



CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

S-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)

Ncert

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 than 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. Why potassium carbonate (K_2CO_3) cannot be prepared by Solvay-ammonia process ?



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14. Lithium carbonate decomposes on heating while sodium carbonate does not.



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



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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 LiF almost insoluble in water while 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

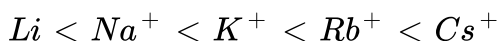
- a. Sodium metal is dropped in water?
- b. Sodium metal is heated in free supply of air?
- c. Sodium peroxide dissolves in water?



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26. (a) Why is LiF least soluble in water among the fluorides of alkali metals ? Justify the given

(b) Justify the given order of mobilities of the alkali metal cations in aqueous solution:



(c) Lithium is the only alkali metal which forms a nitride directly. Explain .

(d) E° for $M^{2+}(aq) \rightarrow M(s)$ (where $M = \text{Ca, Sr or Ba}$) is nearly constant.

Discuss.



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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 reactions between

a. Na_2O_2 and water

b. KO_2 and water

c. Na_2O and CO_2



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29. Which of the following alkali metals is having the least melting point ?

Na (b) *K* (c) *Rb* (d) *Cs*



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



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31. The thermal stability of alkaline earth metal carbonates $MgCO_3$, $CaCO_3$, $BaCO_3$ and $SrCO_3$ decreases as:



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Short Answer Type Questions

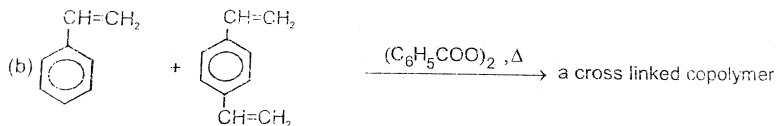
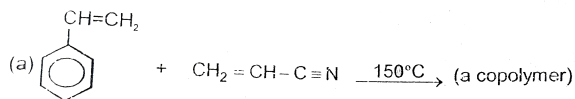
1. How do you account for the strong reducing power of lithium in aqueous solution?

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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 given 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. Why do beryllium and magnesium not impart colour to the flame in the flame test?



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



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12. 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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13. 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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14. 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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15. The stability of peroxide and superoxide of alkali metals increase as we go down to group. Explain giving reason.



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16. 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 milky disappears in the last step.



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17. 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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18. 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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19. 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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1. All alkali metals dissolve in liquid ammonia giving highly conducting ____ solutions.



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2. Can Na metal be used to remove traces of moisture from ethyl alcohol ?



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3. Salt of Li^{\oplus} with larger anions CO_3^{2-} , NO_3^{\ominus} are relatively less stable than its salts with small anions. Comment.



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4. Give reason:

- a. $CaCl_2$ is added to NaCl in the electrolytic manufacture of sodium.
- b. An aqueous solution of iodine becomes colourless, on adding excess of sodium hydroxide.



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5. Why is lithium iodide more covalent than lithium fluoride ?



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6. Why a standard solution of NaOH cannot be prepared by direct weighing cold NaOH ?



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7. Sodium salts in aqueous solution are either neutral or alkaline in nature.



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8. Among the alkali metal halides, lattice enthalpy is maximum for LiF and least for CsI.



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



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10. Beryllium chloride fumes in air.



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



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



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13. 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.



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14. Sodium cannot be obtained by the electrolysis of aqueous solution of $NaCl$ using Pt electrodes.





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15. Hydrated magnesium chloride cannot be dehydrated by heating.



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16. Calcium is generally preferred over sodium to remove traces of water from alcohol.



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

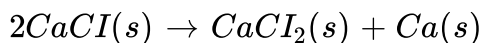


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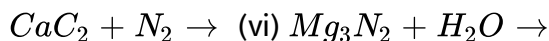
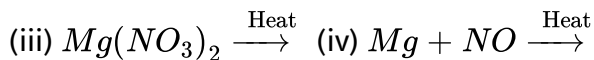
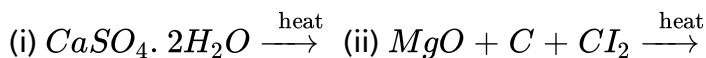
18. The crystalline salts of alkaline earth metals contain more water of crystallisation than the corresponding alkali metal salts. Why ?

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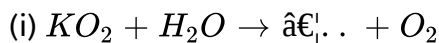
19. The enthalpy of formation of hypothetical $\text{CaCl}(s)$ is found to be -180 kJ mol^{-1} and that of $\text{CaCl}_2(s)$ is -800 kJ mol^{-1} . Calculate $\Delta_f H^\circ$ for the disproportionation reaction:

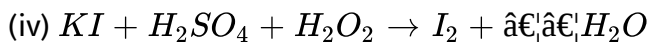
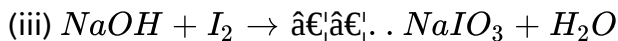
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20. Complete the following :

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21. Complete and balance the following equations.





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22. Give the names and formulae of the compounds indicated by the following statements :

(a) A compound of Ca used in setting fractured bones.

(b) A compound of Mg, S, O and H used as purgative in medicines.

(c) A compound of Ca and C used for the production of acetylene.

(d) A compound of Ca, C and N used as fertilizer.

(e) A compound of Ca and H Which upon reacting with water gives H_2 .



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23. A white solid (x) when heated evolves a colourless gas which does not support combustion. The residue is dissolved in water to form (y) which can be used for white washing. When excess of CO_2 is bubbled through

the solution of (y), it gives a compound (z) which upon heating forms (x)

Identify the compound (x).



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24. A is a binary compound of a univalent metal. When 1.422 g of A reacts completely with 0.321 g of sulphur in an evacuated and sealed tube, 1.743 g of white crystalline solid B produced, which produces a hydrated double salt C with $Al_2(SO_4)_3$. Identify A, B and C.



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25. 0.2g of magnesium ribbon was placed in a crucible and heated with lid on until magnesium began to burn rapidly. At the end of experiment, 0.3g of a white powder was formed. Show that the result does not agree with the combustion equation. What might have gone wrong?



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26. Which of the following statements are not correct? Rectify them.

- (a) sodium when heated in excess of air forms sodium oxide.
 - (b) Solvay ammonia process is employed for the manufacture of both Na_2CO_3 and K_2CO_3 .
 - (c) Rock salt is chemically NaCl.
 - (d) Water glass is sodium silicate.
 - (e) $NaHCO_3$ is less soluble in water than $KHCO_3$.
 - (f) Potassium is used in photoelectric cells.
 - (g) The solution of Na_2CO_3 in water is basic due to cationic hydrolysis.
- Microcosmic salt has formula $Na(NH_4)HPO_4 \cdot 4H_2O$
- (i) Glaubar's salt is $Na_2SO_4 \cdot 5H_2O$.
 - (j) Sodium carbonate upon heating forms CO_2 .



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27. Answer the following :

- (i) What is soda ash?
- (ii) Which electrolyte is used to obtain sodium in Castner's Process?
- (iii) What is the intermediate product in Solvay's process?

- (iv) Which product is formed when monoxide is passed through sodium hydroxide under pressure?
- (v) Out of Na and K, which has higher melting point?
- (vi) What do we get when crystals of washing soda are exposed to air?
- (vii) What is the chemical formula of Carnallite?
- (viii) Why is the solution of sodium in liquid ammonia conducting in nature?



