THE P-BLOCK ELEMENTS

CHEMISTRY

Single Correct Answer Type

1. The Minerals having silicates chains are collectively called
   a) Olivine b) Zircon c) Pyroxenes d) Natrolite
2. Pyrex glass is a mixture of :
   a) Sodium borosilicate and barium borosilicate
   b) Sodium silicate and calcium silicate
   c) Sodium silicate and lead silicate
   d) Sodium silicate and aluminium borosilicate
3. Amorphous boron on burning in air forms:
   a) $B(OH)_3$
   b) Mixture of B_2O_3 and BN
   c) Only B_2O_3
   d) Only BN
4. What is the state of hybridization of carbon in fullerene?
   a) sp^2 b) sp^3 c) sp d) sp^3d
5. Boron was isolated by:
   a) Moseley b) Davy c) Rutherford d) Moisson
6. Which reaction cannot give anhydrous $AlCl_3$?
   a) Heating of $AlCl_3 \cdot 6H_2O$
   b) Passing dry HCl over heated aluminium powder
   c) Passing dry Cl_2 over heated aluminium powder
   d) Heating a mixture of alumina and coke in a current of dry Cl_2
7. An aqueous solution of potash alum gives
   a) Two types of ions b) Only one type of ion c) Four types of ion d) Three types of ions
8. Which is neutral to litmus?
   a) ZnO b) SnO c) CO d) SiO
9. Electrolytic reduction of alumina to aluminium by Hall-Heroult process is carried out:
   a) In the presence of NaCl
   b) In the presence of fluorite
   c) In the presence of cryolite which forms a melt with lower melting temperature
   d) In the presence of cryolite which forms a melt with higher melting temperature
10. The type of glass used in making lenses and prism is
    a) Pyrex glass b) Quartz glass c) Jena glass d) Flint glass
11. Solid CO_2 is used as :
    a) Poison b) Fire extinguisher c) Refrigerant d) Artificial respirant
12. Coke is obtained from coal by:
    a) Cracking
    b) Fractional distillation
    c) Destructive distillation
    d) None of these
13. The liquid field metal expanding on solidification is
    a) Cu b) Ga c) Al d) Zn
14. Solder is an alloy of
    a) Pb + Sn b) Pb + Sn + Zn c) Pb+ Zn d) Sn+ Zn
15. Graphite is used in nuclear reactors:

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a) As a lubricant b) As a fuel c) As moderator d) None of these

16. BF_3 is an example of Lewis acid because it behaves as:
    a) Nucleophile b) Electrophile c) Free radical d) lyophilic
17. What is the number of free electrons present on each carbon atom in graphite?
    a) 0 b) 3 c) 2 d) 1
18. CCl_4 does not show hydrolysis but $SiCl_4$ is readily hydrolysed because:
    a) Carbon cannot expand its octet but silicon can expand
    b) Electronegativity of carbon is higher than of silicon
    c) IP of carbon is higher than of silicon
    d) Carbon forms double and triple bonds but not silicon
19. Lead pipes are corroded quickly by
    a) dil. H_2SO_4 b) Acetic acid c) conc. H_2SO_4 d) Water
20. Purification of alumina is essential because:
    a) Impure alumina is a very poor conductor of electricity
    b) Impure alumina has a very high melting point
    c) Impure alumina cannot react with the oxidizing agent
    d) It is difficult to purify aluminium metal
21. Structure of boric acid (H_3BO_3) is:
    a) Trigonal
    b) Tetragonal
    c) Layer structure in which BO_3 units are linked with oxygen
    d) Layer structure in which BO_3 units are linked by H-bonding
22. Producer gas is a mixture of:
    a) $CO + N_2$ b) $CO + H_2$ c) $N_2 + CH_4$ d) $CO + H_2 + N_2$
23. Which statement is false?
    a) Water gas is a mixture of hydrogen and carbon monoxide
    b) Producer gas is a mixture of carbon monoxide and nitrogen
    c) Water gas is a mixture of water vapour and hydrogen
    d) Natural gas consists of methane, ethane and gaseous hydrocarbons
24. Bauxite ore is made up of $Al_2O_3 + SiO_2 + TiO_2 + Fe_2O_3$. This ore is treated with conc. NaOH solution at 500K and 35 bar pressure for few hours and filtered hot. In the filtrate the species present, are
    a) $NaAl(OH)_4$ only b) $Na_2Ti(OH)_6$ only
    c) $NaAl(OH)_4$ and Na_2SiO_3 both d) Na_2SiO_3 only
25. An element *A* dissolves both in acid and alkali. It is an example of
    a) Amorphous nature of *A* b) Allotropic nature of *A*
    c) Amphoteric nature of *A* d) Dimorphic nature of *A*
26. Which melts in boiling water?
    a) Gun metal b) Wood's metal c) Monel metal d) Bell metal
27. Hardest element of III A group of gp.13 is:
    a) B b) Ga c) Al d) In
28. Tin cry refers to :
    a) Conversion of white to grey tin
    b) Tin plating
    c) Conversion of white tetrahedral tin to white rhombohedral tin
    d) Emission of sound while bending a tin rod
29. The method of zone refining of metals is based on the principle of
    a) Greater noble character of the solid metal than that of the impurity
    b) Greater solubility of the impurity in the molten state than in the solid
    c) Greater mobility of the pure metal than that of impurity
    d) Higher melting point of the impurity than that of the pure metal
30. The hybridization of boron atom in orthoboric acid is:

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a) sp b) sp^2 c) sp^3 d) sp^3d

31. Which is not an allotrope of carbon?
a) Graphite b) Diamond c) Soot d) Carborundum

32. Alum are used as mordant in dyeing because
a) Dye is adsorbed on $Al(OH)_3$ which is deposited on fibre in the hydrolysis process
b) Dye is adsorbed on KOH formed due to hydrolysis
c) Both of the above
d) None of the above

33. Observe the following statements regarding purification of bauxite
I. During Hall's process, silica is removed as Si (vapour).
II. Bauxite ore contaminated with Fe_2O_3 is purified in Baeyer's process.
III. During Serpeck's process, AlN is formed.
The correct answer is
a) I, II and III are correct b) Only I and II are correct
c) Only I and III are correct d) Only II and III are correct

34. Aluminium is not used
a) In silvery paints b) As oxidizer in metallurgy
c) For making utensils d) As a reducing agent

35. Molecular weight of anhydrous aluminium chloride is:
a) 133.5 b) 267.0 c) 241.5 d) 483.0

36. Mg_2C_3 has the following characteristics:
a) It is called magnesium allylide
b) It contains Mg^{2+} and C_3^{4-} ions
c) It on hydrolysis gives propyne
d) All of the above

37. Newton's alloy contains :
a) Bi, Sn, Pb b) Bi, Fe, Cr c) Bi, Sn, Cd d) Pb, Sn, Cd

38. In III A group (thalium) show + 1 oxidation state while other members show + 3 oxidation state, why?
a) Presence of lone pair of electron in Tl b) Large ionic radius of Tl ion
c) Inert pair effect d) None of the above

39. The protective film of oxide on the surface of Al metal may be strengthened by:
a) Galvanizing b) Cathodizing c) Sheradizing d) Anodizing

40. Which of the following is only acidic in nature?
a) $Mg(OH)_2$ b) $Be(OH)_2$ c) $Al(OH)_3$ d) $B(OH)_3$

41. Which poisonous gas is present in the exhaust of car?
a) Methane b) Carbon monoxide c) Acetylene d) Ethane

42. A metallic oxide which imparts purple colour to pottery is:
a) Lead oxide b) Copper oxide c) Sodium oxide d) Manganese dioxide

43. The cryolite is:
a) $NaAlO_3$ b) Na_3AlF_6 c) Na_3AlO_3 d) Na_2AlF_5

44. Quartz is made of silicon and oxygen joined in a network arrangement that is similar to :
a) Diamond b) Graphite c) O_2 d) None of these

45. Solid CO_2 is known as dry ice, because
a) It evaporates at 40°C b) It melts at 0°C
c) Its boiling points is more than 199°C d) It evaporates at '-' 78°C without melting

46. Aluminium chloride exists as dimer, Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives
a) $[Al(OH)_6]^{3-} + 3HCl$ b) $Al_2O_3 + 6HCl$ c) $Al^{3+} + 3Cl^-$ d) $[Al(H_2O)_6]^{3+} + 3Cl^-$

47. Hot conc HNO_3 converts graphite into
a) Graphite oxide b) Benzene hexacarboxylic acid

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c) Both (a) and (b) d) None of the above

48. Which is correct oxidation state of lead?
a) $+3, +4$ b) $+4$ c) $+1, +2$ d) $+2, +4$

49. Which of the following is a three dimensional silicate?
a) Mica b) Spodumene c) Zeolite d) None of these

50. Which of the following is a gas?
a) BF_3 b) BCl_3 c) BBr_3 d) BI_3

51. Plumbo-solvency means dissolution of lead in:
a) Hot water b) Acids c) Ordinary water d) Alkalies

52. On doping Ge metal with a little of ln, one gets:
a) p-type semiconductor
b) n-type semiconductor
c) Insulator
d) Rectifier

53. Vapour density of which gas is near to air?
a) CO b) CO_2 c) NH_3 d) SO_2

54. Muddy water can be purified through coagulation by using
a) Common salt b) Alums c) Sand d) Lime

55. The most abundant gas in ordinary air among the following is:
a) Argon b) Helium c) Carbon dioxide d) Carbon monoxide

56. Corundum is:
a) SiO_2 b) Al_2O_3 c) CaF_2 d) Cr_2O_3

57. Tin dissolves in dilute HNO_3 forming :
a) Metastannic acid b) Nitrous oxide c) Ammonium nitrate d) Stannic nitrate

58. The core of a non-luminous Bunsen burner flame is observed to be yellow in colour. This is because of:
a) Contamination from the metal of the burner
b) Impurities in the fuel
c) Incomplete combustion
d) None of the above

59. The correct order of decreasing ionic nature of lead dihalides is :
a) $PbF_2 > PbCl_2 > PbBr_2 > PbI_2$
b) $PbF_2 > PbBr_2 > PbCl_2 > PbI_2$
c) $PbF_2 < PbCl_2 > PbBr_2 < PbI_2$
d) $PbI_2 < PbBr_2 < PbCl_2 < PbF_2$

60. The correct Lewis acid order for boron halides is:
a) $BF_3 > BCl_3 > BBr_3 > BI_3$
b) $BCl_3 > BF_3 > BBr_3 > BI_3$
c) $BI_3 > BBr_3 > BCl_3 > BF_3$
d) $BBr_3 > BCl_3 > BI_3 > BF_3$

61. Incomplete combustion of petrol or diesel oil in automobile engines can be best detected by testing the fuel gases for the presence of :
a) $CO + H_2O$ b) CO c) NO_2 d) SO_2

62. Alum is not used:
a) As a mordant in dyeing
b) As an insecticide
c) In the purification of water
d) In tanning of leather

63. $BCl_3 + H_2O \rightarrow X$, the products formed in the reaction are
a) $B_2O_3 + HOCl$ b) $H_3BO_3 + HCl$ c) $B_2H_6 + HCl$ d) No reaction

64. Boric acid on heating at 150 °C gives:
a) B_2O_3 b) $H_2B_4O_7$ c) HBO_2 d) H_2BO_3

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65. Which one of the following orders presents the correct sequence of the increasing basic nature of the given oxides?
    a) $Al_2O_3 < MgO < Na_2O < K_2O$
    b) $MgO < K_2O < Al_2O_3 < Na_2O$
    c) $Na_2O < K_2O < MgO < Al_2O_3$
    d) $K_2O < Na_2O < Al_2O_3 < MgO$
66. Which fuel has the highest calorific value?
    a) Coal gas b) Water gas c) Producer gas d) Carbon dioxide gas
67. Anodising can be done by electrolyzing dilute H_2SO_4 with Al an anode, this result is
    a) The formation of protective oxide layer
    b) The formation of $Al_2(SO_4)_3$ and SO_2 gas
    c) The formation of AlH_3 and SO_2 gas
    d) The formation of $Al(HSO_3)$ and H_2 gas
68. Tin reacts with conc. $H_2SO_4$to give:
    a) α- stannic acid. b) Stannous sulphate c) β – stannic acid d) Stannic sulphate
69. The chemical formula of sindhur is
    a) PbO b) Pb_3O_4 c) ZnO d) $SnCl_2$
70. Aluminium oxide is not reduced by chemical reactions since
    a) Aluminium oxide is reactive
    b) Reducing agents contaminate
    c) Aluminium oxide is highly stable
    d) The process pollutes the environment
71. Aluminium reacts with caustic soda to form
    a) Aluminium hydroxide
    b) Aluminium oxide
    c) Sodium meta-aluminate
    d) Sodium tetra aluminate
72. PbO_2 on reaction with HNO_3 gives gas:
    a) NO_2 b) O_2 c) N_2 d) N_2O
73. When orthoboric acid (H_3BO_3) is heated the residue left is:
    a) Boron b) Metaboric acid c) Boric anhydride d) borax
74. Which is a correct statement about diborane structure?
    a) All HBH bond angles are equal
    b) All $H-B$ bond lengths are equal
    c) It has two three-centre-2 electron bonds
    d) All hydrogen and boron atoms are in one plane
75. Thermite is a mixture of
    a) $Cr_2O_3 + Al_2O_3$ b) $Fe_2O_3 + Al$ c) $Fe_2O_3 + Al_2O_3$ d) $Al_2O_3 + 2Cr$
76. White lead or basic lead carbonate is:
    a) $Pb(OH)_2 \cdot 2PbCO_3$
    b) $Pb(OH)_2 \cdot Pb(CH_3COO)_2$
    c) $PbCO_3$
    d) $PbCO_3 \cdot Pb(OH)_2$
77. Cane sugar reacts with conc. HNO_3 to give :
    a) CO_2 and H_2O b) Oxalic acid c) CO and H_2O d) H_2CO_3
78. Man dies in an atmosphere of carbon monoxide, because it:
    a) Combines with the O_2 present in the body to form CO_2
    b) Reduces the organic matter of tissues
    c) Combines with haemoglobin of blood, making it incapable of absorbing O_2
    d) Dries up the blood
79. Which has highest b.p.?
    a) Diamond b) Graphite c) Charcoal d) Lamp black
80. Carbon cannot be used in the reduction of Al_2O_3 because
    a) It is an expensive proposition
    b) The enthalpy of formation of CO_2 is more than that of Al_2O_3
    c) Pure carbon is not easily available
    d) The enthalpy of formation of Al_2O_3 is too high
81. Which of the following has most density?
    a) Pb b) B c) Cu d) Fe

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82. Which of the following oxides is amphoteric in character?
a) SnO_2 b) SiO_2 c) CO_2 d) CaO

83. Water gas is produced by :
a) Passing steam through a red hot coke bed
b) Saturating hydrogen with moisture
c) Mixing oxygen and hydrogen in the ratio of 1 : 2
d) Heating a mixture of CO_2 and CH_4 in petroleum refineries

84. CO forms a volatile compound with:
a) Nickel b) Copper c) Sodium d) Aluminium

85. Red lead is:
a) PbO b) Pb_3O_4 c) PbO_2 d) HgS

86. The order of acidic strength of boron trihalides
a) $BF_3 < BCl_3 < BBr_3 < BI_3$ b) $BI_3 < BBr_3 < BCl_3 < BF_3$
c) $BCl_3 < BBr_3 < BI_3 < BF_3$ d) $BBr_3 < BCl_3 < BF_3 < BI_3$

87. Heating an aqueous solution of aluminium chloride to dryness will give:
a) $AlCl_3$ b) Al_2Cl_6 c) Al_2O_3 d) $Al(OH)Cl_2$

88. Buckminster fullerene is
a) Pure graphite b) C-60 c) Diamond d) C-90

89. Lead (IV) oxide is obtained by :
a) Heating lead (II) oxide strongly in air
b) Heating lead strongly in pure oxygen
c) Oxidizing lead with conc. HNO_3
d) Heating Pb_3O_4 with conc. HNO_3

90. Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that, graphite
a) Is a non-crystalline substance
b) Is an allotropic from of diamond
c) Has molecules of variable molecular masses like polymers
d) Has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds

91. The composition of the common glass is
a) $Na_2O.CaO.6SiO_2$ b) $Na_2O.Al_2O_3.SiO_2$ c) $CaO.Al_2O_3.SiO_2$ d) $Na_2O.CaO.6SiO_2$

92. Aluminium becomes passive in nitric acid because it:
a) Is a noble metal
b) Forms a thin film of oxide
c) Positive reduction potential
d) None of the above

93. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is
a) R_4Si b) $RSiCl_3$ c) R_2SiCl_2 d) R_3SiCl

94. The thermal stability of CF_4 is
a) Less than SiF_4 b) More than SiF_4 c) Less than CCl_4 d) Less than $SiCl_4$

95. An oxide of an element is a gas and dissolves in water to give an acidic solution. The element belongs to
a) II group b) IV group c) VIII group d) Zero group

96. The C—X bond energy order for carbon tetra halides is:
a) $CF_4 > CCl_4 > CBr_4 > CI_4$
b) $CCl_4 > CBr_4 > CI_4 > CF_4$
c) $CI_4 > CBr_4 > CCl_4 > CF_4$
d) None of the above

97. An example of a major air pollutant is:
a) Oxygen b) Carbon dioxide c) Carbon monoxide d) Helium

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98. Pewter is an alloy of :
    a) Pb and Sn b) Pb, Sb and Sn c) Pb, Bi and Sn d) Pb, Bi, Sn and Cd
99. Rose metal is an alloy of.
    a) Sn + Pb + Bi b) Sn + Cu c) Sn + Sb + Cu d) None of these
100. An insulator is:
    a) Silicon b) Graphite c) Aluminium d) Diamond
101. Boron nitride on reacting with caustic alkali gives:
    a) NH_3 b) N_2O c) Na_3BO_3 d) NO_2
102. The different layers in graphite are held together by
    a) Metallic bonding b) Covalent bonding c) Ionic bonding d) Van der Waals' forces
103. Colemanite is a mineral of:
    a) Mg b) B c) Al d) Mn
104. Which of the following is a mixed oxide?
    a) Fe_2O_3 b) PbO_2 c) BaO_2 d) Pb_3O_4
105. In the sale of diamonds the unit of weight is carat. One carat is equal to:
    a) 100 mg b) 300 mg c) 400 mg d) 200 mg
106. Which gas present in atmosphere darkens the surface painted by white lead?
    a) SO_2 b) NH_3 c) CO_2 d) H_2S
107. Which of the following is most abundant in the earth crust?
    a) In b) Ga c) B d) Al
108. Which form of carbon has a two-dimensional sheet-like structure?
    a) Coal b) Coke c) Diamond d) Graphite
109. Extraction of metal from the ore cassiterite involves
    a) Carbon reduction of an oxide ore b) Self-reduction of a sulphide ore
    c) Removal of copper impurity d) Removal of iron impurity
110. An alumina-silica clay, called bentonite is dropped from aeroplanes in the slurry form for:
    a) Fertilizing the soil
    b) Spreading water over fires
    c) Cooling the soil
    d) Fumigation
111. Gun shots are made of lead with a little arsenic. The function of As is to increase:
    a) Range of fire b) Power of fire c) Brittleness d) Weight of fire
112. The colour of blue glass is due to the presence of oxide of
    a) Cr b) Co c) Au d) Ag
113. The glass having smallest coefficient of thermal expansion is :
    a) Soda lime glass b) Soft glass c) Safety glass d) Pyrex glass
114. Carborundum is obtained when silica is heated at high temperature with
    a) Carbon b) Carbon monoxide c) Carbon dioxide d) Calcium carbonate
115. R_3SiCl on hydrolysis forms:
    a) R_3SiOH b) $R_3\text{Si} - \text{O} - \text{Si}R_3$ c) $R_2\text{Si} = \text{O}$ d) None of these
116. Tin plague is the:
    a) Conversion of stannous to stannic
    b) Conversion of white tin to grey tin
    c) Emission of sound while bending a tin rod
    d) Atmospheric oxidation of tin
117. Water glass is:
    a) Calcium silicate
    b) Sodium, calcium silicate
    c) Sodium silicate
    d) Magnesium silicate
118. If a person is injured by the shot of a gun and all the pellets could not be removed, it may cause poisoning

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by:

a) Hg b) Pb c) Fe d) As

119. Which property is common in diamond and graphite?
    a) Electrical conductivity
    b) Relative atomic weight
    c) Crystal structure
    d) Density
120. Carbon dioxide is used for extinguishing fire because:
    a) It has a relatively high critical temperature
    b) In solid state, it is called dry ice
    c) It is neither combustible nor a supporter of combustion
    d) It is a colourless gas
121. In which of the following the inert pair effect is most prominent?

a) Si b) Ge c) Pb d) C

122. One recently discovered allotrope of carbon $(e.g., C_{60})$ is known as

a) Fluorine b) Fullerene c) Flourene d) Freon

123. Which oxide has three dimensional structure?

a) CO b) CO_2 c) SiO_2 d) SO_2

124. Diamond and graphite are:

a) Isomers b) Isotopes c) allotropes d) Polymers

125. CO_2 is called dry ice or drikold because:
    a) It wets the surface
    b) It does not melt
    c) At atmospheric pressure solid CO_2 changes directly into the gas and the liquid phase is not formed and does not wet the surface
    d) It is gaseous in nature
126. Minium is:

a) PbO b) Pb_3O_4 c) PbO_2 d) All of these

127. Which of the following is called alum?
    a) $NaAlO_2$
    b) $Na_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
    c) $KCl \cdot MgCl_2 \cdot 6H_2O$
    d) $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$
128. The carbon of microphones used in public address systems is :

a) Graphite b) Charcoal c) Coke d) Lamp black

129. Aluminium is extracted by the electrolysis of
    a) Alumina b) Bauxite
    c) Molten cryolite d) Alumina mixed with molten cryolite
130. In Gold Schmidt reaction, certain metallic oxides are reduced to the metallic state by-heating with:

a) Metallic magnesium b) Metallic aluminium c) Metallic iron d) Sodium metal

131. Formula for agate is

a) Na_2SiO_3 b) $K_2O.SiO_2.Al_2O_3$ c) SiO_2 d) CaF_2

132. Pure CO can be obtained from:
    a) Sodium oxalate
    b) Nickel tetracarbonyl
    c) Formic acid
    d) Carbon dioxide and hydrogen
133. Which is used for the manufacture of optical instruments?

a) Water glass b) Pyrex glass c) Flint glass d) Jena glass

134. Red liquor is :

a) $(CH_3COO)_3Al$ b) $Al(OH)_3$ c) $Al_2(CO_3)_3$ d) $Al_2(SO_4)_3$

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135. Which element has a limited coordination number of four?
a) Sn b) C c) Si d) Ge

136. Aqueous ammonia is used as a precipitating reagent for Al^{3+} ions as $AI(OH)_3$ rather than aqueous NaOH, because:
a) NH_4^+ is a weak base
b) NaOH is a very strong base
c) NaOH forms $[Al(OH)_4]^-$ions
d) NaOH forms $[Al(OH)_2]^+$ ions

137. In Goldschmidt aluminothermic process,
thermite contains
a) 3 part of Al_2O_3, and 4 part of Al
b) 3 parts of Fe_2O_3 and 2 parts of Al
c) 3 parts of Fe_2O_3 and 1 part of Al
d) 1 parts of Fe_2O_3 and 1 part of Al

138. During the electrolysis of cryolite, aluminium and fluorine are formed in molar ratio
a) 1:2 b) 2:3 c) 1:1 d) 1:3

139. 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

140. The dissolution of $Al(OH)_3$ by a solution of NaOH results in the formation of:
a) $[Al(H_20)_4(OH)]^{2+}$ b) $[Al(H_2O)_2(OH)_4]^-$ c) $[Al(H_2O)_3(OH)_3]$ d) $[Al(H_2O)_6(OH)_3]$

141. Prussic acid is the name of :
a) PH_3 b) HPO_3 c) HCN d) HNC

142. Which gas is used in airated water?
a) CO_2 b) SO_2 c) CO d) Water vapours

143. Which is not an ore of lead?
a) Galena b) Anglesite c) Calamine d) Cerussite

144. Borax on heating with cobalt oxide forms a blue bead of:
a) $Co(BO_2)_2$ b) $CoBO_2$ c) $Co_3(BO_3)_2$ d) $Na_3Co(BO_3)_2$

145. Inorganic benzene is:
a) BN b) BF_4 c) B_2H_6 d) $B_3N_3H_6$

146. The correct formula of borax is:
a) $Na_2[B_4O_5(OH)_4]\cdot 8H_2O$
b) $Na_2B_4O_7\cdot 4H_2O$
c) $Na_2[B_4O_5(OH)_4]\cdot 10H_2O$
d) $Na_2B_4O_7\cdot 8H_2O$

147. The formula of mineral borax is
a) $Na_2B_4O_7$ b) $Na_2B_4O_7.4H_2O$ c) $Na_2B_4O_7.5H_2O$ d) $Na_2B_4O_7.10H_2O$

148. The hardest compound of boron is:
a) Boron oxide b) Boron nitride c) Boron carbide d) Boron hydride

149. For purification of alumina, the modern processes most useful when (i) the impurity present is a lot iron oxides and (ii) the impurity present is a lot of silica, are
a) For (i) the Hall's process; for (ii) Baeyer's process
b) For (i) Serpeck's process; for (ii) Baeyer's process
c) For (i) Hall' process; for (ii) Serpeck's process
d) For (i) Baeyer's process; for (ii) Serpeck's process

150. Carbon reacts with conc. H_2SO_4 to give :
a) CO_2, SO_2, H_2O b) SO_2, H_2O, CO c) CO, H_2O d) CO_2, H_2O

151. Massicot is prepared by:
a) Heating tin in air all about 300°C
b) Heating litharge

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c) Heating red lead
d) Heating lead nitrate

152. Animal charcoal is used for decolourisation of sugar because:
a) It oxidizes coloured material
b) It reduces coloured material
c) It converts coloured material into colourless
d) It adsorbs coloured material

153. Which is used as disinfectant?
a) Boric acid b) Sulphuric acid c) Phosphorus acid d) Phosphoric acid

154. Which gas is liberated when Al_4C_3 is hydrolysed?
a) CH_4 b) C_2H_2 c) C_2H_6 d) CO_2

155. The coal form containing maximum percentage of carbon is:
a) Lignite b) Anthracite c) Bituminous d) Peat

156. Water softner is
a) Borax b) Zeolite c) Both (a) And (b) d) None of these

157. Carbon dioxide is a gas but silica is a solid because :
a) Carbon dioxide is composed of discrete covalent CO_2 molecules whereas silica has continuous tetrahedral structure
b) CO_2 molecules are lighter than SiO_2 molecules
c) CO_2 is more acidic than SiO_2
d) Melting point of silica is very high

