

## BORON FAMILY- PREPARATIONS, PROPERTIES & USES - LEVEL I

**1** Aluminium becomes passive in nitric acid because it-

1. Is a noble metal
2. Forms a thin film of oxide
3. Has a positive reduction potential
4. None of the above

**2** The stability of the +1 oxidation state increases in the sequence:

1.  $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$
2.  $\text{Tl} < \text{In} < \text{Ga} < \text{Al}$
3.  $\text{In} < \text{Tl} < \text{Ga} < \text{Al}$
4.  $\text{Ga} < \text{In} < \text{Al} < \text{Tl}$

**3**  $\text{Al}_2\text{O}_3$  reacts with-

1. Only water
2. Only acids
3. Only alkalis
4. Both acids and alkalis

**4** The correct explanation for the lower atomic radius of Ga as compared to Al is -

1. Poor shielding effect of the 2d-electrons
2. Poor shielding effect of the 3d-electrons
3. Poor shielding effect of the 3p-electrons
4. Poor shielding effect of the 2s-electrons

**5** Borax bead test is responded by:

1. Divalent metals
2. Heavy metals
3. Light metals
4. Metal which forms coloured metaborates

**6** Match the species given in Column I with the properties mentioned in Column II.

Column I	Column II
A. $\text{BF}_4^-$	1. Oxidation state of the central atom is +4
B. $\text{AlCl}_3$	2. Tetrahedral shape
C. $\text{SnO}$	3. Lewis acid
D. $\text{PbO}_2$	4. Can be further oxidized

**Codes**

	A	B	C	D
1.	2	3	4	1
2.	1	2	3	4
3.	1	4	3	2
4.	4	1	3	2

**7** The products formed by the oxidation of  $\text{NaBH}_4$  and  $\text{I}_2$  are:

1.  $\text{B}_2\text{H}_6$  and  $\text{NaI}$  only
2.  $\text{B}_2\text{H}_6$ ,  $\text{H}_2$  and  $\text{NaI}$
3.  $\text{BI}_3$  and  $\text{NaH}$
4.  $\text{NaBI}_4$  and  $\text{HI}$

**8**  $\text{AlF}_3$  is soluble in  $\text{HF}$  only in the presence of  $\text{KF}$  due to the formation of:

1.	$\text{K}_3[\text{AlF}_3\text{H}_3]$	2.	$\text{K}_3[\text{AlF}_6]$
3.	$\text{AlH}_3$	4.	$\text{K}[\text{AlF}_3\text{H}]$

**9** From the following, the compound(s) that react(s) with  $\text{BF}_3$  is/are -

1. Ethers
2.  $\text{H}_2\text{O}$
3.  $\text{NH}_3$
4. All of the above

**10** Aluminium chloride in acidified aqueous solution forms a complex 'A'. The formula of A and hybridisation state of Al in 'A' is respectively-

1.  $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ ,  $\text{sp}^3\text{d}^2$
2.  $[\text{Al}(\text{H}_2\text{O})_4]^{3+}$ ,  $\text{sp}^3$
3.  $[\text{Al}(\text{H}_2\text{O})_4]^{3+}$ ,  $\text{dsp}^2$
4.  $[\text{Al}(\text{H}_2\text{O})]^{3+}$ ,  $\text{d}^2\text{sp}^3$

**11** The element among the following that does not show inert pair effect is-

1.	Al	2.	Sn
3.	Pb	4.	Thallium

**12** A strong oxidizing agent among the following is -

1.  $\text{Tl}^{3+}$
2.  $\text{Ga}^{3+}$
3.  $\text{In}^{3+}$
4.  $\text{Al}^{3+}$

**13** White fumes appear around the bottle of anhydrous  $\text{AlCl}_3$ . This is due to -

1. Formation of  $\text{Al}(\text{OH})_3$
2. Dimerisation of  $\text{AlCl}_3$
3. Hydrolysis of  $\text{AlCl}_3$  give  $\text{HCl}$  gas
4. Absorption of moisture

**14** Match the species given in Column I with properties given in Column II.

Column I	Column II
A. Diborane	1. Used as a flux for soldering metals
B. Quartz	2. Crystalline form of silica
C. Borax	3. Banana bonds
D. Aluminosilicate	4. Used as a catalyst in petrochemical industries

**Codes**

	A	B	C	D
1.	3	4	1	2
2.	1	2	3	4
3.	3	2	1	4
4.	4	1	3	2

**15** Chemically thermite is -

1. Fe and Al
2. Ferric oxide and aluminium powder
3. Barium peroxide and magnesium powder
4. Cu and aluminium

**16** Ionization enthalpy ( $\Delta_i H_1 \text{ kJ mol}^{-1}$ ) for the elements of Group 13 follows the order.

1. $\text{B} > \text{Al} > \text{Ga} > \text{In} > \text{Tl}$	2. $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
3. $\text{B} < \text{Al} > \text{Ga} < \text{In} > \text{Tl}$	4. $\text{B} > \text{Al} < \text{Ga} > \text{In} < \text{Tl}$

