THE s-BLOCK ELEMENTS

FACT/DEFINITION TYPE QUESTIONS

1. Group 2 elements are called alkaline earth metals why? Choose the correct reason(s).
(i) Hydroxides formed by group 2 elements are alkaline in nature.
(ii) Their metal oxides are found in the earth's crust.
(iii) Their oxides are alkaline in nature
(iv) Group 2 elements react with alkalies.
(a) (i) and (ii) (b) (ii) and (iv)
(c) (i), (ii) and (iii) (d) (ii) and (iii)

2. Which of the following alkali metal is highly radioactive?
(a) Rubidium (b) Caesium
(c) Francium (d) Both (a) and (c)

3. Which of the following are found in biological fluids Na^+, Mg^{2+}, Ca^{2+}, K^+, Sr^{2+}, Li^+ and Ba^{2+}
(a) Mg^{2+}, Ca^{2+}, and Sr^{2+}
(b) Na^{2+} and K^+
(c) Na^+, K^+, Mg^{2+} and Ca^{2+}
(d) Sr^+, Li and Ba^{2+}

4. Which of the following statements is not correct for alkali metals?
(a) Alkali metals are the most electropositive metals.
(b) Alkali metals exist in free state in nature.
(c) These metals have the largest size in a particular period of the periodic table.
(d) Both (b) and (c)

5. Which of the following has largest size ?
(a) Na (b) Na^+
(c) Na^- (d) Can't be predicted

6. Ionization potential of Na would be numerically the same as
(a) electron affinity of Na^+
(b) electronegativity of Na^+
(c) electron affinity of He
(d) ionization potential of Mg

7. Which one of the following properties of alkali metals increases in magnitude as the atomic number rises ?
(a) Ionic radius (b) Melting point
(c) Electronegativity (d) First ionization energy.

8. Which of the following has density greater than water?
(a) Li (b) Na
(c) K (d) Rb

9. The elements of group 1 provide a colour to the flame of Bunsen burner due to
(a) low ionization potential
(b) low melting point
(c) softness
(d) presence of one electron in the outermost orbit

10. The metal that produces red-violet colour in the non-luminous flame is
(a) Ba (b) Ag
(c) Rb (d) Pb

11. The alkali metals have low melting point. Which of the following alkali metal is expected to melt if the room temperature rises to 30°C?
(a) Na (b) K
(c) Rb (d) Cs

12. In the case of the alkali metals
(a) the cation is less stable than the atom
(b) the cation is smaller than the atom
(c) the cation and the atom have about the same size
(d) the cation is larger than the atom

13. Which of the following is not correct ?
(a) $2Li_2O \xrightarrow[673K]{heat} Li_2O_2 + 2Li$
(b) $2K_2O \xrightarrow[673K]{heat} K_2O_2 + 2K$
(c) $2Na_2O \xrightarrow[673K]{heat} Na_2O_2 + 2Na$
(d) $2Rb_2O \xrightarrow[673K]{heat} Rb_2O_2 + 2Rb$

14. The element which on burning in air gives peroxide is
(a) lithium (b) sodium
(c) rubidium (d) caesium

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15. 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

16. Which of the following is used as a source of oxygen in space capsules, submarines and breathing masks ?
(a) Li_2O (b) Na_2O_2
(c) KO_2 (d) K_2O_2

17. The ionic mobility of alkali metal ions in aqueous solution is maximum for
(a) Li^+ (b) Na^+
(c) K^+ (d) Rb^+

18. For an aqueous solution under an electric field which of the following have lowest mobility ?
(a) Li^+ (b) Na^+
(c) K^+ (d) Rb^+

19. Which of the following pairs of substances would give same gaseous product on reaction with water?
(a) Na and Na_2O_2 (b) Ca and CaH_2
(c) Ca and CaO (d) Ba and BaO_2

20. Which is the most basic of the following?
(a) Na_2O (b) BaO
(c) As_2O_3 (d) Al_2O_3

21. Which hydride is most stable
(a) NaH (b) KH
(c) CsH (d) LiH

22. The most stable compound is
(a) LiF (b) LiCl
(c) LiBr (d) LiI

23. Which of the following represents a correct sequence of reducing power of the following elements?
(a) Li > Cs > Rb (b) Rb > Cs > Li
(c) Cs > Li > Rb (d) Li > Rb > Cs

24. What is the colour of solution of alkali metals in liquid ammonia?
(a) Bronze (b) Blue
(c) Green (d) Violet

25. The alkali metals dissolve in liquid ammonia giving deep blue solution. The solution is __x__. In concentrated solution, the blue colour changes to __y__ and becomes __z__
(a) x = paramagnetic y = colourless z = diamagnetic
(b) x = diamagnetic y = colourless z = paramagnetic
(c) x = paramagnetic y = bronze z = diamagnetic
(d) x = paramagnetic y = black z = diamagnetic

26. Na metal is stored in
(a) C_6H_6 (b) kerosene
(c) alcohol (d) toluene

27. Which of the following metal is used along with lithium to make the alloy named 'white metal' ?
(a) Nickel (b) Aluminium
(c) Silver (d) Lead

28. Which of the following metal is used as a coolant in breeder nuclear reactors?
(a) Potassium (b) Sodium
(c) Caesium (d) Rubidium

29. Which is most basic in character ?
(a) CsOH (b) KOH
(c) NaOH (d) LiOH

30. Which compound will show the highest lattice energy ?
(a) RbF (b) CsF
(c) NaF (d) KF

31. In crystals which one of the following ionic compounds would you expect maximum distance between centres of cations and anions?
(a) LiF (b) CsF
(c) CsI (d) LiI

32. Among LiI, NaI, KI, the one which is more ionic and more soluble in water is
(a) KI (b) NaI
(c) LiI (d) None of these

33. The products obtained on heating $LiNO_2$ will be
(a) $Li_2O + NO_2 + O_2$ (b) $Li_3N + O_2$
(c) $Li_2O + NO + O_2$ (d) $LiNO_3 + O_2$