158. Alums are used for
a) Tanning of leather b) Coagulation of blood c) Purification of water d) All of these

159. On heating Al at 800°C in air, Al_2O_3 is formed. The reaction is:
a) An endothermic reaction
b) An exothermic reaction
c) Reduction of aluminium
d) None of the above

160. White lead is
a) $PbCO_3PbO$ b) $PbCO_3$ c) $Pb(OH)_2.2PbCO_3$ d) $PbSO_4.PbO$

161. Hot and conc. HNO_3 react with carbon to form:
a) CO_2 b) CO c) C_6H_5COOH d) $NO_2 + CO_2$

162. Anodised aluminium is:
a) Al obtained at anode
b) Al prepared electrolytically
c) Alloy of Al containing 95% Al
d) Al electrolytically coated with aluminium oxide

163. $AlCl_3$ is
a) Anhydrous and ionic b) Covalent and basic
c) Anhydrous and covalent d) Co-ordinate and acidic

164. The variety of glass, used for the preservation of eggs is:
a) Jena glass b) Safety glass c) Water glass d) Bottle glass

165. Which of the following is used for making optical instruments?
a) SiO_2 b) Si c) SiH_4 d) SiC

166. Tincal is
a) $Na_2CO_3.10H_2O$ b) $NaNO_3$ c) $Na_2B_4O_7.10H_2O$ d) NaCl

167. Tin (II) fluoride (anhydrous) can be obtained by :
a) Treating tin with F_2 b) Treating tin with HF c) Dissolving SnO in HF d) None of these

168. Which of the following is the correct statement for red lead?
a) It is an active form of lead b) It decomposes into Pb and CO_2
c) Its molecular formula is Pb_2O_3 d) It decomposes into PbO and O_2

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169. Potash alum dissolves in water to give a/an
a) Acidic solution of H_2SO_4 b) Alkaline solution
c) Acidic solution of HCl d) Neutral solution

170. Which is the least pure form of carbon?
a) Graphite b) Lamp black c) Wood charcoal d) Animal charcoal

171. The calorific value of carbon is about ……. kcal.
a) 7.8 b) 15.6 c) 47 d) 94

172. Aluminium metal is refined by
a) Serpeck's process b) Baeyer's process c) Hall's process d) Hoope's process

173. The metal which does not form ammonium nitrate by reaction with dil HNO_3 is
a) Al b) Fe c) Pb d) Mg

174. Which one of the following metals work as a reduction in smelting process?
a) C b) Al c) Zn d) None of these

175. The incorrect statement/s among the following is/are
IV. NCl_5 does not exist while PCl_5 does.
V. Lead prefers to form tetravalent compounds.
VI. The three $C-O$ bonds are not equal in the carbonate ion.
VII. Both O_2^+ and NO are paramagnetic.
a) I, III and IV
b) I and IV
c) II and III
d) I and III

176. Which of the following is known as inorganic benzene?
a) Borazine b) Phosphonitrilicacid c) Boron nitride d) p- dichlorobenzene

177. Which element does not exhibit allotropy?
a) C b) Sn c) Si d) Pb

178. Carbon monoxide will not reduce:
a) Litharge b) Cupric oxide c) Zinc oxide d) Ferric oxide

179. Graphite is made by heating coke with silica for many hours in a :
a) Blast furnace
b) Blast of steam under pressure
c) In presence of air
d) High electric arc furnace

180. When carbon monoxide is passed over solid caustic soda heated to 200°C, it forms
a) Na_2CO_3 b) CH_3COONa c) $NaHCO_3$ d) HCOONa

181. In purification of bauxite by hall's process
a) Bauxite ore is fused with Na_2CO_3
b) Bauxite ore is heated with NaOH solution at 50°C
c) Bauxite ore is heated with $NaHCO_3$
d) Bauxite ore is fused with coke and heated at 1800°C in a current of nitrogen

182. Which of the following is not a Lewis acid?
a) SiF_4 b) $FeCl_3$ c) BF_3 d) C_2H_4

183. Sapphire is a mineral of:
a) Cu b) Zn c) Al d) Hg

184. Which is/are fire extinguishers?
a) Dry powder containing sand + $NaHCO_3$
b) $NaHCO_3 + H_2SO_4$
c) Foamite extinguishers containing $NaHCO_3 + Al_2(SO_4)_3$
d) All of these

185. Boron nitride has the structure of the type
a) Graphite type b) Diamond type

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c) Both diamond and graphite type d) NaCl type

186. The structure and hybridization of $Si(CH_3)_4$ is :
a) bent, sp b) trigonal, sp^2 c) octahedral, sp^3d d) tetrahedral, sp^3

187. Al_2O_3 can be converted to anhydrous $AlCl_3$ by heating:
a) A mixture of Al_2O_3 and carbon in dry Cl_2 gas
b) Al_2O_3 with Cl_2 gas
c) Al_2O_3 with HCl gas
d) Al_2O_3 with NaCl in solid state

188. Eka aluminium is:
a) Gallium b) Germanium c) Indium d) Scandium

189. Elements of group IV used in semiconductors are
a) C, Si, Ge b) Si, Ge, Sn c) Si, Ge d) B, Si, Ge

190. The acid used for etching the glass is:
a) Sulphuric acid b) Perchloric acid c) Hydrofluoric acid d) Aqua-regia

191. The greatest percentage of CO is in:
a) Coal gas b) Producer gas c) Water gas d) Oil gas

192. The process used for purification of bauxite are containing iron oxide impurity is known as:
a) Hoope's process b) Serpeck's process c) Baeyer's process d) Electrolytic process

193. Which statement is correct?
a) BCl_3 and $AlCl_3$ are both Lewis acids and BCl_3 is stronger than $AlCl_3$
b) BCl_3 and $AlCl_3$ are both Lewis acids and $AlCl_3$ is stronger than BCl_3
c) BCl_3 and $AlCl_3$ are both equally strong Lewis acids
d) Both BCl_3 and $AlCl_3$ are not Lewis acids

194. In the electrolysis of alumina, cryolite is added to:
a) Lower the melting point of alumina
b) Increase the electrical conductivity
c) Both (a) and (b)
d) Remove impurities from alumina

195. Which is true for an element R present in III group of the periodic table?
a) It has oxidation state of + 4 b) It is gas at room temperature
c) It forms R_2O_3 d) It forms RX_2

196. In III A group, Tl (thalium,) shows +1 oxidation state while other members show +3 oxidation state, why?
a) Presence of lone electron in Tl b) Insert pair effect
c) Large ionic radius of Tl ion d) None of the above

197. Which of the following elements is a metalloid?
a) C b) Ge c) Bi d) Sn

198. Hydrogen forms a bridge in the chemical structure of:
a) Hydrogen peroxide b) Lithium hydride c) Diborane d) Sodium peroxide

199. Which of the following is a use of alum?
a) Making explosives b) Bleaching clothes c) Water softening d) All of these

200. Red lead in an example of a/an…oxide
a) Basic b) Mixed c) Super d) Amphoteric

201. Carbon monoxide on heating with sulphur gives:
a) COS b) SO_2 c) SO_3 d) None of these

202. Crystalline varieties of carbon is :
a) Graphite b) Coke c) Peat d) Gas carbon

203. Formula of felspar is
a) $K_2O.Al_2O_3.6SiO_2$ b) $K_2O_3.Al_2O_3.6Si_2O_2.2H_2O$
c) $Al_2O_3.2SiO_2.2H_2O$ d) $3MgO.4SiO_2.H_2O$

204. The ratio of $Fe_2O_3$and Al, in thermite is

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a) 1:3 b) 1:2 c) 3:1 d) None of these

205. The relative Lewis acid character of boron trihalides is in the order
a) $BI_3 > BBr_3 > BF_3 > BCl_3$ b) $BI_3 > BBr_3 > BCl_3 > BF_3$
c) $BF_3 > BCl_3 > BBr_3 > BI_3$ d) $BCl_3 > BF_3 > BI_3 > BBr_3$

206. Alum is added to muddy water because
a) It acts as disinfectant
b) It results in coagulation of clay and sand
c) Clay is soluble in alum, hence removes it
d) It makes water alkaline which is good for health

207. The reducing agent in thermite process is
a) MnO_2 b) BaO_2 c) Mg d) Al

208. There are two H-bridge bonds in diborane molecule because there are:
a) Only 12 electrons
b) 14 electrons
c) 2 electrons less than required for bonding
d) Two electrons more than required for bonding

209. Name of structure of silicates in which three oxygen atoms of $[SiO_4]^{4-}$ are shared is
a) Pyrosilicate b) Sheet silicate
c) Linear chain silicate d) Three dimensional silicate

210. Pb reacts with dilute HNO_3 produces
a) NO b) NH_4NO_3 c) N_2O_5 d) NO_2

211. Aluminium appears like gold when it is mixed with:
a) 90% Cu b) 50% Ni c) 90% Sn d) 50% Co

212. Purification of aluminium done by electrolytic refining is known as
a) Hoope's process b) Serpeck's process c) Hall's process d) Baeyer's process

213. Which of the following is used in making printer's ink, shoe polish, black varnish and paint?
a) Lamp black b) Bone black c) Carbon black d) None of these

214. The hottest part of the Bunsen burner flame is:
a) Top of the outer zone
b) A little below the tip of the flame
c) Above the inner zone
d) Blue zone

215. In the alumino-thermic process, aluminium acts as:
a) An oxidizing agent b) A flux c) A reduction agent d) A solder

216. Diborane reacts with water to form:
a) HBO_2 b) H_3BO_3 c) $H_3BO_3 + H_2$ d) H_2

217. The chief impurity present in red bauxite is
a) SiO_2 b) Fe_2O_3 c) K_2SO_4 d) NaF

218. Be and Al exhibits many properties which are similar but the two elements differ is:
a) Exhibiting amphoteric nature in their oxides
b) Forming polymeric hydrides
c) Forming covalent halides
d) Exhibiting maximum covalency in compounds

219. Borax bead test is responded by:
a) Divalent metals
b) Heavy metals
c) Light metals
d) Metal which forms coloured metaborates

220. A fibrous mineral which can withstand red hot flames without any damage is
a) Talc b) Glass wool c) Soap stone d) Asbestos

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221. Lead may be replaced from its salt solution by:
a) Cu b) Au c) Ag d) Mg
222. Unstable lead compounds are
a) $PbCl_4$, $PbBr_4$ and PbI_4 b) $PbCl_2$, $PbBr_2$ and PbI_2
c) PbO, PbO_2 and Pb_3O_4 d) $PbCl_4^{2-}$, $PbCl_6^{2-}$
223. Which acid is formed when SiF_4 reacts with water?
a) H_2SO_4 b) H_2SiF_4 c) H_2SiF_6 d) None of these
224. Which of the following reactions occurs at the cathode during the charging of lead accumulator?
a) $Pb^{2+} + 2e \longrightarrow Pb$
b) $Pb^{2+} + SO_4^{2-} \longrightarrow PbSO_4$
c) $Pb \rightarrow Pb^{2+} + 2e$
d) $PbSO_4 + 2H_2O \longrightarrow PbO_2 + 4H^+ + SO_4^{2-} + 2e$
225. The two type of bonds present in B_2H_6 are covalent and……
a) Ionic b) Coordinate c) Hydrogen bridge d) None of these
226. Which one shows most pronounced inert pair effect?
a) Si b) Sn c) Pb d) C
227. Which of the following is an ore of lead?
a) Galena b) Calamine c) Malachite d) Dolomite
228. Soldiers of Napolean army while at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniforms. While metallic tin buttons got converted to grey powder. This transformation is related to
a) An interaction with nitrogen of the air at very low to temperatures
b) A change in the partial pressure of oxygen in the air
c) A change in the crystalline structure of tin
d) An interaction with water vapour contained in the humid air
229. In SiF_6^{2-} and $SiCl_6^{2-}$ which one is known and why?
a) SiF_6^{2-} because of small size of F b) SiF_6^{2-} because of large size of F
c) $SiCl_6^{2-}$ because of small size of Cl d) $SiCl_6^{2-}$ because of large size of Cl
230. Which of the following has structure similar to graphite?
a) BN b) B c) B_4C d) B_2H_6
231. Tin(II) chloride (anhydrous) can be obtained :
a) By melting tin in an atmosphere of Cl_2
b) By treating tin with conc. HCl and heating the product to dryness
c) By treating tin with dil. HCl and heating the product to dryness
d) By treating tin with HCl(gas)
232. Which statement is not true about potash alum?
a) Its empirical formula is $KAl(SO_4)_2 \cdot 12H_2O$
b) Its aqueous solution is basic in nature
c) It is used in dyeing industries
d) On heating it melts and loses its water of crystallization
233. Solder is an alloy of :
a) Pb, Sb and Sn b) Pb and Sn c) Pb, Bi and Sn d) Sn, Sb and Cu
234. The thermal stability order for group 14 halides is:
a) $GeX_2 < SiX_2 < SnX_2 < PbX_2$
b) $SiX_2 < GeX_2 < PbX_2 < SnX_2$
c) $SiX_2 < GeX_2 < SnX_2 < PbX_2$
d) $PbX_2 < SnX_2 < GeX_2 < SiX_2$
235. Mica is chemically:
a) Potassium alumino silicate having sheet structure
b) Calcium alumino silicate having fibrous structure

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c) Calcium magnesium silicate having three dimensional network
d) Hydrated sodium alumino silicate having three dimensional network

236. When tin is treated with concentrated nitric acid
a) It is converted into stannous nitrate
b) It is converted into stannic nitrate
c) It is converted into metastannic acid
d) It becomes passive

237. An element 'X' which occurs in the first short period has an outer electronic structure s^2p^1. What is the formula and acid-base character of its oxides?
a) XO_3, basic
b) X_2O_3, basic
c) X_2O_3, acidic
d) XO_2, acidic

238. Pb and Sn are extracted from their Chief ores by:
a) Carbon reduction and self reduction
b) Self reduction and carbon reduction
c) Electrolysis and self reduction
d) Self reduction and electrolysis

239. Boron readily dissolves in:
a) Conc. HCl
b) Fused NaOH at 673 K
c) Fused Na_2CO_3 at 1173K
d) A mixture of conc. HNO_3 and conc. $H_2SO_4(1:2)$

240. The borax bead is chemically:
a) B_2O_3
b) $Na_2B_4O_7$
c) Na_3BO_3
d) $B_2O_3 + NaBO_2$

241. Inorganic benzene is
a) $B_3H_3N_3$
b) BH_3NH_3
c) $B_3H_6N_3$
d) $H_3B_3N_6$

242. Boric acid is prepared from borax by the action of:
a) Hydrochloric acid
b) Sodium hydroxide
c) Carbon dioxide
d) Sodium carbonate

243. Which of the following does not contain silicon?
a) Kaoline
b) Agate
c) Ruby
d) Quartz

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

245. Least stable hydride is :
a) Methane
b) Plumbane
c) Silane
d) Stibine

246. Which member of group 13 is liquid at 30°C?
a) B
b) Al
c) Ga
d) Tl

247. Which fuel has the highest calorific value (kJ/kg)?
a) Charcoal
b) Kerosene
c) Wood
d) Cow dung

248. Lead sulphate is soluble in :
a) conc. HNO_3
b) $KMnO_4/H^+$
c) $K_2Cr_2O_7/H^+$
d) None of these

249. Dry ice is
a) Solid H_2O
b) Solid CO_2
c) Solid N_2O_4
d) Solid NH_3

250. Each $B-H-B$ bridge in $B_2H_6$is formed by the sharing of
a) 2 electrons
b) 4 electrons
c) 1 electrons
d) 3 electrons

251. Which one of the following ores is best concentrated by froth-floatation method?
a) Magnetite
b) Cassiterite
c) Galena
d) Malachite

252. Which metal is powdered, suspended in oil and used as paint?
a) Fe
b) Sn
c) Ag
d) Al

253. Aqueous solution of potash alum is:
a) Alkaline
b) Acidic
c) Neutral
d) Soppy

254. In alumino thermic process, Al is used as

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a) Reducing agent b) Oxidising agent c) Catalyst d) Electrolyte

255. Coal gas:
   a) Burns with a smoky flame
   b) Burns with non-smoky flame
   c) Is not used for lighting purpose
   d) Is not a good fuel

256. Which halide is least stable and has doubtful existence?
   a) CI_4 b) GeI_4 c) SnI_4 d) PbI_4

257. Carbon suboxide C_3O_2 has
   a) Linear structure b) Bent structure
   c) Trigonal planar structure d) Distorted tetrahedral structure

258. On strong heating lead nitrate gives:
   a) PbO, NO, O_2 b) PbO, NO, NO_2 c) PbO_2, PbO, NO_2 d) PbO, NO_2, O_2

259. AlI_3, when react with CCl_4, gives
   a) $AlCl_3$ b) Cl_4 c) Al_4C_3 d) Al_2O_3

260. All alums contain:
   a) One monovalent and one trivalent metal
   b) Both monovalent metal
   c) One divalent and one monovalent metal
   d) Both divalent metal

261. Moderate electrical conductivity is shown by
   a) Silica b) Graphite c) Diamond d) Carborundum

262. The molecules of aluminium chloride in vapour state:
   a) Have no shape
   b) Are shaped like a plane triangle
   c) Are round
   d) Are like randomly broken bricks

263. The correct order of increasing atomic radii, is
   a) $B < Al < Ga$ b) $Ga < Al < B$ c) $Al < B < Ga$ d) $B < Ga < Al$

264. Identify the statement that is not correct as far as structure of diborane is concerned
   a) Each boron atom forms four bonds in diborane
   b) There are two bridging hydrogen atoms in diborane
   c) The hydrogen atoms are not in the same plane in diborane
   d) All B—H bonds in diborane are similar

265. Which of the following is not an ionic trihalide?
   a) AlF_3 b) BF_3 c) InF_3 d) GaF_3

266. Identify B in the following reaction,

$$H_4SiO_4 \xrightarrow[-H_2O]{1000^\circ C} A \xrightarrow[\Delta]{\text{Carbon}} B + CO$$

   a) Corundum b) Quartz c) Silica d) Carborundum

267. The stability of hydrides of carbon family is in the order
   a) $CH_4 > SiH_4 > GeH_4 > SnH_4 > PbH_4$ b) $CH_4 < SiH_4 < GeH_4 < SnH_4 < PbH_4$
   c) $CH_4 > SnH_4 > GeH_4 > SiH_4 > PbH_4$ d) None of the above

268. The number of electrons present in the valency shell of group 13:
   a) One b) Two c) Three d) Zero

269. The straight chain polymer is formed by:
   a) Hydrolysis of $(CH_3)_2\ SiCl_2$ followed by condensation polymerisation
   b) Hydrolysis of $(CH_3)_3\ SiCl$ followed by condensation polymerisation
   c) Hydrolysis of CH_3SiCl_3 followed by condensation polymerisation
   d) Hydrolysis of $(CH_3)_4\ Si$ by addition polymerisation

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270. 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

271. Which of the boron compound is optically active?
a) Boron trifluoride
b) Boron anhydride
c) Borosalicylic acid
d) Sodium tetraborate

272. Extraction of lead by reduction methods is done by
a) Adding more galena into reverberatory furnace
b) Adding more galena and coke into the reverberatory furnace
c) Self reduction of oxide from sulphide present in the furnace
d) Adding more lead sulphate into reverberatory furnace

273. Foramtion of in-numberable compounds of carbon is due to its
a) High reactivity
b) Catenation tendency
c) Covalent and ionic tendency
d) Different valency

274. Moissan boron is
a) Amorphous boron of low purity
b) Crystalline boron of low purity
c) Amorphous boron ultra purity
d) Crystalline boron of ultra purity

275. Boric acid is used in carom boards for smooth gliding of pawns because
a) H_3BO_3 molecules are loosely chemically bonded and hence soft
b) Its low density makes it fluffy
c) It can be powered to a very small grain size
d) H-bonding in H_3BO_3 gives it a layered structure

276. Iodine is decolourised by:
a) $ZnCl_2$
b) $HgCl_2$
c) $SnCl_2$
d) $AlCl_3$

277. Quartz is an example of
a) Chain silicate
b) Sheet silicate
c) Cyclic silicate
d) Three dimensional network silicate

278. In aluminates coordination number of Al is:
a) 4
b) 6
c) 3
d) 1

279. Water as is
a) $CO + N_2$
b) $CO + CO_2 + CH_4$
c) $CO_2 + N_2$
d) $CO + H_2$

280. The inert form of carbon is:
a) Diamond
b) Graphite
c) Coal
d) Charcoal

281. Calorific value of producer gas is low because of
a) High per cent of N_2
b) Low per cent of CO_2
c) High per cent of CO
d) Low per cent of N_2

282. Producer gas is the mixture of
a) $CO + N_2$
b) $CO + H_2$
c) CO + water vapour
d) $N_2 + CH_4$

283. Which of the following has the minimum heat of dissociation?
a) $[(CH_3)_3\ N \longrightarrow BF_3]$
b) $[(CH_3)_3\ N \longrightarrow B(CH_3)F_2]$
c) $[(CH_3)_3\ N \longrightarrow B(CH_3)_2F]$
d) $[(CH_3)_3\ N \longrightarrow B(CH_3)_3\ ]$

284. The most reactive form of carbon is:
a) Diamond
b) Graphite
c) Coal
d) Charcoal

285. Which of the following compounds has peroxide linkage?
a) Pb_2O_3
b) CO_2
c) PbO_2
d) SiO_2

286. Which is not used as pigment in paints?
a) Lead dioxide
b) White lead
c) Lead chromate
d) Pb_3O_4

287. Aluminium does not react with:
a) NaOH
b) HCl
c) N_2
d) HNO_3

288. Thallium shows different oxidation states because:
a) Of its high reactivity

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b) Of inert pair of electron
c) Of its amphoteric nature
d) It is a transition metal

289. The soldiers of Napolean army while at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniform. White metallic tin buttons got converted to grey powder. This transformation is related to
a) A change in the crystalline structure of tin
b) An interaction with nitrogen of the air at very low temperature
c) A change in the partial pressure of oxygen in the air
d) An interaction with water vapour contained in the humid air

290. The structure of BF_3 is
a) Planar triangular b) Pyramidal c) Tetrahedral d) T-shaped

291. Name the type of the structure of silicate in which one oxygen atom of $[SiO_4]^{4-}$ is shared:
a) Three dimensional b) Linear chain silicate c) Sheet silicate d) Pyrosilicate

292. The IUPAC name of complex $K_3[Al(C_2O_4)_3]$ is:
a) Potassium alumino-oxalate
b) Potassium trioxalatoaluminate (III)
c) Potassium aluminium (III) oxalate
d) Potassium trioxalatoaluminate (VI)

293. CO behaves as
a) Lewis acid b) Lewis base c) Amphoteric oxide d) None of these

294. Addition of excess of sodium hydroxide solution to stannous chloride solution, we obtain:
a) $Sn(OH)_2$ b) $SnO_2 \cdot H_2O$ c) Na_2SnO_3 d) Na_2SnO_2

295. Ammonical CuCl absorbs:
a) CO_2 b) SO_2 c) H_2SO_4 d) CO

296. Aluminium hydroxide is soluble in excess at sodium hydroxide forming the ion
a) AlO_2^{3+} b) AlO_2^- c) AlO_2^{3-} d) $Al_2O_3^-$

297. The refractive index of diamond is highest among solids. Its value is:
a) 2.225 b) 3.235 c) 2.15 d) 2.417

298. The correct statement with respect to carbon monoxide is:
a) It combines with water to give carbonic acid.
b) It reacts with haemoglobin in red blood cells.
c) It is a powerful oxidizing agent.
d) It is used to prepare aerated drinks.

