SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

Alkali metals

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

(A) high energy (B) lower frequencies

(C) longer wave-lengths (D) zero wave number

2. The reaction of an element A with water produces combustible gas B and an aqueous solution of C. When another substance D reacts with this solution C also produces the same gas B. D also produces the same gas even on reaction with dilute H_2SO_4 at room temperature. Element A imparts golden yellow colour to Bunsen flame. Then, A, B, C and D may be identified as

(A) Na, H_2, NaOH and Zn (B) K, H_2, KOH and Zn

(C) K, H_2, NaOH and Zn (D) Ca, H_2, $CaCOH_2$ and Zn

3. Which of the following carbonate of alkali metals has the least thermal stability?

(A) Li_2CO_3 (B) K_2CO_3 (C) Cs_2CO_3 (D) Na_2CO_3

4. The alkali metals which form normal oxide, peroxide as well as super oxides are

(A) Na, Li (B) K, Li (C) Li, Cs (D) K, Rb

5. The pair of compounds, which cannot exist together in a solution is

(A) $NaHCO_3$ and NaOH (B) Na_2CO_3 and NaOH

(C) $NaHCO_3$ and Na_2CO_3 (D) $NaHCO_3$ and H_2O

6. Solution of sodium metal in liquid ammonia is a strong reducing agent due to presence of

(A) solvated sodium ions (B) solvated hydrogen ions

(C) sodium atoms or sodium hydroxide (D) solvated electrons

7. The order of solubility of lithium halides in non-polar solvents follows the order

(A) LiI > LiBr > LiCl > LiF (B) LiF > LiI > LiBr > LiCl

(C) LiCl > LiF > LiI > LiBr (D) LiBr > LiCl > LiF > LiI

8. The salt which finds uses in qualitative inorganic analysis is

(A) $CuSO_4 \cdot 5H_2O$ or $ZnSO_4 \cdot 5H_2O$ (B) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

(C) $Na(NH_4)HPO_4 \cdot 4H_2O$ (D) $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

9. Fire extinguishers contain

(A) conc. H_2SO_4 solution (B) H_2SO_4 and $NaHCO_3$ solutions

(C) $NaHCO_3$ solution (D) $CaCO_3$ solution

10. $CsBr_3$ contains

(A) Cs–Br covalent bonds (B) Cs^{3+} and Br^- ions

(C) Cs^+ and Br_3^- ions (D) Cs^{3+} and Br_3^{3-} ions

11. $Na + Al_2O_3 \xrightarrow{\text{High temperature}} X \xrightarrow[\text{water}]{CO_2 \text{ in}} Y$; compound Y is

(A) $NaAlO_2$ (B) $NaHCO_3$ (C) Na_2CO_3 (D) Na_2O_2

12. aq. $NaOH + P_4$ (white) $\longrightarrow PH_3 + X$; compound X is

(A) NaH_2PO_2 (B) $NaHPO_4$ (C) Na_2CO_3 (D) $NaHCO_3$

13. When K_2O is added to water, the solution becomes basic in nature because it contains a significant concentration of

(A) K^+ (B) O^{2-} (C) OH^- (D) O_2^{2-}

14. The order of melting point of chlorides of alkali metals is

(A) LiCl > NaCl > KCl < CsCl (B) LiCl > NaCl > KCl > CsCl

(C) NaCl > KCl > CsCl > LiCl (D) LiCl > NaCl > CsCl > KCl

15. $NaOH(Solid) + CO \xrightarrow{200°C} X$; product X is

(A) $NaHCO_3$ (B) Na_2CO_3 (C) HCOONa (D) H_2CO_3

16. The aqueous solutions of lithium salts are poor conductor of electricity rather than other alkali metals because of

(A) high ionisation energy

(B) high electronegativity

(C) lower ability of Li^+ ions to polarize water molecules

(D) higher degree of hydration of Li^+ ions

17. In $LiAlH_4$, metal Al is present in

(A) anionic part (B) cationic part

(C) in both anionic and cationic part (D) neither in cationic nor in anionic part

