EXERCISE-I

Boron family

1. Identify the statement that is not correct as far as structure of diborane is concerned
(A) There are two bridging hydrogen atoms in diborane
(B) Each boron atom forms four bonds in diborane
(C) The hydrogen atoms are not in the same plane in diborane
(D) All *B* - *H* bonds in diborane are similar

2. Soft heavy metal melts at $30^{o}C$ and is used in making heat sensitive thermometers the metal is
(A) Galium (B) Sodium
(C) Potassium (D) Caesium

3. Which of the following is formed when aluminium oxide and carbon is strongly heated in dry chlorine gas
(A) Aluminium chloride
(B) Hydrate aluminium chloride
(C) Anhydrous aluminium chloride
(D) None of these

4. Which metal burn in air at high temperature with the evolution of much heat
(A) Cu (B) Hg
(C) Pb (D) Al

5. Aluminium hydroxide is soluble in excess of sodium hydroxide forming the ion
(A) $Be(OH)_2$ (B) AlO_2^{-3}
(C) AlO_2^- (D) AlO_3^-

6. Boron form covalent compound due to
(A) Higher ionization energy
(B) Lower ionization energy
(C) Small size
(D) Both (A) and (C)

7. In diborane, the two $H-B-H$ angles are nearly
(A) 60°, 120° (B) 95°, 120°
(C) 95°, 150° (D) 120°, 180°

8. Which of the following is a non-metal
(A) Gallium (B) Indium
(C) Boron (D) Aluminium

9. Which of the following is most acidic
(A) Na_2O (B) MgO
(C) Al_2O_3 (D) CaO

10. When orthoboric acid (H_3BO_3) is heated, the residue left is
(A) Metaboric acid (B) Boron
(C) Boric anhydride (D) Borax

11. Which of the following is only acidic in nature
(A) $Be(OH)_2$ (B) $Mg(OH)_2$
(C) $B(OH)_3$ (D) $Al(OH)_3$

12. Moissan boron is
(A) Amorphous boron of ultra purity
(B) Crystalline boron of ultra purity
(C) Amorphous boron of low purity
(D) Crystalline boron of low purity

13. Which of the following does not exist in free form
(A) BF_3 (B) BCl_3
(C) BBr_3 (D) BH_3

14. Alumina is
(A) Acidic (B) Basic
(C) Amphoteric (D) None of these

15. The most abundant metal in the earth crust is
(A) *Al* (B) *Ca*
(C) *Fe* (D) *Na*

16. Crystalline metal can be transformed into metallic glass by
(A) Alloying
(B) Pressing into thin plates
(C) Slow cooling of molten metal
(D) Very rapid cooling of a spray of the molten metal

17. Which metal is protected by a layer of its own oxide
(A) Al (B) Ag
(C) Au (D) Fe

18. Aluminium is a self–preserving metal, because
(A) It is not tarnished by air
(B) A thin film of basic carbonate on its surface
(C) A non-porous layer of oxide is formed on its surface
(D) It is not affected by salt water

19. Anhydrous $AlCl_3$ cannot be obtained from which of the following reactions
(A) Heating $AlCl_3.6H_2O$
(B) By passing dry HCl over hot aluminium powder
(C) By passing dry Cl_2 over hot aluminium powder
(D) By passing dry Cl_2 over a hot mixture of alumina and coke

20. An element *A* dissolves both in acid and alkali. It is an example of
(A) Allotropic nature of *A*
(B) Dimorphic nature of *A*
(C) Amorphous nature of *A*
(D) Amphoteric nature of *A*

21. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because
(A) Aluminium is a noble metal
(B) Oxygen forms a protective oxide layer
(C) Iron undergoes reaction easily with water
(D) Iron forms mono and divalent ions

22. Aluminium vessels should not be washed with materials containing washing soda since
(A) Washing soda is expensive
(B) Washing soda is easily decomposed
(C) Washing soda reacts with aluminium to form soluble aluminate
(D) Washing soda reacts with aluminium to form insoluble aluminium oxide

23. Which of the statements about anhydrous aluminium chloride is correct
(A) It exists as $AlCl_3$ molecule
(B) It is not easily hydrolysed
(C) It sublimes at 100^oC under vacuum
(D) It is a strong Lewis base

24. Common alum is
(A) $K_2SO_4.Al_2(SO_4)_3.24H_2O$
(B) $K_2SO_4.Cr_2(SO_4)_3.24H_2O$
(C) $K_2SO_4.Fe_2(SO_4)_3.24H_2O$
(D) $(NH_4)_2SO_4.FeSO_4.6H_2O$

