

## Some P-Block Elements

### LEVEL - I

#### General Introduction, Electronic Configuration, Occurrence, Variation of Properties, Oxidation States, Trends in Chemical Reactivity

- The most abundant metal in earth's crust is**
  - 1) Oxygen
  - 2) Aluminium
  - 3) Iron
  - 4) Silicon
- The rare element of the IIIA group elements is**
  - 1) Aluminium
  - 2) Boron
  - 3) Gallium
  - 4) Indium
- The atomic volume of which element is least**
  - 1) Boron
  - 2) Aluminium
  - 3) Gallium
  - 4) Thallium
- Al and Ga have nearly the same covalent radii, because of**
  - 1) Greater shielding effect of 's' electrons of 'Ga' atoms
  - 2) Poor shielding effect of 's' electrons of 'Ga' atoms
  - 3) Poor shielding effect of 'd' electrons of 'Ga' atoms
  - 4) Greater shielding effect of 'd' electrons of 'Ga' atoms
- Among IIIA group elements the elements with highest and lowest ionisation potential are**
  - 1) B, Tl
  - 2) B, In
  - 3) B, Al
  - 4) B, Ga
- IIIA group element with lowest electro- negativity**
  - 1) Al
  - 2) Tl
  - 3) B
  - 4) Ga
- The IIIA element with highest melting point is**
  - 1) Boron
  - 2) Gallium
  - 3) Indium
  - 4) Thallium
- The IIIA element with least melting point is**
  - 1) Boron
  - 2) Indium
  - 3) Gallium
  - 4) Aluminium
- Which of the following does not exhibit inert pair effect?**
  1. Bi
  2. Pb
  3. B
  4. Tl

10. +1 oxidation state is stable for the element

- 1) B                      2) Al                      3) Ga                      4) Tl

11. Thallous chloride is more stable than Thallic chloride because of

- 1) More ionic character  
2) Larger size of  $Tl^+$  ion  
3) High hydration energy of  $Tl^+$  ion  
4) Inert pair effect

12. Which reacts with acids as well as alkalies?

- 1) Mg                      2) Si                      3) Al                      4) Cu

13. Element with giant molecular structure is

- 1) B                      2) Al                      3) Ga                      4) Tl

14. The abundance of B, Al, Ga and Tl in earth crust follows the order

- 1)  $B < Al < Ga < Tl$                       2)  $Tl < B < Al < Ga$   
3)  $Tl < Al < B < Ga$                       4)  $Tl < Ga < B < Al$

15. Melting point of B, Al, Ga and Tl decreasing in the order

- 1)  $B > Al > Tl > Ga$                       2)  $B = Al > Tl = Ga$   
3)  $B > Al > Tl = Ga$                       4)  $Tl > Ga > Al > B$

16. An element M reacts with chlorine to form a compound 'X'. The bond angle in 'X' is. What is 'M'?

1. Be                      2. B  
3. Mg                      4. N

17. The hybridization of central atom in compound  $AlCl_3$  is

1. SP                      2.SP<sup>2</sup>                      3.SP<sup>3</sup>                      4. SP<sup>3</sup>d

18. (A) : Among IIIA group elements Boron has highest melting point.

(R) : Boron has giant polymeric structure.

The correct answer is

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**19. Assertion (A):**  $TiCl_3$  acts as a good oxidant.

**Reason (R):**  $Ti^{+3}$  is less stable than  $Ti^+$ .

The correct answer is

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**20. The increasing order of acidic nature of  $B_2O_3$ ,  $Al_2O_3$ ,  $In_2O_3$  and  $Tl_2O$  is**

- 1)  $Al_2O_3 < In_2O_3 < Tl_2O < B_2O_3$
- 2)  $Tl_2O < In_2O_3 < Al_2O_3 < B_2O_3$
- 3)  $Al_2O_3 < B_2O_3 < In_2O_3 < Tl_2O$
- 4)  $Tl_2O < Al_2O_3 < Br_2O_3 < In_2O_3$

**21. The maximum covalency of Aluminium is '6' where as that of Boron is '4', because**

- 1) Aluminium is more electropositive than Boron.
- 2) 'Al' can form a cation where as Boron cannot.
- 3) 'Al' contains vacant 'd' orbitals in its valence shell where as Boron does not.
- 4) 'Al' is a metal where as Boron is a non metal.

**Anomalous Properties of First Element of the Group: Boron, Some Important Compounds, Borax, Boric Acid, and Boron Hydrides.**

**22. The non metallic element present in the mineral cryolite is**

- 1) F
- 2) Cl
- 3) Br
- 4) I

23. The chemical formula of Felspar is

- 1)  $KAlSi_3O_8$       2)  $Na_3AlF_6$       3)  $NaAlO_2$       4)  $K_2SO_4Al_2(SO_4)_3 \cdot 4Al(OH)_3$

