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Date : 01.04.2025

Time : 02:51:54

Marks : 191

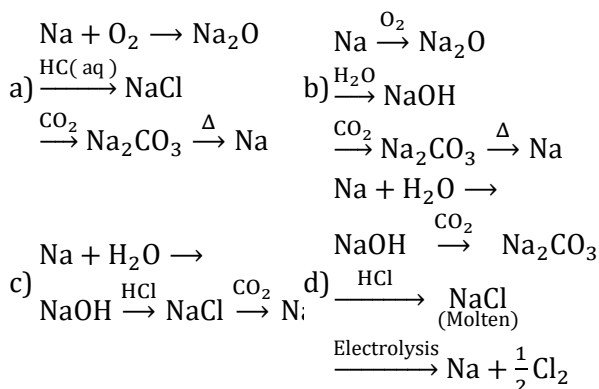
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CHEMISTRY

7.S-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS), ELEMENTS OF GROUP 1 AND 2

Single Correct Answer Type

1. Which of the following sequence of chemical reaction is correct?



2. A gas reacts with CaO and not with NaHCO_3 is:

- a) CO_2 b) Cl_2
 c) O_2 d) N_2

3. Which of the following does not illustrate the anomalous properties of lithium?

- a) Li is much softer than the other group I metals
 The melting point and boiling point of Li are comparatively high
 The ion of Li and its compounds are more heavily hydrated than those of the rest of the group elements
 Li forms a nitride
 c) Li_3N unlike group I metals

4. The ionic carbide is:

- a) CaC_2 b) ZnC
 c) SiC d) TiC

5. The main constituent of bones is:

- a) CaCO_3 b) CaF_2
 c) CaSO_4 d) $\text{Ca}_3(\text{PO}_4)_2$

6. Which of the following is known as dead burnt plaster?

- a) Gypsum b) Plaster of Paris
 c) Anhydrite d) None of these

7. Colemanite is

- a) $\text{Ca}[\text{B}_2\text{O}_4(\text{OH})_2] \cdot 2\text{H}_2\text{O}$ b) $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$
 c) $\text{Ca}(\text{OH})_2$ d) $\text{Na}_2\text{B}_4\text{O}_7 \cdot 2\text{H}_2\text{O}$

8. Solubility of alkaline earth metal hydroxides increases from $\text{Be}(\text{OH})_2$ to $\text{Ba}(\text{OH})_2$ because:

- a) Hydration energy > lattice energy
 b) Lattice energy > hydration energy
 c) Hydration energy is equal to lattice energy
 d) None of the above

9. The blue colour of the solution of sodium in liquid ammonia is due to

- a) the presence of ammoniated electron
 b) the presence of sodium ions
 c) the formation of sodium hydride
 d) the formation of NaNH_2

10. Beryllium shows diagonal relationship with aluminium. Which of the following similarity is incorrect?

- a) Be_2C like AlC_3 yields methane on hydrolysis
 b) Be like Al is rendered passive by HNO_3
 c) $\text{Be}(\text{OH})_2$ like $\text{Al}(\text{OH})_3$ is basic
 d) Be forms beryllates and Al forms aluminates

11. NaOH can also be prepared by electrolysis of aqueous NaCl. Amount of NaOH formed when 0.445 L of $\text{NaCl}(\text{aq})$ is electrolysed for 137 s with a current of 1.08 A, is

- a) 0.09 g b) 0.12 g
 c) 0.06 g d) amount of NaCl has not been given

12. The most soluble fluoride in water is

- a) BeF_2 b) CaF_2
 c) SrF_2 d) BaF_2

13. Mg burns in CO to produce

- a) $\text{MgO} + \text{CO}$ b) MgO_2
 c) $\text{MgO} + \text{C}$ d) MgCO_3

14. The low solubility of LiF and CsI is due to

- a) smaller lattice enthalpy, high hydration enthalpy
 b) high lattice enthalpy, high hydration enthalpy
 c) high lattice enthalpy, low hydration enthalpy
 d) low lattice enthalpy, low hydration enthalpy

15. The chemical which is used for plastering the broken bones is

- a) $(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O}$ b) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
 c) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ d) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
16. Mix calcium sulphate with conc. HCl and forms a paste. Bring a pinch of this paste near to the flame, what colour will you obtain?
 a) Brick red b) Apple green
 c) Golden yellow d) Crimson red
17. 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
18. Ca, Sr and Ba dissolve in liquid ammonia giving a.....
 a) Highly conducting b) Highly reducing
 c) Paramagnetic d) All are correct
19. Which of following elements does not form amide when reacted with ammonia?
 a) Li b) Na
 c) K d) Rb
20. Which one of the following order of stability is correct?
 a) $\text{MgCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$ b) $\text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3 > \text{MgCO}_3$
 c) $\text{MgCO}_3 > \text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3$ d) $\text{CaCO}_3 > \text{BaCO}_3 > \text{MgCO}_3 > \text{SrCO}_3$
21. Which of the following property of hydroxides of alkaline earth metals increases from top to bottom?
 a) Thermal stability b) Basic character
 c) Solubility in water d) All of these
22. Gypsum is:
 a) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ b) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$
 c) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ d) $\text{CaSO}_4 \cdot 3\text{H}_2\text{O}$
23. A mixture contains two moles of Na_2CO_3 and 1 mole of Li_2CO_3 . What will be the volume of CO_2 formed on heating this mixture and the data is converted to STP?
 a) 22.4 L b) 44.8 L
 c) 50.2 L d) 11.2 L
24. In between the metals A and B, both form oxide but B also forms nitride, when both burn in air. So A and B are:
 a) Cs, K b) Mg, Ca
 c) Li, Na d) K, Mg
25. Identify the correct formula of halides of alkaline earth metals from the following
 a) $\text{BaCl}_2 \cdot 6\text{H}_2\text{O}$ b) $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$
 c) $\text{BaCl}_2 \cdot 4\text{H}_2\text{O}$ d) $\text{SrCl}_2 \cdot 4\text{H}_2\text{O}$
26. Solubility of alkaline earth metal sulphates decreases down the group 2 because

- a) they become more ionic b) lattice energy of sulphates does not vary significantly
 c) hydration energy decreases rapidly from Be^{2+} to Ba^{2+} d) lattice energy plays more predominant role than hydration energy
27. What happens, when ionic hydrides of s-block elements in molten state are electrolysed?
 a) Hydride ion migrates at cathode b) Dihydrogen is liberated at cathode
 c) Hydride ion reforms metal hydride d) Dihydrogen is liberated at anode
28. A more economical process but based on same principle was given by
 a) Solvay b) Leblanc
 c) Williamson d) Haber
29. Product of the following reaction is $\text{LiH} + \text{AlCl}_3 \rightarrow$
 a) $\text{LiAlH}_4 + \text{LiCl}$ b) $\text{LiAlH}_4 + \text{HCl}$
 c) $\text{LiAlH}_3 + \text{LiCl}$ d) $\text{LiAlH}_3 + \text{HCl}$
30. Slaked lime $[\text{Ca}(\text{OH})_2]$ is used in the manufacture of
 a) Fire bricks b) Cement
 c) Medicine d) Pigment
31. In which of the following processes, fused sodium hydroxide is electrolysed at 330°C temperature for extraction of sodium?
 a) Castner's process b) Cyanide process
 c) Down's process d) Both (b) and (c)
32. The correct order of solubility of the sulphates of alkaline earth metals in water is
 a) $\text{Be} > \text{Ca} > \text{Mg} > \text{Ba}$ b) $\text{Mg} > \text{Be} > \text{Ba} > \text{Ca}$
 $> \text{Sr}$ $> \text{Sr}$
 c) $\text{Be} > \text{Mg} > \text{Ca} > \text{Sr}$ d) $\text{Mg} > \text{Ca} > \text{Ba} > \text{Be}$
 $> \text{Ba}$ $> \text{Sr}$
33. Which of the following ions, will have maximum hydration energy?
 a) Sr^{2+} b) Ba^{2+}
 c) Ca^{2+} d) Mg^{2+}
34. The first ionization energies of alkaline earth metals are higher than those of the alkali metals. This is because:
 a) There is increase in the nuclear charge of the alkaline earth metals b) There is decrease in the nuclear charge of the alkaline earth metals
 c) There is no change in the nuclear charge d) None of the above
35. Which chloride is covalent and soluble in