**17** Aluminium reacts with concentrated  $\text{HCl}$  and concentrated  $\text{NaOH}$  to liberate which of the following gases-

1.  $\text{H}_2$ , and  $\text{H}_2$
2.  $\text{O}_2$ , and  $\text{O}_2$
3.  $\text{O}_2$ , and  $\text{H}_2$
4.  $\text{H}_2$ , and  $\text{O}_2$

**18** In aluminates, the co-ordination number of Al is-

1.	3	2.	6
3.	1	4.	4

**19** The correct order of atomic radii among the group 13 elements is-

1.  $\text{B} < \text{Al} < \text{In} < \text{Ga} < \text{Tl}$
2.  $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
3.  $\text{B} < \text{Ga} < \text{Al} < \text{Tl} < \text{In}$
4.  $\text{B} < \text{Ga} < \text{Al} < \text{In} < \text{Tl}$

**20** When Al is added to the potassium hydroxide solution:

1. No reaction takes place
2. Oxygen gas is evolved
3. Water is produced
4. Hydrogen gas is evolved

**21**  $\text{AlCl}_3$  on hydrolysis gives -

1.  $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$
2.  $\text{Al}(\text{OH})_3$
3.  $\text{Al}_2\text{O}_3$
4.  $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$

## **BORON FAMILY-** **PREPARATIONS, PROPERTIES & USES** **- LEVEL II**

**22** Orthoboric acid when heated to red hot gives-

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

**23** The complex formed on reaction of Sodium hexafluoroaluminate(III) with  $\text{BF}_3$  is -

1.  $\text{Na}[\text{BF}_4]$
2.  $\text{Na}_2[\text{BF}_4]$
3.  $\text{Na}[\text{BF}_4]_2$
4. None of the above

**24** Assertion: The total number of coordinate bonds and covalent bonds in borazine is 3 and 12 respectively.  
Reason: Its structure is similar to benzene.

1. Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. Assertion is a true statement but Reason is false.
4. Both Assertion and Reason are false statements.

**25** The incorrect statement among the following regarding borax is-

1. It is a useful primary standard for titrating against acids.
2. One molecule of borax contains 4 B—O—B bonds.
3. Aqueous solution of borax can be used as a buffer.
4. It is made up of two triangular  $\text{BO}_3$  units and two tetrahedral  $\text{BO}_4$  units.

**26** The dissolution of  $\text{Al}(\text{OH})_3$  in a solution of  $\text{NaOH}$  results in the formation of -

1.  $[\text{Al}(\text{H}_2\text{O})_4(\text{OH})_2]^+$
2.  $[\text{Al}(\text{H}_2\text{O})_3(\text{OH})_3]$
3.  $[\text{Al}(\text{H}_2\text{O})_2(\text{OH})_4]^-$
4.  $[\text{Al}(\text{H}_2\text{O})_6(\text{OH})_3]$

**27** When hydrated alumina is treated with an aqueous  $\text{NaOH}$  solution, it gives-

1.  $\text{NaAlO}_2$
2.  $\text{Na}(\text{Al}_2\text{O}_3)$
3.  $\text{NaAl}_2\text{O}$
4. Both (2) and (3)

**28** Mellitic acid is formed by the oxidation of graphite with -

1. Chromic acid
2. Alkaline  $\text{KMnO}_4$
3. Fuming  $\text{HNO}_3$
4. dil.  $\text{HNO}_3$

**29**  $\text{Al}_2\text{O}_3$  can be converted to anhydrous  $\text{AlCl}_3$  by heating:

1.  $\text{Al}_2\text{O}_3$  with  $\text{HCl}$  gas
2.  $\text{Al}_2\text{O}_3$  with  $\text{NaCl}$  in solid-state
3. a mixture of  $\text{Al}_2\text{O}_3$  and carbon in dry  $\text{Cl}_2$  gas
4.  $\text{Al}_2\text{O}_3$  with  $\text{Cl}_2$  gas

**30**  $\text{Al}_4\text{C}_3$  is an ionic carbide. It is also known as :

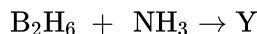
1. Acetylide
2. Methanide
3. Allyide
4. Alloy