25. Which of the following is not true about potash alum
(A) Its empirical formula is $KAl(SO_4)_2.12H_2O$
(B) Its aqueous solution is basic
(C) It is used in dyeing industries
(D) On heating it melts in its water of crystallization

26. Which one of the following is correct statement
(A) The hydroxide of aluminium is more acidic than that of boron
(B) The hydroxide of boron is basic, while that of aluminium is amphoteric
(C) The hydroxide of boron is acidic, while that of aluminium is amphoteric
(D) The hydroxide of boron and aluminium are amphoteric

27. $AlCl_3$ is
(A) Anhydrous and covalent
(B) Anhydrous and ionic
(C) Covalent and basic
(D) Coordinate and acidic

28. Aluminium (III) chloride forms a dimer because
(A) Higher coordination number can be achieved by aluminium
(B) Aluminium has high ionization energy
(C) Aluminium belongs to III group
(D) It cannot form a trimer

29. Aluminium has a great affinity for oxygen and its oxidation is an exothermic process. This fact is made use of in
(A) Preparing thin foils of aluminium
(B) Making utensils
(C) Preparing duralumin alloy
(D) Thermite welding

30. Number of water molecules in Mohr's salt is
(A) 7 (B) 6
(C) 5 (D) 8

31. Bauxite containing impurities of iron oxide is purified by
(A) Hoop's process
(B) Serpeck's process
(C) Baeyer's process
(D) Electrolytic process

32. In the purification of bauxite by Hall's process
(A) Bauxite ore is heated with NaOH solution at $50^{o}C$
(B) Bauxite ore is fused with Na_2CO_3
(C) Bauxite ore is fused with coke and heated at $1800^{o}C$ in a current of nitrogen
(D) Bauxite ore is heated with $NaHCO_3$

33. Which one is used as a bye-product in Serpeck's process
(A) NH_3 (B) CO_2
(C) N_2 (D) PH_3

34. In the metallurgy of aluminium, cryolite is mixed in the molten state because it
(A) Increases the melting point of alumina
(B) Oxidises alumina
(C) Reduces alumina
(D) Decreases the melting point of alumina

35. In the electrolytic extraction of aluminium, cryolite is used
(A) To obtain more aluminium
(B) To decrease temperature to dissolve bauxite
(C) To protect the anode
(D) As reducing agent

36. In the extraction of aluminium, bauxite is dissolved in cryolite because
(A) It acts as a solvent
(B) It reduces melting point of aluminium oxide
(C) It increases the resistance of aluminium oxide
(D) Bauxite becomes active

37. In the extraction of aluminium the electrolyte is
(A) Fused cryolite with felspar
(B) Fused cryolite with fluorspar
(C) Pure alumina in molten cryolite
(D) Pure alumina with bauxite and molten cryolite

38. Aluminium is obtained by
(A) Reducing Al_2O_3 with coke
(B) Electrolysing Al_2O_3 dissolved in Na_3AlF_6
(C) Reducing Al_2O_3 with chromium
(D) Heating alumina and cryolite

39. In the electrolysis of alumina, cryolite is added to
(A) Increase the melting point of alumina
(B) Increase the electrical conductivity
(C) Minimise the anodic effect
(D) Remove impurities from alumina

40. The function of fluorspar in the electrolytic reduction of alumina dissolved in fused cryolite (Na_3AlF_6) is
(A) As a catalyst
(B) To lower the temperature of the melt and to make the fused mixture very conducting
(C) To decrease the rate of oxidation of carbon at the anode
(D) None of the above

41. Electrolytic reduction of alumina to aluminium by Hall-Heroult process is carried out in the presence of
(A) NaCl
(B) Fluorite
(C) Cryolite which forms a melt with lower melting temperature
(D) Cryolite which forms a melt with higher melting temperature

42. In the electrolytic method of obtaining aluminium from purified bauxite, cryolite is added to the charge in order to
(A) Minimize the heat loss due to radiation
(B) Protect aluminium produced from oxygen
(C) Dissolve bauxite and render it conductor of electricity
(D) Lower the melting point of bauxite

43. Hoop's process is used for the purification of the metal
(A) Al (B) Zn
(C) Ag (D) Cu

44. Purification of aluminium done by electrolytic refining is known as
(A) Serpeck's process (B) Hall's process
(C) Baeyer's process (D) Hoop's process