24. The maximum covalency of Boron is

- 1) 4      2) 3      3) 6      4) 5

25. The maximum covalency of Aluminium is

- 1) 3      2) 3      3) 6      4) 5

26. Aluminium exhibits diagonal relationship with

- 1) Beryllium      2) Silicon      3) Carbon      4) Germanium

27. Which element cannot form a complex cation?

- 1) Al      2) B      3) Cs      4) Bi

28.  $Al_2O_3$  is

- 1) Neutral      2) Amphoteric      3) Basic      4) Acidic

29. Basicity of  $H_3BO_3$  is

- 1) 1      2) 2      3) 3      4) 0

30. When borax is heated strongly it gives

1.  $B_2O_3$       2.  $Na_2B_4O_7$       3.  $NaBO_2$       4.  $NaBO_2 + B_2O_3$

31. Borax glass is a mixture of

- 1)  $NaBO_2 + B_2O_3$       2)  $Na_2B_4O_7 + B_2O_3$       3)  $H_2B_4O_7 + B_2O_3$       4)  $Na_2B_4O_7 + 10H_2O + B_2O_3$

32. Borax bead test is responded by:

1. Divalent metals      2. Heavy metals  
3. Light metal      4. Metals which form coloured metaborates

33. Borax bead test is not given by

- 1) Aluminium salt      2) Cobalt salt      3) Copper      4) Nickel salt

34. The colour of  $Co(BO_2)_2$  is

1. Blue      2. Green      3. Yellow      4. Violet

- 35. The metal that does not give the borax bead test**  
1. Chromium      2. Nickel      3. Lead      4. Manganese
- 36. The coloured bead produced when borax is heated with Cu is**  
1. Greenish      2. Green when hot & blue when cold      3. Yellow      4. Red
- 37. In Borax bead test, which compound of the bead reacts with basic radical to form metaborate?**  
1)  $B_2O_3$       2)  $Na_2BO_3$       3)  $NaBO_2$       4)  $Na_2B_4O_7 \cdot 10H_2O$
- 38. Which of the following are the uses of borax?**  
1) As a flux in metallurgy  
2) In making Pyrex glass  
3) In leather industry for cleaning  
4) As a preservative  
1) a, b, c only      2) b, c, d only      3) a, b, d only      4) a, b, c, d
- 39. Borax is used in**  
1. Qualitative analysis      2. Welding  
3. Pyrex glass      4. All
- 40. Total number of electrons involved in the formation of diborane molecule are**  
1) 18      2) 12      3) 6      4) 3
- 41. The non planar molecule among the following is**  
1)  $B_2H_6$       2)  $C_2H_4$       3)  $C_6H_6$       4)  $BCl_3$
- 42. In diborane the hybridization of Boron is**  
1) sp      2)  $sp^2$       3)  $sp^3$       4)  $sp^3d$
- 43. The total number of vacant orbitals involved in bond formation in diborane is**  
1) 2      2) 3      3) 4      4) 6
- 44. The H-B-H bridged angle in diborane is**  
1)  $121.5^\circ$       2)  $97^\circ$       3)  $119^\circ$       4)  $133^\circ$

45. The number of three centered, 2 electron bonds in diborane is  
1) 2                      2) 4                      3) 3                      4) 6
46. Total number of electrons shared between two Boron atoms in  $B_2H_6$  are  
1) 2                      2) 3                      3) 4                      4) 6
47. The bonds not present in diborane are  
1) B-H                      2) B-H-B                      3) B-B                      4) H-B-H
48. The number of bridge hydrogen atoms in diborane is  
1) 1                      2) 2                      3) 3                      4) 4
49. The maximum number of atoms present in the same plane in diborane molecule is  
1) 2                      2) 6                      3) 4                      4) 3
50. The following cannot be obtained from diborane  
1)  $B_2O_3$                       2)  $H_3BO_3$                       3)  $B_2(CH_3)_6$                       4)  $B_2H_2(CH_3)_4$
51. The number of hydrogen atoms that can be replaced by methyl groups in diborane is  
1) 2                      2) 3                      3) 4                      4) 6
52. Diborane on hydrolysis gives  
1)  $B_2O_3$                       2)  $H_3BO_3$                       3)  $HBO_2$                       4)  $B_2N_3H_6$
53. Diborane reacts with carbon monoxide to form  
1)  $BH_3 \cdot CO$                       2)  $B_3N_3H_6$                       3)  $H_3BO_3$                       4)  $B_2C_2H_2$
54. The empirical formula of 'X' in the following reaction  $B_2H_6 + NH_3 \rightarrow X$   
1)  $B_2NH$                       2)  $BNH_2$                       3)  $BNH$                       4)  $CH$
55. Which is not correct for  $H_3BO_3$ ?  
1. It is used as antiseptic  
2. As preservative of foods

3. It gives green colour to flame

4. All are correct

56.  $\text{Na}_2\text{B}_4\text{O}_7 + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{A}$  **The compound A is**

1) Orthoboric acid

2) Metaboric Acid

3) Tetra Boric Acid

4) Pyroboric acid

57. **Orthoboric acid when heated to red hot gives**

1. Metaboric acid

2. Pyroboric acid

3. Boron and water

4. Boric anhydride

58. **Assertion (A): Diborane has two types of hydrogen's.**

**Reason (R): By methylation only four hydrogen atoms of diborane are substituted forming.**

1. Both A and R are true and R is correct explanation of A.

2. Both A and R are true and R is not correct explanation of A.

3. A is true but R is false.

4. A is false but R is true.

59. **Statements regarding  $\text{B}_2\text{H}_6$**

i) It reacts with  $\text{NH}_3$  to form diammoniate of diborane.

ii) It has two 3-centered - 2- electron bonds.

iii) It does not have any action with chlorine.