**31** Hydrated aluminium chloride is an ionic compound and soluble in water giving -

1.  $\text{Al}^{3+}$  and  $\text{Cl}^-$  ions
2.  $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$  and  $\text{Cl}^-$  ions
3.  $[\text{AlCl}_2(\text{H}_2\text{O})_4]^+$  and  $[\text{AlCl}_4(\text{H}_2\text{O})_2]^-$  ions
4. None of the above

## ANOMALOUS BEHAVIOUR OF B & C - LEVEL I

**32** Consider the following reaction,



X and Y in the above reaction are-

1.  $\text{X} = \text{Al}(\text{OH})_2$  ;  $\text{Y} = \text{N}_2[\text{BH}_4]$
2.  $\text{X} = \text{Na}[\text{Al}(\text{OH})_4]$  ;  $\text{Y} = \text{N}_3\text{B}_3\text{H}_6$
3.  $\text{X} = \text{Na}[\text{Al}(\text{OH})_4]$  ;  $\text{Y} = \text{B}_3\text{N}_2$
4. None of the above

**33** A compound among the following that is least likely to behave as a Lewis base is:

1.  $\text{NH}_3$
2.  $\text{BF}_3$
3.  $\text{OH}^-$
4.  $\text{H}_2\text{O}$

**34** The correct statement(s) regarding thallium is/are :

1. Thallium displays both +1, and +3 oxidation states.
2. It resembles group 1 metals in some reactions.
3. Thallium only shows a +1 oxidation state.
4. Both (1) and (2)

## COMPOUNDS OF BORON- PREPARATIONS, PROPERTIES & USES - LEVEL I

**35** The electron-deficient compound among the following is -

1.  $\text{SiCl}_4$
2.  $\text{BCl}_3$
3.  $\text{PCl}_3$
4.  $\text{ICl}$

**36** Boron trifluoride behaves as a Lewis acid because -

1. Boron trifluoride is electron-rich.
2. Boron trifluoride is electron-deficient.
3. Boron trifluoride is highly stable.
4. None of these.

**37** The correct statement(s) among the following options is/are:

- |    |   |
|----|---|
| 1. | Aluminium alloys are used to make aircraft bodies.        |
| 2. | Aluminium utensils should not be kept in water overnight. |
| 3. | Aluminium wire is used to make transmission cables.       |
| 4. | All of the above  |

**38** The correct statement(s) regarding diborane and boric acid is/are-

1. Diborane has two  $3c-2e^-$  bonds.
2. Boric acid has a layered structure.
3. Four  $2c-2e^-$  bonds are present in diborane.
4. All of the above

**39** Assertion: B-X bond length in  $BX_3$  is shorter than the expected value.

Reason:  $p\pi - p\pi$  back bonding occurs between B and X.

1. Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. Assertion is a true statement but Reason is false.
4. Both Assertion and Reason are false statements.

**40**  $BCl_3$  has higher stability than  $TiCl_3$ , because -

- |    |  |
|----|--|
| 1. | The +2 oxidation state of Ti is more stable than the +2 oxidation state of B |
| 2. | The +2 oxidation state of B is more stable than the +2 oxidation state of Ti |
| 3. | The +3 oxidation state of B is more stable than the +3 oxidation state of Ti |
| 4. | The +3 oxidation state of Ti is more stable than the +3 oxidation state of B |

**41** B-Cl bond has a dipole moment. Still, the  $BCl_3$  molecule has zero dipole moment because:

- |    |  |
|----|--|
| 1. | The respective dipole-moments of the B-Cl bond add with each other |
| 2. | The respective dipole-moments of the B-Cl bond cancel each other   |
| 3. | $BCl_3$ is tetrahedral in shape                                    |
| 4. | None of the above  |

**42** A compound X, of boron, reacts with  $NH_3$  on heating to give another compound Y which is called inorganic benzene. The compound X can be prepared by treating  $BF_3$  with Lithium aluminium hydride. The compounds X and Y are represented by the formulas -

1.  $B_2H_6$ ,  $B_3N_3H_6$
2.  $B_2O_3$ ,  $B_3N_3H_6$
3.  $BF_3$ ,  $B_3N_3H_6$
4.  $B_3N_3H_6$ ,  $B_2H_6$

**43** An anion that cannot be formed by Boron is -

1.  $BF_6^{3-}$
2.  $BH_4^-$
3.  $B(OH)_4^-$
4.  $BO_2^-$

**44** Boric acid is a-

1. Protic acid.
2. Weak monobasic acid.
3. Lewis acid.
4. Both '2' and '3'

**45** An element that cannot form  $MF_6^{3-}$  ion is -

1. Ga
2. Al
3. B
4. In

**46**  $H_3BO_3$  is -

1. A Monobasic acid and a weak Lewis acid.
2. A Monobasic and a weak Bronsted acid..
3. A Monobasic and a strong Lewis acid.
4. A Tribasic and a weak Bronsted acid.