- ether?
- a) BeCl_2 b) CaCl_2
 c) CrCl_3 d) BaCl_2
36. Mortar is a mixture of
 a) Cement, sand and water b) MgCl_2 , tar and lime
 c) Lime, Portland cement and water d) None of the above
37. An aqueous solution of KI does not give a precipitate with:
 a) Mg^{2+} b) Pb^{2+}
 c) Hg^{2+} d) Cu^{2+}
38. The characteristic colours given by calcium, strontium and barium in the flame test are respectively
 a) Brick red, apple green, crimson b) Crimson, apple green, brick red
 c) Crimson, brick red, apple green d) Brick red, crimson, apple green
39. The substance used as pigment in paint is
 a) Borax b) Alumina
 c) Lithopone d) None of these
40. Which will react with acid and alkalis both *i. e.*, (amphoteric)
 a) MgO b) CaO
 c) BaO d) BeO
41. Crude sodium chloride is generally obtained by crystallisation of
 a) NH_4Cl solution b) NaOH solution
 c) brine solution d) None of these
42. Which is not true in respect of beryllium chemistry?
 a) Beryllium is amphoteric b) It forms unusual carbide Be_2C
 c) $\text{Be}(\text{OH})_2$ is basic d) Beryllium halides are electron deficient
43. Calcium is obtained by
 a) Electrolysis of molten CaCl_2 b) Roasting of lime stone
 c) Reduction of CaCl_2 with carbon d) Electrolysis of a solution of CaCl_2 in water
44. Setting of plaster of Paris involves
 a) Oxidation with atmospheric oxygen b) Combination with atmospheric CO_2
 c) Dehydration d) Hydration to yield another hydrate
45. A metal M readily forms its sulphate MSO_4 which is water soluble. It forms its oxide MO which becomes inert on heating. It forms its

- insoluble hydroxide $M(\text{OH})_2$ which is soluble in NaOH solution. Then, M is
 a) Be b) Ba
 c) Ca d) Mg
46. Milk of lime is:
 a) CaCO_3 b) CaHCO_3
 c) $\text{Ca}(\text{OH})_2$ d) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
47. In the Castner's process for the extraction of sodium, the anode is made of metal
 a) Sodium b) Nickel
 c) Copper d) Iron
48. The cation which forms a yellow precipitate with potassium chromate in acetic acid is:
 a) NH_4^+ b) Ba^{2+}
 c) Ca^{2+} d) Na^+
49. Which reagent would enable you to remove SO_4^{2-} ions from solution containing both SO_4^{2-} and Cl^- ions?
 a) NaOH b) Pb^{2+}
 c) $\text{Ba}(\text{OH})_2$ d) BaSO_4
50. Which of the following is different from the other three?
 a) MgO b) SnO
 c) ZnO d) Cr_2O_3
51. Blanc fixe used in paints is:
 a) Finely divided BaSO_4 b) Paste of $\text{Ba}(\text{OH})_2$
 c) Suspension of $\text{Ca}(\text{OH})_2$ d) $\text{MgCl}_2 \cdot 5\text{MgO} \cdot 5\text{H}_2\text{O}$
52. The electronic configuration of metal M is $1s^2, 2s^2 2p^6, 3s^1$. The formula of its oxide would be
 a) MO b) M_2O
 c) M_2O_3 d) MO_2
53. A firework gave bright crimson light. It is probably a salt of:
 a) Ca b) Sr
 c) Ba d) Mg
54. From which mineral Ra is obtained?
 a) Limestone b) Rutile
 c) Pitch blende d) Haematite
55. What are the products formed when an aqueous solution of magnesium bicarbonate is boiled?
 a) $\text{MgO}, \text{H}_2\text{O}, \text{CO}_2$ b) $\text{Mg}(\text{HCO}_3)_2, \text{H}_2\text{O}$
 c) $\text{Mg}(\text{OH})_2, \text{H}_2\text{O}$ d) $\text{Mg}, \text{CO}_2, \text{H}_2\text{O}$
56. Which of the following is used in the preparation of cakes and pastries?
 a) Sodium hydrogen carbonate b) Sodium carbonate
 c) Sodium hydroxide d) Potassium hydroxide

57. Which of the following metal carbonates is decomposed on heating?
 a) Na_2CO_3 b) MgCO_3
 c) K_2CO_3 d) Rb_2CO_3
58. Which of the following hydroxides is insoluble in water?
 a) $\text{Ba}(\text{OH})_2$ b) $\text{Ca}(\text{OH})_2$
 c) $\text{Be}(\text{OH})_2$ d) $\text{Mg}(\text{OH})_2$
59. Which of the following is an epsom salt?
 a) $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$ b) $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
 c) $\text{MgSO}_4 \cdot 2\text{H}_2\text{O}$ d) $\text{BaSO}_4 \cdot 2\text{H}_2\text{O}$
60. Which metal dissolves in NaOH with the evolution of H_2 ?
 a) Be b) Ca
 c) Mg d) Sr
61. One mole of magnesium nitride on the reaction with an excess of water gives
 a) One mole of NH_3 b) Two moles of NH_3
 c) One mole of HNO_3 d) Two moles of HNO_3
62. Which of the following hydroxides is amphoteric in nature?
 a) $\text{Be}(\text{OH})_2$ b) $\text{Mg}(\text{OH})_2$
 c) $\text{Ca}(\text{OH})_2$ d) $\text{Ba}(\text{OH})_2$
63. Correct order of decreasing covalent character in metal halides is
 a) $\text{LiI} > \text{LiBr} > \text{LiCl}$ b) $\text{LiCl} > \text{LiBr} > \text{LiI}$
 c) $\text{LiBr} > \text{LiI} > \text{LiCl}$ d) $\text{LiBr} > \text{LiCl} > \text{LiI}$
64. The biggest ion is:
 a) Al^{3+} b) Ba^{2+}
 c) Na^+ d) Mg^{2+}
65. Flash bulbs contain wire or foil of Mg packed in an atmosphere of:
 a) SO_3 b) O_2
 c) Air d) N_2
66. Element found in plant systems which forms an important constituent of photosynthesis is:
 a) Fe b) Cu
 c) Na d) Mg
67. When sodium chloride solution is electrolysed, the gas that is liberated at the cathode is
 a) Oxygen b) Chlorine
 c) Hydrogen d) Air
68. The compound which is insoluble in hot water and NH_3 is:
 a) PbCl_2 b) AgCl
 c) BaSO_4 d) None of these
69. Which of the following on thermal decomposition yields a basic as well as an acidic oxide?
 a) KClO_3 b) CaCO_3
 c) NH_4NO_3 d) NaNO_3
70. On strong heating $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, the product obtained is
 a) MgCl_2 b) MgO
 c) $\text{MgCl}_2 \cdot 2\text{H}_2\text{O}$ d) $\text{MgCl}_2 \cdot 4\text{H}_2\text{O}$
71. A radioactive element X decays giving two inert gases is:
 a) ${}_{92}^{238}\text{U}$ b) ${}_{88}^{226}\text{Ra}$
 c) ${}_{90}^{239}\text{Th}$ d) ${}_{93}^{227}\text{Np}$
72. Which of the following pair cannot exist together in solution?
 a) Na_2CO_3 and NaHCO_3 b) NaHCO_3 and NaOH
 c) Na_2CO_3 and NaOH d) NaOH and NaCl
73. The solubility in water of sulphates down the Be group is $\text{Be} > \text{Mg} > \text{Ca} > \text{Sr} > \text{Ba}$. This is due to:
 a) Increase in m. p. b) High ionisation energy
 c) Higher co-ordination number d) All of the above
74. Lattice energy (numerical value) of chloride of alkali metals is in order of
 a) $\text{LiCl} > \text{NaCl} > \text{KCl} > \text{RbCl} > \text{CsCl}$ b) $\text{LiCl} < \text{NaCl} < \text{KCl} < \text{RbCl} < \text{CsCl}$
 c) $\text{NaCl} < \text{KCl} < \text{LiCl} < \text{RbCl} < \text{CsCl}$ d) $\text{NaCl} < \text{KCl} < \text{RbCl} < \text{CsCl} < \text{LiCl}$
75. Which of the following formula represents lithium imide?
 a) LiNH_2 b) Li_2NH
 c) Li_3N d) LiNH
76. Which of the compounds of cement sets at the slowest rate?
 a) Dicalcium silicate b) Tricalcium silicate
 c) Tricalcium aluminate d) Tetracalcium aluminoferrate
77. When NaOH is made, the gas released at the cathode is
 a) Cl_2 b) H_2
 c) O_2 d) H_2O
78. 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
79. Which of the following metal carbonates decomposes on heating?
 a) MgCO_3 b) Na_2CO_3
 c) K_2CO_3 d) Rb_2CO_3
80. The wire of flash bulbs are made up of:
 a) Mg b) Ba