**The correct statements in above are**

1) iii is only correct

2) ii and iii are correct

3) i and ii are correct

4) i and iii are correct

60. **In diborane the Tau-bonds can be formed by the overlapping of orbitals**

1)  $\text{sp}^3\text{-s-sp}^3$

2)  $\text{sp}^3\text{-sp}^3$

3)  $\text{sp}^2\text{-sp}^3$

4)  $\text{sp}^2\text{-s-sp}^2$

61. **Orthoboric acid contains**

1. Pyramidal units

2. Linear units

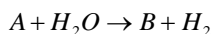
3. T-shaped units

4. Triangular units

62. Which of the following is not a lewis acid?

- 1)  $\text{BF}_3$                       2)  $\text{AlCl}_3$                       3)  $\text{PH}_3$                       4)  $\text{BCl}_3$

63.  $\text{BCl}_3 + \text{LiAlH}_4 \rightarrow \text{A} + \text{LiCl} + \text{AlCl}_3$



$\text{B} \xrightarrow{\text{Red heat}} \text{C}$  In this reaction sequence A, B, and C compounds respectively are

- 1)  $\text{B}_2\text{H}_6, \text{B}_2\text{O}_3, \text{B}$       2)  $\text{B}_2\text{H}_6, \text{H}_3\text{BO}_3, \text{B}_2\text{O}_3$       3)  $\text{B}_2\text{H}_6, \text{H}_3\text{BO}_3, \text{B}$       4)  $\text{HBF}_4, \text{H}_3\text{BO}_3, \text{B}_2\text{O}_3$

64. The structure of diborane contains

- 1) Four 2c- 2e bonds and two 3c-2e bonds  
 2) Two 2c- 2e bonds and four 3c-2e bonds  
 3) Two 2c- 2e bonds and two 3c-2e bonds  
 4) Four 2c- 2e bonds and four 3c-2e bonds

65. Banana bonds in Diborane constitute

- 1) 2 atoms and 3 electrons  
 2) 3 atoms and 2 electrons  
 3) 2 atoms and 2 electrons  
 4) 2 atoms and 4 electrons

66. The number of sigma and pi() bonds present in 'inorganic benzene' respectively are:

- 1) 12, 6                      2) 6, 6                      3) 6, 12                      4) 12, 3

67. Specify the co-ordination geometry around and hybridization of N and B atoms in a 1: 1 complex of  $\text{BF}_3$  and  $\text{NH}_3$

- 1) N: tetrahedral,  $\text{sp}^3$ ; B: tetrahedral,  $\text{sp}^3$   
 2) N: pyramidal,  $\text{sp}^3$ ; B: pyramidal,  $\text{sp}^3$   
 3) N: pyramidal,  $\text{sp}^3$ ; B: planar,  $\text{sp}^3$



4) N: pyramidal,  $sp^3$ ; B: tetrahedral,  $sp^3$

**68. Electro negativity of group 13 elements follows the order**

- 1)  $B > Ga > Al > Tl > In$
- 2)  $B > Tl > Ga > Al > In$
- 3)  $B > Tl > In > Ga > Al$
- 4)  $B > Al > Tl > In > Ga$

**Aluminium: Uses, Reactions with Acids and Alkalies.**

**69. Bauxite is an oxide mineral of**

1. Barium                      2. Boron                      3. Bismuth                      4. Aluminium

**70. Which is not a mineral of aluminium?**

1. Anhydrite                      2. Bauxite  
3. Corundum                      4. Diaspore

**71. Kernite is a mineral containing**

1. Aluminium                      2. Gallium                      3. Boron                      4. Silicon

**72. The important source of boron is**

1. Calamine                      2. Carnalite                      3. Colemanite                      4. Croylite

**73. Heating an aqueous solution of aluminium chloride to dryness will give**

- 1)  $AlCl_3$                       2)  $Al_2Cl_6$                       3)  $Al_2O_3$                       4)  $Al(OH)Cl_2$

**74. During electrolytic reduction of Alumina the reaction at cathode is**

- 1)  $2H_2O_2 \rightarrow O_2 + 4H^+ + 4e^-$                       2)  $3F^- \rightarrow 3F + 3e^-$   
3)  $Al^{+3} + 3e^- \rightarrow Al$                       4)  $2H^+ + 2e^- \rightarrow H_2$

75. X reacts with aqueous NaOH solution to form Y and H<sub>2</sub>. Aqueous solution of Y is heated to 323–333 K and on passing CO<sub>2</sub> into it, Na<sub>2</sub>CO<sub>3</sub> and Z were formed.

