

P Block elements Part 1 (Group 13 & Group 14 Elements)

1. Elemental Properties of Group 13 elements

- Q 1. Which of the following block contains semimetals?
(A) S block (B) P block
(C) d block (D) f block
- Q 2. The stability order of given oxidation state is
(A) $Tl^+ > In^+ > Ga^+$ (B) $Tl^+ < In^+ < Ga^+$
(C) $Tl^{3+} > In^{3+} > Ga^{3+}$ (D) $Tl^{2+} > In^{2+} > Ga^{2+}$
- Q 3. Inert pair effect is due to
(A) Lower penetration power of nS -orbital e-
(B) Higher penetration power of nS -orbital e-
(C) Highest most probable distance of nS electron
(D) Lowest most probable distance of nS electron
- Q 4. Which of the following is anomalous property of IIIA elements?
(A) Absence of d orbitals
(B) Lower coordination number
(C) formation of π bonds
(D) exist as gas
- Q 5. The exhibition of highest co-ordination number depends on the availability of vacant orbitals in the central atom. Which of the following elements is NOT likely to acts as central atom in MF_6^{3-} ? [NCERT Exemplar]
(A) B (B) Al (C) Ga (D) In
- Q 6. Group 13/IIIA elements are known as
(A) Boron Family (B) Aluminum Family
(C) Both A & B (D) None of these
- Q 7. Ga has low melting point because
(A) It is metal
(B) It is semi metal
(C) It exist as Ga_2 molecule
(D) It exist as Ga_4 molecule
- Q 8. Which of the following is used in high temperature thermometry?
(A) Na (B) Ga
(C) Tl (D) Hg
- Q 9. Gallium form $GaCl_2$ because
(A) Ga exist as Ga^{2+} ion
(B) Ga exist as Ga^+ & Ga^{3+} ion
(C) Ga exist as Ga_2^{4+} ion
(D) None of these
- Q 10. The correct order of atomic radius of IIIA elements is
(A) $B < Al < Ga < In < Tl$
(B) $B < Ga < Al < In < Tl$
(C) $B < In < Ga < Al < Tl$
(D) None of these
- Q 11. The correct order of ionization energy of IIIA elements is
(A) $B > Al > Ga > In > Tl$
(B) $B > Ga > Al > In > Tl$
(C) $B > Ga > Al > Tl > In$
(D) None of these
- Q 12. The correct order of Electronegativity of IIIA elements is
(A) $B > Al > Ga > In > Tl$
(B) $B > Ga > Al > In > Tl$
(C) $B > Ga > Al > Tl > In$
(D) $B > Tl > In > Ga > Al$
- Q 13. **Assertion (A):** Boron always form covalent bond
Reason (R): The smaller size of B^{3+} favours formation of covalent bond. [IIT JEE 2007]
(A) Both A & R are true and R is the correct explanation of A
(B) Both A & R are true and R is NOT correct explanation of A
(C) if A is true but R is false
(D) if A is false but R are ture
- Q 14. Boron will react with
(A) Acid (B) Base
(C) Oxidising Acid (D) None of these
- Q 15. The correct order of ability of complex formation is
(A) $IA < IIA < IIIA$ (B) $IA > IIA > IIIA$
(C) $IA = IIA < IIIA$ (D) $IIA > IA > IIIA$

