  $MgCl_2 \cdot 6H_2O$  and  $CaCl_2 \cdot 6H_2O$ .



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56. Complete and balance the following



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Objective Multiple Choice Type Questions  
Choose The Correct Option In The Following  
Questions

1. Among  $LiCl$ ,  $RbCl$ ,  $BeCl_2$ ,  $MgCl_2$ , the compounds with greatest and least ionic character respectively are

A.  $LiCl$ ,  $RbCl$

B.  $RbCl$ ,  $BeCl_2$

C.  $RbCl$ ,  $MgCl_2$

D.  $MgCl_2$ ,  $BeCl_2$

**Answer: B**



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2. 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

A. the hydration energy of sodium sulphate is more than its lattice energy

B. the lattice energy of barium sulphate is less than its hydration energy

C. the lattice energy has no role to play in solubility

D. the hydration energy of sodium sulphate is less than its lattice energy.

**Answer: A**



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3. Why does the solution of sodium in liquid ammonia possess strong reducing nature?

A. sodium atoms

B. sodium hydride

C. sodium amide

D. solvated electrons.

**Answer: D**



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**4. The alkali metals**

A. form salt-like hydrides

B. form predominantly covalent salts

C. show decreased chemical reactivity with oxygen in going from Li to Cs

D. show increasing electronegativity from Li to Cs.

**Answer: A**



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5. Which of the following is not a characteristic of alcohol ?



A. Low m.p.

B. Low electronegativity

C. High ionisation energy

D. Their ions are isoelectronic with noble gases.

**Answer: C**



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6. The properties of lithium are similar to those of Mg. This is because

A. they have the same atomic size

B. their charge/size ratio is the same

C. they possess similar electronic configurations

D. they exist together in nature.

**Answer: B**



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7. Give a reason for each of the following:

Alkali metals are good reducing agents.

A. low ionisation energy

B. large ionic radii

C. high enthalpy of hydration

D. high  $E_{red}$  values.

**Answer: A**



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8. Molten sodium chloride and sodium chloride dissolved in water .

A. oxidised

B. hydrated

C. reduced

D. none of these.

**Answer: B**



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9. Beryllium shows diagonal relationship with aluminium. Which of the following similarly is incorrect?

A. Na

B. B

C. Al

D. K

**Answer: C**



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

A. calcium carbonate

B. calcium nitrate

C. magnesium carbonate

D. barium nitrate,

**Answer: B**



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11.  $Be(OH)_2$  is

A. acidic

B. basic

C. amphoteric

D. neutral.

**Answer: C**



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12. Compounds of group 2 elements are less soluble in water than the corresponding salts of group 1 elements due to

A. their higher ionisation enthalpy

B. their lower electronegativity

C. their lower hydration enthalpy

D. their higher lattice enthalpy.

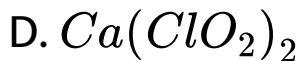
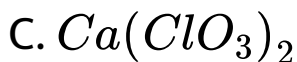
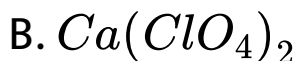
**Answer: D**



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13. Which of the following represents calcium chlorite ?

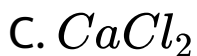


**Answer: D**



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14. Which of the following chlorides is covalent ?



**Answer: B**



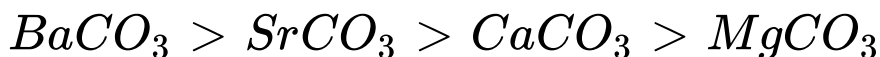
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**15.** Discuss the trend of the following

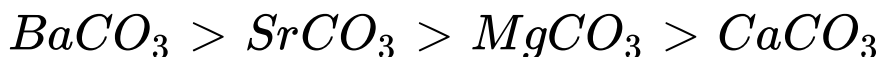
(i) Thermal stability of carbonates of Group 2 elements.

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

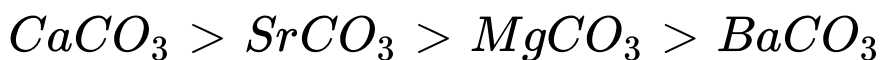
A.