When Z is heated to 1200°C, Al<sub>2</sub>O<sub>3</sub> is formed. X, Y and Z respectively are:

- 1) Al, AlCl<sub>3</sub>, NaAlO<sub>2</sub>                      2) Zn, Na<sub>2</sub>ZnO<sub>2</sub>, Al (OH)<sub>3</sub>  
3) Al, Al (OH)<sub>3</sub>, AlCl<sub>3</sub>                      4) Al, NaAlO<sub>2</sub>, Al (OH)<sub>3</sub>

76. In metallurgy the substance which can act as de-oxidizer is

- 1) B                      2) Al<sub>2</sub>O<sub>3</sub>                      3) AlN                      4) Al

77. Duralumin is an alloy of

- 1) Al + Mg                      2) Al+Cu+Mg+Mn                      3) Al+Zn+Mg+Ni                      4) Al + Cu

78. AlO<sup>-2</sup> ion in aqueous solution exists as

- 1) [Al(OH)<sub>4</sub>]<sup>-</sup>                      2) [Al(OH)<sub>4</sub>.H<sub>2</sub>O]<sup>-</sup>                      3) [Al(OH)<sub>4</sub>(H<sub>2</sub>O)<sub>2</sub>]<sup>-</sup>                      4) [Al(OH)<sub>6</sub>]<sup>-</sup>

79. The aqueous solution of borax turns red litmus to

1. Blue                      2. No Change                      3. Red                      4. White

80. Orthoboric acid when heated to red hot gives

1. Metaboric acid                      2. Pyroboric acid                      3. Boron and water                      4. Boric anhydride

81. The hybridization of boron atom in orthoboric acid is

1. sp                      2.sp<sup>2</sup>                      3.sp<sup>3</sup>                      4.sp<sup>3</sup>d

82. Some statements about the structure of diborane are given below.

A) NMR and RAMAN spectral studies have confirmed that four hydrogens of diborane are one type and remaining two are of another type.

B) Electron diffraction studies have shown that diborane contains two coplanar groups.

C) Diborane is a planar molecular.

D) Boron of diborane undergoes hybridization.

The correct statements are

- 1) Only A, B, C    2) Only A and B    3) Only B, C, D    4) All are correct

**83. Assertion (A): Diborane has two types of hydrogen's.**

**Reason (R): By methylation only four hydrogen atoms of diborane are substituted forming.**

1. Both A and R are true and R is correct explanation of A.
2. Both A and R are true and R is not correct explanation of A.
3. A is true but R is false.
4. A is false but R is true.

**KEY**

- |       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1) 2  | 2) 4  | 3) 1  | 4) 3  | 5) 2  | 6) 1  | 7) 1  | 8) 3  | 9) 3  | 10) 4 |
| 11) 4 | 12) 3 | 13) 1 | 14) 4 | 15) 1 | 16) 2 | 17) 2 | 18) 1 | 29) 1 | 20) 2 |
| 21) 3 | 22) 4 | 23) 1 | 24) 1 | 25) 3 | 26) 1 | 27) 2 | 28) 2 | 29) 1 | 30) 4 |
| 31) 1 | 32) 4 | 33) 1 | 34) 1 | 35) 3 | 36) 3 | 37) 1 | 38) 4 | 39) 4 | 40) 2 |
| 41) 1 | 42) 3 | 43) 1 | 44) 2 | 45) 1 | 46) 3 | 47) 3 | 48) 2 | 49) 2 | 50) 3 |
| 51) 3 | 52) 2 | 53) 1 | 54) 2 | 55) 4 | 56) 1 | 57) 4 | 58) 1 | 59) 3 | 60) 1 |
| 61) 4 | 62) 3 | 63) 2 | 64) 1 | 65) 2 | 66) 4 | 67) 1 | 68) 3 | 69) 4 | 70) 1 |
| 71) 1 | 72) 3 | 73) 3 | 74) 3 | 75) 4 | 76) 4 | 77) 2 | 78) 3 | 79) 1 | 80) 4 |
| 81) 2 | 82) 2 | 83) 1 |       |       |       |       |       |       |       |

## 14<sup>TH</sup> GROUP ELEMENTS

### General Introduction, Electronic Configuration, Occurrence, Variation of Properties, Oxidation States, Trends in Chemical Reactivity

84. The valency shell configuration of IVA element is

- 1)  $ns^2np^1$                       2)  $ns^2np^2$                       3)  $ns^2np^3$                       4)  $ns^2np^4$

85. The most abundant IVA group element in the earth's crust is

- 1) Germanium                      2) Carbon                      3) Silicon                      4) Tin

86. The following element occurs in the free state

- 1) Carbon                      2) Lead                      3) Tin                      4) Silicon

87. The IVA element with highest and lowest first ionisation potential values

- 1) C, Pb                      2) C, Sn                      3) C, Si                      4) Si, Pb

88. Among the following, metalloid is

- 1) C                      2) S                      3) Ge                      4) Pb

89. Which one of the following element has the highest melting point?

- 1) Si                      2) Pb                      3) Sn                      4) C

90. The element with the least density among IVA group elements is

- 1) Carbon                      2) Silicon                      3) Tin                      4) Lead

91. The incorrect statement related to the elements of IVA group is

- 1) The electro negativity of Si and Ge is same  
2) The density of silicon is least  
3) Carbon has higher first ionisation potential  
4) Lead has the lowest first ionization potential

92. Carbon forms a large number of compounds because

- 1) Fixed valency                      2) Non-metallic nature  
3) High ionisation potential                      4) High catenation ability

**93. The following bond has highest energy**

- 1) Si-Si                      2) C-C                      3) Sn-Sn                      4) Pb-Pb

**94. Carbon has the highest catenation character because**

- 1) C is more electronegative                      2) C has higher ionisation potential value  
3) C has only one stable isotope                      4) C-C bond is strong

**95. The element of IVA group that has no catenation ability**

- 1) C                      2) Si                      3) Ge                      4) Pb