299. SiF_4 gets hydrolysed giving
a) SiO_2 b) $Si(OH)_4$ c) $Si(OH)_2F_2$ d) H_2SiF_6

300. Highest electronegativity among the following is for:
a) C b) Si c) Sn d) Pb

301. Addition of $SnCl_2$ to $HgCl_2$ gives precipitate
a) White turning to red
b) White turning to grey
c) Black turning to white
d) None of the above

302. The stability of dihalides of Si, Ge, Sn and Pb increases steadily in the sequence
a) $GeX_2 < SiX_2 < SnX_2 < PbX_2$
b) $SiX_2 < GeX_2 < PbX_2 < SnX_2$
c) $SiX_2 < GeX_2 < SnX_2 < PbX_2$
d) $PbX_2 < SnX_2 < GeX_2 < SiX_2$

303. PbO is
a) Acidic b) Amphoteric c) Basic d) Neutral

304. Among the following the maximum covalent character is shown by the compound:
a) $FeCl_2$ b) $SnCl_2$ c) $AlCl_3$ d) $MgCl_2$

305. Asbestos is chemically:
a) Silicate of calcium and magnesium

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b) Calcium alumino silicate
c) Magnesium alumino silicates
d) Calcium silicate + calcium aluminates

306. Living in the atmosphere of CO is dangerous because :
a) It reduces organic matter of tissues
b) Dries up the blood
c) Combines with O_2 present inside to form CO_2
d) Combines with haemoglobin and makes it incapable to absorb O_2

307. The structure of diborane contains:
a) four $2C-2e$ bonds and two $3C-2e$ bonds
b) two $2C-2e$ bonds and two $2C-2e$ bonds
c) two $2C-2e$ bonds and two $3C-2e$ bonds
d) four $2C-2e$ bonds and two $2C-2e$ bonds

308. Borax is:
a) $Na_2B_4O_7$ b) $Na_2B_4O_7 \cdot 4H_2O$ c) $Na_2B_4O_7 \cdot 7H_20$ d) $Na_2B_4O_7 \cdot 10H_2O$

309. Heating an aqueous solution of aluminium chloride to dryness will give
a) $Al(OH)Cl_2$ b) Al_2O_3 c) Al_2Cl_6 d) $AlCl_3$

310. Hoope's process is used for the purification of the metal
a) Cu b) Al c) Zn d) Ag

311. Which of the following is the electron deficient molecule?
a) PH_3 b) C_2H_6 c) SiH_4 d) B_2H_6

312. Which is false in case of boric acid(H_3BO_3)?
a) It is soluble in hot water
b) It acts as a tribasic acid
c) It has a planer structure
d) It acts as a monobasic acid

313. Bleaching powder on treatment with CO_2 gives :
a) O_2 b) Cl_2 c) HCl d) H_2

314. A gas does not turn lime water milky, supports the combustion of burning magnesium. It has no smell and is colourless. It extinguishes a glowing splint but under some circumstances reacts with oxygen and hydrogen. It is not poisonous. The gas is likely to be :
a) Water vapour b) Nitrogen c) Carbon dioxide d) Helium

315. Carbon burns in air and forms two oxides CO and CO_2. This shows that carbon has:
a) Two allotropic forms
b) Two oxidation states
c) Two isotopes
d) 4 electrons in valency shell

316. Which compound is solid?
a) CO_2 b) NH_3 c) PH_3 d) SiO_2

317. The first I.P. of Al is smaller than that of Mg because:
a) Atomic size of Al $>$ Mg
b) Al has one electron in p-orbital
c) Atomic size of Al $<$ Mgs
d) Not known

318. Which type of forces bind together the carbon atoms in diamond?
a) Coulombic forces b) Dipole-dipole forces c) Van der Waals' forces d) Covalent forces

319. Ordinary glass is:
a) Sodium silicate
b) Copper silicate
c) Calcium silicate
d) A mixture of calcium and sodium silicates with silica

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320. Fluorine is more electronegative than either boron or phosphorus. What conclusion can be drawn from the fact that BF_3 has no dipole moment but PF_3 has?
a) BF_3 is spherically symmetrical, PF_3 is not
b) BF_3 molecule must be linear
c) The atomic radius of P is larger than the atomic radius of B
d) The BF_3 molecule must be planar triangular

321. The materials for manufacture of ordinary glass are :
a) Gypsum, sand and sodium carbonate
b) Sodium carbonate and sand
c) Sodium carbonate , lime stone and sand
d) Potassium carbonate , sand and lime stone

322. The common semiconductor is :
a) Fe b) Se c) Ge d) C

323. Alumina is
a) Acidic b) Amphoteric c) Basic d) None of these

324. In aqueous solution of GaCl disproportionates to
a) $GaCl_2$ and $GaCl_3$ b) Ga and $GaCl_3$ c) $GaCl_2$ and Ga d) $GaCl_3$ and $GaCl_5$

325. Which of the following does not exist in free form?
a) BF_3 b) BH_3 c) BCl_3 d) BBr_3

326. Sodium oxalate on heating with conc. H_2SO_4 gives:
a) CO only b) CO and CO_2 c) CO_2 only d) SO_2 and SO_3

327. In context with the industrial preparation of hydrogen from water gas ($CO+H_2$), which of the following is the correct statement?
a) CO is oxidised to CO_2 with steam in the presence of a catalyst followed by absorption of CO_2 in alkali
b) CO and H_2 are fractionally separated using differences in their densities.
c) CO is removed by absorption in aqueous Cu_2Cl_2 solution
d) H_2 is removed through occlusion with Pd

328. In the reaction $B_2O_3 + C + Cl_2 \longrightarrow A + CO$. The A is
a) CCl_2 b) BCl_3 c) BCl_2 d) B_2Cl_2

329. In electrolysis of aluminium oxide which of the following is added to accelerate the process
a) Silica b) Silicate c) Cryolite d) Nickel

330. Silicon react with hot solution of NaOH forming
a) $Si(OH)_4$ b) $Si(OH)_2$ c) SiO_2 d) Na_2SiO_4

331. Silicon is usually found in :
a) Sand b) Coal c) Lime d) Lime stone

332. Synthetic gas is a mixture of:
a) Steam and carbon monoxide
b) Carbon monoxide and nitrogen
c) Hydrogen and carbon monoxide
d) Hydrogen and methane

333. Lead pipes can be used for:
a) Soft water
b) Hard water
c) Both hard and soft water
d) None of the above

334. Aluminium is not present in which of the following mineral?
a) Cryolite b) Felspar c) Fluorspar d) Mica

335. Diborane does not undergo cleavage reaction with:
a) Trimethyl amine b) Ammonia c) CO d) CO_2

336. Stannous oxide can be obtained by:
a) Heating tin strongly in air

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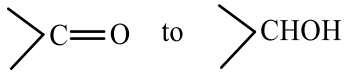
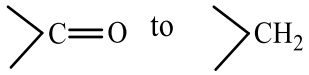
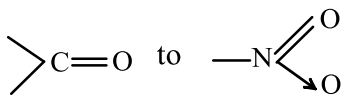
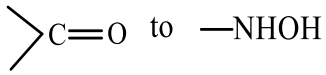
b) Heating meta-stannic acid
c) Heating tin(II) oxalate
d) None of the above

337. Sugar of lead is
a) $2PbSO_4 \cdot PbO$ b) $PbCO_3 \cdot Pb(OH)_2$ c) $PbCO_3$ d) $(CH_3COO)_2Pb$

338. The fraction by volume of carbon monoxide in producer gas is about:
a) 1/2 b) 1/3 c) 1/4 d) 2/3

339. The mass of carbon anode consumed (giving only carbon dioxide) in production of 270 kg of aluminium metal from bauxite by the Hall process is
(Atomic mass of Al=27)
a) 180 kg b) 270 kg c) 540 kg d) 90 kg

340. Carbon dioxide dissolves under pressure in water to give:
a) An alkaline solution
b) An acidic solution
c) A neutral solution
d) A highly alkaline solution

341. $NaBH_4$is used in organic chemistry to convert:
a) 
b) 
c) 
d) 

342. $AlCl_3$ exists in dimer because:
a) Al has greater I.P. b) Al has larger radius c) High charge nucleus d) Incomplete p –orbital

343. Which of the following is not correct?
a) $SiO_2$is used as acidic flux
b) The distance between the layers in graphite is 3.35×10^{-3}cm
c) SiO_2 reacts with Na_2CO_3 and liberates CO
d) The hybridisation of C in graphite is sp^2

344. When sand is heated with hydrofluoric acid and a wet rod is brought in contact with vapours evolving a white deposit is due to
a) SiF_4 b) SiF_2 c) H_4SiO_4 d) None of these

345. Which is not a characteristic property of carbon?
a) Catenation
b) Multiple bond formation
c) Availability of d-orbitals for bonding
d) Highest electronegativity in the group

346. Which of the following is more stable?
a) Pb^{4+} b) Sn^{4+} c) Ge^{4+} d) Si^{4+}

347. In diborane the two $H-B-H$ angles are nearly
a) $95°, 120°$ b) $60°, 120°$ c) $120°, 180°$ d) $95°, 150°$

348. Among the various allotropes of carbon :
a) Diamond is the hardest and graphite is the softest
b) Diamond is the hardest and coke is the softest
c) Diamond is the hardest and lamp black is the softest.
d) Coke is hardest and diamond is softest

349. Oxides of silicon are:

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a) Liquids b) Solids c) Gases d) None of these

350. Which metal is protected by a layer of its own oxide?
a) Fe b) Au c) Ag d) Al

351. Which one of the following statements about the zeolite is false?
a) They are used as cation exchangers
b) Some of the SiO_4^{4-} units are replaced by AlO_4^{5-} and AlO_6^{9-} ions in zeolite
c) They have open structure which enables them to take up small molecules
d) Zeolites are aluminosilicates having three dimensional structure

352. Alane is chemically:
a) AlH_3 b) $(AlH_3)_n$ c) $LiAlH_4$ d) None of these

353. Which of the following form dimeric halides?
a) Al b) Mg c) In d) Ca

354. Pure H_2S gas can be obtained by the action of water on:
a) CuS b) FeS c) Flower of sulphur d) Al_2S_3

355. BF_3 acts as acid according to:
a) Lewis b) Bronsted c) Arrhenius d) None of these

356. Which is used to produce smoke screens?
a) Calcium phosphide b) Sodium carbonate c) Zinc sulphide d) Zinc phosphide

357. Alumino-thermy is a process involving :
a) Reduction of oxide of a metal by heating with sodium
b) Exothermic reduction of metal oxides by heating with sodium
c) Reduction of oxides of a metal by heating with carbon
d) None of the above

358. In extraction of aluminium the electrolyte is
a) Fused cryolite with felspar b) Pure alumina in molten state
c) Fused cryolite with fluorspar d) Pure alumina with bauxite and molten cryolite

359. Nickeloy is an alloy containing:
a) $Ni + Cu + Cr$ b) $Al + Cu + Cr$ c) $Ni + Al + Cu$ d) None of these

360. By chlorinating carbon disulphide with chlorine in presence of aluminium chloride, we get:
a) Carbon tetrachloride b) Chloroform c) Chloral d) Methylene chloride

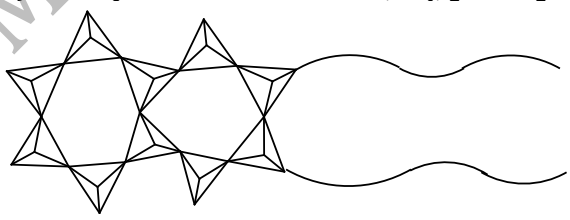
361. The element which forms neutral as well as acidic oxides is:
a) Sn b) Si c) C d) P

362. Carborundum is the commercial name of :
a) Al_2O_3 b) $Ca(H_2PO_4)_2$ c) H_3PO_4 d) SiC

363. Which is amphoteric compound?
a) Cr_2O_3 b) Mn_2O_3 c) Al_2O_3 d) Fe_2O_3

364. Which of the following is not true about potash alum?
a) Its aqueous solution is basic
b) It is used in dyeing industries
c) On heating it melts in its water of crystallization
d) Its empirical formula is $KAl(SO_4)_2 \cdot 12H_2O$

365.



Silicate structure unit of
a) $(Si_4O_{11})_n^{-6n}$ b) $(Si_2O_{11})_n^{-2n}$ c) (Si_2O_3) d) $(SiO_4)^{-4}$

366. Which of the following gives propyne on hydrolysis?
a) La_4C_3 b) B_4C c) Al_4C_3 d) Mg_2C_3

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367. Which has highest bond energy?
a) F—F b) C—C c) N—N d) O—O

368. Which is not correct?
a) $Ge(OH)_2$ is amphoteric
b) $GeCl_2$ is more stable than $GeCl_4$
c) GeO_2 is weakly acidic
d) $GeCl_4$in HCl forms $[GeCl_2]^{2-}$ ion

369. The purest form of coal is
a) Peat b) Anthracite c) Bituminous d) Lignite

370. On the addition of mineral acid to an aqueous solution of borax, the compound formed is:
a) Borodihydride b) Orthoboric acid c) Metaboric acid d) Pyroboric acid

371. Bell metal is an alloy of :
a) Sn + Pb b) Cu + Sn c) Sn + Sb d) None of these

372. The anhydride of carbonic acid H_2CO_3 is:
a) C_2O_2 b) CO_2 c) CO d) Na_2CO_3

373. In Al_2Cl_6, which statement is incorrect?
a) Four Al—Cl bonds are of same length and two of different length
b) Six Al—Cl bonds are of same length and two of different length
c) The angle Cl—Al—Cl is 110° and 93°
d) The angle Al—Cl—Al is 87°

374. Carbon tetrachloride has zero dipole moment because of:
a) Planar structure
b) Smaller size of C and Cl atoms
c) Regular tetrahedral structure
d) None of the above

375. Pyrosilicate ion is:
a) SiO_2^{2-} b) SiO_4^{2-} c) $Si_2O_7^{6-}$ d) $Si_2O_6^{7-}$

376. Diaspora is:
a) $Al_2O_3.2H_2O$ b) $Al_2O_3.3H_2O$ c) Al_2O_3 d) $Al_2O_3.H_2O$

377. The main constituents of coal gas are:
a) $CH_4 + CO + H_2$ b) $CO_2 + CO + H_2$ c) $CO + CO_2$ d) $CO + N_2$

378. Melting point is highest for:
a) B b) Al c) Ga d) In

379. Producer gas, a fuel and also a source of nitrogen is obtained by:
a) Passing steam over incandescent coke
b) Restricted supply of air through a bed of incandescent coke
c) Passing a mixture of steam and air over incandescent coke
d) Spraying oil into hot retorts

380. CO_2 and N_2 are non-supporters of combustion. However, for putting out fires CO_2 is preferred over N_2 because CO_2 :
a) Does not burn
b) Forms non-combustible products with burning substances
c) Is denser than nitrogen
d) Is a more reactive gas

381. Solder is an alloy of lead with
a) Copper b) Zinc c) Nickel d) Tin

382. CeO_2 is present in :
a) Crookes glass b) Pyrex glass c) Flint glass d) All of these

383. The formula of potash alum is
a) $K_2SO_4.Al_2(SO_4)_3.24H_2O$ b) $K_2SO_4.Al_2(SO_4)_3.18H_2O$

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c) $K_2SO_4.(NH_4)_2SO_4.18H_2O$ d) $Na_2SO_4.Al_2(SO_4)_3.24H_2O$

384. In diborane the two $H-B-H$ angles are nearly
a) $60°, 120°$ b) $95°, 120°$ c) $95°, 150°$ d) $120°, 180°$

385. Aluminium chloride exists as dimer, Al_2Cl_6, in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives
a) $Al^{3+} + 3Cl^-$ b) $[Al(H_2O)_6]^{3+} + 3Cl^-$ c) $[Al(OH)_6]^{3-} + 3HCl$ d) $Al_2O_3 + 6HCl$

386. Which is correct for SiO_2?
a) Linear, acidic b) Linear, basic c) Tetrahedral, acidic d) Angular, disc

387. H_3BO_3 is
a) Monobasic and weak Lewis acid
b) Monobasic and weak Bronsted acid
c) Monobasic and strong Lewis acid
d) Tribasic and weak Bronsted acid

388. CO_2 is bubbled into an aqueous solution of Na_2CO_3, to give:
a) NaOH b) HCO_3^- c) H_2O d) OH^-

389. The composition of the common glass is
a) $Na_2O.CaO.6SiO_3$ b) $Na_2O.Al_2O_3.SiO_2$ c) $CaO.Al_2O_3.SiO_2$ d) $Na_2O.CaO.6SiO_2$

390. Feldspar is:
a) Potassium sodium alumino silicate
b) A mixture of potassium, aluminium and silicon oxides
c) Hydrated calcium silicate
d) None of the above

391. Tungsten carbides is an example of:
a) A substitutional solid solution
b) Passive solid solution
c) Sandwich solid solution
d) Interstitial solid solution

392. Carbogen is:
a) Mixture of $O_2 + 5 - 10\%\ CO_2$
b) Used by pneumonia patients for respiration
c) Used by victims of CO for respiration
d) All of the above

393. The compound used in lead accumulators is:
a) PbO b) Pb_2O_3 c) Pb_3O_4 d) PbO_2

394. Which of the following is pseudoalum?
a) $(NH_4)_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24H_2O$
b) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_20$
c) $MnSO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
d) None of the above

395. One that marks the paper like lead is:
a) Ga b) Ti c) B d) Tl

396. Which of the following undergoes sublimation?
a) $AlCl_3$ b) NH_4Cl c) Dry ice d) All of these

397. Which is used as mordant?
a) $AlCl_3$ b) $Al_2(SO_4)_3$ c) Alum d) Al_2O_3

398. Which statement regarding H_3BO_3 is not correct?
a) It is a strong tribasic acid
b) It is prepared by acidifying an aqueous solution of borax
c) It has a layer structure in which planar BO_3 units are joined by H-bonds
d) It does not act as proton donor but acts on Lewis acid by accepting OH^- ions

399. The elements of IV A group or group 14 have 4 electrons in their outermost orbit. They:
a) Form M^{4+} ions

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b) Form $M^{4+}$and M^{4-} ions
c) Exhibit oxidation state of + 4 and +2
d) Exhibit oxidation state of + 4

400. Orthoboric acid when heated to red hot gives:
a) Metaboric acid b) Pyroboric acid c) Boron and water d) Boric anhydride

401. Elements showing the phenomenon of allotropy is
a) lead b) copper c) tin d) aluminium

402. The function of fluorspar in the electrolytic reduction of alumina dissolved in fused cryolite (Na_3AlF_6) is
a) To decrease the rate of oxidation of carbonate the anode
b) To lower the temperature of the melt and to make the fused mixture very conducting
c) As a catalyst
d) None of the above

403. Which can be directly brought into solid state from gaseous state?
a) CO b) CO_2 c) PH_3 d) $CO + H_2$

404. $AlCl_3$ on hydrolysis gives:
a) $Al_2O_3 \cdot H_2O$ b) $Al(OH)_3$ c) Al_2O_3 d) $AlCl_3 \cdot 6H_2O$

405. Al reduces most of the metallic oxides due to its greater affinity for:
a) Oxygen b) Metals c) Electrons d) Protons

406. Annealing of glass is done to:
a) Make it more brittle
b) Make it opaque
c) Check it from becoming brittle
d) Make it transparent

407. Boron carbide,B_4C is widely used for:
a) Making acetylene
b) Making plaster of Paris
c) As a hardest substance after diamond
d) Making boric acid

408. Mark the correct statement:
a) Water gas is used in the manufacture of methyl alcohol.
b) Water gas has the highest calorific value.
c) Water gas burns with luminous flame.
d) The production of water gas is exothermic process.

409. Butter of tin is
a) $SnCl_2 \cdot 5H_2O$ b) $SnCl_2 \cdot 2H_2O$ c) $SnCl_4 \cdot 4H_2O$ d) $SnCl_4 \cdot 5H_2O$

410. In laboratory silicon can be prepared by the reaction
a) Silica with magnesium
b) By heating carbon in electric furnace
c) By heating potassium fluosilicate with potassium
d) None of the above

411. Boric acid is polymeric because of:
a) Its acidic nature
b) Presence of hydrogen bonds
c) Its monobasic nature
d) Its geometry

412. Which of the following shows variable valency?
a) B b) Al c) Tl d) None of these

413. Which statement is correct with respect to the property of the elements with increase in atomic number in the carbon family?
a) Their metallic character decreases

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b) The stability of +2 oxidation state increases
c) Their ionization energy increases
d) Their atomic size decreases

414. Among the halides:
1. BCl_3 2. $AlCl_3$
3. $GaCl_3$ 4. $InCl_3$
The order of decreasing Lewis acid character is:
a) 1, 2, 3, 4 b) 4, 3, 2, 1 c) 3, 4, 2, 1, d) 2, 3, 4, 1

415. Carbon is soluble in :
a) Conc. HCl b) dil. HNO_3 c) H_2SO_4 d) dil. HCl

416. Which cannot be prepared by B_2H_6?
a) $NaBH_4$ b) H_3BO_3 c) $B_2(CH_3)_6$ d) $2(CH_3)_2N.B_2H_6$

417. In feldspar and zeolite, Si^{4+} ions are replaced by which ions?
a) Oxide ion b) Hydroxide ion c) Aluminium ion d) Potassium ion

418. Diamond and Emerald are :
a) C, C b) C, Al_2O_3 c) C, Si d) Si, Al

419. Carborundum is
a) SiC b) $Al_2O_3.H_2O$ c) $Al_2(SO_4)_3$ d) $AlCl_3$

420. Which is not an alloy of aluminium?
a) Magnalism b) Duralumin c) German silver d) Aluminium bronze

421. Purification of alumina takes place by
a) Bosch process b) Hall's process c) Hoope's process d) Quartation process

422. Thermite a mixture used for welding is:
a) Fe and Al
b) Ferric oxide and aluminium powder
c) Barium peroxide and magnesium powder
d) Cu and aluminium

423. Which of the following on hydrolysis with water gives CH_4 ?
a) Be_2C b) Al_4C_3 c) Mn_3C d) All of these

424. The basic structural unit is silicates is
a) SiO_2 b) $[Si_2O_7]^{2-}$ c) SiO_4 tetrahedron d) $[Si_2O_5]^{2-}$

425. Good conductor of heat and current is:
a) Anthracite b) Diamond c) Charcoal d) Graphite

426. The structure of diborane (B_2H_6) contains
a) Four $2c-2e^-$ bonds and four $3c-2e^-$ bonds b) Two $2c-2e^-$ bonds and two $3c-3e^-$bonds
c) Two $2c-2e^-$ bonds and four $3c-2e^-$ bonds d) Four $2c-2e^-$ bonds and two $3c-2e^-$ bonds

427. Which element of group 14 forms only one hydride?
a) C b) Si c) Sn d) Pb

428. The stability of + 1 oxidation state increases in the sequence:
a) Ga < In < Al < Tl b) Al < Ga < In < Tl c) Tl < In < Ga < Al d) In < Tl < Ga < Al

429. Aluminium is extracted from alumina (Al_2O_3) by electrolysis of a molten mixture of:
a) $Al_2O_3 + Na_3AlF_6 + CaF_2$
b) $Al_2O_3 + KF + Na_3AlF_6$
c) $Al_2O_3 + HF + NaAlF_4$
d) $Al_2O_3 + CaF_2 + NaAlF_4$

430. Ultra violet rays are not allowed to pass through:
a) Flint glass b) Crown glass c) Crookes glass d) Safety glass

431. Metal protected by a layer of its own oxide is:
a) Al b) Ag c) Au d) Cu

432. The fuel gas having volume composition equal to 34% CH_4 + 48%H_2 + 15%O_2 +3% CO is:

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a) Oil gas b) Water gas c) Coal gas d) Petrol gas

433. Glass having higher refractive index is prepared of oxide of
a) NiO b) CoO c) PbO d) CaO

434. The colour of copper metaborate and chromium metaborates are respectively:
a) Blue, green b) Green, blue c) Red, green d) Brown, blue

435. Which gas is essential constituent of almost all fuel gases?
a) CO_2 b) N_2 c) Co d) H_2O

436. When $SnCl_2$ reacts with $HgCl_2$, the product formed are :
a) $Sn + HgCl_4$ b) $Sn + Cl_2 + Hg_2Cl_2$ c) $SnCl_4$ and Hg_2 d) None of these

437. The precious stone aquamarine is:
a) Mg-Al silicate b) Be-Al silicate c) Na-Al silicate d) Fluoro silicate of Al

438. $B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na[B(OH)_4] + H_2O$
How can this reaction is made to proceed in forward direction?
a) Addition of *cis*-1, 2-diol b) Addition of borax
c) Addition of *trans*-1, 2-diol d) Addition of Na_2HPO_4

439. CO reacts with chlorine in presence of sunlight to gives:
a) $COCl_2$ b) CO_2 c) CCl_4 d) $CHCl_3$

440. Silicon is
a) Semiconductor b) Insulator c) Conductor d) None of these

441. Aluminium vessels should not be washed with materials containing washing soda since
a) Washing soda reacts with aluminium to form soluble aluminate
b) Washing soda reacts with aluminium to form insoluble aluminium oxide
c) Washing soda is expensive
d) Washing soda is easily decomposed

442. When a mixture of sand and KNO_3 is heated strongly the product(s) is/are:
a) NO_2 b) O_2 c) K_2SiO_3 d) All of these

443. Aluminium deposited as vaporous on glass forms a good mirror, essentially because:
a) It has better shine than Ag
b) It does not scratch
c) Coating is much smoother
d) It does not tarnish in air

444. CO is poisonous gas, antidote for CO poisoning is
a) Carborundum b) Carbogen c) Carbonic acid d) Pure oxygen

445. When CO is heated with NaOH under pressure, we get:
a) Sodium benzoate b) Sodium acetate c) Sodium formate d) Sodium oxalate

446. Glass is a
a) Micro crystalline solid b) Gel
c) Super cooled liquid d) Polymeric mixture

447. Difference between diamond and graphite is due to:
a) Graphite combines with oxygen to form carbon dioxide but diamond does not
b) The atoms in each have different masses
c) The crystal structure in diamond is different from that in graphite
d) All of the above

448. Which element is used for making a transistor?
a) Sn b) Sb c) Si d) Mg

449. Which one of the following compounds, is not a protonic acid?
a) $SO(OH)_2$ b) $SO_2(OH)_2$ c) $B(OH)_3$ d) $PO(OH)_3$

450. Aluminium reacts with nitrogen to form:
a) AlN b) Al_2N_3 c) Al_2N d) Al_4N_6

451. Silica is a/an
a) Acidic flux only b) Gangue only

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c) Basic flux only
d) Both gangue and acidic flux

452. Which one of the following is the correct statement?
a) Boric acid is a protonic acid
b) Beryllium exhibits coordination number of six
c) Chlorides of both beryllium and aluminium have bridged chloride structure in solid phase
d) $B_2H_6.2NH_3$ is known as inorganic benzene

453. Which of the following is a mixed oxide?
a) Fe_2O_3 b) PbO_2 c) Pb_3O_4 d) BaO_2

454. Which metal burn in air at high temperature with the evolution of much heat?
a) Cu b) Pb c) Hg d) Al

455. Which is a true acid anhydride?
a) Al_2O_3 b) CO c) CaO d) CO_2

456. Roasted tin stone ore after washing with water is known as
a) Block tin b) White tin c) Black tin d) Granulated tin

457. Compound of lead used in match industry is:
a) PbO b) PbO_2 c) $PbCl_2$ d) None of these

458. Which gas has more percentage in coal gas?
a) CO b) H c) H_2 d) CH_4

459. A particular elements belongs to group 13 and II period of the periodic table. It is:
a) Gas, slightly metallic b) Liquid, metallic c) Solid, non-metallic d) Solid, less metallic

460. In graphite, the sheets are held by :
a) Ionic forces b) Covalent forces c) Van der Waals' forces d) Metallic forces

461. Silicones have the general formula
a) $(SiO_4)^{4-}$ b) SiO_6^{7-} c) $(SiO_3)_n^{-2n}$ d) $(R_2SiO)_n$

462. Water gas cannot be prepared by a continuous process because:
a) More coke must be added from time to time
b) The furnace must be allowed to cool occasionally
c) It cannot be manufactured without producer gas
d) The reaction ceases when coke is too cool

463. In silica (SiO_2), each silicon atom is bonded to
a) Two oxygen atoms
b) Four oxygen atoms
c) One silicon and two oxygen atoms
d) One silicon and four oxygen atoms

464. Glass reacts with HF to produce
a) H_2SiO_3 b) SiF_4 c) Na_3AlF_6 d) H_2SiF_6

465. Which glass has the highest percentage of lead?
a) Soda glass b) Flint glass c) Jena glass d) Pyrex glass

466. Diamond and graphite both are made of carbon atoms. Diamond is extremely hard whereas graphite is soft. This is because :
a) The chemical bonds between any two carbon atoms in diamond are stronger
b) Diamond is ionic whereas graphite is covalent
c) Each carbon atom in diamond is chemically bonded to a greater number of neighbouring carbon atoms
d) Certain atoms in diamond are smaller in size

467. ……is the byproduct obtained in the Serpeck's process.
a) Oxygen b) Ammonia c) Nitrogen dioxide d) Nitric oxide

468. An ionic compound is:
a) CCl_4 b) $SnCl_2$ c) $SiCl_4$ d) $CeCl_4$

469. 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

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d) The hydroxide of boron and Aluminium are amphoteric

470. Density is highest for :
a) Si b) Ge c) Sn d) Pb

471. If the flame of a gas stove burns with yellow tips, the burner must be adjusted to provide:
a) More gas b) More air c) Less air d) None of these

472. Purification of Al by electrolysis method is called
a) Hall's process b) Baeyer process c) Ostwald process d) Hoope's process

473. Which element shows more pronounced inert pair effect?
a) N b) Sn c) Pb d) C

474. Teflon is:
a) Fluorocarbon b) Hydrocarbon c) Pesticide d) Insecticide

475. CO_2 in water behaves as
a) Weak dibasic acid H_2CO_3
b) Weak monobasic acid HO−COOH
c) Weak diacid base $CO(OH)_2$
d) Weak monoacid base HO−COOH