18. Which one of the following fluoride of alkali metals has the highest lattice energy?

(A) LiF (B) CsF (C) NaF (D) KF

19. Crown ethers and cryptands form

(A) complexes with alkali metals

(B) salts of alkali metals

(C) hydroxides of alkali metals used for inorganic quantitative analysis

(D) organic salts of alkali metals

20. The correct order of degree of hydration of M^+ ions of alkali metals is

(A) $Li^+ < K^+ < Na^+ < Rb^+ < Cs^+$ (B) $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$

(C) $Cs^+ < Rb^+ < K^+ < Na^+ < Li^+$ (D) $Cs^+ < Rb^+ < Na^+ < K^+ < Li^+$

21. The commercial method of preparation of potassium by reduction of molten KCl with metallic sodium at 850°C is based on the fact that

(A) potassium is solid and sodium distils off at 850 °C

(B) potassium being more volatile and distils off thus shifting the reaction forward

(C) sodium is less reactive than potassium at 850 °C with respect to Cl_2

(D) sodium has less affinity to chloride ions in the presence of potassium ion

22. The 'milk of magnesia' used as an antacid is chemically

(A) $Mg(OH)_2$ (B) MgO (C) $MgCl_2$ (D) $MgO + MgCl_2$

23. An alkaline earth metal (M) gives a salt with chlorine, which is soluble in water at room temperature. It also forms an insoluble sulphate whose mixture with a sulphide of a transition metal is called 'lithopone' -a white pigment. Metal M is

(A) Ca (B) Mg (C) Ba (D) Sr

24. The hydroxide of IInd A metal, which has the lowest value of solubility product (K_{sp}) at normal temperature (25°C) is

(A) $Ca(OH)_2$ (B) $Mg(OH)_2$ (C) $Sr(OH)_2$ (D) $Be(OH)_2$

25. $(Yellow\ ppt)\ T \xleftarrow{K_2CrO_4/H^+} X \xrightarrow{dil.HCl} Y(Yellow\ ppt) + Z\uparrow (pungent\ smelling\ gas)$

If X gives green flame test. Then, X is

(A) $MgSO_4$ (B) BaS_2O_3 (C) $CuSO_4$ (D) PbS_2O_3

26. $Mg_2C_3 + H_2O \longrightarrow$ X (organic compound). Compound X is

(A) C_2H_2 (B) CH_4 (C) propyne (D) ethene

27. The hydration energy of Mg^{2+} is

(A) more than that of Mg^{3+} ion (B) more than that of Na^+ ion

(C) more than that of Al^{3+} ion (D) more than that of Be^{2+} ion

28. The correct order of second ionisation potentials (IP) of Ca, Ba and K is

(A) K > Ca > Ba (B) Ba > Ca > K (C) K > Ba > Ca (D) K = Ba = Ca

29. EDTA is used in the estimation of

(A) Mg^{2+} ions (B) Ca^{2+} ions

(C) both Ca^{2+} and Mg^{2+} ions (D) Mg^{2+} ions but not Ca^{2+} ions

30. The correct order of solubility is

(A) $CaCO_3 < KHCO_3 < NaHCO_3$

(B) $KHCO_3 < CaCO_3 < NaHCO_3$

(C) $NaHCO_3 < CaCO_3 < KHCO_3$

(D) $CaCO_3 < NaHCO_3 < KHCO_3$

31. The complex formation tendency of alkaline earth metals decreases down the group because

(A) atomic size increases

(B) availability of empty d and f-orbitals increases

(C) nuclear charge to volume ratio increases (D) all the above

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

(A) Be and Mg (B) Mg and Ca (C) Be and Ca (D) Be and Ba

33. $Y \xleftarrow{\Delta, 205^\circ C} CaSO_4 \cdot 2H_2O \xrightarrow{\Delta, 120^\circ C} X$. X and Y are respectively

(A) plaster of paris, dead burnt plaster

(B) dead burnt plaster, plaster of paris

(C) CaO and plaster of paris

(D) plaster of paris, mixture of gases

34. A metal M readily forms water soluble sulphate, and water insoluble hydroxide $M(OH)_2$. Its oxide MO is amphoteric, hard and having high melting point. The alkaline earth metal M must be

(A) Mg (B) Be (C) Ca (D) Sr

35. $(White\ ppt)\ D \xleftarrow{Na_2CO_3} A \xrightarrow[(in\ acetic\ acid)]{K_2CrO_4} B(Yellow\ ppt)$