**96. Common oxidation state of IVA group elements is**

- 1) +IV                      2) +I                      3) +III                      4) +II

**97. +2 oxidation state of lead is more stable than +4, because of**

- 1) Penetration power                      2) Octet configuration  
3) Inert pair effect                      4) Presence of vacant orbitals

**98. The element exhibiting inert pair effect is**

- 1) Carbon                      2) Silicon                      3) Diamond                      4) Lead

**99. Tin shows the oxidation state(s)**

- 1) +2, +4                      2) +1, +2                      3) +3, +4                      4) Only +4

**100. Stable oxidation state of lead is**

- 1) +2                      2) +1, +2                      3) +3, +4                      4) +4

**101. Which of the following statements is correct with respect to the property of elements with increase in atomic number in the carbon family?**

- 1) The metallic character decreases                      2) The stability of +2 oxidation state increases  
3) Their ionisation energy increases                      4) Their atomic size decreases

**102. Which of the following cannot form complex compounds?**

- 1) C                      2) Si                      3) Ge                      4) Al

**103. Which of the following is a semiconductor?**

- 1) C                      2) Si                      3) Ge                      4) 2 and 3

104. Which of the following is an amphoteric oxide?

- 1)  $\text{CO}_2$                       2)  $\text{SiO}_2$                       3)  $\text{SnO}_2$                       4)  $\text{CaO}$

105. Maximum covalency exhibited by Carbon and Silicon are respectively

- 1) 4, 6    2) 4, 4    3) 6, 6    4) 4, 8

106. Si has diagonal relationship with

- 1) Sulphur                      2) Boron                      3) Aluminium                      4) Carbon

107. The difference in properties of  $\text{CH}_4$  and  $\text{SiH}_4$  is due to

- 1) Large difference in the electro negativity of carbon and silicon  
2) Less difference in the size of carbon and Silicon atoms  
3) The inability of carbon to expand its octet  
4) The inability of silicon to form double bonds

108. Which of the following does not exist?

- 1)  $\text{CCl}_6^{-2}$                       2)  $\text{SiF}_6^{-2}$   
3)  $\text{GeF}_6^{-2}$                       4)  $\text{SnCl}_6^{-2}$

109. In  $\text{H}_2\text{SiF}_6$ , the covalency of Si is

- 1) 2                      2) 4                      3) 6                      4) 8

110. An unstable compound is

- 1)  $\text{CCl}_4$                       2)  $\text{SiCl}_4$                       3)  $\text{GeCl}_4$                       4)  $\text{PbCl}_4$

111. (A):  $\text{Pb}(+2)$  is more stable than  $\text{Pb}(+4)$ .

(R): The element lead exhibits variable oxidation states.

The correct answer is

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).  
2) Both (A) and (R) are true and (R) is not the correct explanation of (A).  
3) (A) is true but (R) is false.  
4) (A) is false but (R) is true.

**112. (A): Carbon forms a large number of compounds.**

**(R): Carbon has high catenation power.**

**The correct answer is**

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**113. CO can be used as a fuel but not CO<sub>2</sub> because**

- 1) CO<sub>2</sub> is not a good fuel.
- 2) CO is a good fuel.
- 3) CO can be oxidized but not CO<sub>2</sub>.
- 4) CO<sub>2</sub> can be oxidized but not CO.

**114. The order of calorific values of fuel gases is**

- 1) Carburetted water gas > Producer gas > Semi water gas
- 2) Carburetted water gas > Semi water gas > Producer gas
- 3) Producer gas > Semi water gas > Carburetted water gas
- 4) Semi water gas > Producer gas > Carburetted water gas

**115. Regarding fuel gases**

**I) Water gas is called blue gas.**

**II) Major component in producer gas is CO.**

**III) Major component in semi water gas is N<sub>2</sub>.**

**The correct combination is**

- 1) I & III are correct
- 2) I & II are correct
- 3) All are correct
- 4) II & III are correct

116. Which of the following oxides is amphoteric in character?

- 1) CaO                      2) CO<sub>2</sub>                      3) SiO<sub>2</sub>                      4) SnO<sub>2</sub>

117. The stability of dihalides of Si, Ge, Sn and Pb increases steadily in the sequence

- 1) PbX<sub>2</sub> < SnX<sub>2</sub> < GeX<sub>2</sub> < SiX<sub>2</sub>      2) GeX<sub>2</sub> < SiX<sub>2</sub> < SnX<sub>2</sub> < PbX<sub>2</sub>  
3) SiX<sub>2</sub> < GeX<sub>2</sub> < PbX<sub>2</sub> < SnX<sub>2</sub>      4) SiX<sub>2</sub> < GeX<sub>2</sub> < SnX<sub>2</sub> < PbX<sub>2</sub>

**Anomalous Behaviour of First Element: Carbon, Allotropic Forms, Physical and Chemical Properties, Uses of Some Important Compounds: Oxides**

118. Which is not an allotrope of carbon?

- 1) Graphite                      2) Diamond                      3) Carborundum                      4) Coke

119. The geometry of 'C' in diamond is

- 1) Planar                      2) Tetrahedral                      3) Linear                      4) Octahedral

120. The number of carbon atoms bonded to each carbon atom in diamond crystal is

- 1) 2                      2) 4                      3) 3                      4) 1