2. Compounds of Group 13 elements

- Q 1. **Assertion (A):** $\text{Al}(\text{OH})_3$ is Amphoteric in nature
Reason (R): $\text{Al}-\text{O}$ and $\text{O}-\text{H}$ bonds can be broken with equal ease in $\text{Al}(\text{OH})_3$. [IIT JEE 1998]
 (A) Both A & R are true and R is the correct explanation of A
 (B) Both A & R are true and R is NOT correct explanation of A
 (C) if A is true but R is false
 (D) if A is false but R are true
- Q 2. Which of the following oxides are Amphoteric oxide?
 (A) Al_2O_3 , In_2O_3 (B) Al_2O_3 , Ga_2O_3
 (C) Al_2O_3 , B_2O_3 (D) Al_2O_3 , Tl_2O
- Q 3. Which of the following is only Acidic in nature?
 [AIIMS 2004]
 (A) $\text{Be}(\text{OH})_2$ (B) $\text{Mg}(\text{OH})_2$
 (C) $\text{B}(\text{OH})_3$ (D) $\text{Al}(\text{OH})_3$
- Q 4. Al_2O_3 can be converted into anhydrous AlCl_3 by heating [CBSE PMT 2006]
 (A) Al_2O_3 with HCl gas
 (B) Al_2O_3 with NaCl in solid state
 (C) A mixture of Al_2O_3 & Carbon in dry Cl_2 gas
 (D) Al_2O_3 with Cl_2 gas
- Q 5. Al_2O_3 on heating with Carbon In atmosphere of N_2 at high temperature produces [AIIMS 1999]
 (A) $\text{Al} + \text{CO}_2$ (B) $\text{Al} + \text{CO}_2 + \text{NO}$
 (C) $\text{Al}_4\text{C}_3 + \text{NO}$ (D) $\text{AlN} + \text{CO}$
- Q 6. Which of the following statement about anhydrous Aluminum is correct? [IIT JEE 1982]
 (A) It exists as AlCl_3 molecules
 (B) It is not easily hydrolysed
 (C) It sublimes at 100°C under vacuum
 (D) It is a strong lewis base
- Q 7. Heating an aqueous solution of Aluminum chloride to dryness will give [AIEEE 2005]
 (A) $\text{Al}(\text{OH})\text{Cl}_2$ (B) Al_2O_3
 (C) Al_2Cl_6 (D) AlCl_3
- Q 8. The coordination number of Al in the crystalline state of AlCl_3 is [IIT JEE 2009]
- Q 9. Aluminum chloride exist as dimer Al_2Cl_6 in solid state as well as in non-polar solvent like benzene when dissolved in water, it gives [AIEEE 2004]
 (A) $[\text{Al}(\text{OH})_6]^{3-} + 3\text{HCl}$ (B) $[\text{Al}(\text{H}_2\text{O})_6]^{3+} + 3\text{Cl}^-$
 (C) $\text{Al}^{3+} + 3\text{Cl}^-$ (D) $\text{Al}_2\text{O}_3 + 6\text{HCl}$
- Q 10. The correct order of Lewis acid character is
 (A) $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$
 (B) $\text{BI}_3 > \text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
 (C) $\text{BCl}_3 > \text{BF}_3 > \text{BBr}_3 > \text{BI}_3$
 (D) None of these
- Q 11. The statements that are not true about elements of boron family are
 (A) Sums of first three ionisation energies decrease from B to Tl
 (B) Sum of first three ionisation energies for Ga decreases because of the increase in size
 (C) Tl (III) compounds are more stable compared to Tl (I) compounds
 (D) Boron can form stable B^{3+} anion only but not B^{3+} cation
- Q 12. The statements that are true about III group elements from the following are
 (A) Al is a better reducing agent than carbon.
 (B) Indium is less basic than gallium.
 (C) Maximum Covalency of B is 4 & for Al is 6.
 (D) Heavier elements of group III have greater tendency to form multiple bonds.
- Q 13. BCl_3 does not exist as a dimer but BH_3 exists as B_2H_6 because
 (A) Cl is more electronegative than hydrogen
 (B) there is $\text{p}\pi - \text{p}\pi$ back bonding in BCl_3
 (C) large size of the Cl atom does not fit between the small sized B atoms, while small sized H atoms occupy the space between B atoms
 (D) both (B) and (C)
- Q 14. The bond dissociation energy of B - F bond in BF_3 is higher than C - F bond in CF_4 , the correct reason for it is [AIIMS 2016]
 (A) Stronger σ bond between B & F in BF_3 as compared to that between C & F bond in CF_4
 (B) significant $\text{p}\pi - \text{p}\pi$ interaction between B & F in BF_3 whereas there is no possibility of such interaction between C & F bond in CF_4
 (C) Lower degree of $\text{p}\pi - \text{p}\pi$ interaction between B & F in BF_3 than C & F in CF_4
 (D) Smaller Size of B atoms as compared to that of C atom
- Q 15. AlCl_3 dimerises due to formation of
 (A) $3\text{C} - 4\text{e}$ bond (B) $3\text{C} - 2\text{e}$ bond
 (C) $2\text{C} - 2\text{e}$ bond (D) $3\text{C} - 6\text{e}$ bond