- c) Cu d) Ag
81. The correct order of hydration energy of alkaline earth metal ions is:
 $\text{Be}^{2+} > \text{Mg}^{2+}$
 a) $> \text{Ca}^{2+} > \text{Sr}^{2+}$ b) $\text{Ba}^{2+} > \text{Be}^{2+} > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{Sr}^{2+}$
 $\text{Mg}^{2+} > \text{Be}^{2+}$ d) None of the above
 c) $> \text{Ba}^{2+} > \text{Ca}^{2+} > \text{Sr}^{2+}$
82. When magnesium is burnt in air, compounds of magnesium formed are magnesium oxide and:
 a) MgCO_3 b) $\text{Mg(NO}_2)_2$
 c) $\text{Mg(NO}_3)_2$ d) Mg_3N_2
83. Celestine is an ore of:
 a) Ba b) Ca
 c) Sr d) Mg
84. The second ionisation enthalpy of the alkaline earth metals are smaller than that of corresponding group I metals. This is due to
 a) large size of alkali metals b) stable configuration of alkali metal ions
 c) small size of alkaline earth metals d) stable configuration of alkaline earth metal monocation
85. Nitrogen dioxide cannot be prepared by heating
 a) KNO_3 b) $\text{Pb(NO}_3)_2$
 c) $\text{Cu(NO}_3)_2$ d) AgNO_3
86. NaOH is not used in
 a) paper industry b) soap industry
 c) rayon industry d) plastic industry
87. Which of the following compounds has the lowest melting point?
 a) CaF_2 b) CaCl_2
 c) CaBr_2 d) CaI_2
88. In the hardening stage of plaster of Paris, the compound formed is
 a) CaSO_4 b) Orthorhombic $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 c) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ d) Monoclinic $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
89. Sodium hydroxide is prepared by the electrolysis of sodium chloride solution and the electrodes used as cathode and anode are respectively.
 a) mercury and platinum b) platinum and mercury
 c) mercury and carbon d) carbon and mercury
90. LiAlH_4 act as
 a) oxidising agent b) hydroxylating agent

- c) reducing agent d) either oxidising or reducing agent
91. The diagonal relationship in Be and Al is due to
 a) similar ionisation enthalpy b) similar metallic character
 c) similar ionic size and charge/radius ratio d) similar electronegativity
92. Which out of the following statements is not correct for anhydrous calcium chloride?
 a) It is prepared by heating hydrated calcium chloride above 533 K b) It is used for drying alcohols and NH_3
 c) It is used as a dehydrating agent to control snow and ice on highway and pavements d) When mixed in concrete, it gives quicker initial setting and improves its strength
93. Which of the following is not an ore of magnesium?
 a) Carnallite b) Dolomite
 c) Calamine d) Sea water
94. Element A burns in nitrogen to give an ionic compound B. Compound B reacts with water to give C and D. The solution of C becomes milky on bubbling carbon dioxide. The element A is
 a) Li b) Mg
 c) Ca d) Be
95. The metal ion, that plays an important role in muscle contraction, is
 a) Be^{2+} b) Mg^{2+}
 c) Ca^{2+} d) Ba^{2+}
96. A metal M forms a water soluble MSO_4 and inert MO. MO in aqueous solution forms insoluble M(OH)_2 , soluble in NaOH. Metal M is
 a) Be b) Mg
 c) Ca d) Sr
97. Plaster of Paris on making paste with little water sets to hard mass due to formation of
 a) CaSO_4 b) $\text{CaSO}_4 \cdot 1/2 \text{H}_2\text{O}$
 c) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ d) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
98. Hydrogen gas is liberated in the reaction of sodium hydroxide with
 a) CO_2 b) ZnCl_2
 c) Cl d) Zn
99. What is A in the following reaction
 $\text{LiAlH}_4 + \text{PCl}_3 \rightarrow \text{A} + \text{AlCl}_3 + \text{LiCl}$
 a) POCl_3 b) PH_3
 c) PH_2 d) PH_4
100. Beryllium shows diagonal relationship with

- a) Mg b) Na
c) B d) Al
101. Which statement is correct for alkaline earth metals?
They are diatomic b) They are highly electronegative elements
a) and form ions of the type M^{2-}
They are monoatomic and They are diatomic
c) form ions of the type M^{2+} d) and form ions of the type M^{2+}
102. Milk of magnesia is:
a) $Mg(OH)_2$ b) $Ca(OH)_2$
c) $Ba(OH)_2$ d) None of these
103. The oxide, which is best soluble in H_2O is
a) $Ba(OH)_2$ b) $Sr(OH)_2$
c) $Ca(OH)_2$ d) $Mg(OH)_2$
104. In aqueous solution the most stable sulphate is
a) $BeSO_4$ b) $MgSO_4$
c) $CaSO_4$ d) $BaSO_4$
105. In the manufacture of NaOH by the electrolysis of NaCl solution, the cathode and anode are separated using a diaphragm because
It prevents the It prevents the
a) reaction between H_2 and Cl_2 formed b) mixing of NaOH and NaCl
It prevents the it increases the yield
c) reaction between NaOH and Cl_2 . d) of NaOH
106. The carbonates and hydrogen carbonates of alkali metals are highly stable. Their stability
a) decreases from top to bottom b) increases from top to bottom
c) remains same d) does not follow a regular trend in the group
107. Dolomite is a carbonate ore of:
a) Ca b) Mg
c) Both Ca and Mg d) Neither Ca nor Mg
108. The compound X on heating gives a colourless gas. The residue is dissolved in water to obtain Y. Excess CO_2 is bubbled through aqueous solution of Y, Z is formed. Z on gentle heating gives back X. The compound X is:
a) $CaCO_3$ b) Na_2CO_3
c) $CaSO_4 \cdot 2H_2O$ d) K_2CO_3
109. Iceland spar is:
a) $CaSiO_4$ b) $CaCO_3$
c) CaF_2 d) $NaAlF_6$
110. Magnesium forms Mg^{2+} and not Mg^+ because:

- a) Magnesium (II) carbonate is insoluble in water b) Generally higher oxidation states are preferred by metals
c) Ionic radius of $Mg(II)$ is smaller than of $Mg(I)$ d) Hydration energy of divalent magnesium ion is higher
111. Scarlet flame colour of Bunsen flame is characteristic of:
a) Sn b) K
c) Sb d) Sr
112. Least abundant metal in IIA group is:
a) Sr b) Ca
c) Ra d) Be
113. 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 b) Ionisation enthalpy
c) Hydration enthalpy d) Electron gain enthalpy
114. Which of the following will liberate hydrogen by its reaction with hydrochloric acid?
a) Copper b) Phosphorus
c) Mercury d) Magnesium
115. Bessemer's process is a method for the manufacture of:
a) NaOH b) HNO_3
c) H_2SO_4 d) Bleaching powder
116. The correct trend of melting point and boiling point of alkali metal halides is
a) fluoride > chloride > bromide > iodide b) fluoride < chloride < bromide < iodide
c) fluoride < chloride < bromide < iodide d) iodide < fluoride < chloride < bromide
117. Soda lime is
a) NaOH b) NaOH and CaO
c) CaO d) Na_2CO_3
118. The chemical formula of plaster of Paris is
a) $CaSO_4 \cdot \frac{1}{2} H_2O$ b) $CaSO_4 \cdot H_2O$
c) $CaSO_4 \cdot 2H_2O$ d) $CaSO_4 \cdot 3H_2O$
119. Magnesium wire burns in the atmosphere of CO_2 because:
a) Magnesium acts as an oxidizing agent b) Magnesium has 2 electrons in the outermost orbit
c) Magnesium acts as a reducing agent and removes oxygen from CO_2 d) None of the above