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28. How will you prepare the following

- (a) sodium carbonate from sodium chloride
- (b) Sodium thiosulphate from sodium sulphite
- (c) Sodium cyanide from sodium metal.
- (d) Sodium silicate from silica.



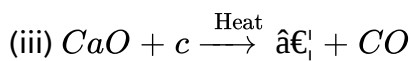
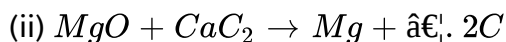
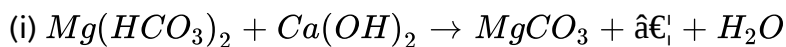
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29. Why do not we use $MgCl_2$ instead of $CaCl_2$ to lower the melting point of NaCl in the Down's process?



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30. Complete and balance the following equations.



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31. Explain why hydrated magnesium chloride can not be dehydrated upon heating.



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32. Give the chemical composition of the following :

- (a) Anhydrite (b) Fluid magnesia (c) Dead burnt plaster (d) Sorel Cement
(e) Epsom salt (f) Magnesia mixture



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33. 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. Assign reason.



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34. The solubility of calcium acetate decreases while that of lead nitrate increases with increase in temperature.



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35. (a). What is the hybrid state of Be in $BeCl_2$ in vapour state. What will be the change in the hybrid state of $BeCl_2$ in the solid state?

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

(c). Why do halides and hydrides of beryllium polymerise?



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36. (a) What is slaked lime ?

(b) Beryllium and magnesium do not give colour to flame. Why?

(c) How is NaOH prepared by castner-kellner method?



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37. Epsom salt's chemical formula is



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38. (a) Why do alkali metals impart colour to the flame?

(b) How is Na_2CO_3 obtained by solvay ammonia process?

(c) Which compound of calcium is used in surgical bandages during fractured bone of the body ?



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39. Write the formulae of (a) slaked lime (b) Lime stone.



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40. (a) Which compound of sodium is used for softening hard water?

(b) What is the effect of heat on the compounds ? (Write equations for the reactions):

(c) Draw the structure of :

(i) $BeCl_2$ (in vapour state)

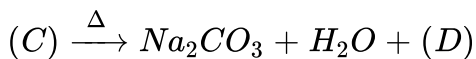
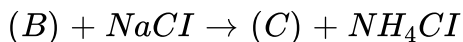
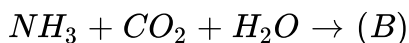
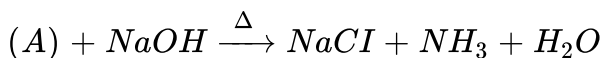
(ii) $BeCl_2$ (in solid state)



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Hot Conceptual Questions

1. Identify (A), (B), (C) and (D) and give their chemical formulae.



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Value Based

1. Calcium is a member of alkaline earth family (group 2 elements). Earth's crust contains about 3.4 percent calcium. The main ores of calcium are lime stone, calcite or chalk ($CaCO_3$), gypsum ($CaSO_4 \cdot 2H_2O$) and fluoroite (CaF_2). Metallic calcium is obtained by the electrolysis of molten calcium chloride.

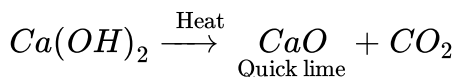
(i) What is slaked lime ?

(ii) What happens when slaked lime is heated?

(iii) What is the value associated with quick lime ?

A. (i) Slaked lime is $Ca(OH)_2$

(ii) Upon heating, slaked lime decomposes to give quick lime



(iii) Quick lime has wide range of applications. It acts as a basic flux

in metallurgy to remove acidic impurities. For many years, farmers

have used lime to lower the acidity of soil for their crops. This is

known as liming. Quick lime has also been used to remove SO_2

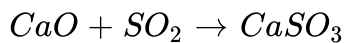
from the chimneys of factories. In fact, an aqueous suspension of

quick lime is injected into the purification chamber before the

gases escape. It combines with SO_2 to form both calcium sulphite

and calcium sulphate. Since these are not gases, they remain in the

chimney.



B.

C.

D.

Answer:



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Problems For Practice

1. What is the nature of lithium compounds?



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2. Which alkali metal imparts pale violet colour to the flame?



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3. Name the alkali metal carbonate which evolves CO_2 upon heating.



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4. Why do alkali metals dissolve in liquid ammonia to form blue solution which is conducting in nature?



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5. What happens to the crystals of washing soda when exposed to air ?



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6. Arrange LiF, NaF, KF, RbF and CsF in order of increasing lattice energy.



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7. Which alkali metal hydride is used for filling meteorological balloons?



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8. Water glass is:



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9. (a) Name the most abundant metal in the earth's crust.

(b). Name the most abundant non-metal in the earth's crust.



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10. Which alkali metal chloride is soluble in alcohol?



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11. In Down's process for the manufacture of sodium, CaCl_2 , is added to increase its melting point.



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12. Among LiF and LiI , which has more covalent character and why?



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13. The alkaline earth metals, which do not impart any colour to Bunsen flame are :



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14. Lithium resembles magnesium in some respects though placed in a different group.



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15. Epson salt's chemical formula is



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16. Which are more electropositive - alkali metals or alkaline earth metals?



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17. Which is quick lime ?



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18. Magnesite is an ore of ____.



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19. The correct order of relative basic character of NaOH , $\text{Mg}(\text{OH})_2$ and $\text{Al}(\text{OH})_3$ is

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20. Which alkaline earth metal constitute Grignard reagent?

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21. Arrange CaSO_4 , MgSO_4 , BaSO_4 in increasing solubility in water.

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22. Name the compound of Mg, O, Cl and H used as cement for joining cracked teeth

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23. Which is covalent in CaH_2 , NaH BeH_2 ?



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24. Name a compound of calcium and hydrogen used as a portable source of hydrogen



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25. Name the salt which is generally given to the patient before taking stomach X-ray.



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26. Arrange $BeCl_2$, $MgCl_2$, $CaCl_2$, $SrCl_2$ and $BaCl_2$ in increasing order of (i) tendency to get hydrolysed (ii) lattice energy (iii) covalent nature



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Ncert Exeplar Problems With Solution

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

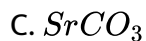
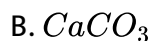
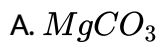
D. Electron-gain enthalpy

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?



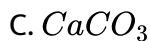
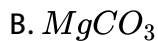
Answer: D



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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?



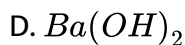
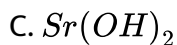
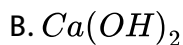
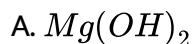


Answer: A



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

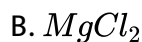


Answer: A



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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

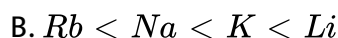
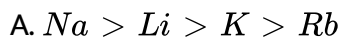


Answer: A



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



C. $Li > Na > K > Rb$

D. $K < Li < Na < Rb$

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

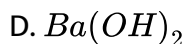
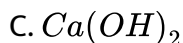
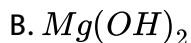
D. Low ionisation enthalpy of lithium atom

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 $\text{Ca}(\text{OH})_2$. The by-product obtained in this process is



B. NaCl

C. NaOH

D. NaHCO_3

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

- A. $CaSO_4$
- B. $CaSO_4 \cdot \frac{1}{2}H_2O$
- C. $CaSO_4 \cdot H_2O$
- D. $CaSO_4 \cdot 2H_2O$

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 element does not form hydride upon heating with hydrogen?