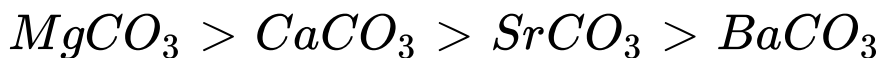
B.



C.



D.



.

**Answer: A**



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16. A fire work gives out crimson coloured light. It contains the salt of

A. calcium

B. sodium

C. barium

D. strontium

**Answer: D**



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17. Alkali metals contain

A. 7 valence electrons

B. 1 valence electron

C. 4 valence electrons

D. 2 valence electrons.

**Answer: B**



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**18.** Alkali metals give colour in Bunsen flame due to

A. low ionisation potential

B. low m.p.

C. softness

D. one electron in the outermost orbit.

**Answer: A**



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19. Which is manufactured by electrolysis of fused sodium chloride?

A.  $NaOH$

B.  $NaClO$

C.  $NaClO_3$

D.  $Na$ .

**Answer: D**



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20. Sodium is made by the electrolysis of a molten mixture of about 40% NaCl and 60%  $CaCl_2$  because

(a)  $Ca^{2+}$  ion can reduce NaCl to Na

(b)  $CaCl_2$  helps in conduction of electricity

(c) this mixture has a lower melting point than NaCl

(d)  $Ca^{2+}$  can displace Na from  $NaCl$ .

A.  $Ca^{2+}$  ion can reduce NaCl to Na

B.  $CaCl_2$  helps in conduction of electricity

C. this mixture has a lower melting point than NaCl

D.  $Ca^{2+}$  can displace Na from  $NaCl$ .

**Answer: C**



**Watch Video Solution**

21. Sodium carbonate is manufactured by Solvay process. The products that are recycled are

A.  $CO_2$  and  $NH_3$

B.  $CO_2$  and  $NH_4Cl$

C.  $NaCl$ ,  $CaO$

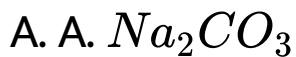
D.  $CaCl_2$ ,  $CO$ .

**Answer: A**



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**22.** Which of the following compounds is efflorescent ?

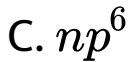
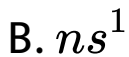
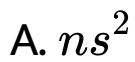


**Answer: B**



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**23.** The outer electronic configuration of alkaline earth metals is



**Answer: A**



**Watch Video Solution**

**24.** Electrolysis of  $KCl \cdot MgCl_2 \cdot 6H_2O$  gives:

potassium only

magnesium only

magnesium and chlorine

potassium and magnesium.

A. potassium only

B. magnesium only

C. magnesium and chlorine

D. potassium and magnesium.

**Answer: C**



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25. Which of the following metals is present in chlorophyll ?

A. Mg

B. Be

C. Ca

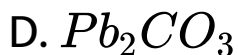
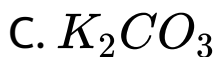
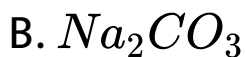
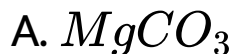
D. none of these.

**Answer: A**



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26. Which of the following metal carbonates is decomposed on heating?



**Answer: A**



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27. Write the equations for the following and balance them

Magnesium reacts with nitrogen to give magnesium nitride.



D. none of these

**Answer: A**



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28. Mixture of  $MgCl_2$  and  $MgO$  is called

A. Portland cement

B. Sorel's cement

C. double salt

D. none of these

**Answer: B**



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29. The flame test with a salt P gave a brick red flame. What is the cation in P.

A. Ca

B. basic

C. Sr

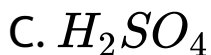
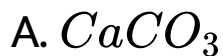
D. none of these

**Answer: A**



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30. A substance absorbs  $CO_2$  and violently reacts with water. The substance is

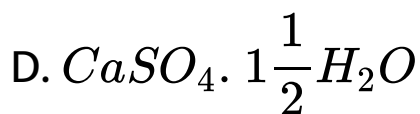
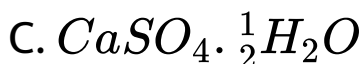


**Answer: B**



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31. What is plaster of Paris and how is it prepared?