121. C–C bond length in Diamond is

- 1) 1.33Å                      2) 1.54Å                      3) 1.20Å                      4) 1.8Å

122. Diamond is hard because of ..... bond present in it.

- 1) Covalent                      2) Ionic                      3) Dative                      4) Metallic

123. Delocalised electrons are not present in

- 1) Petroleum Coke                      2) Graphite                      3) Gas Carbon                      4) Diamond

124. When diamond is heated in vacuum at 2000<sup>0</sup>C, the substance formed is

- 1) Amorphous carbon                      2) Coal                      3) Graphite                      4) Carbon monoxide

125. The formula of Carborundum is

- 1) SiO<sub>2</sub>                      2) Na<sub>2</sub>SiO<sub>3</sub>                      3) SiC                      4) H<sub>4</sub>SiO<sub>4</sub>



126. Thermodynamically most stable allotrope of carbon is

- 1) Diamond                      2) Graphite                      3) Coal                      4) Coke

127. In graphite hybridization of carbon is

- 1) sp                      2)  $sp^2$                       3)  $sp^3d$                       4)  $sp^3$

128. All carbon atoms are  $sp^3$  hybridised in the following substance except

- 1) Methane                      2) Ethane                      3) Diamond                      4) Graphite

129. Layer structure is present in

- 1) Graphite                      2) Coal                      3) Diamond                      4) Coke

130. The C–C bond length and the distance between adjacent layers in graphite are

- 1) 1.54A, 3.35A                      2) 1.4A, 2.35A                      3) 1.42A, 3.35 A                      4) 1.34A, 3.35A

131. Graphite is a good conductor, because it has

- 1) Crystalline structure                      2)  $sp^2$  hybridised carbon  
3) Free electrons                      4) Free atoms

132. Hybridisation of carbon atom in carbon dioxide is

- 1)  $sp^2$                       2)  $sp^3$                       3) sp                      4)  $dsp^2$

133. The oxide which exists as solid at room temperature is

- 1) CO                      2)  $CO_2$                       3)  $SiO_2$                       4)  $SO_2$

134. The following is an acidic gaseous oxide

- 1)  $PbO_2$                       2)  $SnO_2$                       3)  $SiO_2$                       4)  $CO_2$

135. Water gas is a mixture of

- 1)  $CO_2 + H_2$                       2)  $CO + H_2$                       3)  $CO + N_2$                       4)  $CO_2 + H_2O$

136. Producer gas is a mixture of

- 1)  $CO + CO_2$                       2)  $CO + H_2O$                       3)  $CO + N_2$                       4)  $CO + O_2$

137. The major component in producer gas is

- 1)  $H_2$                       2) CO                      3)  $N_2$                       4)  $CO_2$

**138. The common constituent of producer gas and water gas is**

- 1)  $N_2$                       2) CO                      3)  $CO_2$                       4)  $H_2$

**139. Semi water gas is mainly a mixture of**

- 1)  $N_2$ , CO and  $H_2$                       2)  $N_2$ ,  $CO_2$  and  $CH_4$   
3)  $CH_4$ , CO and  $H_2$                       4)  $N_2$ ,  $CO_2$  and CO

**140. The correct statement among the following is**

- 1) Producer gas is manufactured in a generator  
2) The maximum covalence of silicon is four  
3) Formation of water gas is an endothermic reaction  
4) Producer gas is known as blue gas

**141. A mixture of CO,  $H_2$  and hydrocarbons is known as**

- 1) Water gas                      2) Carburetted water gas  
3) Semi water gas                      4) Producer gas

**142. A gas which burns with blue flame is**

- 1) CO                      2)  $N_2$                       3) NO                      4)  $CO_2$

**143. Among the following calorific value is highest for**

- 1) Water gas                      2) Producer gas  
3) Semi water gas                      4) Carburetted water gas

**144. Calorific value lowest for**

- 1) Water gas                      2) Producer gas  
3) Semi water gas                      4) Carburetted water gas

**145. Calorific value is highest for which of the following fuel gas?**

- 1) Coal gas                      2) Water gas                      3) Producer gas                      4) Carbon dioxide gas

**146. The hybrid orbitals with 33.33% s – character are involved in the bonding of one of the crystalline allotropes of carbon. The allotrope is**

- 1) Carbon black                      2) Graphite                      3) Diamond                      4) Gas carbon

**147. The correct statement regarding Graphite is**

- 1) Graphite is not a conductor because; it does not contain free electrons.
- 2) Graphite is a three dimensional conductor because, the p–electrons are delocalised three dimensionally.
- 3) Graphite is a two dimensional conductor because p-electrons are delocalised two dimensionally.
- 4) In graphite all the carbon atoms undergo  $sp^3$  hybridization.

**148. The following are some statements about graphite**

- I) Used as a lubricant
- II) Used in lead pencils
- III) It has  $sp$  hybridised carbons

**The correct combination is**

- 1) All are correct
- 2) Only I and II are correct
- 3) Only II is correct
- 4) Only II and III are correct

**149.(A): Diamond is a very hard element.**

**(R): Diamond has giant three dimensional network structures and C-C bond is a strong bond.**

**The correct answer is**

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**150. (A): Diamond is non conductor of electricity.**

**(R): In diamond carbon atom is  $sp^2$  hybridised.**

**The correct answer is**

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**151. (A): Graphite is used as a lubricant.**

**(R): Graphite has a layer lattice structure and the attractive forces between layers are weak.**

**The correct answer is**

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- 2) Both (A) and (R) are true and (R) is not the correct explanation of (A).
- 3) (A) is true but (R) is false.
- 4) (A) is false but (R) is true.