3. Compounds of Boron Part – I

- Q 1. The statements that are true about aluminum group elements are
1. Ga and Tl form mostly ionic compound.
 2. B^{3+} is not known.
 3. BBr_3 is a weaker acid than BCl_3 and BF_3
 4. Thallium hydroxide is the weakest base among aluminium group hydroxides.
- (A) 1, 2 (B) 1, 2, 3
(C) 1, 2, 4 (D) 2, 3, 4
- Q 2. The correct statement about orthoboric acid is
- (A) it is a strong monobasic acid
(B) it is not proton donor, but a weak Lewis acid
(C) it is a tribasic acid
(D) dissolution of boric acid in water is an endothermic process
- Q 3. Which of the following statements are not correct?
- (A) H_3BO_3 is monobasic acid.
(B) Decreasing order of acidity is $BBr_3 > BCl_3 > BF_3$.
(C) Rotation about B-B bond is possible in B_2H_6 like in the case of C_2H_6
(D) In and Tl are more stable in + 3 state than in + 1 state.
- Q 4. Which of the following compounds are formed, when boron trichloride is treated with water?
- (A) $H_3BO_3 + HCl$ (B) $B_2H_6 + HCl$
(C) B_2O_3 (D) None
- Q 5. TlI_3 a soluble ionic compound, in aqueous medium will give
- (A) Tl^{3+} and I^- ions (B) Tl^+ , I^- and I_2
(C) Tl^{3+} and I_3^- ions (D) Tl^+ and I_3^- ions
- Q 6. The elements having the maximum and minimum melting points among the members of group IIIA respectively are
- (A) B, Ti (B) Ti, B
(C) B, Ga (D) Al, Ti
- Q 7. Which of the following is not an anomalous property of Boron?
- (A) Boron are band conductor whereas other elements of IIIA are good conductor
(B) Boron form monomeric halides whereas other does not
(C) Boron hydrides, Boranes are stable
(D) Boron exist in two forms – crystalline & amorphous, whereas other elements are metal
- Q 8. The type of hybridization of boron in diborane is
- (A) sp (B) sp^2 (C) sp^3 (D) dsp^2
- Q 9. Consider the following statements concerning diborane:
1. There is free rotation about B-B axis
 2. All the H atoms are bonded to B atoms in a similar way
 3. Its final hydrolysis products are hydrogen and boric acid
 4. It forms addition compounds with ammonia
- Which of these statements are correct ?
- (A) 1 and 2 (B) 2 and 3
(C) 3 and 4 (D) 1 and 4
- Q 10. Which one is NOT a borane?
- (A) B_5H_9 (B) B_5H_{10}
(C) B_5H_{11} (D) B_6H_{10}
- Q 11. Diborane reacts with Water to form
- (A) HBO_2 (B) H_3BO_3
(C) $H_3BO_3 + H_2$ (D) H_2
- Q 12. Which of the following is the correct statement?
[AIEEE 2008]
- (A) Boric acid is a protonic acid
(B) Beryllium exhibits coordination number of 6
(C) Chlorides of both Be & Al have bridged chloride structure of solid phase
(D) $B_2H_6 \cdot 2NH_3$ is known as Inorganic Benzene
- Q 13. The product of reaction of diborane with excess ammonia at low temperature and at high temperature are, respectively
- (A) borazine and boron nitride
(B) boron nitride and $B_2H_6 \cdot 2NH_3$
(C) $B_2H_6 \cdot 2NH_3$ and boron nitride
(D) boron nitride and borazine
- Q 14. From B_2H_6 , all of the following compound can be prepared except
- (A) B_2O_3 (B) H_3BO_3
(C) $B_2(CH_3)_6$ (D) $NaBH_4$
- Q 15. Which one of the following methyl diboranes does not exist ?
- (A) $B_2H_4(CH_3)_2$ (B) $B_2H_3(CH_3)_3$
(C) $B_2H_2(CH_3)_4$ (D) $B_2H(CH_3)_2$

