

## 11.THE P-BLOCK ELEMENTS

### Single Correct Answer Type

1. Which of the following is arranged in the increasing order of enthalpy of vaporization?
  - a)  $\text{NH}_3, \text{PH}_3, \text{AsH}_3$
  - b)  $\text{AsH}_3, \text{PH}_3, \text{NH}_3$
  - c)  $\text{NH}_3, \text{AsH}_3, \text{PH}_3$
  - d)  $\text{PH}_3, \text{AsH}_3, \text{NH}_3$
2. The number of P – O – P bonds in cyclic metaphosphoric acid is
  - a) Zero
  - b) Two
  - c) Three
  - d) Four
3. Phosphorus trichloride,  $\text{PCl}_3$ , undergoes hydrolysis to produce an oxoacid. It has the formula
  - a)  $\text{HPO}_3$
  - b)  $\text{H}_3\text{PO}_3$
  - c)  $\text{H}_3\text{PO}_4$
  - d)  $\text{H}_3\text{PO}_2$
4. Principal cause of ozone depletion is the
  - a) Presence of fluorocarbons
  - b) Acid rain
  - c) Photochemical smog
  - d) Green-house effect
5. Following are neutral oxides except
  - a) NO
  - b)  $\text{N}_2\text{O}$
  - c) CO
  - d)  $\text{NO}_2$
6. Thermodynamically most stable form of carbon is
  - a) Graphite
  - b) Diamond
  - c) Ionsdaleite
  - d) Chaoite
7. In making casting of metal, silicon is used as
  - a) Oxidizer
  - b) Semiconductor
  - c) Deoxidizer
  - d) None of these
8. Reactivity of borazole is greater than that of benzene because
  - a) Borazole is polar compound
  - b) Borazole is non-polar compound
  - c) Borazole is electron deficient compound
  - d) Of localized electrons in it
9. Cold solution of barium nitrite on mixing with sulphuric acid produces
  - a)  $\text{BaSO}_4 + \text{HNO}_2$
  - b)  $\text{BaSO}_4 + \text{HNO}_3$
  - c)  $\text{BaSO}_4 + \text{NO}_2$
  - d)  $\text{BaSO}_4 + \text{N}_2 + \text{O}_2$
10. Borax is used
  - a) As a flux in brazing and in silver soldering
  - b) In making enamel
  - c) In leather tanning
  - d) In all given above
11. Which is the incorrect statement about silicones?
  - a) They are repeating units ( $\text{SiO}_4$ ) in silicates
  - b) They are synthetic polymers containing repeated  $\text{R}_2\text{SiO}_2$  units
  - c) They are formed by hydrolysis of  $\text{R}_2\text{SiCl}_2$
  - d) All the above are incorrect statements
12.  $\text{SnCl}_2$  can be used as
  - a) Reducing agent
  - b) Oxidizing agent
  - c) Catalyst in Friedel Crafts reaction
  - d) A base
13. In aqueous solution  $\text{GaCl}$  disproportionates to
  - a)  $\text{GaCl}_2$  and  $\text{GaCl}_3$
  - b) Ga and  $\text{GaCl}_3$
  - c)  $\text{GaCl}_2$  and Ga
  - d)  $\text{GaCl}_3$  and  $\text{GaCl}_5$
14.  $p\pi-p\pi$  multiple bonds occur between
  - a) C and C
  - b) C and O
  - c) C and N
  - d) In all cases
15. Thermite welding uses Al because of
  - a) Its low melting point
  - b) Its lightness
  - c) Its greater affinity for oxygen
  - d) All the properties given above
16.  $\text{BF}_3$  behaves as a
  - a) Lewis acid and lone pair from the Lewis base is filled into empty  $2p_z$  orbital
  - b) Lewis base and lone pair on B is donated to empty orbital of the Lewis acid
  - c) Amphoteric species due to interaction with acid and base both
  - d) Polymer substance
17. The structural formula of hypophosphorus acid is



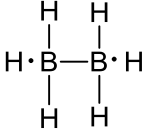
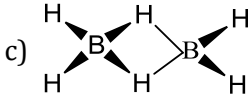
34. Sindoor is represented by  
 a)  $\text{Pb}(\text{NO}_3)_2$                       b)  $\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$                       c)  $\text{Pb}(\text{OH})_2 \cdot 4\text{PbCO}_3$                       d)  $\text{Pb}_3\text{O}_4$
35. Which of the following statements are true for zeolites?  
 1. They are formed by the replacement of some of the silicon atoms of the  $\text{SiO}_2$  lattice, by say, aluminium  
 2. They have a more closed structure than feldspar  
 3. They can absorb  $\text{CO}_2$ ,  $\text{NH}_3$  and EtOH  
 4. They can separate straight chain hydrocarbons from a mixture containing both straight, chain and branched chain hydrocarbons  
*Of these statements*  
 a) 1, 2 and 3 are correct    b) 1, 3 and 4 are correct    c) 1, 2 and 4 are correct    d) 2, 3 and 4 are correct
36. The structure of  $\text{BF}_3$  is  
 a) Tetrahedral                      b) Pyramidal                      c) Planar triangular                      d) T-shaped
37. For the hydrides of nitrogen family going down the group  
 a) Stability decreases                      b) Reducing activity increases  
 c) Bond angle H-M-H decreases                      d) All the above variations followed
38. Gas that strikes in thundering of light is  
 a) CO                      b) NO                      c)  $\text{CO}_2$                       d)  $\text{H}_2$
39.  $\text{Na}_3\text{AlF}_6$  is added to  $\text{Al}_2\text{O}_3$  to  
 a) Improve the electrical conductivity of the cell                      b) Increases rate of production  
 c) Increase the melting point                      d) Decrease the electrical conductivity
40. The thermal disproportionation of  $\text{B}_2\text{Cl}_4$  gives  
 a)  $\text{BCl}_3$                       b)  $\text{B}_4\text{Cl}_4$                       c)  $\text{B}_8\text{Cl}_8$                       d) All of these
41. Borazine  $\text{B}_3\text{N}_3\text{H}_6(A)$  is converted into disubstituted product  $\text{B}_3\text{N}_3\text{H}_4\text{X}_2(B)$ . Number of isomers of  $B$  would be  
 a) 2                      b) 4  
 c) 6                      d) No isomer, exists as single product
42. Select the incorrect statement  
 a) Mixture of  $\text{NH}_4\text{Cl}$  and  $\text{NaNO}_3$  on heating gives  $\text{N}_2$  gas  
 b) CFC is used as refrigerating fluid and as propellant in aerosols  
 c) Phosphine is formed when  $\text{P}_4$  react with NaOH  
 d) Phosphine dissolves in water forming  $\text{P}_2\text{O}_5$
43.  $p\pi-p\pi$  multiple bonding between nitrogen atoms is present in  
 a) Hyponitrous acid                      b) Nitrous acid                      c) Nitric acid                      d) In all of these
44. Radius of Ga is less than that of Al because of  
 a) Lanthanoid contraction                      b) Greater screening effect  
 c) Inert pair effect                      d) None of these
45. The oxide which is not a reducing agent is  
 a)  $\text{CO}_2$                       b)  $\text{NO}_2$                       c)  $\text{SO}_2$                       d)  $\text{ClO}_2$
46.  $\text{NH}_3$  can't be obtained by  
 a) Heating of  $\text{NH}_4\text{NO}_3$  or  $\text{NH}_4\text{NO}_2$   
 b) Heating of  $\text{NH}_4\text{Cl}$  or  $(\text{NH}_4)_2\text{CO}_3$   
 c) Heating of  $\text{NH}_4\text{NO}_3$  with NaOH  
 d) Reaction of AlN or  $\text{Mg}_3\text{N}_2$  or  $\text{CaCN}_2$  with  $\text{H}_2\text{O}$
47. Which of the following is false statement?  
 a)  $\text{BH}_3$  is a Lewis acid                      b) All the B – H distance in diborane ( $\text{B}_2\text{H}_6$ ) are equal  
 c) Boranes are easily hydrolysed                      d)  $\text{LiAlH}_4$  reduces  $\text{BCl}_3$  to borane
48. Litharge is chemically  
 a) PbO                      b)  $\text{PbO}_2$                       c)  $\text{Pb}_3\text{O}_4$                       d)  $(\text{CH}_3\text{COO})_2\text{Pb}$
49. Select the incorrect statement about  $\text{N}_2\text{O}_4$   
 a) It self ionizes as  $\text{NO}^+$ ,  $\text{NO}_3^-$

- b) Substance containing  $\text{NO}^+$  is said to be acid and that containing  $\text{NO}_3^-$  is said to be base  
 c)  $\text{N}_2\text{O}_4$  is paramagnetic  
 d)  $\text{NO}_2$  dimerises to  $\text{N}_2\text{O}_4$  with disappearance in paramagnetism
50. The crystal structures of both chaoite and carbon (VI) are based on  
 a)  $-\text{C} \equiv \text{C} - \text{C} \equiv \text{C} -$       b)  $-\text{C}=\underset{|}{\text{C}}-\underset{|}{\text{C}}=\underset{|}{\text{C}}-$       c)  $-\underset{|}{\text{C}}-\underset{|}{\text{C}}-$       d) All of these
51. Which reactions can be used to prepare diborane?  
 I.  $\text{NaBH}_4 + \text{BF}_3$  (in ether)  $\rightarrow$   
 II.  $\text{NaBH}_4 + \text{I}_2 \rightarrow$   
 III.  $\text{BF}_3 + \text{NaH} \rightarrow$   
 a) I, III      b) I, II      c) II, III      d) I, II and III
52. Beryllium and aluminium have similar properties because  
 a) They belong to same group      b) They have different electronegativity  
 c) They have same electronegativity      d) They have same ionization energy
53. Which of the following has the highest first ionization energy?  
 a) Lithium      b) Beryllium      c) Boron      d) Carbon
54. Which of the following are used as transition materials and light-emitting devices (LED)?  
 I. Gallium-phosphides  
 II. Indium-phosphides  
 III. Gallium-arsenides  
 IV. Indium-arsenides  
 a) All      b) Except I all      c) Except I, II all      d) Only IV
55. Boron carbide is used  
 a) In nuclear reactor to absorb neutrons      b) As an abrasive  
 c) Both (a) and (b)      d) None of the above
56. Acid rain may cause  
 a) Rusting easier      b) Stone-cancer in Taj Mahal  
 c) Non-fertility of soil      d) All of the above
57. 'Anhydron' is a very effective desiccant (water absorber) used in 'dry batteries.' It is  
 a) Conc.  $\text{H}_2\text{SO}_4$       b)  $\text{P}_2\text{O}_5$       c)  $\text{CaCl}_2$       d)  $\text{Mg}(\text{ClO}_4)_2$
58. Mixture of  $\text{Al}(\text{OH})_3$  and  $\text{Fe}(\text{OH})_3$  can be separated by  
 a)  $\text{HCl}$       b)  $\text{NH}_4\text{OH}$       c)  $\text{NaOH}$       d)  $\text{HNO}_3$
59. Select the correct statement(s)  
 a) Cyanamide ion ( $\text{CN}_2^{2-}$ ) is isoelectronic with  $\text{CO}_2$  and has the same linear structure  
 b)  $\text{Mg}_2\text{C}_3$  reacts with water to form propyne  
 c)  $\text{CaC}_2$  has NaCl type of lattice  
 d) All the above are correct statements
60. About 2 to 5% of gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) is added to Portland cement. It is just to  
 a) Increase the setting rate of the cement during hydration  
 b) Slow down the setting rate to increase strength  
 c) Both (a) and (b) are correct  
 d) None of the above is correct
61. Which is/are used as ligand in complexes?  
 a)  $\text{CN}^-$       b)  $\text{CO}$       c) Both (a) and (b)      d) None of these
62.  $\text{Pb}_3\text{O}_4$  reacts with  $\text{HNO}_3$  forming nitrate and oxide which are  
 a)  $\text{Pb}(\text{NO}_3)_4$  from  $\text{PbO}_2$ , and  $\text{PbO}$  remains unreacted  
 b)  $\text{Pb}(\text{NO}_3)_2$  from  $\text{PbO}$ , and  $\text{PbO}_2$  remains unreacted  
 c)  $\text{Pb}(\text{NO}_3)_2$  from  $\text{Pb}(\text{NO}_3)_4$ , and  $\text{PbO}$  remains unreacted  
 d)  $\text{Pb}_3\text{O}_4$  remains insoluble in  $\text{HNO}_3$
63. From  $\text{B}_2\text{H}_6$  all the following can be prepared except

- a)  $\text{H}_3\text{BO}_3$                       b)  $\text{NaBH}_4$                       c)  $\text{B}_2(\text{CH}_3)_6$                       d)  $\text{B}_2\text{O}_3$
64. Unstable lead compounds are  
a)  $\text{PbCl}_4$ ,  $\text{PbBr}_4$  and  $\text{PbI}_4$     b)  $\text{PbCl}_2$ ,  $\text{PbBr}_2$  and  $\text{PbI}_2$     c)  $\text{PbO}$ ,  $\text{PbO}_2$  and  $\text{Pb}_3\text{O}_4$     d)  $\text{PbCl}_4^{2-}$ ,  $\text{PbCl}_6^{2-}$
65. The variation in element-element bond energy follows the order  
a)  $\text{C} - \text{C} > \text{Si} - \text{Si} > \text{Ge} - \text{Ge} > \text{Sn} - \text{Sn} > \text{Pb} - \text{Pb}$   
b)  $\text{Si} - \text{Si} > \text{C} - \text{C} > \text{Pb} - \text{Pb} > \text{Sn} - \text{Sn} > \text{Ge} - \text{Ge}$   
c)  $\text{C} - \text{C} > \text{Ge} - \text{Ge} > \text{Sn} - \text{Sn} > \text{Pb} - \text{Pb} > \text{Si} - \text{Si}$   
d)  $\text{C} - \text{C} > \text{Sn} - \text{Sn} > \text{Pb} - \text{Pb} > \text{Ge} - \text{Ge} > \text{Si} - \text{Si}$
66. Indium is used  
a) To dope crystals to make *p-n-p* transistors                      b) In thermistors  
c) In low melting point solder                      d) All the above are correct
67. Stable oxides of carbon are  
a)  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{C}_3\text{O}_2$                       b)  $\text{CO}_2$ ,  $\text{C}_3\text{O}_2$ ,  $\text{C}_2\text{O}$                       c)  $\text{CO}$ ,  $\text{CO}_2$                       d)  $\text{C}_2\text{O}$ ,  $\text{C}_3\text{O}_2$
68. A person working with phosphorus suffers from a disease in which bones decay. It is known as  
a) Arthrities                      b) Phossy jaw                      c) Rickets                      d) Cancer
69. In liquid  $\text{NH}_3$   
a)  $\text{NH}_4\text{Cl}$  is an acid                      b)  $\text{NaNH}_2$  is a base  
c)  $\text{CH}_3\text{COOH}$  behaves as strong acid                      d) All of the above facts are true
70. Red lead used as primer for iron to prevent it from rusting is  
a)  $\text{Pb}_3\text{O}_4$                       b)  $\text{PbO}$                       c)  $\text{PbO}_2$                       d)  $\text{Pb}_2\text{O}$
71. Which is insoluble in excess of  $\text{NH}_4\text{OH}$ ?  
a)  $\text{Al}(\text{OH})_3$                       b)  $\text{Cu}(\text{OH})_2$                       c)  $\text{Zn}(\text{OH})_2$                       d)  $\text{Cd}(\text{OH})_2$
72. Which is the most spontaneous in forward side?  
a)  $\text{Al}^{3+} + 2\text{e}^- \rightarrow \text{Al}^+$                       b)  $\text{Ga}^{3+} + 2\text{e}^- \rightarrow \text{Ga}^+$                       c)  $\text{In}^{3+} + 2\text{e}^- \rightarrow \text{In}^+$                       d)  $\text{Tl}^{3+} + 2\text{e}^- \rightarrow \text{Tl}^+$
73. The gas evolved by heating potassium ferrocyanide crystals with conc.  $\text{H}_2\text{SO}_4$  is  
a)  $\text{CO}$                       b)  $\text{CO}_2$                       c)  $\text{SO}_2$                       d)  $\text{SO}_3$
74.  $(\text{Me})_2\text{SiCl}_2$  on hydrolysis will produce  
a)  $(\text{Me})_2\text{Si}(\text{OH})_2$                       b)  $(\text{Me})_2\text{Si} = \text{O}$   
c)  $[-\text{O} - (\text{Me})_2\text{Si} - \text{O}]_n$                       d)  $\text{Me}_2\text{SiCl}(\text{OH})$
75. Chooses the correct statements  
a) Superphosphate is  $[3\text{Ca}(\text{H}_2\text{PO}_4)_2 + 7\text{CaSO}_4]$                       b) Triple superphosphate is  $4\text{Ca}(\text{H}_2\text{PO}_4)_2$   
c) Both (a) and (b) are correct                      d) None of the above is correct
76.  $\text{CO}$  behaves as  
a) Lewis acid                      b) Lewis base                      c) Amphoteric oxide                      d) None of these
77.  $\text{NO}_2$  is not obtained when following is heated  
a)  $\text{Pb}(\text{NO}_3)_2$                       b)  $\text{AgNO}_3$                       c)  $\text{LiNO}_3$                       d)  $\text{KNO}_3$
78. Which of the following is the false statement?  
a) Reducing action of  $\text{NaBH}_4$  and  $\text{LiAlH}_4$  are specific                      b)  $\text{B}_2\text{H}_6$  reduces alkene to primary alcohol  
c) Both (a) and (b) are the false statements                      d) None of the above is false statement
79.  $\text{AlCl}_3$  fumes in moist air because it  
a) Is covalent  
b) Is volatile  
c) Is hygroscopic  
d) Forms  $\text{HCl}$  in moist air
80. White lead is  
a)  $\text{PbSO}_4 \cdot \text{PbO}$                       b)  $\text{PbCO}_3 \cdot \text{PbO}$                       c)  $\text{PbCO}_3$                       d)  $\text{Pb}(\text{OH})_2 \cdot \text{PbCO}_3$
81. The colour of blue glass is due to the presence of oxide of  
a) Chromium                      b) Cobalt                      c) Gold                      d) silver
82. Which gas cannot be collected over water?  
a)  $\text{O}_2$                       b)  $\text{PH}_3$                       c)  $\text{N}_2$                       d)  $\text{SO}_2$