**47** The hybridization of boron in diborane is-

1. sp
2.  $sp^2$
3.  $sp^3$
4.  $dsp^2$

**48** Boric acid is polymeric due to-

1. Its acidic nature.
2. The presence of hydrogen bonds.
3. Its monobasic nature.
4. Its geometry.

**49** In diborane, the two H-B-H angles are nearly-

1.  $60^\circ$ ,  $120^\circ$
2.  $97^\circ$ ,  $120^\circ$
3.  $97^\circ$ ,  $150^\circ$
4.  $120^\circ$ ,  $180^\circ$

**50** Which among the following is a gas?

1.  $BF_3$
2.  $BCl_3$
3.  $BBr_3$
4.  $BI_3$

**51** The effect of heating Boric acid at 370 K or above is -

1. Orthoboric acid changes to metaboric acid.
2. Metaboric acid changes to boric oxide.
3. Both '1' and '2'
4. Neither '1' nor '2'

**52** An aqueous solution of Borax is-

1. Neutral
2. Amphoteric
3. Basic
4. Acidic

**53** Quartz is made of silicon and oxygen joined in a network arrangement that is similar to:

1. Diamond
2. Graphite
3.  $O_2$
4. None of the above

## COMPOUNDS OF BORON- PREPARATIONS, PROPERTIES & USES - LEVEL II

**54** Assertion: Boron always forms a covalent bond.

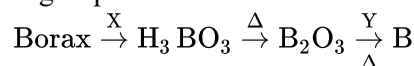
Reason: Boron has a diagonal relationship with silicon.

1. Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
2. Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
3. Assertion is a true statement but Reason is false.
4. Both Assertion and Reason are false statements.

**55** The B-F bond lengths in  $BF_3$  (130 pm) and  $BF_4^-$  (143 pm) differ because of-

1. Presence of triple bond character in  $BF_3$
2. Resonance in  $BF_4^-$
3. Presence of a double bond character in  $BF_3$
4. Presence of a double bond character in  $BF_4^-$

**56** Borax is converted into crystalline boron by the following steps:



X and Y are respectively :

1. HCl, Mg
2. HCl, C
3. C, Al
4. HCl, Al

**57**  $B_2H_6$  can't be prepared by -

1.  $NaBH_4 + I_2 \rightarrow$
2.  $BF_3 + NaH \rightarrow$
3.  $B_3N_3H_6 + H_2O \rightarrow$
4.  $Mg_3B_2 + \text{dil HCl} \rightarrow$

**58**



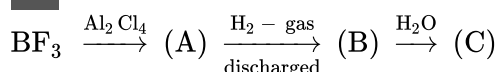
This reaction is made to proceed in forward direction by -

1. Addition of Cis- 1,2 diol
2. Addition of borax
3. Addition of trans 1,2- diol
4. Addition of  $Na_2HPO_4$

**59** An Aqueous solution of borax reacts with 2 moles of acid due to -

1. Formation of 2 moles of  $B(OH)_3$  only
2. Formation of 2 moles of  $[B(OH)_4]^-$  only
3. Formation of 1 mole each of  $B(OH)_3$  and  $[B(OH)_4]^-$
4. Formation of 2 moles each of  $[B(OH)_4]^-$  and  $B(OH)_3$ , only  $[B(OH)_4]^-$  reacts with an acid

**60** Consider the following reaction



The correct statement among the following is -

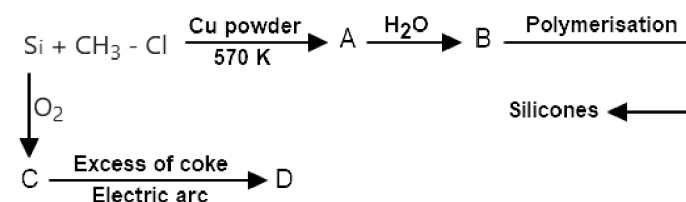
1. (A) is  $BCl_3$
2. (C) is  $B_2H_6$
3. (C) is  $[B_2(OH)_4]^-$
4. (B) is  $B_2Cl_4$

**61** Boric acid on heating at  $150^\circ C$  gives:

1.  $B_2O_3$
2.  $H_2B_4O_7$
3.  $HBO_2$
4.  $H_2BO_3$

## CARBON FAMILY - PREPARATIONS, PROPERTIES & USES - LEVEL I

**62** Select the correct statement(s) regarding the following reaction sequence:



1. The compound (A) is  $(CH_3)_2SiCl_2$
2. The compound D is  $SiC$
3. The compound (B) is  $(CH_3)_2Si(OH)_2$
4. All of the above

**63** Carbogen is:

1. A mixture of  $O_2 + 5 - 10\%$  of  $CO_2$ .
2. Used by pneumonia patients for respiration.
3. Used by victims of CO for respiration.
4. All of the above.

