



Some p-Block Elements Principles and Process Important Questions With Answers

NEET Chemistry 2023

1. Which one of the following elements is unable to form MF_6^{3-} ion?

- a) **B** b) Al c) Ga d) In

Solution : -

The element M in the complex ion MF_6^{3-} has a coordination number of six. Since B has only s- and p-orbitals and no d-orbitals, therefore, at the maximum it can show a coordination number of 4. Thus, B cannot form complex of the type MF_6^{3-} .

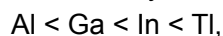
2. The stability of +1 oxidation state among Al, Ga, In and Tl increases in the sequence :

- a) **Al < Ga < In < Tl** b) Tl < In < Ga < Al c) In < Tl < Ga < Al d) Ga < In < Al < Tl

Solution : -

The given elements belong to 13th group. The elements mainly exhibit +3 and +1 oxidation states. As we know, the stability of lower oxidation state i.e., +1 state, increases on moving down the group due to inert pair effect.

The, stability follows the order :



3. The tendency of BF_3 , BCl_3 and BBr_3 behave as Lewis acid decreases in the sequence:

- a) $\text{BCl}_3 > \text{BF}_3 > \text{BBr}_3$ b) **$\text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$** c) $\text{BBr}_3 > \text{BF}_3 > \text{BCl}_3$ d) $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3$

Solution : -

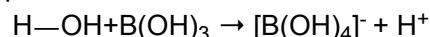
As the size of halogen atom increases, the acidic strength of boron halides increases. Thus, BF_3 is the weakest Lewis acid. This is because of the pn-pn back bonding between the fully filled 2p-orbitals of F and vacant 2p-orbitals of boron which makes BF_3 less electron deficient, but such back donation is not possible in case of BCl_3 or BBr_3 due to larger energy difference between their orbitals. Thus, the tendency to behave as lewis acid follows the order: $\text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$.

4. Boric acid is an acid because its molecule :

- a) Contains replaceable H^+ ion b) Gives up a proton c) **Accepts OH^- from water releasing proton**
d) Combines with proton from water molecule

Solution : -

Boric acid behaves as a Lewis acid, by accepting a pair of electrons from OH^- ion of water thereby releasing a proton.

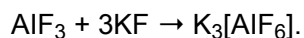


5. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of :

- a) **$\text{K}_3[\text{AlF}_6]$** b) $\text{K}_3[\text{AlF}_6]$ c) AlH_3 d) $\text{K}[\text{AlF}_3\text{H}]$

Solution : -

AlF_3 is insoluble in anhydrous HF because the F^- ions are not available in hydrogen bonded HF but, it becomes soluble in presence of little amount of KF due to formation of complex, $\text{K}_3[\text{AlF}_6]$.

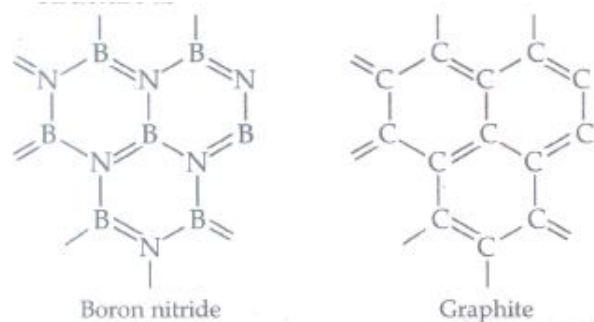


6. Which of the following structure is similar to graphite?

- a) **BN** b) B c) B_4C d) B_2H_6

Solution : -

Boron nitride $(BN)_x$ resembles with graphite in structure as



7. Which one of the following molecular hydrides acts as a Lewis acid?

- a) NH_3 b) H_2O c) **B_2H_6** d) CH_4

Solution : -

Among the given molecules, only diborane is electron deficient i.e., it does not complete octet. Thus, it acts as a Lewis acid.

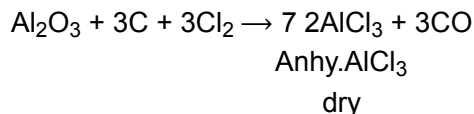
NH_3 and H_2O being electron rich species behave as Lewis base.

8. Al_2O_3 can be converted into anhydrous $AlCl_3$ by heating :

- a) Al_2O_3 with Cl_2 gas b) Al_2O_3 with HCl gas c) Al_2O_3 with $NaCl$ in solid state
d) A mixture of Al_2O_3 and carbon in dry Cl_2 gas

Solution : -

Al_2O_3 can be converted into anhydrous $AlCl_3$ by heating a mixture of Al_2O_3 and carbon in dry chlorine.