83. Artificial gem used for cutting glass is  
 a) Graphite                      b) Diamond                      c) SiC                      d) CaCN<sub>2</sub>
84. N<sub>2</sub> gas is passed or heated Mg and B. Products formed are  
 a) Mg<sub>3</sub>N<sub>2</sub>, BN                      b) Mg<sub>3</sub>N<sub>2</sub>, BN and Mg<sub>3</sub>B<sub>2</sub>  
 c) MgN, BN                      d) No reaction
85. Element  $M + N_2 \xrightarrow[\text{H}_2\text{O}]{\Delta} \text{NH}_3$   
 Element  $M$  belonging to group 13 can be  
 a) B or Al                      b) Ga or Al                      c) Mg or Al or B                      d) Mg or B
86. Fe<sup>2+</sup> reduces NH<sub>2</sub>OH to  
 a) NH<sub>3</sub>                      b) N<sub>3</sub>H                      c) N<sub>2</sub>H<sub>4</sub>                      d) N<sub>2</sub>
87. Select the incorrect statement(s)  
 a) Interstitial carbides are formed by metalloids like Si and B  
 b) Covalent carbides are formed by metalloids  
 c) CO and CN<sup>-</sup> both are fatal due to complex formation with Fe(III) present in blood  
 d) SiC is called carborundum
88. Carbon monoxide is a poisonous gas, the antidote used for this poisoning is  
 a) Pure oxygen                      b) Carbonic acid                      c) Carborundum                      d) Carbogen
89. Solid crystalline PCl<sub>5</sub> has structure which of the following?  
 a) Bi-pyramidal moieties                      b) Octahedral and tetrahedral ions  
 c) Square-pyramidal moieties                      d) Pentagonal moieties
90. Out of Si, Ge, Sn and Pb which forms stable ionic compounds in divalent state?  
 a) Pb                      b) Sn                      c) Ge                      d) Si
91. B can be obtained from halide by van Arkel method. This involves reaction  
 a)  $2\text{BCl}_3 + 3\text{H}_2 \xrightarrow[\text{filament}]{\text{red hot W or Ta}} 2\text{B} + 6\text{HCl}$   
 b)  $2\text{BI}_3 \xrightarrow{\text{red hot W or Ta}} 2\text{B} + 3\text{I}_2$   
 c) Both (a) and (b)  
 d) None of the above
92. In diamond crystal each carbon atom is linked with carbon atoms. The number of carbon atoms linked is  
 a) 2                      b) 4                      c) 3                      d) 1
93. Select the correct statements  
 a) Hydrides of B and Si are volatile and catches fire on exposure to air  
 b) Oxide of B and Si (B<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub>) are acidic in nature  
 c) Borates and silicates have tetrahedral BO<sub>4</sub> and SiO<sub>4</sub> structural units  
 d) All the above are correct statements
94. Thallium and lead are classified as chemically soft because  
 a) They have higher affinities for soft anions as I<sup>-</sup> and S<sup>2-</sup> ions  
 b) They are soft in reactivity  
 c) They are stable in lower oxidation state (Tl<sup>+</sup>, Pb<sup>2+</sup>)  
 d) They are stable in higher oxidation state (Tl<sup>3+</sup>, Pb<sup>4+</sup>)
95. Select the incorrect statement about hydrides of group 15 elements  
 a) The central atom in the hydride is sp<sup>2</sup> hybridised  
 b) NH<sub>3</sub> readily form NH<sub>4</sub><sup>+</sup> salts with H<sup>+</sup>; PH<sub>4</sub><sup>+</sup> salts are formed with H<sup>+</sup> under anhydrous condition  
 c) The tetrahedron is distorted due to repulsion between the lone pair of electrons and the bond pairs  
 d) The bond energy of the  $M - \text{H}$  bond decreases from NH<sub>3</sub> to BiH<sub>3</sub> because of increase in the size of the element
96. Alzheimer'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) are correct                      d) None of the above is correct

97. Which among the following statements is false regarding glass?
- It absorbs ultra-violet light
  - It consists of silicates of sodium and alkali
  - HF causes marking on glass
  - All the halogen acids (HF, HCl, HBr and HI) are stored in glass bottles
98. Silicones are
- Synthetic polymers containing repeated  $R_2SiO$  units
  - Silicates with common  $SiO_4$  units
  - Ketones with silyl group ( $SiH_3$ ) similar to alkyl  $(SiH_3)_2CO$
  - Zircon (neso silicates)
99. Addition of sodium carbonate to a solution of an oxide in water produces  $CO_2$ . This experiment indicates that
- The oxide is that of a non-metal
  - The oxide is basic
  - The oxide is amphoteric
  - The oxide is neutral
100. The minerals having silicate chains are collectively called
- Olivine
  - Zircon
  - Pyroxenes
  - Natrolite
101. Consider the reaction,
- $$(NH_4)_2HAsO_3 + CuSO_4 \rightarrow \underbrace{CuHAsO_3}_{\text{green ppt}} + (NH_4)_2SO_4$$
- The green precipitate is also known as
- Pair's green
  - Scheele's green
  - Verdigr's green
  - Rinmann's green
102. Maximum number of covalent bonds formed by N and P respectively are
- 3, 5
  - 3, 6
  - 4, 5
  - 4, 6
103. Fusion of borane with NaOH produces
- $B_2O_3 + H_2$
  - $NaBO_2 + H_2$
  - $Na_2B_4O_7 + H_2$
  - $Na_3BO_3 + H_2$
104. The true statement for the acids of phosphorus.  $H_3PO_2$ ,  $H_3PO_3$  and  $H_3PO_4$  is
- Their acidic nature is:  $H_3PO_4 < H_3PO_3 < H_3PO_2$
  - All of them are reducing in nature
  - All of them are tribasic acids
  - The geometry of phosphorus is tetrahedral in all the three
105. Buckminster fullerene is
- Pure graphite
  - C-60
  - Diamond
  - C-90
106.  $Fe^{3+}$  oxidises  $NH_2OH$  to
- $NO_2$
  - $N_2O$
  - $N_2$
  - $NO$
107. An example of an "ortho" acid is
- $HAsO_2$
  - $H_3AsO_4$
  - $(HPO_3)_n$
  - $H_4As_2O_7$
108. What is the role of phosphate ion in a detergent?
- It reduces pH of the water
  - It increase pH of the water
  - It removes  $Ca^{2+}$  and  $Mg^{2+}$  ions from water that causes hardness
  - It increases its solubility in water
109. Select the correct statement about stability of cations
- $Ge^{4+} > Sn^{4+} > Pb^{4+}$
  - $Ge^{2+} < Sn^{2+} < Pb^{2+}$
  - $Pb^{2+} > Pb^{4+} > Sn^{4+} > Sn^{2+}$
  - All the above are correct statement
110.  $PI_3$  upon hydrolysis gives
- Monobasic acid and dibasic acid
  - Monobasic acid and tribasic acid
  - Monbasic acid and a salt
  - Dibasic acid and tribasic acid
111. A gaseous substance dissolves in water giving a pale blue solution which decolourises  $KMnO_4$  and oxidizes KI to  $I_2$ . Gaseous substance is
- $N_2O_5$
  - $NH_3$
  - $N_2O_3$
  - $HNO_3$
112. In  $BF_3$

- a) All the B – F bonds are single covalents in nature  
 b) Boron-fluorine bond has some double bond character and this bond is delocalized  
 c) Bond energy and bond length of B – F bond indicate its single bond character  
 d) All the bonds are ionic
113. Quartz is a crystalline variety of  
 a) Silicon carbide                      b) Sodium silicate                      c) Silica                      d) Silicon
114. Select the correct statements  
 a) Hydrides of B and Si are volatile and catch fire on exposure to air  
 b) Oxides of B and Si ( $B_2O_3$  and  $SiO_2$ ) are acidic in nature  
 c) Borates and silicates have tetrahedral  $BO_4$  and  $SiO_4$  structural units  
 d) All the above are correct statements
115. Calgon (sodium metaphosphate) finds application as  
 a) Artificial jewel                      b) Paint                      c) A resin                      d) Washing powder
116. Bonding present between the carbon atoms in graphite is  
 a) Metallic                      b) Ionic                      c) Covalent                      d) Van der Waals' forces
117. Dipole moment of CO is very small (0.1 D) (inspite of the larger difference in electronegativity) between C and O) and negative end of the dipole lies near the less electronegative C-atom. It is due to  
 a) Occupation of anti-bonding molecular orbitals  
 b) Occupation of empty *d*-orbitals  
 c) Occupation of lone-pairs  
 d) Occupation of the lone pairs as well as empty *d*-orbitals
118. The correct structural representation of diborane is  
 a)  $[BH_2]^+ + [BH_4]^-$                       b)                       c)                       d)  $H_2 \left[ \begin{array}{c} H \\ \diagup \\ B \\ \diagdown \\ H \end{array} \right] = B = \left[ \begin{array}{c} H \\ \diagdown \\ B \\ \diagup \\ H \end{array} \right]$
119. Select the correct statement(s)  
 a) Red oxide is called litharge                      b) Yellow oxide is called massicot  
 c) Both (a) and (b) are correct                      d) None of the above is correct
120. Consider the following reactions,  
 I:  $ZnO + C \rightarrow Zn + CO$   
 II:  $Cr_2O_3 + 2Al \rightarrow Al_2O_3 + 2Cr$   
 III:  $Al_2O_3 + 2Cr \rightarrow Cr_2O_3 + 2Al$   
 In this, possible reactions are  
 a) I, III                      b) II, III                      c) I, II                      d) I, II, III
121.  $B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na[B(OH)_4] + H_2O$   
 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  $Na_2HPO_4$
122. Which of the following dibasic acids shows geometrical isomerism?  
 a) Hyponitrous acid  $H_2N_2O_2$                       b) Maleic acid  $C_4H_4O_4$   
 c) Both (a) and (b)                      d) None of the above
123. In the reaction,  $B_2O_3 + C + Cl_2 \rightarrow A + CO$  A is  
 a)  $BCl_2$                       b)  $B_2Cl_2$                       c)  $CCl_2$                       d)  $BCl_3$
124. Molecule(s) possessing three-centre-two electron bonds and three-centre-four electron bonds would include  
 a)  $B_2H_6$  and  $SiF_4$                       b)  $XeF_6$  and  $BF_6$                       c)  $B_2H_6$  and  $XeF_6$                       d)  $B_2H_6$  alone
125.  $B_2Cl_4$   
 a) Can be formed by passing  $BCl_3$  over Hg at low pressure in an electric discharge  
 b) Can exist on non-eclipsed and planar structure  
 c) Decomposes at low temperature



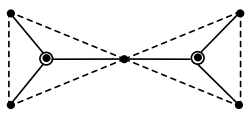
- d) Can show all the facts given above
126. 1 mole each of  $\text{H}_3\text{PO}_2$ ,  $\text{H}_3\text{PO}_3$  and  $\text{H}_3\text{PO}_4$  will neutralize  $x$  moles of  $\text{NaOH}$ ,  $y$  moles of  $\text{Ca}(\text{OH})_2$  and  $z$  mole of  $\text{Al}(\text{OH})_3$  (assuming all as strong electrolytes).  $x, y, z$  are in the ratio of  
 a) 3:1.5:1                      b) 1:2:3                      c) 3:2:1                      d) 1:1:1
127. Which silicon compound is used as lubricant?  
 a) Asbestos                      b) Silicones                      c) Zeolite                      d) Mica
128. On heating lead nitrate the product formed is  
 a)  $\text{NO}$                       b)  $\text{NO}_2$                       c)  $\text{N}_2\text{O}$                       d)  $\text{N}_2\text{O}_5$
129. In which cases geometry of the molecule is pyramidal?  
 a)  $\text{N}(\text{CH}_3)_3$                       b)  $\text{N}(\text{SiH}_3)_3$                       c) Both (a) and (b)                      d) None of these
130. On hydrolysis,  $\text{PCl}_3$  gives  
 a)  $\text{H}_3\text{PO}_3$                       b)  $\text{H}_3\text{PO}_4$                       c)  $\text{POCl}_3$                       d)  $\text{HPO}_3$
131. Stabilities of adducts formed with boron-halides is in order  
 a)  $\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3$                       b)  $\text{BBr}_3 < \text{BCl}_3 < \text{BF}_3$                       c)  $\text{BCl}_3 < \text{BBr}_3 < \text{BF}_3$                       d)  $\text{BF}_3 < \text{BBr}_3 < \text{BCl}_3$
132. On photochemical decomposition of  $\text{HNO}_3$  the products formed are  
 a)  $\text{NO}$  and  $\text{O}_2$                       b)  $\text{NO}_2$  and  $\text{O}_2$                       c)  $\text{N}_2\text{O}_4$  and  $\text{NO}_2$                       d)  $\text{N}_2\text{O}_5$  and  $\text{NO}_2$
133. The solubility of  $\text{Al}(\text{OH})_3$  in strong  $\text{NaOH}$  solution is best explained by the formation of  
 a)  $\text{AlO}_3^-$  ion                      b) Double salt  
 c) A peptised colloidal sol                      d) A complex hydroxyl aluminate ion
134. Which one of the following is not a green house gas?  
 a)  $\text{CO}_2$                       b)  $\text{H}_2\text{O}$                       c)  $\text{N}_2$                       d)  $\text{O}_3$
135. Boric acid is the trivial name for  
 a) Orthoboric acid                      b) Metaboric acid                      c) Pyroboric acid                      d) None of these
136. Boric acid is a weak acid. Thus, it behaves as  
 a) Proton donor as in  
 $\text{H}_3\text{BO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{H}_2\text{BO}_3^-$   
 b) An hydroxyl acceptor as in  
 $\text{B}(\text{OH})_3 + \text{H}_2\text{O} \rightleftharpoons [\text{B}(\text{OH})_4]^- + \text{H}^+$   
 c) Proton acceptor as in  
 $\text{H}_3\text{BO}_3 + \text{H}_2\text{O} \rightleftharpoons \text{H}_4\text{BO}_3^+ + \text{OH}^-$   
 d) An electron donor as in  
 $\text{H}_3\text{BO}_3 \rightleftharpoons \text{H}_3\text{BO}_3^+ + \text{e}^-$
137. The reaction of  $\text{P}_4$  with  $X$  leads selectively to  $\text{P}_4\text{O}_{10}$ . The  $X$  is  
 a) Dry  $\text{O}_2$                       b) A mixture of  $\text{O}_2$  and  $\text{N}_2$   
 c) Moist  $\text{O}_2$                       d)  $\text{O}_2$  in the presence of aqueous  $\text{NaOH}$
138. On passing  $\text{CO}_2$  into aqueous solution containing  $\text{Al}^{3+}$   
 a)  $\text{Al}_2(\text{CO}_3)_3$  is formed                      b)  $\text{Al}(\text{OH})_3$  is precipitated  
 c)  $[\text{Al}(\text{OH})_4]^-$  is formed                      d) Colloidal  $\text{Al}(\text{OH})_3$
139. Glass is best described as a  
 a) Solid                      b) Liquid                      c) Super cooled liquid                      d) Colloidal sol
140. Phosgene can be obtained when  
 a) White phosphorus react with alkali                      b) Calcium phosphide reacts with water  
 c) Chloroform reacts with air                      d) Bone comes in contact with water
141. Boron does not form  $\text{B}^{3+}$  cation easily. It is due to  
 a) Energy required to form  $\text{B}^{3+}$  ion is for more than that which would be compensated by lattice energies or hydration energies of such ion  
 b) Boron is non-metal  
 c) Boron is semiconductor  
 d) None of the above
142. Which of the following has the regular tetrahedral structure?

- a)  $\text{BF}_4^-$                       b)  $\text{SF}_4$                       c)  $\text{XeF}_4$                       d)  $[\text{Ni}(\text{CN})_4]^{2-}$
143. All of the following are bases except  
a)  $\text{N}_2\text{H}_4$                       b)  $\text{NH}_2\text{OH}$                       c)  $\text{NH}_3$                       d)  $\text{N}_3\text{H}$
144. In which case geometrical isomerism is not exhibited?  
a) Hyponitrous acid              b) 2-butene                      c) 1-butene                      d) 2-pentene
145.  $\text{Al}_2(\text{SO}_4)_3$  is used in the following but not  
a) As a coagulant and precipitant in treating drinking water and sewage  
b) In paper industry  
c) As a mordant in dyeing  
d) In plastic industry
146. Consider the following statements  
I. In diamond, each carbon atom is linked tetrahedrally to four other carbon atoms by  $sp^3$  bonds  
II. Graphite has planar hexagonal layers of carbon atoms held together by weak van der Waals' forces  
III. Silicon exists only in diamond structure due to its tendency to form  $p\pi-p\pi$  bonds to itself  
In this  
a) Only I and II are correct                      b) Only I is correct  
c) Only II and III are correct                      d) All the above are correct statements
147. Select the correct statement(s) about group 13 (IIIA) elements  
a) Stability of hydrides ( $\text{MH}_3$ ) decreases as we move down the group  
b)  $\text{MX}_3$  is a strong Lewis acid  
c)  $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$  exists in aqueous solution  
d) All the above are correct statements
148. Diamagnetic species can be  
a)  $\text{B}_2\text{Cl}_4$                       b)  $\text{GaCl}_2$                       c)  $\text{GaS}$                       d) All of these
149. Which one of the following acid possesses oxidizing reducing and complex forming properties?  
a)  $\text{HNO}_3$                       b)  $\text{HCl}$                       c)  $\text{H}_2\text{SO}_4$                       d)  $\text{HNO}_2$
150.  $\text{H}_3\text{BO}_3$  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
151. Repeated use of which one of the following fertilizers would increase the acidity of the soil?  
a) Urea                      b) Superphosphate of lime  
c) Ammonium sulphate                      d) Potassium nitrate
152. Non-oxide ceramics can be  
a)  $\text{B}_4\text{C}$                       b)  $\text{SiC}$                       c)  $\text{Si}_3\text{N}_4$                       d) All of these
153. Carbogen is  
a) Mixture of  $\text{CO} + \text{CO}_2$                       b) Mixture of  $\text{O}_2 + \text{CO}_2$   
c) Pure form of carbon                      d) Unsaturated organic compound
154. Lead pencil contains  
a) Lead                      b) Graphite  
c) Alloy of lead and tin                      d) Alloy of lead and graphite
155.  $p\pi-p\pi$  multiple bonding is present in  
a) Oxides of nitrogen                      b) Oxides of phosphorus  
c) Halides of nitrogen                      d) Halides of phosphorus
156. When orthoboric acid is heated to red heat the residue is  
a) Boron                      b) Boric oxide                      c) Metaboric acid                      d) Pyroboric acid
157. Stability of pentahalides is in order  
a)  $\text{P} > \text{Sb} > \text{As} > \text{Bi}$  for given X                      b)  $\text{F} > \text{Cl} > \text{Br}$  for given element  
c) Both (a) and (b)                      d) None of the above
158.  $\text{NaOCl}$  reacts with  $\text{NH}_3$  to produce  
a)  $\text{NH}_2\text{OH}$                       b)  $\text{NH}_2\text{NH}_2$                       c)  $\text{N}_2$                       d)  $\text{NO}$