**152. The following are some statements about graphite**

- I) C–C bond length is  $1.42\text{Å}$
- II) Distance between two layers is  $3.35\text{Å}$
- III) Bond angle is  $60^\circ$

**The correct combination is**

- 1) All are correct.
- 2) Only I and II are correct.
- 3) Only II is correct.
- 4) All are incorrect.

**153.  $L_1$  is the length between two adjacent carbon atoms in a layer and  $L_2$  is the length in-between two layers of graphite. The approximate ratio between  $L_1$  and  $L_2$  is**

- 1) 1: 1
- 2) 2: 5
- 3) 5: 2
- 4) 1: 5

**154. What is the C-C bond length (in  $\text{Å}$ ) in diamond**

- 1) 1.54
- 2) 3.34
- 3) 2.0
- 4) 5.2

155. Which of the following is used for making optical instruments?

- 1)  $\text{SiO}_2$                       2) Si                      3)  $\text{SiH}_4$                       4) SiC

156. The catenation tendency of C, Si and Ge is in the order  $\text{Ge} < \text{Si} < \text{C}$ . The Bond energies in ( $\text{KJ Mol}^{-1}$ ) respectively are (2001)

- 1) 167, 180, 348                      2) 180, 167, 348  
3) 348, 167, 180                      4) 348, 180, 167

157. Which one of the following is correct set for ' $\text{SiO}_2$ '?

- 1) Linear, Acidic                      2) Linear, Basic  
3) Tetrahedral, Acidic                      4) Angular, Basic

158. What is the number of free electrons contributed by each carbon atom in graphite?

- 1) Zero                      2) 3                      3) 2                      4) 1

159. Graphite is a soft solid lubricant extremely difficult to melt. The reason for this anomalous behaviour is that graphite

- 1) Is an allotropic form of carbon  
2) Has molecules of variable molecular masses like polymers  
3) Has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds  
4) Is a non-crystalline substance

160. The number and type of bonds between two carbon atoms in calcium carbide are

- 1) One sigma, one pi                      2) One sigma, two pi  
3) Two sigma, one pi                      4) Two sigma, two pi

**Important compounds of silicon and a few uses, silicon tetra chloride, silicons, silicates and zeolites, their uses**

**161. Silica is high melting solid, because**

- 1) It exists as discrete molecules.
- 2) It has many resonance structures.
- 3) It has giant network structure.
- 4) Each Si atom is surrounded by 4 Si atoms.

**162. Silica has the following structure**

- 1) Linear
- 2) Planar
- 3) Angular
- 4) Polymeric

**163. In  $\text{SiO}_2$  each silicon atom is surrounded by**

- 1) 4 oxygen atoms in a square planar manner
- 2) 4 oxygen atoms in a tetrahedral manner
- 3) 6 oxygen atoms in a octahedral manner
- 4) 3 oxygen atoms in a planar fashion

**164. Silica contains**

- 1)  $\text{SiO}^{2-}_4$
- 2)  $\text{SiO}^{3-}_4$
- 3)  $\text{SiO}^-_4$
- 4)  $\text{SiO}_4$  tetrahedral units

**165. The oxidation state of Si in  $\text{H}_2\text{SiF}_6$**

- 1) + II
- 2) + IV
- 3) + VI
- 4) + VIII

**166. Which of the following reacts with silica?**

- 1) HF
- 2) HCl
- 3) HBr
- 4) HI

**167. The hybridization of carbon in CO and silicon in  $\text{SiO}_2$  respectively are**

- 1) sp, sp
- 2)  $\text{sp}^2$ ,  $\text{sp}^2$
- 3) sp,  $\text{sp}^3$
- 4) sp,  $\text{sp}^2$

**168.  $\text{SiO}_2$  is not soluble in**

- 1) HF                      2) NaOH                      3) KOH                      4)  $\text{HNO}_3$

**169. An acidic flux among the following is**

- 1) CaO                      2) MgO                      3)  $\text{SiO}_2$                       4)  $\text{CaH}_2$

**170. Silicon tetrafluoride on hydrolysis gives**

- 1) Ortho silicic acid and meta silicic acid  
2) Ortho silicic acid and hydrofluoro silicic acid  
3) Meta silicic acid and silica  
4) Meta silicic acid and Hydrofluoro silicic acid

**171. The structure of ' $\text{SiO}_2$ ' is**

- 1) Octahedral                      2) Tetrahedral                      3) Trigonal                      4) Linear

**172. Water glass is**

- 1) Glass made up of water    2) Sodium silicate    3) Water gas    4) Crystal carbonate

**173. The repeating unit of silicones**

- 1)  $\text{RSiO}_2$                       2)  $\text{R}_2\text{SiO}$                       3)  $\text{R}_2\text{SiO}_2$                       4)  $\text{RSiO}_2$

**174. The starting materials for the formation of silicone polymers are**

- 1) Silicates                      2) Chloro silanes  
3) Silanes                      4) Silicon carbide

**175. Silicones are the polymers formed by hydrolysis of**

- 1) Silicondioxides                      2) Silanes  
3) Silicates                      4) Chlorosilanes