120. Which is used to remove N_2 from air?
 a) Mg b) P
 c) H_2SO_4 d) $CaCl_2$
121. Identify the correct statement.
 Elemental sodium can be prepared and isolated by electrolysis of an aqueous solution of NaCl
 a) Elemental Na is a strong oxidising agent
 b) Elemental Na is easily oxidized
 c) Elemental Na is insoluble in NH_3
 d) Elemental Na is easily oxidized
122. Melting point is highest for:
 a) Be b) Mg
 c) Sr d) Ca
123. Identify the weakest oxidising agent among the following
 a) Li^+ b) Na^+
 c) Cd^{2+} d) I_2
124. Several blocks of Mg are fixed to the bottom of a ship to:
 a) Prevent action of water and salt
 b) Prevent puncturing by under sea rocks
 c) Keep away the sharks
 d) Make the ship lighter
125. Calcium is obtained by
 a) Electrolysis of molten $CaCl_2$
 b) Electrolysis of solution of $CaCl_2$ in water
 c) Reduction of $CaCl_2$ with carbon
 d) Roasting of lime stone
126. On dissolving moderate amount of sodium metal in liquid NH_3 at low temperature, which one of the following does not occur?
 a) Blue coloured solution is obtained
 b) Na^+ ions are formed in the solution
 c) Liquid NH_3 solution becomes good conductor of electricity
 d) Liquid NH_3 solution remains diamagnetic
127. Gypsum on heating at $120-230^\circ C$ gives:
 a) Hemihydrate b) Monohydrate
 c) Dehydrates d) Anhydrous salt
128. A solid is a compound of group 1 element and it gives a bright red colour in the flame test. The solid is
 a) LiBr b) CsCl
 c) KCl d) NaCl
129. In the alkaline earth metals, the element forming predominantly covalent compound is
 a) Ca b) Sr
 c) Mg d) Be
130. Which is quick lime?
 a) $CaCO_3$ b) $Ca(OH)_2 + H_2O$
 c) $Ca(OH)_2$ d) CaO
131. Barium burns in air to form
 a) Ba_2O_2 b) BaO_2
 c) $Ba(OH)_2$ d) BaO
132. The compound which liberate(s) a mixture of NO_2 and O_2 on heating is
 a) LiOH b) NaOH
 c) $LiNO_3$ d) Li_2CO_3
133. Which of the following compounds of sodium is the most basic?
 a) Na_2CO_3 b) $NaHCO_3$
 c) NaOH d) All are equally basic
134. Ionic compound $BaSO_4$ is insoluble in water due to
 a) High lattice energy b) Low lattice energy
 c) Low hydration energy d) Both (a) and (c)
135. The alkali metals have low melting points. 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
136. In which of the following reactions, MgO is not formed?
 a) $Mg + CO_2 \rightarrow$ b) $Mg + \text{dil. } HNO_3 \rightarrow$
 c) $Mg + NO \xrightarrow{\Delta}$ d) $Mg + B_2O_3 \rightarrow$
137. Beryllium and aluminium exhibit many properties which are similar but the two elements differ in
 a) exhibiting maximum covalency in compounds
 b) forming polymeric hydrides
 c) forming covalent halides
 d) exhibiting amphoteric nature in their oxides
138. A substance which gives a brick red flame and breaks down on heating giving oxygen and a brown gas is:
 a) Calcium carbonate b) Magnesium nitrate
 c) Magnesium carbonate d) Calcium nitrate
139. Chlorine reacts with 'X' to form bleaching powder. 'X' is
 a) Dry slaked lime b) Sodium hydroxide
 c) Acetone d) Chloral
140. Which category of salts of alkaline earth metals

- is not found in solid state, but found in solution state?
- a) Carbonates b) Bicarbonates
c) Hydroxides d) Sulphates
141. Which of the following alkaline earth metal sulphate has hydration enthalpy by higher than its lattice enthalpy:
- a) CaSO_4 b) BeSO_4
c) BaSO_4 d) SrSO_4
142. Thomas slag is
- a) $\text{Ca}_3(\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ b) $\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaSiO}_3$
c) MgSiO_3 d) CaSiO_3
143. The active constituent of bleaching powder is:
- a) $\text{Ca}(\text{OCl})_2$ b) $\text{Ca}(\text{OCl})\text{Cl}$
c) $\text{Ca}(\text{ClO}_2)_2$ d) $\text{Ca}(\text{ClO}_2)\text{Cl}$
144. The correct increasing covalent character is:
- a) $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$ b) $\text{BeCl}_2 < \text{NaCl} < \text{LiCl}$
c) $\text{BeCl}_2 < \text{LiCl} < \text{NaCl}$ d) $\text{LiCl} < \text{NaCl} < \text{BeCl}_2$
145. Which can undergo both oxidation and reduction?
- a) Ba^{2+} b) BaCl_2
c) Ba^+ d) BaH_2
146. H_2O is dipolar whereas BeF_2 is not. It is because:
- a) The H_2O involves H-electronegativity of F is greater than O b) 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
147. Which of the following exists in polymeric form?
- a) AlCl_3 b) BeCl_2
c) B_2H_6 d) SiCl_4
148. Who discovered radium?
- a) Bohr b) Fermi
c) Curie d) Rutherford
149. The most reactive element among the following is:
- a) Mg b) Ca
c) Sr d) Ba
150. At high temperature nitrogen combines with CaC_2 to give:
- a) Calcium cyanide b) Calcium cyanamide
c) Calcium carbonate d) Calcium nitride
151. Which among the following sets of compounds is used as raw material for the preparation of sodium carbonate by Solvay process?
- a) NaOH , HCl , CO_2 b) NH_4Cl , H_2O , NaCl
c) NaCl , NH_3 , $\text{Ca}(\text{OH})_2$ d) NaCl , CaCO_3 , H_2SO_4
152. Some of the group II metal halides are covalent and soluble in organic solvents. Among the following metal halides, the one which is soluble in ethanol is
- a) BeCl_2 b) MgCl_2
c) CaCl_2 d) SrCl_2
153. Baryta water is:
- a) BaO b) $\text{Ca}(\text{OH})_2$
c) $\text{Ba}(\text{OH})_2$ d) BaSO_4
154. The element that forms a solid basic oxide at room temperature is:
- a) Mg b) S
c) H d) P
155. $\text{Be}(\text{OH})_2$ is insoluble in water, while $\text{Ba}(\text{OH})_2$ is highly soluble due to
- a) Lattice energy b) Common ion effect
c) Bond order d) Hard acid
156. Milk of magnesia is used as
- a) Antichlor b) Antacid
c) Antiseptic d) Food preservative
157. Superphosphate of lime is a mixture of:
- a) Primary calcium phosphate and Epsom b) Primary magnesium phosphate and Epsom
c) Primary magnesium phosphate and gypsum d) Primary calcium phosphate and gypsum
158. Which alkaline earth metal forms peroxide on burning in air?
- a) Be b) Ca
c) Sr d) Ba
159. Choose the correct option from the codes given below regarding elements and their characteristics colour given in Column I and Column II respectively of the following table.
- | Column I | | | Column II |
|----------|----|---|-------------|
| A | Li | 1 | Crimson red |
| B | Na | 2 | Yellow |
| C | K | 3 | Red violet |
| D | Rb | 4 | Blue |
| | | 5 | Violet |
- Codes**
- A B C D

- a) 2 1 3 5b) 1 2 4 3
c) 1 2 5 3d) 1 2 3 4
160. Which compound gives acetylene on reaction with water?
a) Al_4C_3 b) Mg_3N_2
c) CaC_2 d) CaH_2
161. Which of the following compounds is used in gun powder?
a) NaNO_3 b) KNO_3
c) LiNO_3 d) None of these
162. Among RbCl , BeCl_2 , MgCl_2 , LiCl , the compounds with least and greatest ionic character respectively are
a) RbCl and LiCl b) MgCl_2 and RbCl
c) BeCl_2 and RbCl d) BeCl_2 and LiCl
163. Which component of cement sets at the slowest rate?
a) Dicalcium silicate b) Tricalcium silicate
c) Tricalcium aluminate d) Tetracalcium aluminoferrite
164. The alkaline earth metals have smaller size than those of corresponding alkali metals. This is due to
a) increase in nuclear ionisation enthalpy b) decrease in nuclear charge
c) increase in nuclear charge d) increase in number of shells
165. Photoelectric effect is maximum in
a) Cs b) Na
c) K d) Li
166. Lithium being very small in size, polarises a large CO_3^{2-} ion leading to the formation of more stable
a) Li_2O and CO b) Li_2O and CO_2
c) Li_2O_2 and CO d) LiO and CO_2
167. The action of dilute HNO_3 on magnesium gives:
a) NO b) H_2
c) NO_2 d) NH_4NO_3
168. The correct order of solubility of alkali metal fluorides in water is
a) $\text{CsF} < \text{NaF} < \text{KF} < \text{LiF}$ b) $\text{LiF} < \text{NaF} < \text{KF} < \text{CsF}$
c) $\text{LiF} < \text{NaF} < \text{KF} < \text{CsF}$ d) $\text{CsF} < \text{NaF} < \text{KF} < \text{LiF}$
169. Barium is extracted from its ore:
a) Dolomite b) Witherite
c) Carnallite d) Gypsum
170. The metal present in Grignard reagent is:
a) Ca b) Mg
c) Zn d) Fe