159.  $d\pi-p\pi$  bonding is shown in  
 a)  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{N}^{3-}$ ,  $\text{CN}^-$     b)  $\text{P}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{PO}_4^{3-}$     c)  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{BiH}_3$     d)  $\text{CO}$ ,  $\text{NO}$ ,  $\text{CO}_2$ ,  $\text{NO}_2$
160. Glacial phosphoric acid is  
 a)  $\text{HPO}_3$     b)  $\text{H}_3\text{PO}_3$     c)  $\text{H}_3\text{PO}_4$     d)  $\text{H}_4\text{P}_2\text{O}_7$
161. Paramagnetic species are  
 a)  $\text{NO}$ ,  $\text{NO}_2$ ,  $\text{O}_2$     b)  $\text{N}_2\text{O}_2$ ,  $\text{N}_2\text{O}_4$ ,  $\text{O}_3$     c)  $\text{NO}^+$ ,  $\text{NO}_2^+$ ,  $\text{O}_2^+$     d)  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$
162. Anodizing can be done by electrolyzing dilute  $\text{H}_2\text{SO}_4$  with Al as anode. This results in  
 a) The formation of protective oxide layer ( $\text{Al}_2\text{O}_3$ )  
 b) The formation of  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{SO}_2$  gas  
 c) The formation of  $\text{AlH}_3$  and  $\text{SO}_2$  gas  
 d) The formation of  $\text{Al}(\text{HSO}_3)_3$  and  $\text{H}_2$  gas
163.  $\text{MH}_3 + \text{H}^+ \rightarrow \text{MH}_4^+$   
 $\Delta G^\circ$  is most negative when  $M$  is  
 a) N    b) P    c) As    d) Sb
164. The solid  $\text{PCl}_5$  exists as  
 a)  $\text{PCl}_3$     b)  $\text{PCl}_4^+$     c)  $\text{PCl}_6^-$     d)  $\text{PCl}_4^+$  and  $\text{PCl}_6^-$
165. Marsh gas primarily contains  
 a)  $\text{CH}_4$     b)  $\text{C}_2\text{H}_6$     c)  $\text{H}_2\text{S}$     d)  $\text{C}_2\text{H}_2$
166. Lead is soluble in  
 a)  $\text{CH}_3\text{COOH}$     b)  $\text{H}_2\text{SO}_4$     c)  $\text{HCl}$     d)  $\text{HNO}_3$
167.  $\text{MnO}_4^-/\text{H}^+$  oxidises  $\text{NO}_2^-$  to  
 a)  $\text{N}_2$     b)  $\text{NH}_3$     c)  $\text{NO}_3^-$     d)  $\text{N}_2\text{O}$
168. Following metals are soluble in aqua-regia  
 a) Pt    b) Au    c) Ag    d) All of these
169. General formula of aluminium alums is ( $M^I$  is monovalent cation)  
 a)  $[\text{M}^I(\text{H}_2\text{O})_6][\text{Al}(\text{H}_2\text{O})_6](\text{SO}_4)_2$     b)  $[\text{M}^I(\text{H}_2\text{O})_4][\text{Al}(\text{H}_2\text{O})_6](\text{SO}_4)_2$   
 c)  $[\text{M}^I(\text{H}_2\text{O})_4][\text{Al}(\text{H}_2\text{O})_4](\text{SO}_4)_4$     d)  $[\text{M}^I(\text{H}_2\text{O})_6][\text{Al}(\text{H}_2\text{O})_6](\text{SO}_4)_4$
170. Select the incorrect statements  
 a)  $\text{B}_2\text{H}_6$  has all B – H bond equal  
 b)  $\text{AlH}_3$  is colourless solid and is polymeric containing Al – H – Al bridges  
 c)  $\text{LiAlH}_4$  is ionic compound  
 d)  $\text{AlX}_3$  ( $X = \text{Cl}, \text{Br}, \text{I}$ ) have low melting point, are covalent and have the halogen-bridged dimeric structure
171. Bond angle of  $109^\circ 28'$  is found in  
 a)  $\text{NH}_3$     b)  $\text{H}_2\text{O}$     c)  $\text{CH}_5^+$     d)  $\text{NH}_4^+$
172. The dipole moments of the given molecules are such that  
 a)  $\text{BF}_3 > \text{NF}_3 > \text{NH}_3$     b)  $\text{NF}_3 > \text{BF}_3 > \text{NH}_3$     c)  $\text{NH}_3 > \text{NF}_3 > \text{BF}_3$     d)  $\text{NH}_3 > \text{BF}_3 > \text{NF}_3$
173. The relative stability of the different oxidation state  
 $\text{Tl}^+ > \text{Tl}^{3+} > \text{Ga}^{3+} > \text{Ga}^+$   
 $\text{Tl}^+ > \text{In}^+ > \text{Ga}^+$   
 Is an example of  
 a) Redox potential    b) disproportionation    c) Inert pair effect    d) Electron-affinity
174. Method used for obtaining highly pure silicon, used as a semiconductor material, is  
 a) Oxidation    b) Electrochemical    c) Crystallisation    d) Zone refining
175. Nitrogen is obtained by the thermal decomposition of  
 a)  $\text{NH}_4\text{NO}_2$     b)  $\text{NH}_4\text{NO}_3$     c)  $\text{AgNO}_3$     d)  $\text{Pb}(\text{NO}_3)_2$
176.  $\text{B}(\text{OH})_3 + \text{NaOH} \rightleftharpoons \text{NaBO}_2 + \text{Na}[\text{B}(\text{OH})_4] + \text{H}_2\text{O}$   
 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  $\text{Na}_2\text{HPO}_4$

177. Consider the following statements for diborane
1. Boron is approximately  $sp^3$  hybridized
  2. B – H – B angle is  $180^\circ$
  3. There are two terminal B – H bonds for each boron atom
  4. There are only 12 bonding electron available
- Of these statements*
- a) 1, 2 and 4 are correct    b) 1, 2 and 3 are correct    c) 2, 3 and 4 are correct    d) 1, 3 and 4 are correct
178. Which of the following is the ionic carbide?
- a)  $Fe_3C$                                   b)  $SiC$                                   c)  $CaC_2$                                   d)  $Cu_2C$
179. Polyphosphates are used as water softening agents because they
- a) Form soluble complexes with anionic species
  - b) Precipitate anionic species
  - c) Form soluble complexes with cationic species
  - d) Precipitate cationic species
180. Compound A undergoes hydrolysis to produce a colourless gas with rotten fish smell. The gas gives a vortex ring. The gas is
- a)  $PH_3$                                   b)  $P_2O_3$                                   c)  $P_2O_5$                                   d)  $P_2S_5$
181. Nitrogen differs from P, As, Sb and Bi in the following properties
- a) It forms diatomic molecule
  - b) It is not able to extent its coordination number beyond four
  - c) Nitrogen does not function as a Lewis acid whereas P, As, Sb and Bi do so
  - d) In all the properties given above
182. 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
183.  $N_2O$  (laughing gas) finds use in the following except
- a) As a propellant for whipped ice-cream
  - b) As an anaesthetic
  - c) For the preparation of  $N_3H$
  - d) As fuel for rockets
184. Which one of the following statements about the zeolite 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 aluminosilicats 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
185. Which is/are true statements?
- a) Diamond is unaffected by conc acids but graphite reacts with hot conc.  $HNO_3$  forming mellitic acid,  $C_6(COOH)_6$
  - b) CO is toxic because it forms a complex with haemoglobin in the blood
  - c)  $C_3O_2$ , carbon suboxide, is a foul-smelling gas
  - d) All the above are true statements
186. Which of the following statements are true?
- a) Cold and very dilute  $HNO_3$  forms  $NH_4NO_3$  with Zn or Sn
  - b) Concentrated  $HNO_3$  forms  $H_2SnO_3$  with Sn
  - c) Cold and more concentrated  $HNO_3$  forms  $NO_2$  with Cu
  - d) All the above are correct
187. In plants, atmospheric nitrogen is converted into
- a) Carbohydrate
  - b) Proteins
  - c) Amino acids
  - d) Fats
188. Silicon reacts with hot solution of NaOH forming
- a)  $Si(OH)_4$
  - b)  $Si(OH)_2$
  - c)  $SiO_2$
  - d)  $Na_4SiO_4$
189. Metallic tin and conc.  $HNO_3$  reacts to form
- a) Metastannic acid
  - b) Stannic nitrate
  - c) Stannous nitrite
  - d) Stannous nitrate

190. Sulphide mineral +  $\text{CN}^- \xrightarrow{\text{O}_2} [\text{M}(\text{CN})_2]^-$   
 $2[\text{M}(\text{CN})_2]^- + \text{Zn} \rightarrow [\text{Zn}(\text{CN})_4]^{2-} + 2\text{M}$   
 M can be  
 a) Mg, Ag, Au                      b) Ag, Au                      c) Pt, Au                      d) Pt, Ag
191. The solution of sodium meta aluminate on boiling with ammonium chloride gives a white precipitate of  
 a)  $\text{Al}_2\text{O}_3$                                       b)  $\text{AlCl}_3$   
 c)  $\text{Al}(\text{OH})_3$                                       d)  $(\text{NH}_4)_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3$
192.  $\text{PbCl}_2$  is soluble in  
 a) Dil. HCl                                      b)  $\text{CH}_3\text{COOH}$                                       c) Hot water                                      d) Dil.  $\text{H}_2\text{SO}_4$
193. At room temperature the solid compound is  
 a)  $\text{CO}_2$                                       b)  $\text{SiO}_2$                                       c)  $\text{NO}_2$                                       d)  $\text{SO}_2$
194. Carborundum is  
 a)  $\text{CaC}_2$                                       b)  $\text{Fe}_3\text{C}$                                       c)  $\text{CaCO}_3$                                       d) SiC
195. Which are acid salts?  
 a)  $\text{NaH}_2\text{PO}_2, \text{Na}_2\text{HPO}_3$                       b)  $\text{Na}_2\text{HPO}_3, \text{Na}_2\text{HPO}_4$                       c)  $\text{NaHCO}_3, \text{Na}_2\text{HPO}_4$                       d) All of these
196. The dipole moments of the given molecules are such that  
 a)  $\text{BF}_3 > \text{NF}_3 > \text{NH}_3$                       b)  $\text{NF}_3 > \text{BF}_3 > \text{NH}_3$                       c)  $\text{NH}_3 > \text{NF}_3 > \text{BF}_3$                       d)  $\text{NH}_3 > \text{BF}_3 > \text{NF}_3$
197. Thermal stability of boron compounds is in order  
 a)  $\text{B}_2\text{F}_4 < \text{B}_2\text{Cl}_4 < \text{B}_2(\text{OR})_4 < \text{B}_2(\text{NR}_2)_4$   
 b)  $\text{B}_2\text{Cl}_4 < \text{B}_2\text{F}_4 < \text{Br}(\text{OR})_4 < \text{B}_2(\text{NR}_2)_4$   
 c)  $\text{B}_2(\text{NR}_2)_4 < \text{B}_2(\text{OR})_4 < \text{B}_2\text{Cl}_4 < \text{B}_2\text{F}_4$   
 d)  $\text{B}_2(\text{NR}_2)_4 < \text{B}_2(\text{OR})_4 < \text{B}_2\text{F}_4 < \text{B}_2\text{Cl}_4$
198.  $\text{CO}_2$  in water behaves as  
 a) Weak dibasic acid  $\text{H}_2\text{CO}_3$                                       b) Weak monobasic acid  $\text{HO} - \text{CO}_2\text{H}$   
 c) Weak diacid base  $\text{CO}(\text{OH})_2$                                       d) Weak monoacid base  $\text{HO} - \text{CO}_2\text{H}$
199. Among these ores the highest phosphorus content is in  
 a) Chlorapatite                                      b) Phosphorite                                      c) Fluorspar                                      d) Equal
200.  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O} \xrightarrow{\Delta} \text{NaBO}_2 + (\text{A}) + \text{H}_2\text{O}$   
 $(\text{A}) + \text{MnO} \xrightarrow{\Delta} (\text{B})$   
 (A) and (B) are  
 a)  $\text{Na}_3\text{BO}_3, \text{Mn}_3(\text{BO}_3)_2$                                       b)  $\text{Na}_2(\text{BO}_2)_2, \text{Mn}(\text{BO}_2)_2$   
 c)  $\text{B}_2\text{O}_3, \text{Mn}(\text{BO}_2)_2$                                       d) None of the above is correct
201. Nitric oxide is formed by the reaction of  
 a)  $\text{C} + \text{N}_2\text{O}$                                       b)  $\text{Cu} + \text{HNO}_3$                                       c)  $\text{Cu} + \text{N}_2\text{O}$                                       d)  $\text{Cu} + \text{NO}_2$
202. Extra pure  $\text{N}_2$  can be obtained by heating  
 a)  $\text{NH}_3$  and  $\text{CuO}$                                       b)  $\text{NH}_4\text{NO}_3$                                       c)  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$                                       d)  $\text{Ba}(\text{N}_3)_2$
203. White arsenic has the chemical composition  
 a)  $\text{As}_2$                                       b)  $\text{As}_4$                                       c)  $\text{As}_2\text{O}_5$                                       d)  $\text{As}_2\text{O}_3$
204.  $\text{PCl}_5 + \text{CH}_3\text{CH}_2\text{OH} \rightarrow$   
 $\bar{X} \quad \bar{Y} \quad \bar{Z}$   
 In the above reaction Cl replaces one of the H-atoms in  $\text{CH}_3\text{CH}_2\text{OH}$ . This H is of  
 a) C (in X)                                      b) C (in Y)                                      c) O (in Z)                                      d) Any of X, Y and Z
205. The percentage of p-character in the orbitals forming P – P bonds on  $\text{P}_4$  is  
 a) 25                                      b) 33                                      c) 50                                      d) 75
206.  $4\text{HNO}_3 + \text{P}_4\text{O}_{10} \rightarrow 4\text{HPO}_3 + \text{X}$   
 In the above reaction the product X is  
 a)  $\text{NO}_2$                                       b)  $\text{N}_2\text{O}_3$                                       c)  $\text{N}_2\text{O}_4$                                       d)  $\text{N}_2\text{O}_5$
207. Most abundant uncombined element present in atmosphere is  
 a) Ca                                      b) Mg                                      c) Al                                      d) N

208. When  $\text{PCl}_5$  reacts with sulphuric acid sulphuryl chloride is formed as the final product. This shows that sulphuric acid
- Has two hydroxyl groups in its structure
  - Is a derivative of sulphur dioxide
  - Is a dibasic acid
  - Has greater affinity for water
209. Aqueous solution of  $\text{SnO}$  liberates  $\text{CO}_2$  with  $\text{NaHCO}_3$ . This shows that  $\text{SnO}$  is
- An acidic oxide
  - A basic oxide
  - An amphoteric oxide
  - A Lewis acid
210. Which of the following cuts ultraviolet rays?
- Soda glass
  - Crooke's glass
  - Pyrex
  - None of these
211. Pure  $\text{N}_2$  is prepared in the laboratory by heating a mixture of
- $\text{NH}_4\text{Cl}$  and  $\text{NaOH}$
  - $\text{NH}_4\text{OH}$  and  $\text{NaCl}$
  - $\text{NH}_4\text{Cl}$  and  $\text{NaNO}_2$
  - $\text{NH}_4\text{Cl}$  and  $\text{NaNO}_3$
212. Graphite is a good conductor of heat and electricity because it contains
- Layers of carbon atoms
  - Sheet like structure
  - Free electrons
  - $p\pi$ - $p\pi$  bonding
213. When boron is fused with  $\text{NaOH}$ , products formed are
- $\text{Na}_2\text{B}_4\text{O}_7$  and  $\text{H}_2$
  - $\text{NaBO}_2$  and  $\text{H}_2$
  - $\text{Na}_3\text{BO}_3$  and  $\text{H}_2$
  - $\text{B}_2\text{O}_3$  and  $\text{H}_2$
214. The silicate anion in the mineral kinoite is a chain of three  $\text{SiO}_4$  tetrahedra that share corners with adjacent tetrahedral. The mineral also contains  $\text{Ca}^{2+}$  ions,  $\text{Cu}^{2+}$  ions, and water molecules in a 1:1:1 ratio. The mineral is
- $\text{Ca}_2\text{Cu}_2\text{Si}_3\text{O}_{10} \cdot 2\text{H}_2\text{O}$
  - $\text{CaCuSi}_3\text{O}_{10} \cdot \text{H}_2\text{O}$
  - $\text{Ca}_2\text{Cu}_2\text{Si}_3\text{O}_8 \cdot 2\text{H}_2\text{O}$
  - $\text{Ca}_2\text{Cu}_2\text{Si}_3\text{O}_6 \cdot 2\text{H}_2\text{O}$
215. Compound used on thermal insulator is
- Silica gel
  - Zeolites
  - Silicones
  - Asbestos
216. Arsenic drugs are mainly used for the treatment of
- Cholera
  - Typhoid
  - Jaundice
  - Syphilis
217. Which is used as a rocket fuel?
- $\text{N}_2\text{H}_4$
  - Polybutadiene
  - Both (a) and (b)
  - None of these
218. Formula of the following silicate anion is
- 
- $\text{SiO}_4^{4-}$
  - $\text{Si}_2\text{O}_7^{6-}$
  - $\text{Si}_2\text{O}_8^{6-}$
  - $\text{Si}_3\text{O}_9^{6-}$
219. Which of the following phosphorus is the most reactive?
- Red phosphorus
  - White phosphorus
  - Scarlet phosphorus
  - Violet phosphorus
220. The borax bead test can be used to detect the presence of
- $\text{Al}^{3+}$
  - $\text{Mg}^{2+}$
  - $\text{Fe}^{3+}$
  - $\text{Na}^+$
221. With  $\text{FeCl}_3$ , a neutral solution of orthophosphate gives a yellow precipitate insoluble in
- $\text{CH}_3\text{COOH}$
  - $\text{HCl}$
  - $\text{H}_2\text{SO}_4$
  - $\text{NaOH}$
222.  $\text{BF}_3$  on hydrolysis forms
- $\text{H}_3\text{BO}_3$
  - $\text{HBF}_4$
  - Both (a) and (b)
  - None of these
223. Which of the following statements about  $\text{H}_3\text{BO}_3$  is not correct?
- It is strong tribasic acid
  - It is prepared by acidifying an aqueous solution of borax
  - It has a layer structure in which planar  $\text{BO}_3$  units are joined by hydrogen bonds
  - It does not act as a Lewis acid by accepting hydroxyl ion
224. Which of the following oxides of nitrogen is solid?
- $\text{NO}_2$
  - $\text{N}_2\text{O}$
  - $\text{N}_2\text{O}_3$
  - $\text{N}_2\text{O}_5$
225. When zeolite is treated with hard water, there is exchange reaction between calcium/magnesium ion/and....
- Aluminium ion
  - Sodium ion
  - Water of hydration
  - Sulphate ion
226. Which of the following shows electrical conduction?
- Potassium ion
  - Graphite
  - Diamond
  - Sodium ion
227. Laughing gas is prepared by heating

- a)  $\text{NH}_4\text{Cl} + \text{NaNO}_3$       b)  $\text{NH}_4\text{Cl}$       c)  $(\text{NH}_4)_2\text{SO}_2$       d)  $\text{NH}_4\text{NO}_2$
228. By passing air over red hot coke the gas obtained is  
a) Coal gas      b) Water gas      c) Oil gas      d) Producer gas
229. Which is least basic?  
a)  $\text{NF}_3$       b)  $\text{NCl}_3$       c)  $\text{NBr}_3$       d)  $\text{NI}_3$
230. The decrease stability of higher oxidation state in *p*-block with increasing atomic number is due to  
a) Decrease in bond energy as going down the group  
b) Energy required to unpair  $ns^2$  electrons is not compensated by the energy released in forming the two additional bonds  
c) Both of the above  
d) None of the above
231. Substances burn more readily in  $\text{N}_2\text{O}$  than in air because  $\text{N}_2\text{O}$   
a) Is reactive at high temperature  
b) Dissociates to give  $\text{O}_2$  that supports combustion  
c) The activation energy is increased on increasing temperature  
d) Acts as a catalyst
232.  $\text{HNO}_3$  in pure state is colourless but it is often of yellow colour. It is due to  
a) Unstable structure of  $\text{HNO}_3$  which immediately changes to  $\text{NO}_2^-$   
b) Photochemical decomposition in presence of sunlight  
c) Interaction of atmospheric gases with  $\text{HNO}_3$   
d) Conversion of  $\text{HNO}_3$  into  $\text{NO}_2^+$
233. Both  $\text{NF}_3$  and  $\text{NCl}_3$  are covalent but they differ in the extent of hydrolysis because  
a)  $\text{NF}_3$  is more stable than  $\text{NCl}_3$  and hydrolysis product of  $\text{NF}_3$ ,  $\text{HOF}$ , does not exist  
b) Dipole moment of  $\text{NF}_3$  is greater than that of  $\text{NCl}_3$   
c) Electronegativity of F is greater than that of Cl  
d) Cl can expand its octet by using *d*-orbitals
234. A certain compound on burning in air forms three oxides. One of the oxides turned lime water milky, the other turned anhydrous  $\text{CuSO}_4$  blue and third formed a solution of  $\text{pH} = 9$ . Compound is formed of  
a) S, N and H      b) S, N and C      c) S, C and H      d) S, H and Na
235. Which is silane?  
a)  $\text{SiO}_2$       b)  $\text{SiO}_3$       c)  $\text{SiH}_4$       d) Si
236. Which one of the following bonds has the highest bond energy?  
a) C – C      b) Si – Si      c) Ge – Ge      d) Sn – Sn
237. The electronegativities of N, C, Si and P are such that  
a)  $P < Si < C < N$       b)  $Si < P < N < C$       c)  $Si < P < C < N$       d)  $P < Si < N < C$
238. A colourless salt gives a white ppt (soluble in ammonium acetate) and a brown coloured pungent gas on reaction with conc.  $\text{H}_2\text{SO}_4$ . Salt is  
a)  $\text{Ba}(\text{NO}_3)_2$       b)  $\text{Pb}(\text{NO}_3)_2$       c)  $\text{NaNO}_3$       d)  $\text{NH}_4\text{NO}_3$
239. Which of the following species have undistorted octahedral structures?  
1.  $\text{SF}_6$   
2.  $\text{PF}_6^-$   
3.  $\text{SiF}_6^{2-}$   
4.  $\text{SeF}_6$   
*Select the correct answer using the code below*  
a) 2, 3 and 4      b) 1, 3 and 4      c) 1, 2 and 3      d) 1, 2 and 4
240. Which of the following compounds has the greatest ionic character?  
a)  $\text{PCl}_5$       b)  $\text{SiCl}_4$       c)  $\text{CCl}_4$       d)  $\text{BCl}_3$
241. Water glass is  
a) Glass made up of water      b) Sodium silicate  
c) Water glass      d) Crystal carbonate