4. Compounds of Elements – Part II

- Q 1. Three moles of B_2H_6 are completely reacted with methanol. The number of moles of Boron containing the product is [JEE Adv. 2015]
- Q 2. Which one is metaboric acid?
(A) HBO_2 (B) $H_2B_4O_7$
(C) BCl_3 (D) $AlCl_3$
- Q 3. H_3BO_3 is [IIT JEE 2003S]
(A) Monobasic and weak Lewis acid
(B) Monobasic and weak Bronsted acid
(C) Monobasic and strong lewis acid
(D) Tribasic and weak Bronsted acid
- Q 4. Boric acid polymerases due to
(A) its polymer is natural
(B) the presence of hydrogen bonds
(C) its monobasic nature
(D) its geometry
- Q 5. Which statement regarding H_3BO_3 is NOT correct? [CBSE PMT 1994]
(A) It is a strong Tribasic Acid
(B) It is prepared by acidifying an aqueous solution of Borax
(C) It has a layer structure in which planar BO_3 units are joined together by Hydrogen Bond
(D) It does not act as proton donor but acts as Lewis acid by accepting OH^- ions
- Q 6. Pick out the incorrect statement
(A) BO_3^{2-} ion is triangular polar in which boron is sp^3 hybridised
(B) Boric acid contains planar triangular BO_3^{2-} units which are bonded together through hydrogen bonds into two dimensional sheets
(C) Borazine is isoelectronic with benzene. In both compounds, the π electrons are delocalised
(D) The structure of BN resembles with diamond.
- Q 7. Explain what happens when boric acid is heated? [NCERT]
- Q 8. Aqueous solution of Borax is?
(A) Acidic (B) Basic
(C) Amphoteric (D) Oxidising
- Q 9. In borax bead test, which compound is formed? [CBSE PMT 2002]
(A) Ortho Borate (B) Meta Borate
(C) Double Borate (D) Tetra Borate
- Q 10. Borax Bead test is responded by
(A) Divalent Metal (B) Heavy Metal
(C) Light Metal
(D) Metal which form coloured Metaborates
- Q 11. Borax Bead test is not given by
(A) Aluminum Salt (B) Cobalt Salt
(C) Copper Salt (D) Nickel Salt
- Q 12. Borax is used as cleansing agent because on dissolving in water, it gives [AIIMS 2006]
(A) Alkaline Solution (B) Acidic Solution
(C) Bleaching solution (D) Colloidal Solution
- Q 13. The bonds present in Borazole are
(A) $12\sigma, 3\pi$ (B) $9\sigma, 6\pi$
(C) $6\sigma, 6\pi$ (D) $9\sigma, 9\pi$
- Q 14. The hardest compound of boron is
(A) Boron Oxide (B) Boron Nitride
(C) Boron Carbide (D) Boron Hydride
- Q 15. $Na_2B_4O_7 \cdot 10H_2O$ exist as
(A) $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$
(B) $Na_2[B_4O_7(OH)_2] \cdot 8H_2O$
(C) $Na_2[B_4O_3(OH)_6] \cdot 7H_2O$
(D) None of these
- Q 16. Which of the given addition will made reaction to proceed in forward direction? [IIT JEE 2006]
 $B(OH)_3 + NaOH \rightleftharpoons NaBO_2 + Na[B(OH)_4] + H_2O$
(A) Borax (B) Cis-1,2-diol
(C) Na_2HPO_4 (D) Trans-1,2-diol
- Q 17. Which one of the following boron compounds are optically active?
(A) Boron trifluoride (B) Boron anhydride
(C) Borosalicylic acid (D) Sodium tetraborate
- Q 18. What happens when [NCERT]
(A) Borax is strongly heated
(B) Boric acid is added to water
(C) BF_3 is reacted with Alumina
- Q 19. When Metal X is heated with NaOH, a white ppt A is formed which is soluble in excess of NaOH to give soluble complex B. Compound A is soluble in dilute HCl to form compound C. The Compound A when heated strongly gives D, which is used to extract metal. Identify X, A, B, C & D. write suitable reactions. [NCERT]
- Q 20. A certain salt X, gives the following reactions
(A) Its aqueous solution is alkaline in nature
(B) it swells up to a glassy material Y on strong Heating.
(C) When Conc. H_2SO_4 is added to a hot solution of X, white crystal of an acid Z separates out.

5. Elemental Properties of Group 14 Elements

- Q 1. The second most abundant element in the earth crust is
(A) Carbon (B) Aluminum
(C) Silicon (D) Oxygen
- Q 2. The correct order of Ionisation Energy of Sn & Pb is
(A) Sn > Pb (B) Pb > Sn
(C) Pb \approx Sn (D) Can not predict
- Q 3. The lead of lead pencils melts at
[AIIMS 2012, 2014]
(A) 2000 °C (B) 350 °C
(C) 3170 °C (D) 75 °C
- Q 4. The catenation property order is
[NCERT Exemplar]
(A) C > Si > Ge > Sn (B) C >> Si > Ge \approx Sn
(C) Si > C > Sn > Ge (D) Ge > Sn > Si > C
- Q 5. Carbon atom has high Catenation Property because
(A) Carbon has tetravalency
(B) Carbon can form multiple bonds
(C) Carbon form Strong Bonds
(D) All of these
- Q 6. Which of the following element reacts with Water?
(A) Carbon (B) Silicon
(C) Tin (D) Lead
- Q 7. Incorrect statement about Ge is
(A) GeO₂ is weakly acidic
(B) Ge(OH)₂ is amphoteric
(C) GeCl₂ is more stable than GeCl₄
(D) Ge-Ge bond energy is greater than that Si-Si
- Q 8. It is because of inability of nS² orbital electrons of valence shell to participate in bonding that
[NEET 2017]
(A) Sn²⁺ is reducing and Pb⁴⁺ is oxidising
(B) Sn²⁺ is oxidising and Pb⁴⁺ is reducing
(C) Sn²⁺ and Pb⁴⁺ are both reducing is oxidising
(D) Sn⁴⁺ is reducing and Pb²⁺ is oxidising
- Q 9. **Assertion (A):** Pb⁴⁺ compounds are stronger oxidising agents than Sn⁴⁺ compounds.
Reason(R): The higher oxidation state of Group 14 elements are more stable for the heavier members of the group due to Inert pair effect.
[IIT JEE 2008]
- (A) Both A & R are true and R is the correct explanation of A
(B) Both A & R are true and R is NOT correct explanation of A
(C) if A is true but R is false
(D) if A is false but R are true
- Q 10. PbI₄ does not exist because of
(A) small size of Pb⁴⁺ and large size of I⁻ ions.
(B) high oxidizing power of Pb⁴⁺ ions
(C) high reducing power of I⁻ ions
(D) high hydration energy of Pb⁴⁺ ions
- Q 11. If two compounds have the same crystal structure and analogous formula, they are called
(A) Allotropes (B) isotopes
(C) isomers (D) isobars
- Q 12. In buck minster fullerene, each carbon atom is
(A) Anthracite (B) Coal
(C) Wood Charcoal (D) Graphite
- Q 13. Which allotrope is not soluble in toluene?
(A) C – 70 (B) Graphite
(C) Fullerene (D) A & C both
- Q 14. Which atom does have dangling valancies?
(A) Diamond (B) Graphite
(C) Fullerene (D) both A and B
- Q 15. Most recently developed carbon allotrope ‘C–60’ Buckminster fullerene has the shape of
(A) Football (B) Thin sheet of steel
(C) Diamond (D) None of these
- Q 16. Thermodynamically the most stable form of C is
[NCERT]
(A) Diamond (B) Graphite
(C) Fullures (D) Coal
- Q 17. Mark the wrong statement
(A) Diamond is the densest variety of carbon
(B) Diamond is the hardest variety of carbon
(C) Diamond is not acted upon by fused Na₂CO₃
(D) Coke is the hardest and graphite is the softest
- Q 18. The nature of chemical bonding in diamond is
(A) Ionic (B) Covalent
(C) Coordinate (D) Metallic