45. In the Hoope's process for refining of aluminium, the fused materials form three different layers and they remain separated during electrolysis also. This is because
(A) The upper layer is kept attracted by the cathode and the lower layer is kept attracted by the anode
(B) There is special arrangement in the cell to keep the layers separate
(C) The 3 layers have different densities
(D) The 3 layers are maintained at different temperatures

46. During metallurgy of aluminium bauxite is dissolved in cryolite because
(A) Bauxite is non-electrolyte
(B) Cryolite is a flux
(C) Cryolite acts as an electrolyte
(D) All are correct

47. For the electrolytic refining of aluminium, the three fused layers consist of

	Bottom Layer	**Middle Layer**	**Upper Layer**
(A)	Cathode of pure *Al*	Cryolite and fluorspar	Anode of *Al* and *Cu* alloy
(B)	Cathode of *Al* and *Cu* alloy	Bauxite and cryolite	Anode of pure *Al*
(C)	Anode of *Al* and *Cu* alloy	Cryolite and barium fluoride	Cathode of pure *Al*
(D)	Anode of impure *Al*	Bauxite, cryolite and fluorspar	Cathode of pure *Al*

48. Heating an aqueous solution of aluminium chloride to dryness will give
(A) $AlCl_3$ (B) Al_2Cl_6
(C) Al_2O_3 (D) $Al(OH)Cl_2$

49. The structure of diborane (B_2H_6) contains
(A) Four 2c-2e bonds and two 3c-2e bonds
(B) Two 2c-2e bonds and four 3c-2e bonds
(C) Two 2c-2e bonds and two 3c-3e bonds
(D) Four 2c-2e bonds and four 3c-2e bonds

50. Which of the following is the electron deficient molecule
(A) B_2H_6 (B) C_2H_6
(C) PH_3 (D) SiH_4

Carbon family

51. Which alkali metal carbonate decomposes on heating to liberate CO_2 gas
(A) Li_2CO_3 (B) $CaCO_3$
(C) Na_2CO_3 (D) Al_2CO_3

52. Which of the following gives propyne on hydrolysis
(A) Al_4C_3 (B) Mg_2C_3
(C) B_4C (D) La_4C_3

53. Which one of the following statements is not correct
(A) Zinc dissolves in sodium hydroxide solution
(B) Carbon monoxide reduces iron (III) oxide to iron
(C) Mercury (II) iodide dissolves in excess of potassium iodide solution
(D) Tin (IV) chloride is made by dissolving tin solution in concentrated hydrochloric acid

54. In laboratory silicon can be prepared by the reaction
(A) By heating carbon in electric furnace
(B) By heating potassium with potassium dichromate
(C) Silica with magnesium
(D) None of these

55. Which of the following is the correct statement for red lead
(A) It is an active form of lead
(B) Its molecular formula is Pb_2O_3
(C) It decomposes into *Pb* and CO_2
(D) It decomposes into XeF_6 and O_2

56. Suppose you have to determine the percentage of carbon dioxide in a sample of a gas available in a container. Which is the best absorbing material for the carbon dioxide
(A) Heated copper oxide
(B) Cold, solid calcium chloride
(C) Cold, solid calcium hydroxide
(D) Heated charcoal

57. The number and type of bonds between 2 carbon atoms in N_2
(A) One sigma (σ) and one pi (π) bond
(B) One sigma O_2 and two pi (π) bond
(C) One sigma (σ) and half pi (π) bond
(D) One sigma CO_2 bond

58. Metalloid among the following is
(A) Si (B) C
(C) Pb (D) Ge

59. '*Lead pencil*' contains
(A) PbS (B) Graphite
(C) (H_3BO_3) (D) Pb

60. Nitrogen gas is absorbed by
(A) Calcium hydroxide (B) Ferrous sulphate
(C) Calcium carbide (D) Aluminium carbide

61. Plumbosolvancy implies dissolution of lead in
(A) Bases (B) Acids
(C) Ordinary water (D) $CuSO_4$ sol

62. Which of the following glass is used in making wind screen of automobiles
(A) Crook's (B) Jena
(C) Safety (D) Pyrex

63. Glass reacts with *HF* to produce
(A) SiF_4 (B) H_2SiF_6
(C) H_2SiO_3 (D) Na_3AlF_6

64. The type of glass used in making lenses and prisms is
(A) A flint glass (B) Jena glass
(C) Pyrex glass (D) Quartz glass

65. When carbon monoxide is passed over solid caustic soda heated to 200^o *C*, it forms
(A) Na_2CO_3 (B) $NaHCO_3$
(C) $H-COONa$ (D) CH_3COONa