9. Which of the following is the electron deficient molecule?

- a) **B_2H_6** b) C_2H_6 c) PH_3 d) SiH_4

Solution : -

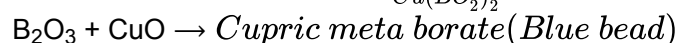
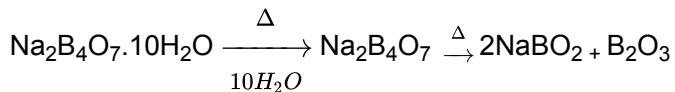
B_2H_6 is electron deficient molecule because boron atom has three half-filled orbitals in excited state.

10. In borax bead test which compound is formed?

- a) Ortho borate **b) Meta borate** c) Double oxide d) Tetra borate

Solution : -

In borax bead test the coloured meta borates are formed by transition metal salts.



11. The type of hybridisation of boron in diborane is :

- a) **sp^3 -hybridisation** b) sp^2 -hybridisation c) sp -hybridisation d) sp^3d^2 -hybridisation

Solution : -

Hybridisation of boron in diborane is sp^3 .

12. Boron compounds behave as Lewis acid because of their:

- a) Ionization property **b) Electron deficient nature** c) Acidic nature d) Covalent nature.

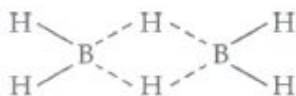
Solution : -

Lewis acids are those substances which can accept a pair of electron and boron compounds are usually electron deficient in nature.

13. Which of the following compounds has a 3-centre bond?
a) **Diborane** b) CO_2 c) Boron trifluoride d) Ammonia

Solution : -

In diborane 3-centred-2-electron bond is present.



14. Aluminium (III) chloride forms a dimer because Aluminium:
a) Belongs to 3rd group **b) Can have higher co-ordination number** c) Cannot form a trimer
d) Has high ionization energy

Solution : -

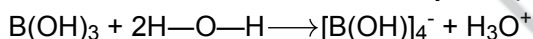
AlCl_3 forms a dimer as there is unsaturation in coordination. Also, it enables Al-atom to complete their octets.



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

Solution : -

Boric acid is a weak monobasic acid with $K_a = 1.0 \times 10^{-9}$. It may be noted that boric acid does not act as protonic acid but behaves as a Lewis acid by accepting a pair of electrons from OH^- ion.



16. It is because inability of ns^2 electrons of the valence shell to participate in bonding that :
a) Sn^{2+} is reducing while Pb^{4+} is oxidising b) Sn^{2+} is oxidizing while Pb^{4+} is reducing
c) Sn^{2+} and Pb^{2+} are both oxidizing and reducing d) Sn^{4+} is reducing while Pb^{4+} is oxidising

Solution : -

Inability of valence shell ns^2 electrons to participate in bonding on moving down the group in heavier p-block elements are called inert pair effect. This results Pb(II) is more stable than Pb(IV) and Sn(IV) is more stable than Sn(II) .

17. Which of the following oxidation states are the most characteristic oxidation states for lead and tin respectively?
a) +4, +2 **b) +2, +4** c) +4, +4 d) +2, +2

Solution : -

The tendency to form +2 ionic state increases on moving down the group due to inert pair effect. Most characteristic oxidation state for lead and tin are +2, +4 respectively.

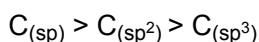
18. The correct order regarding the electronegativity of hybrid orbitals of carbon is :
a) $sp < sp^2 < sp^3$ b) $sp < sp^2 < sp^3$ **c) $sp > sp^2 > sp^3$** d) $sp < sp^2 > sp^3$

Solution : -

Electronegativity of carbon is not fixed. It varies with the state of hybridization.

Electronegativity is directly proportional with s-character, i.e., as electronegativity increases with increase in s-character of the hybrid orbital.

Hence, the order is



19. Percentage of lead in lead pencil is :

- a) Zero b) 20 c) 80 d) 70

Solution : -

In lead pencil, graphite and clay is present, So the percentage of lead is zero.

20. Which of the following does not show electrical conduction?

- a) Potassium b) Graphite c) **Diamond** d) Sodium

Solution : -

Diamond does not show electrical conductivity due to the absence of free electrons. Sodium and potassium are metallic conductors while graphite is a non-metallic conductor.

21. In graphite, electrons are :

- a) Localised on each C-atom b) Localised on every third C-atom c) Spread out between the structure
d) **Both (b) and (c)**

Solution : -

In the structure of graphite, two dimensional sheet like network joined together in hexagonal rings. These layers are held together by weak vander Waal's forces. In graphite each carbon atom is bonded to three others, forming sp^2 -hybrid bonds. The fourth electron forms a π -bond.