34. On heating anhydrous Na_2CO_3,.....is evolved
(a) CO_2 (b) water vapour
(c) CO (d) no gas

35. Complete the following two reactions.
(i) $4LiNO_3 \rightarrow x + O_2$
(ii) $2NaNO_3 \rightarrow y + O_2$
(a) $x = LiNO_2$, $y = NaNO_2$
(b) $x = Li_2O + NO_2$, $y = Na_2O + NO_2$
(c) $x = Li_2O + NO_2$, $y = NaNO_2$
(d) $x = LiNO_2$, $y = Na_2O + NO_2$

36. Which of the following does not illustrate the anomalous properties of lithium?
(a) The melting point and boiling point of Li are comparatively high
(b) Li is much softer than the other group I metals
(c) Li forms a nitride Li_3N unlike group I metals
(d) The ion of Li and its compounds are more heavily hydrated than those of the rest of the group

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37. Why lithium react less vigorously with water than other alkali metals?
(a) Lithium has most negative $E^{\ominus}$ value
(b) Lithium has small size and very high hydration energy.
(c) Lithium has least negative $E^{\ominus}$ value
(d) Both (a) and (b)

38. Identify the correct statement
(a) Elemental sodium can be prepared and isolated by electrolysing an aqueous solution of sodium chloride
(b) Elemental sodium is a strong oxidising agent
(c) Elemental sodium is insoluble in ammonia
(d) Elemental sodium is easily oxidised

39. Washing soda has formula
(a) $Na_2CO_3.7H_2O$ (b) $Na_2CO_3.10H_2O$
(c) $Na_2CO_3.3H_2O$ (d) Na_2CO_3

40. The process associated with sodium carbonate manufacture is known as
(a) Chamber (b) Haber
(c) LeBlanc (d) Castner

41. In Solvay ammonia process, sodium bicarbonate is precipitate due to
(a) presence of NH_3
(b) reaction with CO_2
(c) reaction with brine solution
(d) reaction with NaOH

42. Sodium carbonate is manufactured by Solvay process. The products which can be recycled are
(a) CO_2 and NH_3 (b) CO_2 and NH_4Cl
(c) NaCl and CaO (d) $CaCl_2$ and CaO.

43. How NH_3 is recovered in Solvay process?
(a) By reaction of NH_4Cl and $Ca(OH)_2$
(b) By reaction of NH_4HCO_3 and NaCl
(c) By reaction of $(NH_4)_2CO_3$ with H_2O
(d) By any of the above

44. Why Solvay process cannot be extended to the manufacture of potassium carbonate?
(a) Ammonium hydrogen carbonate does not react with potassium chloride.
(b) Potassium hydrogen carbonate is too soluble to be precipitated by the addition of ammonium hydrogencarbonate to a saturated solution of potassium chloride.
(c) Ammonium carbonate is precipitated out instead of potassium hydrogen carbonate on reaction of ammonium hydrogen carbonate with potassium chloride
(d) None of the above

45. Which of the following is/are present as impurity in crude sodium chloride, obtained by crystallisation of brine solution?
(i) Sodium sulphate (ii) Calcium chloride
(iii) Magnesium chloride (iv) Potassium chloride
(a) (i), (ii) and (iv) (b) (ii) and (iii)
(c) (iii) and (iv) (d) (i), (ii) and (iii)

46. Which is manufactured by electrolysis of fused NaCl ?
(a) NaOH (b) Na
(c) NaClO (d) $NaClO_3$.

47. Baking soda is
(a) $NaHCO_3$ (b) K_2CO_3
(c) Na_2CO_3 (d) NaOH

48. Baking powder contains :
(a) $NaHCO_3$, $Ca(H_2PO_2)_2$ and starch
(b) $NaHCO_3$, $Ca(H_2PO_2)_2$
(c) $NaHCO_3$, starch
(d) $NaHCO_3$

49. Which of the following is the most abundant ion within cell fluids?
(a) Sodium ions (b) Potassium ions
(c) Calcium ions (d) None of these

50. Which of the following is non-metallic?
(a) B (b) Be
(c) Mg (d) Al

51. Electronic configuration of calcium atom may be written as
(a) $[Ne], 4p^2$ (b) $[Ar], 4s^2$
(c) $[Ne], 4s^2$ (d) $[Ar], 4p^2$

52. The outer electronic configuration of alkaline earth metal is
(a) ns^2 (b) ns^1
(c) np^6 (d) nd^{10}

53. Which of the following atoms will have the smallest size ?
(a) Mg (b) Na
(c) Be (d) Li

54. The first ionization energy of magnesium is lower than the first ionization energy of
(a) Lithium (b) Sodium
(c) Calcium (d) Beryllium

55. Which of the following relations is correct with respect to first (I) and second (II) ionization potentials of sodium and magnesium?
(a) $I_{Mg} = II_{Na}$ (b) $I_{Mg} < II_{Na}$
(c) $I_{Na} > I_{Mg}$ (d) $II_{Na} > II_{Mg}$

56. The first ionization energies of alkaline earth metals are higher than those of alkali metals. This is because
(a) there is no change in the nuclear charge
(b) there is decrease in the nuclear charge of alkaline earth metals
(c) there is increase in the nuclear charge of alkaline earth metals
(d) none of these

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57. Which of the following has maximum ionization energy

(a) $Ba \longrightarrow Ba^{+} + e^{-}$ (b) $Be \longrightarrow Be^{+} + e^{-}$

(c) $Ca \longrightarrow Ca^{2+} + 2e^{-}$ (d) $Mg \longrightarrow Mg^{2+} + 2e^{-}$

58. The most electropositive amongst the alkaline earth metals is

(a) beryllium (b) magnesium

(c) calcium (d) barium

59. Alkaline earth metals are not found free in nature because of

(a) their thermal instability

(b) their low melting points

(c) their high boiling points

(d) their greater chemical reactivity

60. A firework gives out crimson coloured light. It contains a salt of

(a) Ca (b) Na

(c) Sr (d) Ba

61. Following are colours shown by some alkaline earth metals in flame test. Which of the following are not correctly matched?