242. With excess of  $\text{Cl}_2$  ammonia forms  
 a) Ammonium chloride    b) Nitrogen trichloride    c) Nitrosyl chloride    d) Nitrogen
243. Compound used in safety matches is  
 a)  $\text{P}_4\text{S}_3$     b)  $\text{P}_4$     c)  $\text{P}_2\text{O}_5$     d)  $\text{PCl}_3$
244. Which of the following statement regarding *ortho* boric acid ( $\text{H}_3\text{BO}_3$ ) is false?  
 a) It acts as a monobasic acid    b) It is soluble in hot water  
 c) It has a planar structure    d) It acts as a tribasic acid
245. Borax  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$  is actually  
 a)  $\text{Na}_2[\text{B}_4\text{O}_5(\text{OH})_4] \cdot 8\text{H}_2\text{O}$     b)  $\text{Na}_2[\text{B}_4\text{O}_4(\text{OH})_6] \cdot 7\text{H}_2\text{O}$   
 c)  $\text{Na}_2[\text{B}_4\text{O}_3(\text{OH})_8] \cdot 6\text{H}_2\text{O}$     d)  $\text{Na}_2[\text{B}_4\text{O}_2(\text{OH})_{10}] \cdot 5\text{H}_2\text{O}$
246. Pentavalent phosphorus is more stable compared to that of nitrogen even through they belong to same group; it is due to  
 a) More reactivity of phosphorus    b) Inert nature of nitrogen  
 c) Presence of *d*-orbital    d) Large size of phosphorus atom
247.  $\text{NO}_2$  is not obtained when following is heated  
 a)  $\text{Pb}(\text{NO}_3)_2$     b)  $\text{AgNO}_3$     c)  $\text{LiNO}_3$     d)  $\text{KNO}_3$
248. Amphoteric oxides are  
 a)  $\text{SnO}, \text{SnO}_2$     b)  $\text{GeO}, \text{GeO}_2$     c) Both (a) and (b)    d) None of these
249. Orthoboric acid  $\text{H}_3\text{BO}_3$  behaves as weak monobasic acid giving  $\text{H}_3\text{O}^+$  and  
 a)  $\text{H}_2\text{BO}_2^+$     b)  $\text{H}_2\text{BO}_2^-$     c)  $[\text{B}(\text{OH})_4]^-$     d)  $[\text{B}(\text{OH})_4]^+$
250. Soda free glass fibre are made of  
 a)  $\text{H}_3\text{BO}_3, \text{B}_2\text{O}_3$  and  $\text{Ca}_3(\text{BO}_3)_2$     b)  $\text{H}_3\text{BO}_3, \text{B}_2\text{O}_3$   
 c)  $\text{H}_3\text{BO}_3$     d)  $\text{B}_2\text{O}_3$
251. Select the correct statement(s) about  $\text{H}_3\text{BO}_3$   
 a) It has triangular  $\text{BO}_3^{3-}$  units  
 b) In solid states, molecules are hydrogen bonded  
 c) Both (a) and (b) are correct  
 d) None of the above statements is correct
252. Which gas is used in aerated water?  
 a)  $\text{CO}_2$     b)  $\text{SO}_2$     c)  $\text{CO}$     d) Water vapours
253. Red and white phosphorus will differ but not in  
 a) Smell    b) Solubility in  $\text{CHCl}_3$   
 c) Exhibiting phosphorescence    d) Reactions with  $\text{HNO}_3$
254. Which of the following have the highest melting points?  
 a) *p*-block elements    b) *s*-block elements  
 c) *d*-block elements    d) All have equal melting points
255. Green house effect is due to  
 a) Disturbance of the earth's delicate thermal balance  
 b) Absorption of heat radiation by atmospheric gases particularly water vapours  
 c) Both (a) and (b)  
 d) None of the above
256. In  $\text{B}_2\text{H}_6$   
 a) There is direct boron-boron bond  
 b) The B – H bonds are ionic  
 c) It is isostructural to  $\text{C}_2\text{H}_6$   
 d) Boron atoms are linked through hydrogen bridges
257. Borax is converted into B by steps  

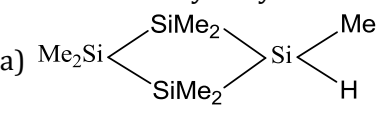
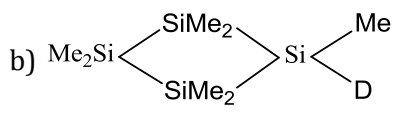
$$\text{Borax} \xrightarrow{\text{I}} \text{H}_3\text{BO}_3 \xrightarrow{\Delta} \text{B}_2\text{O}_3 \xrightarrow{\text{II}} \text{B}$$
 I and II reagents are  
 a) Acid, Al    b) Acid, C    c) Acid, Fe    d) Acid, Mg



258. Ambidentate ligands are  
 a)  $\text{NO}_2^-$                       b)  $\text{CN}^-$                       c)  $\text{CNS}^-$                       d) All of these
259. In  $\text{P}_4$  (tetrahedral)  
 a) Each P is joined to four P                      b) Each P is joined to three P  
 c) Each P is joined to two P                      d)  $\text{P}_4$  does not exist
260. Carbon and silicon belong to group 14. What is the nature of carbide of silicon?  
 a) Covalent                      b) Ionic                      c) Interstitial                      d) None of these
261.  $\text{AlO}_2^-$  is known as  
 a) Aluminium dioxo ion    b) Meta aluminate ion    c) Dioxo aluminium ion    d) Aluminium oxide ion
262. Major minerals containing nitrogen are  
 a) DNA                      b) RNA                      c)  $\text{KNO}_3, \text{NaNO}_3$                       d) All of these
263. Which of the following is/are paramagnetic?  
 $\text{NO}_2, \text{NO}, \text{N}_2\text{O}_4, \text{N}_2\text{O}_2, \text{N}_2\text{O}_5$   
 a) Only  $\text{NO}_2$                       b)  $\text{NO}_2, \text{NO}$                       c)  $\text{NO}, \text{NO}_2, \text{N}_2\text{O}_5$                       d) All are paramagnetic
264. Which of the following compounds is/are possible?  
 a)  $\text{B}_2\text{Cl}_4, \text{BCl}_2, \text{Cl}_2\text{B}$                       b)  $\text{GaCl}_2, \text{GaS}$                       c)  $\text{Ga}[\text{GaCl}_4] \cdot \text{Ga}_2\text{S}_2$                       d) All of these
265. Which involves breaking of covalent bonds?  
 a) Boiling of  $\text{H}_2\text{S}$                       b) Melting of  $\text{SiO}_3$                       c) Melting of KCN                      d) Boiling of  $\text{CCl}_4$
266. Which of the following is most acidic?  
 a)  $\text{N}_2\text{O}_5$                       b)  $\text{P}_2\text{O}_5$                       c)  $\text{As}_2\text{O}_5$                       d)  $\text{Sb}_2\text{O}_5$
267. Select the correct statement(s)  
 a) Si, uses all of its valence electrons in an  $sp^3$ -hybridisation and crystallizes in an fcc structure similar to diamond  
 b) Diamond is an electrical insulator, graphite is an electrical conductor but silicon is a semiconductor  
 c) Most common silica is quartz  
 d) All of the above are correct statements
268. In graphite, additional electrons are  
 a) Localized on each C-atom  
 b) Localized on every third C-atom  
 c) Present in anti-bonding orbital  
 d) Delocalized forming extended  $\pi$ -bonding system
269. Water softener is  
 a) Borax                      b) Zeolite                      c) Both (a) and (b)                      d) None of these
270. Name of the structure of silicates in which three oxygen atoms of  $[\text{SiO}_4]^{4-}$  are shared is  
 a) Pyrosilicate                      b) Sheet silicate  
 c) Linear chain silicate                      d) Three dimensional silicate
271.  $\text{Al}^{3+}$  of  $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$  (alum) can be replaced by  
 a)  $\text{Cr}^{3+}$                       b)  $\text{Co}^{3+}$                       c)  $\text{Fe}^{3+}$                       d) All of these
272. The substance used as a fast drying agent in the laboratory is  
 a)  $\text{Na}_2\text{PO}_4$                       b)  $\text{P}_2\text{O}_5$   
 c) Charcoal                      d) Anhydrous calcium chloride
273. Standard reduction electrode potential of lead suggests that it is reactive metal but it appears more noble (unreactive). It is due to  
 a) Surface coating of oxide                      b) High over potential of reduction of  $\text{H}^+$  to  $\text{H}_2$   
 c) Both (a) and (b)                      d) None of the above
274. An alloy of boron and aluminium is allowed to react with  $\text{NH}_3$ . Products formed are  
 a) BN, AlN and  $\text{H}_2$                       b)  $\text{B}(\text{NH}_2)_3, \text{Al}(\text{NH}_2)_3$  and  $\text{H}_2$   
 c) BN,  $\text{Al}(\text{NH}_2)_3$  and  $\text{H}_2$                       d)  $\text{B}(\text{NH}_2)_3, \text{AlN}$  and  $\text{H}_2$
275. Which of the following has the highest calorific value?  
 a) Water gas                      b) Producer gas                      c) Carbonium oxide                      d) Coal gas

276. When chlorine is passed through molten tin, the product obtained is  
 a)  $\text{SnCl}_4$                       b)  $[\text{SnCl}_6]^{2-}$                       c)  $[\text{SnCl}_4]^{2-}$                       d)  $\text{SnCl}_2$
277. When vapours of  $\text{SiCl}_4$  are passed over hot Mg, then the product formed is  
 a)  $\text{SiCl}_2 + \text{MgCl}_2$                       b)  $\text{MgSi} + \text{Cl}_2$                       c)  $\text{MgSiCl}_6$                       d)  $\text{Si} + \text{MgCl}_2$
278. Borax is used as a buffer since  
 a) Its aqueous solution contains equal amount of weak acid and its salt  
 b) It is easily available  
 c) Its aqueous solution contains equal amount of strong acid and its salt  
 d) Statement that borax is a buffer, is wrong
279. Aqueous solution of the following are matched according to their properties shown. Select the correct matching  
 a)  $\text{Cl}_2\text{O}_7$  – acidic                      b)  $\text{Al}_2\text{Cl}_6$  – white fumes  
 c)  $\text{Al}_2\text{O}_3$  – amphoteric                      d) All of the above are correct matching
280. The wrong statement about  $\text{N}_2\text{O}$  is  
 a) It is nitrous oxide                      b) It is least reactive oxide of nitrogen  
 c) It is not a linear molecule                      d) It is known as laughing gas
281. The dipole moment of  $\text{NF}_3$  is less than that of  $\text{NH}_3$  because  
 a) F is more reactive than H  
 b)  $\text{NH}_3$  forms associated molecules  
 c) The resultant of the individual bond polarities is less  
 d) The resultant of the individual bond polarities is opposed by the polarity of lone pair
282. Consider the following boron halides  
 1.  $\text{BF}_3$       2.  $\text{BCl}_3$       3.  $\text{BBr}_3$       4.  $\text{BI}_3$   
 The Lewis acid characters of these halides are such that  
 a)  $1 < 2 < 3 < 4$                       b)  $1 < 3 < 2 < 4$                       c)  $4 < 3 < 2 < 1$                       d)  $4 < 2 < 3 < 1$
283. Concentrations of the atmospheric  $\text{CO}_2$  have been rising because of  
 a) Use of fossil fuels                      b) Acid rain                      c) Photochemical smog                      d) Ozone depletion
284. Carbon and silicon belong to (IV) group. The maximum coordination of carbon is commonly occurring compounds is 4, whereas that of silicon is 6. This is due to  
 a) Large size of silicon                      b) More electropositive nature of silicon  
 c) Availability of *d*-orbital in silicon                      d) Both (a) and (b)
285.  $\text{N}_2\text{O}$  is formed when  
 a) Moist Fe reacts with NO                      b)  $\text{Sn}^{2+}$  reacts with conc.  $\text{HNO}_3$  in presence of HCl  
 c) Cold dil.  $\text{HNO}_3$  reacts with Cu and Zn                      d) By all the reactions
286. Hot conc.  $\text{HNO}_3$  converts graphite into  
 a) Graphite oxide                      b) Benzene hexacarboxylic acid  
 c) Both (a) and (b)                      d) None of the above
287. One of the acid listed below is formed only from  $\text{P}_2\text{O}_3$ ; the rest are formed from  $\text{P}_2\text{O}_5$ . Acid formed from  $\text{P}_2\text{O}_3$  is  
 a)  $\text{HPO}_3$                       b)  $\text{H}_2\text{P}_2\text{O}_7$                       c)  $\text{H}_2\text{PO}_4$                       d)  $\text{H}_2\text{PO}_3$
288.  $\text{PbO}_2 \rightarrow \text{PbO} \quad \Delta G_{298} < 0$   
 $\text{SnO}_2 \rightarrow \text{SnO} \quad \Delta G_{298} > 0$   
 Most probable oxidation state of Pb and Sn will be  
 a)  $\text{Pb}^{4+}, \text{Sn}^{4+}$                       b)  $\text{Pb}^{4+}, \text{Sn}^{2+}$                       c)  $\text{Pb}^{2+}, \text{Sn}^{2+}$                       d)  $\text{Pb}^{2+}, \text{Sn}^{4+}$
289. Calcium cyanamide on treatment with steam produces  
 a)  $\text{NH}_3 + \text{CaO}$                       b)  $\text{NH}_3 + \text{CaHCO}_3$                       c)  $\text{NH}_3 + \text{CaCO}_3$                       d)  $\text{NH}_3 + \text{Ca(OH)}_2$
290. Pure boron is best prepared by  
 a) Heating  $\text{B}_2\text{O}_3$  with  $\text{H}_2$   
 b) Heating  $\text{B}_2\text{O}_3$  with Na or K  
 c) Heating  $\text{KBF}_4$  with Na or K

- d) Heating  $\text{BBr}_3$  with  $\text{H}_2$  in the presence of a catalyst
291. While testing  $\text{BO}_3^{3-}$ , there is green-edged flame on heating the salt with conc.  $\text{H}_2\text{SO}_4$  and  $\text{CH}_3\text{OH}$ . Green colour is of  
 a)  $(\text{CH}_3)_3\text{B}$                       b)  $(\text{CH}_3\text{O})_3\text{B}$                       c)  $\text{B}_2\text{O}_3$                       d)  $\text{H}_3\text{BO}_3$
292. The compound having maximum carbon percentage is  
 a) Peat                      b) Bituminous                      c) Lignite                      d) Anthracite
293. The statement true for  $\text{N}_3^-$  is  
 a) It has non-linear structure  
 b) It is called pseudohalogen  
 c) The formal oxidation state of nitrogen in this anion is +1  
 d) It is isoelectronic with  $\text{N}_2\text{O}$
294. Which blue-liquid is obtained on reacting equimolar amounts of two gases at  $-30^\circ\text{C}$ ?  
 a)  $\text{N}_2\text{O}$                       b)  $\text{N}_2\text{O}_3$                       c)  $\text{N}_2\text{O}_4$                       d)  $\text{N}_2\text{O}_5$
295. Which is a set of acid salts and can react with base?  
 a)  $\text{NaH}_2\text{PO}_2, \text{Na}_2\text{HPO}_3, \text{NaH}_2\text{PO}_4$                       b)  $\text{Na}_2\text{HPO}_3, \text{NaH}_2\text{PO}_3, \text{Na}_2\text{HPO}_4$   
 c)  $\text{NaHCO}_3, \text{NaH}_2\text{PO}_3, \text{Na}_2\text{HPO}_4$                       d) All of the above
296. Hardening of cement is due to  
 a) Dehydration                      b) Hydrolysis  
 c) Hydration and hydrolysis                      d) Polymerization
297.  $\text{H}_3\text{BO}_3$  is  
 a) Monobasic acid and weak Lewis acid                      b) Monobasic and weak Bronsted acid  
 c) Monobasic and strong Lewis acid                      d) Tribasic and weak Bronsted acid
298. Boron nitride has the structure of the type  
 a) Both diamond and graphite                      b) Graphite  
 c) Diamond                      d)  $\text{NaCl}$
299. This salt of oxoacids of phosphorus is used as washing detergent  
 a) Wavellite                      b) Microcosmic salt                      c) Calgon                      d) Chlorapatite
300. Alums are used as mordant in dyeing because  
 a) Dye is adsorbed on  $\text{Al}(\text{OH})_3$  which is deposited on fibre in the hydrolysis process  
 b) Dye is adsorbed on  $\text{KOH}$  formed due to hydrolysis  
 c) Both (a) and (b)  
 d) None of the above
301. Out of  $\text{CO}_2, \text{SiO}_2, \text{GeO}, \text{SnO}_2$  and  $\text{PbO}_2$   
 a)  $\text{CO}_2$  and  $\text{SiO}_2$  are acidic,  $\text{SnO}_2$  is amphoteric and  $\text{PbO}_2$  is an oxidizing agent  
 b)  $\text{PbO}_2$  is converted to  $\text{Pb}(\text{NO}_3)_2$  on reaction with  $\text{HNO}_3$   
 c) Both (a) and (b) are correct  
 d) None of the above is correct
302. Of the following acids  
 I: hypo phosphorous acid  
 II: hydrofluoric acid  
 III: oxalic acid  
 IV: glycine  
 a) I, II are monobasic: III dibasic acid and IV amphoteric  
 b) II monobasic: I, III dibasic acid: IV amphoteric  
 c) I monobasic, II, III dibasic, IV amphoteric  
 d) I, II, III dibasic: IV amphoteric
303. Which of the following has the highest first ionization energy?  
 a) Lithium                      b) Beryllium                      c) Boron                      d) Carbon
304. Essential constituents of plants and animal tissues are  
 a) N and P                      b) N and As                      c) Cu and Mg                      d) Ca and Mg