**64** Amphoteric oxides are:

1.  $Tl_2O_3, SiO_2$
2.  $CO_2, B_2O_3$
3.  $B_2O_3, SiO_2$
4.  $Al_2O_3, PbO_2$

**65** The sharp decrease in ionization enthalpy from carbon to silicon happens because of-

1.	Decrease in the charge of elements upon moving down the group.
2.	Decrease in the atomic sizes of elements upon moving down the group.
3.	Increase in the atomic sizes of elements upon moving down the group.
4.	Increase in the charge of elements upon moving down the group.

**66** The basic structural unit of silicates is-

1.  $(SiO_4)^{4-}$
2.  $(SiO_3)^{2-}$
3.  $(SiO_4)^{2-}$
4.  $(SiO)^-$

**67** The incorrect statement among the following options is-

1.	Conc. $HNO_3$ can be transported in an aluminium container.
2.	Diamond is used as an abrasive.
3.	A mixture of dilute $NaOH$ and aluminium pieces is used to declog the drain.
4.	Graphite can't be used as a lubricant.

**68** The species among the following that does not exist is-

1.  $(SnF_6)^{2-}$
2.  $(GeCl_6)^{2-}$
3.  $(CCl_6)^{2-}$
4.  $(SiF_6)^{2-}$

**69** The amphoteric oxide among the following is -

1.  $\text{CO}_2$
2.  $\text{PbO}_2$
3.  $\text{SiO}_2$
4.  $\text{SeO}_2$

**70** The reason behind carbon showing catenation property but lead does not is-

1. Due to the smaller size of C than that of Pb
2. Due to the smaller size of Pb than that of C
3. Due to the smaller ionization energy of C than that of Pb
4. Due to inert pair effect

**71** The incorrect statement among the following is -

1.  $\text{Ge}(\text{OH})_2$  is amphoteric
2.  $\text{GeCl}_2$  is more stable than  $\text{GeCl}_4$
3.  $\text{GeO}_2$  is weakly acidic
4.  $\text{GeCl}_4 + 2\text{HCl} \rightleftharpoons \text{H}_2[\text{GeCl}_6]$

**72** The correct statement regarding inert pair effect is -

- |    |  |
|----|--|
| 1. | $\text{Sn}^{2+}$ is an oxidizing agent while $\text{Pb}^{4+}$ is a reducing agent. |
| 2. | $\text{Sn}^{2+}$ and $\text{Pb}^{2+}$ both are oxidizing agents.                   |
| 3. | $\text{Sn}^{4+}$ is a reducing agent while $\text{Pb}^{4+}$ is an oxidizing agent. |
| 4. | $\text{Sn}^{2+}$ is a reducing agent while $\text{Pb}^{4+}$ is an oxidizing agent. |

**73** A compound among the following having a similar structure to graphite is:

1. B
2.  $\text{B}_4\text{C}$
3.  $\text{B}_2\text{H}_6$
4. BN

**74** Incorrect statement among the following options is :

- |    |   |
|----|---|
| 1. | Tl (+1) is more stable than Tl (+3).  |
| 2. | For group 13, the stability of the +3 oxidation state decreases down the group. |
| 3. | Ge, Sn, and Pb show both the +2 and +4 states.                                  |
| 4. | None of the above.  |

**75** The incorrect statement among the given options is-

- |    |  |
|----|--|
| 1. | Inert pair effect is because of the poor shielding of the $ns^2$ electrons by the d- and f- electrons. |
| 2. | Allotropy is the existence of an element in more than one form.  |
| 3. | Catenation is the bonding of atoms of the same element into a series, called a chain.                  |
| 4. | None of the above.   |

**76** The most volatile compound among the following is -

1.  $\text{CH}_4$
2.  $\text{SiH}_4$
3.  $\text{GeH}_4$
4.  $\text{SnH}_4$

## CARBON FAMILY - PREPARATIONS, PROPERTIES & USES - LEVEL II

**77** The correct statement(s) regarding Lead compounds is/are:

1. Lead (II) reacts with  $\text{Cl}_2$  to give  $\text{PbCl}_4$
2. Lead (IV) chloride is highly stable towards heat.
3. Lead is not known to form an iodide,  $\text{PbI}_4$
4. Both (1) and (3)

**78** Silicate, among the following, that has only one oxygen atom of  $[\text{SiO}_4]^{4-}$  shared with the next unit is:

1. Sheet silicate
2. Pyrosilicate
3. Three dimensional silicate
4. Linear chain silicate

**79** A mixed oxide compound among the following is -

1.  $\text{PbO}_2$
2.  $\text{SnO}_2$
3.  $\text{Pb}_2\text{O}_3$
4.  $\text{Pb}_3\text{O}_4$