22. Carbon and silicon belong to (IV) group. The maximum coordination number of carbon in commonly occurring compounds is 4, whereas that of silicon is 6. This is due to :

- a) **Availability of low lying d-orbitals in silicon** b) Large size of silicon
c) More electronegative nature of silicon d) Both (b) and (c)

Solution : -

Carbon has no d-orbitals, whereas silicon contains d-orbitals in its valence shell which can be used for bonding purposes.

23. Which of the following types of forces bind together the carbon atoms in diamond?

- a) Ionic b) **Covalent** c) Dipolar d) van der Waals

Solution : -

In diamond, each carbon atom undergoes sp^3 - hybridisation and is covalently bonded to three other carbon atoms by single bonds.

24. Which of the following is an insulator?

- a) Graphite b) Aluminium c) **Diamond** d) Silicon

Solution : -

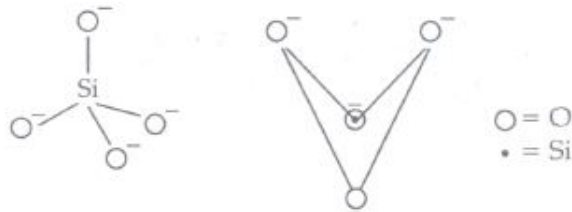
All the above are conductors except diamond. Hence, diamond is an insulator.

25. The basic structural unit of silicates:

- a) SiO^- b) **SiO_4^{4-}** c) SiO_3^{2-} d) SiO_4^{2-}

Solution : -

The basic building unit of all silicates is the tetrahedral SiO_4^{4-} . It is represented as,



26. Which of these is not a monomer for a high molecular mass silicon polymer?

- a) $MeSiCl_3$ b) Me_2SiCl_2 c) **Me_3SiCl** d) $PbSiCl_3$

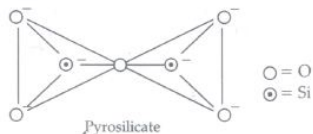
Solution : -

Me_3SiCl is not a monomer for a high molecular mass silicon polymer because it generates Me_3SiOH when subjected to hydrolysis which contains only one reacting site. Hence, the polymerisation reaction stops just after first step.

27. Name the type of the structure of silicate in which one oxygen atom of $[\text{SiO}_4]^{4-}$ is shared?
 a) Sheet silicate **b) Pyrosilicate** c) Three dimensional silicate d) Linear chain silicate

Solution : -

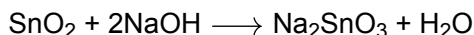
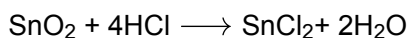
In pyrosilicate, only one oxygen atom is shared.



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

Solution : -

SnO_2 reacts with acid as well as base. So, SnO_2 is an amphoteric compound.

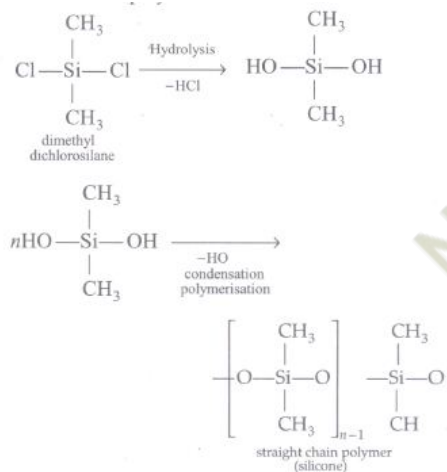


CaO is basic in nature while SiO_2 and CO_2 are acidic in nature.

29. The straight chain polymer is formed by
 a) Hydrolysis of $(\text{CH}_3)_3\text{SiCl}$ followed by condensation polymerisation
 b) Hydrolysis of CH_3SiCl_3 followed by condensation polymerisation
 c) Hydrolysis of $(\text{CH}_3)_4\text{Si}$ by addition polymerisation
d) Hydrolysis of $(\text{CH}_3)_2\text{SiCl}_2$ followed by condensation polymerisation

Solution : -

Hydrolysis of $(\text{CH}_3)_2\text{SiCl}_2$ followed by condensation polymerization.



30. Which one of the following anions is present in the chain structure of silicates?
 a) $\text{Si}_2\text{O}_7^{6-}$ b) $(\text{SiO}_5^{2-})_n$ **c) $(\text{SiO}_3^{2-})_n$** d) SiO_4^{4-}

Solution : -

$[\text{SiO}_3^{2-}]_n$ and $[\text{Si}_4\text{O}_{11}]^{6-}$ have chain structure of silicates.