305.  $\text{H}_3\text{BO}_3$  and  $\text{HBO}_2$  do not differ in  
 a) Oxidation number      b) Basicity      c) Melting point      d) Structure
306. Percentage of lead in lead pencil is  
 a) 30      b) 20      c) 10      d) Zero
307. Holme's signals can be given by using  
 a)  $\text{CaC}_2 + \text{CaCN}_2$       b)  $\text{CaC}_2 + \text{Ca}_3\text{P}_2$       c)  $\text{CaC}_2 + \text{CaCO}_3$       d)  $\text{Ca}_3\text{P}_2 + \text{CaCN}_2$
308. Arsenic drugs are mainly used for the treatment of  
 a) Cholera      b) Typhoid      c) Jaundice      d) Syphilis
309. Glass having higher refractive index is prepared using  
 a) NiO      b) CoO      c) PbO      d) CaO
310. The incorrect statement is  
 a) Anhydrous  $\text{AlCl}_3$  is a covalent substance  
 b) Ionic compounds generally have low melting point and boiling point  
 c) A molecule shows a more stable forms as compound to individual atom  
 d)  $\text{CCl}_4$  is a non-polar solvent
311. Which of the following is not an acid anhydride?  
 a)  $\text{CO}_2$       b) CO      c)  $\text{SO}_2$       d)  $\text{SO}_3$
312. Light elements B, Al, C and Si are  
 a) Oxophiles (high affinity for oxygen)      b) Fluorophiles (high affinity for fluorine)  
 c) Both type      d) None of the types given
313. Which is/are used as an anaesthetic?  
 a)  $\text{N}_2\text{O}$       b)  $\text{C}_2\text{H}_4$       c)  $\text{CHCl}_3$       d) All of these
314. The element which forms oxides in all oxidation states +1 to +5 is  
 a) N      b) P      c) As      d) Sb
315. The bond angle in  $\text{AsH}_3$  is greater than that in  
 a)  $\text{NH}_3$       b)  $\text{H}_2\text{O}$       c)  $\text{BCl}_3$       d) None of these
316. Select the correct statement(s)  
 a) Aluminium dissolves in dilute mineral acids but is made passive by concentrated nitric acid  
 b) Aluminium vessel can be used as storage of NaOH  
 c) Both (a) and (b)  
 d) None of the above
317. Dimer formation can take place with  
 a)  $\text{BH}_3$       b)  $\text{AlCl}_3$       c)  $\text{NO}_2$       d) All of these
318.  $\text{S}_3\text{O}_9$  is a trimer of  $\text{SO}_3$ . Number of (S – S) bonds in  $\text{S}_3\text{O}_9$  is  
 a) Three      b) Two      c) One      d) Zero
319. Nitration of aromatic compounds is done using a mixture of conc.  $\text{H}_2\text{SO}_4$  and conc.  $\text{HNO}_3$ . Intermediate formed in the nitration process is  
 a)  $\text{NO}_2^+$  (nitronium ion)  
 b)  $\text{NO}_3^-$  (nitrate ion)  
 c)  $\text{NO}^+$  (nitrosonium ion)  
 d)  $\text{NO}_2^-$  (nitrite ion)
320. In which case hydrolysis is faster  
 a)       b)   
 c) At equal rate      d) No hydrolysis
321. Anion containing both three- and four-coordinated boron is  
 a)  $[\text{B}(\text{OH})_4]^-$       b)  $\text{B}_3\text{O}_6^{3-}$       c)  $[\text{B}_4\text{O}_5(\text{OH})_4]^{2-}$       d)  $\text{BO}_3\text{BO}_4^{4-}$
322. Hydrazine is not  
 a) A reducing agent      b) An oxidizing agent      c) An acid      d) A base
323. NaOH can't be stored in

- a) Al vessel                      b) Zn vessel                      c) Both (a) and (b)                      d) None of these
324. Which of the following compounds do not exist?  
 $N_4, P_4, PCl_5, NCl_5, NCl_3, P_2O_5, NO_2, PO_2$   
 a)  $N_4, NCl_5, NO_2$                       b)  $N_4, NCl_5, PO_2$                       c)  $PCl_5, NCl_5, PO_2$                       d) All of these
325. Which forms  $p\pi-p\pi$  multiple bonds with itself and with C and O?  
 a) P, As                      b) N, As                      c) N, P                      d) N
326. The high reactivity and low volatility of white phosphorus is due to  
 a) Tetrahedrally arranged  $P_4$  units                      b) Bond angle of  $60^\circ$   
 c) Weak van der Waals' force of attraction                      d) Increased steric (strain) factor
327. Lead as impurity in the extraction of silver is removed by  
 a) Parke's process                      b) Solvay process                      c) Cyanide process                      d) None of these
328. Boron sesquioxide is  
 a)  $B_2O_3$                       b)  $BO_3$                       c)  $BO_3^{3-}$                       d)  $BO_2^-$
329. Diborane is a Lewis acid forming addition compound  $B_2H_6 \cdot 2NH_3$  with  $NH_3$ , a Lewis base. This  
 a) Is ionic and exists as  $[BH_2(NH_3)_2]^+$  and  $[BH_4]^-$  ions  
 b) On heating is converted into borazine,  $B_3N_3H_6$  (called inorganic benzene)  
 c) Both (a) and (b) are correct  
 d) None of the above is correct
330. When a mixture of carbon monoxide and chlorine is exposed to sunlight the product formed is  
 a) Thionyl chloride                      b) Phosgene                      c) Phosphine                      d) Carbon tetrachloride
331. Nitric oxide is paramagnetic in  
 a) Gaseous state                      b) Liquid state                      c) Solid state                      d) Polymeric state
332. Nitrosonium ion ( $NO^+$ ) is isoelectronic with  
 a) Carbon dioxide                      b) Carbon monoxide                      c) Nitrogen dioxide                      d) Nitric oxide
333. Select the incorrect statement  
 a) Mellitic acid is benzene hexa-carboxylic acid  
 b) Pb dissolves in conc. HCl forming  $PbCl_2$   
 c) Pb dissolves in hot NaOH forming  $Na_2[Pb(OH)_6]$   
 d) Diamond is unreactive but graphite forms  $(CF)_n$  with  $F_2$
334. Concentrated nitric acid, upon long standing turns yellow-brown due to the formation of  
 a) NO                      b)  $NO_2$                       c)  $N_2O$                       d)  $N_2O_4$
335. The sides of safety matches contain  
 a) Red phosphorus + sand powder  
 b)  $P_4S_3$   
 c)  $Ca_3(PO_4) +$  glass pieces  
 d)  $KClO_3, KNO_3,$  sulphur + antimony
336. Alum is found to contain hydrated monovalent cation  $[M(H_2O)_6]^+$ , trivalent cation  $[M'(H_2O)_6]^{3+}$  and  $SO_4^{2-}$  in the ratio of  
 a) 1:1:1                      b) 1:2:3                      c) 1:3:2                      d) 1:1:2
337.  $NaNO_2$  and  $NaNO_3$  are used as food additives and generally added to meat to  
 a) Retard oxidation of meat to brown coloured material  
 b) Prevent growth of botulism bacteria  
 c) Impart red colour to oxidized meat by NO by reaction of heme in blood  
 d) Make all of the functions given above effective
338. Select the correct statements  
 a) Catenation is maximum in carbon  
 b) Carbon has pronounced ability to form  $p\pi-p\pi$  multiple bonds to itself and to other elements like O and N  
 c) Both (a) and (b) are correct  
 d) None of the above is correct

339. Global warming is called  
 a) Photochemical smog    b) Green-house effect    c) Acid rain    d) Respiration
340. Select the correct statement  
 a) Oxides of carbon family ( $MO_2$ ) are all network solids with octahedral coordination  
 b) Silicon dioxide (silica) is a network solid with tetrahedral coordination and is a giant molecule  
 c)  $GeO_2$ ,  $SnO_2$  and  $PbO_2$  are all acidic oxides  
 d) None of the above appears correct
341. Element of group 14 used in semiconductors are  
 a) C, Si, Ge    b) Si, Ge, Sn    c) Si, Ge    d) B, Si, Ge
342. Which of the following oxides of nitrogen is paramagnetic?  
 a)  $N_2O$     b)  $N_2O_5$     c)  $NO_2$     d)  $N_2O_3$
343. Which is/are correct statements about  $P_4O_6$  and  $P_4O_{10}$ ?  
 a) Both form oxyacids  $H_3PO_3$  and  $H_3PO_4$  respectively  
 b) In  $P_4O_6$  each P is joined to four O and in  $P_4O_{10}$  each P is joined to six O atoms  
 c) Both (a) and (b)  
 d) None of the above
344. The major constituent in cement is  
 a) Silica    b) Magnesium oxide    c) Calcium carbonate    d) Iron oxide
345. In the preparation of red phosphorus from white phosphorus  
 a)  $MnO_2$  is used as a catalyst  
 b) The white phosphorus is treated in an electric furnace  
 c) A little iodine is used as catalyst  
 d) The gas  $P_4$  is released
346. Methanides are  
 a)  $Mg_2C_3$ ,  $Be_2C$ ,  $Al_4S_3$  and  $CaC_2$     b)  $Mg_2C_3$ ,  $Be_2C$  and  $Al_4C_3$   
 c)  $Be_2C$ ,  $Al_4C_3$  and  $CaC_2$     d)  $Be_2C$  and  $Al_4C_3$
347. The type of hybridization of boron in diborane is  
 a)  $sp$     b)  $sp^2$     c)  $sp^3$     d)  $sp^3d^2$
348. 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 form 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
349. 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
350. Among the following, the paramagnetic compound is  
 a)  $Na_2O_2$     b)  $P_2O_5$     c)  $N_2O$     d)  $KO_2$

#### Multiple Correct Answers Type

351. Conc.  $H_2SO_4$  reacts with carbon forming  
 a)  $CO_2$     b)  $SO_2$     c)  $H_2CO_3$     d)  $H_2SO_3$
352. Nylon-6 is formed from caprolactam which is formed from  
 a) Cyclohexanone and hydroxyl amine    b) Cyclohexanone and hydrazine  
 c) Benzophenone and hydrazine    d) Benzophenone and hydroxylamine
353. Select the correct statement(s)  
 a)  $BF_3$  forms adducts with  $NH_3$ ,  $ROH$  and  $RNH_2$

- b)  $\text{BCl}_2$  forms adducts with  $\text{NH}_3$ ,  $\text{H}_2\text{O}$  and  $\text{RNH}_2$   
 c)  $\text{BCl}_3$  reacts with liquid  $\text{NH}_3$  and ethanol forming  $\text{B}(\text{NH}_2)_3$  and  $\text{B}(\text{OEt})_3$   
 d)  $[\text{BCl}_4]^-$ ,  $[\text{BBr}_4]^-$  and  $[\text{BI}_4]^-$  ions can be made only in non-aqueous media
354. Select the correct statement(s)  
 a) Diborane is an electron-deficient compound  
 b) Diborane is stoichiometrically analogous to ethane ( $\text{C}_2\text{H}_6$ )  
 c) Total electrons involved in bonding are 12 in diborane and ethane  
 d) Total electrons involved in bonding are 12 in diborane and 14 in ethane
355. Group 14 (carbon family) elements have the following properties  
 a) They are all network solids with octahedral network  
 b) Only  $\text{SiO}_2$  is a network solid with tetrahedral coordination and is a giant molecule  
 c)  $\text{SnO}_2$  and  $\text{PbO}_2$  are amphoteric oxides  
 d) All oxides are acidic
356. Select the correct statement(s)  
 a)  $\text{BF}_3$  fumes strongly in moist air and is partially hydrolysed by excess of water  
 b)  $\text{BF}_3$  is converted into the adducts  $\text{BF}_3 \cdot \text{H}_2\text{O}$  and  $\text{BF}_3 \cdot 2\text{H}_2\text{O}$  with small amounts of water at low temperature  
 c)  $\text{H}_2\text{BO}_3$  is a weak acid but  $\text{HBF}_4$  is a very strong acid  
 d)  $\text{KBF}_4$  is sparingly soluble in water
357. Boric acid is a weak Lewis acid proton comes from  
 a) By its ionization  
 b) When it forms complex with  $\text{H}_2\text{O}$   
 c) When it forms borate esters with alcohol  
 d) All of the above
358. The nitrogen oxide(s) that contain(s) N – N bond(s) is (are)  
 a)  $\text{N}_2\text{O}$                       b)  $\text{N}_2\text{O}_3$                       c)  $\text{N}_2\text{O}_4$                       d)  $\text{N}_2\text{O}_5$
359.  $\text{SiO}_2$  exists in the form/s is  
 a) Cristobalite                      b) Tridymite                      c) Quartz                      d) None of these
360. Select the correct statement(s)  
 a) Aluminium monohalides are formed by the reactions of the trihalides with aluminium at 1300K followed by rapid cooling  
 b) Aluminium monochloride (red) is formed when aluminium reacts with HCl at 1200 K  
 c) Aluminium monohalides disproportionate at room temperature  
 d)  $\text{Ga}_2\text{Cl}_4$  exists as  $\text{Ga}^+[\text{GaCl}_4]^-$  and is diamagnetic and has crystalline structure
361. Select the correct statement(s)  
 a) Boron trimethyl is a weaker Lewis acid than the boron trihalides or monborane  
 b) Lewis acid property when  $\text{Me}_3\text{N}$  is a donor is in order:  
 $\text{BBr}_3 > \text{BCl}_3 > \text{BF}_3 \sim \text{BH}_3 > \text{BMe}_3$   
 c) Lewis and property when  $\text{Me}_3\text{P}$  is a donor is in order:  
 $\text{BBr}_3 > \text{BCl}_3 \sim \text{BH}_3 > \text{BF}_3 \sim \text{BMe}_3$   
 d) Lewis acid property when CO is a donor: no adduct is formed with halides and Lewis acid property of  
 $\text{BH}_3 \gg \text{BF}_3 \cdot \text{BMe}_3$
362. Select ionic carbides  
 a)  $\text{Al}_4\text{C}_3$ ,  $\text{CaC}_2$ ,  $\text{Mg}_2\text{C}_3$                       b)  $\text{Al}_4\text{C}_3$ ,  $\text{SiC}$ ,  $\text{B}_4\text{C}$                       c)  $\text{CaC}_2$ ,  $\text{Mg}_2\text{C}_3$                       d)  $\text{CaC}_2$ ,  $\text{SiC}$ ,  $\text{Mg}_2\text{C}_3$
363.  $\text{SiCl}_4$  is hydrolysed but  $\text{CCl}_4$  is not hydrolysed because  
 a) Si has vacant *d*-orbital and can accommodate lone-pair of electrons from oxygen of water  
 b) Si has relatively large size and can increase its coordination number from four to five  
 c) Si has relatively smaller size and thus interaction with  $\text{H}_2\text{O}$  is spontaneous  
 d) Si has oxidation number of six while carbon has oxidation number of four in all its compounds
364. Correct statement(s) out of the following is  
 a)  $\text{N}(\text{CH}_3)_3$  has pyramidal structure                      b)  $\text{N}(\text{SiH}_3)_3$  shows planar arrangement  
 c)  $\text{SiC}$  is highly volatile                      d)  $\text{SiO}_2$  is called silane
365. +3 oxidation state is more characteristics in case of

- a) B                                      b) Tl                                      c) Ga                                      d) Al
366. Silly putty
- Is a silicone polymer
  - Has a composition intermediate between silicone oils and silicone rubbers
  - Is an asbestos
  - Is not related to any chemical
367. Silicones
- Are synthetic polymer containing repeating ( $R_2SiO_2$ ) units
  - Are formed by hydrolysis of  $R_2SiCl_2$
  - Are natural occurring repeating ( $SiO_4$ ) units
  - Single  $R_2SiO_2$  unit
368. Carbon suboxide ( $C_3O_2$ ) is formed when
- Carbon reacts with conc.  $H_2SO_4$
  - Malonic acid reacts with  $P_4O_{10}$
  - Carbon reacts with strong alkali solution
  - Oxalic acid is heated strongly
369. Select the correct statement(s)
- In graphite, only three electrons (out of four) are involved in  $\sigma$  bondin
  - $\pi$ -bonding electrons in graphite are delocalized over the whole structure
  - Conduction of electricity in graphite is due to mobile electrons
  - Diamond is insulator due to absence of mobile electrons
370. Select the correct statement(s)
- $SbCl_3$  is hydrolysed to orange  $SbOCl$  soluble in dil. HCl
  - $BiCl_3$  is hydrolysed to white  $BiOCl$  soluble in dil. HCl
  - $PCl_5$  can change to  $PCl_6^-$  and  $PCl_4^+$  with no change in hybridization of P
  - $NCl_5$  and  $PCl_5$  are stable compounds
371. Thermodynamic tendency of  $PH_3(g)$  to react with  $HX(g)$  would be favoured by
- Low H – X bond energy
  - High electron affinity of X
  - High lattice energy of  $PH_4X(s)$
  - High electronegativity of P
372. Heating of oxalic acid with conc  $H_2SO_4$  evolves
- $SO_2$
  - $CO_2$
  - $SO_3$
  - CO
373. The following side reaction in the production of  $N_2H_4$
- $$N_2H_4 + 2NH_2Cl \rightarrow N_2 + 2NH_4Cl$$
- Is catalysed by traces of heavy metals as  $Cu^{2+}$
  - Is suppressed by addition of gelatin or glue
  - Is made reversible by removing  $N_2$
  - Is made reversible by adding NaOH
374. The great thermal and chemical stability of silicones is attributed to high strength of
- Silicon-carbon bond
  - Silicon-oxygen bond
  - Silicon-silicon bond
  - Carbon-carbon bond
375. Select the statement(s)
- The enthalpy difference between  $\alpha$ - and  $\beta$ - graphite is very large and thus two forms are not interconvertible
  - The enthalpy difference between  $\alpha$ - and  $\beta$ -graphite is very small and two forms are interconvertible
  - $\alpha$ -graphite changes to  $\beta$ -graphite at about 1300 K
  - $\beta$ -graphite changes to  $\alpha$ -graphite at about 1300 K
376. Actual source of protons in boric acid is based on the following
- $B(OH)_3(aq) + 2H_2O(l) \rightleftharpoons H_3O^+(aq) + [B(OH)_4]^-(aq)$
  - $3B(OH)_3(aq) \rightleftharpoons [B_3O_3(OH_4)]^-(aq) + H^+(aq) + 2H_2O(l)$   
In neutral or basic solution
  - $B(OH)_3 \rightleftharpoons H_2BO_2^- + H^+$
  - All of the above
377.  $N_2H_4$  reduces  $IO_3^-/H^+$



- a) To  $I^+$   
 b) With  $I_2$  as an intermediate indicated by violet colour in  $CCl_4$  layer  
 c) Indicated by blue colour with starch  
 d) To  $I^-$
378.  $N_2H_4$   
 a) Is an endothermic compound  
 b) Burns in air with evolution of heat in an exothermic compound  
 c) Is kinetically stable  
 d) Reduces  $FeCl_3$  to  $FeCl_2$  in acidic medium
379. Select the correct statement(s)  
 a)  $COCl_2$  is called phosphine gas  
 b)  $C_3O_2$  (carbon suboxide) has  $sp^2$  hybridised carbons  
 c) CO is toxic because it forms a complex with haemoglobin in the blood  
 d) Diamond is unaffected by concentrated acid but graphite is oxidized to mellitic acid with concentrated  $HNO_3$
380. Select the correct statement(s)  
 a) A saturated solution of boric acid in water is neutral to the indicator bromocresol green  
 b)  $AlF_3$  is insoluble in anhydrous HF  
 c) Aqueous solution of  $KHF_2$  is basic to the indicator bromocresol green  
 d) Aqueous solution of boric acid and potassium hydrogen difluoride is alkaline to bromocresol indicator
381. Which of the following statements is/are correct?  
 a) CO is good reducing agent  
 b) CO has the structure  $C \equiv O$   
 c) Water gas is equimolar mixture of CO and  $N_2$   
 d) Coal gas is a mixture of CO,  $H_2$ ,  $CH_4$  and  $CO_2$
382.  $N_2H_4$  and  $H_2O_2$  show central atoms  
 a) Hybridisation of central atoms  
 b) Oxidizing nature  
 c) Reducing nature  
 d) Molar mass
383. Which fumes in moist air?  
 a)  $AlCl_3$   
 b)  $BF_3$   
 c)  $CuSO_4$   
 d)  $NH_3$
384. In acidic medium  $N_2H_4$   
 a) Is oxidized to  $N_2$   
 b) Loses four electrons  
 c) Has equivalent mass 8  
 d) Reduces  $AuCl_3$  to  $AuCl$
385. Select the correct statement(s)  
 a) In  $\alpha$ -graphite, the layers are arranged in the sequence  $ABAB \dots$   
 b) In  $\beta$ -graphite, the layers are arranged in the sequence  $ABCABC \dots$   
 c) In  $\alpha$ -graphite, the layers are arranged in the sequence  $ABCABC \dots$   
 d) In  $\beta$ -graphite, the layers are arranged in the sequence  $ABAB \dots$
386. Gases responsible for "green-house effect" are  
 a)  $CO_2$   
 b)  $H_2O$   
 c)  $O_3$   
 d)  $N_2$
387. Select the correct statement(s)  
 a) Graphite is composed of planar, two dimensional sheets of  $sp^2$  hybridised carbon atoms  
 b) Each sheet is a network of fused, hexagonal rings of carbons  
 c) The layers in graphite are held together by relatively weak van der Waals' forces of attraction  
 d) Graphite is thermodynamically the most stable allotropic form of carbon
388. Select the correct statement(s)  
 $NH_2OH$  forms *syn* and *anti* isomer with  
 a) Benzaldehyde  
 b) Acetone  
 c) Acetaldehyde  
 d) Benzophenone
389.  $NH_2OH$  can be used as  
 a) An oxidizing agent  
 b) A reducing agent  
 c) A autoxidant in photographic developers