**Answer: C**



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**32.** Portland cement is manufactured by using

A. lime stone, clay and sand

B. lime stone, gypsum and sand

C. lime stone, gypsum and alumina

D. lime stone, clay and gypsum.

**Answer: D**



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**33.** Which one of the following components of cement sets at the slowest rate: Dicalcium silicate, Tricalcium silicate, Tricalcium aluminate, Tricalcium aluminoferrite.

- A. Dicalcium silicate
- B. Tricalcium silicate
- C. Tricalcium aluminate
- D. Tricalcium aluminoferrite.

**Answer: A**



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34. When  $Na_2CO_3 \cdot 10H_2O$  is kept open in air,

it

- (a) absorbs moisture
- (b) loses water to form anhydrous salt
- (c) loses water to form a monohydrate
- (d) decomposes to give  $CO_2$  and  $Na_2O$ .

A. absorbs moisture

B. loses water to form anhydrous salt

C. loses water to form a monohydrate



D. decomposes to give  $CO_2$  and  $Na_2O$ .

**Answer: C**



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**35.** Describe the setting of plaster of Paris.

A. monohydrate

B. orthorhombic gypsum

C. monoclinic gypsum

D. dead burnt plaster.

**Answer: C**



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**36.** Which of the following elements differs from the rest in several physical and chemical properties?

(a)Li

(b)Na

(c)Rb

(d)Cs

A. Li

B. Na

C. Rb

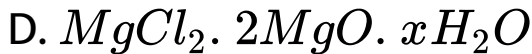
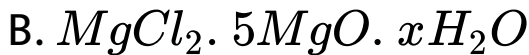
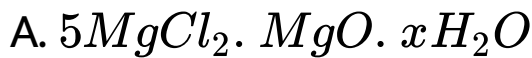
D. Cs.

**Answer: A**



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**37.** What is Sorel's cement and how is it prepared?

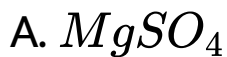


**Answer: B**



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**38.** When epsom salt is heated at  $150^\circ C$ , the compound obtained is



**Answer: B**



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**39.** When  $CaO$  is heated in an oxy-hydrogen flame,

A. it decomposes to give oxygen

B. it melts to give fused  $CaO$

C. it becomes incandescent

D. no observable change takes place.

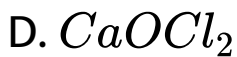
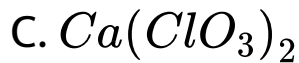
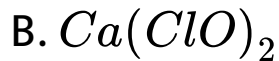
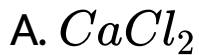
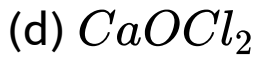
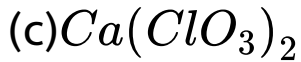
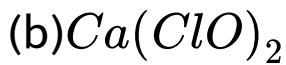
**Answer: C**



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**40.** When slaked lime is treated with chlorine, the product obtained is

(a)  $CaCl_2$



**Answer: D**



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41. Which of the following is not chemically  $CaCO_3$  ?

- A. Precipitated chalk
- B. Iceland spar
- C. Shells of sea animals
- D. Asbestos.

**Answer: D**



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42. When a mixture of anhydrous  $Na_2CO_3$  and  $NaHCO_3$  is heated to  $100^\circ C$ , a loss in mass is recorded. This is due to

- A. decomposition of  $Na_2CO_3$  alone
- B. decomposition of  $NaHCO_3$  alone
- C. decomposition of both
- D. removal of water of crystallisation

**Answer: B**



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43. The chloride that can be extracted with ether is

A.  $NaCl$

B.  $LiCl$

C.  $KCl$

D.  $RbCl$

**Answer: B**



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44. The weakest base among the following is

A. NaOH

B. KOH

C.  $Ca(OH)_2$

D.  $Zn(OH)_2$

**Answer: D**



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45. Calcium chloride and potassium chloride solutions could easily be distinguished from one another by

- A. performing a flame test
- B. comparing their colours
- C. adding  $NH_4OH$  to each solution
- D. adding  $AgNO_3$  to each solution.

