

## Alkaline Earth Metals

1. The electronic configuration of the outermost orbit in the case of alkaline earth metals is

- 1)  $ns^2$                       2)  $ns^2np^1$                       3)  $ns^1$                       4)  $ns^2np^4$

2. In the periodic table, the element with atomic number 38 belongs to

- 1) Period IV and group II                      2) Period IV and group IV  
3) Period III and group IV                      4) Period V and group II

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

- 1)  $Na_2CO_3$                       2)  $MgCO_3$                       3)  $K_2CO_3$                       4)  $K_2CO_3$

4. Beryllium shown diagonal relationship with

- 1)  $Na$                       2)  $B$                       3)  $Al$                       4)  $K$

5. Epsom salt is

- 1)  $CaSO_4 \cdot 2H_2O$                       2)  $MgSO_4 \cdot 7H_2O$                       3)  $BaSO_4$                       4)  $SrSO_4$

6. Plaster of Paris is

- 1)  $CaSO_4$                       2)  $CaSO_4 \cdot H_2O$                       3)  $2CaSO_4 \cdot H_2O$                       4)  $CaSO_4 \cdot 2H_2O$

7. If  $CO_2$  is passed in excess into lime water, the milkiness first formed disappears due to

- 1) Reversal of original reaction  
2) Formation of volatile calcium derivative  
3) Formation of soluble calcium bicarbonate  
4) Formation of soluble magnesium hydroxide

8. Carnallite is

- 1)  $KCl$                       2)  $LiAl(SiO_3)_2$                       3)  $MgCl_2 \cdot 6H_2O$                       4)  $KCl_2 \cdot MgCl_2 \cdot 6H_2O$

9. Which of the following does not give flame colouration?

- 1)  $MgCl_2$                       2)  $BaCl_2$                       3)  $CaCO_3$                       4)  $SrCO_3$

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

- 1)  $Be^{2+}$                       2)  $Mg^{2+}$                       3)  $Ba^{2+}$                       4)  $Ca^{2+}$

11. The fluorspar is

- 1)  $CaSO_4$                       2)  $BaSO_4$                       3)  $CaF_2$                       4)  $CaCO_3$

12. Calcium is extracted by the electrolysis of

- 1) Fused mixture of  $CaCl_2$  and  $CaF_2$                       2)  $CaCl_2$  solution  
3) Fused mixture of  $CaCl_2$  and  $NaF$                       4)  $Ca_3(PO_4)_2$  solution

13. Magnesium wire burns in the atmosphere of  $CO_2$  because

- 1) Magnesium acts as an oxidising agent  
2) Magnesium has 2 electrons in the outermost orbit  
3) Magnesium acts as a reducing agent and removes oxygen from  $CO_2$   
4) None of the above

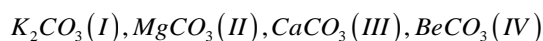
14. Select the correct statement out of the following.

- 1) Calcium fluoride is soluble in water.  
2) Barium sulphate is soluble in water.  
3) Barium hydroxide is insoluble in water.  
4) Magnesium sulphate is soluble in water.

15. Suspension of slaked lime in water is called

- 1) Quick lime                      2) Milk of lime                      3) Lime water                      4) Washing of lime

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



- 1)  $I < II < III < IV$     2)  $IV < II < III < I$     3)  $IV < II < I < III$     4)  $II < IV < III < I$

17. Silica reacts with magnesium to form a magnesium compound X. X reacts with dilute HCl and forms Y. Y is

- 1)  $MgO$     2)  $MgSiO_3$     3)  $SiCl_4$     4)  $MgCl_2$

18. Plaster of Paris is contact with water sets into a hard mass. The composition of hard mass is

- 1)  $CaSO_4 \cdot H_2O$     2)  $CaSO_4 \cdot Ca(OH)_2$     3)  $CaSO_4 \cdot 2H_2O$     4)  $CaSO_4 \cdot 2H_2O$

19. Cement contains mainly

- 1)  $Ca, Al, O$     2)  $Ca, Si, O$     3)  $Ca, S, Al, O$     4)  $Ca, Al, Si, O$

20. In cement, lime is provided by heating

- 1)  $Ca(OH)_2$     2)  $CaCO_3$     3)  $CaSO_4$     4) clay

21. The raw materials used for cement are

- 1)  $CaCO_3$  and  $SiO_2$     2)  $CaCO_3$  and clay    3)  $CaO$  and  $SiO_2$     4)  $Ca(OH)_2$  and clay