- d) Oxime forming reagent (with carbonyl compound)
390. Consider the following statements  
 I: Boric acid is a mild antiseptic and is used as a food preservative  
 II: Borax and other borates are used in water-treatment, timber preservation, glass manufacture  
 III: Sodium peroxoborate is an important constituent of washing powder  
*Select the correct statement*  
 a) I, II                      b) II, III                      c) I, III                      d) I, II, III
391. Tin (II) chloride is used  
 a) As a mordant in dyeing                      b) As a reducing agent  
 c) As an oxidizing agent                      d) In the preparation of colloidal gold
392. Select the correct statement(s)  
 a) On the basis of Lewis acidity, an oxygen atom is more effective than an fluorine atom as a  $\pi$ -donor towards boron  
 b) 1, 2-diols have a strong tendency to form borate esters on account of chelate effect  
 c) Borate esters are stable due to chelate effect  
 d) None of the above is correct statement
393. Select the correct alternate(s)  
 a) The group BN is isoelectronic with  $C_2$   
 b) No species with  $B \equiv N$  group is formed  
 c) Common form of boron nitride has an ordered layer structure closely resembling that of graphite  
 d) AlN has the wurtzite structure

#### Assertion - Reasoning Type

This section contain(s) 0 questions numbered 394 to 393. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

- a) Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1  
 b) Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1  
 c) Statement 1 is True, Statement 2 is False  
 d) Statement 1 is False, Statement 2 is True

- 394
- Statement 1:** Boranes are volatile and decompose to boron, and hydrogen at red heat  
**Statement 2:** All the boranes react with ammonia depending on the conditions
- 395
- Statement 1:** Si-Si bonds are weaker than Si-O bonds  
**Statement 2:** Silicon forms double bonds with itself
- 396
- Statement 1:** GeO, SnO and PbO are more basic and ionic than the corresponding  $GeO_2$ ,  $SnO_2$  and  $PbO_2$   
**Statement 2:** GeO is acidic while SnO And PbO are amphoteric

397

**Statement 1:**  $\text{BF}_3$  is a useful organic catalyst for Friedel crafts reactions

**Statement 2:** It is covalent, gaseous and hydrolysed by water

398

**Statement 1:** White phosphorus is more reactive than red phosphorus.

**Statement 2:** red phosphorus consists of  $\text{P}_4$  tetrahedral units linked to one another to form linear chains.

399

**Statement 1:** Among chalcogens, tendency of catenation is maximum for sulphur.

**Statement 2:** S-S bond dissociation energy is higher then O-O bond dissociation energy.

400

**Statement 1:** White phosphorus is stored under water.

**Statement 2:** White phosphorus is highly reactive and catches fire spontaneously in air.

401

**Statement 1:** Calcium carbide on hydrolysis gives acetylene

**Statement 2:** Calcium carbide contains  $\text{C}^{4-}$  anions

402

**Statement 1:** The ionization energy of gallium remains nearly same as that of aluminium.

**Statement 2:** This is due to shielding of outer shell electrons form the nucleus by the d electrons of gallium.

403

**Statement 1:**  $\text{OF}_2$  is named as oxygen difluoride.

**Statement 2:**  $\text{OF}_2$  is oxygen is less electronegative than fluorine.

404

**Statement 1:** Liquid  $\text{NH}_3$  is used for refrigeration.

**Statement 2:** Liquid  $\text{NH}_3$  does not vaporize quickly.

### Matrix-Match Type

This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

405. Match the compounds (in Column I) with their use (in Column II)

**Column-I**

**Column- II**

(A) Boric acid

(1) In Friedel-Craft acylation

- (B) Borax (2) Mild antiseptic  
 (C) Aluminium chloride (3) Washing powder  
 (D) Sodium peroxoborate (4) Buffer

**CODES :**

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

406. Match the species in Column I with their characteristic(s) in Column II

Column-I	Column- II
(A) $\text{NH}_2\text{OH}$	(1) Reducing agent
(B) $\text{N}_3\text{H}$	(2) Oxidizing agent
(C) $\text{NH}_2 - \text{NH}_2$	(3) Weak base
(D) $\text{NH}_3$	(4) Molecule or anion with linear structure
(E) $\text{N}_2\text{O}$	(5) Isoelectronic of $\text{CO}_2$

**CODES :**

	A	B	C	D	E
a)	1,2,3	1,4,5	1,2	1,3	1,2,4,5
b)	1,2	1,2,3	1,4,5	1,2,4,5	1,2,4,5
c)	1,2,4,5	1,2	1,3	1,4,5	1,2,4,5
d)	1,4,5	1,3	1,2,4,5	1,2	1,2,4,5

407. Match the types of borates (in Column I) with their formula (in Column II)

Column-I	Column- II
(A) Metaborate	(1) $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$
(B) Orthoborates	(2) $\text{Mg}_2\text{B}_2\text{O}_5$
(C) Pyroborates	(3) $\text{K}_3(\text{BO}_2)_3$
(D) Perborate	(4) $\text{Ca}_3(\text{BO}_3)_2$

**CODES :**

A	B	C	D
---	---	---	---

- a) 4 2 1 3  
 b) 3 4 2 2  
 c) 2 3 4 1  
 d) 2 1 3 4

408. Match the reactions of metals with dilute  $\text{HNO}_3$  (in Column I) with the nitrogen compounds (obtained by oxidation/reduction (in Column II)

Column-I

Column- II

- |                                     |                              |
|-------------------------------------|------------------------------|
| (A) $\text{Mg} + \text{dil. HNO}_3$ | (1) $\text{NO}$              |
| (B) $\text{Zn} + \text{dil. HNO}_3$ | (2) $\text{H}_2$             |
| (C) $\text{Sn} + \text{dil. HNO}_3$ | (3) $\text{N}_2\text{O}$     |
| (D) $\text{Pb} + \text{dil. HNO}_3$ | (4) $\text{NH}_4\text{NO}_3$ |

CODES :

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

409. Match the acids (in Column I) with number of acid salts formed by them (in Column II)

Column-I

Column- II

- |                          |          |
|--------------------------|----------|
| (A) Hypophosphorus acid  | (1) Two  |
| (B) Orthophosphorus acid | (2) Zero |
| (C) Orthophosphoric acid | (3) One  |
| (D) Mellitic acid        | (4) Five |

CODES :

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

410. Match the items (in Column I) with their formula (in Column II)

Column-I

Column- II

- (A) Tetraboric acid  
 (B) Borax  
 (C) Borazine  
 (D) Amphoteric

- (1)  $B_3N_3H_6$   
 (2)  $Ga(OH)_2$   
 (3)  $H_2B_4O_7$   
 (4)  $Na_2B_4O_7 \cdot 10H_2O$

**CODES :**

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

411. Match the oxide of Column I with their corresponding property (ies) in Column II

Column-I	Column- II
(A) $Pb_3O_4$	(1) Oxidation state +2
(B) $SnO_2$	(2) Oxidation state +4
(C) $PbO_2$	(3) Amphoteric
(D) $CO_2$	(4) Basic
(E) $GeO$	(5) Acidic

**CODES :**

	A	B	C	D	E
a)	2,3	2,4	1,3	1,2,3	2,5
b)	2,4	1,3	2,3	2,5	2,5
c)	1,2,3	2,3	2,4	2,5	2,5
d)	1,3	1,2,3	2,5	2,4	2,5

412. Match the compounds (in Column I) with their oxidation number of N (in Column II)

Column-I	Column- II
(A) $N_2H_4$	(1) -1
(B) $NH_2OH$	(2) 3
(C) $HNO_2$	(3) 4
(D) $NO_2$	(4) 5
(E) $HNO_3$	(5) -2

**CODES :**

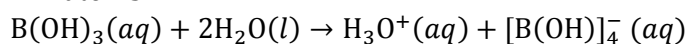
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>a)</b>	2	3	4	5	1
<b>b)</b>	5	1	2	3	1
<b>c)</b>	1	2	3	4	1
<b>d)</b>	3	4	1	2	1

**Linked Comprehension Type**

This section contain(s) 17 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

**Paragraph for Question Nos. 413 to -413**

Boric oxide  $B_2O_3$  reacts with water to form boric acid. The net ionisation reaction of boric acid when dissolves in water is



Boric acid is quite toxic and slippery. The solution of the salt are generally quite complex because they contain polymers of the borate anions as well as the simple anion  $[B(OH)]_4^-$ ,  $BO_3^{3-}$  and  $BO_4^{5-}$ . Borates hydrolyze in water to given basic solution and this is why boran is used in some cleaning agents

413. Which of the following statements is/are correct?

- Boric acid is Lewis base
- Hybridisation of boron in acid is  $sp^3$
- Boric acid molecule held together by hydrogen bonding
- All of the above

**Paragraph for Question Nos. 414 to - 414**

Like halides of boron, halides of aluminium do not show back bonding because of increase in size of aluminium. Actually aluminium atoms complete their octets by forming dimers. Thus, chloride and bromide of aluminium exist as dimers, both in the vapour state and in polar. Solvents like benzene while the corresponding boron halides exists as monomer. In boron trihalides the extent of back bonding decreases with increase in size of halogens and thus, Lewis acid character increases

414. Which of the following reaction is incorrect?

- $BCl_3 + 3EtOH \rightarrow B(OEt)_3 + 3HCl$
- $BF_3 + 2H_2O \rightarrow [BF_3OH]^- + H_3O^+$
- $BF_3 + F^- \rightarrow BF_4^-$
- $BCl_3 + 2C_5H_5N \rightarrow Cl_3B(C_2H_5N)_2$

**Paragraph for Question Nos. 415 to - 415**

The tetrafluoroborate anion  $BF_4^-$ , is a Lewis base. The other tetrahaloborate anions,  $BCl_4^-$  and  $BBr_4^-$ , can be prepared in non-aqueous solvents

Based on the above short write-up, answer the following questions

415.  $BF_4^-$  is

- a)  $F^-$  donor  
c) A lone-pair donor

- b) A lone-pair acceptor  
d) Solvated in aqueous solution

**Paragraph for Question Nos. 416 to - 416**

Certain aspects of the aqueous chemistry of aluminium compounds derive from the nature of the hydrated aluminium ion-  $[Al(H_2O)_6]^{3+}$



Read the above write-up and answer the following questions

416. Above equilibrium indicates that

- a)  $H_2O$  is a Lowry-Bronsted acid  
b)  $H_2O$  is a Lowry-Bronsted base  
c)  $H_2O$  is a Lowry-Bronsted acid as well as a base  
d)  $H_2O$  is neither acid nor base

**Paragraph for Question Nos. 417 to - 417**

Diborane is an electron deficient compound stoichiometrically, it is analogous to ethane,  $C_2H_6$ . However, the total number of electrons involved in bonding and less in diborane

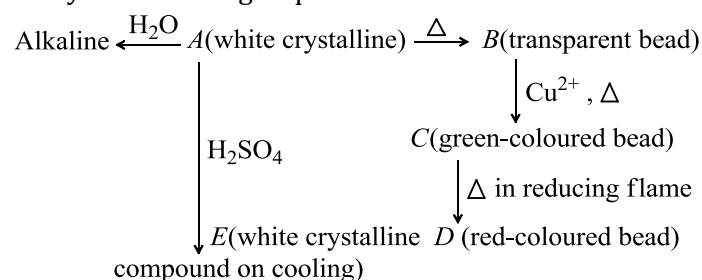
Read the above short note and answer the following question

417. Bonding electrons involved

- a) In  $B_2H_6$  is 14 and in  $C_2H_6$  is 16  
b) In  $B_2H_6$  is 12 and in  $C_2H_6$  is 14  
c) In  $B_2H_6$  is 10 and in  $C_2H_6$  is 12  
d) In  $B_2H_6$  is 16 and in  $C_2H_6$  is 18

**Paragraph for Question Nos. 418 to - 418**

Study the following sequence of reactions:



418. A is

- a)  $NaBO_2$                       b)  $Na_2B_4O_7$                       c)  $H_3BO_3$                       d)  $HBO_3$

**Paragraph for Question Nos. 419 to - 420**

Read the following discovery and answer the questions at the end

“Element carbon appears in many structural forms or allotropes. Three of these forms are crystalline –diamond, graphite and the recently discovered fullerece (buckyball) – while more than 40 others, including coke and carbon black, are amorphous. Now there seems to be set a fourth crystalline allotrope of carbon, reported in 1995 by Richard in 1995 by Richard Lagow at the University of Texas”



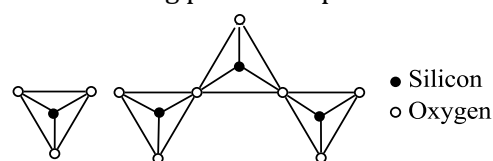
419. Newly discovered allotrope of carbon has the form  
 a) Polyynes                      b) Fullerene                      c) Buckyball                      d) None of these

**Paragraph for Question Nos. 420 to - 421**

Read the following short write-up and answer the questions at the end of it

The name 'silica' covers an entire group of minerals, which have the general formula  $\text{SiO}_2$ , the most common of which is quartz. Quartz is a framework silicate with  $\text{SiO}_4$  tetrahedra arranged in spirals. The spirals can turn in a clockwise or anti-clockwise direction – a feature that results in there being two mirror images, optically active, varieties of quartz

420. The following pictures represent various silicate anions. Their formulae are respectively



- a)  $\text{SiO}_3^{2-}$      $\text{Si}_3\text{O}_7^{2-}$                       b)  $\text{SiO}_4^{4-}$      $\text{Si}_3\text{O}_{10}^{8-}$                       c)  $\text{SiO}_4^{2-}$      $\text{Si}_3\text{O}_9^{2-}$                       d)  $\text{SiO}_3^{4-}$      $\text{Si}_3\text{O}_7^{8-}$

**Paragraph for Question Nos. 421 to - 422**

Based on the following short report, answer the questions given at the end

In some foam-type fire extinguishers, the reactants are  $\text{Al}_2(\text{SO}_4)_3(aq)$  and  $\text{NaHCO}_3(aq)$ . When the extinguisher is activated, these reactants are allowed to mix producing  $\text{Al}(\text{OH})_3(s)$  and  $\text{CO}_2(g)$ . The  $\text{Al}(\text{OH})_3 - \text{CO}_2$  foam extinguishes the fire

421.  $\text{CO}_2$  is formed as a result of  
 a) reaction between  $\text{Al}^{3+}$  and  $\text{HCO}_3^-$   
 b) Reaction between hydrolysis product of  $\text{Al}^{3+}$  and  $\text{HCO}_3^-$   
 c) Reaction between hydrolysis product of  $\text{NaHCO}_3$  and  $\text{Al}_2(\text{SO}_4)_3$   
 d) Direct reaction between  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{NaHCO}_3$

**Paragraph for Question Nos. 422 to - 423**

Question given below are based on the following technical report

The  $\text{CO}_2$  as well as  $\text{H}_2\text{O}$  absorbs strongly in the infrared region, and its presence in the atmosphere decreases the loss of heat from the earth by radiation. This global warming is called the 'green house effect' (other gases, including the oxides of nitrogen from car exhausts, freons from aerosols and refrigerators and methane from bacteria in the soil and in the rumen of cows, also add to the green house effect). The concentration of atmospheric  $\text{CO}_2$  has increased by 10%. This is resulting in the increase in the mean temperature of the earth by  $2.5^\circ\text{C}$ , varying from  $2^\circ\text{C}$  at the equator to  $4^\circ\text{C}$  at the poles. This could have dramatic effect on the climate

422. As a result of green house effect, there can be  
 A: increase in rate of evaporation of water, thus, untimely more rain, flooding, etc  
 B: tropical storms in certain parts of the world  
 C: decrease in pH of the soil

D: increase in pH of the soil

Select the correct alternate

a) B, C, D

b) A, C, D

c) A, B, D

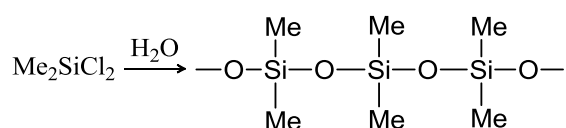
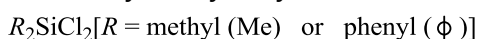
d) A, B, C

#### Paragraph for Question Nos. 423 to - 424

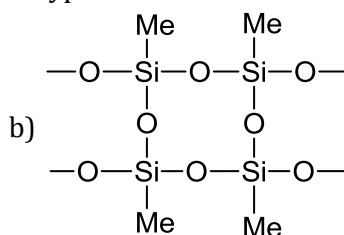
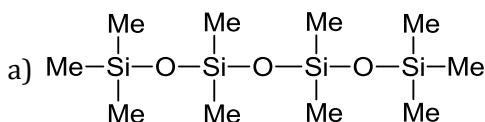
Read the following write-ups and answer the questions at the end of it

Silicones are synthetic polymers containing repeated  $R_2SiO$  units. Since, the empirical formula is that of a ketone ( $R_2CO$ ), the name silicone has been given to these materials. Silicones can be made into oils, rubbery elastomers and resins. They find a variety of applications because of their chemical inertness, water repelling nature, heat-resistance and good electrical insulating property

Commercial silicone polymers are usually methyl derivatives and to a lesser extent phenyl derivatives and are synthesized by the hydrolysis of



423. If we mix  $SiMe_3Cl$  with  $SiMe_2Cl_2$ , we get silicones of the type

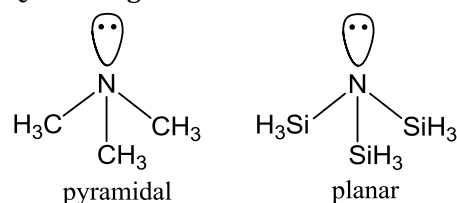


c) Both (a) and (b)

d) None of the above

#### Paragraph for Question Nos. 424 to - 425

Question given below is based on the following structures:



424. Structures of  $N(CH_3)_3$  and  $N(SiH_3)_3$  are different. It is due to the fact that

a) Silicon also uses  $d$ -orbitals in multiple bonding

b) In case of  $N(SiH_3)_3$ , lone pair of N-atom is transferred to the empty  $d$ -orbitals of silicon ( $p\pi-d\pi$  overlapping)

c) Both (a) and (b)

d) None of the above

#### Paragraph for Question Nos. 425 to - 426

Consider the following scheme involving oxides and oxy-acids of nitrogen. Based on this answer the questions given at the end



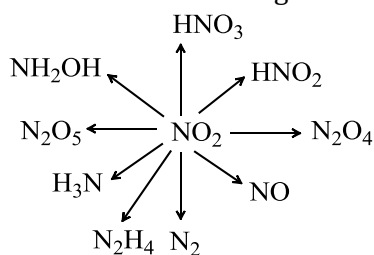
Answer the following questions

428. Equivalent mass of  $N_2H_4$  (molar mass =  $42 \text{ g mol}^{-1}$ ) is  
 a) 42                                      b) 21                                      c) 10.5                                      d) 14

### Integer Answer Type

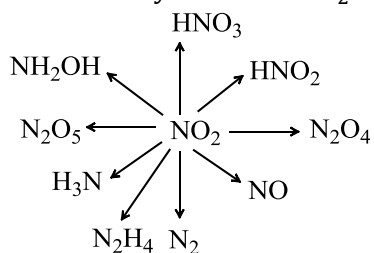
429. More than four bonds are made with how many elements in carbon family?  
 430. In the hydrolysis of borax  
 $Na_2B_4O_7 + 7H_2O \rightarrow 2Na[B(OH)_4] + B(OH)_3$  products formed are to be neutralized by HCl. Number of moles of HCl required per mole of borax hydrolysed is.....  
 431. A silicate mineral has three  $SiO_4$  tetrahedra that share corners with adjacent tetrahedral. Mineral also contains  $Ca^{2+}$ ,  $Cu^{2+}$  and  $H_2O$  in 1:1:1 molar ratio. Thus, total number of atoms of Cu, Si and Ca per unit of mineral is.....  
 432. Aluminium methanide contains ..... carbon atom(s)  
 433. Total number of B and N atom in borazine is.....  
 434. How many of the fuel gases have CO and  $H_2$  both as combustible gases?  
 LPG, water gas, Producer gas, Coal gas, CNG  
 435.  $B(OH)_3$  can accept ..... hydroxide ion(s) from  $H_2O$   
 436. Out of the elements C, S, Ge, Sn and Pb and +4 oxidation state is shown by how many element(s)  
 437. Total number of  $\sigma$  bond in  $N_3H$  is.....  
 438. What is the total negative charge on the silicate  $[Si_4O_{11}]$ ?  
 439. Number of isotopes of carbon .....