- A. Be

B. Mg

C. Sr

D. Ba

Answer: A



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17. The chemical formula of soda ash is

A. $Na_2CO_3 \cdot 10H_2O$

B. $Na_2CO_3 \cdot 2H_2O$

C. $Na_2CO_3 \cdot H_2O$

D. Na_2CO_3

Answer: D



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18. A substance which gives 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 $Ca(OH)_2$?

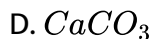
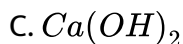
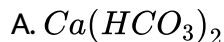
- A. It is used in the preparation of bleaching powder
- B. It is a light blue solid
- C. It does not possess disinfectant property
- D. It is used in the manufacture of cement

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., $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$, $\text{SrCl}_2 \cdot 2\text{H}_2\text{O}$, 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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22. 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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23. Several sodium compounds find use in industries. Which of the following compounds are used for textile industry?

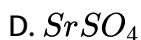
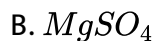
- A. Na_2CO_3
- B. $NaHCO_3$
- C. $NaOH$
- D. $NaCl$

Answer: A::C



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

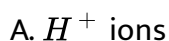


Answer: A::B



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25. 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)?



B. Mg^{2+} ions

C. Ca^{2+} ions

D. SO_4^{2-} ions

Answer: B::C



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

A. $BaCl_2 \cdot 2H_2O$

B. $BaCl_2 \cdot 4H_2O$

C. $CaCl_2 \cdot 6H_2O$

D. $SrCl_2 \cdot 4H_2O$

Answer: A::C



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27. 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::B



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28. 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



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Matching Types Questions

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

Column I Column II

- | | |
|--------------|--|
| <i>A. Li</i> | 1. Insoluble sulphate |
| <i>B. Na</i> | 2. Strongest monoacidic base |
| <i>C. Ca</i> | 3. Most negative E^\ominus value among alkali metals |
| <i>D. Ba</i> | 4. Insoluble oxalate |
| | 5. $6s^2$ outer electronic configuration |

Column I Column II

- A. (a) Li (i) Insoluble sulphate

Column I Column II

- B. (b) Na (ii) Strongest mono acidic base

- Column I Column II
- C. (c) Ca (iii) Most negative E° value among alkali metals
- Column I Column II
- D. (d) Ba (iii) Insoluble oxalate

Answer: A-III, B-II, C-IV, D-I



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

Column I

Column II

- A. $CaCO_3$ 1. Density ornamental work
- B. $Ca(OH)_2$ 2. Manufacture of sodium carbonate from caustic soda
- C. CaO 3. Manufacture of high quality paper
- D. $CaSO_4$ 4. Used in white washing

Column I Column II

- A. (a) $CaCO_3$ (i) Dentistry, ornamental work

B.

Column I Column II

- (b) $Ca(OH)_2$ (ii) Manufacture of sodium carbonate from caustic soda

Column I Column II

- C. (c) CaO (iii) Manufacture of high quality paper

Column I Column II

- D. (d) $CaSO_4$ (iv) Used in white washing

Answer: A-III, B-IV, C-II, D-I



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

Column I Column II

A. Cs 1. Apple green

B. Na 2. Violet

C. K 3. Brick red

D. Ca 4. Yellow

E. Sr 5. Crimson red

F. Ba 6. Blue

A. N/A

B. N/A

C. N/A

D. N/A

Answer: A-VI, B-IV, C-II, D-III, E-V, F-A



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4. 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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5. 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.

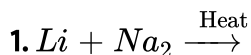
- A. Both A and R correct and R is the correct explanation of A
- B. Both A and R correct but R is not the correct Explanation of A
- C. Both A and R are not correct.
- D. A is not correct but R is correct

Answer: D



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Complete The Following



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



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3. $NaNO_3 \xrightarrow{\text{Heat}}$



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4. $KO_2 + H_2SO_4 \rightarrow$



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5. $Na_2O_2 + H_2SO_4 \rightarrow$

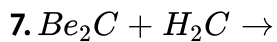


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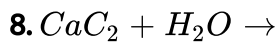
6. $Mg_3N_2 + H_2O \rightarrow$



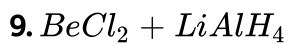
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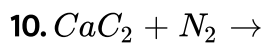
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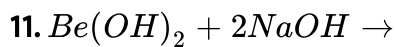
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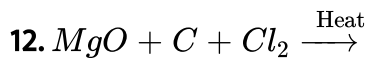
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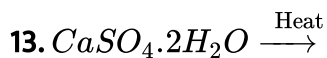
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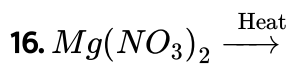
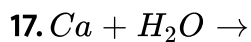
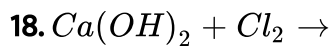
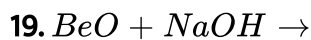


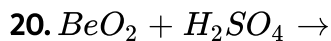
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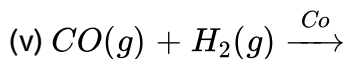
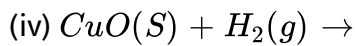
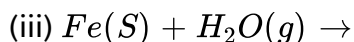
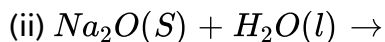
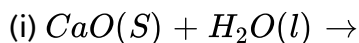


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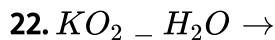


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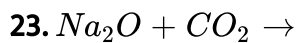
21. Complete the following reactions :



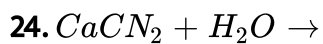
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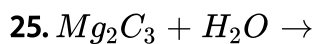
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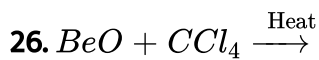
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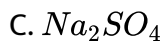
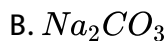
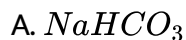


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1. An ingredient of baking powder is-



Answer:



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2. Sodium reacts with water more vigorously than lithium because

A. it has higher atomic mass

B. it is more electropositive

C. it is more electronegative

D. it is a metal

Answer: b



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3. Sodium carbonate can be manufactured by Solvay's process but potassium carbonate cannot be prepared because :

- A. K_2CO_3 is more soluble
- B. K_2CO_3 is less soluble
- C. $KHCO_3$ is more soluble than $NaHCO_3$
- D. $KHCO_3$ is less soluble than $NaHCO_3$

Answer: c



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4. Which of the following represents correct order of decreasing reducing nature?

A. $Li > Na > K > Rb$

B. $Rb > K > Na > Li$

C. $Rb > Li > Na > K$

D. $Li > Rb > K > Na$

Answer: d



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5. Alkali metals are characterised by :

A. characterised colouration to flame

B. high melting points

C. low reactivity with water

D. high ionisation enthalpies

Answer: a



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6. Sodium metal can be kept under:

- A. benzene
- B. kerosene
- C. alcohol
- D. water

Answer: b



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7. A substance X is a compound of an element of group 1A the substance X gives a violet colour in flame test, X is

- A. NaCl
- B. LiCl
- C. KCl

D. None of these

Answer: c



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8. An element having electronic configuration is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$ will form:

A. acidic oxide

B. basic oxide

C. amphoteric oxide

D. neutral oxide

Answer: b



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9. Calcium carbide reacts with water to give ethyne or acetylene gas and calcium hydroxide. Write the balanced chemical equation for this reaction.