476. The tendency for catenation in Group 14 elements varies in the order
a) C >> $Si > Ge = Sn > Pb$
b) C << $Si < Ge = Sn < Pb$
c) C >> $Si < Ge < Sn < Pb$
d) C >> $Si = Ge = Sn > Pb$

477. Coordination number of aluminium is
a) 8 b) 6 c) 12 d) 4

478. The approximate composition of soda glass is:
a) SiO_2 75%, Na_2O 15%, CaO 8%, Al_2O_3 2%
b) SiO_2 45%, Na_2O 4%, CaO 3%, K_2O 4%, PbO 44%
c) SiO_2 80%, Na_2O 4%, CaO 0.5%, K_2O 0.5%, B_2O_3 12%, $Al_2O_3$3%
d) None of the above

479. Lead pipes are readily corroded by :
a) H_2SO_4 b) HCl c) CH_3COOH d) Pure water

480. Monosilane on coming in contact with air burns with a luminous flame producing vortex rings. These rings are of
a) SiO_2 b) SiO c) Si d) H_2SiO_3

481. A colourless gas which burns with blue flame and reduces CuO to Cu is:
a) N_2 b) CO c) CO_2 d) NO_2

482. Lapis lazuli is
a) Sodium alumino silicate
b) Copper sulphate
c) Zinc sulphate
d) Ferrous sulphate

483. Bone black is an allotrope of :
a) P b) C c) S d) Bone

484. The use of diamond as a gem depends on its:
a) Hardness b) High refractive index c) Purest form of carbon d) Chemical inertness

485. PbO is ……oxide.
a) Basic b) Acidic c) Amphoteric d) Neutral

486. Common alum is
a) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
b) $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$
c) $K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$
d) $K_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24H_2O$

487. In silicon dioxide
a) There are double bonds between silicon and oxygen atoms
b) Silicon atom is bonded to two oxygen atoms
c) Each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bounded to two silicon atoms
d) Each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bounded to two silicon atoms

488. Aqueous solution of sodium silicate is:

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a) Acidic b) Alkaline c) Neutral d) Insoluble

489. Boron cannot form which one of the following anions?
a) BF_6^{3-} b) BH_4^- c) $B(OH)_4^-$ d) BO_2^-

490. During day time plants absorb:
a) Carbon dioxide b) Carbon monoxide c) Nitrogen d) Oxygen

491. Diamond is hard because
a) All the four valence electrons are bonded to each carbon atom by covalent bonds
b) It is a giant molecule
c) It is made up of carbon atoms
d) It cannot be burnt

492. The process used for purification of bauxite ore containing high silica content as impurity is:
a) Baeyer's process b) Hall's process c) Hoope's process d) Serpeck's process

493. The geometry and the hybridisation present about the central atom in BF_3 is:
a) Linear, sp b) Trigonal planar, sp^2 c) Tetrahedral, sp^3 d) Pyramidal, sp^3

494. Aluminium is mainly extracted from:
a) Magnetite b) Bauxite c) Alumina d) Haematite

495. A metal, M forms chlorides in its $+2$ and $+4$ oxidation states. Which of the following statements about these chlorides is correct?
a) $M\text{Cl}_2$ is more volatile than $M\text{Cl}_4$
b) $M\text{Cl}_2$ is more soluble in the anhydrous ethanol than $M\text{Cl}_4$
c) $M\text{Cl}_2$ is more ionic than $M\text{Cl}_4$
d) $M\text{Cl}_2$ is more easily hydrolysed than $M\text{Cl}_4$

496. Which is not a crystalline form of silica?
a) Quartz b) Azurite c) Crystobalite d) Tridymite

497. Which is likely to show inert-pair effect?
a) K b) Mg c) Al d) Pb

498. A potter wishes to make a deep blue glaze. Which one of these available chemicals should be mixed?
a) Iron oxide b) Cuprous oxide c) Cobalt oxide d) Nickel oxide

499. Specify the coordination geometry around and hybridization of N and B-atoms in a 1 : 1 complex of BF_3 and NH_3 :
a) N : Tetrahedral, $sp3$; B : Tetrahedral, sp^3
b) N : Pyramidal, $sp3$; B : Pyramidal, sp^3
c) N : Pyramidal, $sp3$; B :Planar, sp^3
d) N : Pyramidal, $sp3$; B :Tetrahedral, sp^3

500. The bonds present in borazole are:
a) $12\sigma, 3\pi$ b) $9\sigma, 6\pi$ c) $6\sigma, 6\pi$ d) $9\sigma, 9\pi$

501. Tin, a silvery white metal exists in:
a) Four allotropic forms
b) Three allotropic forms
c) Five allotropic forms
d) Two allotropic forms

502. Carbon suboxide C_3O_2 has
a) Bent structure b) Trigonal planar structure
c) Linear structure d) Distorted tetrahedral structure

503. Which of the following oxide is amphoteric?
a) CaO b) CO_2 c) SiO_2 d) SnO_2

504. In graphite, electrons are:
a) Localized on each carbon atom
b) Spread out between the sheets
c) Localized on every third carbon atom

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d) Present in antibonding orbital

505. Which is formed when $SiCl_4$ vapours are passed over hot Mg?
a) $SiCl_2 + MgCl_2$ b) $Si + MgCl_2$ c) $Mg_2Si + Cl_2$ d) $MgSiCl_6$

506. Which of the following does not have a tetrahedral structure?
a) BH_3 b) NH_4^+ c) BH_4^- d) CH_4

507. Which of the following oxides is strongly basic?
a) Tl_2O b) B_2O_3 c) Al_2O_3 d) Ga_2O_3

508. Aluminium metal is corroded in coastal places near to the sea, because protective oxide film:
a) Is removed by seawater
b) Reacts with seawater
c) Is attacked by salt present in seawater
d) Reacts with sand particles

509. The most abundant metal in the earth crust
a) Al b) Ca c) Fe d) Na

510. Which mixed sulphate is not an alum?
a) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$
b) $K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$
c) $Na_2SO_4 \cdot Fe_2(SO_4)_3 \cdot 24H_2O$
d) $CuSO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$

511. $(Me)_2SiCl_2$ on hydrolysis will produce
a) $(Me)_2Si(OH)_2$ b) $(Me)_2Si = O$
c) $[-O-(Me)_2Si-O-]_n$ d) $Me_2SiCl(OH)$

512. In the aluminothermic process, Al acts as a/an
a) Solder b) Oxidizing agent c) Reducing agent d) Flux

513. Which is used as control rods in nuclear reactors?
a) Al b) Ga c) Tl d) B

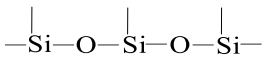
514. Potash alum is water soluble and ionises in aqueous solution to give:
a) One type of ions b) Two types of ions c) Three types of ions d) Four types of ions

515. Which is covalent compound?
a) Aluminium oxide b) Aluminium fluoride c) Aluminium chloride d) Aluminium sulphate

516. Lead sugar is:
a) $PbCl_2$ b) $Pb(NO_3)_2$ c) $PbSO_4$ d) $(CH_3COO)_2Pb$

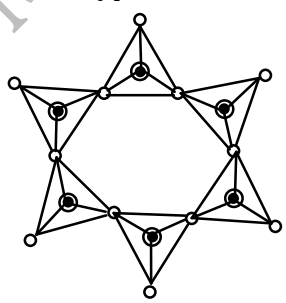
517. Which does not exist?
a) $[SnCl_6]^{2-}$ b) $[GeCl_6]^{2-}$ c) $[SiCl_6]^{2-}$ d) $[CCl_6]^{2-}$

518. Which form of carbon is used in making boot polish, printing ink, paint and black varnish?
a) Bone black b) Graphite c) Gas carbon d) Lamp black

519. Which of the following shows bond in silicone?
a) Si—C—Si—O—Si b) Si—C—Si—C—Si c)  d) Si— Si— Si— Si

520. Which of the following organo-silicon compound on hydrolysis will give a three dimensional silicone?
a) R_3SiCl b) $RSiCl_3$ c) $SiCl_4$ d) R_2SiCl_2

521. Which type of silicate is shown in the given figure?



a) Orthosilicate b) Pyrosilicate c) Meta silicate d) None of these

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522. Tin sulphide is:
a) Yellow solid
b) Soluble in yellow ammonium sulphide
c) Precipitated by H_2S in acidic medium
d) All of the above

523. CO_2 is liberated during :
a) Combustion of coke b) Fermentation c) Respiration d) All of these

524. Which of the following glass is used in making wind screen of automobiles?
a) Saftey b) Jena c) Crook's d) Pyrex

525. Lead pipes are not suitable for drinking water because
a) A layer of lead dioxide is deposited over pipes
b) Lead forms basic lead carbonate
c) Lead reacts with water containing air to form $Pb(OH)_2$
d) Lead reacts with air to form litharge

526. When sodium or potassium oxide is heated in a current of CO_2 at 360°C, we get:
a) Sodium formate b) Sodium oxalate c) Sodium acetate d) Sodium carbonate

527. Aluminium forms:
a) Electrovalent compounds only
b) Covalent compounds only
c) Electrovalent and covalent compounds both
d) Coordinate compounds only

528. Chrome yellow is:
a) $PbCrO_4$ b) $K_2Cr_2O_7$ c) $PbMoO_4$ d) Pb_3O_4

529. Which oxidation states are the most characteristics of lead and tin respectively?
a) $+2, +4$ b) $+4, +4$ c) $+2, +2$ d) $+4, +2$

530. The alloy used in preparation of balance beam:
a) Magnalium b) Duralumin c) Aluminium bronze d) Nickeloy

531. The substance used to impart green colour to glass is:
a) Cu_2O b) CdS c) MnO_2 d) Cr_2O_3

532. In the reaction: $BF_3 + 3LiBH_4 \longrightarrow 3LiF + X$; X is:
a) B_4H_{10} b) B_2H_6 c) BH_3 d) B_3H_8

533. Which metal powder if spread in air, becomes hazardous?
a) Al b) B c) Ca d) K

534. Crystalline silicon was obtained by:
a) Berzelius b) Wöhlar c) Deville d) Winkler

535. 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 both mono and divalent ions

536. An aqueous solution of a substance gives a white precipitate on treatment with dil HCl, which dissolved on heating. On passing H_2S in hot acidic solution a black precipitate is formed. The substance is:
a) Hg_2^{2+} salt b) Cu^{2+} salt c) Ag^{+} salt d) Pb^{2+}salt

537. Silicon hydrides are named as:
a) Silicones b) Silicates c) Silicols d) Silanes

538. H_2SO_4 is not used for the preparation of CO_2 from marble chips because:
a) It does not react
b) Huge amount of heat is evolved
c) The reaction is vigorous
d) Calcium sulphate is sparingly soluble and gets deposited on marble chips and stops the reaction

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539. Which compound can make fire proof clothes?
a) Aluminium sulphate b) Ferrous sulphate c) Magnesium sulphate d) Cuprous sulphate

540. B—F bond order in BF_3 is:
a) 1 b) 2 c) 3 d) 4/3

541. A kettle which becomes furred-up in use has inside it a deposit composed mainly of:
a) Calcium carbonate
b) Magnesium bicarbonate
c) Magnesium sulphate
d) Sodium sulphate

542. Among the following the hardest substance is :
a) Peat b) Lignite c) Graphite d) Anthracite

543. 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 with cryolite

544. Which of the following is not correct in case of boron nitride?
a) It is also called borazon
b) It is chemically unreactive
c) It is hard because it has diamond like structure
d) It has magnetic properties

545. When sugar is treated with conc. H_2SO_4, we get a pure form of :
a) Carbon b) Hydrogen c) Oxygen d) None of these

546. Borazole is obtained by reaction of:
a) $NH_3 + B_2H_6$ in 2 : 1 ratio
b) $NH_3 + B_2H_6$ in 1 : 2 ratio
c) $NH_3 + B_2H_6$ in 1 : 4 ratio
d) $NH_3 + B_2H_6$ in 4 :1 ratio

547. Percentage of lead in lead pencil is
a) 20 b) 80 c) 70 d) Zero

548. In B_2H_6:
a) There is a direct boron-boron bond
b) The structure is similar to that of C_2H_6
c) The boron atoms are linked through hydrogen bridges
d) All the atoms are in one plane

549. Zn on heating with barium carbonate gives :
a) BaO b) ZnO c) CO d) All of these

550. Covalency and hybridization of B in BF_4^- is:
a) 5, sp b) 4, sp^3 c) 3, sp^3 d) 2, sp^2

551. Hybridisation of boron in diborane is:
a) sp b) sp^2 c) sp^3 d) sp^3d^2

552. When tin is treated with concentrated nitric acid
a) It is converted into stannous nitrate b) It becomes passive
c) It converted into stannic nitrate d) It is converted into metastannic acid

553. The ability of a substance to assume two or more crystalline structures is called:
a) Isomerism b) Amorphism c) Polymorphism d) Isomorphism

554. Glass is soluble in:
a) HF b) H_2SO_4 c) $HClO_4$ d) Aqua-regia

555. Al_2O_3 formation involves large quantity of heat evolution which makes its use in:
a) Deoxidizer b) Confectionary c) Indoor photography d) Thermite welding

556. Duralumin is an alloy of:
a) Al and Mg b) Mg and Cu c) Al, Mg, Mn and Cu d) Al and Cu

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557. Among the following the purest form of carbon is :
a) Bituminous coal b) Coal-tar c) Coal gas d) Graphite

558. Which of the following anion is present in chain structure of silicate?
a) $[Si_2O_5^{2-}]_n$ b) $[SiO_3^{2-}]_n$ c) SiO_4^{4-} d) $Si_2O_7^{6-}$

559. Tin reacts with:
a) Hot conc. HCl b) Conc. HNO_3 c) $HgCl_2$ on heating d) All of these

560. Which gas is responsible for green house effect?
a) CO_2 b) SO_2 c) CO d) SO_3

561. Al and Ga have the same covalent radii because of:
a) Greater sheilding power of s-electrons of Ga atoms
b) Poor sheilding power of s-electrons of Ga atoms
c) Poor shielding power of d-electrons of Ga atoms
d) Greater shielding power of d-electrons of Ga atoms

562. BCl_3 does not exist as dimer but BH_3 exist as dimer (B_3H_6) because:
a) Chlorine is more electronegative than hydrogen
b) There is $p\pi - p\pi$ back bonding in BCl_3 but BH_3 does not contain such multiple bonding
c) Large sized chlorine atoms do not fit in between the small boron atoms whereas small sized hydrogen atoms get fitted between boron atoms
d) None of the above

563. Magnalium contains
a) Al + Mg b) Mg + Cu c) Mg + Fe d) Mg + Ag

564. Crystalline form of silica is called
a) Crystalline silicon b) Quartz c) Rock d) Talc

565. Borax is prepared by treating colemanite with:
a) $NaNO_3$ b) NaCl c) Na_2CO_3 d) $NaHCO_3$

566. Which is not the property of diamond?
a) It is insoluble in all solvents
b) It is an isomer of graphite
c) It is purest form of carbon
d) It is oxidized with a mixture of $K_2Cr_2O_7$ and H_2SO_4 at 200° C

567. What happens when steam is passed over red hot carbon?
a) $C + 2H_2O \longrightarrow CO_2 + 2H_2$
b) $C + H_2O \longrightarrow Co + H_2$
c) Water vapour dissociates into H_2 and O_2
d) None of the above

568. 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

569. Boric acid when burnt with ethyl alcohol gives a green edged flame due to the combustion of:
a) Boric anhydride b) Metaboric acid c) Ethyl borate d) Orthoboric acid

570. Purest form of silica is :
a) Quartz b) Flint c) Sandstone d) Keiselguhr

571. Alzeimer's disease is caused due to Al interaction with internal organs of the body if food is contaminated with Al. This disease
a) Induces senility in young persons b) Causes memory loss
c) Both (a) and (b) d) None of the above

572. In the reaction, $LiH + AlH_3 \longrightarrow LiAlH_4$, AlH_3 and LiH act as:

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a) Lewis acid and Lewis base
b) Lewis base and Lewis acid
c) Bronsted base and Bronsed acid
d) None of the above

573. Metalloid among the following is:
a) Si b) C c) Ge d) Pb

574. The most abundant metal in the earth crust is
a) Na b) Al c) Ca d) Fe

575. Alumina may be converted into anhydrous aluminium chloride by:
a) Heating it with conc. HCl
b) Heating in a current of dry chlorine
c) Heating it with rock salt
d) Mixing it with carbon and heating the mixture in a current of dry chlorine

576. Which metal is an important component of transistors?
a) Ag b) Ge c) Os d) Ra

577. When Al is added to potassium hydroxide solution:
a) No reaction takes place
b) Oxygen is evolved
c) Water is produced
d) Hydrogen is evolved

578. An acid among the following is:
a) $B(OH)_3$ b) $Al(OH)_3$ c) $Fe(OH)_3$ d) None of these

579. Which is not used as a refrigerant?
a) NH_3 b) CO_2 c) CCl_2F_2 d) CO

580. Which is used in high temperature thermometry?
a) Na b) Tl c) Ga d) Hg

581. Which ore is best concentrated by froth floatation process?
a) Malachite b) Cassiterite c) Galena d) Magnetite

582. Buckminster-fullerene is a variety of
a) Boron b) Carbon c) Ammonia d) Fluorine

583. Commercially important ore of lead is:
a) Haematite b) Sphalerite c) Siderite d) Galena

584. $(CH_3)_2SiCl_2$ undergoes hydrolysis but $(CH_3)_2CCl_2$ does not why?
a) Low lying d-orbitals present in Si but not in C
b) Only $3p$ orbital is involved in C
c) Silicon is more acidic
d) Si − Cl bond is more polar than C − Cl bond

585. The state of hybridization of boron and oxygen atoms in boric acid (H_3BO_3)are respectively:
a) sp^3 and sp^3 b) sp^2 and sp^3 c) sp^3 and sp^2 d) sp^2 and sp^2

586. Al-Bronze contains Al and:
a) Zn b) Sb c) Cu d) Ni

587. Which one of the following is used as an acid flux in metallurgy?
a) CaO b) SiO_2 c) Na_2CO_3 d) SO_2

588. In the electrolytic method of obtaining aluminium from purified bauxite, cryolite is added to the charge in order to
a) Minimise 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

589. CO_2 is not used in :
a) Making Na_2CO_3 b) Fire extinguishers c) Making aerated water d) Disinfecting water

590. Boron when heated with carbon forms

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a) B_4C b) BC_4 c) B_4C_3 d) B_2C_3

591. Activation of charcoal:
   a) Can be achieved only with charcoal from nut shells
   b) Increases the adsorbing power of the charcoal
   c) Is accomplished by giving powdered charcoal an electrical charge
   d) Is achieved by heating the charcoal in air

592. Stable compounds in $+1$ oxidation state are formed by:
   a) B b) Al c) Ga d) Tl

593. Which of the following is a good conductor of heat and electricity?
   a) Diamond b) Graphite c) Anthracite d) Charcoal

594. An aqueous solution of BCl_3 is:
   a) Weak acid b) Weak base c) Neutral d) Strong base

595. Which element occurs in free state?
   a) C b) Si c) Ge d) Sn

596. C and Si belong to IV group or group 14. The maximum coordination number of carbon in commonly occurring compounds is 4, whereas that of silicon is 6. This is due to :
   a) Large size of silicon
   b) Availability of vacant d-orbitals in silicon
   c) More electropositive nature of silicon
   d) Silicon being vulnerable to attack by nucleophilic

597. Pyrene (a fire extinguisher) is:
   a) $SiCl_4$ b) CCl_4 c) $GeCl_4$ d) $SbCl_5$

598. Which does not exist?
   a) B^{3+} b) Al^{3+} c) Ga^{3+} d) In^{3+}

599. The reducing power of divalent species decreases in the order :
   a) Ge > Sn > Pb b) Sn > Ge > Pb c) Pb > Sn > Ge d) None of these

600. The hardest substance amongst the following
   a) Be_2C b) Tritonium c) B_4C d) Graphite

601. The hybridization of carbon in carbon monoxide is:
   a) sp^3 b) sp^2 c) sp d) dsp^2

602. Newly shaped glass articles when cooled suddenly become brittle, therefore these are cooled slowly, this process is known as:
   a) Tempering b) Annealing c) Quenching d) Galvanising

603. Aluminium carbide reacts with dil. HCl to give:
   a) C_2H_2 b) C_2H_4 c) CH_4 d) C_2H_6

604. The blue coloured mineral 'Lapis Lazuli' used as semiprecious stone is:
   a) Sodium alumino silicate
   b) Zinc cobaltate
   c) Prussian blue
   d) Basic copper carbonate

605. The correct order of decreasing hardness of the following compounds is:
   a) Diamond > Borazon > Carborundum > Corundum
   b) Borazon > Diamond > Carborundum > Corundum
   c) Corundum > Carborundum > Borazon > Diamond
   d) None of the above

606. It is impossible to fuse strips of copper, silver or iron into soda glass because of a difference in the properties of glass and the metal. The property concerned is:
   a) Coefficient of expansion
   b) Melting point
   c) Ignition point

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d) Heat of fusion

607. The catalyst used in Friedel-Craft's reaction is:
   a) Finely divided nickel
   b) Finely divided platinum
   c) Anhydrous aluminium chloride
   d) Pt

608. The metal used in acid storage batteries is :
   a) Copper b) Tin c) Magnesium d) Lead

609. In Hall's process, the ore is mixed with:
   a) Coke b) Calcium carbonate c) Sodium hydroxide d) Sodium carbonate

610. Sesquioxide of lead is:
   a) PbO b) PbO_2 c) Pb_2O d) Pb_2O_3

611. Tin (IV) chloride (anhydrous) can be obtained :
   a) By action of molten tin and Cl_2
   b) By heating tin and conc. HCl and dehydrating the product in an atmosphere of HCl(g)
   c) By treating tin with dil. HCl and heating the product to dryness
   d) None of the above

612. What product is formed on heating lead nitrate?
   a) $PbO + NO + O_2$ b) $PbO + NO_2 + O_2$ c) $Pb + NO_2$ d) $PbO + N_2$

613. Which of the following imparts green colour to flame:
   a) $B(OMe)_3$ b) Na(OMe) c) $Al(OBr_2)_3$ d) $Sn(OH)_2$

614. Which among CH_4, SiH_4, GeH_4 and SnH_4 is most volatile?
   a) CH_4 b) SiH_4 c) GeH_4 d) SnH_4

615. Destructive distillation of coal does not gives:
   a) C_2H_2 b) C_2H_4 c) Carbides d) Coal gas

616. Red lead is an example of
   a) Basic oxide b) Super oxide c) Mixed oxide d) Amphoteric

617. Which of the following statements about H_3BO_3 is not correct?
   a) It is prepared by acidifying an aqueous solution of borax
   b) It has a layer structure in which planar BO_3 units are joined by hydrogen bonds
   c) It does not act as proton donor but acts as Lewis acid by accepting hydroxyl ion
   d) It is a strong tribasic acid

618. Cassiterite is an ore of
   a) Iron b) Lead c) Mercury d) Tin

619. Hoope's process is used in the refining of:
   a) Al b) Zn c) Ag d) Cu

620. B_2O_3 is:
   a) Ionic b) Basic c) Acidic d) Amphoteric

621. Boron compounds behave as Lewis acid because of their:
   a) Acidic nature b) Covalent nature c) Electron deficiency d) Ionization property

622. Which is pseudo solid?
   a) Glass b) Diamond c) Sodium chloride d) $CaCO_3$

623. The number of carbon compounds is very large because it:
   a) Is tetravalent
   b) Forms double and triple bonds
   c) Is non-metal
   d) shows catenation

624. Which species does not exist?
   a) $[BF_6]^{3-}$ b) $[AlF_6]^{3-}$ c) $[GaF^6]^{3-}$ d) $[InF_6]^{3-}$

625. Boron halides behave as Lewis acids because of their …… nature.

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a) Proton donor b) Covalent c) Electron deficient d) Ionising

626. Boron differs from the other members of group 13 because it:
a) Has much lesser radius
b) Is non-metal
c) Is covalent in its compounds
d) Has maximum covalency of 6(B_2H_6)

627. The purification method used for mineral $Al_2O_3 \cdot 2H_2O$ is:
a) Froth floatation b) Leaching c) Liquation d) Magnetic separation

628. Anhydrous $AlCl_3$ is obtained from
a) Aluminium and chlorine gas
b) Hydrogen chloride gas and Aluminium metal
c) Both of the above
d) None of the above

629. Colour is imparted to glass by mixing:
a) Synthetic dyes b) Metal oxides c) Oxides of non-metal d) Coloured salt

630. Mineral of aluminium that does not contain oxygen is:
a) Corundum b) Diaspore c) Bauxite d) Cryolite

631. When Al is added to KOH solution
a) Hydrogen is evolved
b) Oxygen is evolved
c) Oxygen is evolved
d) No action takes place

632. The composition of mica is:
a) $NaAlSiO_4.3H_2O$ b) $K_2O.3Al_2O_3.6SiO_2.2H_2O$ c) $K_2HAl(SiO_4)_3$ d) $NaK.SiO_4.10H_2O$

633. Lead chromate is……..in colour.
a) Red b) Yellow c) White d) Black

634. Pure boron is best prepared by
a) Heating B_2O_3 with H_2
b) Heating B_2O_3 with Na and K
c) Heating KBF_4 with Na or K
d) Heating BBr_3 with H_2 is presence of a catalyst

635. The role of fluorspar (CaF_2) which is added in small quantities in the electrolytic reduction of alumina dissolved in fused cryolite (Na_3AlF6) is:
a) As a catalyst
b) To make the fused mixture very conducting
c) To increase the temperature of the melt
d) To decrease the rate of oxidation of carbon at the anode

636. Litharge is not commonly used in :
a) Manufacture of special glasses
b) Glazing pottery
c) Preparing paints
d) Lead storage battery

637. The precious Ruby stone is:
a) Alumina
b) Aluminium silicate
c) Sodium aluminium silicate
d) Sodium silicate

638. Wood charcoal is used in gas masks because it:
a) Is poisonous b) Liquefies gas c) Is porous d) Adsorbs gases

639. CO_2 is obtained by heating :
a) Na_2CO_3 b) K_2CO_3 c) $NaHCO_3$ d) None of these

640. Which is not correct?
a) Al acts as a reducing agent.
b) Al does not react with steam even at higher temperature
c) Al forms a number of alloys with other metals
d) Al is ionic in all its compounds

641. On controlled hydrolysis and condensation, R_3SiCl yields

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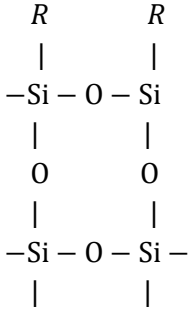
a) $R_3Si-O-SiR_3$

b) $(-R_3Si-O-SiR_3-)_n$

c) R_3SiOH

d) 