440. Out of  $B_2Cl_4$ ,  $GaCl_2$ ,  $GaS$  and  $S_2$  number of diamagnetic substances are.....  
 441.  $\Delta G$  is negative for the following reaction  
 $Tl^{3+} \rightarrow Tl^{x+}$   
 When  $x = \dots\dots$   
 442. Consider the following reactions

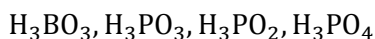


In how many reactions  $NO_2$  has been oxidized?

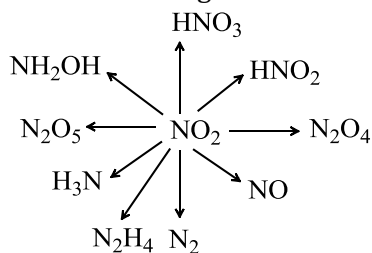
443. Total number of atoms of carbon and oxygen in graphite oxide.....  
 444. How many P – H bonds are there in  $H_3PO_2$ ?  
 445. In how many reactions  $NO_2$  has been reduced in



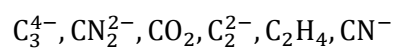
446. Maximum covalency of aluminium is.....  
 447. Borax is found to have..... tetrahedral unit(s)  
 448. Number of tribasic acid out of the following is .....



449. When malonic acid is dehydrated using  $P_4O_{10}$  at  $150^\circ\text{C}$ , species formed has total number of atoms .....
450. How many POP bonds are there in  $P_4O_{10}$ ?
451. Total electrons involved in all the B – H bridging bond is.....
452.  $\text{Al}(s)$  is to be converted into  $\text{Al}^{3+}(aq)$  ion. How many steps are involved? (Assume ionization in one step)
453. How many species out of the following have reducing properties?  
 $\text{NH}_3, \text{PH}_3, \text{H}_3\text{PO}_2, \text{H}_3\text{PO}_3, \text{H}_3\text{PO}_4, \text{LiAlH}_4, \text{BH}_3$
454. Alum is found to contain hydrated monovalent cation, trivalent cation and sulphate in the simplest ratio  $x: y: z$  where  $x + y + z =$
455. How many of the following oxides are basic oxides?  
 $\text{CO}_2, \text{SnO}_2, \text{PbO}, \text{PbO}_2, \text{Pb}_3\text{O}_4, \text{Al}_2\text{O}_3$
456.  $\text{CaCO}_3(s) \rightleftharpoons \text{CaO}(s) + \text{CO}_2(g), K = 10^{-9}$  at 300 K. What is  $p_{\text{CO}_2}$ ?
457. Among the following the number of compounds that can react with  $\text{PCl}_5$  to give  $\text{POCl}_3$  is  
 $\text{O}_2, \text{CO}_2, \text{SO}_2, \text{H}_2\text{O}, \text{H}_2\text{SO}_4, \text{P}_4\text{O}_{10}$  is.....
458. Total electrons involved in all the B – H terminal bonds is...
459. A phosphate mineral has formula  $\text{Ca}_x\text{P}_3\text{O}_{12}\text{F}$ . Thus,  $x$  is.....
460. In  $\text{PCl}_5$ , how many (P – Cl) are inclined at  $120^\circ$  with one each?
461. How many of the species are isoelectronic?  
 $\text{N}_2\text{O}, \text{CO}_2, \text{CN}_2^{2-}, \text{N}_3^-, \text{NH}_2\text{OH}, \text{N}_3\text{H}$
462. Inert pair effect is shown by how many elements? Ga, Al, Tl, Pb, Sn, Ge
463. A  $x$  – membered ring is formed in  $(\text{BN})_n$  where  $x$  is .....
464.  $\text{B}_2\text{H}_6$  has B – H terminal bonds and B – H bridging bonds which is equal to
465. In the following, equilibrium partial pressure of  $\text{NH}_3, \text{N}_2$  and  $\text{H}_2$  gases are 4, 1 and 2 atm respectively at 300 K. What is the value of  $K_p$ ?  
 $\text{N}_2(g) + 3\text{H}_2(g) \rightleftharpoons 2\text{NH}_3(g)$
466. How many of the species are paramagnetic?  
 $\text{N}_2\text{O}, \text{NO}, \text{NO}_2, \text{O}_2, \text{NO}_2^+, \text{NO}^+, \text{CO}^+$
467. For the half-cell reaction  
 $M^{2+} + 2e^- \rightarrow M$   
 $E^\circ$  (in volts) are given for different metals
- |      |       |       |       |       |
|------|-------|-------|-------|-------|
| Cu   | Zn    | Fe    | Pb    | Sn    |
| 0.34 | -0.76 | -0.48 | -0.13 | -0.14 |
- How many of these metals can reduce  $\text{Cu}^{2+}$  to Cu?
468.  $\text{Cl}_2(g)$  is to be converted into  $\text{Cl}^-(aq)$  ion. How many steps are involved?
469. In the oxidation of  $\text{N}_2\text{H}_4$  to  $\text{N}_2$ , equivalent weight of  $\text{N}_2\text{H}_4$  would be.....
470. 25.0 mL of 0.05 M solution of  $\text{NH}_2\text{OH}$  was boiled with excess of  $\text{Fe}^{3+}$  in acidic medium. The  $\text{Fe}^{2+}$  formed required 25.0 mL of 0.1 N  $\text{Cr}_2\text{O}_7^{2-}$  in acidic medium. What is the oxidation number of the N in new product?
471.  $\text{NO}_3^-$  is reduced to  $\text{NH}_4^+$ . What is change in oxidation number?
472. How many elements in group 14 are used as semiconductor?
473. Maximum change in oxidation number of nitrogen in



474. Total number of  $\sigma$  and  $\pi$  bonds in carbon suboxide ( $\text{C}_3\text{O}_2$ ) is.....
475. A mixture contains 3 moles of CO and  $\text{CO}_2$ . On passing the mixture over heated charcoal, volume increases to 5 moles. Thus,  $\text{CO}_2$  in the mixture is ..... mole(s)
476. How many of the following have two  $\sigma$  and two  $\pi$  bonds?



11.THE P-BLOCK ELEMENTS

**: ANSWER KEY :**

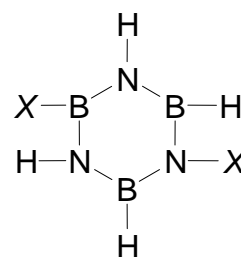
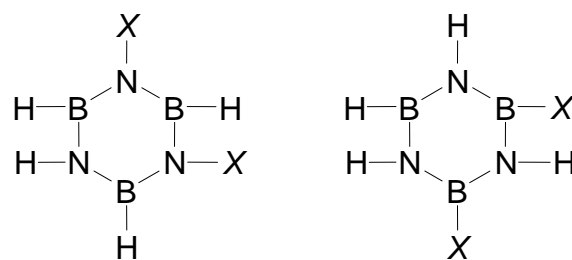
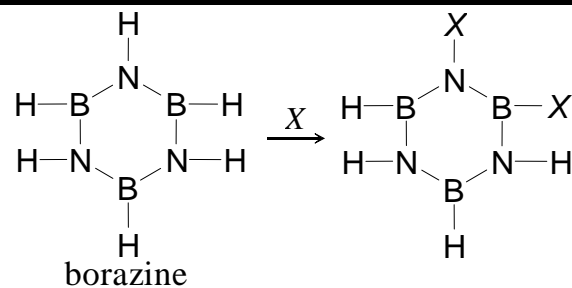
1)	d	2)	c	3)	b	4)	a	189)	a	190)	b	191)	c	192)	c
5)	d	6)	a	7)	c	8)	d	193)	b	194)	d	195)	c	196)	c
9)	a	10)	d	11)	a	12)	a	197)	b	198)	a	199)	b	200)	c
13)	b	14)	d	15)	c	16)	a	201)	b	202)	d	203)	d	204)	c
17)	a	18)	a	19)	c	20)	c	205)	d	206)	d	207)	d	208)	a
21)	c	22)	b	23)	b	24)	a	209)	a	210)	b	211)	c	212)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

17)	a,b	18)	b	19)	a,b,c,d	20)	
	a,b						
21)	a,b,c	22)	b,d	23)	a,b	24)	
	a,b						
25)	b,d	26)	a	27)	a,b,c	28)	
	a,b,c,d						
29)	c,d	30)	a,b,d	31)	a,d	32)	
	a,b,c						
33)	a,b	34)	a,b,c	35)	a,b	36)	
	a,b						
37)	a,b,c,d	38)	a,c	39)	a,b,c,d	40)	d
41)	a,b,d	42)	a,b,c	43)	a,b,c,d	1)	b
	2)		c		3)		d
	3)		d		4)		b
5)	b	6)	a	7)	a	8)	c
9)	a	10)	a	11)	a	1)	a
	2)		a		3)		b
	3)		b		4)		a
5)	d	6)	c	7)	c	8)	b
1)	c	2)	d	3)	c	4)	c
5)	b	6)	b	7)	a	8)	b
9)	b	10)	d	11)	a	12)	c
13)	a,c	14)	b	15)	a	16)	c
1)	4	2)	2	3)	7	4)	3
5)	6	6)	2	7)	1	8)	1
9)	3	10)	6	11)	3	12)	3
13)	1	14)	2	15)	3	16)	2
17)	6	18)	6	19)	2	20)	1
21)	5	22)	6	23)	4	24)	3
25)	6	26)	4	27)	2	28)	9
29)	4	30)	8	31)	5	32)	3
33)	5	34)	5	35)	6	36)	8
37)	2	38)	4	39)	4	40)	3
41)	8	42)	1	43)	8	44)	2
45)	7	46)	8	47)	2	48)	3



## : HINTS AND SOLUTIONS :

- 1 **(d)**  
 $\text{PH}_3 < \text{AsH}_3 < \text{NH}_3$   
 Most volatile least volatile due to H-bonding  
 Electrons
- 9 **(a)**  
 $\text{Ba}(\text{NO}_2)_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HNO}_2$
- 12 **(a)**  
 $\text{SnCl}_2 + 2\text{FeCl}_3 \rightarrow 2\text{FeCl}_2 + \text{SnCl}_4$
- 13 **(b)**  
 $3\text{GaCl} \rightarrow 2\text{Ga} + \text{GaCl}_3$   
 $\uparrow \quad \uparrow$   
 by reduction by oxidation
- 14 **(d)**  
 $\text{C} = \text{C}, \text{C} = \text{O}, \text{C} \equiv \text{N}$
- 17 **(a)**  
 Monobasic acid
- 20 **(c)**  
 $3\text{Ga}^+ \rightarrow 2\text{Ga} + \text{Ga}^{3+}$  (disproportionation)
- 22 **(b)**  
 $\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb}^{2+}$   
 Stability of  $\text{Pb}^{2+} > \text{Pb}^{4+}$ , hence  $\text{Pb}^{4+}$  ( $\text{PbO}_2$ ) is best oxidizing agent
- 23 **(b)**  
 $\text{CO}_2$ :  $180^\circ$   
 $\text{SO}_2$ :  $119^\circ$   
 $\text{CH}_4$ :  $109^\circ 28'$   
 $\text{NH}_3$ :  $107.0^\circ$
- 29 **(d)**  
 $\text{Pb}^{4+} < \text{Pb}^{2+}$   
 Thus,  $\text{PbI}_4$  is not formed
- 36 **(c)**  
 $sp^2$  hybridised B
- 38 **(b)**  
 $\text{N}_2 + \text{O}_2 \rightarrow \text{NO}$
- 41 **(b)**

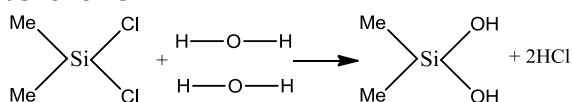


In all four different isomers of B.

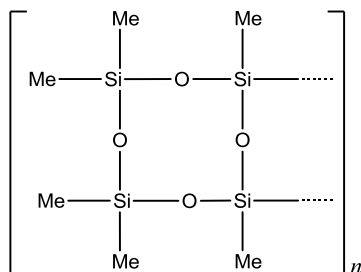
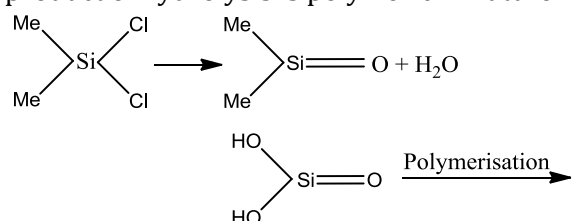
- 42 **(a)**  
 $\text{NH}_4\text{Cl} + \text{NaNO}_3 \rightarrow \text{NH}_4\text{NO}_3 \xrightarrow{\Delta} \text{N}_2\text{O}$  (not  $\text{N}_2$ )
- 46 **(a)**  
 $\text{NH}_4\text{NO}_3 \xrightarrow{\Delta} \text{N}_2\text{O} + 2\text{H}_2\text{O}$   
 $\text{NH}_4\text{NO}_2 \xrightarrow{\Delta} \text{N}_2 + 2\text{H}_2\text{O}$
- 49 **(c)**  
 $\text{N}_2\text{O}_4$  is diamagnetic
- 53 **(d)**  
 $\text{Li} < \text{B} < \text{Be} < \text{C}$
- 56 **(d)**  
 $\text{CaCO}_3$  of Taj Mahal is affected by acid rain making its surface rough (called cancer)
- 58 **(c)**  
 $\text{NaOH}$  dissolves  $\text{Al}(\text{OH})_3$ ;  $\text{Fe}(\text{OH})_3$  remains insoluble  
 $\text{NaOH} + \text{Al}(\text{OH})_3 \rightarrow \text{Na}[\text{Al}(\text{OH})_4]$   
 soluble
- 62 **(b)**  
 $\text{Pb}_3\text{O}_4$  is a double oxide  $\text{PbO}_2 \cdot 2\text{PbO}$   
 $\text{PbO}$  is not affected by  $\text{HNO}_3$   
 $\text{PbO}$  changes to  $\text{Pb}(\text{NO}_3)_2$
- 71 **(a)**

- Al(OH)<sub>3</sub> is precipitated in NH<sub>4</sub>OH medium
- 72 (d)  
Stability of Ga<sup>+</sup> < In<sup>+</sup> < Tl<sup>+</sup>  
Ga<sup>3+</sup> > In<sup>3+</sup> > Tl<sup>3+</sup>  
Due to inert pair effect
- 73 (a)  
K<sub>4</sub>[Fe(CN)<sub>6</sub>] + 6H<sub>2</sub>SO<sub>4</sub> + 6H<sub>2</sub>O  
→ 2K<sub>2</sub>SO<sub>4</sub> + FeSO<sub>4</sub> + 3(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>  
+ 6CO

- 74 (c)  
Me<sub>2</sub>SiCl<sub>2</sub> on hydrolysis will produce Me<sub>2</sub>Si(OH)<sub>2</sub> as follows



MeSi(OH)<sub>2</sub> is unstable compound and it loses water molecule to give Me<sub>2</sub>SiO. 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.