6. Allotropes of C, Carbon Monoxide

- Q 1. Most impure form of carbon is
(A) Wood charcoal (B) Animal charcoal
(C) Lamp black (D) Graphite
- Q 2. In graphite, electrons are [CBSE PMT 1993]
(A) localized on each C atom
(B) localized on every third C atom
(C) spread out between the structure
(D) Both B & C
- Q 3. Graphite is used in nuclear reactor
(A) As a lubricant (B) As a fuel
(C) For lining inside of the reactor as an insulator
(D) For reducing the velocity of neutrons
- Q 4. Graphite is a soft lubricant and extremely hard to melt. The reason for this anomalous behavior is that graphite [AIIEE 2003]
(A) is an allotropic form of diamond
(B) has molecules of variable molecular masses like polymers
(C) has carbon atoms arranged in large plates of rings of strongly bound carbon atoms with weak interplate bonds
(D) it is a non-crystalline substance
- Q 5. In the sale of diamonds the unit of weight is carat. One carat is equal to
(A) 100 mg (B) 200 mg
(C) 300 mg (D) 400 mg
- Q 6. Graphite is
(A) a good conductor of heat
(B) an amorphous allotrope of carbon
(C) softer than diamond
(D) used for making lubricants
- Q 7. The charcoal used to decolourise brown sugar solution is
(A) Wood charcoal (B) Coconut charcoal
(C) Animal charcoal (D) Sugar Charcoal
- Q 8. Activated charcoal is employed to remove colouring matter from pure substance, it works by
(A) Bleaching (B) Oxidation
(C) reduction (D) Adsorption
- Q 9. Variety of carbon used in gas masks is
(A) lamp black (B) wood charcoal
(C) graphite (D) gas carbon
- Q 10. Which of the following is used making printer's ink, shoe polish, black varnish and paint?
(A) Bone black (B) carbon black

- (C) Gas black (D) Lamp black
- Q 11. The most reactive form of carbon is
(A) Diamond (B) Graphite
(C) Coal (D) Charcoal
- Q 12. Carbon monoxide combines with hydrogen when heated to 150-160 degree C in presence of a catalyst to
(A) Acetaldehyde (B) Methyl alcohol
(C) Acetone (D) Formaldehyde
- Q 13. Carbon monoxide is absorbed by
(A) An ammoniacal solution of cuprous chloride
(B) Nickel tetracarbonyl formation
(C) Using Activated Charcoal
(D) None of these
- Q 14. Identify the correct statement with respect to carbon monoxide?
(A) It combines with water to form carbonic acid
(B) It reacts with hemoglobin in red blood cells
(C) It is a powerful oxidizing agent
(D) It is used to prepare aerated drinks
- Q 15. CO gas is poisonous because
(A) It forms more stable complex with Hemoglobin than formed by Oxygen
(B) It forms less stable complex with Hemoglobin than formed by Oxygen
(C) It reacts with Hemoglobin and breaks its structure
(D) it causes death
- Q 16. CO is a poisonous gas. Antidote for CO poisoning is
(A) Carborundum (B) Carbogen
(C) Carbonyl chloride (D) pure CO₂

7. Carbon Dioxide, Carbides

- Q 1. Heating of oxalic acid with conc. H₂SO₄ evolves.
(A) CO (B) CO₂
(C) SO₂ (D) SO₃
- Q 2. Carbon dioxide is absorbed by plants in the presence of chlorophyll and sunlight to produce
(A) cellulose (B) formic acid
(C) glucose (D) starch
- Q 3. Solid CO₂ is called dry ice. Choose the correct statement about dry ice. [AIIMS 2000]
(A) It melts at 0 °C