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

Solution : -

Zeolites are aluminosilicates having three dimensional open structure in which four or six membered ring predominates, Thus, due to open chain structure, they have cavities and can take up water and other small molecules.

32. The substance used as a smoke screen in warfare is

- a) **SiCl₄** b) PH₃ c) PCl₅ d) C₂H₂

Solution : -

SiCl₄ gets hydrolysed in moist air and gives white fume which are used as a smoke screen in warfare.

33. The symbol of element with atomic number 113, is

- a) **Nh** b) Ni c) No d) Nb

34. H₃BO₃ is

- a) **monobasic and weak Lewis acid** b) monobasic and weak Bronsted acid
c) monobasic and strong Lewis acid d) tribasic and weak Bronsted acid

35. In III A group, Tl(thallium,) shows +1 oxidation state while other members show +3 oxidation state, why?

- a) Presence of lone electron in Tl b) **Inert pair effect** c) Large ionic radius of Tl ion d) None of the above

36. The liquefied metal expanding on solidification is

- a) **Ga** b) Al c) Zn d) Cl

37. Ionisation enthalpy($\Delta_i H_1$ kJ mol⁻¹) for the elements of group 13 follows the order

- a) B > Al > Ga > In > Tl b) B < Al < Ga < In < Tl c) B > Al > Ga < In > Tl d) **B > Al < Ga > In < Tl**

38. The B-F bond length in BF₃ is shorter than that in BF₄⁻. This is because of

- a) resonance in BF₃ but not in BF₄⁻ b) pπ-pπ back bonding in BF₄⁻ but not in BF₃
c) **pπ-pπ back bonding in BF₃ but not in BF₄⁻** d) pπ-dπ back bonding in BF₃ but not in BF₄⁻

39. Soldiers of Napoleon army while at Alps during freezing winter suffered a serious problem as regards to the tin buttons of their uniforms. White metallic tin buttons got converted to grey powder. This transformation is related to

- a) an interaction with nitrogen of the air at very low temperatures
b) a change in the partial pressure of oxygen in the air c) **a change in the crystalline structure of tin**
d) an interaction with water vapour contained in the humid air

40. The order of acidic strength of boron trihalides

- a) **BF₃ < BCl₃ < BBr₃ < BI₃** b) BI₃ < BBr₃ < BCl₃ < BF₃ c) BCl₃ < BBr₃ < BI₃ < BF₃
d) BBr₃ < BCl₃ < BF₃ < BI₃

41. Aluminium chloride exists as dimer Al₂Cl₆ in solid state as well as in solution of non-polar solvents such as benzene. When dissolved in water, it gives

- a) [Al(OH)₆]³⁺ + 3HCl b) Al₂O₃ + 6HCl c) Al³⁺ + 3Cl⁻ d) **[Al(H₂O)₆]³⁺ + 3Cl⁻**

42. Which of the following is known as inorganic benzene?

- a) **Borazine** b) Phosphonitrilic acid c) Boron nitride d) p-dichlorobenzene

43. The structure of diborane(B₂H₆) contains

- a) four 2c-2e⁻ bonds and four 3c - 3e⁻ bonds b) two 2c-2e⁻ bonds and two 3c - 3e⁻ bonds
c) two 2c-2e⁻ bonds and four 3c - 3e⁻ bonds d) **four 2c-2e⁻ bonds and two 3c - 3e⁻ bonds**

44. Which of the following cuts ultraviolet rays?

- a) Soda glass b) **Crooke's glass** c) Pyrex glass d) None of these

45. B(OH)₃ + NaOH ⇌ NaBO₂ + Na[B(OH)₄] + H₂O How can this reaction be made to proceed in forward direction?

- a) **Addition of cis-1,2-diol** b) Addition of borax c) Addition of trans-1,2-diol d) Addition of Na₂HPO₄

46. Aluminium reacts with caustic soda to form

- a) aluminium hydroxide b) aluminium oxide c) **sodium meta aluminate** d) sodium tetra aluminate

47. Al_2O_3 can be converted to anhydrous AlCl_3 by heating
a) Al_2O_3 with HCl gas b) Al_2O_3 with NaCl in solid state **c) a mixture of Al_2O_3 and carbon in dry Cl_2 gas**
d) Al_2O_3 with Cl_2 gas
48. Borax is used as cleansing because on dissolving in water it gives
a) alkaline solution b) acidic solution c) bleaching solution d) colloidal solution
49. Which glass will not crack when temperature changes?
a) Pyrex b) Boro silicate c) Calcium silicate d) Flint
50. Which of the following is the electron deficient molecule?
a) B_2H_6 b) C_2H_6 c) PH_3 d) SiH_4