**Answer: A**



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46. The mobilities of the alkali metal ions in aqueous solution are

$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$  because

A. Na

B. KOH

C. Rb

D. Li

**Answer: D**



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47. Both lithium and magnesium display several similar properties due to the diagonal relationships, however, the one which is incorrect, is:

A. both form nitrides

B. nitrates of both Li and Mg yield

$NO_2$  and  $O_2$  on heating

C. both form basic carbonates

D. both form soluble bicarbonates

**Answer: C**



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**48.** A water sample has ppm level concentration of following anions

$$F^- = 10, SO_4^{2-} = 100, NO_3^- = 50$$

The anion/anions that make/makes the water sample unsuitable for drinking is/are:

A. only  $F^-$

B. only  $SO_4^{2-}$

C. only  $NO_3^-$

D. both  $SO_4^{2-}$  and  $NO_3^-$

**Answer: A**



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

A. MgO

B. BeO



C. BaO

D. CaO

**Answer: B**



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



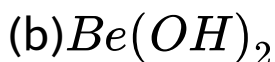
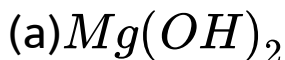


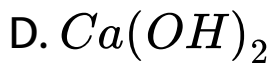
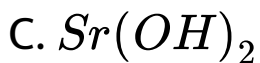
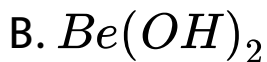
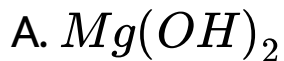
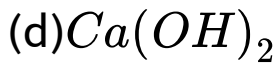
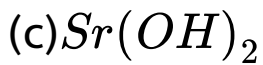
**Answer: A**



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51. Which of the following is an amphoteric hydroxide?





**Answer: B**



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52. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor M is

A. Ca

B. Sr

C. Be

D. Mg

**Answer: D**



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

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

**Answer: D**



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**55.** Magnesium burns with a \_\_\_\_ flame.



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





**Answer: A**



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**57.** Which alkaline earth metal chloride is most covalent?





B.  $SrX_2$

C.  $MgX_2$

D.  $CaX_2$

**Answer: A**



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**True Or False Type Questions State Whether The Following Statements Are True Or False**

1. s-block elements are also referred to as transition elements. True/False



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2. The first element of a group shows close resemblance with other elements of the group. True/False.



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3. Beryllium exhibits diagonal relationship with ..... (magnesium / aluminium).



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4. The electronic configuration of alkali metals is of the type  $[\text{Noble gas}]ns^1$ . True/False



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5. The atomic and ionic radii of alkali metals are the smallest in their respective periods.



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6. The density of alkali metals increases from Li to Cs.



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7. 'Each alkali metal is the most electropositive element in its period'. Comment on the statement and explain.



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



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9. Li is used in photoelectric cells.



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10. K, Rb and Cs form mainly superoxides.



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11. Why are lithium halides partially covalent ?

Explain with examples.



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**12.** In spite of very high ionisation energy, lithium is the strongest reducing agent among all the alkali metals. Explain.



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**13.** 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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**14.** The densities of alkaline earth metals are much smaller than those of alkali metals.



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**15.** Why are the second ionisation energies of alkaline earth metals much smaller than those of alkali metals ?



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**16.** Why do alkaline earth metals and their compounds impart characteristic colours to the flame?



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**17.** The flame test with a salt P gave a brick red flame. What is the cation in P.



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18.  $Be(OH)_2$  is



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19.  $BaCl_2$  is a low melting volatile solid.



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20. Assertion : Among alkaline earth metals, Be predominantly forms covalent bond.

Reason : Be is smaller in size and hence has greater polarising power.



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21. Why do lithium and sodium not occur in free state in nature ?



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22. Lithium forms alloys with a number of metals. Why?



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**23.** Sodium acts as a strong reducing agent.

Why?



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**24.** Hydrated magnesium chloride on heating gives magnesium oxide.



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25. Plaster of Paris is chemically calcium sulphate monohydrate.



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## Fill In The Banks Type Questions

1. The general electronic configuration of s-block elements is .....



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2. What are the highest oxidation states shown by s-block elements ?



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3. Why do ionic radii of alkali metals increase on moving down the group ?



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4. The tendency of alkali metal cations to undergo hydration..... in going from

$Li^+$  to  $Cs^+$ .



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5. Lithium compounds impart .....colour to the flame.



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6. Alkali metals are kept under .....because they are highly.....and get ....when exposed to air.