642. Semi water gas is mixture of :
   a) Water gas and producer gas
   b) Water gas and CO_2
   c) Producer gas and CO_2
   d) Producer gas and oil gas

643. Borax bead test is not given by:
   a) An aluminium salt b) A cobalt salt c) A copper salt d) A nickel salt

644. In the preparation of amorphous silicon, HF acid is used to remove
   a) Mg b) SiO_2 c) Si d) None of these

645. Boric acid is not used:
   a) As an antiseptic
   b) As a flux in soldering
   c) In making optical glasses
   d) In making enamels and pottery glazes

646. Which of the following is amphoteric?
   a) CO_2 b) PbO_2 c) SiO_2 d) GeO_2

647. Which of the following cannot liberate H_2 with acids?
   a) Al b) In c) Ti d) B

648. Which of the following compounds are formed when BCl_3 is treated with water?
   a) $B_2O_3 + HCl$ b) $B_2H_6 + HCl$ c) $H_3BO_3 + HCl$ d) None of these

649. Which of the following processes does not involve a catalyst?
   a) Thermite process b) Ostwald process c) Contact process d) Haber process

650. The metal which does not form a polynuclear carbonyl is :
   a) Sodium b) Manganese c) Iron d) Cobalt

651. What is formed when oxalic acid is dehydrated by conc. H_2SO_4?
   a) $C + CO_2$ b) CO c) CO_2 d) $CO + CO_2$

652. Tetra ethyl lead is used as:
   a) Fire extinguisher b) Antiknock compound c) Pain killer d) Mosquito killer

653. Lead is not affected by dilute HCl in cold, because :
   a) Pb is less electronegative than H
   b) PbO film is formed which resists chemical attack by acid
   c) A protective coating of $PbCl_2$ is formed on Pb surface
   d) PbO_2 film is always present on Pb surface, which resists chemical attack

654. Which of the following statement is correct with respect to the property of elements in the carbon family with an increase in the atomic number? Their
   a) Atomic size decreases b) Stability of +2 oxidation state increases
   c) Metallic character decreases d) Ionization energy increases

655. The chemical formula of phosgene or carbonyl chloride is:
   a) PH_3 b) $COCl_2$ c) $POCl_3$ d) PCl_3

656. Carbon in CO_2 is:
   a) sp -hybridized b) sp^2-hybridized c) sp^3-hybridized d) dsp^3-hybridized

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657. Ordinary sand (SiO_2) is attacked by:
a) conc. HCl b) conc. HBr c) hot KOH d) None of these
658. Which is not a mineral of aluminium?
a) Anhydrite b) Bauxite c) Corundum d) Diaspora
659. Graphite is soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite.
a) Has molecules of variable molecular masses like polymers
b) Has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds
c) Is a non-crystalline substance
d) Is an allotropic form of diamond
660. Which does not react with water?
a) B_2S_3 b) B_4C c) Al_4C_3 d) Al_2S_3
661. Which of the following is obtained on heating, potassium ferrocyanide with H_2SO_4?
a) CO_2 b) CO c) C_2H_2 d) $(CN)_2$
662. The metallic character of the elements of IV A group or group 14 :
a) Decreases from top to bottom
b) Has no significance
c) Does not change
d) Increases from top to bottom
663. When a solution of sodium hydroxide is added in excess to the solution of potash alum, we obtain:
a) A white precipitate
b) Bluish white precipitate
c) A clear solution
d) A crystalline mass
664. Which of the following is better fuel?
a) Solid b) Liquid c) Gaseous d) Semi solid
665. Flux is used to
a) Remove silica b) Remove silica undesirable metal oxide
c) Remove all impurities from ores d) Reduce metal oxide
666. Al dissolves in molten NaOH with the formation of:
a) Sodium aluminate (Na_3AlO_3)
b) Sodium meta-aluminate ($NaAlO_2$)
c) Aluminium hydroxide
d) Alumina
667. Silicon carbide is used as:
a) Dehydrating agent b) Abrasive c) Solvent d) Catalyst
668. Electrolytic reduction of pure alumina is not possible because:
a) It is amphoteric
b) It dissociates on fusion
c) It melts at very high temperature
d) None of the above
669. The main factor responsible for weak acidic nature of B—F bonds in BF_3 is:
a) Large electronegativity of F
b) Three centred two electorn bonds in BF_3
c) $p\pi - d\pi$ back bonding
d) $p\pi - p\pi$ back bonding
670. The correct order of increasing C—O bond length in CO, CO_3^{2-} and CO_2 is:
a) $CO_3^{2-} < CO_2 < CO$ b) $CO < CO_3^{2-} < CO_2$ c) $CO_2 < CO_3^{2-} < CO$ d) $CO < CO_2 < CO_3^{2-}$
671. A solution of a salt in water on addition of dilute HCl gives a white ppt. soluble in hot water. The salt

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contains :

a) Ag^+ b) Pb^{2+} c) H^{2+} d) Fe^{2+}

672. Thallium shows different oxidation sates because:
   a) It is a transition meta;
   b) Of inert pair effect
   c) Of its amphoteric character
   d) Of its high reactivity

673. 'Lead Pencil' contains
   a) PbS b) FeS c) Graphite d) Pb

674. Which one is explosive?
   a) PCl_5
   b) $Pb(NO_3)_2$
   c) NH_4NO_3 + Al powder
   d) $C_6H_5NO_2$

675. 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 the above

676. A salt which gives CO_2 with hot H_2SO_4 and also decolourises acidified $KMnO_4$ on warming is:
   a) HCO_3^- b) CO_3^{2-} c) Oxalate d) acetate

677. 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-3e bonds

678. Elements of group 13 form oxides of the general formula:
   a) M_4O_5 b) MO c) M_2O_3 d) M_2O_4

679. Quartz watches contain
   a) Hands made of quartz b) Silica coating on the numbers
   c) A crystal of quartz as an essential component d) A coating of quartz on the outer body

680. Alumina on heating with carbon in nitrogen atmosphere gives:
   a) Al + CO b) $Al + CO_2$ c) AlN + CO d) $Al + CO + N_2$

681. Carbon reacts with strong electropositive metal oxides to form:
   a) Carbide b) Carbonate c) Hydroxide d) Oxide

682. Tetrahalides of IV A group of group 14 elements are:
   a) Ionic b) Covalent c) Polar d) Coordinate covalent

683. The percentage of carbon is least in :
   a) White cast iron b) Grey cast iron c) Wrought iron d) Steel

684. Conc. HNO_3 can be stored in container of:
   a) Cu b) Al c) Zn d) Sn

685. Water glass is
   a) Glass made of water b) Sodium silicate c) Calcium formate d) Pyrex glass

686. Tendency of catenation is strongest in:
   a) C b) O c) N d) Si

687. On adding ammonium hydroxide solution to $Al_2(SO_4)_3$ (aq):
   a) A precipitate is formed which does not dissolve in excess of ammonium hydroxide
   b) A precipitate is formed which does not dissolve in excess of ammonia solution
   c) No precipitate is formed
   d) None of the above

688. Borax bead test depends on the formation of:
   a) Boron oxide b) Boron metal c) Metal metaborates d) All of these

689. Graphite is good conductor of current but diamond is non-conductor because :
   a) Diamond is hard and graphite is soft

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b) Graphite and diamond have different atomic configuration
c) Graphite is composed of positively charged carbon ions
d) Graphite has hexagonal layer structure with mobile π-electrons while diamond has continuous tetrahedral covalent structure with no free electrons

690. When Sn (IV) chloride is treated with excess of conc. HCl, the complex $[SnCl_6]^{2-}$ is formed. The oxidation state of Sn in this complex is:
a) +6 b) +4 c) -2 d) +2

691. $SiH_4 + O_2$ mixture on bubbling through water and bubbles coming in contact with air:
a) Burns with a luminous flame
b) Vortex rings of finely divided silica are formed
c) $SiH_4 + 2O_2 \longrightarrow SiO_2 + 2H_2O$,reaction occurs
d) All of the above

692. The main component of glass which gives heat resistance to laboratory glassware is
a) PbO b) MgO c) B_2O_3 d) Al_2O_3

693. An element *R* is in group 13. Which is true with respect of?
a) It is a gas at room temperature
b) It has an oxidation state of +4
c) It forms an oxide of the type R_2O_3
d) It forms a halide of the type RX_2

694. Bucky ball or buck minster fullerene is:
a) An allotrope of carbon
b) It is referred as C – 60
c) It has sp^2-hybridized nature and resembles with soccer ball
d) All of the above

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THE P-BLOCK ELEMENTS

CHEMISTRY

: ANSWER KEY :

1)	c	2)	a	3)	b	4)	a	177)	d	178)	c	179)	d	180)	d
5)	b	6)	a	7)	d	8)	c	181)	a	182)	d	183)	c	184)	d
9)	c	10)	d	11)	c	12)	c	185)	a	186)	d	187)	a	188)	a
13)	b	14)	a	15)	c	16)	b	189)	c	190)	c	191)	c	192)	c
17)	d	18)	a	19)	b	20)	d	193)	a	194)	c	195)	c	196)	b
21)	d	22)	a	23)	c	24)	a	197)	b	198)	c	199)	c	200)	b
25)	c	26)	b	27)	a	28)	d	201)	a	202)	a	203)	a	204)	c
29)	b	30)	b	31)	d	32)	a	205)	b	206)	b	207)	d	208)	c
33)	d	34)	b	35)	b	36)	d	209)	b	210)	a	211)	a	212)	a
37)	a	38)	c	39)	d	40)	d	213)	a	214)	b	215)	c	216)	c
41)	b	42)	d	43)	b	44)	a	217)	b	218)	d	219)	d	220)	d
45)	d	46)	d	47)	b	48)	d	221)	d	222)	a	223)	c	224)	d
49)	c	50)	a	51)	c	52)	a	225)	c	226)	c	227)	a	228)	c
53)	a	54)	b	55)	a	56)	b	229)	a	230)	a	231)	d	232)	b
57)	c	58)	c	59)	a	60)	c	233)	b	234)	c	235)	a	236)	c
61)	b	62)	b	63)	b	64)	b	237)	c	238)	b	239)	d	240)	d
65)	a	66)	a	67)	a	68)	d	241)	c	242)	a	243)	c	244)	d
69)	b	70)	c	71)	c	72)	b	245)	b	246)	c	247)	b	248)	d
73)	c	74)	c	75)	b	76)	a	249)	b	250)	a	251)	c	252)	d
77)	b	78)	c	79)	a	80)	d	253)	b	254)	a	255)	b	256)	d
81)	a	82)	a	83)	a	84)	a	257)	a	258)	d	259)	a	260)	a
85)	b	86)	a	87)	c	88)	b	261)	b	262)	b	263)	d	264)	d
89)	d	90)	d	91)	a	92)	b	265)	b	266)	d	267)	a	268)	c
93)	b	94)	b	95)	b	96)	a	269)	a	270)	c	271)	c	272)	a
97)	c	98)	a	99)	a	100)	d	273)	b	274)	a	275)	d	276)	c
101)	a	102)	d	103)	b	104)	d	277)	d	278)	b	279)	d	280)	a
105)	d	106)	d	107)	d	108)	d	281)	a	282)	a	283)	d	284)	d
109)	a	110)	d	111)	c	112)	b	285)	c	286)	a	287)	d	288)	b
113)	d	114)	a	115)	b	116)	b	289)	a	290)	a	291)	d	292)	b
117)	c	118)	b	119)	b	120)	c	293)	b	294)	d	295)	d	296)	b
121)	c	122)	b	123)	c	124)	c	297)	d	298)	b	299)	d	300)	a
125)	c	126)	b	127)	b	128)	a	301)	b	302)	c	303)	b	304)	c
129)	d	130)	b	131)	c	132)	b	305)	a	306)	d	307)	a	308)	d
133)	c	134)	a	135)	b	136)	c	309)	b	310)	b	311)	d	312)	b
137)	c	138)	b	139)	c	140)	b	313)	b	314)	b	315)	b	316)	d
141)	c	142)	a	143)	c	144)	a	317)	b	318)	d	319)	d	320)	d
145)	d	146)	a	147)	d	148)	c	321)	c	322)	c	323)	b	324)	b
149)	d	150)	a	151)	d	152)	d	325)	b	326)	b	327)	a	328)	b
153)	a	154)	a	155)	b	156)	c	329)	c	330)	d	331)	a	332)	c
157)	a	158)	d	159)	b	160)	c	333)	b	334)	c	335)	d	336)	c
161)	d	162)	d	163)	c	164)	c	337)	d	338)	b	339)	d	340)	b
165)	a	166)	c	167)	c	168)	d	341)	a	342)	d	343)	c	344)	c
169)	a	170)	d	171)	a	172)	d	345)	c	346)	d	347)	a	348)	c
173)	c	174)	b	175)	c	176)	a	349)	b	350)	d	351)	b	352)	b

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353) a	354) d	355) a	356) a	557) d	558) b	559) d	560) a
357) b	358) d	359) c	360) a	561) c	562) b	563) a	564) b
361) c	362) d	363) c	364) d	565) c	566) b	567) b	568) d
365) a	366) d	367) b	368) b	569) c	570) a	571) c	572) a
369) b	370) b	371) b	372) b	573) c	574) b	575) d	576) b
373) a	374) c	375) c	376) d	577) d	578) a	579) d	580) c
377) a	378) a	379) b	380) a	581) c	582) b	583) d	584) a
381) d	382) a	383) a	384) b	585) b	586) c	587) b	588) d
385) b	386) c	387) a	388) b	589) d	590) a	591) b	592) d
389) d	390) a	391) d	392) d	593) b	594) a	595) a	596) b
393) d	394) c	395) d	396) d	597) b	598) a	599) a	600) c
397) c	398) a	399) c	400) d	601) c	602) b	603) c	604) a
401) c	402) b	403) b	404) b	605) a	606) a	607) c	608) d
405) a	406) c	407) c	408) a	609) d	610) d	611) a	612) b
409) d	410) a	411) b	412) c	613) a	614) a	615) c	616) c
413) b	414) b	415) c	416) c	617) d	618) d	619) a	620) c
417) c	418) b	419) a	420) c	621) c	622) a	623) d	624) a
421) b	422) b	423) d	424) c	625) c	626) b	627) b	628) c
425) d	426) d	427) d	428) b	629) b	630) d	631) a	632) b
429) a	430) c	431) a	432) c	633) b	634) d	635) b	636) d
433) c	434) a	435) c	436) c	637) a	638) d	639) c	640) d
437) b	438) a	439) a	440) a	641) a	642) a	643) a	644) b
441) a	442) d	443) d	444) b	645) b	646) b	647) d	648) c
445) c	446) c	447) c	448) c	649) a	650) a	651) d	652) b
449) c	450) a	451) d	452) c	653) c	654) b	655) b	656) a
453) c	454) d	455) d	456) c	657) c	658) a	659) b	660) a
457) b	458) c	459) c	460) c	661) b	662) d	663) c	664) c
461) d	462) d	463) b	464) b	665) b	666) a	667) b	668) c
465) b	466) c	467) b	468) b	669) d	670) d	671) b	672) b
469) c	470) d	471) b	472) d	673) c	674) c	675) c	676) c
473) c	474) a	475) a	476) a	677) a	678) c	679) c	680) c
477) b	478) a	479) c	480) a	681) a	682) b	683) c	684) b
481) b	482) a	483) b	484) b	685) b	686) a	687) a	688) c
485) c	486) a	487) d	488) b	689) d	690) b	691) d	692) c
489) a	490) a	491) a	492) d	693) c	694) d		
493) b	494) b	495) c	496) b				
497) d	498) c	499) a	500) a				
501) b	502) c	503) a	504) b				
505) b	506) a	507) a	508) c				
509) a	510) d	511) c	512) c				
513) d	514) c	515) c	516) d				
517) d	518) d	519) c	520) b				
521) d	522) d	523) d	524) a				
525) c	526) d	527) c	528) a				
529) c	530) a	531) d	532) b				
533) a	534) c	535) b	536) d				
537) d	538) d	539) a	540) d				
541) a	542) d	543) b	544) d				
545) a	546) a	547) d	548) c				
549) d	550) b	551) c	552) d				
553) c	554) a	555) d	556) c				

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THE P-BLOCK ELEMENTS

CHEMISTRY

: HINTS AND SOLUTIONS :

2 **(a)**
It is a fact.

3 **(b)**

$$3B + \frac{1}{2}N_2 + \frac{3}{2}O_2 \longrightarrow B_2O_3 + BN$$

4 **(a)**
The state of hybridization of carbon in fullerene is sp^2 hybridised

5 **(b)**
Davy isolated boron

6 **(a)**
Rest all are the methods to prepare anhydrous $AlCl_3$.

$$2AlCl_3 \cdot 6H_2O \xrightarrow{\Delta} Al_2O_3 + 6HCl + 9H_2O$$

7 **(d)**
Potash alum is double salt. Its chemical composition is
$K_2SO_4.Al_2(SO_4)_3.24H_2O$
$K_2SO_4.Al_2(SO_4)_3.24H_2O$
$\rightarrow 2K^+ + 2Al^{3+} + 4SO_4^{2-} + 24H_2O$
∴ It gives three types of ions on dissociation
K^+, Al^{3+} and SO_4^{2-}

8 **(c)**
CO is neutral oxide of carbon.

9 **(c)**
Addition of cryolite makes the fused melt at lower melting temperature as well as good conductor of current.

11 **(c)**
Solid CO_2 directly sublimes to gas by taking heat from surroundings to bring in cooling.

12 **(c)**
Destructive distillation of coal (heated to nearly 1270 K) gives coke (solid residue 70%) and hot vapours and gases.

13 **(b)**
Liquified Ga expand on solidification , because it is less electropositive in nature and has the weak metallic bond

15 **(c)**
To slow down the speed of neutrons.

16 **(b)**
BF_3 is electron deficient compound.

17 **(d)**
Graphite has a two dimensional structure. In this case, only three of the four valence electrons of each carbon atom are involved in bonding. Thus, each carbon atom makes use of sp^2-hybrid orbitals. Hence, the fourth valence of each carbon atom remains unsatisfied *ie*, the fourth valence electron remains unpaired or free. This free electron can easily move from one carbon to another under the influence of applied potential. So, in structure of graphite only one electron is free on each carbon atom.

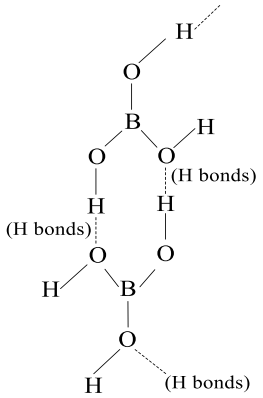
18 **(a)**
It is a reason for given fact.

19 **(b)**
Organic acids dissolve lead in presence of oxygen

$$Pb + 2CH_3COOH + \frac{1}{2}O_2 \longrightarrow Pb(CH_3COO)_2 + H_2O$$

20 **(d)**
It is a fact.

21 **(d)**
H_3BO_3 has layer structure with H-bonding.



22 **(a)**
Producer gas (a mixture of $CO + N_2$) is prepared by incomplete combustion of coal in restricted supply of air.

23 **(c)**
Water gas is $CO + H_2$.

24 **(a)**
In bauxite ore, only Al_2O_3 reacts with conc. NaOH and forms sodium meta aluminate.
This further dissolves in water.

$$Al_2O_3 + 2H_2O + 2NaOH \xrightarrow[35\ bar]{500\ K} 2NaAlO_2 + 3H_2O$$

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$NaAlO_2 + 2H_2O \rightarrow NaAl(OH)_4$

25 **(c)**
Amphoteric substance can react with both acid and base

26 **(b)**
Wood's metal an alloy of Bi (50%), Pb (25%), Sn (12.5%) and Cd (12.5%) has m.p. 71°C.

27 **(a)**
The hardness progressively decreases with increase in at. no. in gp.13.

28 **(d)**
It is a reason for given fact.

29 **(b)**
The method of zone refining of metals is based on the principle of greater solubility of the impurity in the molten state than in the solid. Elements which are used as semiconductors like Si, Ge, Ga, etc are refined by this method.

30 **(b)**
In H_3BO_3 boron atom is sp^2-hybridised.

31 **(d)**
Carborundum is SiC.

33 **(d)**
Red bauxite which contains Fe_2O_3 as the main impurity, is refined either by Baeyer's process or by Hall's process. White bauxite containing SiO_2 impurity is refined by Serpeck's method. In Serpeck's method, following reactions take place

$$Al_2O_3.2H_2O + 3C + N_2 \xrightarrow{1800°C} 2AlN + 3CO + 2H_2O$$

$$AlN + 3H_2O \longrightarrow Al(OH)_3 + NH_3$$

$$2Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$

35 **(b)**
$AlCl_3$ exists as Al_2Cl_6.

36 **(d)**
$Mg_2C_3 + 4H_2O \longrightarrow 2Mg(OH)_2 + CH_3C \equiv CH$

37 **(a)**
It is a fact.

39 **(d)**
$4Al + 3O_2 \longrightarrow 2Al_2O_3$ involves oxidation and the process of anodising will favour formation of Al_2O_3.

40 **(d)**
Expect $B(OH)_3$ all other hydroxide are of metallic hydroxide having the basic nature, $B(OH)_3$ are the hydroxide of non-metal showing the acidic nature

41 **(b)**
Incomplete combustion of petrol leads to formation of CO.

42 **(d)**
MnO_2 imparts purple colour to glass.

43 **(b)**
Cryolite (Na_3AlF_6) is added to Al_2O_3 before electrolysis to lower the fusion temperature of bauxite in order to dissolve it and making good conductor of current.

44 **(a)**
Both possess giant molecular structure.

45 **(d)**
Solid CO_2 is known as dry ice because it evaporates at $-78°C$ without changing in the liquid state

47 **(b)**
Graphite converts into benzene hexa carboxylic acid heating with hot conc HNO_3

48 **(d)**
Lead shows +2, +4 oxidation state due to inert pair effect

49 **(c)**
Zeolite (permutit) is a three-dimensional silicate. It is used in removing hardness of water.

50 **(a)**
BF_3 is gas.

51 **(c)**
It is a fact.

52 **(a)**
Doping of gp.13 element (In) with Ge (gp.14 element) causes p-type semiconductor. Doping of gp.15 element (As) with Ge (gp.14 element) causes n-type semiconductor.

53 **(a)**
Both CO and air have nearly same mol. wt. of CO, is 28; of air it is ≈29.

54 **(b)**
Muddy water can be purified through coagulation by using alums.

55 **(a)**
The composition of dry air is: $N_2 = 78.08\%$; $O_2 = 20.95\%$; $Ar = 0.93\%$; $CO_2 = 0.03\%$; $Ne = 0.0018\%$; $He = 0.0005\%$; $Kr = 0.0001\%$ and $Xe = 0.00001\%$. In addition to these it also contains water vapours hydrocarbons,H_2O_2, sulphur compounds.

56 **(b)**
Diamond is an allotropic form of carbon, carborundum is SiC, corundum is Al_2O_3, borazon is BN.

57 **(c)**
$4Sn + 10HNO_3 \longrightarrow 4Sn(NO_3)_2 + NH_4NO_3 + 3H_2O$

58 **(c)**

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Incomplete combustion of gases leaves carbon residue to develop yellow colour.

59 **(a)**

Larger anion are more easily deformed to produce covalent nature. Also note decreasing ionic nature and not increasing.

60 **(c)**

The Lewis acid order for boron halides are explained in terms of back-bonding.

61 **(b)**

Incomplete combustion of petrol gives out CO from exhaust of auto vehicle.

62 **(b)**

Alum is antibacterial and not insecticide.

63 **(b)**

$BCl_3 + 3H_2O \rightarrow B(OH)_3 + 3HCl$

Thus, the products are $B(OH)_3$ or H_3BO_3 and HCl.

64 **(b)**

$4H_3BO_3 \longrightarrow H_2B_4O_7 + 5H_2O$

65 **(a)**

As metallic character of element attached to oxygen atom increases, the difference between the electronegativity values of element and oxygen increases and thus basic character of oxides increases and *vice-versa*. Hence the increasing correct order of basic nature is $Al_2O_3 < Mgo < Na_2O < K_2O$.

66 **(a)**

Calorific values are: Coal gas = 450−560 BTU/ft^3 (British thermal unit per cubic feet); water gas = 310 BTU/ft^3; producer gas = 103 BTU/ft^3; CO_2= 0.

68 **(d)**

$Sn + 4H_2SO_4(Conc.) \longrightarrow Sn(SO_4)_2 + 2SO_2 + 4H_2O$

69 **(b)**

The chemical formula of sindhur is Pb_3O_4. It is also called red lead or trilead tetraoxide. Red lead is used as a red pigment in making antirust and also as an oxidising agent in glass and match industries.

70 **(c)**

Aluminium oxide is highly stable therefore, it is not reduced by chemical reaction

71 **(c)**

Aluminium reacts with caustic soda to form sodium meta aluminate.

$2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2 \uparrow$

sodium meta aluminate

72 **(b)**

$PbO_2 + 2HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + \frac{1}{2}O_2$

73 **(c)**

$2H_3BO_3 \longrightarrow B_2O_3 + 3H_20$

75 **(b)**

Thermite is a mixture of $Fe_2O_3 + Al$.

76 **(a)**

It is a fact; also known as white lead.

77 **(b)**

$C_{12}H_{22}O_{11} + 18[O] \longrightarrow 6H_2C_2O_4 + 5H_2O$

78 **(c)**

It is a reason for given fact.

79 **(a)**

Diamond possesses the highest b.p. among all due to giant molecular structure. It does not melt and directly vaporise at 3773K.

80 **(d)**

The enthalpy of formation of Al_2O_3 is very high and hence, it is not possible to reduce it by carbon.

82 **(a)**

A species is amphoteric if it is soluble in acid (behaves as a base) as well as in base (behaves as an acid).

SnO_2 is an amphoteric oxide.

$SnO_2 + 4HCl \longrightarrow SnCl_4 + 2H_2O$

$SnO_2 + 2NaOH \longrightarrow Na_2SnO_3 + H_2O$

83 **(a)**

$H_2O + C \longrightarrow CO + H_2$

84 **(a)**

$Ni(CO)_4$ is volatile gas at room temperature.

85 **(b)**

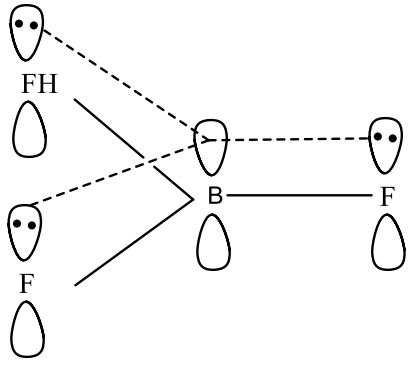
It is also known as minium or sindhur.