171. Which gives least basic oxide?
a) Mg b) Ba
c) Be d) Ra
172. Alloys of which metal are light and strong and are used in the manufacture of aeroplane parts?
a) Cr b) Sn
c) Fe d) Mg
173. Electrolysis of fused $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ gives:
a) Potassium only b) Magnesium only
c) Magnesium and chlorine d) Potassium, magnesium and chlorine
174. Mixture of MgCl_2 and MgO is called
a) Portland cement b) Sorel's cement
c) Double salt d) None of these
175. The solubilities of carbonates of magnesium group decreases down due to decrease in:
a) Inter ionic attractions b) Entropy of solution formation
c) Lattice energy d) Hydration energy of cation
176. Hydrogen carbonate of lithium does not exist in solid state due to
a) low polarisation value of Li^+ b) low hydration energy of Li^+
c) high hydration energy of Li^+ d) high polarisation value of Li^+
177. Which of the following substances is used in the laboratory for fast drying of neutral gases?
a) Sodium sulphate b) Phosphorus pentoxide
c) Sodium phosphate d) Anhydrous calcium chloride
178. Which one of the following substances is used in the laboratory for a fast drying of neutral gases?
a) Phosphorus pentoxide b) Active charcoal
c) Anhydrous calcium chloride d) Na_3PO_4
179. Which alkaline earth metal is the most abundant in the earth's crust?
a) Mg b) Ca
c) Sr d) Ba
180. Oxygen can be obtained by heating:
a) Na_2O b) Fe_2O_3
c) Fe_3O_4 d) BaO_2
181. Bleaching powder is obtained by interaction of Cl_2 and:
a) dil. $\text{Ca(OH)}_2(aq)$ b) dry CaO

- c) conc. $\text{Ca(OH)}_2(aq)$ d) Dry slaked lime
182. The most soluble halide in water is:
 a) CaF_2 b) CaCl_2
 c) CaBr_2 d) CaI_2
183. Crude sodium chloride obtained by crystallisation of brine solution does not contain
 a) MgSO_4 b) Na_2SO_4
 c) MgCl_2 d) CaSO_4
184. Bleaching powder is obtained by the interaction of chlorine and
 a) Dry calcium oxide b) Dry slaked lime
 c) conc. solution of Ca(OH)_2 d) dilute solution of Ca(OH)_2
185. Sodium is heated in air at 350°C to form A. Compound A when reacts with carbon dioxide forms sodium carbonate and Y. Here, Y is
 a) hydrogen peroxide b) hydrogen
 c) ozone d) oxygen
186. A colourless salt X has 50% Na_2SO_3 and 50% H_2O . How much of SO_2 at NTP is obtained when 2.52 g of X reacts with excess of dil. H_2SO_4 ?
 a) 22.4 L b) 0.448 L
 c) 44.8 L d) 0.224 L
187. The highly efficient method of obtaining

beryllium is:

- a) Reduction of beryllium halide with Mg
 b) Reduction of beryllium oxide with carbon
 c) Electrolysis of fused beryllium chloride
 d) Dissociation of beryllium carbide
188. In which of the following the hydration energy is higher than the lattice energy?
 a) BaSO_4 b) MgSO_4
 c) RaSO_4 d) SrSO_4
189. The weakest base among NaOH , Ca(OH)_2 , KOH and Be(OH)_2 is:
 a) NaOH b) Ca(OH)_2
 c) KOH d) Be(OH)_2
190. $\text{CaC}_2 + \text{N}_2 \rightarrow A$, product A is
 a) CaCN_2 b) CaCN_2 and C
 c) $\text{CaCN}_2 + \text{N}_2$ d) None of these
191. A combustible gas is liberated when caustic soda solution is heated with
 a) S b) NH_4Cl
 c) I_2 d) Zn

N.B.Navale

Date : 01.04.2025

Time : 02:51:54

Marks : 191

TEST ID: 71

CHEMISTRY

7.S-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS),ELEMENTS OF GROUP 1 AND 2

: ANSWER KEY :

1)	d	2)	a	3)	a	4)	a	165)	a	166)	b	167)	b	168)	c
5)	d	6)	c	7)	b	8)	a	169)	b	170)	b	171)	c	172)	d
9)	a	10)	c	11)	c	12)	a	173)	d	174)	b	175)	d	176)	d
13)	c	14)	b	15)	a	16)	a	177)	d	178)	c	179)	b	180)	d
17)	b	18)	d	19)	a	20)	b	181)	a	182)	d	183)	a	184)	b
21)	d	22)	c	23)	a	24)	d	185)	d	186)	d	187)	b	188)	b
25)	b	26)	c	27)	d	28)	a	189)	d	190)	b	191)	d		
29)	a	30)	a	31)	a	32)	c								
33)	d	34)	a	35)	a	36)	a								
37)	a	38)	d	39)	c	40)	d								
41)	c	42)	c	43)	a	44)	d								
45)	a	46)	c	47)	b	48)	b								
49)	c	50)	a	51)	a	52)	b								
53)	b	54)	c	55)	a	56)	a								
57)	b	58)	c	59)	b	60)	a								
61)	b	62)	a	63)	a	64)	b								
65)	b	66)	d	67)	c	68)	c								
69)	b	70)	b	71)	b	72)	b								
73)	c	74)	a	75)	b	76)	a								
77)	b	78)	b	79)	a	80)	a								
81)	a	82)	d	83)	c	84)	b								
85)	a	86)	d	87)	d	88)	d								
89)	c	90)	c	91)	c	92)	b								
93)	c	94)	c	95)	c	96)	a								
97)	d	98)	a	99)	b	100)	d								
101)	c	102)	a	103)	a	104)	d								
105)	a	106)	b	107)	c	108)	a								
109)	b	110)	d	111)	d	112)	c								
113)	c	114)	d	115)	d	116)	a								
117)	b	118)	a	119)	c	120)	a								
121)	d	122)	a	123)	a	124)	d								
125)	a	126)	d	127)	a	128)	a								
129)	d	130)	d	131)	d	132)	c								
133)	c	134)	d	135)	d	136)	b								
137)	a	138)	d	139)	a	140)	b								
141)	b	142)	b	143)	b	144)	a								
145)	c	146)	d	147)	b	148)	c								
149)	d	150)	b	151)	c	152)	a								
153)	c	154)	a	155)	a	156)	b								
157)	d	158)	d	159)	c	160)	c								
161)	b	162)	c	163)	a	164)	c								

N.B.Navale

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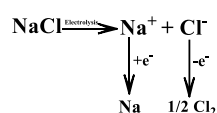
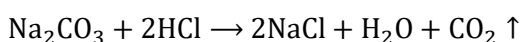
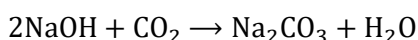
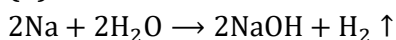
CHEMISTRY

7.S-BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS), ELEMENTS OF GROUP 1 AND 2

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 (d)



In case of options (a), (b) and (c), in the last step of heating Na_2CO_3 gives Na-metal which is not formed, because it is thermally stable.

Thus, correct sequence of reaction is given in (d).

2 (a)

$\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$; CO_2 does not react with NaHCO_3 .

3 (a)

Statement I does not illustrate the anomalous properties of lithium.

Actually, Li is harder than other alkali metals.

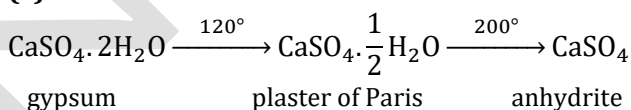
4 (a)

Ca^{2+} and C_2^{2-} ions.

5 (d)

Bones contain $\text{Ca}_3(\text{PO}_4)_2$.

6 (c)



or dead burnt plaster

The anhydrous CaSO_4 is called dead burnt plaster because it does not set like plaster of Paris when moistened with water.

8 (a)

For an ionic compound to be soluble in water its hydration energy should be more than its lattice energy.

9 (a)

The presence of ammoniated electron is responsible for the blue colour of the solution of sodium in liquid ammonia.

10 (c)

Both $\text{Be}(\text{OH})_2$ and $\text{Al}(\text{OH})_3$ are amphoteric.

11 (c)

$$W = Z \cdot e = \frac{40}{96500} \times 108 \times 137 = 0.06 \text{ g}$$

12 (a)

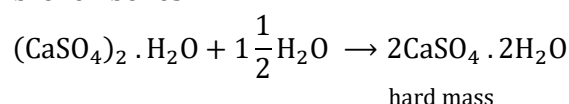
Beryllium fluoride (BeF_2) is the most soluble fluoride in water.

14 (b)

The low solubility of LiF in water is due to its high lattice enthalpy and low solubility of CsI is due to smaller hydration enthalpy of its two ions.