	Metal	**Colour**
(i)	Calcium	Apple green
(ii)	Strontium	Crimson
(iii)	Barium	Brick red

(a) (i) and (iii) (b) (i) only

(c) (ii) only (d) (ii) and (iii)

62. Which one of the following properties of alkali metals increases in magnitude as the atomic number rises ?

(a) Ionic radius (b) Melting point

(c) Electronegativity (d) First ionization energy

63. Out of the following elements which one do you expect to be most reactive, chemically ?

(a) Mg (b) Ca

(c) Sr (d) Ba

64. In the reaction $Mg + \underset{(steam)}{H_2O} \rightarrow X + H_2$; X is

(a) MgO (b) $Mg(OH)_2$

(c) MgH_2 (d) None of these

65. The metals A and B form oxide but B also forms nitride when both burn in air. The A and B are

(a) Cs, K (b) Mg, Ca

(c) Li, Na (d) K, Mg

66. Which of the following is the best method for preparation of BeF_2?

(a) Reaction of Be with F_2

(b) Thermal decomposition of $(NH_4)_2BeF_4$

(c) Reaction of Be with HF

(d) All of the above are equally effective

67. Arrange the following compounds in order of increasing solubility

(i) MgF_2 (ii) CaF_2,

(iii) BaF_2

(a) (i) < (ii) < (iii) (b) (ii) < (i) < (iii)

(c) (ii) < (iii) < (ii) (d) (iii) < (ii) < (i)

68. Alkaline earth metals are

(a) reducing agent (b) amphoteric

(c) dehydrating agent (d) oxidizing agent

69. The oxidation state shown by alkaline earth metals is

(a) +2 (b) +1, +2

(c) –2 (d) –1, –2

70. Which one of the following is the most soluble in water?

(a) $Mg(OH)_2$ (b) $Sr(OH)_2$

(c) $Ca(OH)_2$ (d) $Ba(OH)_2$

71. Which of the following alkaline earth metal hydroxides is amphoteric in character

(a) $Be(OH)_2$ (b) $Ca(OH)_2$

(c) $Sr(OH)_2$ (d) $Ba(OH)_2$

72. Of the metals Be, Mg, Ca and Sr of group 2 A. In the periodic table the least ionic chloride would be formed by

(a) Be (b) Mg

(c) Ca (d) Sr

73. The order of solubility of sulphates of alkaline earth metals in water is

(a) Be > Mg > Ca > Sr > Ba

(b) Mg > Be >> Ba > Ca > Sr

(c) Be > Ca > Mg > Ba >> Sr

(d) Mg > Ca > Ba >> Be > Sr

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

(a) hydration energies of cations

(b) inter-ionic attraction

(c) entropy of solution formation

(d) lattice energies of solids

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

(a) $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$

(b) $MgCO_3 < BeCO_3 < CaCO_3 < K_2CO_3$

(c) $K_2CO_3 < MgCO_3 < CaCO_3 < BeCO_3$

(d) $BeCO_3 < MgCO_3 < K_2CO_3 < CaCO_3$

76. In which of the following the hydration energy is higher than the lattice energy?

(a) $MgSO_4$ (b) $RaSO_4$

(c) $SrSO_4$ (d) $BaSO_4$

77. Which of the following alkaline earth metal sulphates has hydration enthalpy higher than the lattice enthalpy?

(a) $CaSO_4$ (b) $BeSO_4$

(c) $BaSO_4$ (d) $SrSO_4$

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78. Beryllium shows diagonal relationship with aluminium. Which of the following similarity is incorrect ?
(a) Be forms beryllates and Al forms aluminates
(b) $Be(OH)_2$ like $Al(OH)_3$ is basic.
(c) Be like Al is rendered passive by HNO_3 .
(d) Be_2C like Al_4C_3 yields methane on hydrolysis.

79. The substance **not** likely to contain $CaCO_3$ is
(a) gypsum (b) sea shells
(c) dolomite (d) a marble statue

80. Plaster of Paris is
(a) $CaSO_4.2H_2O$ (b) $CaSO_4.H_2O$
(c) $CaSO_4.\frac{1}{2}H_2O$ (d) $CaSO_4.4H_2O$

81. Gypsum on heating at 120 – 130°C gives
(a) anhydrous salt (b) hemihydrate
(c) monohydrate (d) dihydrate

82. Plaster of Paris on making paste with little water sets to hard mass due to formation of
(a) $CaSO_4$ (b) $CaSO_4.1/2H_2O$
(c) $CaSO_4.H_2O$ (d) $CaSO_4.2H_2O$

83. The chemical which is used for plastering the broken bones is
(a) $(CaSO_4)_2H_2O$ (b) $MgSO_4.7H_2O$
(c) $FeSO_4.7H_2O$ (d) $CuSO_4.5H_2O$

84. Dead burn plaster is
(a) $CaSO_4.2H_2O$ (b) $MgSO_4.7H_2O$
(c) $CaSO_4.½H_2O$ (d) $CaSO_4$

85. The formula for calcium chlorite is
(a) $Ca(ClO_4)_2$ (b) $Ca(ClO_3)_2$
(c) $CaClO_2$ (d) $Ca(ClO_2)_2$

86. Bone ash contains
(a) CaO (b) $CaSO_4$
(c) $Ca_3(PO_4)_2$ (d) $Ca(H_2PO_4)_2$

87. Mortar is a mixture of
(a) $CaCO_3$, sand and water
(b) slaked lime and water
(c) slaked lime, sand and water
(d) $CaCO_3$ and CaO

88. Which gas is released when $CaCO_3$ reacts with dilute HCl?
(a) H_2 (b) CO_2
(c) O_2 (d) Cl_2

89. Setting of cement is an
(a) exothermic reaction
(b) endothermic reaction
(c) neither endothermic nor exothermic
(d) example of neutralisation reaction

90. For a good quality cement what should be the ratio of following :
I. Silica to alumina
II. CaO to the total of oxides of SiO_2, Al_2O_3 and Fe_2O_3
(a) I = 2.5 to 4
II = Greater than 2
(b) I = Nearly 4
II = Less than 2
(c) I = 2.5
II = Closer to 2
(d) I = 2.5 to 4
II = Closer to 2

91. Calcitonin and parathyroid hormone regulate concentration of which of the following element in plasma?
(a) Calcium (b) Magnesium
(c) Sodium (d) Potassium

92. Which of the following metal is found in green colouring pigment chlorophyll of plants?
(a) Fe (b) Mg
(c) Na (d) Al

STATEMENT TYPE QUESTIONS

93. Select the correct statements
(i) Cs^+ is more highly hydrated that the other alkali metal ions
(ii) Among the alkali metals Li, Na, K and Rb, lithium has the highest melting point
(iii) Among the alkali metals only lithium forms a stable nitride by direct combination with nitrogen
(a) (i), (ii) and (iii) (b) (i) and (ii)
(c) (i) and (iii) (d) (ii) and (iii)