- (B) its boiling point is more than 199°C
 (C) It directly change too vapours lowering the temperature to -78°C
 (D) None of the above
- Q 4. Supercritical CO_2 is used as [AIIMS 2007]
 (A) Dry Ice (B) Fire fighting
 (C) A solvent for extraction of organic compounds from natural sources
 (D) A highly inert medium for carrying out various reactions
- Q 5. Burning sulphur continues to burn in
 (A) NO (B) N_2O
 (C) CO_2 (D) NH_3
- Q 6. The number and type of bonds between two carbon atoms in CaC_2
 (A) One sigma (σ) and one pi (π)
 (B) One sigma (σ) and two pi (π) bonds
 (C) One sigma (σ) and one and a half pi (π) bond
 (D) One sigma (σ) bond
- Q 7. When a mixture of air and steam is passed over red hot coke, the outgoing gas contains
 (A) producer gas (B) $\text{CO} + \text{H}_2$
 (C) $\text{CO} + \text{CO}_2$ (D) $\text{H}_2\text{O} + \text{CO}$
- Q 8. In which of the following there is $p\pi-d\pi$ bond?
 (A) Graphite (B) Trisilylamine
 (C) Trimethylamine (D) CS_2
- Q 9. The carbides in which carbon atom is trigonally hybridized and tetrahedrally hybridized are respectively
 (A) C_8K , Cr_3C_2 (B) SiC , Mn_3C
 (C) C_8K , Be_2C (D) Be_2C , Al_4C_3
- Q 10. You are given a mixture of CO and O_2 . How will you find the relative proportions of the gases in the mixture?
 (A) By passing the mixture into $\text{Ca}(\text{OH})_2$ solution
 (B) By treating the mixture with hydrogen.
 (C) By treating the mixture into CaO solution.
 (D) By treating the mixture with carbon.
- Q 11. $\text{C}(\text{OH})_4$ is unstable because a carbon atom can not hold more than one $-\text{OH}$ groups but $\text{Si}(\text{OH})_4$ is a stable compound because
 (A) $\text{C}-\text{O}$ bond energy is low
 (B) $\text{C}-\text{O}$ bond energy is high
 (C) $\text{Si}-\text{O}$ bond energy is low
 (D) $\text{Si}-\text{O}$ bond energy is high
- Q 12. Match the following in column I for its use/gas produced on hydrolysis:
- | Column I | Column II |
|-----------------------------|---------------------------|
| (1) Be_2C | (A) Bullet proof material |
| (2) Mg_2C_3 | (B) Acetylene |
| (3) MgC_2 | (C) Methane |
| (4) B_4C | (D) Propyne |
- Q 13. Explain the following reactions [NCERT]
 (A) Silicon is heated with MeCl at high temperature in presence of Cu
 (B) Silicon dioxide is heated with HF
 (C) CO is heated with ZnO

8. Type of Silicates

- Q 1. The fundamental unit of silicate is [NEET 2013]
 (A) SiO_2 (B) SiO_4^{4-}
 (C) SiO_3 (D) $\text{Si}_2\text{O}_5^{2-}$
- Q 2. In silicon oxide [AIIEE 2005]
 (A) there are double bonds between Si & O atom
 (B) Si atom is bonded to 2 O atoms
 (C) Each Si atom is surrounded by 2 O atoms and each O atom is bonded to 2 Si atoms
 (D) Each Si atom is surrounded by 4 O atoms and each O atom is bonded to 2 Si atoms
- Q 3. In the sheet like silicates
 (A) No O atom is shared among SiO_4^{4-} tetrahedra
 (B) One O atom per tetrahedron is shared
 (C) Two O atoms per tetrahedron are shared
 (D) Three O atoms per tetrahedron are shared
- Q 4. The hybridization of silicon in silicates is
 (A) sp^2 (B) sp^3
 (C) dsp^2 (D) sp^3d
- Q 5. In which of the following two $[\text{SiO}_4]^{4-}$ units are joined by sharing an oxygen atom? [CBSE PMT 2011]
 (A) Orthosilicate (B) Pyrosilicate
 (C) Pyroxenes (D) Amphiboles
- Q 6. In which of the following silicates, 2 common Oxygen atoms are present?
 (A) Pyro Silicates (B) Cyclic Silicates
 (C) Sheet Silicates (D) 3-D silicates