22. Mortar is a mixture of

- 1)  $Ca(OH)_2$ , silica and water    2)  $CaCO_3$  and  $SiO_2$   
3)  $CaO$  and silica    4)  $CaCO_3$ ,  $SiO_2$  and water

23. Calcium carbide reacts with water to produce

- 1)  $CH_4$     2)  $C_2H_4$     3)  $C_2H_2$     4)  $C_2H_6$

24. Magnesium has polarising power close to that of

- 1)  $Li$     2)  $Na$     3)  $K$     4)  $Cs$

25. The metal X is prepared by the electrolysis of fused chloride. It reacts with hydrogen to form a colourless solid from which hydrogen is released on treatment with water. The metal is

- 1) Al                      2) Ca                      3) Cu                      4) Zn

26. A 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 gently heating gives back X. The compound X is

- 1)  $CaCO_3$                       2)  $Na_2CO_3$                       3)  $Ca(HCO_3)_2$                       4)  $K_2CO_3$

27. The process of setting of cement under water is essentially

- 1) An oxidation process                      2) A reduction process  
3) A double decomposition process                      4) A hydration process

28.  $BeF_2$  is soluble in water, whereas, the fluorides of other alkaline earth metals are insoluble because of

- 1)  $BeF_2$  Ionic nature of  
2) Greater hydration energy of  $Be^{2+}$  ion as compared to crystal lattice  
3) Covalent nature of  $BeF_2$   
4) None of the above

29. The order of increasing lattice energy of the following compounds is

- 1)  $NaCl < CaO < BaBr < BaO$                       2)  $NaBr < NaCl < BaO < CaO$   
3)  $NaCl < NaBr < BaO < CaO$                       4)  $NaBr < NaCl < CaO < BaO$

30. Plaster of Paris hardens by

- 1) Giving off  $CO_2$                       2) Utilising water  
3) Changing into  $CaCO_3$                       4) Giving out water

31. When hydrated  $MgCl_2 \cdot 6H_2O$  is strongly heated

- 1)  $MgO$  is formed  
2)  $Mg(OH)_2$  is formed  
3)  $Mg(OH)Cl$  is formed  
4) Anhydrous  $MgCl_2$  is formed

32. Gypsum is added to clinker during cement manufacture to

- 1) Decrease the rate setting of cement  
2) Bind the particles of calcium silicate  
3) Facilitate the formation of colloidal gel  
4) All of the above

33. Which of the following is most soluble in water?

- 1)  $MgSO_4$                   2)  $CaSO_4$                   3)  $SrSO_4$                   4)  $BaSO_4$

34. At high temperature, nitrogen combines with  $CaC_2$  to give

- 1) Calcium cyanide    2) Calcium cyanamide  
3) Calcium carbonate    4) Calcium nitride

35. The hydration energy of  $Mg^{2+}$  ions is higher than that of

- 1)  $Al^{3+}$                           2)  $Be^{2+}$                           3)  $Na^+$                           4) None of these

36. Which of the following is used for taking the X-ray spectra of the digestive system?

- 1)  $CaSO_4$                           2)  $BaSO_4$                           3)  $MgSO_4$                           4)  $BaCO_3$

37. The mixture  $MgCl_2$  of and  $MgO$  is called

- 1) Sorel cement    2) Mixed salt  
3) Portland cement    4) Magnesium oxychloride

38. Portland cement does not contain

- 1)  $Ca_3Al_2O_6$                           2)  $Ca_3SiO_3$                           3)  $Ca_2SiO_4$                           4)  $Ca_3(PO_4)_2$

39. When magnesium burns in air, compounds of magnesium formed are magnesium oxide and

- 1)  $Mg_3N_2$                       2)  $MgCO_3$                       3)  $Mg(NO_3)_2$                       4)  $Mg(NO_2)_2$

40. A fire work gave bright crimson light. It probably contained a salt of

- 1)  $Ca$                       2)  $Sr$                       3)  $Ba$                       4)  $Mg$

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

- 1) Their high ionisation energy                      2) Their low electro negativity  
3) Their low hydration energy                      4) Their high lattice energy

42. In the reaction,  $Be + 2NaOH \rightarrow A + H_2$  A is

- 1)  $Be(OH)_2$                       2)  $BeO$                       3)  $Na_2BeO_2$                       4) None of these