86 **(a)**

Boron trihalides are Lewis acid. The order of their acidic strength is as

$BF_3 < BCl_3 < BBr_3 < BI_3$

In the boron halides, a $p\pi$-$p\pi$ back bonding arises due to empty orbital of boron and filled orbitals of halogen.



This $p\pi$-$p\pi$ back bonding has maximum effect in BF_3 as the size of B and F-atoms are comparative

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and this effect decreases as the size of halogen increases. Due to this effect, tendency of accepting lone pair of electron of boron decreases *i. e.*, Lewis acid character decreases.

87 **(c)**

On heating $AlCl_3$ (aq) to dryness, Al_2O_3 is formed.

$$2AlCl_3 + 6H_2O \longrightarrow 2Al(OH)_3 + 6HCl$$

$$Al(OH)_3 \longrightarrow Al_2O_3 + 3H_2O$$

88 **(b)**

C-60 is called Buckminster fullerene. It is discovered in 1990 as a constituent of soot. Its shape is like a soccer ball.

89 **(d)**

$$Pb_3O_4 + 4HNO_3 \xrightarrow{\Delta} Pb(NO_3)_2 + 2H_2O + 2PbO_2$$

90 **(d)**

C-atoms form covalently bonded plates (layers). Layers are bonded weakly together, that's why one layer can slide over other cause lubricacy. Cannot be melted easily as large number of atoms being bonded strongly in the layer form big entity.

91 **(a)**

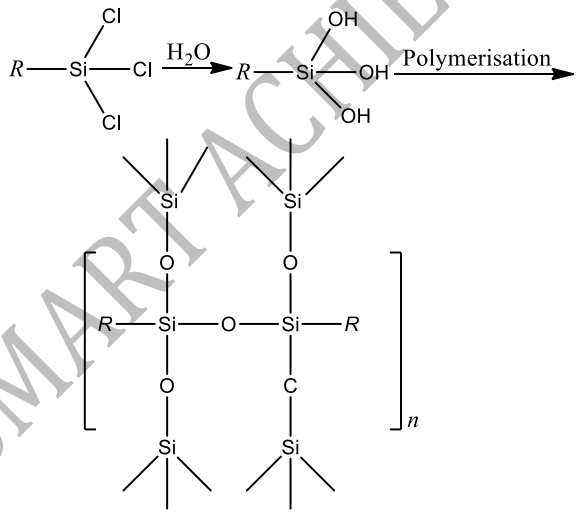
The simplest glass is soda glass which is also called soft glass. Glass is super-cooled liquid mixture. The composition of soft glass is $Na_2O.\,CaO.\,6SiO_2$.

92 **(b)**

Surface of Al forms Al_2O_3 in nitric acid and becomes passive.

93 **(b)**

$RSiCl_3$ gives cross linked silicon polymer on hydrolysis.



94 **(b)**

CF_4 has more ionic character than CCl_4, SiF_4 and $SiCl_4$.

Hence, it has more lattice energy and thermal stability.

95 **(b)**

Carbon element belongs to IV A group.

$$C + O_2 \rightarrow CO_2$$

$$CO_2 + H_2O \rightarrow H_2CO_3$$

carbonic acid

96 **(a)**

The C—X bond energy in CF_4, CCl_4, CBr_4 and CI_4 are 116, 81, 68 and 51 respectively.

97 **(c)**

CO and CO_2 are major air pollutant. However, CO_2 is used in photosynthesis and CO is left to pollute air.

98 **(a)**

It is a fact.

99 **(a)**

Rose metal contains Sn + Pb + Bi used in electric fuses.

28% 22% 50%

100 **(d)**

Diamond is bad conductor of current.

101 **(a)**

$$BN + 3NaOH \longrightarrow Na_3BO_3 + NH_3$$

102 **(d)**

Graphite has two dimensional sheet like structure in which the various layers are held together by weak van der Waals' forces

103 **(b)**

Colemanite is $Ca_2B_6O_{11} \cdot 5H_2O$.

104 **(d)**

Pb_3O_4 is a mixed oxide. It can be represented as $2PbO - PbO_2$

105 **(d)**

It is a fact.

106 **(d)**

Due to formation of PbS (black).

107 **(d)**

Abundance in earth crust in ppm:

B (10), Al (81300), Ga (15), In (1),Tl (0.3).

108 **(d)**

Graphite possesses sp^2-hybridization.

109 **(a)**

The important ore of tin is cassiterite (SnO_2). Tin is extracted from cassiterite ore by carbon reduction method in a blast furnace.

$$SnO_2 + 2C \rightarrow Sn + 2CO$$

The product often contain traces of iron which is removed by blowing air through the melt to oxidise to FeO which then floats to the surface.

$$2Fe + O_2 \rightarrow 2FeO.$$

110 **(d)**

Bentonite is spread to destroy the bacteria,

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insects and other pests by exposure to poisonous gas or smoke. This is called fumigation.

111 **(c)**
Addition of As in lead makes it brittle.

113 **(d)**
It is therefore used to prepare laboratory glass apparatuses.

114 **(a)**
Silica on heating with carbon at high temperature gives carborundum (silicon carbide)

$$SiO_2 + 3C \xrightarrow{\Delta} \underset{\text{carborundum}}{SiC} + 2CO$$

Carborundum is very hard substance.

115 **(b)**
$R_3SiCl + HOH \longrightarrow R_3SiOH + HCl$
$R_3SiOH + HOSiR_3 \longrightarrow R_3Si{-}O{-}SiR_3$

116 **(b)**
White tin converts to grey tin a low temperature.

117 **(c)**
Water glass is sodium silicate.

118 **(b)**
Bullet of gun possesses lead in it.

119 **(b)**
Both have at. wt. equal to 12.

121 **(c)**
The inert pair effect is most prominent in Pb because from top to bottom due to increase in number of shells

122 **(b)**
Buckminster fullerene is C −60 (allotrope of carbon).

123 **(c)**
SiO_2 has giant molecular structure.

124 **(c)**
Diamond and graphite are crystalline allotropes of carbon.

125 **(c)**
It is a reason for given fact.

126 **(b)**
Minium is also known as red lead.

127 **(b)**
General formula of alum is, $M_2'SO_4 \cdot M_2'''(SO_4)_3 \cdot 24H_2O$

128 **(a)**
Graphite is good conductor of current.

129 **(d)**
Alumina is mixed with molten cryolite to lower its melting point and to make it good conductor of electricity.

130 **(b)**
$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + 2Fe\ ;\Delta H = -ve;$
The heat given out is used in welding. This is also called Gold Schmidt alumino thermic process.

131 **(c)**
Agate is SiO_2.

132 **(b)**
$Ni(CO)_4 \xrightarrow{\Delta} Ni + 4CO$

133 **(c)**
Flint glasses are clear, transparent, potash lead glass.

135 **(b)**
Carbon cannot expand its octet due to inavailability of d-subshell in 2nd shell.

136 **(c)**
$AlCl_3 + 3NaOH \longrightarrow Al(OH)_3 + 3NaCl$
$Al(OH)_3 + OH^- \longrightarrow Al(OH)_4^-$ (soluble)

137 **(c)**
Goldschmidt in 1905 discovered a method for the reduction of haematite (Fe_2O_3) with aluminium metal. The process is known as aluminothermic process, as in this process, large heat is produced. In this, Fe_2O_3 and aluminium are taken in 3:1 ratio and this mixture, known as thermite, is ignited to initiate the reaction, when Fe_2O_3 is reduced to molten Fe.

$$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + \underset{\text{molten}}{2Fe} + 3230\ kJ$$

138 **(b)**
Electrolysis of cryolite can be explained as

$$Na_3AlF_6 \rightleftharpoons 3NaF + AlF_3$$
$$4AlF_3 \rightleftharpoons 4Al^{3+} + 12F^-$$
$$+12e^- \downarrow \qquad \downarrow -12e^-$$
$$\underset{\text{(at cathode)}}{4Al} \qquad \underset{\text{(at anode)}}{6F_2}$$

So, the molar ratio of Al and F_2 is 4:6=2:3

139 **(c)**
CO_2 get absorbed by $Ca(OH)_2$ to form insoluble $CaCO_3$

140 **(b)**
$Al(OH)_3 + OH^- \longrightarrow [Al(OH)_4^-]$.
Coordination no. is six thus, it exists as $[Al(H_2O)_2(OH)_4]^-$.

142 **(a)**
Carbon dioxide gas remains present in airated water and soft-drinks.

143 **(c)**
Calamine is an ore of Zn.

144 **(a)**
$Na_2B_4O_7 \longrightarrow 2NaBO_2 + B_2O_3$
$B_2O_3 + Co \longrightarrow Co \cdot O \cdot B_2O_3$ or $Co(BO_2)_2$

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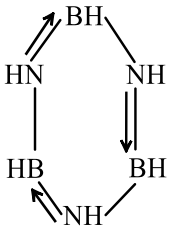
(Blue bead)

145 **(d)**

Inorganic benzene is borazole or $B_3N_3H_6$ having structure similar to C_6H_6, *i.e.*,



146 **(a)**

Borax is $Na_2B_4O_7 \cdot 10H_2O$ or $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$

147 **(d)**

The mineral borax is $Na_2B_4O_7.10H_2O$. It is used to detect coloured basic radicals in inorganic salt analysis.

148 **(c)**

Boron carbide also called **norbide** is hardest boron compound.

149 **(d)**

Iron oxide impurity – Baeyer's process

Silica impurity – Serpeck's process

150 **(a)**

$$C + \underset{(Conc.)}{2H_2SO_4} \longrightarrow CO_2 + 2SO_2 + 2H_2O$$

151 **(d)**

Massicot is PbO

$$Pb(NO_3)_2 \longrightarrow PbO + 2NO_2 + \frac{1}{2}O_2$$

152 **(d)**

A characteristic of charcoal.

153 **(a)**

Boric acid is used as disinfectant in eye wash under the name boric lotion.

154 **(a)**

$$Al_4C_3 + 12H_2O \rightarrow 3CH_4 + 4Al(OH)_3$$

155 **(b)**

The purest variety of coal is anthracite.

156 **(c)**

Boron and zeolite are used as water softner

157 **(a)**

It is a reason for given fact.

158 **(d)**

Potash alum is used for tanning of leather, as mordant in dyeing and calico printing, for sizing paper, as a styptic to stop bleeding and purification of water.

159 **(b)**

Each combustion is exothermic.

160 **(c)**

Basic lead carbonate is generally known as white lead.

Formula of compound	**Name of the compound**
$PbCO_3.PbOPbCO_3$	Cerussite
$Pb(OH)_2.2PbCO_3$	White lead
$PbSO_4.PbO$	Lanarkite

161 **(d)**

$$C + 4HNO_3 \longrightarrow CO_2 + 4NO_2 + 2H_2O$$

162 **(d)**

$$Al \longrightarrow Al^{3+} + 3e.$$

164 **(c)**

Water glass is sodium silicate.

165 **(a)**

Silica (SiO_2) is used for making optical instruments.

166 **(c)**

Naturally occurring crude borax is called tincal. Thus, it is chemically $Na_2B_4O_7.10H_2O$.

167 **(c)**

$$SnO + HF \longrightarrow SnF_2 + H_2O$$

168 **(d)**

Generally red lead decompose into PbO and O_2

169 **(a)**

$K_2(SO_4).Al_2(SO_4)_3.24H_2O$ gives

$$K_2SO_4 + Al_2(SO_4)_3 + 24H_2O$$

$Al_2(SO_4)_3$ undergoes hydrolysis to give H_2SO_4

$Al_2(SO_4)_3 + 6H_2O \rightarrow 2Al(OH)_3 + 3H_2SO_4$

due to which aqueous solution of potash alum is acidic.

170 **(d)**

It is a fact.

171 **(a)**

Calorific value is the heat liberated by burning 1g fuel $= \frac{94}{12} = 7.8$ kcal /g. Heat of combustion of carbon $= 94$ kcal mol^{-1}

172 **(d)**

Aluminium metal is refined by Hoope's electrolytic process.

173 **(c)**

Lead form nitric oxide and lead nitrate with dil HNO_3

$$3Pb + 8HNO_3 \longrightarrow 3Pb(NO_3)_2 + 2NO + 4H_2O$$

174 **(b)**

In smelting, carbon is used as a reducing agent but it is a non-metal. Al is also used as reducing agent and it is a metal.

$$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$$

175 **(c)**

1.In nitrogen *d*-orbitals are absent, so it does not

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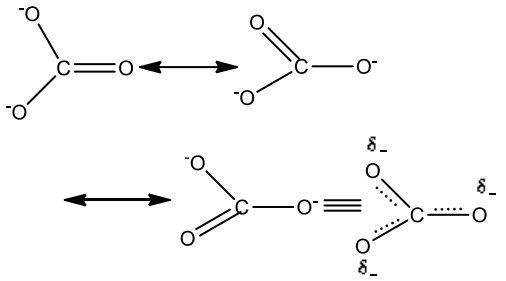
form NCl_5. Thus,NCl_5 does not exist but PCl_5 does.

2. Pb^{2+} is more stable than Pb^{4+}, due to inert pair effect.

3.In carbonate ion (CO_3^{2-}) all the three $C-O$ bonds are identical due to resonance.

4.

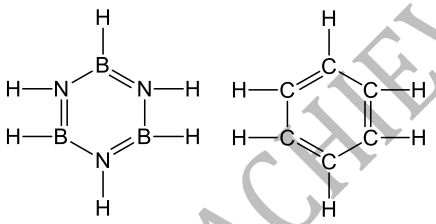


5. $O_2^+(8+8-1=15)=\sigma 1s^2, \sigma * 1s^2, \sigma 2s^2, \sigma * 2s^2, \sigma 2p_s^2, \pi 2p_y^2 \approx \pi 2p_z^2, {}^{*}_{\pi} 2p_y^1$

NO (7+8=15)

Hence, bo0th O_2^+ and NO contains one unpaired electrons, so paramagnetic.

176 **(a)**
Borazine $B_3N_3H_6$ is isoelectronic to benzene and hence, is called inorganic benzene. Some physical properties of benzene and borazine are also similar



177 **(d)**
Only lead in group 14 does not have allotropes.

178 **(c)**
Zn is stronger oxidant than carbon.

179 **(d)**
It is a method for preparation of graphite

$$SiO_2 + \underset{\text{Coke}}{3C} \xrightarrow{\text{Furnace}} SiC + 2CO$$

$$SiC \longrightarrow Si + \underset{\text{Graphite}}{C}$$

180 **(d)**

$$CO + NaOH \xrightarrow{200^\circ C} \underset{\text{sodium formate}}{HCOONa}$$

181 **(a)**
In Hall's process

$$Al_2O_3 \cdot 2H_2O + Na_2CO_3 \longrightarrow 2NaAlO_2 + CO_2 + 2H_2O$$

$$2NaAlO_2 + 3H_2O + CO_2 \xrightarrow{333K} 2Al(OH)_3 \downarrow + Na_2CO_3$$

$$2Al(OH)_3 \xrightarrow{1473K} Al_2O_3 + 3H_2O$$

182 **(d)**
In C_2H_4, each carbon has complete octet and cannot expand it.

183 **(c)**
Sapphire is a natural crystalline form of blue transparent corundum (alumina, Al_2O_3); The colour being due to traces of cobalt and other metals.

184 **(d)**
All are used as fire extinguishers.

186 **(d)**
It is a fact.

187 **(a)**

$$Al_2O_3 + 3Cl_2 + 3C \longrightarrow 2AlCl_3 + 3CO$$

dry

188 **(a)**
Gallium when was not discovered, its properties were predicted by Mendeleef under the name eka aluminium.

190 **(c)**
HF reacts with silica present in glass and dissolves it to give marking on surface.

191 **(c)**
Water gas contains about 40% of CO.

192 **(c)**
This process is mainly used when bauxite contains Fe_2O_3 as main impurity.

193 **(a)**
BCl_3 and $AlCl_3$ both are electron deficient compounds and can accept lone pair to act as Lewis acid. Also BCl_3 involves smaller boron atom and thus, attracts electron pair more easily.

194 **(c)**
Cryolite (Na_3AlF_6) is added to Al_2O_3 before electrolysis to lower the fusion temperature of bauxite in order to dissolve it and making good conductor of current.

195 **(c)**
Al + III group $\longrightarrow$ forms Al_2O_3

196 **(b)**
In III group, Tl (thalium) show+1 oxidation state due to inert pair effect. The outer shell's' electrons (ns^2) penetrate to $(n-1)d$ electrons and thus, become closer to nucleus and are more effectively pulled towards the nucleus. This results in less

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availability of ns^2 electron pair for bonding or ns^2 electron pair becomes inert.

198 **(c)**
Diborane possesses four B−H covalent bonds and two three centred (two electrons) B−H−B or hydrogen bridge bonds. These bonds are also known as **banana bonds.**

199 **(c)**
Alums are used as water-softener. These are also used in tanning of leather, as mordant in dyeing and to stop bleeding.

201 **(a)**
$CO + S \xrightarrow{Heat} COS$ (Carbonyl sulphide)

203 **(a)**
Felspar is an ore of Al. Its composition is $KAlSi_3O_8$ or $K_2O.Al_2O_3.6SiO_2$.

204 **(c)**
Thermite is the mixture of Fe_2O_3 and Al. Due to great affinity of aluminium towards oxygen, it readily combines with oxygen. Hence, Goldshmidt used Al to reduce metal oxides in extraction. In thermite, the ratio of Fe_2O_3 and Al is taken 3:1 by weight.

$$Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3$$
$$(2 \times 56 + 3 \times 16 = 160) \qquad (2 \times 27 = 54)$$

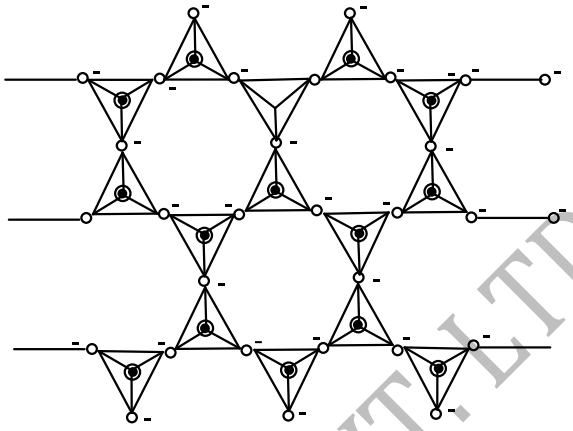
205 **(b)**
$BI_3 > BBr_3 > BCl_3 > BF_3$
This order can be easily explained on the basis of the tendency of the halogen atom to back donate its lone pair of electrons to the empty p-orbital of the boron atom through $p\pi - p\pi$ bonding.

206 **(b)**
Alum acts as coagulating agent, so it is used to purify water and separate mud from it.

207 **(d)**
Al is used as reducing agent in thermite process.
$$Cr_2O_3 + 2Al \rightarrow 2Cr + Al_2O_3$$

208 **(c)**
Diborane possesses four B—H covalent bonds and two three centred (two electrons) B—H—B or hydrogen bridge bonds. These bonds are also known as **banana bonds.**

209 **(b)**
The structure of silicates has been found with the help of X-ray diffraction technique. All silicates have tetrahedral SiO_4^{4-} ion as a basic building unit $i.e.$, all silicates are composed of many units. Tetrahedral shape of $[SiO_4]^{4-}$ ion is due to sp^3-hybridisation of Si-atom. Sheet silicates are formed when three oxygen atoms (bridging O-atoms) of each $(SiO_4)^{4-}$ unit are shared. Hence, the general formula of sheet silicates is $(Si_2O_5)^{2n-}$



210 **(a)**
Pb reacts with dilute HNO_3 and produces NO.
$3Pb + 8HNO_3 \rightarrow 3Pb(NO_3)_2 + 2NO + 4H_2O$
dil.

211 **(a)**
It is a fact. The alloy is called Rolled gold.

213 **(a)**
Lamp black is used for all these purposes. Carbon black is used in making tyres. Bone black is used for decolourisation of sugar.

214 **(b)**
It is a fact.

215 **(c)**
$2Al + Cr_2O_3 \longrightarrow Al_2O_3 + 2Cr\,;\, \Delta H = -ve$
Reductant Oxidant

216 **(c)**
$B_2H_6 + 6H_2O \longrightarrow 2H_3BO_3 + 6H_2$

217 **(b)**
The main impurity in red bauxite is ferrite (Fe_2O_3) and the main impurity in white bauxite is silica (SiO_2).

218 **(d)**
Al shows maximum covalency of six whereas as boron shows four.

219 **(d)**
Metals forming coloured bead can be identified by boras bead test.

220 **(d)**
Asbestos can withstand red hot flames without any damage.

221 **(d)**
Mg is placed above lead in electrochemical series.

222 **(a)**
Lead is found to be stable in +2 oxidation state, due to inert pair effect hence,
$PbCl_4$, $PbBr_4$ and PbI_4 are less stable compounds

223 **(c)**

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$SiF_4 + 4H_2O \longrightarrow Si(OH)_4 + 4HF$

$SiF_4 + 2HF \longrightarrow H_2SiF_6$

224 **(d)**

H_2SO_4 is regenerated during charging.

225 **(c)**

Diborane possesses four B−H covalent bonds and two three centred (two electrons) B−H−B or hydrogen bridge bonds. These bonds are also known as **banana bonds.**

226 **(c)**

The reluctance of the *s*-electrons of the valence shell to take part in bonding is called inert pair effect. It increases on moving down in a group. Hence, Pb shows most pronounced inert pair effect.

227 **(a)**

Galena (PbS) is the ore of lead. Malachite is an ore of copper while dolomite is an ore of magnesium and calamine is an ore of zinc.

228 **(c)**

Grey tin is very brittle and easily crumbles down to a powder in very cold climates Grey tin = white tin

(cubic) (tetragonal)

229 **(a)**

In SiF_6^{2-} and $SiCl_6^{2-}$, SiF_6^{2-} is known due to the small size of F atoms. The small six F atoms can be easily accommodated around Si atom to form SiF_6^{2-} while in $SiCl_6^{2-}$, six large Cl atoms cannot e accommodated around Si atom.

230 **(a)**

Boron nitride has similar structure to graphite.

231 **(d)**

$Sn(s) + HCl(g) \longrightarrow SnCl_2 + H_2$

232 **(b)**

Alum form acidic solution on dissolution in water due to hydrolysis of Al^{3+} ions.

233 **(b)**

Solder is used in welding purposes.

234 **(c)**

The stability of group 14 tetrahalides decreases down the group whereas of dihalides increases down the group.

235 **(a)**

Mica is a group of minerals, the most important of which are muscotive $H_2KAl_3(SiO_4)_3$ and phlogopite $H_2KMg_3Al(SiO_4)_3$ having sheet structure.

236 **(c)**

Tin is oxidised to meta stannic acid when it is treated with nitric acid.

$$Sn + 4HNO_3 \rightarrow H_2SnO_3 + 4NO_2 + H_2O$$

237 **(c)**

The outer electronic structure of '*X*' is s^2p^1, hence, element '*X*' belongs to third group. It will be non-metal because it is present in the first short period of third group. Its valency is +3 because it belongs to third group.

Hence, formula of its oxide will be X_2O_3. The oxide will be acidic in nature because it is oxide of non-metal.

239 **(d)**

Boron is oxidized to H_3BO_3 by mixture of HNO_3 and H_2SO_4.

240 **(d)**

Borax on heating forms a glassy mass called borax bead.

$$Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{740^oC} \underbrace{NaBO_2 + B_2O_3}_{\text{Bead}}$$

241 **(c)**

Borazine, $B_3N_3H_6$ is also known as inorganic benzene due to its resemblance in structure and properties with benzene.

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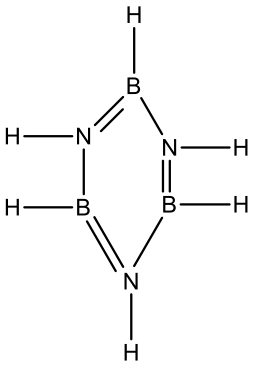
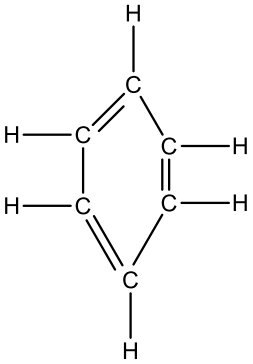


borazole or borazine



benzene

242 **(a)**

$Na_2B_4O_7 + 2HCl + 5H_2O \longrightarrow 2NaCl + 4H_3BO_3$

243 **(c)**

Ruby is mineral of aluminium *ie*, Al_2O_3.

It does not contain silicon.

244 **(d)**

Zeolites are aluminosilicates having three dimensional open structure in which four or six membered rings predominates.

Thus, due to open chain structure, they have cavities and can take up water and other small molecules.

245 **(b)**

The stability and basic character of hydrides decreases down the group.

246 **(c)**

The m.p. are

B	Al	Ga	Tl
2300°C	660°C	29.8°C	303°C

247 **(b)**

It is a fact.

248 **(d)**

$PbSO_4$ is insoluble compound.

249 **(b)**

Solid CO_2 sublimes directly to the vapour state (without converting into liquid) at $-78°C$ under atmospheric pressure, hence used as a refrigerant and called dry ice or cardice. It is used to freeze metals, ice-cream and in laboratory as a coolant.

251 **(c)**

Froth-floatation is used to concentrate sulphide ores [Galena (PbS)].

252 **(d)**

It is an use of Al which on coating prevents corrosion of surface coated.

253 **(b)**

Due to hydrolysis of Al^{3+} ions.

254 **(a)**

In alumino thermic process, aluminium is used as reducing agent.

$$e.g., Fe_2O_3 + 2Al \xrightarrow{3000°C} Al_2O_3 + 2Fe + 185\text{kcal}$$

255 **(b)**

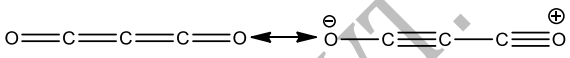
It is a fact.

256 **(d)**

Pb^{4+} is strong oxidant and I^- is strong reductant and thus, PbI_4 does not exist.

257 **(a)**

Carbon suboxide (C_3O_2) is anhydride of malonic acid. It has linear structure. $C-C$ bond length is 130 Å and $C-O$ bond length is 120 Å.



258 **(d)**

$$Pb(NO_3)_2 \longrightarrow PbO + 2NO_2 + \frac{1}{2}O_2$$

259 **(a)**

AlI_3, on reaction with CCl_4, gives the $AlCl_3$

$$4AlI_3 + 3CCl_4 \longrightarrow 4AlCl_3 + 3CI_4$$

260 **(a)**

General formula of alum is, $M_2'SO_4 \cdot M_2'''(SO_4)_3 \cdot 24H_2O$

261 **(b)**

In graphite carbon atom is sp^2 hybridised and has a delocalised π-electron cloud responsible for its high electrical conductivity.