- Q 7. Pyrosilicates have formula
 (A) $Si_2O_7^{4-}$ (B) $Si_2O_7^{5-}$
 (C) $Si_2O_7^{6-}$ (D) $Si_2O_6^{7-}$
- Q 8. Chain Silicates have general formula
 (A) $(SiO_3^{2-})_n$ (B) $(Si_4O_{11}^{6-})_n$
 (C) $(SiO_2^{3-})_n$ (D) Both A & B
- Q 9. Sheet silicates have general formula
 (A) $(Si_2O_5^{2-})_n$ (B) $(SiO_2^{5-})_n$
 (C) $(SiO_3^{2-})_n$ (D) None of these
- Q 10. SiO_2 reacts with
 (A) HF (B) NaOH
 (C) Both A & B (D) None of these
- Q 11. Name the structure of silicates in which three oxygen atoms of $[SiO_4]^{4-}$ are shared?
[IIT JEE 2005S]
 (A) Pyrosilicates
 (B) Sheet Silicates
 (C) Linear Chain Silicates
 (D) Three dimensional Silicates
- Q 12. Number of O - atoms shared per SiO_4^{4-} tetrahedron in (a) sheet structure silicates, (b) cyclic silicates and (c) single strand chain silicates are, respectively
 (A) 4, 2, 2 (B) 4, 3, 2
 (C) 3, 3, 2 (D) 3, 2, 2
- Q 13. Zeolites are obtained by replacing some Si^{4+} by
 (A) Na^+ (B) Al^{3+}
 (C) Both A & B (D) K^+
- Q 14. **Assertion (A):** If Al atom replace a few Si atoms in three dimensional network of SiO_2 , the overall structure acquires a negative charge.
Reason(R): Al is a trivalent and Si is tetravalent.
[NCERT Exemplar]
 (A) Both A & R are true and R is the correct explanation of A
 (B) Both A & R are true and R is NOT correct explanation of A
 (C) if A is true but R is false
 (D) if both A & R are false
- Q 15. In ultramarines, which of the following ions are present?
 (A) Na^+ ions (B) Al^{3+} ions
 (C) S^{2-} ions (D) All of these

9. Silicones, Quartz & Glass

- Q 1. Which of the following shows bonding in Silicone?
[AIIMS 1994]
 (A) Si-C-Si-C-Si (B) Si-Si-Si-Si
 (C) -Si-O-Si-O-Si (D) Si-C-Si-O-Si
- Q 2. Which of these is not a monomer for a high molecular mass silicon polymer?
[NEET 2013]
 (A) $MeSiCl_3$ (B) Me_2SiCl_2
 (C) Me_3SiCl (D) $PhSiCl_3$
- Q 3. The hydrolysis of $(CH_3)_2SiCl_2$ produces
[IIT JEE 2003S]
 (A) $(CH_3)_2Si=O$ & HCl
 (B) $HO - \begin{array}{c} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{array} - O - Si - O - \begin{array}{c} CH_3 \\ | \\ Si \\ | \\ CH_3 \end{array} - OH$ and HCl
 (C) $(CH_3)_2Si(OH)_2$ & HCl
 (D) Silicone Polymers
- Q 4. The structure and hybridization of $Si(CH_3)_4$ is
[CBSE PMT 1996]
 (A) Octahedral, SP^3d (B) Tetrahedral, SP^3
 (C) Bent, SP (D) Trigonal, SP^2
- Q 5. Which of the following is correct?
 (A) Silicones are organosilicon polymers containing R-Si-O-Si-linkage
 (B) R_3SiCl on hydrolysis and dehydration gives $R_3Si-O-SiR_3$
 (C) Both (D) None
- Q 6. Silicon has high tendency to form polymer like silicones. The chain length of silicone polymer can be controlled by adding
[NCERT Exemplar]
 (A) $MeSiCl_3$ (B) Me_2SiCl_2
 (C) Me_3SiCl (D) Me_4Si
- Q 7. Which is the property of silicon?
 (A) High Water resistant
 (B) Electrical Insulator
 (C) Silicones are more stable with $-CH_3$ among alkyl group
 (D) All of these
- Q 8. **Assertion (A):** SiF_6^{2-} is known but $SiCl_6^{2-}$ is not
Reason(R): Size of F is small and its lone pair of electrons interact with d orbital of Si strongly.
[AIIMS 2005]
 (A) Both A & R are true and R is the correct explanation of A