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7. When heated in oxygen, lithium forms....., sodium forms....., while potassium forms.....



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8. LiF is.....in water due to its high.....energy.



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**9.** Why is the solution of an alkali metal in ammonia blue?



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**10.** Lithium exhibits diagonal relationship with



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**11.** The first ionisation enthalpies of the alkaline earth metals are higher than that of alkali

metals but second ionisation enthalpies are smaller, why?



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12. The right order of the solubility of sulphates of alkaline earth metals in water is



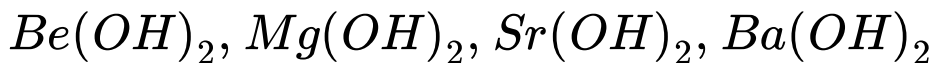
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13. BeO possesses a..... lattice with coordination number of .....



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14. Arrange the following in the order of property mentioned.



(decreasing solubility in water)



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15. The violet flame shown by potassium in bunsen flame is due to jumping of the

electron from



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**16.** The formula of the ore sylvine is .....



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



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**18.** Sodium-lead alloy is used in the preparation of which is used as an ..... compound to improve the quality of petrol



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**19.** The formula of dolomite is .....



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**20.** Soaps do not work in hard water containing calcium and magnesium ions because



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**21.** Lithium is found to occur in the ashes of plants such as .....



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22. Lithium is softer than ..... but harder than other alkali metals.



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23. On passing  $CO_2$  through a concentrated aqueous solution of  $Na_2CO_3$ , ..... is formed.



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24. Keiserite is an ore of ..... and has the composition.



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25. Why is cement clinker obtained from rotary Kiln mixed with gypsum?



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**Assertion Reason Type Questions**



1. Assertion: (A) Boron has a smaller first ionisation enthalpy than beryllium.

Reason( R) The penetration of 2s electron to the nucleus is more than the 2p electron hence 2p electrons is more shielded by the inner core of electrons than the 2s electrons.

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are  
CORRECT but Reason is not the CORRECT  
explanation of the Assertion.

C. If Assertion is CORRECT but Reason is  
INCORRECT.

D. If Assertion is INCORRECT but Reason is  
CORRECT.

**Answer: C**



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2. The atomic and ionic radii of alkali metals are the smallest in their respective periods.

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.

C. If Assertion is CORRECT but Reason is INCORRECT.

D. If Assertion is INCORRECT but Reason is  
CORRECT.

**Answer: B**



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**3. Assertion :** The alkali metal cations have a strong tendency to get hydrated.

**Reason :** The alkali metal cations are quite large in size.

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.

C. If Assertion is CORRECT but Reason is INCORRECT.

D. If Assertion is INCORRECT but Reason is CORRECT.

**Answer: B**



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4. Why are the solutions of alkali metal atoms in liquid ammonia blue coloured and highly conducting?

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.

C. If Assertion is CORRECT but Reason is INCORRECT.

D. If Assertion is INCORRECT but Reason is CORRECT.

**Answer: A**



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5. Assertion : The alkaline earth metal hydroxides are more basic than the corresponding alkali metal.

Reason : The ionisation enthalpies of alkaline earth metals are much lower than those of alkali metals.

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.



B. If both Assertion and Reason are  
CORRECT but Reason is not the CORRECT  
explanation of the Assertion.

C. If Assertion is CORRECT but Reason is  
INCORRECT.

D. Both Assertion and reason are  
INCORRECT

**Answer: D**



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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



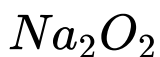
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3. Why are alkali metals not found in nature ?



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4. Find out the oxidation state of sodium in



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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

(i) ionisation enthalpy

(ii) basicity of oxides and

(iii) solubility of hydroxides



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**7.** Compare the alkali metals and alkaline earth metals with respect to

(i) ionisation enthalpy

(ii) basicity of oxides and

(iii) solubility of hydroxides



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**8.** Compare the alkali metals and alkaline earth metals with respect to solubility of hydroxides.



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



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



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



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**14.** Discuss the various reactions that occur in the Solvay process



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15. Potassium carbonate cannot be prepared by Solvay process. Why ?



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



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**17.** 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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**18.** Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii)

sodium hydroxide (iii) sodium peroxide (iv)

sodium carbonate ?