66. Which is used to produce smoke screens
(A) Calcium phosphide (B) Zinc sulphide
(C) Sodium carbonate (D) Zinc phosphide

67. Sodium oxalate on heating with conc. H_2SO_4 gives
(A) *CO* only (B) CO_2 only
(C) CO and CO_2 (D) SO_2 and SO_3

68. Extraction of lead by reduction methods is done by
(A) Adding more galena into reverberatory furnace
(B) Adding more lead sulphate into reverberatory furnace
(C) Adding more galena and coke into the reverberatory furnace
(D) Self reduction of oxide from sulphide present in the furnace

69. Which gas is used in excess water
(A) CO_2 (B) SO_2
(C) *CO* (D) Water vapours

70. The compound which does not possess a peroxide linkage is
(A) Na_2O_2 (B) CrO_5
(C) H_2SO_5 (D) PbO_2

71. Soldiers of Napolean army while at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniforms. White metallic tin buttons got converted to grey powder. This transformation is related to
(A) A change in the partial pressure of oxygen in the air
(B) A change in the crystalline structure of tin
(C) An interaction with nitrogen of the air at very low to temperatures
(D) An interaction with water vapour contained in the humid air

72. Solid CO_2 is known as dry ice, because
(A) It melts at $0°C$
(B) It evaporates at $40°C$
(C) It evaporates at $-78°C$ without melting
(D) Its boiling point is more than 199°C

73. Which one of the following statements about the zeolites is false
(A) Zeolites are aluminosilicates having three dimensional network
(B) Some of the SiO_4^{-4} units are replaced by AlO_4^{-5} and AlO_6^{9-} ions in zeolites
(C) They are used as cation exchangers
(D) They have open structure which enables them to take up small molecules

74. Which of the following cuts ultraviolet rays
(A) Soda glass (B) Crooke's glass
(C) Pyrax (D) None of these

75. In IIIA group, *Tl* (thalium) shows +1 oxidation state while other members show +3 oxidation state. Why
(A) Presence of lone pair of electron in *Tl*
(B) Inert pair effect
(C) Large ionic radius of Tl ion
(D) None of these

76. Carbon suboxide C_3O_2 has **[DCE 2003]**
(A) Linear structure
(B) Bent structure
(C) Trigonal planar structure
(D) Distorted tetrahedral structure

77. Which of the following is a mixed oxide
(A) Fe_2O_3 (B) PbO_2
(C) Pb_3O_4 (D) BaO_2

78. Noble gases are absorbed on
(A) Anhydrous $CaCl_2$ (B) Charcoal
(C) Conc. H_2SO_4 (D) Coconut

79. Lapis lazuli is
(A) Ferrous sulphate
(B) Copper sulphate
(C) Sodium alumino silicate
(D) Zinc sulphate

80. Which of the following statement is correct with respect to the property of elements in the carbon family with an increase in atomic number, their
(A) Atomic size decreases
(B) Ionization energy increases
(C) Metallic character decreases
(D) Stability of +2 oxidation state increases

81. Which of the following compounds of elements in group IV would you expect to be most ionic in character
(A) CCl_4 (B) $SiCl_4$
(C) $PbCl_2$ (D) $PbCl_4$

82. Which of the following compounds of lead is used in match industry
(A) PbO (B) PbO_2
(C) $PbCl_2$ (D) None of these

83. Type metal is an alloy of Pb, Sb and Sn. It consists of
(A) Equal amounts of the three metals
(B) More amount of lead
(C) More amount of antimony
(D) More amount of tin

84. Which is correct oxidation state of lead
(A) + 2, + 4 (B) + 1, + 2
(C) + 3, + 4 (D) + 4

85. Sugar of lead is
(A) $2PbSO_4.PbO$ (B) $(CH_3COO)_2Pb$
(C) $PbCO_3$ (D) $PbCO_3.Pb(OH)_2$

86. Which of the following compounds has peroxide linkage
(A) Pb_2O_3 (B) SiO_2
(C) CO_2 (D) PbO_2

87. Percentage of lead in lead pencil is
(A) Zero (B) 20
(C) 80 (D) 70

88. Which of the following has most density
(A) Fe (B) Cu
(C) B (D) Pb

89. Red lead in an example of a/an .... oxide
(A) Basic (B) Super
(C) Mixed (D) Amphoteric

90. Which of the following lead oxides is 'Sindhur'
(A) PbO (B) PbO_2
(C) Pb_2O_3 (D) Pb_3O_4