94. Which of the following sequence of T and F is correct for alkali metals ? Here T represents True and F represents False statement.
(i) Alkali metal hydrides are ionic solids with high melting point.
(ii) All alkali halides are ionic in nature.
(iii) Li is the least powerful reducing agent and Na is the most powerful reducing agent.
(a) TTT (b) TFT
(c) FTF (d) TFF

95. Which of the following statement(s) is/are correct regarding Li_2CO_3 and Na_2CO_3 ?
(i) Sodium salt evolve CO_2 at higher temperature.
(ii) Polarization of Na^+ is lesser than that of Li^+.
(a) Both statements (i) and (ii) are correct
(b) Both statements (i) and (ii) are incorrect
(c) Statement (ii) is correct explanation for statement (i)
(d) Statement (i) is correct explanation for statement (ii)

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96. Which of the following sequence of T and F is correct for given statements?

(i) The alkali metal hydroxides are the strongest of all bases.

(ii) All alkali metal halides have high negative enthalpies of formation.

(iii) The stability of the carbonates and hydrogen carbonates of alkali metals decrease with increase in electropositive character down the group.

(iv) Only $LiHCO_3$ exist as solid.

(a) TTFF (b) TTTT

(c) FTFT (d) TFFT

97. Which of the following statement(s) is/are correct?

(i) The atomic and ionic radii of alkaline earth metals are smaller than those of the corresponding alkali metals in the same periods.

(ii) Second ionisation enthalpies of the alkaline earth metals are smaller than those of the corresponding alkali metals.

(iii) Compounds of alkaline earth metals are more extensively hydrated than those of alkali metals

(a) (i) and (ii) (b) (ii) and (iii)

(c) (i) and (iii) (d) (i), (ii) and (iii)

98. Which of the following statements are correct ?

(i) Copper - beryllium alloys are used in the preparation of high strength springs

(ii) Metallic beryllium is used for making window X-ray tubes.

(iii) Magnesium powder is used in incendiary bombs and singnals.

(iv) Barium is used in treatment of cancer.

(a) (i), (ii) and (iv) (b) (i) and (iii)

(c) (i), (ii) and (iii) (d) (i), (ii), (iii) and (iv)

99. Which of the following is/are not characteristic property(ies) of alkaline earth metals ?

(i) All alkaline earth metal oxides are basic in nature and forms sparingly soluble hydroxides with water.

(ii) The hydrated chlorides, bromides and iodies of Ca, Sr and Ba on heating undergoes hydrolysis while corresponding hydrated halides of Be and Mg on heating undergo dehydration.

(iii) Nitrates of alkaline earth metals decompose on heating as below

$2M(NO_3)_2 \rightarrow 2MO + 4NO_2 + O_2$

(a) (i) only (b) (ii) only

(c) (i) and (iii) (d) (i) and (ii)

100. Which of the following statement(s) is/are correct regarding Al and Be ?

(i) Both of these react with alkali.

(ii) There is diagonal relationship among these elements.

(a) Both (i) and (ii) (b) Only (i)

(c) Only (ii) (d) Neither (i) nor (ii)

MATCHING TYPE QUESTIONS

101. Match the columns

Column-I (Alkali metal)	**Column-II (Colour imparted to an oxidizing flame)**
(A) Cs	(p) Yellow
(B) Rb	(q) Blue
(C) K	(r) Violet
(D) Na	(s) Red violet
(E) Li	(t) Crimson red

(a) A – (q), B – (s), C – (r), D – (p), E – (t)

(b) A – (s), B – (q), C – (r), D – (p), E – (t)

(c) A – (t), B – (r), C – (s), D – (p), E – (q)

(d) A – (q), B – (p), C – (r), D – (p), E – (t)

102. Match the columns

Column-I (Metal)	**Column-II (Oxide formed on burning)**
(A) Caesium	(p) Superoxide
(B) Lithium	(q) Peroxide
(C) Sodium	(r) Monoxide

(a) A – (q), B – (p), C – (r)

(b) A – (r), B – (q), C – (p)

(c) A – (p), B – (r), C – (q)

(d) A – (q), B – (r), C – (p)

103. Match the columns. Here Column-I shows the names of the metals used with lithium to make useful alloys and Column-II shows the uses of these alloys

Column-I	**Column-II**
(A) Aluminium	(p) Armour plates
(B) Magnesium	(q) Aircraft parts
(C) Lead	(r) Bearings for motor engines.

(a) A – (q), B – (p), C – (r)

(b) A – (q), B – (r), C – (p)

(c) A – (p), B – (q), C – (r)

(d) A – (p), B – (r), C – (q)

104. Match the columns.

Column-I (Sodium compound)	**Column-II (Uses)**
(A) Sodium carbonate	(p) In fire extinguisher
(B) Sodium chloride	(q) In manufacture of glass, soap, borax and caustic soda.
(C) Sodium hydroxide	(r) In preparation of Na_2O_2, NaOH and Na_2CO_3
(D) Sodium hydrogen carbonate	(s) In petroleum refining

(a) A – (q), B – (r), C – (s), D – (p)

(b) A – (s), B – (q), C – (r), D – (p)

(c) A – (p), B – (s), C – (r), D – (q)

(d) A – (s), B – (r), C – (p), D – (q)

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105. Match the columns

	Column-I		Column-II
(A)	Quick lime	(p)	$Ca(OH)_2$
(B)	Slaked lime	(q)	CaO
(C)	Bleaching powder	(r)	$Ca(OCl)_2$
(D)	Plaster of Paris	(s)	$CaSO_4.H_2O$

(a) A – (p), B – (q), C – (r), D – (s)
(b) A – (s), B – (r), C – (q), D – (p)
(c) A – (q), B – (p), C – (r), D – (s)
(d) A – (q), B – (p), C – (s), D – (r)

106. Match the columns

(A)	Quick lime	(p)	Setting fractured bones
(B)	Plaster of Paris	(q)	A constituent of chewing gum
(C)	Slaked lime	(r)	Manufacture of bleaching powder
(D)	Limestone	(s)	Manufacture of dyestuffs

(a) A – (p), B – (s), C – (q), D – (r)
(b) A – (s), B – (p), C – (r), D – (q)
(c) A – (q), B – (r), C – (p), D – (s)
(d) A – (r), B – (q), C – (s), D – (p)

ASSERTION-REASON TYPE QUESTIONS

Directions : Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

107. **Assertion:** Lithium salts are mostly hydrated.
Reason : The hydration enthalpy of alkali metal ions decreases with increase in ionic sizes.