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**19.** Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate ?



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20. Starting with sodium chloride how would you proceed to prepare (i) sodium metal (ii) sodium hydroxide (iii) sodium peroxide (iv) sodium carbonate ?



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21. Starting with sodium chloride how would you proceed to prepare sodium carbonate? Mention the steps only.



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**22.** What happens when magnesium is burnt in air ?



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**23.** What happens when quick lime is heated with silica ?



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24. What happens when chlorine reacts with slaked lime?



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25. Calcium nitrate decomposes on heating according to the equation :



The relative molecular mass of calcium nitrate is 164. Calculate :

the weight of calcium oxide obtained when

16.4 g of calcium nitrate is heated to constant weight. ( $Ca = 40$ ,  $O = 16$ ,  $N = 14$ )



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**26.** Describe two important uses of each of the following: (i) caustic soda (ii) sodium carbonate (iii) quicklime



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**27.** Describe two important uses of each of the following: (i) caustic soda (ii) sodium carbonate (iii) quicklime



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**28.** Describe two important uses of each of the following: (i) caustic soda (ii) sodium carbonate (iii) quicklime



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29. Draw the structure of (i)  $BeCl_2$  (vapour)

(ii)  $BeCl_2$  (solid)



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30. Draw the structure of (i)  $BeCl_2$  (vapour)

(ii)  $BeCl_2$  (solid)



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**31.** The hydroxides and carbonates of sodium and potassium are easily soluble in water while the corresponding salts of magnesium and calcium are sparingly soluble in water. Explain.



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**32.** Describe the importance of the following:  
limestone.



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**33.** Describe the importance of the following:

(i) limestone (ii) cement (iii) plaster of paris



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**34.** Describe the importance of the following:

(i) limestone (ii) cement (iii) plaster of paris



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**35.** Why are lithium salts commonly hydrated and those of the other alkali ions usually anhydrous?



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



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**37.** Explain the significance of sodium, potassium, magnesium and calcium in biological fluids.



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**38.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of air?

(iii) sodium peroxide dissolves in water?



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**39.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of air?

(iii) sodium peroxide dissolves in water?



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**40.** What happens when

(i) sodium metal is dropped in water?

(ii) sodium metal is heated in free supply of air?

(iii) sodium peroxide dissolves in water?



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**41.** The mobilities of the alkali metal ions in aqueous solution are

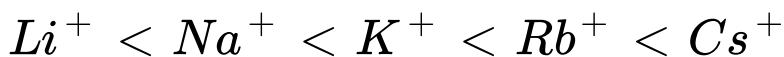
$Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$  because



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42. Comment on each of the following observations:

(a) The mobilities of the alkali metal ions in aqueous solution are



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

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

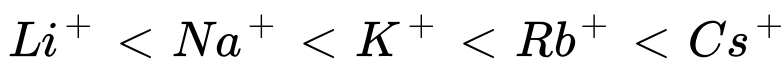


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**43.** Comment on each of the following observations:

(a) The mobilities of the alkali metal ions in aqueous solution are



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

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



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**44.** 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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**45.** 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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**46.** 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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47. 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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**48.** 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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**49.** 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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50. 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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51. How would you explain the following observations ?

(i)  $\text{BeO}$  is almost insoluble but  $\text{BeSO}_4$  is soluble in water

(ii)  $\text{BaO}$  is soluble but  $\text{BaSO}_4$  is insoluble in water

(iii)  $\text{LiI}$  is more soluble than  $\text{KI}$  in ethanol



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52. How would you explain the following observations ?

(i)  $\text{BeO}$  is almost insoluble but  $\text{BeSO}_4$  is soluble in water

(ii)  $\text{BaO}$  is soluble but  $\text{BaSO}_4$  is insoluble in water

(iii)  $\text{LiI}$  is more soluble than  $\text{KI}$  in ethanol



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

A. Na

B. K

C. Rb

D. Cs

**Answer: D**



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

A. Li

B. Na

C. K

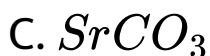
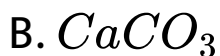
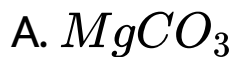
D. Cs

**Answer: A**



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



**Answer: D**



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