**80** The incorrect statement among the following is -

1.  $\text{SnF}_4$  is ionic in nature
2.  $\text{PbF}_4$  is covalent in nature
3.  $\text{SiCl}_4$  is easily hydrolysed
4.  $\text{GeX}_4$  ( $\text{X}=\text{F}, \text{Cl}, \text{Br}, \text{I}$ ) is more stable than  $\text{GeX}_2$

**81** The percentage of lead in a lead pencil is-

1. 20
2. 0
3. 80
4. 70

**82** Tin cry refers to-

1. Conversion of white to grey tin
2. Tin plating
3. Conversion of white tetrahedral tin to white rhombohedral tin
4. Emission of sound while bending a tin rod

**83** A compound that is sparingly soluble in cold water and fairly soluble in hot water is-

1.  $\text{Pb}(\text{NO}_3)_2$
2.  $\text{PbCl}_2$
3.  $\text{PbSO}_4$
4.  $\text{PbCrO}_4$

## STRUCTURE & PROPERTIES OF ALLOTROPES OF C - LEVEL I

**84** The incorrect statement regarding diamond and graphite is-

- |    |  |
|----|--|
| 1. | In diamond each carbon is $\text{sp}^2$ hybridised and in graphite, each carbon is $\text{sp}^3$ hybridised. |
| 2. | Diamond is an insulator  |
| 3. | Graphite has a planar geometry.  |
| 4. | Both (2) and (3)   |

**85** The incorrect statement regarding allotropes/allotropy is :

- |    |   |
|----|---|
| 1. | Allotropy is the existence of an element in more than one form.                 |
| 2. | Allotropes have the same chemical properties but different physical properties. |
| 3. | Diamond and graphite are allotropes of carbon.                                  |
| 4. | None of the above.  |

## COMPOUNDS OF CARBON, PREPARATIONS, PROPERTIES & USES - LEVEL I

**86** Dry ice is -

1. Solid  $\text{NH}_3$
2. Solid  $\text{SO}_2$
3. Solid  $\text{CO}_2$
4. Solid  $\text{N}_2$

**87** CO is a poisonous gas because :

- |    |   |
|----|---|
| 1. | It forms a complex with hemoglobin.   |
| 2. | The CO-Hb complex is about 300 times more stable than the O <sub>2</sub> -Hb complex. |
| 3. | It can kill a person through suffocation on not receiving oxygen.                     |
| 4. | All of the above.   |

**88** An excessive content of  $\text{CO}_2$  is responsible for global warming as:

- |    |   |
|----|---|
| 1. | Higher the level of carbon dioxide, higher is the amount of heat trapped. |
| 2. | Higher the level of oxygen, higher is the amount of heat trapped.         |
| 3. | Higher the level of carbon dioxide, lesser is the amount of heat trapped. |
| 4. | Higher the level of oxygen, lesser is the amount of heat trapped.         |

**89** The correct reaction(s) among the following options is/are -

1.  $\text{SiO}_2 + 4\text{HF} \rightarrow \text{SiF}_4 + 2\text{H}_2\text{O}$
2.  $\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$
3.  $\text{SiF}_4 + 2\text{HF} \rightarrow \text{H}_2\text{SiF}_6$
4. All of the above

**90** Carbon dioxide is a gas but silica is a solid because:

1. Carbon dioxide is composed of discrete covalent  $\text{CO}_2$  molecules whereas silica has a continuous tetrahedral structure.
2.  $\text{CO}_2$  molecules are lighter than  $\text{SiO}_2$  molecules.
3.  $\text{CO}_2$  is more acidic than  $\text{SiO}_2$ .
4. The melting point of silica is very high.



**91** Thermodynamically the most stable form of carbon is-

1. Diamond
2. Graphite
3. Fullerenes
4. Coal

**92** The hybridization of carbon in (a)  $\text{CO}_3^{2-}$  (b) diamond (c) graphite is respectively-

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

**93** Identify the correct statements among the following:

- a.  $\text{CO}_2(\text{g})$  is used as a refrigerant for ice-cream and frozen food.
  - b. The structure of  $\text{C}_{60}$  contains twelve six-carbon rings and twenty five-carbon rings.
  - c. ZSM-5, a type of zeolite, is used to convert alcohol into gasoline.
  - d. CO is a colourless and odourless gas
1. (a) and (c) only
  2. (b) and (c) only
  3. (c) and (d) only
  4. (a), (b) and (c) only

**94** The correct statement among the following regarding behavior of  $\text{BCl}_3$  and  $\text{CCl}_4$  in water is -

1.	$\text{BCl}_3$ readily undergoes hydrolysis while $\text{CCl}_4$ completely resists hydrolysis.
2.	$\text{CCl}_4$ readily undergoes hydrolysis while $\text{BCl}_3$ completely resists hydrolysis.
3.	Both $\text{BCl}_3$ and $\text{CCl}_4$ readily undergo hydrolysis.
4.	Neither $\text{BCl}_3$ nor $\text{CCl}_4$ undergo hydrolysis.