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10. Magnesium has polarising power close to that of :

A. Li

B. Na

C. KCl

D. Cs

Answer: a



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11. The alkaline earth metal present in Chlorophyll is :

A. Be

B. Mg

C. Se

D. Ba

Answer: b



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12. Compounds of alkaline earth metals are less soluble in water than the corresponding alkali metal salts due to :

A. their increased covalent character

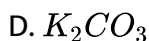
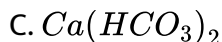
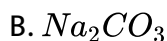
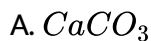
B. their high ionisation enthalpies

C. high lattice enthalpies

D. none of the above

Answer: c

13. A solid compound ' X ' on heating gives CO_2 gas and a residue. The residue mixed with water form ' Y '. On passing an excess of CO_2 through ' Y ' in the water, a clear solution ' Z ' is obtained. On boiling ' Z ' compound ' X ' is reformed. The compound ' X ' is :



Answer: a

14. Which of the following is not an ore of magnesium?

- A. Carnallite
- B. Magnesite
- C. Dolomite
- D. Gypsum

Answer: d



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15. Which of the following metals does not form ionic hydride?

- A. Ba
- B. Mg
- C. Ca
- D. Sr

Answer: b



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16. Assertion : Setting of cement is an endothermic process.

Reason : Setting of cement involves hydration and rearrangement of the molecules of calcium aluminates and calcium silicates.

- A. an oxidation process
- B. a reduction process
- C. a double decomposition process
- D. a hydration process.

Answer: d



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Vsaq

1. The alkali metals have an outer electronic configuration of



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2. Why are alkali metals so named?



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3. Which of the following carbonates does not evolve CO_2 on heating ?



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4. Write the name of alkali metal with polarising power close to that of magnesium.



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5. Why are alkali metals difficult to be reduced?



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6. Which is the strongest reducing agent among alkali metals?



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7. Which is more basic NaOH or KOH?



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8. What is the nature of compounds of lithium?



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9. Which is responsible for the blue colour of alkali metals in liquid ammonia?



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10. Name the radioactive element of group 1



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11. What will happen when sodium is exposed to moist air?



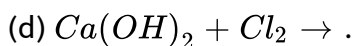
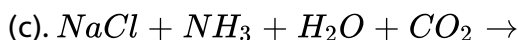
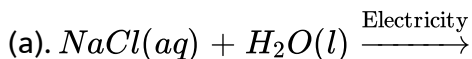
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12. What is soda ash?



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13. Complete and balance the following chemical equations:





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14. Does Na_2CO_3 decompose on heating?



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15. Name the process used in the manufacture of Na_2CO_3 .



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16. What is the correct sequence of alkali metals in a group?



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17. why are the element of group - 2 called alkaline earths ?



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18. Sodium is more electropositive than magnesium.



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19. *Be* and *Mg* atoms do not impart colour to the flame.



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20. What is the chemical formula of dolomite ?



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21. Arrange the following in decreasing order of ionic character .

CaCl_2 , BeCl_2 , BaCl_2



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22. Arrange the following in decreasing order of solubility in Water.

(i) $Be(OH)_2$, $Ca(OH)_2$, $Ba(OH)_2$, $Sr(OH)_2$.

(ii) $BaSO_4$, $MgSO_4$, $CaSO_4$, $SrSO_4$.



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23. Sorel's cement is



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24. What happens chemically when quick lime is added to water ?



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25. $MgCl_2 \cdot 6H_2O$ on heating gives anhydrous $MgCl_2$.



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26. Formula of gypsum salt is



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27. How many H_2O Molecules are present in a molecule of plaster of paris ?



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28. The alkaline earth metals, which do not impart any colour to Bunsen flame are :



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Saq

1. What are alkali metals kept in Kerosene?



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2. Alkali metals have low ionisation energies. Explain.



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3. Explain why cesium and not sodium is used in photo electric cell?



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4. In aqueous solution, Li^+ ion has the least mobility among alkali metals. Why?



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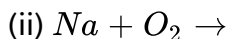
5. Why do alkali metals form unipositive ions and impart characteristic colours to flame?



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6. Complete the following :

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7. Why do alkali metals dissolve in liquid ammonia to form blue solution which is conducting in nature?

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

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9. Strengths of the bases increases from LiOH to CsOH . Justify.



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



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11. Sodium metal can be used to dry diethyl ether and not ethyl alcohol.
Why?



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12. Sodium is prepared by the electrolysis of molten NaCl but not by the electrolysis of its aqueous solution.



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13. Give two important uses of washing soda and baking soda.



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14. Assign reasons for the following

(i) alkali metals impart characteristic colour to flame

(ii) Alkali metals are strong reducing agents.

(iii) An aqueous solution of Na_2CO_3 is basic in nature.



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



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16. $\Delta_i H_1$ value of Mg more than that of Na while its $\Delta_i H_2$ value is less . Explain.



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17. Discuss the structure of beryllium chloride in different states.



[Watch Video Solution](#)

18. What is diagonal relationship? Why does *Li* resemble with *Mg*?



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19. How will you prepare anhydrous magnesium chloride from sea water ?



[Watch Video Solution](#)

20. How is gypsum converted into plaster of paris ? Why is plaster of paris helpful in setting broken bones?



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21. Describe with the help of chemical equations what happens when :

- (i) Lime stone is heated.
- (ii) water is dropped on quick lime .
- (iii) gypsum is heated to 473 k.



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22. write the important uses of Gypsum and plaster of paris.



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



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24. state any one reason for alkaline earth metals ions in general to have a greater tendency to form complexes than the alkali metals .



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



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26. 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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27. What is diagonal relationship? Why does Li resemble with Mg ?

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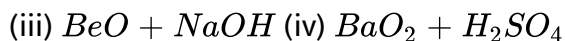
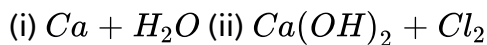
28. Beryllium differs from rest of the members of group-2 in many characteristics. Explain with suitable examples to support this statement.

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

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30. Complete the following :

[Watch Video Solution](#)

1. What is baking soda? Write the chemical name of baking soda. Give the important uses of baking soda. How does baking soda differ chemically from washing soda?



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2. How is Na_2CO_3 manufactured by solvey Ammonia process? Discuss in brief its important characteristics.



Watch Video Solution

3. Discuss the important characteristics in which Li differs from other alkali metals



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4. 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?



Watch Video Solution

5. 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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6. In Castner-Kellner cell, sodium hydroxide is formed in the central compartment.



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1. Compared with the alkaline earth metals, the alkali metals exhibit

- A. smaller ionic radii
- B. Higher boiling points
- C. Greater hardness
- D. Lower ionisation enthalpies

Answer: D



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2. Which is maximum basic in the following ?

- A. Na_2O
- B. BaO
- C. As_2O_3

D. Al_2O_3

Answer: A



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3. Micro-cosmic salt is :

A. $Na_2HPO_4 \cdot 2H_2O$

B. $(NH_4)_2HPO_4 \cdot 2H_2O$

C. $Na(NH_4)HPO_4 \cdot 4H_2O$

D. None of these

Answer: C



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4. Which of the following has the highest lattice energy ?

A. RbF

B. CsF

C. NaF

D. KF

Answer: C



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5. The affinity of sodium with water is used in

A. drying of alcohols

B. drying of ammonia

C. drying benzene

D. drying most of the compounds

Answer: C



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6. Which is maximum reactive towards water ?