43. Identify the correct statement

- 1) Gypsum contains a lower percentage of calcium than plaster of Paris  
2) Gypsum is obtained by heating plaster of Paris  
3) Plaster of Paris is obtained by hydration of gypsum  
4) Plaster of Paris is obtained by partial oxidation of gypsum

44. The sodium is made by electrolysis of a molten mixture of 40%  $NaCl$  and 60%  $CaCl_2$  because

- 1)  $CaCl_2$  helps in the conduction of electricity  
2)  $Ca^{2+}$  can  $NaCl$  reduce to  $Na$   
3)  $Ca^{2+}$  can displace  $Na$  from  $NaCl$   
4) This mixture has a lower melting point than  $NaCl$

45. The right order of the solubility of sulphates of alkaline earth metals is

- 1)  $Be > Ca > Mg > Ba > Sr$                       2)  $Mg > Be > Ba > Ca > Sr$   
3)  $Be > Mg > Ca > Sr > Ba$                       4)  $Mg > Ca > Ba > Be > Sr$

46. Slaking is the process of adding water to

- 1)  $CaSO_4$                       2)  $CaCl_2$                       3)  $CaCO_3$                       4)  $CaO$

47. The highly efficient method of obtaining beryllium is

- 1) Reduction of beryllium halide with  $Mg$   
2) Reduction of beryllium oxide with carbon  
3) Dissociation of beryllium carbide  
4) Electrolysis of fused beryllium chloride

48. A chloride dissolves appreciably in cold water. When placed on a platinum wire in Bunsen flame, no distinctive colour is noticed. Which one is cation?

- 1)  $Mg^{2+}$                       b)  $Ba^{2+}$                       3)  $Pb^{2+}$                       4)  $Ca^{2+}$

49. The first ionisation energies of alkaline earth metal are higher than those of the alkali metals. This is because

- 1) There is increase in the nuclear charge of the alkaline earth metal.  
2) There is decrease in the nuclear charge of the alkaline earth metal.  
3) There is no change in the nuclear charge  
4) None of the above

50. Which of the following is correct?

- 1)  $Mg$  Burns in air releasing dazzling light rich in UV rays.  
2)  $CaCl_2 \cdot 6H_2O$  When mixed with ice gives freezing mixture  
3)  $Mg$  cannot form complexes  
4)  $Be$  can form complexes due to its very small size

51. Chemical A is used for water softening to remove temporary hardness. A reacts with  $Na_2CO_3$  to generate caustic soda. When  $CO_2$  is bubbled through A, it turns cloudy. What is the chemical formula of A?

- 1)  $CaCO_3$                       2)  $CaO$                       3)  $Ca(OH)_2$                       4)  $Ca(HCO_3)_2$

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

- 1)  $Mg(NO_3)_2$       2)  $Mg_3N_2$       3)  $NH_3$       4)  $MgO$

53. The pair of amphoteric hydroxides is

- 1)  $Be(OH)_2, Zn(OH)_2$       2)  $Al(OH)_3, LiOH$   
3)  $B(OH)_3, Be(OH)_2$       4)  $Be(OH)_2, Mg(OH)_2$

54. Which of the following has maximum ionisation energy?

- 1)  $Ba \rightarrow Ba^+ + e^-$       2)  $Be \rightarrow Be^+ + e^-$       3)  $Ca \rightarrow Ca^{2+} + 2e^-$       4)  $Mg \rightarrow Mg^{2+} + 2e^-$

55. Peroxide bond is present in

- 1)  $MgO$       2)  $CaO$       3)  $LiO_2$       4)  $BaO_2$

56. The substance not likely to contain  $CaCO_3$  is

- 1) Dolomite      2) Sea shell      3) Calcined gypsum      4) Marble statue

57. (A) Beryllium and magnesium donot impart characteristic colour to the Bunsen-burner flame.

(R) Both Beryllium and magnesium have high ionisation energy.

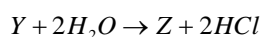
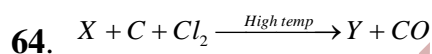
- 1) If both (1) and (R) are correct and (R) is the correct explanation of (A).  
2) If both (1) and (R) are correct and (R) is not the correct explanation of (A).  
3) If (1) is correct and (R) is wrong.  
4) If (1) is wrong and (R) is correct.  
e) If both (1) and (R) are wrong.