$\downarrow$ dil. H_2SO_4

$C(White\ ppt)$

If A is the metallic salt, then the white ppt. of D must be of

(A) stronsium carbonate (B) red lead

(C) barium carbonate (D) calcium carbonate

36. $(Milky\ Cloud)\ C \xleftarrow{CO_2} A + Na_2CO_3 \longrightarrow B + C$

The chemical formulae of A and B are

(A) NaOH and $Ca(OH)_2$ (B) $Ca(OH)_2$ and NaOH

(C) NaOH and CaO (D) CaO and $Ca(OH)_2$

37. The correct order of basic-strength of oxides of alkaline earth metals is

(A) BeO > MgO > CaO > SrO (B) SrO > CaO > MgO > BeO

(C) BeO > CaO > MgO > SrO (D) SrO > MgO > CaO > BeO

38. $X \xrightarrow{N_2, \Delta} Y \xrightarrow{H_2O} Z(colourless\ gas) \xrightarrow[CuSO_4]{} T(blue\ colour)$

Then, substances Y and T are

(A) $Y = Mg_3N_2$ and $T = CuSO_4 \cdot 5H_2O$ (B) $Y = Mg_3N_2$ and $T = CuSO_4 \cdot 4NH_3$

(C) $Y = Mg(NO_3)_2$ and T = CuO (D) $Y = MgO$ and $T = CuSO_4 \cdot 4NH_3$

39. Weakest base among KOH, NaOH, $Ca(OH)_2$ and $Zn(OH)_2$ is

(A) $Ca(OH)_2$ (B) KOH

(C) NaOH (D) $Zn(OH)_2$

40. If X and Y are the second ionisation potentials of alkali and alkaline earth metals of same period, then -

(A) X > Y (B) X < Y (C) X = Y (D) X << Y

41. $X \xrightarrow{CoCl_2} CaCl_2 + Y \uparrow$; the effective ingredient of X is

(A) OCl^- (B) Cl^- (C) OCl^+ (D) OCl_2^-

42. White heavy precipitate is formed when $BaCl_2$ is added to a clear solution of compound **A**. Precipitate is insoluble in dilute HCl. Then, the compound **A** is

(A) a bicarbonate (B) a carbonate

(C) a sulphate (D) a chloride

43. $X + C + Cl_2 \xrightarrow[\text{of about } 1000\,K]{\text{High temperature}} Y + CO \; ; \; Y + 2H_2O \rightarrow Z + 2HCl$

Compound Y is found in polymeric chain structure and is an electron deficient molecule. Y must be

(A) BeO (B) $BeCl_2$ (C) BeH_2 (D) $AlCl_3$

44. $BeCl_2 + LiAlH_4 \longrightarrow X + LiCl + AlCl_3$

(A) X is LiH (B) X is BeH_2

(C) X is $BeCl_2 \cdot 2H_2O$ (D) None

45. The order of thermal stability of carbonates of IIA group is

(A) $BaCO_3 > SrCO_3 > CaCO_3 > MgCO_3$

(B) $MgCO_3 > CaCO_3 > SrCO_3 > BaCO_3$

(C) $CaCO_3 > SrCO_3 > BaCO_3 > MgCO_3$

(D) $MgCO_3 = CaCO_3 > SrCO_3 = BaCO_3$

46. A pair of substances which gives all the same products on reaction with water is

(A) Mg and MgO (B) Sr and SrO (C) Ca and CaH_2 (D) Be and BeO

47. A metal which is soluble in both water and liquid NH_3 separately -

(A) Cr (B) Mn (C) Ba (D) Al

48. $Be_2C + H_2O \longrightarrow BeO + X$

$CaC_2 + H_2O \longrightarrow Ca(OH)_2 + Y$; then X and Y are respectively

(A) CH_4, CH_4 (B) CH_4, C_2H_6 (C) CH_4, C_2H_2 (D) C_2H_2, CH_4

49. Which of the following groups of elements have chemical properties that are most similar

(A) Na, K, Ca (B) Mg, Sr, Ba (C) Be, Al, Ca (D) Be, Ra, Cs

50. $MgBr_2$ and MgI_2 are soluble in acetone because of

(A) Their ionic nature (B) Their coordinate nature

(C) Their metallic nature (D) Their covalent nature