**95** The incorrect statement among the given options is :

1.	$\text{CO}_2$ can be prepared by the action of dilute hydrochloric acid on calcium carbonate.
2.	CO is prepared by the dehydration of formic acid with conc. $\text{H}_2\text{SO}_4$ .
3.	$\text{CO}_2$ is commercially prepared by passing steam over hot coke.
4.	CO is commercially prepared by passing steam over hot coke.

## COMPOUNDS OF CARBON, PREPARATIONS, PROPERTIES & USES - LEVEL II

**96** A compound that gives propyne on hydrolysis is -

1.  $\text{Al}_4\text{C}_3$
2.  $\text{Mg}_2\text{C}_3$
3.  $\text{B}_4\text{C}$
4.  $\text{La}_4\text{C}_3$

**97** The correct order of ease of hydrolysis is-

1.  $\text{CCl}_4 < \text{SiCl}_4 < \text{PCl}_5 < \text{AlCl}_3$
2.  $\text{AlCl}_3 < \text{CCl}_4 < \text{PCl}_5 < \text{SiCl}_4$
3.  $\text{CCl}_4 < \text{AlCl}_3 < \text{PCl}_5 < \text{SiCl}_4$
4.  $\text{CCl}_4 < \text{AlCl}_3 < \text{SiCl}_4 < \text{PCl}_5$

**98** When a metal X is treated with sodium hydroxide, a white precipitate (A) is obtained, which is soluble in excess of NaOH to give soluble complex (B). Compound (A) is soluble in dilute HCl and forms compound (C). The compound (A) when heated strongly gives (D), which is used to extract the metal.

X, C & D are respectively :

1.	Aluminium, aluminium chloride, alumina
2.	Aluminium, aluminium hydroxide, aluminium chloride
3.	Aluminium hydroxide, aluminium chloride, aluminium
4.	Aluminium hydroxide, aluminium chloride, sodium tetrahydroaluminate

**99**  $\text{CO}_2$  and  $\text{N}_2$  are non-supporters of combustion. However, for putting out fires  $\text{CO}_2$  is preferred over  $\text{N}_2$  because  $\text{CO}_2$ :

1. Does not burn.
2. Forms non-combustible products with burning substances.
3. Is denser than nitrogen.
4. Is a more reactive gas.

## PROPERTIES OF STRUCTURE OF SiO<sub>2</sub> & OTHER COMPOUNDS - LEVEL I

**100** The correct statement regarding polymeric silicon dioxide is -

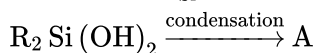
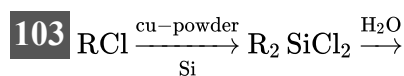
1. Each silicon atom is surrounded by four oxygen atoms and each oxygen atom is bonded to two silicon atoms.
2. Each silicon atom is surrounded by two oxygen atoms and each oxygen atom is bonded to two silicon atoms.
3. Silicon atom is bonded to two oxygen atoms.
4. These are double bonds between silicon and oxygen atoms.

**101** A compound among the following that is used in cosmetic surgery is -

1.	Silica	2.	Silicates
3.	Silicones	4.	Zeolites

**102** When silicon is boiled with caustic soda solution, the gas is evolved is-

1. O<sub>2</sub>
2. SiH<sub>4</sub>
3. H<sub>2</sub>
4. None of the above



Compound (A) is -

1.	A linear silicone	2.	A chlorosilane
3.	A linear silane	4.	A network silane

**104** A compound among the following that is not a monomer for a high molecular mass silicone polymer is-

1. Me<sub>3</sub>SiCl
2. PhSiCl<sub>3</sub>
3. MeSiCl<sub>3</sub>
4. Me<sub>2</sub>SiCl<sub>2</sub>

**105** Silicon carbide is used as:

1.	Dehydrating agent	2.	Abrasive
3.	Solvent	4.	Catalyst

**106** R<sub>3</sub>SiCl on complete hydrolysis forms:

1. R<sub>3</sub>SiOH
2. R<sub>3</sub>Si—O—SiR<sub>3</sub>
3. R<sub>3</sub>Si = O
4. None of the above.

**107**

Given below are two statements:

<b>Assertion (A):</b>	Silicones are water-repelling in nature.
<b>Reason (R):</b>	Silicones are organosilicon polymers, which have ( - R <sub>2</sub> SiO - ) as repeating units.
1.	Both (A) and (R) are true and (R) is the correct explanation of (A).
2.	Both (A) and (R) are true but (R) is not the correct explanation of (A).
3.	(A) is true but (R) is false.
4.	(A) is false but (R) is true.