58. (A)  $Be(OH)_2$  dissolves in excess of  $NaOH$ .

(R)  $Be(OH)_2$  is an amphoteric compound.

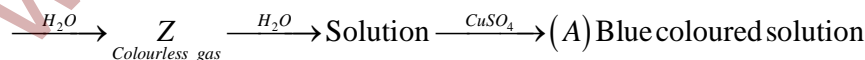


59. (A) Alkaline earth metals are softer than alkali metals.  
 (R) Atomic radii of alkaline earth metals are smaller than corresponding alkali metals in the same periods of periodic table.
60. (A) Beryllium compounds are covalent in nature.  
 (R) The size of  $Be^{2+}$  ion is larger in comparison to the radii of the other divalent ions of alkaline earth metals.
61. (A) Sulphur is estimated as  $BaSO_4$  and not as  $MgSO_4$ .  
 (R) The ionic radius of  $Mg^{2+}$  is smaller than that of  $Ba^{2+}$  ion.
62. (A)  $Na_2SO_4$  is soluble in water but  $BaSO_4$  is insoluble.  
 (R) Lattice energy of barium sulphate exceeds its hydration energy.
63. Identify the correct statement.
- 1) The percentage of calcium is lower in gypsum in comparison to plaster of Paris.
  - 2) Gypsum is not a natural product; it is obtained by heating of plaster of Paris.
  - 3) Plaster of Paris is obtained by hydration of gypsum.
  - 4) Plaster of Paris is formed by oxidation of gypsum.



Compound  $Y$  is found in polymeric chain structure and is an electron deficient molecule. The compound  $Y$  is

- 1)  $BeO$                       2)  $BeCl_2$                       3)  $Be(OH)_2$                       4)  $BeO \cdot Be(OH)_2$

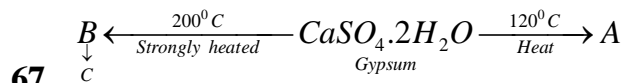


Substances  $X, Y, Z$  and  $A$  are respectively

- 1)  $Mg_3N_2, MgO, NH_3, CuSO_4 \cdot 5H_2O$                       2)  $Mg(NO_3)_2, MgO, H_2, CuSO_4 \cdot 5H_2O$   
 3)  $Mg_3N_2, MgO, NH_3, [Cu(NH_3)_4]SO_4$                       4)  $Mg(NO_3)_2, MgO_2, H_2O_2, CuSO_4 \cdot 5H_2O$

66. The hydration energy of ion  $Mg^{2+}$  is

- 1) More than that of  $Mg^{3+}$  ion      2) More than that of  $Na^+$  ion  
 3) More than that of  $Al^{3+}$  ion      4) More than that of  $Be^{2+}$  ion



A, B and C are respectively

- 1) Plaster of Paris, dead burnt plaster, calcium sulphide  
 2) Dead burnt plaster, plaster of Paris, lime  
 3) Plaster of Paris, dead burnt plaster, lime  
 4) Anhydrous calcium sulphate, plaster of Paris, calcium sulphite

68. Match (X) with (Y) and select the correct alternative

X

Y

A) Sorel cement

1)  $CaH_2$

B) Anhydronite

2)  $BaSO_4 + ZnS$

C) Hydrolith

3)  $MgCl_2 \cdot 5MgO \cdot xH_2O$

D) Lithopone

4)  $Mg(ClO_4)_2$

- |    | A | B | C | D |
|----|---|---|---|---|
| 1) | 1 | 2 | 3 | 4 |
| b) | 2 | 3 | 4 | 1 |
| c) | 3 | 4 | 1 | 2 |
| d) | 4 | 1 | 2 | 3 |

69. List-1

- A) Hydraulic mortar
- B) Dead burnt
- C) Electron
- D) Grignards reagent

List-II

- 1) RMgX
- 2) Aeroplane parts
- 3) Antiseptic
- 4)  $CaSO_4$  anhydrous

The correct match is

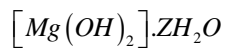
- |    | A | B | C | D |
|----|---|---|---|---|
| 1) | c | d | b | a |
| 2) | a | b | d | e |
| 3) | c | b | d | e |
| 4) | c | d | a | c |