108. **Assertion :** Lithium carbonate is not so stable to heat.
Reason : Lithium being very small in size polarizes large CO_3^{2-} ion leading to the formation of more stable Li_2O and CO_2

109. **Assertion :** Compounds of beryllium is largely covalent and get hydrolysed easily.
Reason : This is due to high value of ionisation potential and small size of Be.

110. **Assertion :** Radium is most abundant *s*-block element.
Reason : *s*-block elements are non-radioactive in nature.

CRITICAL THINKING TYPE QUESTIONS

111. The melting point of lithium (181°C) is just double the melting point of sodium (98°C) because
(a) down the group, the hydration energy decreases
(b) down the group, the ionization energy decreases
(c) down the group the cohesive energy decreases
(d) None of these

112. Li has the maximum value of ionisation potential among alkali metals i.e. lithium has the minimum tendency to ionise to give LI^+ ion. Thus, in aq. solution lithium is
(a) strongest reducing agent
(b) poorest reducing agent
(c) strongest oxidising agent
(d) poorest oxidising agent

113. Lithium is strongest reducing agent among alkali metals due to which of the following factor?
(a) Ionization energy (b) Electron affinity
(c) Hydration energy (d) Lattice energy

114. Which of the following statements is incorrect?
(a) Alkali metal hydroxide are hygroscopic
(b) Dissolution of alkali metal hydroxide is endothermic
(c) Aqueous solution of alkali metal hydroxides are strongly basic
(d) Alkali metal hydroxides form ionic crystals

115. Which of the following on thermal decomposition yields a basic as well as acidic oxide ?
(a) $NaNO_3$ (b) $KClO_3$
(c) $CaCO_3$ (d) NH_4NO_3

116. Which one of the following on hydrolysis, gives the corresponding metallic hydroxide, H_2O_2 and O_2?
(a) Li_2O (b) Na_2O_2
(c) NaO_2 (d) Na_2O

117. Which of the following oxides of potassium is not known ?
(a) K_2O (b) K_2O_4
(c) KO_3 (d) K_2O_3

118. Suppose an element is kept in air chamber, than air content was evaluated after sometime , oxygen and nitrogen content was found to be low comparitively. The given element will be
(a) Li (b) Rb
(c) Na (d) K

119. Suppose metal react with the oxygen to form oxide, than aqueous solution of this oxide when added to a solution of HI, solution turn yellowish brown in colour. This compound is
(a) Na_2O (b) Li_2O
(c) NaOH (d) Na_2O_2

120. Which of the following salt of lithium is most soluble in organic solvent ?
(a) LiF (b) LiCl
(c) LiBr (d) LiI

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121. Arrange the following in increasing order of their melting point ?

(A) LiCl, (B) NaCl, (C) KCl

(a) A < B < C (b) B < A < C

(c) C < A < B (d) A < B ≃ C

122. The raw materials in Solvay Process are

(a) $Na_2CO_3, CaCO_3$ and NH_3

(b) $Na_2SO_4, CaCO_3$ and NH_3

(c) NaCl, NH_3 and $CaCO_3$.

(d) NaOH, CaO and NH_3.

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

(a) smaller ionic radii (b) highest boiling points

(c) greater hardness (d) lower ionization energies.

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

(a) solubility of their hydroxides in water

(b) solubility of their sulphates in water

(c) ionization energy

(d) electronegativity

125. Which one of the following does not react with water even under red hot condition?

(a) Na (b) Be

(c) Ca (d) K

126. Magnesium burns in CO_2 to form

(a) MgO + C (b) MgO + CO

(c) $MgCO_3$ (d) MgO.

127. Arrange the following in increasing order of their solubility?

$MgCO_3$(A), $CaCO_3$(B), $SrCO_3$(C), Na_2CO_3(D)

(a) A < B < C < D (b) A < C < B < D

(c) C < A < B < D (d) C < B < A < D

128. Which of the following will precipitate first when aqueous solution containing sulphate ions are added?

(a) Mg^{2+} (b) Ca^{2+}

(c) Sr^{2+} (d) Ba^{2+}

129. If the fluoride salts of group 2 metals are dissolved in water,than which of the following will show high solubility?

(a) BaF_2 (b) RbF_2

(c) CaF_2 (d) BeF_2

130. Aqueous solution of group 2 is precipitated by adding Na_2CO_3, then this precipitate is tested on flame, no light in visible region is observed , this element can be

(a) Ba (b) Mg

(c) Ca (d) Sr

131. Which of the following statement is false ?

(a) Strontium decomposes water readily than beryllium

(b) Barium carbonate melts at a higher temperature than calcium carbonate

(c) Barium hydroxide is more soluble in water than magnesium hydroxide

(d) Beryllium hydroxide is more basic than barium hydroxide.

132. Bleaching powder is obtained by the interaction of chlorine with

(a) dil. solution of $Ca(OH)_2$

(b) dry CaO

(c) conc. solution of $Ca(OH)_2$

(d) dry slaked lime

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HINTS AND SOLUTIONS

FACT/DEFINITION TYPE QUESTIONS

1. **(c)** Group 2 elements are called alkaline earth metals as their oxides and hydroxides are alkaline in nature and these metal oxides are found in the earth's crust.

2. **(c)** Francium is highly radioactive.

3. **(c)** Monovalent sodium and potassium ions and divalent magnesium and calcium ions are found in large proportions in biological fluids.

4. **(b)** Alkali metals readily lose electron to give monovalent M^+ ion. Hence they are never found in free state in nature.

5. **(c)** A cation is always much smaller than the corresponding atom, whereas an anion is always larger than the corresponding atom.