15 (a)

$(\text{CaSO}_4)_2 \cdot \text{H}_2\text{O}$ is plaster of Paris. Since, on adding water, it sets into a hard mass due to the formation of gypsum, it is used for plastering the broken bones.



16 (a)

The colour of the paste in the flame is brick red.

17 (b)

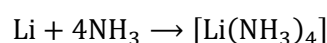
Calcium nitrate gives brick red flame and breaks down on heating to give oxygen and a brown gas (NO_2).

18 (d)

All are fact. It is the ammonia solvated electron $(\text{NH}_3)_x \cdot e$ responsible for these properties.

19 (a)

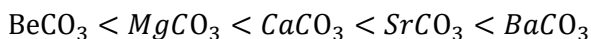
Lithium doesn't form amide when reacted with ammonia. It forms tetraamminelithium, $\text{Li}(\text{NH}_3)_4$. The equation for the reaction is as follows:



20 (b)

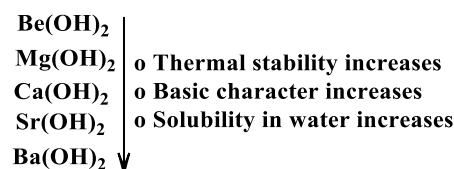
In II-A group, the stability of carbonates increase with the rise in atomic number due to small size of the resulting oxide ion.

i.e.,



21 (d)

On moving from top to bottom



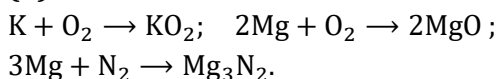
22 (c)

Gypsum is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.

23 (a)

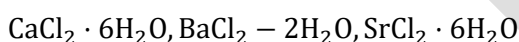
Decomposition of Li_2CO_3 , $\text{Li}_2\text{CO}_3 \xrightarrow{\Delta} \text{Li}_2\text{O} + \text{CO}_2$
 1 mol 22.4 L
 Na_2CO_3 is thermally stable, i.e., it doesn't give CO_2 gas of heating. Hence, volume of CO_2 formed on heating the mixture at STP is 22.4 L.

24 (d)



25 (b)

The correct formula of halides of alkaline earth metals is

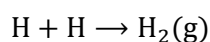
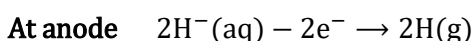
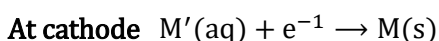
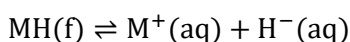


26 (c)

Due to very large size of sulphate ions, the magnitude of lattice energy of alkaline earth metal sulphates remains almost constant. Thus, their solubility is governed by only hydration energy which decreases from Be^{2+} to Ba^{2+}

27 (d)

When ionic hydrides of s-block elements are subjected to electrolysis, dihydrogen gas is liberated at anode which confirms the existence of hydrogen in the form of hydride ion (H^-). Following reactions takes place:

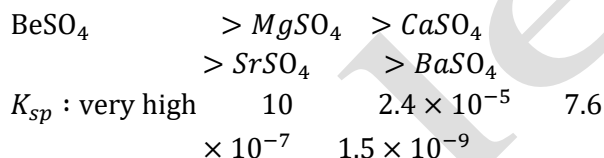


28 (a)

A more economical process but based on same principle was given by Solvay.

32 (c)

The solubility of sulphates of alkaline earth metals decreases regularly on moving down the group because solubility product decreases from BeSO_4 to BaSO_4 . Hence, the order of solubility of their sulphates is



33 (d)

Hydration energy of smaller cations are higher than those of larger cations, hence Mg^{2+} has maximum hydration energy among these.

34 (a)

It is reason for the given fact.

35 (a)

BeCl_2 is covalent in nature.

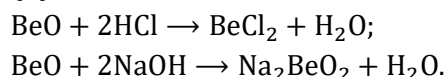
37 (a)

KI reacts with Pb^{2+} , Hg^{2+} and Cu^{2+} to give insoluble iodides of Pb, Hg and Cu.

38 (d)

Ca – brick red colour
 Sr – crimson red
 Ba – green.

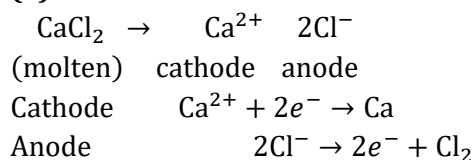
40 (d)



42 (c)

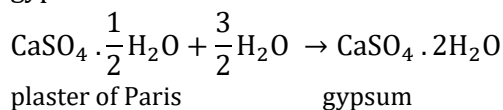
Be(OH)_2 is amphoteric as it reacts with both acids and bases.

43 (a)



44 (d)

On hydration plaster of Paris, converts into gypsum.



46 (c)

Ca(OH)_2 is also known as milk of lime.

48 (b)

BaCrO_4 is yellow solid, insoluble in CH_3COOH .

49 (c)

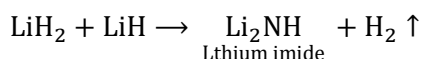
- Ba²⁺ forms insoluble BaSO₄, Pb²⁺ forms PbCl₂ and PbSO₄ both insoluble in cold water.
- 50 (a) MgO is basic; rest all are amphoteric.
- 51 (a) Blanc fixe is finely divided BaSO₄.
- 52 (b) Electronic configuration indicates that the metal is univalent (alkali metal). Its oxide will be M₂O.
- 53 (b) Sr imparts crimson red light to flame.
- 54 (c) Mme Curie and her husband Piere Curie isolated radium from pitch blende.
- 55 (a)
$$\text{Mg}(\text{HCO}_3)_2 \xrightarrow{\Delta} \text{MgO} + \text{H}_2\text{O} + 2\text{CO}_2$$
aqueous solution of (products)
magnesium bicarbonate
- 56 (a) Sodium hydrogen carbonate (NaHCO₃) is added to cakes and pastries because when it is heated, it generates bubbles of CO₂, which make cakes puffy.
- 57 (b)
$$\text{MgCO}_3 \xrightarrow{\text{Heat}} \text{MgO} + \text{CO}_2$$
The metal oxide of which is stable, has unstable carbonate
- 58 (c) The solubility of hydroxides of alkaline earth metals in water increases on moving down the group
- 59 (b) Magnesium sulphate heptahydrate [MgSO₄ · 7H₂O] is called epsom salt.
- 60 (a)
$$\text{Be} + 2\text{NaOH} \rightarrow \text{Na}_2\text{BeO}_2 + \text{H}_2$$
- 61 (b) One mole of magnesium nitride on the reaction with an excess of water gives two moles of ammonia.
$$\text{Mg}_3\text{N}_2 + 6\text{H}_2\text{O} \rightarrow 3\text{Mg}(\text{OH})_2 + 2\text{NH}_3$$

1 mol 2 mol
- 62 (a) Be(OH)₂ has minimum basicity and has amphoteric character as it dissolves both in acid and in alkali.
$$\text{Be}(\text{OH})_2 + 2\text{HCl} \rightarrow \text{BeCl}_2 + 2\text{H}_2\text{O}$$
$$\text{Be}(\text{OH})_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{BeO}_2 + 2\text{H}_2\text{O}$$
- 63 (a) The correct order of decreasing covalent character in metal halides is
LiI > LiBr > LiCl
smaller cation polarises anion to a greater extent.
Hence, possesses larger covalent nature.
- 64 (b) Cationic radius increases down the group and decreases along the period.
- 65 (b)
$$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO} + \text{Light}$$
- 66 (d) Mg is present in chlorophyll.
- 67 (c)
$$2\text{NaCl} + 2\text{H}_2\text{O} \xrightarrow{\text{Electrolysis}} 2\text{NaOH} + \text{Cl}_2$$

+ H₂ anode cathode
- 68 (c) BaSO₄ is insoluble in NH₃ and hot water.
- 69 (b)
$$\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$$

basic oxide Acidic oxide
- 70 (b) On strong heating, MgCl₂ · 6H₂O is hydrolysed by its own water of crystallisation.
$$\text{MgCl}_2 \cdot 6\text{H}_2\text{O} \xrightarrow{\Delta} \text{MgO} + 2\text{HCl} + 2\text{H}_2\text{O}$$
- 71 (b)
$${}^{226}_{88}\text{Ra} \rightarrow {}^{222}_{86}\text{Rn} + {}^4_2\text{He}$$
- 72 (b) NaHCO₃ and NaOH both reacts to form Na₂CO₃.
$$\text{NaHCO}_3 + \text{NaOH} \rightarrow \text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$$
- 73 (c) It is a fact.
- 74 (a) The correct order for lattice energy of chloride of alkali metals
LiCl > NaCl > KCl > RbCl > CsCl
Smaller cation polarises anion to a greater extent hence, possess larger covalent nature and thus higher lattice energy.
- 75 (b) Lithium imide is an inorganic compound with the chemical formula Li₂NH. This white solid can be formed by a reaction between lithium amide and

lithium hydride.