262 **(b)**

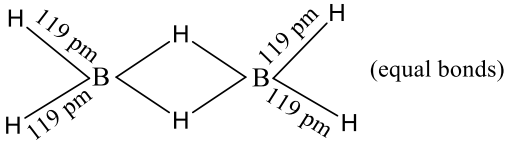
Al atom in $AlCl_3$ is sp^2-hybridised which lead for equilateral triangle geometry.

263 **(d)**

Atomic size increases in a group from top to bottom. But in IIIA group, gallium (Ga,1.35 Å) has size smaller than aluminium (1.43 Å). The reason is that in gallium d-electrons shield nuclear charge poorly and hence, due to greater effective nuclear charge (Z_{eff}) it has smaller size.

264 **(d)**

B_2H_6 has two types of $B-H$ bonds



(equal bonds)

265 **(b)**

BF_3 is covalent molecule.

266 **(d)**

Orthosilicic acid (H_4SiO_4), on heating at high temperature, loses two water molecules and gives silica (SiO_2) which on reduction with carbon gives carborundum (SiC) and CO.

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$$H_4SiO_4 \xrightarrow[-2H_2O]{1000^\circ C} SiO_2 \xrightarrow[\Delta]{C} SiC + CO$$

carborundum

267 **(a)**
The stability of hydrides of carbon family decreases down the group, hence order is $CH_4 > SiH_4 > GeH_4 > SnH_4 > PbH_4$

268 **(c)**
Gp. III A (Mendeleef's periodic table) or gp. 13th (Long form) elements possess 3 electrons in their valence shell having ns^2np^1 configuration.

270 **(c)**
Moissan boron is amorphous boron. It has 95-98% boron and is black in colour. It is prepared by reduction of B_2O_3 with Na or Mg.

271 **(c)**
It is a fact.

273 **(b)**
Generally IV group element shows catenation tendency and carbon has more catenation power

274 **(a)**
Moissan boron is amorphous boron, obtained by reduction of B_2O_3 with Na or Mg. It has 95.98% boron and black in colour

275 **(d)**
Boric acid is used in carom boards for smooth gliding of pawns because H-bonding in H_3BO_3 gives it a layered structure.

276 **(c)**
$SnCl_2 + I_2 + 2HCl \longrightarrow SnCl_4 + 2HI$

277 **(d)**
Quartz is an example of three dimensional network of $(SiO_2)_n$ silicate.

278 **(b)**
Coordination no. of Al is six in complex state, e.g., $Al(H_2O)_6^{3+}$; $[Al(H_2O)_4(OH)_2]^+$

279 **(d)**
Water gas is a mixture of carbon monoxide and hydrogen. It is obtained by passing steam over red-hot coke. It is a good fuel gas.

$$C + H_2O \rightarrow CO + H_2$$

water gas

$$C + H_2O \longrightarrow \underbrace{CO + H_2}_{\text{water gas}}$$

280 **(a)**
Diamond is most inert form of carbon.

281 **(a)**
Producer gas is a mixture of $CO + N_2$. Its calorific value is low due to high percentage of nitrogen.

282 **(a)**
Producer gas is a mixture of $CO + N_2$.

283 **(d)**
The tendency of trimethyl boron to act as Lewis acid decreases due to + IE of CH_3 gp. and thus, coordination becomes weaker.

284 **(d)**
Charcoal is most reactive form of carbon.

286 **(a)**
It is a fact. Rest all are used in pigments.

287 **(d)**
It becomes passive in HNO_3 due to formation of oxide film on the surface.

288 **(b)**
Inert pair effect is the phenomenon in which outer shell (ns^2) electrons penetrate t (n-1)d electrons and thus, becomes closer to nucleus and are more effectively pulled towards nucleus. This results in less availability of ns electrons for bonding. The inert pair effect begins when $n \geq 4$ and increases with increasing value of n.

289 **(a)**
As temperature decreases, white tin (β-form) changes to grey tin (α-form).

$$\underset{\text{(grey)}}{\alpha\text{-Sn}} \overset{15.2^\circ C}{\rightleftharpoons} \underset{\text{(white)}}{\beta\text{-Sn}}$$

α-Sn has a much lower density.

292 **(b)**
Follow the IUPAC rules for nomenclature of complexes.

294 **(d)**
$SnCl_2 + 2NaOH \longrightarrow Sn(OH)_2 + 2NaCl$
$Sn(OH)_2 + 2NaOH \longrightarrow Na_2SnO_2 + 2H_2O$

295 **(d)**
$$\underset{\text{(Amm.sol.)}}{CuCl} + CO \longrightarrow CuCl \cdot CO$$

297 **(d)**
It is a fact.

298 **(b)**
It is a reason for given fact.

299 **(d)**
It is hydrolysed with water to form a H_2SiF_6

300 **(a)**
Electronegativity decreases down the group.

301 **(b)**
Stannous chloride ($SnCl_2$) is a good reducing agent. It reduces $HgCl_2$ into Hg (grey precipitate), in two steps.

$$SnCl_2 + 2HgCl_2 \rightarrow SnCl_4 + \underset{\text{white}}{Hg_2Cl_2} \downarrow$$
$$SnCl_2 + Hg_2Cl_2 \rightarrow SnCl_4 + \underset{\text{grey}}{2Hg} \downarrow$$

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302 **(c)**
Due to inert pair effect, the stability of +2 oxidation state increases as we move down this group.
$\therefore \quad SiX_2 < GeX_2 < SnX_2 < PbX_2$

303 **(b)**
It react with alkali as well as acid

304 **(c)**
$AlCl_3$ will show maximum covalent character on account of higher polarising power of Al^{3+} because of its higher positive charge and smaller size (Fajan's rule).

305 **(a)**
It is a variety of fibrous silicate minerals mainly calcium, magnesium silicates.

307 **(a)**
B_2H_6 has 4B—H bond (i.e., 2 centre-2 electron bonds) and two 3 centre-2 electron bone $i.e.$, B—H—B bonds.

308 **(d)**
Borax or tincal is chemically sodium tetraborate decahydrate, i.e., $Na_2B_4O_7 \cdot 10H_2O$.

309 **(b)**
Aqueous solution of $AlCl_3$ is acidic due to hydrolysis

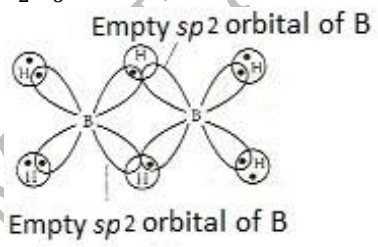
$$AlCl_3 + 3H_2O \rightleftharpoons Al(OH)_3 + 3HCl$$

On strongly heating $Al(OH)_3$ is converted into Al_2O_3.

$$2Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$

310 **(b)**
Hoope's process ⇒ Purification of Al
Hall and Heroult process ⇒ reduction of Al_2O_3
Baeyer's and Serpeck's process ⇒ concentration of bauxite ore

311 **(d)**
B_2H_6



312 **(b)**
H_3BO_3 is monobasic Lewis acid;
$H_3BO_3 + H_2O \longrightarrow B(OH)_4^- + H^+$

313 **(b)**
$CaOCl_2 + CO_2 \longrightarrow CaCO_3 + Cl_2$

314 **(b)**
These are characteristics of N_2.

315 **(b)**
In CO andCO_2, carbon has +2 and +4 oxidation states respectively.

316 **(d)**
SiO_2possesses giant molecular, three dimensional network solid structure.

317 **(b)**
$Mg : 1s^2, 2s^2 \xrightarrow{\text{Removal of } 2s'e'} Mg^+ : 1s^2, 2s^1$
$Al : 1s^2, 2s^2 2p^1 \xrightarrow{\text{Removal of } 2p'e'} Al^+ : 1s^2, 2s^2$
Removal of electron is easier from $2p$-subshell thus, lower IP for Al.

318 **(d)**
Diamond is sp^3-hybridized covalent molecule.

319 **(d)**
It is a fact.

320 **(d)**
This give rise to net dipole moment zero in BF_3. BF_3 (sp^2 – hybridization) PF_3 (sp^3).

322 **(c)**
Ge, Si are used as semiconductors.

323 **(b)**
Alumina is amphoteric oxide, which reacts acid as well as base

325 **(b)**
Boron from different hydride of general formula B_nH_{n+4} and B_nH_{n+6} but BH_3 is unknown

326 **(b)**
Sodium oxalate react with conc. H_2SO_4 to form CO and CO_2 gas

328 **(b)**
$B_2O_3 + 3C + 3Cl_2 \longrightarrow 2BCl_3 + 3CO$

329 **(c)**
Cryolite added to lower the melting point of alumina and to increase the electrical conductivity

331 **(a)**
Sand contains silicates having silicon.

332 **(c)**
Synthesis gas is $CO + 3H_2$.

333 **(b)**
Hard water deposits a protective film on the inner surface of lead pipes which resists further dissolution of Pb in water.

334 **(c)**
Fluorspar is CaF_2.

335 **(d)**
B_2H_6 form addition product with $(CH_3)_3N, NH_3$ and CO as:

$$B_2H_6 + 2N(CH_3)_3 \longrightarrow [2H_3B \leftarrow N(CH_3)_3]$$
$$B_2H_6 + 2NH_3 \longrightarrow [BH_2(NH_3)_2]^+[BH_4]^-$$
$$B_2H_6 + 2CO \longrightarrow 2[BH_3 \cdot CO]$$

336 **(c)**

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$SnC_2O_4 \xrightarrow{\Delta} SnO + CO + CO_2$

338 **(b)**

CO in producer gas is 33%.

339 **(d)**

In Hall and Heroult process

$$2Al_2O_3 \longrightarrow 4Al + 3O_2$$

$$4C + 3O_2 \longrightarrow 2CO_2 + 2CO\uparrow$$

$$2Al_2O_3 + 4C \longrightarrow 4Al + 2CO_2 + 2CO$$

Only for removal of CO_2, following equation is possible

$$2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$$

$3 \times 12 \quad 4 \times 27$

$=36\text{ g} \quad =108\text{ g}$

∵ For 108 g of Al, 36 g of C is required in above reaction.

∴ For 270×10^3g of Al, required amount of C

$$= \frac{36}{108} \times 270 \times 10^3$$

$$= 90 \text{ kg}$$

340 **(b)**

$CO_2 + H_2O \longrightarrow H_2CO_3$ (An acid)

342 **(d)**

Al has six electrons in $AlCl_3$ and thus, acquires electron pair from Cl atom of another $AlCl_3$ molecule to exist as Al_2Cl_6.

343 **(c)**

Silica reacts with metal carbonate forming silicate with the evolution of CO_2.

$$Na_2CO_3 + SiO_2 \rightarrow \underset{\text{sodium silicate}}{Na_2SiO_3} + CO_2\uparrow$$

344 **(c)**

Sand, on heating with HF, give silicon tetrafluoride vapours, which form silicic acid (H_4SiO_4), on coming in contact with water.

$$SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O$$

$$3SiF_4 + 4H_2O \rightarrow 2H_2SiF_6 + \underset{\text{white}}{H_4SiO_4}$$

345 **(c)**

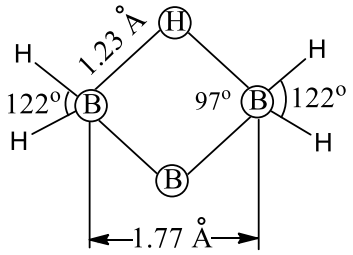
2nd-orbital has no d-subshell.

346 **(d)**

Inert pair effect increases down the gp. and thus , +4 ionic valence is not shown by lower elements.

347 **(a)**

Dilthey in 1921 proposed a bridge structure for diborane. Four hydrogen atoms, two on the left and two on the right known as terminal hydrogens and two boron atoms lie in the same plane. Two hydrogen atoms forming bridges, one above and other below, lie in a perpendicular to the rest of molecule



348 **(c)**

It is a fact.

349 **(b)**

Silicon oxides are solids.

350 **(d)**

The thin protective layer of oxide, Al_2O_3 is formed which protects the metal form further attack if air and water and thus stable in air

351 **(b)**

Zeolite have SiO_4 and AlO_4 tetrahedrons linked together in a three dimensional open structure in which four or six membered ring predominate Due to open chain structure they have cavities and can take up water and other small molecules

352 **(b)**

Alane is polymeric hydride of aluminium.

353 **(a)**

$Al_2Cl_6, In_2Cl_6, Ca_2Cl_6$

354 **(d)**

$Al_2S_3 + 6H_2O \longrightarrow 2Al(OH)_3 + 3H_2S$(pure).

355 **(a)**

It can accept lone pair of electron.

359 **(c)**

The alloy of Ni + Al + Cu is called nickeloy.

360 **(a)**

$$CS_2 + 3Cl_2 \xrightarrow{AlCl_3} CCl_4 + S_2Cl_2$$

361 **(c)**

CO is neutral; CO_2 is acidic.

362 **(d)**

Carborundum is chemically silicon carbide.

363 **(c)**

Al_2O_3 although an oxide of metal but reacts with acids and alkalies both and thus, amphoteric.

365 **(a)**

Chain silicates Double chain silicates can be formed when two simple chains are joined together by shared oxygens. These minerals are called amphiboles, and they are well known. The most numerous and best known amphiboles are the asbestos minerals. These are based on the structural unit $(Si_4O_{11})_n^{6n-}$. The structure of amphiboles is

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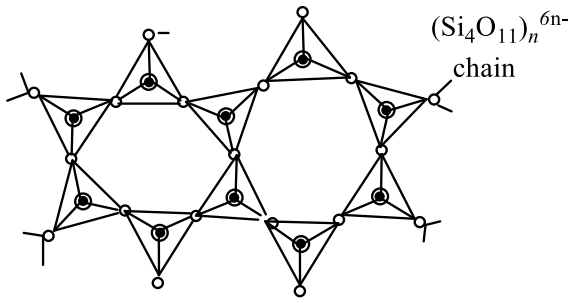


Stricture of amphiboles $(Si_4O_{11})_n^{6n-}$

366 **(d)**
Propyne can be prepared by the hydrolysis of magnesium carbide

367 **(b)**
C—C bond energy is maximum as catenation is maximum in carbon.

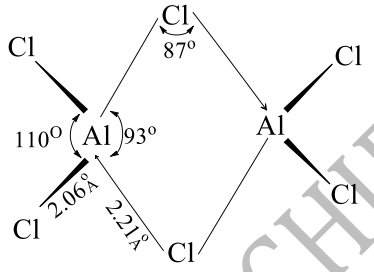
368 **(b)**
Ge possesses more tendency to show +4 oxidation state.

370 **(b)**
$Na_2B_4O_7 + H_2SO_4 + 5H_2O \longrightarrow Na_2SO_4 + 4H_3BO_3$

371 **(b)**
Bell metal has Cu 80% + Sn 20%.

372 **(b)**
Carbon in CO_2 and H_2CO_3 bot has +4 oxidation state.

373 **(a)**
Al_2Cl_6 has the structure given below:



374 **(c)**
The resultant vector sum of all the four C—Cl bonds is zero in regular tetrahedral geometry.

375 **(c)**
It is a fact.

376 **(d)**
Diaspora is $Al_2O_3 \cdot H_2O$.It is an ore of Al.

377 **(a)**
Coal gas contains mainly CH_4 (23%), CO (11%), H_2 (56%) and some other gases H_2, CO_2, etc.

378 **(a)**
Melting point order: B > Al > ln > Ga
2453K 953K 430K 303K

379 **(b)**
Producer gas (a mixture of CO $+N_2$) is prepared by incomplete combustion of coal in restricted supply of air.

380 **(a)**
$CO_2$is more denser than air and N_2 and thus, covers igniting materials more.

381 **(d)**
Solder is an alloy of tin and lead. Its melting point is quite low, hence, it is very useful in stitching in ICs in various electrical instruments.

382 **(a)**
CeO_2 is used to cut off UV radiations when passed through glass.

383 **(a)**
Alum is a double salt having general formula $M_2SO_4M_2'(SO_4)_3.24H_2O$ where M is monovalent metal and $M'$is trivalent metal. Potash alum has potassium (K) as monovalent metal. Potash alum is
$K_2SO_4.Al_2(SO_4)_3.24H_2O$.

384 **(b)**
In diborane, H − B − H (H-terminal) and H − B − H(H-bridged) bond angles are 120° and 97° respectively.

385 **(b)**
$AlCl_3$ is covalent but in water, it becomes ionic due to large hydration energy of Al^{3+}.
$AlCl_3 + 6H_2O \rightleftharpoons [Al(H_2O)_6]^{3+} + 3Cl^-$

386 **(c)**
SiO_2 is acidic oxide having sp^3-hybridisation and thus tetrahedral.

387 **(a)**
Central boron atom in H_3BO_3 is electron deficient, therefore it accepts a pair of electron, hence it is weak Lewis acid. There is no d-orbital of suitable energy in boron atom. So, it can accommodate only one additional electron pair in its outermost shell. Thus, H_3BO_3 is a monobasic weak Lewis acid.
$H_2O + B(OH)_3 \longrightarrow [B(OH)_4]^- + H^+$
base acid

388 **(b)**
$Na_2CO_3 + H_2O \longrightarrow 2NaHCO_3$

389 **(d)**
Common glass$-Na_2O.CaO.6SiO_2$

390 **(a)**
Feldspar is pot. sod. alumino silicate.

391 **(d)**
Small carbon atoms are present interstitial sites in lattice of tungsten atoms.

392 **(d)**

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These are characteristics of carbogen.

393 **(d)**
Electrodes of lead accumulators are made up of lead anode and lead packed with lead dioxide as cathode.

394 **(c)**
General formula of alum is, $M_2^{I}SO_4 \cdot M_2^{III}(SO_4)_3 \cdot 24H_2O$

395 **(d)**
Tl has marking nature.

396 **(d)**
All can be directly converted from solid state to gas with.

397 **(c)**
It is an use of alum.

398 **(a)**
H_3BO_3 is monobasic acid.

399 **(c)**
$+4$ due to ns^2np^2-configuration and $+2$ due to inert pair effect.

403 **(b)**
$CO_2$is known as dry ice, $i.e.$, $CO_2(g) \longrightarrow CO_2(s)$.

404 **(b)**
$AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$

405 **(a)**
$2Al + Cr_2O_3 \longrightarrow Al_2O_3 + 2Cr\ ;\ \Delta H = -ve$

406 **(c)**
The phenomenon of very slow regulated homogeneous cooling of glass to relieve strain is called annealing.

407 **(c)**
B_4C is next hardest to diamond.

408 **(a)**
It is a use of water gas
$CO + H_2 + H_2 \xrightarrow{\text{Catalyst}} CH_3OH$

410 **(a)**
$SiO_2 + 2Mg \longrightarrow Si + 2MgO$

412 **(c)**
Due to inert pair effect.

413 **(b)**
Due to inert pair effect which increases down the group.

414 **(b)**
The acidic character of chlorides increases down the gp.BCl_3 is weak acid to show $p\pi - p\pi$ back bonding.

415 **(c)**
$C + 2H_2SO_4(\text{Conc.}) \longrightarrow 2H_2O + 2SO_2 + CO_2$
$C + 4HNO_3(\text{Conc.}) \longrightarrow 2H_2O + 4NO_2 + CO_2$

416 **(c)**
It is a fact.

417 **(c)**
Generally, the ion exchange tendency of a material depends on the extent of isomorphous substitution in the tetrahedral framework. Thus, the Si^{4+} ions of feldspar and zeolite are replaced by Al^{3+} (aluminium ion).

419 **(a)**
When silica is heated with carbon in electric furnace, it is reduced to carborundum or silicon carbide.
$SiO_2 + 3C \rightarrow SiC + 2CO$

420 **(c)**
German silver contains Cu, Zn and Ni.

421 **(b)**
Hall's process is used for purification of alumina.
Hoope's process is used for refining of alumina.

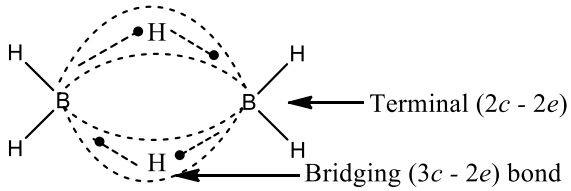
422 **(b)**
$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + 2Fe\ ;\ \Delta H = -ve;$
The heat given out is used in welding. This is also called Gold-schmidt alumino thermic process.

423 **(d)**
Although Mn_3C is not real methanide but All Mn_3C, Be_2C and Al_4C_3 on hydrolysis gives CH_4.
$Mn_3C + 6H_2O \longrightarrow 3Mn(OH)_2 + CH_4 + H_2$

424 **(c)**
The basic structural unit in silicates is SiO_4 tetrahedron. In SiO_4^{4-} unit, silicon atom is bonded to four oxide ions tetrahedrally.

425 **(d)**
Graphite is good conductor of current due to the presence of mobile π-electron left on carbon after sp^2-hybridization.

426 **(d)**
(B_2H_6) has structure



427 **(d)**
Pb forms only one hydride as PbH_4. Sn forms only two hydrides as SnH_4 and Sn_2H_6. Rest all forms number of hydrides.

428 **(b)**
Due to lone pair effect.

429 **(a)**
Extraction of Al from Al_2O_3 is made by electrolytic reduction of molten mixture of alumina (Al_2O_3), cryolite(Na_3AlF_6) and fluorspar CaF_2 in the ratio

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of 20 : 40 : 20 respectively.

430 **(c)**

Crookes glass contains CeO_2 which cuts off radiations.

431 **(a)**

Surface of Al forms Al_2O_3 on exposure to air and becomes passive.

432 **(c)**

These are the compositions of gases present in coal gas.

434 **(a)**

$Cu(BO_2)_2$ is blue and chromium metaborate is green.

435 **(c)**

Most of the fuel gases contain CO as one of the component.

436 **(c)**

$$SnCl_2 + HgCl_2 \longrightarrow SnCl_4 + \underset{\text{(Black)}}{Hg_2Cl_2}$$

$$SnCl_2 + HgCl_2 \longrightarrow SnCl_4 + \underset{\text{(Grey)}}{Hg_2}$$

437 **(b)**

It is a fact.

438 **(a)**

$$B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na^+[B(OH)_4]^- + H_2O$$

This reaction is reversible reaction because sodium metaborate, $Na^+[B(OH)_4]^-$ formed by the reaction between $B(OH)_3$ and NaOH gets hydrolysed to regenerate $B(OH)_3$ and NaOH.

$$Na^+[B(OH)_4]^- \xrightarrow{\text{Hydrolysis}} NaOH + B(OH)_3$$

If some quantity of polyhydroxy compounds like *cis*-1, 2-diol, catechol, glycerol etc is added to the reaction mixture then the $B(OH)_3$combines with such polyhydroxy compounds to give chelated complex compound. Due to complex compound formation, stability increases and due to higher stability of complex, reaction moves in forward direction.

439 **(a)**

$CO + Cl_2 \longrightarrow COCl_2$ (Phosgene)

440 **(a)**

Semiconductors are bad conductors of electricity at room temperature but become conductor of electricity at high temperature or when some impurities are added to them.

∴ Si and Ge are semiconductors.

442 **(d)**

$4KNO_3 + 2SiO_3 \longrightarrow K_2SiO_3 + 4NO_2 + O_2$

444 **(b)**

Antidote for CO poisoning is carbogen. Carbogen is a mixture of 90% oxygen and 5-10%carbon dioxide.

447 **(c)**

Diamond has tetrahedral structure (sp^3-hybridization).

Graphite has flatlayer structure (sp^2).

448 **(c)**

Si is used in making transistor. It is a semiconductor.

449 **(c)**

$B(OH)_3$ is not protonic acid because it does not give proton on ionisation directly while it acts as Lewis acid due to a acceptance of $OH^-$from water and forms a hydrated species.

$$B(OH)_3 + H_2O \rightarrow [B(OH)_4]^- + H^+$$

450 **(a)**

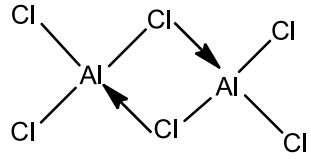
$$2Al + N_2 \longrightarrow 2AlN$$

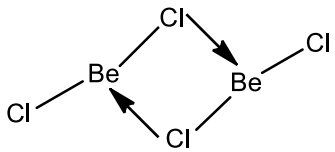
451 **(d)**

When SiO_2 (silica) is present as earthly impurity in an ore, it is called gangue and when it is added to remove basic impurities like CaO, FeO etc. It is called an acidic flux.

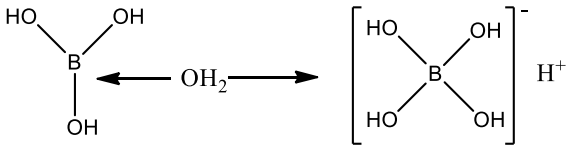
452 **(c)**

Chlorides of both beryllium and aluminium have bridged structures in solid phase.





Boric acid is not a protonic acid



Borazole, inorganic benzene contains $B_3N_3H_6$.

453 **(c)**

Pb_3O_4 is a mixed oxide. It can be represented as $2PbO.PbO_2$.

454 **(d)**

Aluminium metal burn in air at high temperature. This reaction is highly exothermic

$$4Al + 3O_2 \longrightarrow 2Al_2O_3$$

455 **(d)**

CO_2 is acid anhydride of H_2CO_3.

456 **(c)**

Tin stone after roasting and washing is called

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black tin.

457 **(b)**
It acts as an oxidant.

458 **(c)**
Coal gas contains 56% H_2.

459 **(c)**
The element is boron.

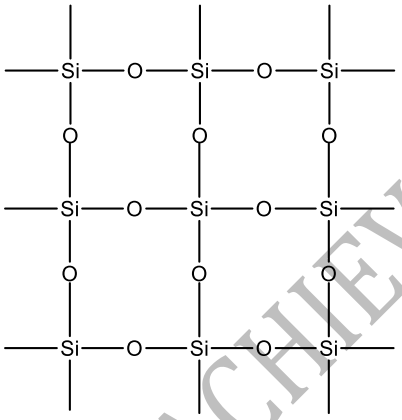
460 **(c)**
It is a fact.

461 **(d)**
Silicones one organosilicon compounds having the general formula $(R_2SiO)_n$ which contain repeated R_2SiO units held by Si $-$O$-$Si linkages

462 **(d)**
The reaction equilibrium for preparation of water gas is endothermic.

$$CO_2 + H_2 \rightleftharpoons CO + H_2O \; ; \triangle H = 9 \text{ kcal}$$

463 **(b)**
In silica, silicon has large size, so the $3p$-orbitals of Si does not overlap effectively with $2p$ $-$orbitals of oxygen. Therefore, Si=O are not formed. The tetravalency of Si is satisfied by the formation of Si $-$ O bonds, thus it is surrounded by four oxygen atoms.



464 **(b)**

$$SiO_2 + 4HF \longrightarrow SiF_4 + 2H_2O$$

465 **(b)**
Flint glass or lead glass has composition of $K_2O.PbO.6SiO_2$.
It is used in making electric bulb and optical instruments.