Hence, correct order of the size is

$$Na^- > Na > Na^+$$

6. **(a)** $Na \rightarrow Na^+ + e^-$; IE of Na = + ve

$Na^+ + e^- \rightarrow Na$; E.A. of Na^+ = – ve

Both are equal but opposite in nature

7. **(a)** Within a group, ionic radius increases with increase in atomic number. The melting points decrease down the group due to weakening of metallic bond. The electronegativity and the 1st ionization energy also decreases down the group.

8. **(d)** Li, Na, K are lighter than water but Rb is heavier than water.

9. **(a)**

10. **(c)** Alkali metals have large size. When they are heated in the flame of Bunsen burner, the electrons present in the valence shell move from lower energy level to higher energy level by absorption of heat from the flame. When they come back to the ground state, they emit the extra energy in the form of visible light to provide colour to the flame.

11. **(d)**

12. **(b)** Gp 1 metals form cations M^+ by loss of electron from outermost shell. Electronic configuration of Gp 1 metals is ns^1. When the outer electron is removed to give a positive ion, the size decreases because the outermost shell is completely removed. After removal of an electron, the positive charge of the nucleus is greater on the remaining electrons so that each of the remaining electrons are attracted more strongly towards the nucleus. This further reduces the size.

13. **(a)** Lithium does not form peroxide.

14. **(b)** Sodium metal on burning in air gives sodium peroxide.

15. **(c)** All the alkali metals when heated with oxygen form different types of oxides for example lithium forms lithium oxide (Li_2O), sodium forms sodium peroxide (Na_2O_2), while K, Rb and Cs form their respective superoxides.

$$2Li + \frac{1}{2} O_2 \rightarrow Li_2O$$

16. **(c)** Because KO_2 not only provides O_2 but also removes $1CO_2$ as follows

$$4KO_2 + 2CO_2 \rightarrow 2K_2CO_3 + 3O_2$$

$$4KO_2 + 4CO_2 + 2H_2O \rightarrow KHCO_3 + 3O_2$$

17. **(d)** Smaller the size of cation higher is its hydration energy and lesser is its ionic mobility hence the correct order is $Li^+ < Na^+ < K^+ < Rb^+$

18. **(a)** In aqueous solution because of high charge density of Li^+ it is heavily hydrated, therefore due to its extensive hydration which increases its size to highest the mobility of Li^+ ion will be lowest.

19. **(b)** Both Ca and CaH_2 produce H_2 gas with water.

$$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2 \uparrow$$

$$CaH_2 + 2H_2O \longrightarrow Ca(OH)_2 + 2H_2 \uparrow$$

20. **(a)**

21. **(d)** The basic character and stability of hydrides decrease down the group.

22. **(a)** For a given metal, order of stability of halides is

MF > MCl > MBr > MI

23. **(a)** A reducing agent is a substance which can loose electron and hence a reducing agent should have low ionisation energy. Now since ionisation energy decreases from Li to Cs, the reducing property should increase from Li to Cs. The only exception to this is lithium. This is because the net process of converting an atom to an ion takes place in 3 steps.

(i) $M(s) \rightarrow M(g)$ ΔH = Sublimation energy

(ii) $M(g) \rightarrow M^+(g) + e^-$ ΔH = Ionisation energy

(iii) $M^+(g) + H_2O \rightarrow M^+(aq)$ ΔH = Hydration energy

The large amount of energy liberated in hydration of Li (because of its small size) makes the overall ΔH negative. This accounts for the higher oxidation potential of lithium i.e., its high reducing power.

24. **(b)** The alkali metals dissolve in liquid ammonia giving deep blue solution.

25. **(c)** x = paramagnetic y = bronze

z = diamagnetic

26. **(b)** Na reacts violently and may catch fire on exposure to moisture (air + water). So it is always stored in kerosene. Na reacts with alcohol to produce H_2.

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27. **(d)** Lithium with lead is used to make white metal.

28. **(b)** Liquid sodium is used as a coolant in fast breeder nuclear reactors.

29. **(a)** Since the ionization energies of alkali metals decrease down the group, the ionic character and consequently basic property of their hydroxides increases in the same order, i.e. from LiOH to CsOH.

30. **(c)** With the same anion, smaller the size of the cation, higher is the lattice energy. The correct order of size of cations is –

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

Hence, the lattice energy of NaF will be maximum. i.e., NaF.

31. **(c)** As Cs^+ ion has larger size than Li^+ and I^- has larger size than F^-, therefore maximum distance between centres of cations and anions is in CsI.

32. **(a)** Larger cation (K^+) develops less polarisation in anion and thus KI has more ionic nature and more soluble in water.

33. **(a)** $4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

34. **(d)** Anhydrous form of Na_2CO_3 does not decompose on heating even to redness. It is a amorphous powder called soda ash.

35. **(c)** $4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

$2\ NaNO_3 \rightarrow 2NaNO_2 + O_2$

36. **(b)** Li is much softer than the other group I metals. Actually Li is harder then other alkali metals.

37. **(b)** Lithium although has most negative $E^{\ominus}$ value reacts less vigorously with water than other alkali metals due to its small size and very high hydration energy.

38. **(d)** Elemental sodium is easily oxidised (has low I.P.) and acts as reductant.

39. **(b)** Washing soda is $Na_2CO_3.10\ H_2O$.

40. **(c)**

41. **(c)** $NH_4HCO_3 + \underset{\text{Brine}}{NaCl} \longrightarrow \underset{\text{Sod. bicarbonate ppt.}}{NaHCO_3 \downarrow} + NH_4Cl$

42. **(a)** CO_2 and NH_3 formed are reused (See Solvay process)

43. **(a)** NH_3 is recovered when the solution containing NH_4Cl is treated with $Ca(OH)_2$

$2NH_4Cl + Ca(OH)_2 \rightarrow 2NH_3 + CaCl_2 + H_2O$

44. **(b)**

45. **(d)** Sodium sulphate, calcium chloride and magnesium chloride are present as impurities in crude sodium chloride.

46. **(b)** Na metal is manufactured by electrolysis of fused NaCl by two methods.

(i) Castner's process

(ii) Down's process

In both the above processes electrolysis of fused sodium chloride produces Na at cathode.

$$2NaOH \rightleftharpoons 2Na^+ + OH^-$$

at cathode $2Na^+ + 2e^- \longrightarrow 2Na$

at anode $4OH^- \longrightarrow 2H_2O + O_2 + 4e$

47. **(a)** $NaHCO_3$ (baking soda) is one of the major constituents of baking powder.