## PROPERTIES OF STRUCTURE OF SiO<sub>2</sub> & OTHER COMPOUNDS - LEVEL II

**108** An anion present in the chain structure silicate is -

1. Si<sub>2</sub>O<sub>7</sub><sup>6-</sup>
2. (Si<sub>2</sub>O<sub>5</sub><sup>2-</sup>)<sub>n</sub>
3. (SiO<sub>3</sub><sup>2-</sup>)<sub>n</sub>
4. SiO<sub>4</sub><sup>4-</sup>

**109** Given below are two statements:

<b>Assertion (A):</b>	If aluminium atoms replace a few silicon atoms in three-dimensional network of silicon dioxide, the overall structure acquires a negative charge.
<b>Reason (R):</b>	Aluminium is trivalent while silicon is tetravalent.

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

**110** The silicate anion in the mineral kinoite is a chain of three  $\text{SiO}_4$  tetrahedra, that share corners with adjacent tetrahedra. The charge of the silicate anion is-

1. -4
2. -8
3. -6
4. -2

## PROPERTIES OF GLASS, Pb & Sn COMPOUNDS - LEVEL I

**111** An amphoteric oxide among the following is-

1.  $\text{CO}_2$
2. CO
3.  $\text{SnO}_2$
4. CaO

**112** The products formed on heating  $\text{Pb}(\text{NO}_3)_2$  are -

1.  $\text{PbO}$ ,  $\text{N}_2$ ,  $\text{O}_2$
2.  $\text{Pb}(\text{NO}_2)_2$ ,  $\text{O}_2$
3.  $\text{PbO}$ ,  $\text{NO}_2$ ,  $\text{O}_2$
4.  $\text{Pb}$ ,  $\text{N}_2$ ,  $\text{O}_2$

**113** The incorrect statement among the following is -

1.  $\text{PbX}_2$  is more stable than  $\text{PbX}_4$
2.  $\text{PbCl}_4$  is less stable than  $\text{SnCl}_4$  but  $\text{PbCl}_2$  is more stable than  $\text{SnCl}_2$
3.  $\text{PbCl}_4$  is less stable than  $\text{SnCl}_4$
4.  $\text{Pb}(\text{II})$  is a good reducing agent while  $\text{Sn}(\text{II})$  is not

**114** Death due to gunshot is caused by poisoning of:

1. Hg
2. Pb
3. Fe
4. As

**115** The most characteristic oxidation state for lead and tin is respectively:

1. +4, +2
2. +2, +4
3. +4, +4
4. +2, +2

**116** A species among the following that decomposes easily is: -

1.  $\text{PbI}_2$
2.  $\text{PbI}_4$
3.  $\text{Pb}(\text{CH}_3\text{COO})_4$
4.  $\text{PbCl}_2$

**117** When  $\text{SnCl}_2$  reacts with  $\text{HgCl}_2$ , the product formed is-

1.  $\text{Sn} + \text{HgCl}_4$
2.  $\text{Sn} + \text{Cl}_2 + \text{Hg}_2\text{Cl}_2$
3.  $\text{SnCl}_4$  and  $\text{Hg}_2\text{Cl}_2$
4. None of the above

**118** Litharge is not commonly used in:

1. Manufacture of special glasses
2. Glazing pottery
3. Preparing paints
4. Lead storage battery

## PROPERTIES OF GLASS, Pb & Sn COMPOUNDS - LEVEL II

**119** Sn crumbles to a powder in very cold weather, due to -

1. Expansion of the crystal lattice
2. Formation of  $\text{SnO}$  at low temperature
3. The conversion of Sn to powdery meta stannic acid
4. The transition from white tin to grey form, that is amorphous

**120** The soldiers of the Napoleon army while at the Alps during freezing winter suffered a serious problem with regards to the tin buttons of their uniforms. White Metallic tin buttons get converted to grey powder. This transformation is related to-

1. An interaction with water vapour contained in humid air
2. A change in the crystalline structure of tin
3. A change in the partial pressure of  $\text{O}_2$  in the air
4. An interaction with  $\text{N}_2$  of air at low temperature

**121** The reagent that is used to remove  $\text{SO}_4^{2-}$  and  $\text{Cl}^-$  is -

1. NaOH
2.  $\text{Pb}(\text{NO}_3)_2$
3.  $\text{BaSO}_4$
4. KOH