The product is light sensitive and can undergo disproportionation to form lithium nitride.

76 (a)

It is a fact.

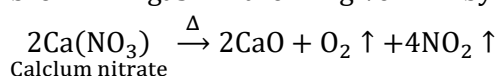
77 (b)

At cathode $\text{H}^+ + \text{e}^- \rightarrow \text{H}$, $\text{H} + \text{H} \rightarrow \text{H}_2$

At anode $\text{Cl}^- \rightarrow \text{Cl} + \theta^-$, $\text{Cl} + \text{Cl} \rightarrow \text{Cl}_2$

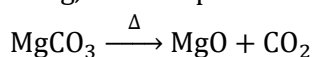
78 (b)

Brick red colour is given by Ca while O_2 and brown gas are given by nitrate.



79 (a)

On heating, it decomposes with evolution of CO_2 .



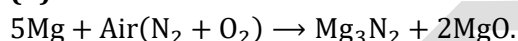
80 (a)

It is an use of Mg.

81 (a)

Smaller is ion, more is hydration energy.

82 (d)



83 (c)

Celestine is SrSO_4 .

84 (b)

The second ionisation enthalpies of alkaline earth metals are smaller than alkali metals. This is due to stable completely filled ns^2 configuration of alkali metal cations.

85 (a)

Only nitrates of heavy metals and lithium decompose on heating to produce NO_2 .

86 (d)

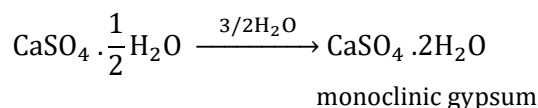
NaOH is not used in plastic industry. It is used in paper, rayon and soap industry.

87 (d)

CaI_2 has maximum covalent character due to large size of anion and possesses lowest lattice energy. Thus melting point is lowest.

88 (d)

Plaster of Paris absorb water to form monoclinic gypsum which is a hard substance.



89 (c)

Sodium hydroxide is generally prepared commercially by the electrolysis of sodium chloride is Castner-Kellner cell.

When brine solution is electrolysed using a mercury cathode and carbon anode.

91 (c)

The diagonal relationship in Be and Al is due to similar ionic size and charge/radius ratio. Generally, on moving from left to right across a period, the ionic charge increases to maximum and then decreases, while the ionic size decreases, causing an increase in its polarising power (Fajan's rule). On the other hand, on moving down a group the ionic charge remains the same while ionic size increases.

Therefore, polarising power decreases. On moving diagonally, these two effects partly balance each other and therefore, there is no marked change in their properties.

92 (b)

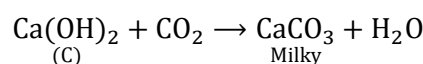
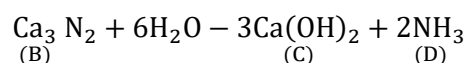
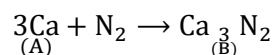
Anhydrous CaCl_2 is not used to dry alcohol as it forms $\text{CaCl}_2 \cdot 4\text{C}_2\text{H}_5\text{OH}$ and also reacts with NH_3 .

93 (c)

Carnallite ($\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$), dolomite ($\text{MgCO}_3 \cdot \text{CaCO}_3$) and sea water are the ores of magnesium, calamine (ZnCO_3) is an ore of zinc.

94 (c)

Carbon dioxide turns only lime water milky. Thus, the compound C must be $\text{Ca}(\text{OH})_2$ and the element A must be Ca. The reactions are as follows:



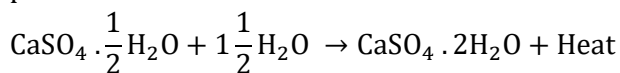
96 (a)

On moving down, water solubility of alkaline earth metals decreases. Oxides and hydroxides of alkaline earth metals are basic, except Be, which gives amphoteric.

Hence, metal is Be.

97 (d)

Plaster of Paris is a white powder. It changes into a hard mass called gypsum on mixing with water. There is a slight increase in volume during this process.



Plaster of Paris

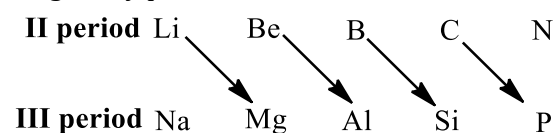
gypsum

98 (a)

Hydrogen gas is liberated in the reaction of sodium hydroxide with CO_2 .

100 (d)

The elements of IInd period show similar properties as the elements of IIIrd period which are diagonally placed to them.



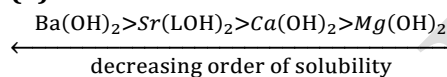
101 (c)

It is a fact.

102 (a)

A suspension of $\text{Mg}(\text{OH})_2$ in water is used as antacid under the name of milk of magnesia.

103 (a)



104 (d)

Solubility of sulphates decreases down the group, therefore BaSO_4 is least soluble sulphate while BeSO_4 is highly soluble sulphate. Hence, BaSO_4 will be most stable while BeSO_4 is least stable in aqueous solution.

105 (a)

In the manufacture of NaOH by the electrolysis of NaCl solution, the cathode and anode are separated using a diaphragm because, it prevents the reaction between H_2 and Cl_2 formed.

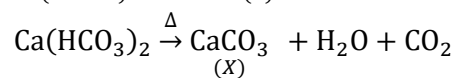
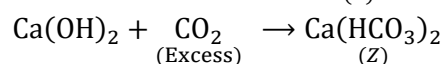
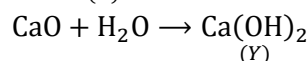
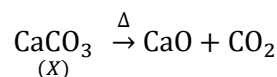
106 (b)

As the electropositive character increases from top to bottom, the stability of the carbonates and hydrogen carbonates increases from top to bottom.

107 (c)

Dolomite is $\text{CaCO}_3 \cdot \text{MgCO}_3$.

108 (a)



109 (b)

CaCO_3 is called Iceland spar.

110 (d)

It is a reason for given fact.

111 (d)

Scarlet red flame-Sr; Crimson red-Ca; Apple green-Ba

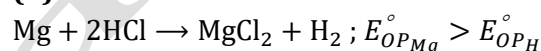
112 (c)

Ra is radioactive and thus, decays instantaneously.

113 (c)

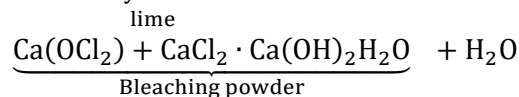
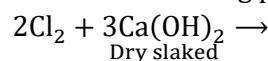
Hydration enthalpy of Li^+ is highest among all other alkali metal due to its smaller size. Therefore, Li^+ acts as a strong reducing agent.

114 (d)



115 (d)

Hasenclever plant (old method), Beckmann's plant (new method) are the commercial method to obtain bleaching powder by:



116 (a)

The order of melting point and boiling point of alkali metal halides decreases as fluoride > chloride > bromide > iodide

This trend is due to decrease in negative value of $\Delta_f H^\ominus$ of halides with increase in size.

117 (b)

$\text{NaOH} + \text{CaO}$ is called soda lime. 3 : 1

118 (a)

Plaster of Paris $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$, gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.

119 (c)

Mg is more powerful reductant than carbon.

120 (a)

Mg combines directly with N_2 .