- A. Li
- B. K
- C. Na
- D. Rb

Answer: D



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7. Which has the maximum electropositive character ?

- A. Cu
- B. Cs
- C. Ba

D. Cr

Answer: B



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8. The electronic configuration of metal M is $1s^2 2s^2 2p^6 3s^1$. The formula of its oxide will be :

A. MO

B. M_2O

C. M_2O_3

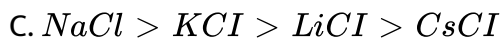
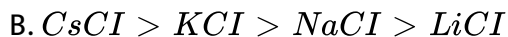
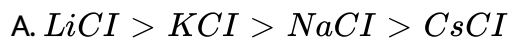
D. MO_2

Answer: B



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



Answer: D



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10. which has the maximum m.p ?

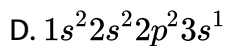
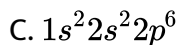
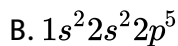
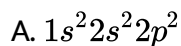


Answer: B



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11. Which electronic configuration corresponds to least ionisation energy?

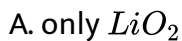


Answer: D



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12. Which is formed with lithium is heated in air?



B. only Li_3N

C. Both Li_2O_2 and Li_3N

D.

Answer: C



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13. What types of ions are present in anhydrous mixture of KF and HF ?

A. K^+ , H^+ , F^-

B. $(KF)^+$, $(HF)^-$

C. KH^+ , F^-

D. K^+ , $(HF)^-$

Answer: D



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14. Sodium gives blue colour in NH_3 solution. This blue colour is due to

A. ammoniated Na^+

B. *ammoniated* Na^-

C. ammoniated e^-

D. Na^+ / N^- pair.

Answer: C



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15. When washing soda is heated.

A. CO is released

B. $CO + CO_2$ is released

C. CO_2 is released

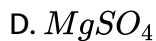
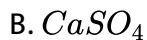
D. Water vapours are released.

Answer: D



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16. Which sulphate has the highest solubility in water ?



Answer: C



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17. Ba, Sr, Ca and Mg may be arranged in order of decreasing first ionisation energy (IE_1) as :

A. Mg,Ca,Sr,Ba

B. Ca,Sr,Ba,Mg

C. Sr,Ba,Mg,Ca

D. Ba,Mg,Ca,Sr

Answer: A



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18. Which is the correct order of increasing basic strength?

A. $MgO < BeO < CaO < BaO$

B. $Ca < Sr < Ba < Mg$

C. $Be < CaO < MgO < BeO$

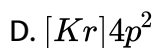
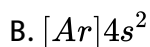
D. $CaO < BaO < BeO < MgO$

Answer: B



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19. Electronic configuration calcium atom can be written as



Answer: B



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20. The most electropositive amongst the alkaline earth metals is:

A. Beryllium

B. Magnesium

C. Calcium

D. Barium

Answer: D



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21. Which imparts brick red colour to the flame ?

A. Be

B. Mg

C. Ca

D. Sr

Answer: C



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22. All the following substances react with water. The pair that gives the same gaseous product is

A. K and KO_2

B. Na and Na_2O_2

C. Ca and CaH_2

D. Ba and BaO_2

Answer: C



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23. Which of the following metal ions plays an important role in muscle contraction?

A. K^+

B. Na^+

C. Mg^{2+}

D. Ca^{2+}

Answer: D



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24. The correct order of increasing thermal stability of K_2CO_3 , $MgCO_3$, $CaCO_3$, and $BeCO_3$ is

A. $I < II < III < IV$

B. $IV < II < III < I$

C. $IV < II < I < III$

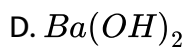
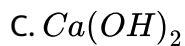
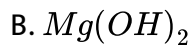
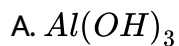
D. $II < IV < III < I$

Answer: B



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25. The strongest base in the following is :

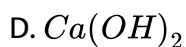
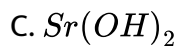
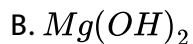
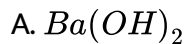


Answer: D



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26. The hydroxide which is max, soluble in water is ?

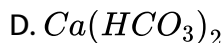
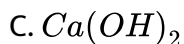
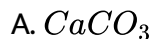


Answer: A



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27. Chemical A is used for water softening to remove temporary hardness. A reacts with sodium carbonate to generate caustic soda. When CO_2 is bubbled through a solution of A, it turns cloudy. What is the chemical formula of A ?



Answer: D



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28. Calcium carbide on hydrolysis forms :

- A. ethane
- B. ethylene
- C. methane
- D. acetylene

Answer: D



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29. As the alkaline earth metals (except Be) tend to lose their valence electrons readily they act as

- A. weak oxidising agents
- B. weak reducing agents
- C. strong oxidising agent
- D. strong reducing agents bases

Answer: D



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30. Initial setting of cement is mainly due to

- A. dehydration and gel formation
- B. dehydration and gel formation
- C. dehydration and dehydrolysis
- D. hydration and oxidation

Answer: A



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31. H_2O is depolar, wheras BeF_2 is not. it because

- A. The electronegativity of F is greater than that of O.

B. H_2O involves hydrogen bonding whereas BeF_2 is discrete molecule.

C. H_2O is linear and BeF_2 is angular

D. H_2O is angular and BeF_2 is linear

Answer: D



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32. The correct sequence of increasing covalent character is represented by

A. $LiCl < NaCl < BeCl_2$

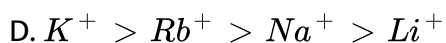
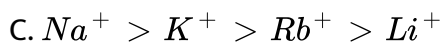
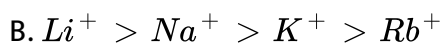
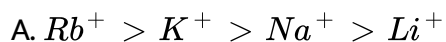
B. $BeCl_2 < LiCl < NaCl$

C. $NaCl < LiCl < BeCl_2$

D. $BeCl_2 < NaCl < LiCl$

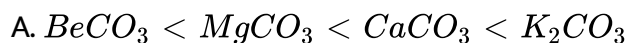
Answer: C

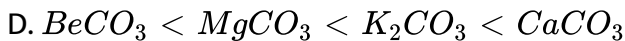
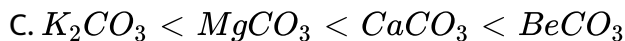
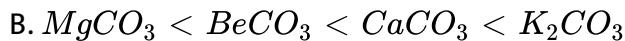
33. The correct order of mobility of alkali metal ions in aqueous solution is



Answer: A

34. The correct order of increasing thermal stability of K_2CO_3 , $MgCO_3$, $CaCO_3$, and $BeCO_3$ is





Answer: A



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35. 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: B

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

A. CaO

B. SiO_2

C. BeO

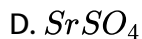
D. B_2O_3

Answer: A

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

A. CaSO_4

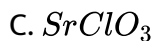
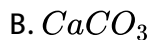
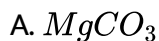


Answer: B



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



Answer: D



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39. 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

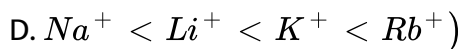
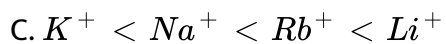


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40. The ease of adsorption of the hydrated alkali metal ions on ion-exchange resins follows the order:

A. $Li^+ < K^+ < Na^+ < Rb^+$

B. $Rb^+ < K^+ < Na^+ < Li^+$



Answer: B



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41. Which of the following alkaline earth metal ions has the highest ionic mobility in aqueous solution?



