16.(A) Carbon monoxide is a neutral oxide, all other are amphoteric :

$SnO_2 + 4HCl \longrightarrow SnCl_4 + 2H_2O$

$ZnO + 2HCl \longrightarrow ZnCl_2 + H_2O$

$SiO_2 + 2NaOH \longrightarrow Na_2SiO_3 + H_2O$

SnO_2 and ZnO also react with NaOH. SiO_2 is also attached by H_3PO_4.

17.(D) PbI_4 is least stable. It is due to inert pair effect, the stable oxidation state of lead is +2 and also the size of iodine is very large.

18. $Al_2S_3 + 6H_2O \longrightarrow \underset{\text{Foul odour}}{2Al(OH)_3\downarrow + 3H_2S(g)\uparrow}$

Foul odour on damping of Al_2S_3 is due to the formation of H_2S gas as shown above.

19. The total hydration energy of $AlCl_3$

$= \text{Hydration energy of } Al^{3+} + 3 \times \text{Hydration energy of } Cl^-$

$= -4665 + 3(-381)\text{kJ/mol} = -5808 \text{ kJ/mol}$

The above hydration energy is more than the energy required for ionization of $AlCl_3$ into Al^{3+} and $3Cl^-$. Due to this reason, $AlCl_3$ becomes ionic in aqueous solution. In aqueous solution, it undergoes ionization completely as

$AlCl_3 + 6H_2O \longrightarrow [Al(H_2O)_6]^{3+} + 3Cl^-$

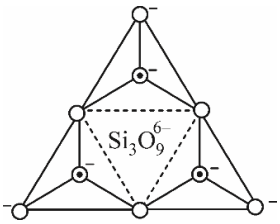
20. Glass is commonly known as supercooled liquid.

21.(A) Due to small size and high charge on Al in $Al(OH)_3$ the fission ability of $Al-O$ and $O-H$ bonds become comparable and compound can give both H^+ and HO^- under appropriate reaction conditions as :

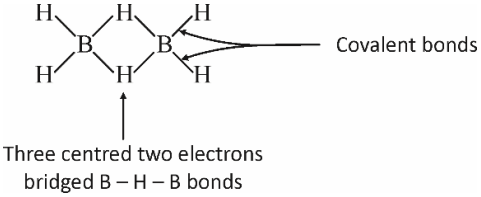
$\underset{\text{Base}}{Al(OH)_3} + 3HCl \longrightarrow AlCl_3 + 3H_2O$; $\underset{\text{Acid}}{Al(OH)_3} + NaOH \longrightarrow Na[Al(OH)_4]$

Therefore, both statements are correct and statement-II is a correct explanation of statement-I.

22.



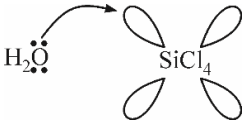
23. Three centred two electron bonds.



24.(B) In BCl_3, bond angle $= 120°$

In PCl_3, $AsCl_3$ and $BiCl_3$, central atom is sp^3 hybridised. Since P, As and Bi are from the same group, bond angle decreases down the group as electronegativity decreases down the group. Hence, overall order of bond angle is : B > P > As > Bi

25.(C) $SiCl_4$ reacts with water due to vacant d-orbitals available with Si as :



No such vacant d-orbitals are available with carbon, hence CCl_4 does not react with water. Otherwise, both $SiCl_4$ and CCl_4 are covalent.

Statement I is correct but statement II is incorrect.

26. Compound $X \xrightarrow{LiAlH_4} Y$ (a hydride) + other compound. Hydride Y contains 21.72% hydrogen.

$Y + O_2 \xrightarrow{\Delta} B_2O_3 + H_2O$

Therefore, Y is a hydride of boron and it is obtained by reduction of X with $LiAlH_4$.

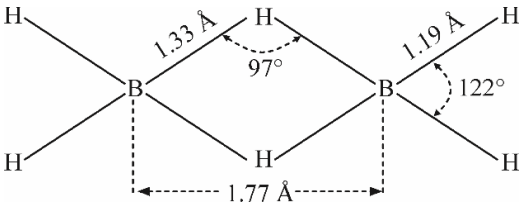
So, X is either BCl_3 or BF_3.

$$\underset{X}{4BCl_3} + LiAlH_4 \longrightarrow \underset{Y}{2B_2H_6} + \underbrace{3AlCl_3 + 3LiCl}_{\text{Other products}}$$

Molar mass of $B_2H_6 = 2\times 11 + 6 = 28$; % of H in $B_2H_6 = \frac{6}{28}\times 100 = 21.5\%$

$B_2H_6 + 3O_2 \longrightarrow B_2O_3 + 3H_2O + \text{Heat}$

Structure of Y (B_2H_6)



(a) There are 4 terminal B – H bonds

(b) There are two 3-center-2-electron B – H – B bridged bonds.

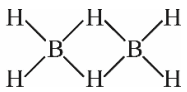
(c) Terminal H – B – H planes are perpendicular to bridged B – H – B bonds :

27. **(i)** $Na_2B_4O_7 + HCl \longrightarrow NaCl + H_3BO_3$

$H_3BO_3 \xrightarrow[\text{Heat}]{\text{Red (P)}} B_2O_3 + H_2O$

$B_2O_3 + Al \xrightarrow{\Delta} B + Al_2O_3$

(ii) B_2H_6 :

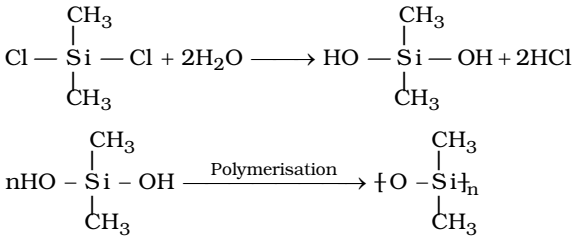


It has 4 terminal B – H bonds. There are two B – H – B, three centred two electron bridge bonds.

$B_2H_6 + HCl \longrightarrow BCl_3 + H_2$

28.(A) CO_2 is acidic oxide, H_2O is neutral, CaO is strongly basic and CuO is weakly basic. Therefore, order of acidic strength is : $CaO < CuO < H_2O < CO_2$

29.(C) Me_2SiCl_2 on hydrolysis yields a linear chain silicone as :



30. $3KF + AlF_3 \longrightarrow K_3AlF_6$

$K_3AlF_6 + 3BF_3 \longrightarrow \underset{\text{ppt}}{AlF_3\downarrow} + 3KBF_4$