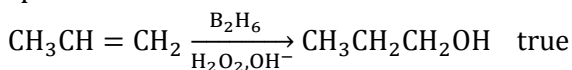


- 76 (b)  
Ligand in complexes, it is a Lewis base  
Ni + 4CO → [Ni(CO)<sub>4</sub>]

- 77 (d)  
2KNO<sub>3</sub>  $\xrightarrow{\Delta}$  2KNO<sub>2</sub> + O<sub>2</sub>

- 78 (d)  
(d) CH<sub>3</sub>COCH<sub>3</sub>  $\xrightarrow{\text{LiAlH}_4}$  CH<sub>3</sub>CH<sub>2</sub>OH + CH<sub>3</sub>OH  
 $\xrightarrow{\text{NaBH}_4}$  X

Thus, reducing action of NaBH<sub>4</sub> and LiAlH<sub>4</sub> is specific - true



1° alcohol

- 79 (c)  
AlCl<sub>3</sub> + H<sub>2</sub>O → Al(OH)<sub>3</sub> + 3HCl ↑

fumes

- 82 (d)  
SO<sub>2</sub> is soluble in H<sub>2</sub>O

- 85 (a)  
B + N<sub>2</sub> → BN  $\xrightarrow{\text{H}_2\text{O}}$  NH<sub>3</sub>  
Al + N<sub>2</sub> → AlN  $\xrightarrow{\text{H}_2\text{O}}$  NH<sub>3</sub>

- 86 (b)  
NH<sub>4</sub>OH + Fe<sup>2+</sup> → Fe<sup>3+</sup> + N<sub>3</sub>H

- 88 (d)  
CO + O<sub>2</sub> → CO<sub>2</sub>

- 89 (b)  
2PCl<sub>5</sub> ⇌ PCl<sub>6</sub><sup>⊖</sup> + PCl<sub>4</sub><sup>⊕</sup>  
Octahedral tetrahedral

- 92 (b)  
Due to tetravalent nature of carbon

- 97 (d)  
HF can't be stored in glass bottles

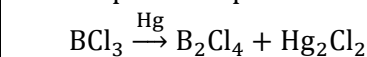
- 99 (a)  
Oxide + Na<sub>2</sub>CO<sub>3</sub> →  
Since carbonate is decomposed by oxide, forming CO<sub>2</sub> thus, oxide is acidic in nature, and thus is oxide that of non-metal

- 103 (d)  
6NaOH + B<sub>2</sub>H<sub>6</sub> → 2Na<sub>3</sub>BO<sub>3</sub> + 6H<sub>2</sub>

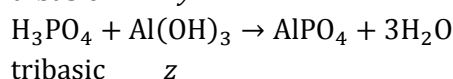
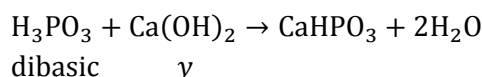
- 109 (d)  
Due to inert-pair effect stability of +2 oxidation state increases and that of +4 oxidation state decreases along a group 14

- 110 (a)  
PI<sub>3</sub> + 3H<sub>2</sub>O → H<sub>3</sub>PO<sub>3</sub> + HI  
Dibasic monobasic

- 125 (d)  
There is free rotation about (B - B) bond and in liquid and gaseous state B<sub>2</sub>Cl<sub>4</sub> exists as non-eclipsed and planar structure



- 126 (d)  
H<sub>3</sub>PO<sub>2</sub> + NaOH → NaH<sub>2</sub>PO<sub>2</sub> + 2H<sub>2</sub>O  
1 x  
monobasic



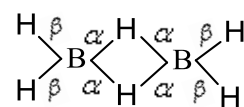
Thus, x : y : z = 1 : 1 : 1

- 128 (b)  
Pb(NO<sub>3</sub>)<sub>2</sub>  $\xrightarrow{\Delta}$  2NO<sub>2</sub> + PbO

- 130 (a)  
PCl<sub>3</sub> + 3H<sub>2</sub>O → H<sub>3</sub>PO<sub>3</sub> + 3HCl

- 133 (d)  
 $\text{Al(OH)}_3 + \text{NaOH} \rightarrow \text{Na[Al(OH)}_4\text{]}$
- 138 (b)  
 $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightleftharpoons \text{CO}_3^{2-} + 2\text{H}^+$   
 $2\text{Al}^{3+} + 3\text{CO}_3^{2-} + 3\text{H}_2\text{O} \rightarrow 2\text{Al(OH)}_3 + 3\text{CO}_2$
- 140 (c)  
 $\text{CHCl}_3 + \text{O}_2 \rightarrow \text{COCl}_2 + \text{HCl}$   
 phosgene
- 142 (a)  
 $\text{BF}_4^-$  – tetrahedral  
 $\text{SF}_4$ :  $sp^3d$  (one lone pair)  
 $\text{XeF}_4$ :  $sp^3d^2$  (two lone pairs)  
 $[\text{Ni(CN)}_4]^{2-}$ :  $dsp^2$
- 147 (d)  
 (a) ( $M - \text{H}$ ) bond energy decreases – true  
 (b)  $\text{MX}_3$  is electron-deficient and thus is a Lewis acid – true  
 (c)  $\text{Al}^{3+}$  is hydrated due to +3 charge and smaller cationic size – true
- 150 (a)  
 Central boron atom in  $\text{H}_3\text{BO}_3$  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,  $\text{H}_3\text{BO}_3$  is a monobasic weak Lewis acid.  
 $\text{H}_2\text{O} + \text{B(OH)}_3 \rightarrow [\text{B(OH)}_4]^- + \text{H}^+$   
 base      acid
- 151 (c)  
 $(\text{NH}_4)_2\text{SO}_4 \xrightarrow{\text{H}_2\text{O}} \text{NH}_4\text{OH} + \text{H}_2\text{SO}_4$   
 weak base      strong acid
- 156 (b)  
 $2\text{H}_3\text{BO}_3 \rightarrow \text{B}_2\text{O}_3 + 3\text{H}_2\text{O}$
- 158 (b)  
 $\text{NH}_3 + \text{NaOCl} \rightarrow \text{NaOH} + \text{NH}_2\text{Cl}$   
 $\text{NH}_2\text{Cl} + \text{NH}_3 \rightarrow \text{NH}_2\text{NH}_2 + \text{HCl}$
- 163 (a)  
 $\text{NH}_3$  is protonated most easily  
 Thus,  $\Delta G^\circ$  is most negative
- 166 (d)  
 $\text{PbCl}_2, \text{PbSO}_4$  – Insoluble  
 $\text{CH}_3\text{COOH}$  does not react  
 $\text{Pb(NO}_3)_2$  – soluble
- 168 (d)  
 All these noble metals soluble in aqua regia  
 (1 part  $\text{HNO}_3$  (conc) 3 parts  $\text{HCl}$  (conc))
- 170 (a)  
 $\text{B}_2\text{H}_6$  has two types of bonds  
 $\alpha$ : formed by sharing of one electron between B

and H  
 $\beta$ : formed by sharing of two electrons between B and H  
 Bond length  $\alpha > \beta$

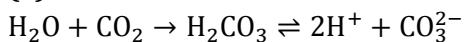


- 171 (d)  
 There is no repulsion, thus bond angle of  $109^\circ 28'$  is retained
- 175 (a)  
 $\text{NH}_4\text{NO}_2 \xrightarrow{\Delta} \text{N}_2 + 2\text{H}_2\text{O}$
- 176 (a)  
 $\text{B(OH)}_3 + \text{NaOH} \rightleftharpoons \text{NaBO}_2 + \text{Na}^+[\text{B(OH)}_4]^- + \text{H}_2\text{O}$   
 This reaction is reversible reaction because sodium metaborate,  $\text{Na}^+[\text{B(OH)}_4]^-$  formed by the reaction between  $\text{B(OH)}_3$  and  $\text{NaOH}$  gets hydrolysed to regenerate  $\text{B(OH)}_3$  and  $\text{NaOH}$ .  
 $\text{Na}^+[\text{B(OH)}_4]^- \xrightarrow{\text{Hydrolysis}} \text{NaOH} + \text{B(OH)}_3$   
 If some quantity of polyhydroxy compounds like *cis*-1, 2-diol, catechol, glycerol etc is added to the reaction mixture then the  $\text{B(OH)}_3$  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.
- 178 (c)  
 $\text{CaC}_2 \rightleftharpoons \text{Ca}^{2+} + \text{C}_2^{2-}$
- 182 (a)  
 The important ore of tin is cassiterite ( $\text{SnO}_2$ ). Tin is extracted from cassiterite ore by carbon reduction method in a blast furnace.  
 $\text{SnO}_2 + 2\text{C} \rightarrow \text{Sn} + 2\text{CO}$   
 The product often contain traces of iron which is removed by blowing air through the melt to oxidise to  $\text{FeO}$  which then floats to the surface.  
 $2\text{Fe} + \text{O}_2 \rightarrow 2\text{FeO}$ .
- 188 (d)  
 $4\text{NaOH} + \text{Si} \rightarrow \text{Na}_4\text{SiO}_4 + 2\text{H}_2$
- 190 (b)  
 Ag and Au are extracted by this method
- 191 (c)  
 $\text{NH}_4\text{Cl} + \text{NaAlO}_2 + \text{H}_2\text{O} \rightarrow \text{NaCl} + \text{Al(OH)}_3 + \text{NH}_3$
- 194 (d)  
 Artificial diamond
- 195 (c)  
 Acid salts have ionisable  $\text{H}^+$  and can further react

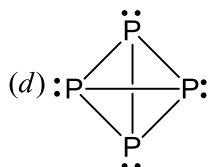
with base forming next series of salts

Salts		Normal salt	Acid salt
H <sub>3</sub> PO <sub>2</sub>	monobasic	NaH <sub>2</sub> PO <sub>2</sub>	NaH <sub>2</sub> PO <sub>3</sub>
H <sub>3</sub> PO <sub>3</sub>	dibasic	Na <sub>2</sub> HPO <sub>3</sub>	NaH <sub>2</sub> PO <sub>4</sub>
H <sub>3</sub> PO <sub>4</sub>	tribasic	Na <sub>3</sub> PO <sub>4</sub>	Na <sub>2</sub> HPO <sub>4</sub>
H <sub>2</sub> CO <sub>3</sub>	dibasic	Na <sub>2</sub> CO <sub>3</sub>	NaHCO <sub>3</sub>

198 (a)



205 (d)



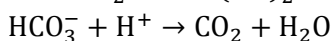
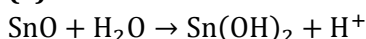
Each P-atom is sp<sup>3</sup> hybridised

Thus, p-character is 75%

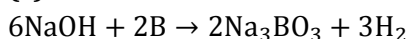
206 (d)

N<sub>2</sub>O<sub>5</sub>, HNO<sub>3</sub> have N-atom with +5 oxidation number

209 (a)



213 (c)



218 (b)

Charge

Two Si<sup>4+</sup> +8

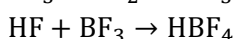
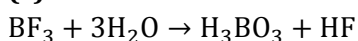
Seven O<sup>2-</sup> -14

Si<sub>2</sub>O<sub>7</sub><sup>6-</sup>

220 (c)

Coloured cations are detected

222 (c)



223 (a)

It is weak monobasic acid

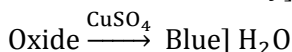
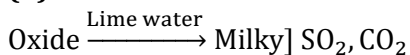
226 (b)

Due to vacant electrons

228 (d)

(CO + N<sub>2</sub>)

234 (d)

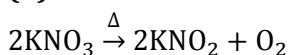


Oxide → pH > 9] Na<sub>2</sub>O

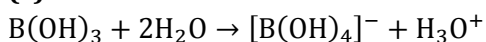
241 (b)

Na<sub>2</sub>SiO<sub>3</sub>, CaSiO<sub>3</sub>

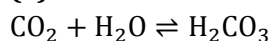
247 (d)



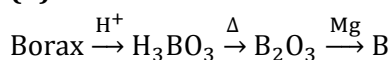
249 (c)



252 (a)



257 (d)



260 (a)

SiC – Covalent

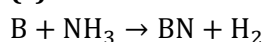
263 (b)

NO and NO<sub>2</sub> have unpaired electrons, thus paramagnetic

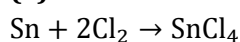
271 (d)

All being trivalent

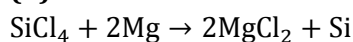
274 (c)



276 (a)



277 (d)



278 (a)

B(OH)<sub>3</sub> and [B(OH)<sub>4</sub>]<sup>-</sup>

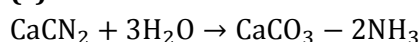
288 (d)

Due to inert-pair effect

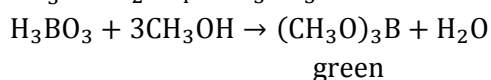
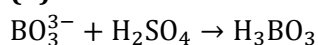
Pb<sup>2+</sup> > Pb<sup>4+</sup>

Sn<sup>4+</sup> > Sn<sup>2+</sup>

289 (c)



291 (b)

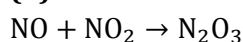


293 (d)

N<sub>2</sub>O: 14 + 8 = 22

N<sub>3</sub><sup>-</sup>: 21 + 1 = 22

294 (b)



296 (c)

Hydration is an exothermic process

302 (c)

I. H<sub>2</sub>PO<sub>2</sub> is monobasic acid forming NaH<sub>2</sub>PO<sub>2</sub>

II. H<sub>2</sub>F<sub>2</sub> forms two series of salts KHF<sub>2</sub> and K<sub>2</sub>F<sub>2</sub>

Thus, dibasic acid

III. H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> is dibasic acid

IV.  $\begin{array}{l} \text{CH}_2\text{NH}_2 \leftarrow \text{basic} \\ | \\ \text{COOH} \leftarrow \text{acidic} \end{array}$  Thus, amphoteric.

305 (a)

ON

H<sub>3</sub>PO<sub>3</sub> +3

HBO<sub>2</sub> +3

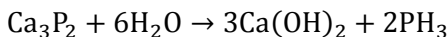
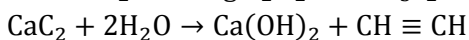
306 (d)

Graphite is present in lead pencils

307 (b)

Holme's signals are used to guide the ships.

Containers with holes and filled with  $\text{CaC}_2$  and  $\text{Ca}_3\text{P}_2$  are thrown into sea water. Water reacts with  $\text{CaC}_2$  forming  $\text{C}_2\text{H}_2$  and  $\text{Ca}_3\text{P}_2$  forming  $\text{PH}_3$

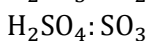
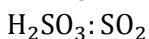
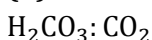


$\text{PH}_3$  further reacts with  $\text{H}_2\text{O}$  and burns with flame which further ignites  $\text{C}_2\text{H}_2$  and flame in the form of torch is helpful in guiding the ways to missing ships

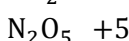
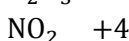
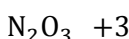
310 (b)

Ionic compounds have high m.p. and high b.p.

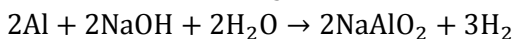
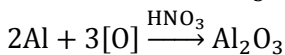
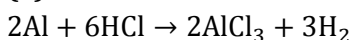
311 (b)



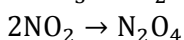
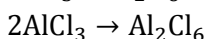
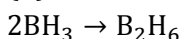
314 (a)



316 (a)



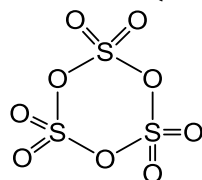
317 (d)



$\text{BH}_3$ ,  $\text{AlCl}_3$  and  $\text{NO}_2$ , are all electron-deficients, hence dimer formation takes place

318 (d)

There is no (S – S) bond in  $\text{S}_3\text{O}_9$

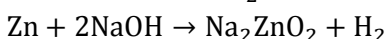
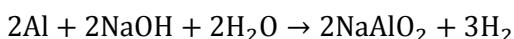


320 (c)

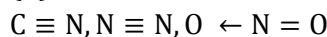
Since Si – H and Si – D bonds are not affected, hence hydrolysis takes place at equal rates

323 (c)

$\text{NaOH}$  reacts with  $\text{Al}$  and  $\text{Zn}$  both thus cannot be stored in the vessel made of  $\text{Al}$  or  $\text{Zn}$



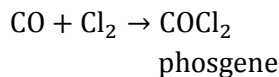
325 (d)



327 (a)

In this process, molten zinc is added to mineral when silver is extracted into zinc in larger quantity than lead

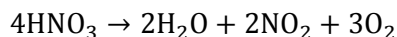
330 (b)



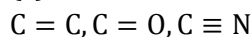
333 (b)

$\text{H}_2\text{PbCl}_6$  is formed

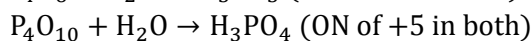
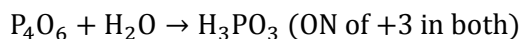
334 (b)



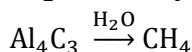
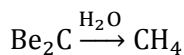
338 (c)



343 (c)

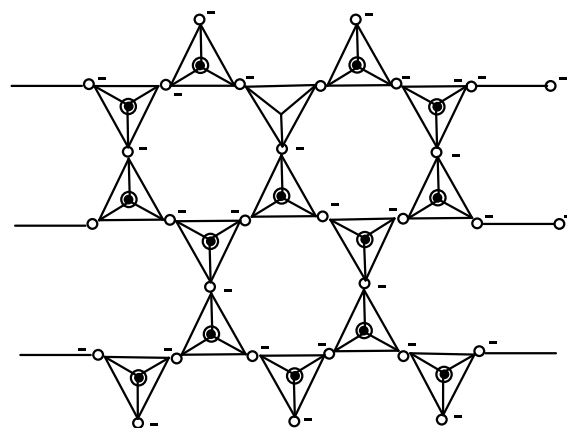


346 (d)

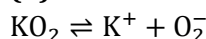


349 (b)

The structure of silicates has been found with the help of X-ray diffraction technique. All silicates have tetrahedral  $\text{SiO}_4^{4-}$  ion as a basic building unit *i. e.*, all silicates are composed of many units. Tetrahedral shape of  $[\text{SiO}_4]^{4-}$  ion is due to  $sp^3$ -hybridisation of Si-atom. Sheet silicates are formed when three oxygen atoms (bridging O-atoms) of each  $(\text{SiO}_4)^{4-}$  unit are shared. Hence, the general formula of sheet silicates is  $(\text{Si}_2\text{O}_5)^{2n-}$



350 (d)



$\text{O}_2^-$  (superoxide) is paramagnetic

359 (a,b,c)

$\text{SiO}_2$  exists in quartz, tridymite and cristobalite forms and each of these have a different structure

- at high and low temperatures
- 365 **(a,c,d)**  
B, Al and Ga show a characteristic oxidation state of +3. Tl shows +1 oxidation state which is more stable than +3 oxidation state
- 372 **(b,d)**  
Conc.  $\text{H}_2\text{SO}_4$  acts as a dehydrating agent. Oxalic acid on dehydration will give CO and  $\text{CO}_2$
- $$\text{COOH} \xrightarrow[\text{conc H}_2\text{SO}_4]{\Delta} \text{CO} + \text{CO}_2 + \text{H}_2\text{O}$$
- COOH
- 381 **(a,d)**  
CO has the structure  $\text{C} \equiv \text{O}$ . Water gas is a mixture of CO and  $\text{H}_2$ . It acts as reducing agent as
- $$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$$
- $$\text{CuO} + \text{CO} \rightarrow \text{Cu} + \text{CO}_2$$
- 391 **(a,b,d)**  
Tin (II) chloride,  $\text{SnCl}_2$  is a reducing agent. Therefore, it can form colloidal gold from gold salt solution
- 394 **(b)**  
 $\text{B}_2\text{H}_6 + 6\text{H}_2\text{O} \rightarrow 2\text{H}_3\text{BO}_3 + 6\text{H}_2$
- $$\text{B}_2\text{H}_6 + \text{NH}_3 (\text{excess}) \rightarrow \text{B}_2\text{H}_6 \cdot 2\text{NH}_3$$
- $$\text{B}_2\text{H}_6 + \text{NH}_3 (\text{excess}) \rightarrow \text{Boron nitride}$$
- 395 **(c)**  
Si-Si bonds are weaker than Si-O bonds and Si has no tendency to form double bonds with itself
- 396 **(d)**  
Increased stability of lower valent states on descending a group is illustrated by the facts that  $\text{Ge}^{2+}$  and  $\text{Sn}^{2+}$  are strong reducing agents
- 397 **(b)**  
 $\text{BF}_3 + \text{H}_2\text{O} \rightarrow \text{H}[\text{BF}_3\text{OH}]$
- $$\text{BF}_3 + 3\text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_3 + 3\text{HF}$$
- Since B has 6 electrons in the outer shell in  $\text{BF}_3$  molecules, it can readily accept a lone pair of electrons from a donor atom
- 398 **(b)**  
White P exists as discrete  $\text{P}_4$  tetrahedral molecule having P-P-P bond angle  $60^\circ$ . Hence, molecule is under strain and more reactive while red P exists

as  $\text{P}_4$  tetrahedral joined together through covalent bonds giving polymeric structure.

- 399 **(a)**  
Catenation means the tendency of an element to form chains of identical atoms which is pronounced in sulphur among chalcogens.
- 400 **(a)**  
The ignition temperature of white P is low (about  $30^\circ\text{C}$ ) in air. It readily catches fire giving dense fumes of phosphorous pentoxide. It is therefore kept in water.
- 401 **(c)**  
Calcium carbide on hydrolysis gives acetylene. Calcium carbide contains  $\text{C}_2^{2-}$  anion
- 402 **(a)**  
In Ga, 10-d electrons in penultimate shell shield the nucleus less effectively, the outer electrons are held firmly by the nucleus. As a result, the ionisation energy remains nearly the same as that of aluminium in spite of the fact that atomic size increases.
- 403 **(a)**  
The compound of oxygen and fluorine is more electronegative than oxygen fluorides as fluorine is more electronegative than oxygen
- 404 **(a)**  
Liquid ammonia has a large heat of vaporization (0.327 cal/g). It is therefore used in ice plants.
- 413 **(c)**  
Boric acid is a Lewis acid, Boron possesses  $sp^2$  hybridisation and their molecules are held together by hydrogen bonding
- 414 **(d)**  
Only one electron pair of pyridine can be accommodated not two electron pairs