Answer: C



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42. In the reaction, $M + CO_2 \rightarrow MO_2$ (superoixde) the metal M is :

A. Lithium

B. Sodium

C. Potassium

D. Barium

Answer: C



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43. Which of the following metals cannot give flame test ?

A. Be

B. Na

C. K

D. Ca

Answer: A



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44. 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 ?

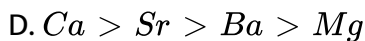
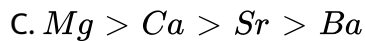
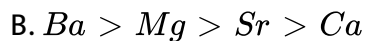
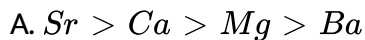


Answer: A



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45. The correct order of the solubility of alkaline- earth metal sulphates in water is :



Answer: C



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46. Which of the following statements is false ?

A. Ca^{2+} ion are not important in maintaing the regular beating of the heart

B. Mg^{2+} ions are 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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47. The product obtained as a result of a reaction of nitrogen with CaC_2 is

A. $CaCN_3$

B. Ca_2CN

C. $CaCN_2$

D. $CaCN$

Answer: C



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1. Which of the following is the strongest base ?

A. LiOH

B. NaOH

C. KOH

D. CsOH

Answer: D



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2. Which of the following oxides is formed when potassium metal is burnt in excess air ?

A. K_2O

B. KO

C. KO_2

D. K_2O_2

Answer: C



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3. Which has the maximum K_{sp} value ?

- A. KOH
- B. CsOH
- C. LiOH
- D. RbOH

Answer: B



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4. Which of the following compounds has the lowest anion to cation size ratio ?

A. LiF

B. NaF

C. CsI

D. CsF

Answer: D



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5. The alkali metal that reacts with nitrogen directly to form nitride is

A. Li

B. Na

C. K

D. Rb

Answer: A



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6. Which statement is false in case of alkali metals ?

- A. Lithium is the strongest reducing agent
- B. Sodium is amphoteric in nature
- C. Li^+ ion is exceptionally small
- D. All alkali metals give blue colour in liquid ammonia

Answer: B



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7. A sodium fire in the laboratory is extinguished by

- A. CCl_4
- B. sand
- C. water

D. kerosene

Answer: A



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8. Diagonal Relationship Of Lithium With Magnesium

A. Magnesium

B. Beryllium

C. Aluminium

D. Boron

Answer: A



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9. Alkali metals are generally extracted by electrolysis of their ores.

- A. Reduction methods
- B. Double decomposition methods
- C. Displacement methods
- D. Electrolytic methods

Answer: D



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10. Cs^+ ions impart violet colour to Bunsen flame. This is due to the fact that the emitted radiations are of

- A. High energy
- B. Low energy
- C. Longer wavelength
- D. None of the three

Answer: B



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11. When dry ammonia gas is passed over heated sodium (out of contact of air) the product forms is

- A. Sodium amide
- B. Sodium azide
- C. Sodium nitride
- D. Sodium hydride

Answer: A



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

- A. Rb^{+}

B. Cs^+

C. Li^+

D. Na^+

Answer: C



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13. lithium has highest ionisation energy but is strongest reducing agent in solution because of its

A. Ionisation enregy

B. Electric affinity

C. Hydration energy

D. Lattice energy

Answer: C



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14. Alkali metals have high oxidation potential and hence they behave as :

- A. oxidising agents
- B. Lewis bases
- C. reducing agents
- D. electrolytes

Answer: C



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15. 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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16. The correct order of solubility of the sulphates of alkaline earth metals in water is

A. $Be > Ca > Mg > Ba > Sr$

B. $Mg > Be > Ba > Ca > Sr$

C. $Be > Mg > Ca > Sr > Ba$

D. $Mg > Ca > Ba > Be > Sr$

Answer: C



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

- A. $LiCl$ and $RbCl$
- B. $RbCl$ and $BeCl_2$
- C. $RbCl$ and $MgCl_2$
- D. $MgCl_2$ and $BeCl_2$

Answer: B



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18. White heavy precipitates are formed when $BaCl_2$ is added to a clear solution of compound A. Precipitates are insoluble in dilute HCl. Then, the compound A is :

- A. A nitrate
- B. A bromide

C. A sulphate

D. A carbonate

Answer: C



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19. Which will liberate hydrogen on reacting with hydrochloric acid ?

A. Copper

B. Phosphours

C. Mercury

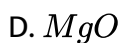
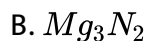
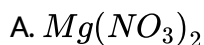
D. Magnesium

Answer: D



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20. A metal X on heating in nitrogen gas gives Y , Y on treatment with H_2O gives a colourless gas which when passed through $CuSO_4$ solution gives a blue colour. Y is:



Answer: B



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21. Formula of gypsum is $CaSO_4 \cdot xH_2O$ and of plaster of paris is $(2CaSO_4) \cdot yH_2O$, then $(x-y)$ is equal to

A. 0

B. 1

C. 3

D. $5/2$

Answer: A



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22. The substance not likely to contain $CaCO_3$ is:

A. sea shells

B. dolomite

C. a marble statue

D. Calcined gypsum

Answer: D



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

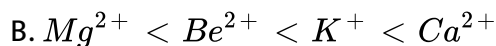
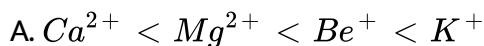


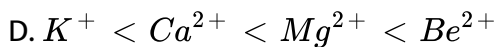
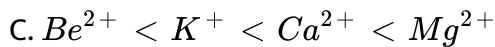
Answer: B



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24. The charge/size ratio of a cation determines its polarising power. Which one of the following sequences represents the increasing order of the polarising power of the cationic species, K^+ , Ca^{2+} , Mg^{2+} , Be^{2+} ?



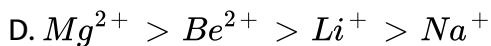
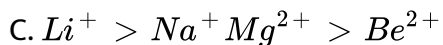
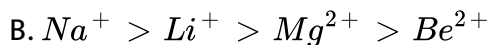
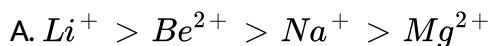


Answer: D



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25. The set representing the correct order of ionic radius is

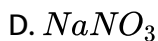
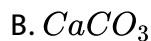


Answer: B



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



Answer: B



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27. The correct statement for the molecule, CsI_3 is

A. It is a covalent molecule

B. It contains Cs^+ and I_3^- ions

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

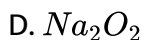
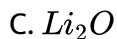
D. It contains Cs^+ , I^- and lattice molecule

Answer: B



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28. A metallic oxide reacts with water to form its hydroxide hydrogen peroxide and also liberates oxygen. The metallic oxide could be :



Answer: B



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29. Monovalent sodium and potassium ions, bivalent magnesium and calcium ions are found in :

A. lipids

B. fats

C. enzymes

D. biological fluids

Answer: D



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30. Amongst the following, select the element, with highest ionization enthalpy

A. Sodium amide

B. Potassium

C. Beryllium

D. Magnesium

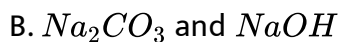
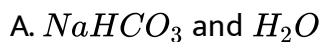
Answer: C

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



Answer: D

32. The pair of compounds which cannot exist in solution is:



C. NaHCO_3 and NaOH

D. NaHCO_3 and Na_2CO_3

Answer: C



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33. A solid compound ' X ' on heating gives CO_2 gas and a residue. The residue mixed with water form ' Y '. On passing an excess of CO_2 through ' Y ' in the water, a clear solution ' Z ' is obtained. On boiling ' Z ' compound ' X ' is reformed. The compound ' X ' is :

A. $\text{Ca}(\text{HCO}_3)_2$

B. CaCO_3

C. Na_2CO_3

D. K_2CO_3

Answer: B

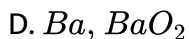
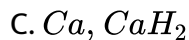
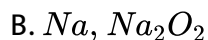
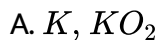


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34. In which of the following pairs, each member produces the same gas when reacted with water?