- 121 (d)
Because of its low ionisation energies, elemental Na loses its valence s-electron easily and undergoes oxidation.
- 122 (a)
M.p. order is $\text{Mg} < \text{Ra} < \text{Ba} < \text{Sr} < \text{Ca} < \text{Be}$.
- 123 (a)
Lithium ion has small size, it has the highest hydration enthalpy, which compensate its high ionisation energy and therefore, its E° value is most negative. Thus, Li is the most powerful reducing agent in aqueous solution.
- 124 (d)
Mg due to lightness and toughness is used in ships.
- 125 (a)
Calcium is manufactured by the electrolysis of a molten mixture of calcium chloride containing some CaF_2 .

$$\text{CaCl}_2 \rightleftharpoons \text{Ca}^{2+} + 2\text{Cl}^-$$

$$\text{Ca}^{2+} + 2e^- \rightarrow \text{Ca} \text{ (at cathode)}$$
- 126 (d)
The alkali metals dissolve in liquid ammonia giving deep blue solutions which are conducting in nature.
- 128 (a)
Lithium salts impart bright red colour to the flame
- 129 (d)
From Be to Ba ionic character increases
- 130 (d)
 CaO (quick lime)
 Ca(OH)_2 – (slaked lime)
 $\text{Ca(OH)}_2 + \text{H}_2\text{O}$
 – an aqueous suspension of Ca(OH)_2 in water, call CaCO_3 (lime stone)
- 131 (d)
Alkaline earth metals combine directly with O_2 to form oxides which when further heated in presence of excess of O_2 form peroxides. Thus, BaO is formed
- 132 (c)

$$\text{LiNO}_3 \xrightarrow{\text{A}} \text{Li}_2\text{O} + \text{NO}_2 \uparrow + \text{O}_2 \uparrow$$
- 133 (c)
Sodium hydroxide, i.e. NaOH is most basic in nature.
- 134 (d)
 BaSO_4 has high lattice energy and low hydration energy.
- 135 (d)
If the temperature rises to 30°C , Cs will get melt.
- 136 (b)

$$\text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg(NO}_3)_2 + \text{H}_2 \uparrow$$
 dil.
 Hence, MgO is not formed in this reaction.
- 137 (a)
Be ($Z = 4$) has maximum covalency of four while Al ($Z = 13$) has maximum covalency of 6.
- 138 (d)

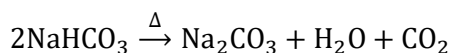
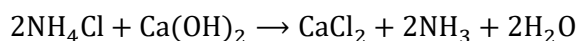
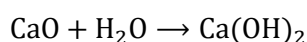
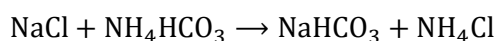
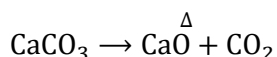
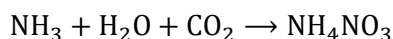
$$\text{Ca(NO}_3)_2 \rightarrow \text{CaO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$$
 Ca imparts brick red colour to flame.
- 139 (a)

$$\text{Cl}_2 + \text{Ca(OH)}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$$
 Compound 'X' is dry slaked lime.
- 140 (b)
Bicarbonates of alkaline earth metals exist only in solution state.
- 141 (b)
 BeSO_4 is soluble in water.
- 142 (b)
Thomas slag or phosphatic slag is a mixture of calcium phosphate and calcium silicate $[\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaSiO}_3]$. It is used as manure.
- 144 (a)
Follow Fajan's rule.
- 145 (c)

$$\text{Ba}^+ + e \rightarrow \text{Ba}$$

$$\text{Be}^+ \rightarrow \text{Be}^{2+} + e$$
- 146 (d)
 BeF_2 is linear (sp -hybridization), H_2O is angular (sp^3 -hybridization).
- 147 (b)
 BeCl_2 exists in polymeric form.
- 148 (c)
Mme Curie and her husband Pierre Curie isolated radium from pitch blende.
- 149 (d)
Ba possesses lowest ionization potential.
- 150 (b)

$$\text{CaC}_2 + \text{N}_2 \rightarrow \text{CaCN}_2 + \text{C}$$
- 151 (c)
For the preparation of sodium carbonate by Solvay process, few materials used are NaCl , NH_3 and Ca(OH)_2 (for CO_2).
- The process involves the following reactions:



Most of the NH_3 can be recovered in the process.

152 (a)

Only beryllium chloride (BeCl_2) is soluble in ethanol.

153 (c)

Aqueous solution of baryta (BaO) is called baryta water, *i. e.*, Ba(OH)_2 .

154 (a)

Metal oxides are basic; non-metal oxides are acidic.

157 (d)

It is a fact.

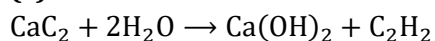
158 (d)

Ba and Ra on burning in air forms peroxides (MO_2). Rest all give oxides (MO).

159 (c)

Column I			Column II
A	Li	1	Crimson red
B	Na	2	Yellow
C	K	3	Violet
D	Rb	4	Red violet

160 (c)



161 (b)

Potassium nitrite (KNO_3) is used in gun powder.

162 (c)

BeCl_2 and RbCl has the least and greatest ionic

character respectively.

163 (a)

It is a fact.

164 (c)

Alkaline earth metals have smaller size than those of corresponding alkali metals is due to high value of nuclear charge, which increase along a period from left to right.

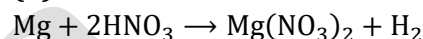
165 (a)

Group first elements are so highly electropositive that they emit electron, even when exposed to light (photoelectric effect) and this character increases on moving down the group from lithium towards caesium

166 (b)

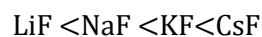
Lithium being very small in size, polarises a large CO_3^{2-} ion leading to the formation of more stable Li_2O and CO_2 .

167 (b)



168 (c)

The correct order of solubility of alkali metal fluorides in water is



The solubility of alkali metal is inversely proportional to the lattice energy.

More the lattice energy, lesser will be solubility.

169 (b)

Witherite is BaSO_3 .

170 (b)

Grignard reagents are RMgX .

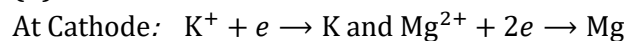
171 (c)

The basic character of metal oxides and hydroxides decreases along the period and increases down the gp

172 (d)

Mg alloys are lighter.

173 (d)



174 (b)

Mixture of MgCl_2 and MgO is called Sorel's cement. It is $\text{MgCl}_2 \cdot 5\text{MgO} \cdot x\text{H}_2\text{O}$.

175 (d)

The hydration energy of cations decrease with increase in size of cation.

176 (d)

Hydrogen carbonate of lithium does not exist in solid state due to high polarisation value of Li^+ ion which causes formation of more stable Li_2O and CO_2 .

177 (d)

Anhydrous calcium chloride is used in the laboratory for fast drying of neutral gases

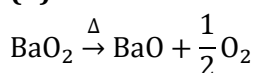
178 (c)

Anhydrous CaCl_2 is used for fast drying of neutral gases.

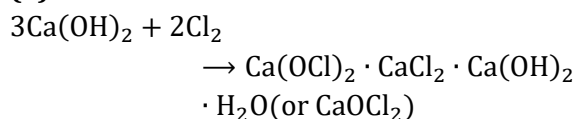
179 (b)

Abundance ratio is $\text{Ca} > \text{Mg} > \text{Be} > \text{Sr} \sim \text{Ba} > \text{Ra}$.

180 (d)



181 (a)



182 (d)

The solubility order: $\text{CaF}_2 < \text{CaCl}_2 < \text{CaBr}_2 < \text{CaI}_2$.

183 (a)

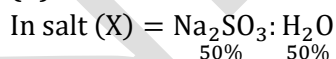
Crude sodium chloride (NaCl) obtained by crystallisation of brine solution contains CaSO_4 .

Na_2SO_4 , CaCl_2 , MgCl_2 as impurities. CaCl_2 and MgCl_2 are deliquescent, i.e. absorb moisture from atmosphere and give wet appearance to the salt. Crude salt is dissolved in water and insoluble impurities are removed by filtration. Hence, MgSO_4 is not present in crude sodium chloride.

184 (b)



186 (d)

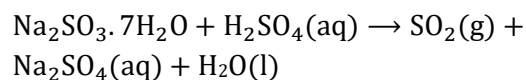


Molar mass of $\text{Na}_2\text{SO}_3 = 126$

Molar mass of $\text{H}_2\text{O} = 18$

Hence, 7 molecules of water are attached with Na_2SO_3 .

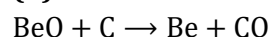
$$\therefore \text{Formula} = \text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O} \quad 126:18 \times 7 \Rightarrow 126:126 \Rightarrow 1:1$$



$$\therefore 252 \text{ g } \text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O} \text{ gives } = 22.4 \text{ L } \text{SO}_2$$

$$\therefore 2.52 \text{ g } \text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O} \text{ will give } = \frac{22.4}{252} \times 2.52 = 0.224 \text{ L}$$

187 (b)



188 (b)

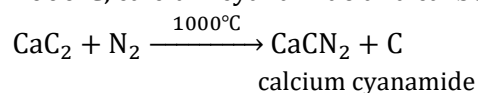
Hydration energy of alkaline earth metals sulphates decreases down the group. Mg^{2+} being smaller than the other ions, is readily hydrated. Thus, MgSO_4 has higher hydration energy than lattice energy.

189 (d)

Alkali metal hydroxides are more stronger base than alkaline earth metal hydroxides. Also basic character of hydroxides of alkaline earth metals increase down the gp.

190 (b)

When calcium carbide reacts with nitrogen at 1000°C , calcium cyanamide and carbon is formed.



191 (d)