466 **(c)**
It is a reason for given fact.

467 **(b)**
Serpeck's process involves:

$$Al_2O_3 + 3C + N_2 \longrightarrow 2AlN + 3CO$$

$$AlN + 3H_2O \longrightarrow Al(OH)_3\downarrow + NH_3\uparrow$$

$$2Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$

468 **(b)**
The tendency of elements of p-block to show lower (+2) oxidation state, ($i.e.$, ionic) increases down the gp.due inert pair effect.

469 **(c)**
$B(OH)_3 \implies H_3BO_3$ boric acid
$Al(OH)_3 \implies$ amphoteric

470 **(d)**
Density of gp. 14 elements are: C (3.51); Si(2.34); Ge (5.32); Sn (7.26) and Pb (11.34) in g/cm^3.

471 **(b)**
To provide sufficient air for complete combustion.

472 **(d)**

1. Ostwald process: It is used to manufacture HNO_3.
2. Hoope's process It is the method used to purify aluminium. Pure Al makes anode and impure aluminium makes cathode in this reaction.
3. Hall's process It is used to purify bauxite having no specific impurity.
4. Baeyer's process It is used to purify bauxite having chief impurity of iron.

$\therefore$ Hoope's process is correct answer.

473 **(c)**
The inert pair effect increases with increase in no. of outermost shell down the group.

474 **(a)**
Teflon is a polymer of C_2F_4.

475 **(a)**

$$CO_2 + H_2O \longrightarrow H_2CO_3$$

476 **(a)**
The correct decreasing order of catenation property of group 14 elements is as follows
$C >> Si > Ge = Sn > Pb$
Catenation property is directly proportional to the bond energy.

477 **(b)**
$Al(13) = 1s^2, 2s^2 2p^6, 3s^2 3p^1$
$\therefore$ It can have maximum coordination number as 6.

478 **(a)**
It is a fact.

479 **(c)**
Water containing organic acids corrodes lead.

480 **(a)**
Monosilane ($e.g.$, SiH_4) on coming in contact with air burns with a luminous flame producing vortex ring. These rings are of silica.

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$$SiH_4 + 2O_2 \rightarrow SiO_2 + 2H_2O$$

481 **(b)**
CO burns with blue flame.

482 **(a)**
Lapis lazuli is a rock composed mainly of the following mineral, lazurite, hauynite sodalite, nosean, calcite pyrite. Lapis lazuli is actually sulphur containing, sodium aluminium silicate having chemical composition
$3Na_2O \cdot 3Al_26SiO_2 \cdot 2Na_2S$

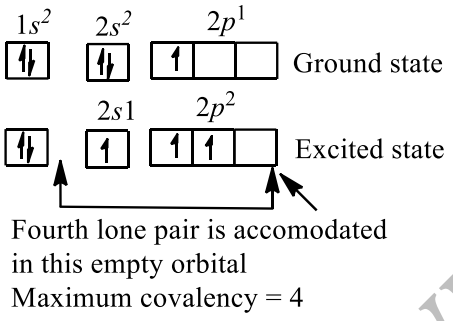
483 **(b)**
Bone black is amorphous form of carbon.

484 **(b)**
The property of diamond which makes its use as precious stone.

485 **(c)**
PbO reacts with acids and alkalies both.

488 **(b)**
$Na_2SiO_3 + 2H_2O \longrightarrow \underset{\text{Strong alkali}}{2NaOH} + \underset{\text{Weak acid}}{H_2SiO_3}$

489 **(a)**



Due to absence of $2d$-orbital, maximum covalency is four.
Thus $BF_6^{3-}$is not formed,
Thus (a) is not formed.
$BH_4^-(BH_3 + H^-)$
$B(OH)_4^-(B(OH)_3 + OH^-)$
and $BO_2^-$are formed.

490 **(a)**
Photosynthesis.

491 **(a)**
In diamond each carbon atom is linked to four other carbon atoms by sigma bond. Each σ C-C bond is formed by the overlapping of sp^3 hybrid orbitals of each carbon atom. Each carbon atom is present at the centre of a regular tetrahedron. Each carbon atom is surrounded by four other carbon atoms present at the corners of a regular tetrahedron. Structure of diamond is a rigid three dimensional network. This explain high density and hardness of diamond.

492 **(d)**
This process is used when silica is present in considerable amount in bauxite ore.

493 **(b)**
Boron atom in BF_3 is sp^2-hybridised and possesses trigonal planar structure.

494 **(b)**
Bauxite is$Al_2O_3 \cdot 2H_2O$.

495 **(c)**
MCl_2 oxidation state of M=+2
MCl_4 oxidation state of M=+4
Higher the oxidation state, smaller the size.
Greater the polarizing power, greater the covalent characteristics.
Hence, MCl_4 is more covalent and MCl_2 is more ionic.

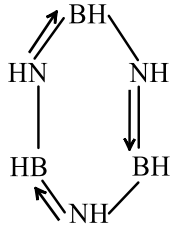
496 **(b)**
Azurite is basic copper carbonate; $2CuCO_3 \cdot Cu(OH)_2$; intense blue colour used as gemstone.

497 **(d)**
In the heavier elements of group IIIA, IVA and V A the ns^2 electrons have extra stability and hence, do not take part in bond formation. The reluctancy of s-electron pair to take part in bond formation is known as the inert pair effect. The inert pair effect increases as the atomic number increases in the group.
Lead (Pb) is the element of group 14 (IV A) hence, it shows inert pair effect, hence for lead compounds +2 oxidation state is more predominant.

498 **(c)**
CoO imparts blue colour to glass.

499 **(a)**
In complex $[H_3N \longrightarrow BF_3]$, both N and B attains sp^2-hybridisation and acquires tetrahedral geometry.

500 **(a)**
Inorganic benzene is borazole or $B_3N_3H_6$ having structure similar to C_6H_6, i.e.,



501 **(b)**
Sn exists in grey, white, rhombic forms.

502 **(c)**
Carbon suboxide has linear structure with C—C bond length equal to 130 Å and C—O bond length

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equal to 120 Å

$O = C = C = C = O \leftrightarrow^{-} O - C \equiv C - C \equiv O^{+}$

503 **(a)**

SnO_2, ZnO, BeO, As_2O_3, Al_2O_3 are amphoteric oxides.

504 **(b)**

Due to sp^2-hybridization one p-electron on each carbon forms π-bond.

505 **(b)**

$SiCl_4 + 2Mg \longrightarrow Si + 2MgCl_2$

506 **(a)**

BH_3 has sp^3-hybridized boron but it exists as B_2H_6.

507 **(a)**

As we move down the group , the basic nature of the oxides of group 13 elements increases. Tl_2O in aqueous solution gives TlOH which is as strong a base as alkali metal hydroxides

$Tl_2O + H_2O \longrightarrow 2TlOH$

508 **(c)**

It is a reason for given fact.

509 **(a)**

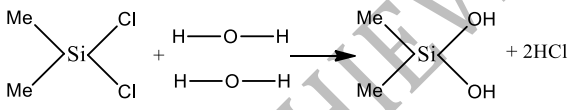
The most abundant metal in the earth crust is aluminium.

510 **(d)**

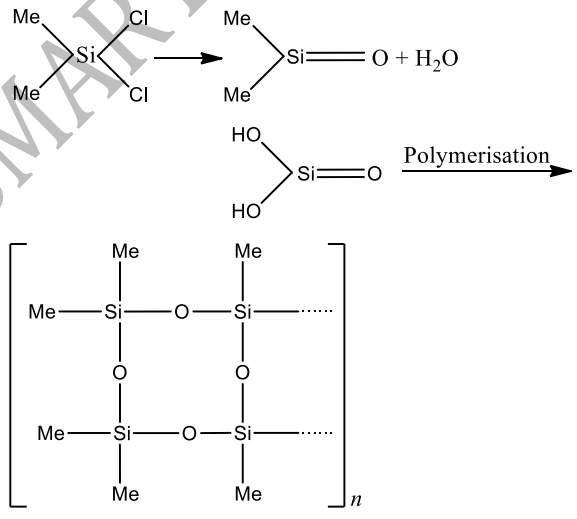
General formula of alum is,$M_2'SO_4 \cdot M_2'''(SO_4)_3 \cdot 24H_2O$, Cu is bivalent.

511 **(c)**

Me_2SiCl_2 on hydrolysis will produce $Me_2Si(OH)_2$ as follows



$MeSi(OH)_2$ is unstable compound and it loses water molecule to give Me_2SiO. But silicon atom because of its very large size in comparison to oxygen, is unable to form π-bond. Thus, the product of hydrolysis is polymeric in nature.



512 **(c)**

Aluminium reduces Fe_2O_3 or Cr_2O_3 to respective metals and acts as a reducing agent

$Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$

513 **(d)**

Boron absorbs neutrons.

$_5B^{10} + {}_0n^1 \longrightarrow {}_5B^{11} + \gamma$

514 **(c)**

K^+, Al^{3+} and SO_4^{2-} ions.

515 **(c)**

$AlCl_3$ is covalent and exists as Al_2Cl_6.

516 **(d)**

$(CH_3COO)_2$ Pb is called lead sugar.

517 **(d)**

Carbon cannot expand its octet due to absence of d −orbital in 2nd shell.

518 **(d)**

These are use of lamp black.

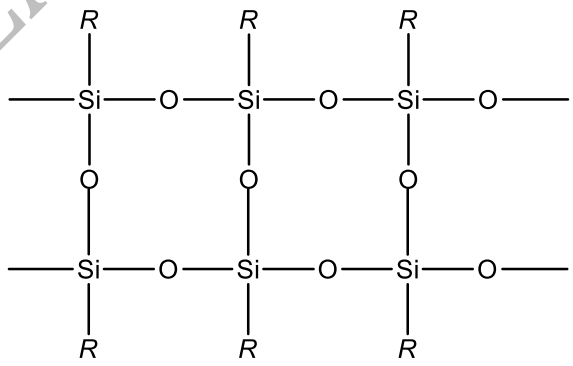
519 **(c)**

It is a fact.

520 **(b)**

$RSiCl_3 \xrightarrow{3H_2O} RSi(OH)_3 + 3HCl$

$RSi(OH)_3 \xrightarrow{\text{Polymerization}}$



Three dimensional structure of silicon.

521 **(d)**

When two oxygen of each SiO_4^{4-} tetrahedron are shared with others, cyclic or ring structures are obtained. These silicates are known as cyclosilicates or cyclic silicates.

$[Si_6O_{18}]^{12-}$ is an example of cyclosilicate. In this silicate six SiO_4 tetrahedra linked together.

522 **(d)**

These are facts about SnS.

$SnS + \underset{\text{Yellow amm.sulphide}}{(NH_4)_2S_2} \longrightarrow \underset{\text{Soluble}}{(NH_4)_2SnS_3}$

523 **(d)**

These are facts.

525 **(c)**

Lead react with water to form lead hydroxide $Pb(OH)_2$ hence, lead pipes are not suitable for

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drinking purpose

526 **(d)**

$CO_2 + Na_2O \longrightarrow Na_2CO_3$

527 **(c)**

$AlCl_3$ is covalent whereas AlF_3 is ionic.

528 **(a)**

Chrome yellow is lead chromate.

529 **(c)**

Due to inert pair effect.

530 **(a)**

Magnalium is Al +Mg + Cu.

531 **(d)**

Chromium oxide imparts green colour to glass.

532 **(b)**

$BF_3 + 3LiBH_4 \longrightarrow 3LiF + 2B_2H_6$

533 **(a)**

Al powder (larger surface area) having more affinity for oxygen gives Al_2O_3 with highly exothermic reaction.

534 **(c)**

It is a fact.

535 **(b)**

The formation of oxide film on Al surface prevents it from further corrosion.

536 **(d)**

$PbCl_2$ is soluble in hot water but insoluble in cold water.

$$Pb^{2+} + 2HCl \xrightarrow{\Delta} \underset{\text{soluble}}{PbCl_2} \xrightarrow{H_2S} \underset{\text{black}}{PbS}$$

537 **(d)**

Like alkanes, these are called silanes.

538 **(d)**

It is a reason for given fact.

539 **(a)**

It is an use of $Al_2(SO_4)_3$.

540 **(d)**

Due to back bonding ($p\pi - p\pi$) giving resonance, bond order in BF_3 is 1.33.

541 **(a)**

Kettle involves continuous use of boiling water in which if water is hard Ca, Mg bicarbonates are decomposed to Ca and Mg carbonates.

543 **(b)**

Aluminium is obtained by electrolysing alumina dissolved in cryolite (Na_3AlF_6)

$$4Na_3AlF_6 \rightleftharpoons 12\,Na^+ + 4Al^{3+} + 12F^-$$

$$4Al^{3+} + 12e^- \longrightarrow 4Al \quad \text{(at cathode)}$$

$$12F^- \longrightarrow 6F_2 + 12e^- \quad \text{(at anode)}$$

$$2Al_2O_3 + 6F_2 \longrightarrow 4AlF_3 + 3O_2$$

544 **(d)**

It has no unpaired electrons.

545 **(a)**

$$C_{12}H_{22}O_{11} \xrightarrow{H_2SO_4} 12C + 11H_2O$$

549 **(d)**

$$Zn + BaCO_3 \xrightarrow{\Delta} ZnO + BaO + CO$$

550 **(b)**

B in BF_4^- is sp^3-hybridised having four hybrid orbitals.

551 **(c)**

sp^3 hybridisation, but four bonds are neither linear nor in one plane.

552 **(d)**

Tin is oxidized to *meta* stannic acid when it is treated with nitric acid

$$Sn + 4HNO_3 \longrightarrow H_2SnO_3 + 4NO_2 + H_2O$$

553 **(c)**

This phenomenon for a substance is called polymorphism and also in case, an element does so it is called allotropy.

554 **(a)**

The SiO_2 present in glass reacts with HF

$$SiO_2 + 6HF \longrightarrow \underset{\text{(Soluble)}}{H_2SiF_6} + 2H_2O$$

556 **(c)**

It is a fact.

557 **(d)**

Among these, graphite is purest form.

558 **(b)**

Anions in chain silicate is $[SiO_3^{2-}]_n$ or $[Si_4O_{11}^{6-}]_n$.

559 **(d)**

$Sn + 2HCl \longrightarrow SnCl_2 + H_2$

$Sn + 4HNO_3 \longrightarrow SnO_2 + 4NO_2 + 2H_2O$

$Sn + 2HgCl_2 \longrightarrow SnCl_2 + Hg_2Cl_2$

560 **(a)**

CO_2 is major contributor to green house effect. This controls the earth's climate.

561 **(c)**

It is a reason for given fact.

563 **(a)**

Magnalium is an alloy of Al and Mg.

564 **(b)**

Crystalline form of silica is called quartz.

565 **(c)**

$$Ca_2B_6O_{11} + 2Na_2CO_3 \longrightarrow 2CaCO_3 \downarrow + Na_2B_4O_7 + 2NaBO_2$$

566 **(b)**

Diamond is not isomer but allotrope of graphite.

567 **(b)**

A method to prepare water gas ($CO + H_2$).

568 **(d)**

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In the electrolytic method, for the purification of bauxite, cryolite is added to lower the melting point of bauxite

570 **(a)**
Quartz is purest form of silica.

571 **(c)**
It causes senility and loss of memory

572 **(a)**
LiH has H^- ion which donates electron pair ($i.e.$, acts as Lewis base) to AlH_3 (a Lewis acid).

573 **(c)**
C and Si are non-metals; Pb is metal.

575 **(d)**
$Al_2O_3 + 3C + 3Cl_2 \longrightarrow 2AlCl_3 + 3CO$

576 **(b)**
Germanium chips are used in transistors.

577 **(d)**
$2Al + 2KOH + 2H_2O \longrightarrow 2KAlO_2 + 3H_2$

578 **(a)**
It is H_3BO_3 a monobasic Lewis acid (boric acid).

580 **(c)**
It is a fact.

581 **(c)**
Galena (PbS) is sulphide ore. Froth floatation method is usually used for sulphide ores.

582 **(b)**
A recently discovered family of carbon allotropes is buckminster fullerene. The most common fullerene has the formula C_{60} and contains hexagonal and pentagonal rings of carbon atoms. Hence, in ketones the two valencies of carbonyl group are satisfied by alkyl groups.

583 **(d)**
Galena is PbS.

584 **(a)**
$(CH_3)_2SiCl_2$ undergoes hydrolysis but $(CH_3)_2CCl_2$ does not because in Si, low lying d-orbital is present but in C, it does not present.

585 **(b)**
In H_3BO_3, B is sp^2-hybridized and oxygen is sp^2-hybridized having two lone pair on it.

586 **(c)**
Al-bronze is an alloy containing Al-Cu.

587 **(b)**
SiO_2 (silica) is used as an acid flux in metallurgy. It reacts with gangue to form slag.

588 **(d)**
Cryolite (Na_3AlF_6) is added to alumina for its electrolysis to decrease its melting point and also increase its conductivity.

589 **(d)**
CO_2 does not possess disinfectant nature.

590 **(a)**
It Form boron carbide. The molecular formula of boron carbide is $B_{12}C_3$

$4B + C \xrightarrow{\Delta} B_4C$

591 **(b)**
Activated charcoal possesses more adsorption power.

592 **(d)**
The influence of inert pair effect, ($i.e.$, non-availability of ns electron pair for bonding) increases down the group.

593 **(b)**
Graphite is a good conductor of heat and electricity.

594 **(a)**
$BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$

595 **(a)**
Coal deposits are found very commonly.

596 **(b)**
Silicon can expand its octet by using $3d$-orbitals.

597 **(b)**
Pyrene is chemically CCl_4.

598 **(a)**
Boron being non-metal does not form cation.

599 **(a)**
The stability of + 2 oxidation state shows the order
$Ge^{2+} < Sn^{2+} < Pb^{2+}$.

600 **(c)**
B_4C is the hardest substance along with diamond

601 **(c)**
CO has sp-hybridization.

602 **(b)**
The phenomenon of very slow regulated homogeneous cooling of glass to relieve strain is called annealing.

603 **(c)**
$Al_4C_3 + 12H_2O \underset{(Dil.HCl)}{\longrightarrow} 4Al(OH)_3 + 3CH_4$

$Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$

604 **(a)**
Lapis Lazuli is a name for sodium alumino silicate.

605 **(a)**
Diamond is an allotropic form of carbon, carborundum is SiC, corundum is Al_2O_3, borazon is BN.

606 **(a)**
It is a reason for given fact.

607 **(c)**

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It is a fact.

608 **(d)**
Electrodes of Pb (anode) and Pb + PbO_2 (cathode) are used in batteries.

609 **(d)**
Hall's process involves:

$$Al_2O_3 + Na_2\,CO3 \longrightarrow 2NaAlO_2 + CO_2$$
$$2NaAlO_2 + CO_2 + 3H_2O \longrightarrow 2Al(OH)_3\downarrow + Na_2CO_3$$
$$2Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + 3H_2O$$

610 **(d)**
It is plumbus plumbate, *i.e.*, $PbO \cdot PbO_2$.

611 **(a)**
$Sn(l) + 2Cl_2(g) \longrightarrow SnCl_4(g)$

612 **(b)**
$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2 + O_2$

613 **(a)**
Boron compound on heating form B_2O_3 which imparts green flame.

614 **(a)**
CH_4 having lowest mol. wt. has lowest b.p.

615 **(c)**
Destructive distillation of coal (heated to nearly 1270 K) gives coke (solid residue 70%) and hot vapours and gases.

616 **(c)**
Red lead (Pb_3O_4) is a mixed oxide. Its structure is $2PbO.PbO_2$.

617 **(d)**
H_3BO_3 *ie*, $B(OH)_3$ is weak non basic acid

618 **(d)**
Cassiterite is an ore of tin (SnO_2). It is also called tin stone.

619 **(a)**
It is a method for refining of Al.

620 **(c)**
B is non-metal and oxide of non-metals are acidic.

621 **(c)**
Boron in its compounds has incomplete octet and thus, acts as Lewis acid.

622 **(a)**
Glass is super cooled liquid.

623 **(d)**
Catenation is the property of an element to unite with its atoms forming a long open or closed chain.

624 **(a)**
$[BF_6]^{3-}$ does not exist because boron does not have vacant *d*-subshells.

625 **(c)**
According to Lewis, the compound which can accept a lone pair of electron, are called acids. Boron halides, being electron deficient compounds, can accept a lone pair of electrons, so termed as Lewis acid.

626 **(b)**
It is the only non-metal in gp.13.

627 **(b)**
Leaching involves washing out of soluble components from ore.

628 **(c)**
$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$
$2Al + 3Cl_2$ (dry gas) $\longrightarrow 2AlCl_3$

629 **(b)**
Metal oxides or some salts are fused with glass to impart colour to glass.

630 **(d)**
Cryolite is Na_3AlF_6.

631 **(a)**
$2KOH + 2Al + 2H_2O \longrightarrow 2KAlO_2 + 3H_2$

632 **(b)**
It is a fact.

633 **(b)**
Due to the yellow colour of chromate ion.

635 **(b)**
Addition of CaF_2 to alumina dissolved in Na_3AlF_6 makes it more conducting.

636 **(d)**
PbO_2 and not PbO is used in batteries.

637 **(a)**
Ruby stone is name for alumina (Al_2O_3).

638 **(d)**
A property of wood charcoal to remove poisonous gases from surrounding.

639 **(c)**
$2NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2$

640 **(d)**
Al too forms covalent compounds, *e*. g., $AlCl_3$.

641 **(a)**
R_3SiCl on hydrolysis can only form a dimer.

$$R_3SiCl \xrightarrow{H_2O} R_3SiOH$$
$$R_3SiOH + R_3SiOH \xrightarrow[-H_2O]{} R_3Si - O - SiR_3$$

642 **(a)**
It is a fact.

643 **(a)**
Borax bead test is given by elements which form coloured ion.

644 **(b)**
Amorphous silicon is prepared by the reduction of silica (rocks). Extra pure silicon is obtained by the removal of SiO_2 by HF.

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$SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O$

645 **(b)**
Rest all are uses of boric acid.

646 **(b)**
CO_2, SiO_2 and GeO_2 are acidic oxides.

647 **(d)**
Boron does not react with acids.

648 **(c)**
BCl_3 is completetely hydrolysed by water yielding boric acid and hydrochloric acid
$BCl_3 + 3H_2O \longrightarrow H_2BO_3 + 3HCl$

649 **(a)**
The reaction itself occurs violently.

650 **(a)**
Alkali metals do not form carbonyls.

652 **(b)**
Antiknocks are used to increase octane no. of gasoline.

653 **(c)**
It is a reason for given fact.

654 **(b)**
In carbon family stability of +2 oxidation state increases on moving down the group in the Periodic Table with an increase in atomic number due to screening effect

655 **(b)**
Phosgene is carbonyl chloride, , *e*., $COCl_2$.

656 **(a)**
CO_2 is linear and *sp*-hybridized.

657 **(c)**
$SiO_2 + 2KOH \xrightarrow{\Delta} K_2SiO_3 + H_2O$

658 **(a)**
Anhydrite is naturally occurring $CaSO_4$.

659 **(b)**
A fact about graphite due to sp^2-hybridisation.

660 **(a)**
Rest all react with water.

661 **(b)**
$K_4Fe(CN)_6 + 6H_2SO_4 + 6H_2O \longrightarrow 2K_2SO_4 + FeSO_4 + 3(NH_4)_2SO_4 + 6CO$

662 **(d)**
The metallic character in each gp. increases down the gp.

663 **(c)**
$Al(OH)_3$ formed as white precipitate gets dissolved in excess of NaOH to form soluble $NaAlO_2$.

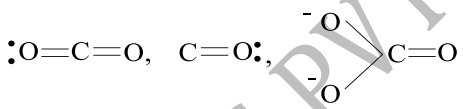
665 **(b)**
Flux is mostly used in removal of silica and undesirable metal oxide.

666 **(a)**
$2Al + 6NaOH \longrightarrow 2Na_3AlO_3 + 3H_2$
Fused

668 **(c)**
Melting point of Al_2O_3 is about 2000°C.

669 **(d)**
It is $p\pi - p\pi$ bonding involving B and F atom responsible for the acidic nature of boron halides as $BF_3 < BCl_3 < BBr_3 < BI_3$ smaller atom shows more back bonding.

670 **(d)**
Structures of CO_2, CO and CO_3^{2-} are



Bond multiplicity decreases the bond length. Thus, CO with a triple bond will have shortest C—O bond length. CO_2 with a double bond will have a larger C—O band length. CO_3^{2-} is a resonance hybrid of three structure with a C—O length of more than a C—O double bond but less than a C—O single bond. Thus, C—O bond length is maximum in CO_3^{2-}.

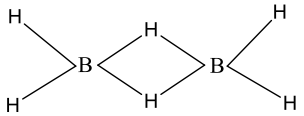
671 **(b)**
$PbCl_2$is soluble in hot water.

672 **(b)**
Inert pair effect is the phenomenon in which outer shell (ns^2) electrons penetrate to $(n-1)d$ electrons and thus, becomes closer to nucleus and are more effectively pulled towards nucleus. This results in less availability of ns electrons for bonding. The inert pair effect begins when $n \geq 4$ and increases with increasing value of n.

674 **(c)**
It is used as explosive.

676 **(c)**
Oxalates are strong reducing agent and give CO_2 with conc. H_2SO_4.

677 **(a)**
$3c-2e$; $B-H-B$, $2c-2e$; $H-B-H$



678 **(c)**
Each has three electrons in its outer shell.

680 **(c)**
$Al_2O_3 + 3C + N_2 \longrightarrow 2AlN + 3CO$

681 **(a)**
$2Al_2O_3 + 9C \xrightarrow{2000^\circ C} Al_4C_3 + 6CO$

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682 **(b)**
+4 oxidation state of carbon family is covalent in nature.

683 **(c)**
Wrought iron is purest form of carbon.

684 **(b)**
Al becomes passive in conc. HNO_3 and thus, conc. HNO_3 can be stored in Al vessels.

685 **(b)**
Water gas is sodium silicate Na_2SiO_3.

686 **(a)**
Bond energy for C—C is maximum.

687 **(a)**
$Al_2(SO_4)_3 + 6NH_4OH \longrightarrow 2Al(OH)_3 + 3(NH_4)_2SO_4$
$Al(OH)_3$ is insoluble in NH_4OH but soluble in NaOH.

688 **(c)**
Borax on heating forms a glassy mass called borax bead.

$$Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{740^oC} \underbrace{NaBO_2 + B_2O_3}_{\text{Bead}}$$

689 **(d)**
It is a reason for given fact.

690 **(b)**
$a + 6 \times (-1) = -2; \quad \therefore a = +4$

691 **(d)**
All these are characteristics noted during the process.

693 **(c)**
Gp. III A or gp.13 members have ns^2np^1 configuration.

694 **(d)**
These are characteristics of bucky ball.

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