48. **(a)** Baking powder has starch, $NaHCO_3$ and $Ca(H_2PO_2)_2$.

49. **(b)** Potassium ions are the most abundant cations within cell fluids.

50. **(a)** Metallic character decreases, as we go to the right side in a period and increases when we move downwards in a group.

51. **(b)** Ca (20) = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$ = [Ar], $4s^2$.

52. **(a)**

53. **(c)** Within a period, the size decreases from left to right, i.e., Na > Mg > Li > Be. Atomic size increases down the group.

54. **(d)**

55. **(d)** The IInd ionisation potential of Na is higher than Mg because it requires more energy to remove an electron from a saturated shell or stable (fully filled) orbital.

$$_{11}Na \longrightarrow 1s^2,\ 2s^2\ 2p^6,\ 3s^1 \xrightarrow{I}$$

$$1s^2,\ 2s^2\ 2p^6,\ 3s^0 \xrightarrow{II}$$

$$1s^2,\ 2s^2\ 2p^5,\ 3s^0$$

$$_{12}Mg \longrightarrow 1s^2,\ 2s^2\ 2p^6,\ 3s^2 \xrightarrow{I}$$

$$1s^2,\ 2s^2\ 2p^6,\ 3s^1 \xrightarrow{II} 1s^2,\ 2s^2\ 2p^6,\ 3s^0$$

Here Na-I < Mg-I and Na-II > Mg-II.

56. **(c)** As we go from grp I element to grp II element in a period, an extra electron is added in same shell which results in increase in nuclear charge due to which force of attraction by the nucleus increases and hence ionic radii decreases and consequently I.E. increases.

57. **(d)** **58. (d)** **59. (d)** **60. (c)**

61. **(a)** Calcium gives brick red colour and barium gives apple green colour in flame test.

62. **(a)** Within a group, ionic radius increases with increase in atomic number. The melting points decrease down the group due to weakning of metallic bond. The electronegativity and the 1st ionization energy also decreases down the group.

63. **(d)** Barium is most electropostive element among those given. Hence it is most reactive.

64. **(a)** $Mg(OH)_2$ is not formed because of poor solubility of MgO in H_2O.

65. **(d)** K and Mg, both form oxides

$$K + O_2 \rightarrow KO_2; 2Mg + O_2 \rightarrow 2MgO$$

Mg form nitride also $3Mg + N_2 \rightarrow Mg_3N_2$

K does not form nitride.

66. **(b)** Thermal decomposition of $(NH_4)_2BeF_4$ is the best method for preparation of BeF_2.

67. **(b)** $BaF_2 > MgF_2 > CaF_2$

68. **(a)** Alkaline earth metals have a fairly strong tendency to lose their outermost electrons due to which they act as reducing agent.

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69. **(a)**

70. **(d)** For a compoud to be soluble, the hydration energy must exceed lattice energy. For Gp.II hydroxides ($Mg(OH)_2$, $Sr(OH)_2$, $Ca(OH)_2$, $Ba(OH)_2$, lattice energy decrease more rapidly than the hydration energy & so their solubility increases down the group. $Ba(OH)_2 > Sr(OH)_2 > Ca(OH)_2 > Mg(OH)_2$

71. **(a)** $Be(OH)_2$ is amphoteric while $Ca(OH)_2$, $Sr(OH)_2$ and $Ba(OH)_2$ are all basic.

72. **(a)** Because of small atomic size and high I.E. Be forms covalent chloride.

73. **(a)**

74. **(a)** As we move down the group, the lattice energies of carbonates remain approximately the same. However the hydration energies of the metal cation decreases from Be^{++} to Ba^{++}, hence the solubilities of carbonates of the alkaline earth metal decrease down the group mainly due to decreasing hydration energies of the cations from Be^{++} to Ba^{++}.

75. **(a)** As the basicity of metal hydroxides increases down the group from Be to Ba, the thermal stability of their carbonates also increases in the same order. Further group 1 compounds are more thermally stable than group 2 because their hydroxide are much basic than group 2 hydroxides therefore, the order of thermal stability is

$BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$.

76. **(a)** In alkaline earth metals ionic size increases down the group. The lattice energy remains constant because sulphate ion is so large, so that small change in cationic sizes do not make any difference. On moving down the group the degree of hydration of metal ions decreases very much leading to decrease in solubility

$\therefore\ BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$

77. **(b)** Be^{2+} is very small, hence its hydration enthalpy is greater than its lattice enthalpy

78. **(b)** The $Be(OH)_2$ and $Al(OH)_3$ are amphoteric in nature.

79. **(a)** Gypsum is $CaSO_4.2H_2O$

80. **(c)** Chemically plaster of Paris is $CaSO_4.1/2H_2O$.

81. **(b)** $$CaSO_4 \cdot 2H_2O \xrightarrow{120^\circ C} CaSO_4 \cdot \frac{1}{2}H_2O$$

Plaster of Paris is hemihydrate.

82. **(d)** Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$) on making paste with little water sets to a hard mass due to formation of gypsum ($CaSO_4.2H_2O$).

$$CaSO_4 \cdot \frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4.2H_2O + \text{Heat}$$

Plaster of Paris Gypsum

83. **(a)** $(CaSO_4)_2.H_2O$ – Plaster of paris is used for plastering the broken bones.

84. **(d)** **85.** **(d)** **86.** **(c)** **87.** **(c)**

88. **(b)** $CaCO_3 + 2HCl \longrightarrow 2CaCl_2 + H_2O + CO_2$

89. **(a)** During setting of cement, silicates and aluminates of calcium are hydrated. Hydration is an exothermic process. Therefore setting of cement is exothermic process.

90. **(d)** For a good quality cement, the ratio of silica (SiO_2) to alumina (Al_2O_3) should be between 2.5 and 4 and the ratio of lime (CaO) to the total of the oxides of silicon (SiO_2), aluminium (Al_2O_3) and iron (Fe_2O_3) should be as close as possible to 2.

91. **(a)** The calcium concentration in plasma is regulated at about 100 mgL^{-1}. It is maintained by two hormones: calcitonin and parathyroid hormone.