70. List-1

- A) Plaster of paris
- B) Electron
- C) Cement mortar
- D)  $(MgCO_3)$

List-II

- 1) Antacid
- 2) In Surgical bandages
- 3) Alloy
- 4) Slaked lime, sand water, cement



The correct match is

- |    | A | B | C | D |
|----|---|---|---|---|
| 1) | a | b | c | d |
| 2) | b | c | d | a |
| 3) | c | b | d | a |
| 4) | b | c | a | d |

71. Match the following.

**List-I**

- A) Fire extinguisher
- B) Grignard reagent
- C) Moulds and crucibles
- D) Whitherite

**List-II**

- 1)  $C_2H_5MgI$
- 2)  $BaCO_3$
- 3)  $NaHCO_3$
- 4)  $CaSO_4.H_2O$
- 5)  $2CaSO_4.H_2O$

The correct match is

	A	B	C	D
1)	3	5	4	1
2)	3	1	5	2
3)	4	1	2	3
4)	5	3	2	4

72. Match the following.

**List-I**

- A) Beryl
- B) Gypsum
- C) Celestite
- D) Barytes

**List-II**

- 1)  $SrSO_4$
- 2)  $BaSO_4$
- 3)  $Be_3Al_2Si_6O_{18}$
- 4)  $CaSO_4.2H_2O$

The correct match is

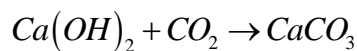
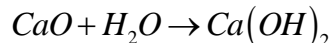
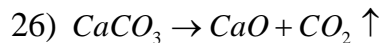
	A	B	C	D
1)	3	4	1	2
2)	1	2	3	4
3)	3	2	1	4
4)	2	3	1	4

KEY

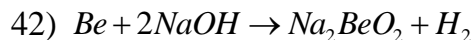
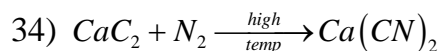
- 1) 1    2) 4    3) 2    4) 3    5) 2    6) 3    7) 3    8) 4    9) 1    10) 4  
11) 3    12) 3    13) 3    14) 4    15) 2    16) 2    17) 4    18) 3    19) 4    20) 2  
21) 2    22) 1    23) 3    24) 1    25) 2    26) 1    27) 4    28) 2    29) 2    30) 2  
31) 1    32) 1    33) 1    34) 2    35) 3    36) 2    37) 1    38) 4    39) 1    40) 2  
41) 4    42) 3    43) 1    44) 4    45) 3    46) 4    47) 4    48) 1    49) 1    50) 1  
51) 3    52) 2    53) 1    54) 4    55) 4    56) 3    57) 1    58) 2    59) 4    60) 3  
61) 2    62) 1    63) 1    64) 2    65) 3    66) 2    67) 3    68) 3    69) 1    70) 2  
71) 2    72) 4

HINTS

- 7)  $Ca(OH)_2 + CO_2 \rightarrow CaCO_3$   
 $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$
- 9)  $Mg^{+2}$  has high hydration energy
- 13)  $Mg + CO_2 \rightarrow MgO + CO$
- 16) Thermal stability order is  $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$
- 17)  $SiO_2 + 2Mg \rightarrow 2MgO + Si$   
 $MgO + 2HCl \rightarrow MgCl_2 + H_2O$
- 23)  $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$
- 25)  $Ca + H_2 \rightarrow CaH_2$   
 $CaH_2 + 2H_2O \rightarrow Ca(OH)_2 + 2H_2$

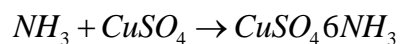
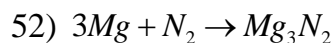
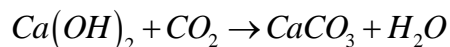
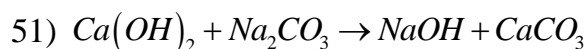


28)  $Be^{+2}$  have greater hydration energy.



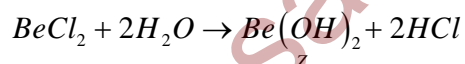
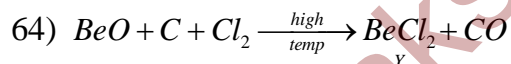
45) Due to hydration energy.

48)  $Mg^{+2}$  do not give flame colour due to high hydration energy.



59)  $Be^{+2}$  has smaller ionic radii compare with remaining in the same group.

63) Hence M.wt of Gypsum higher than M.wt of PoP.



66) Hydration energy  $\times \frac{1}{\text{size of ion}}$