- (B) Both A & R are true and R is NOT correct explanation of A
 (C) if A is true but R is false
 (D) if both A & R are false
- Q 9. Quartz is extensively used as piezoelectric material, It contains [NCERT Exemplar]
 (A) Pb (B) Si
 (C) Ti (D) Sn
- Q 10. General formula of Glass is (M = Na, K Rb & M' = Ca)
 (A) $M_2O.M'O + 6SiO_2$
 (B) $M_2SiO_3.M'SiO_3 + 4SiO_2$
 (C) $M_2O.M'O + 4SiO_2$
 (D) Both A & B
- Q 11. Glass is a [AIEEE 2003]
 (A) Super cooled liquid
 (B) Gel
 (C) Polymeric Mixture
 (D) Micro-Crystalline solid
- Q 12. Cerium oxide containing special variety of glass, which cuts off ultraviolet rays is known as
 (A) Crookes glass (B) flint glass
 (C) Jena glass (D) Pyrex glass
- Q 13. For making a good quality mirror, plates of float glass are used. These are obtained by floating molten glass over a liquid metal which does not solidify before glass. The metal used can be [AIEEE 2003]
 (A) tin (B) Sodium
 (C) Magnesium (D) Mercury
- Q 14. Which one of the following is opaque to ultraviolet rays?
 (a) Crookes glass (b) Flint glass
 (c) pyrex glass (d) Soda glass
- Q 15. The principal constituent of Pyrex glass is
 (A) Zn (B) B (C) Pb (D) Cl
- Q 16. Which glass can withstand high temperatures of the order of 1000°C ?
 (A) Quartz (B) Pyrex
 (C) Potash (D) Potash lead
- Q 17. Litharge is chemically [AIIMS 2007]
 (A) PbO (B) PbO_2
 (C) Pb_3O_4 (D) $Pb(CH_3COO)_2$
- Q 18. **Assertion (A):** Pb_3O_4 reacts with HNO_3 and forms PbO_2
Reason(R): Lead is stable in +4 oxidation state. [AIIMS 2018]
 (A) Both A & R are true and R is the correct explanation of A
 (B) Both A & R are true and R is NOT correct explanation of A
 (C) if A is true but R is false
 (D) if both A & R are false
- Q 19. **Assertion (A):** PbI_4 is a stable compound.
Reason(R): Iodine stabilises higher oxidation state. [AIIMS 2003]
 (A) Both A & R are true and R is the correct explanation of A
 (B) Both A & R are true and R is NOT correct explanation of A
 (C) if A is true but R is false
 (D) if both A & R are false

Answer Key

1. Elemental Properties of Group 13 elements

- | | | |
|---------|---------|---------|
| (1). B | (2). A | (3). B |
| (4). D | (5). A | (6). C |
| (7). C | (8). B | (9). B |
| (10). B | (11). C | (12). D |
| (13). A | (14). C | (15). A |

2. Compounds of Group 13 elements

- | | | |
|---------|------------|------------|
| (1). A | (1). B | (3). C |
| (4). C | (5). D | (6). C |
| (7). B | (8). 6 | (9). B |
| (10). B | (11). B, C | (12). A, C |
| (13). C | (14). B | (15). B |

3. Compounds of Boron Part – I

- | | | |
|---------|---------|-----------|
| (1). A | (2). B | (3). C, D |
| (4). A | (5). D | (6). B |
| (7). B | (8). C | (9). C |
| (10). D | (11). C | (12). C |
| (13). C | (14). C | (15). D |

4. Compounds of Elements – Part II

- | | | |
|-------------|---------|---------|
| (1). 6 | (2). A | (3). A |
| (4). B | (5). A | (6). D |
| (7). SUBJ. | (8). B | (9). B |
| (10). D | (11). A | (12). A |
| (13). A | (14). C | (15). A |
| (16). B | (17). C | |
| (18). SUBJ. | | |
| (19). SUBJ. | | |
| (20). SUBJ. | | |

5. Elemental Properties of Group 14 Elements

- | | | |
|------------|---------|---------|
| (1). C | (2). B | (3). C |
| (4). B | (5). D | (6). C |
| (7). C, D | (8). D | (9). C |
| (10). B, C | (11). A | (12). B |
| (13). A | (14). D | (15). A |
| (16). | (17). C | (18). B |

6. Allotropes of C, Carbon Monoxide

- | | | |
|---------|---------|--------------|
| (1). A | (2). D | (3). D |
| (4). C | (5). B | (6). A, C, D |
| (7). C | (8). D | (9). B |
| (10). D | (11). D | (12). B |
| (13). A | (14). B | (15). A |
| (16). B | | |

7. Carbon Dioxide, Carbides

- | | | |
|-----------|------------------------------|--------|
| (1). A, B | (2). A, C, D | (3). C |
| (4). C | (5). B | (6). B |
| (7). D | (8). B | (9). C |
| (10). A | (11). A | |
| (12). | (1 – C, 2 – D, 3 – B, 4 – A) | |
| (13). | SUBJ. | |

8. Type of Silicates

- | | | |
|---------|---------|---------|
| (1). B | (2). D | (3). C |
| (4). B | (5). B | (6). B |
| (7). C | (8). D | (9). A |
| (10). C | (11). B | (12). B |
| (13). C | (14). A | (15). D |

9. Silicones, Quartz & Glass

- | | | |
|---------|---------|---------|
| (1). C | (2). C | (3). A |
| (4). B | (5). C | (6). C |
| (7). D | (8). A | (9). B |
| (10). D | (11). A | (12). A |
| (13). D | (14). A | (15). B |
| (16). A | (17). A | (18). C |
| (19). D | | |