Answer: C



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



B. KCl

C. $MgCl_2$

D. CaF_2

Answer: C



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

Column I *Column II*

A. Cs 1. Apple green

B. Na 2. Violet

C. K 3. Brick red

D. Ca 4. Yellow

E. Sr 5. Crimson red

F. Ba 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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37. 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. Li_2O , Na_2O_2 and KO_2

Answer: D



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38. The low solubility of LiF and that of CsI in water are respectively due to which of the properties of the alkali metal ions?

- A. Higher hydration enthalpy of Li^+ , higher lattice enthalpy of Cs^+
- B. Smaller hydration enthalpy of Li^+ , higher lattice enthalpy of Cs^+
- C. Smaller hydration enthalpy of Li^+ , smaller lattice enthalpy of Cs^+
- D. Higher lattice enthalpy of Li^+ , smaller hydration enthalpy of Cs^+

Answer: D



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Comprehension 2

1. A Typical characteristic of the representative element is that the first member of each group gives different present in that group. Lithium is no exception. Through it is the first member of the alkali metal family (group f), it is anomalous in behaviour. This may be attributed to the

small size of both Li and Li^+ ion, high ionisation enthalpy, high polarising power, and non-availability of d-electrons in its valence shell.

Lithium is the strongest reducing agent among the alkali metals due to which of the following characteristics ?

- A. Ionisation enthalpy
- B. Electron gain enthalpy
- C. Hydration enthalpy
- D. Lattice enthalpy

Answer: C



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2. A typical characteristic of the representative element is that the first member of each group gives different properties in that group. Lithium is no exception. Though it is the first member of the alkali metal family (group 1), it is anomalous in behaviour. This may be attributed to the small size of both Li and Li^+ ion, high ionisation enthalpy, high

polarising power, and non-availability of d-electrons in its valence shell.

Lithium nitrate upon heating gives

A. O_2

B. NO_2

C. O_2 and NO_2

D. None of these

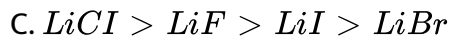
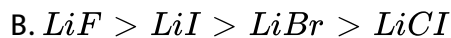
Answer: C



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3. A Typical characteristic of the representative element is that the first member of each group gives different present in that group. Lithium is no exception. Through it is the first member of the alkali metal family (group f), it is anomalous in behaviour. This may be attributed to the small size of both Li and Li^+ ion, high ionisation enthalpy, high polarising power, and non-availability of d-electrons in its valence shell.

The order of solubility of lithium in non-polar solvents is :



Answer: A



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4. A Typical characteristic of the representative element is that the first member of each group gives different present in that group. Lithium is no exception. Through it is the first member of the alkali metal family (group f), it is anomalous in behaviour. This may be attributed to the small size of both Li and Li^+ ion, high ionisation enthalpy, high polarising power, and non-availability of d-electrons in its valence shell.

Which of the following ions has the lowest mobility in aqueous solution ?





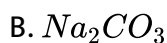
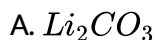
Answer: A

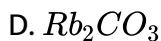
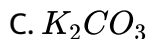


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5. A Typical characteristic of the representative element is that the first member of each group gives different present in that group. Lithium is no exception. Through it is the first member of the alkali metal family (group f), it is anomalous in behaviour. This may be attributed to the small size of both Li and Li^+ ion, high ionisation enthalpy, high polarising power, and non-availability of d-electrons in its valence shell.

Which among the following compound has the least thermal stability ?





Answer: A

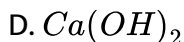
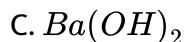
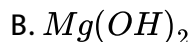
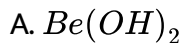


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Comprehension 3

1. The solubility of a crystalline compound in water is influenced by two factors. These are lattice enthalpy and hydration enthalpy. Lattice enthalpy is needed to separate the ions from the crystal lattice. At the same time hydration enthalpy is released when the ion are dissolved in water. The resultant of these two opposing tendencies guides the solubility of the compound in water. If lattice enthalpy has a greater magnitude, the compound has low solubility. In case hydration enthalpy is more, then the compound is highly soluble in water.

The hydroxide which is maximum soluble in water is :



Answer: C



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2. The solubility of a crystalline compound in water is influenced by two factors. These are lattice enthalpy and hydration enthalpy. Lattice enthalpy is needed to separate the ions from the crystal lattice. At the same time hydration enthalpy is released when the ion are dissolved in water. The resultant of these two opposing tendencies guides the solubility of the compound in water. If lattice enthalpy has a greater magnitude, the compound has low solubility. In case hydration enthalpy is more, then the compound is highly soluble in water.

A metal M readily forms a water soluble sulphate MSO_4 water insoluble

hydroxide $M(OH)_2$ and oxide MO which becomes inert upon heating.

The hydroxide is soluble in $NaOH$. The metal M is

A. Be

B. Mg

C. Ca

D. Sr.

Answer: A



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3. The solubility of a crystalline compound in water is influenced by two factors. These are lattice enthalpy and hydration enthalpy. Lattice enthalpy is needed to separate the ions from the crystal lattice. At the same time hydration enthalpy is released when the ion are dissolved in water. The resultant of these two opposing tendencies guides the solubility of the compound in water. If lattice enthalpy has a greater magnitude, the compound has low solubility. In case hydration enthalpy

is more, then the compound is highly soluble in water.

A chemical compound 'A' is used for water softening to remove temporary hardness 'A' reacts with Na_2CO_3 to form caustic soda. When CO_2 is bubbled through 'A' it becomes cloudy. The chemical formula of 'A' is :

A. CaO

B. $CaC(OH)_2$

C. $Ca(HCO_3)_2$

D. $CaCO_3$

Answer: D



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Scp

1. Which out of the following will give basic solution ?

A. Ammonium acetate

B. Ammonium chloride

C. Na_2CO_3 and $NaOH$

D. $NaHCO_3$ and $NaCl$

Answer: C



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2. The metallic lustre exhibited by sodium is explained by

A. diffusion of sodium ions

B. oscillations of loose electrons

C. excitation of free proton

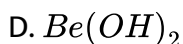
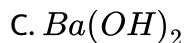
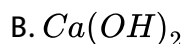
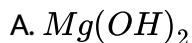
D. existence of body central cubic lattice

Answer: B



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3. The hydroxide of alkaline earth metal, which has the lowest value of solubility product (K_{sp}) at normal temperature ($25^{\circ}C$) is :



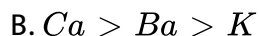
Answer: D

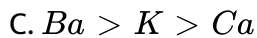


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4. The decreasing order of the second ionisation potential of K , Ca and Ba is

(At. No : K = 19 , Ca = 20 , Ba = 56)





Answer: A



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5. Which of the following is correct for $CsBr_3$?