92. **(b)**

STATEMENT TYPE QUESTIONS

93. **(d)** Amongst alkali metal Li ions are highly hydrated.

94. **(d)** Lithium halides are some what covalent in nature. Li is the most powerful reducing agent and Na is the least powerful reducing agent.

95. **(c)**

96. **(a)** For statement (iii), stability of the carbonates and hydrogen carbonates of alkali metals increases with increase in electropositive character down the group. Hydrogen carbonate of lithium does not exist as a solid.

97. **(d)** All the given statements are correct.

98. **(c)** Radium is used in treatment of cancer.

99. **(d)** All alkaline earth metal oxides except BeO are basic in nature. BeO is amphoteric in nature.
Hydrated halides of Ca, Sr and Ba on heating undergo dehydration while corresponding hydrated halides of Be and Mg on heating suffer hydrolysis.

100. **(a)**

MATCHING TYPE QUESTIONS

101. **(a)**

102. **(c)** $Cs + O_2 \rightarrow CsO_2$ (Superoxide)
$4Li + O_2 \rightarrow 2Li_2O$ (Oxide)
$2Na + O_2 \rightarrow Na_2O_2$ (Peroxide)

103. **(a)** Lithium metal is used to make useful alloys, for example with lead to make 'white metal' bearings for motor engines, with aluminium to make aircraft parts, and with magnesium to make armour plates.

104. **(a)** **105.** **(c)**

106. **(b)** Quick lime is used for the manufacture of dyestuffs.
Plaster of Paris is used for setting of fractured bones.
Slaked lime is used for the manufacture of bleaching powder.
Limestone is a constituent of chewing gum.

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ASSERTION-REASON TYPE QUESTIONS

107. (a) Li^+ has maximum degree of hydration among other alkali metals.

108. (a) Lithium carbonate is unstable to heat; 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.

109. (a) Because of high value of ionisation enthalpy and small size it forms compound which are highly covalent in nature, hence, it get hydrolysed easily.

110. (d) Both assertion and reason are false.
Radium is the rarest of all s-block elements comprising only 10^{-10} percent of igneous rocks. Francium (s-block member) is radioactive; its long lived isotope ^{223}Fr ahs a half life of only 21 minutes.

CRITICAL THINKING TYPE QUESTIONS

111. (c) The atom becomes larger on descending the group, so the bonds becomes weaker (metallic bond), the cohesive force/energy decreases and accordingly melting point also decreases.

112. (a) The ionisation potential value of lithium is maximum among alkali metals i.e., its tendency to ionise to give Li^+ ions should be the minimum i.e. Li should be the poorest reducing agent. But, lithium is the strongest reducing agent in aq. solution. This is due to the largest value of hydration energy of Li^+ ions.

113. (c) Li due to highest hydration energy among the alkali metals is the strongest reducing agent.

114. (b) During the dissolution of alkali metal hydrides energy is released in large amount, i.e., it is exothermic in nature.

115. (c) Calcium carbonate on thermal decomposition gives CaO (Basic oxide) and CO_2 (Acidic oxide)

$$\underset{}{CaCO_3} \xrightarrow{\Delta} \underset{\text{Basic oxide}}{CaO} + \underset{\text{Acidic oxide}}{CO_2\uparrow}$$

116. (c) $2NaO_2 + 2H_2O \rightarrow 2NaOH + H_2O_2 + O$

117. (b) O_4^{2-} ion is not possible and K_2O_4 is unknown .

118. (a) All the given elements react with oxygen to form oxides but only Li also react with nitrogen to form Li_3N.

119. (d) (a) and (b) forms corresponding hydroxides (NaOH and LiOH) in aqueous solution

$$M_2O + H_2O \longrightarrow 2M^+ + 2OH^- \ (M = Na \text{ or } Li)$$

Therefore reaction of HI with (a), (b) and (c) is simply a neutralization reaction, while aqueous solution of (d) form H_2O_2 which act as oxidizing agent, hence convert Iodide to Iodine(I_2).

$$Na_2O_2 + 2H_2O \longrightarrow 2Na^+ + 2OH^- + H_2O_2$$

120. (d) LiI is more soluble as the degree of covalent character is high due to larger size of anion i.e., iodide ion by greater polarization of lithium cation.

121. (a)

122. (c) NaCl (brine), NH_3 and CO_2 are raw materials. $CaCO_3$ is source of CO_2.

123. (d) Because of larger size and smaller nuclear charge, alkali metals have low ionization potential relative to alkaline earth metals.

124. (a) Lattice energy decreases more rapidly than hydration energy for alkaline earth metal hydroxides. On moving down a group $\therefore$ solubility of their hydroxides increases.

125. (b) $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

$2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$

All alkali metals decompose water with the evolution of hydrogen.

$Ca + 2H_2O \longrightarrow Ca(OH)_2 + H_2\uparrow$

$Sr + 2H_2O \longrightarrow Sr(OH)_2 + H_2\uparrow$

$Be + 2H_2O \longrightarrow$ No reaction

Ca, Sr, Ba and Ra decompose cold water readily with evolution of hydrogen. Mg decomposes boiling water but Be is not attacked by water even at high temperatures as its oxidation potential is lower than the other members.

126. (a) Mg burns in CO_2 to give MgO and C.

127. (d) Group1 carbonates are more soluble than group 2 which are sparingly soluble, and also in case of group 2, down the group the solubility of carbonates decreases.

128. (d) Down the group solubility of sulphate decreases. Thus Ba^{2+} ions will precipitate out most easily.

129. (a) BeF_2 is highly soluble in water due to the high hydration enthalpy of the small Be^{2+} ion.

130. (b) Electrons in Mg due to its small size are tightly bound so they cannot be excited by the flame.

131. (d) $Be(OH)_2$ is amphoteric, but the hydroxides of other alkaline earth metals are basic. The basic strength increases gradually.

132. (d) When cold calcium hydroxide reacts with chlorine, then bleaching powder is obtained.

$$\underset{\text{slaked lime}}{3Ca(OH)_2} + 2Cl_2 \longrightarrow \underset{\text{Bleaching powder}}{Ca(OCl)_2.Ca(OH)_2.CaCl_2.2H_2O}$$

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