**176. The basic structural unit in silicates is**

- 1)  $\text{SiO}_2$     2)  $\text{Si}_2\text{O}_6$                       3)  $\text{Si}_3\text{O}_2$                       4)  $\text{SiO}_4$

**177. Which of the following contain discrete  $\text{SiO}_4^{4-}$  tetrahedron units?**

- 1) Ortho silicates      2) Pyro silicates      3) Cyclic silicates      4) Asbestos

**178. Asbestos is an example for**

- 1) Zeolite      2) Amphibole      3) Pyroxene      4) Silicone

**179. Willimite is an example for**

- 1) Sheet silicates      2) Chain silicates      3) 3D silicates      4) Ortho silicates

**180. Amphiboles belongs to**

- 1) Frame work silicates      2) Chain silicates      3) Cyclic silicates      4) Pyro silicates

**181. Which of the following is not a frame work silicate?**

- 1) Zeolite      2) Kaolin  
3) Ultramarine      4) Feldspar

**182.  $\text{SiO}_2$  is a solid while  $\text{CO}_2$  is a gas, this is because**

- 1)  $\text{SiO}_2$  contains weak vanderwaal attraction while  $\text{CO}_2$  contains strong covalent bonds.  
2) Solid  $\text{SiO}_2$  has a three dimensional net work structure whereas  $\text{CO}_2$  contain discrete molecules.  
3) Both contain strong covalent bonds.  
4) Both contain weak vanderwaal attraction.

**183.  $\text{SiO}_2 + \text{A} \rightarrow \text{X} + \text{Y}$ . In this reaction Y is one of the global warming gases. A is the water soluble alkali metal carbonate whose molecular weight is 106. The common name of 'X' is**

- 1) Washing soda      2) Baking soda      3) Flint glass      4) Water glass

**184.  $\text{SiCl}_4$  undergoes hydrolysis but not  $\text{CCl}_4$  since**

- 1) C-Cl bond is stronger than Si-Cl bond  
2) Electro negativity of Si is more than C  
3) Electro negativity of Cl is greater than C



4) Silicon contains vacant d orbitals and its maximum covalency is 6

185. The following are some statements about  $\text{SiCl}_4$

I)  $\text{SiCl}_4$  undergoes hydrolysis

II) It acts as a Lewis acid

III) Si atom is  $sp^3$  hybridised

The correct combination is

- 1) All are correct.                      2) Only I and II are correct.  
3) Only II is correct.                    4) Only II and III are correct.

186. What is X in the following reaction?

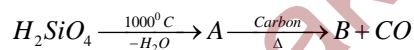


- 1)  $\text{H}_4\text{SiO}_4$                                   2)  $\text{SiH}_4$                                   3)  $(\text{SiOOH})_2$                                   4)  $\text{Si}(\text{ClO}_4)_4$

187. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is

- 1)  $R_2\text{SiCl}_2$                                   2)  $R\text{SiCl}_3$                                   3)  $R_2\text{SiCl}$                                   4)  $R_4\text{Si}$

188. Identify B in the following reaction



- 1) Carborundum                      2) Quartz                                  3) Kieselguhr                                  4) Sand stone

189. Hydrolysis of  $\text{SiCl}_4$  gives compound X and HCl, on heating to  $1000^\circ\text{C}$  X loses water and forms Y. Identify X and Y respectively

- 1)  $\text{H}_2\text{SiO}_4$  and  $\text{SiO}_2$                       2)  $\text{SiO}_2$  and si                                  3)  $\text{SiO}_2$  and SiC                                  4)  $\text{H}_2\text{SiO}_4$  and SiC

190. What is the empirical formula of sheet silicates?

- 1)  $(\text{Si}_2\text{O}_5)_n^{2n-}$                                   2)  $(\text{SiO}_3)_n^{2n-}$                                   3)  $(\text{SiO}_3)_n^{n-}$                                   4)  $(\text{Si}_2\text{O}_7)_n^{3n-}$

**KEY**

84) 2   85) 3   86) 1   87) 2   88) 3   89) 4   90) 2   91) 4   92) 4   93) 2  
94) 4   95) 4   96) 1   97) 3   98) 4   99) 1   100) 1   101) 2   102) 1   103) 4  
104) 3   105) 1   106) 2   107) 1   108) 1   109) 3   110) 4   111) 2   112) 1   113) 3  
114) 2   115) 1   116) 4   117) 4   118) 3   119) 2   120) 2   121) 2   122) 1   123) 4  
124) 3   125) 3   126) 2   127) 2   128) 4   129) 1   130) 3   131) 3   132) 3   133) 3  
134) 4   135) 2   136) 3   137) 3   138) 2   139) 1   140) 3   141) 2   142) 1   143) 4  
144) 2   145) 1   146) 2   147) 3   148) 2   149) 1   150) 3   151) 1   152) 2   153) 2  
154) 1   155) 1   156) 4   157) 3   158) 4   159) 3   160) 2   161) 3   162) 4   163) 2  
164) 4   165) 2   166) 1   167) 3   168) 4   169) 3   170) 2   171) 2   172) 2   173) 2  
174) 2   175) 4   176) 4   177) 1   178) 2   179) 4   180) 2   171) 2   182) 2   183) 4  
184) 4   185) 1   186) 1   187) 2   188) 1   189) 1   190) 1