A. It is a covalent compound

B. It contains Cs^+ and Br^- ions

C. It contains Cs^+ and Br^{3-} ion

D. It contains Cs^+ , Br^- and Br_2 molecule

Answer: C



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6. The correct order of increasing thermal stability of K_2CO_3 , $MgCO_3$, $CaCO_3$, and $BeCO_3$ is

A. $I < II < III < IV$

B. $IV < II < III < I$

C. $IV < II < I < III$

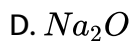
D. $II < IV < III < I$

Answer: B



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7. Sodium nitrate decomposes above $800^\circ C$ to give



Answer: B



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8. The set representing the correct order of the first ionisation potential is

A. $K > Na > Li$

B. $Be > Mg > Ca$

C. $B > C > N$

D. $Ge > Si > C$

Answer: B



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9. The least stable ion among the following is

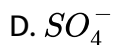


Answer: D



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10. A sodium salt on treatment with $MgCl_2$ gives white precipitate only on heating. The anion of the sodium salt is :



Answer: A

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11. Bleaching powder and bleach solution are produced on a large scale and used in several household products. The effectiveness of bleach solution is often measured by iodometry.

Bleaching powder contains a salt of an oxoacid as one of its components.

The anhydride of that oxoacid is:



Answer: A

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12. Alkali metal hydrides react with water to give

- A. Basic solution
- B. Acidic solution
- C. Neutral solution
- D. Hydrogen gas.

Answer: A::D



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Mcr

1. Which of the following pairs of elements will give superoxides and peroxides respectively when heated with excess of air ?

- A. K, Br
- B. Na, Rb
- C. K,Rb
- D. Na,Ba

Answer: C::D



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2. Highly pure dilute solution of sodium in liquid ammonia

- A. show blue colour
- B. Exhibits electrical conductivity
- C. Produces sodium amide
- D. Produces hydrogen gas

Answer: A::B::C



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3. All the compounds listed below will react with water. In which of the cases, same gaseous product is obtained ?

A. Na

B. Na_2O_2

C. KO_2

D. NaH

Answer: A::D



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4. Flame test is not given by

A. Be

B. Mg

C. KO_2

D. Sr

Answer: A::B



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5. Which of the following statements are false?

A. $BeCl_2$ is linear molecule in the vapour state

B. Calcium hydride is called hydrolith

C. Carbides of both Be and Ca react with water to form acetylene

D. Oxides of both Be and Ca are amphoteric

Answer: C::D



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6. The reagent(s) used for softening the temporary hardness of water is (are):

A. $Ca_3(PO_4)_2$

B. $Ca(OH)_2$

C. Na_2CO_3

D. NaOCl

Answer: B::C::D



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Assertion Reason

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

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

- A. If both assertion and reason are correct and reason is correct explanation for assertion.
- B. If both assertion and reason are correct but reason is not correct explanation for assertion
- C. If assertion is correct but reason is incorrect
- D. If both assertion and reason are incorrect

Answer: C



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2. Give reasons for the following:

a. Alkali metals are soft and volatile.

b. First ionisation enthalpies of alkali metals are low.

A. If both assertion and reason are correct and reason explanation for assertion.

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

C. If assertion is correct but reason is incorrect

D. If both assertion and reason are incorrect

Answer: A



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3. Assertion (A): Alkali metals can form ionic hydrides which contain hydride ion, H^- .

Reason (R): The alkali metals have low EN. Their hydrides conduct electricity, when fused and liberate hydrogen at the anode.

A. If both assertion and reason are correct and reason explanation for assertion.

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

C. If assertion is correct but reason is incorrect

D. If both assertion and reason are incorrect

Answer: A



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4. Assertion (A): K_2CO_3 cannot be prepared by Solvay process.

Reason (R): $KHCO_3$ being fairly soluble does not precipitate out in carbonation tower.

- A. If both assertion and reason are correct and reason is correct explanation for assertion.
- B. If both assertion and reason are correct but reason is not correct explanation for assertion
- C. If assertion is correct but reason is incorrect
- D. If both assertion and reason are incorrect

Answer: A



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5. Assertion (A): Sodium ions are discharged in preference to hydrogen ions at a mercury cathode.

Reason (R): The nature of cathode can affect the order of discharge of cations.

- A. If both assertion and reason are correct and reason explanation for assertion.
- B. If both assertion and reason are correct but reason is not correct explanation for assertion
- C. If assertion is correct but reason is incorrect
- D. If both assertion and reason are incorrect

Answer: A



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6. Assertion : Li^+ ions has the lowest mobility in aqueous solution

Reason : Li^+ ion has very high ionisation enthalpy.

- A. If both assertion and reason are correct and reason is correct explanation for assertion.
- B. If both assertion and reason are correct but reason is not correct explanation for assertion
- C. If assertion is correct but reason is incorrect
- D. If both assertion and reason are incorrect

Answer: B



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7. Statement I: Alkali metals dissolve in liquid ammonia to give blue solutions.

Statement II: Alkali metals in liquid ammonia give solvated species of the type $[M(NH_3)_n]^\oplus$ (M = alkali metals).

- A. If both assertion and reason are correct and reason is correct explanation for assertion.

- B. If both assertion and reason are correct but reason is not correct explanation for assertion
- C. If assertion is correct but reason is incorrect
- D. If both assertion and reason are incorrect

Answer: B



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8. Statement 1 : Both Be and Mg don't impart any characteristic colours to the flame

Statement 2 : Both these elements have high value of ionisation enthalpies.

- A. Statement : 1 is true, Statement 2 is also true, Statement 2 is the correct explanation of statement 1
- B. Statement 1 is true, Statement 2 is also true, statement 2 is not the correct explanation of statement 1

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is also false, Statement 2 is true

Answer: A



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9. Statement 1 : Sodium metal dissolves in liquid ammonia to form a blue coloured solution.

Statement 2 : The blue solution is a good conductor of electricity.

A. Statement : 1 is true, Statement 2 is also true, Statement 2 is the correct explanation of statement 1

B. Statement 1 is true, Statement 2 is also true, statement 2 is not the correct explanation of statement 1

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is also false, Statement 2 is true

Answer: B



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10. 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. Statement : 1 is true, Statement 2 is also true, Statement 2 is the correct explanation of statement 1

B. Statement 1 is true, Statement 2 is also true, statement 2 is not the correct explanation of statement 1

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is also false, Statement 2 is true

Answer: A



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11. Assertion (A): In rainy season, common salt becomes damp after sometime on keeping.

Reason (R): Common salt (NaCl) is hygroscopic in nature.

A. Statement : 1 is true, Statement 2 is also true, Statement 2 is the correct explanation of statement 1

B. Statement 1 is true, Statement 2 is also true, statement 2 is not the correct explanation of statement 1

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is also false, Statement 2 is true

Answer: C



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12. BeSO_4 is soluble in water but BaSO_4 is insoluble.

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

- A. Statement : 1 is ture, Statement 2 is also ture, Statement 2 is the correct explanation of statement 1
- B. Statement 1 is ture, Statement 2 is also ture, statement 2 is not the correct explanation of statement 1
- C. Statement 1 is true, Statement 2 is false.
- D. Statement 1 is also false, Statement 2 is ture

Answer: A



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