



NCERT IN TEXT QUESTIONS

7.1. Why are pentahalides more covalent than trihalides ?

Ans: The group 15 elements have 5 e^{-1} s in their valence shell. It is difficult to lose 3 e^{-1} s to form E^{3+} and even more difficult to lose 5 e^{-1} s to form E^{5+} . Thus, they have very little tendency to form ionic compounds. Further, since the elements in +5 state have less tendency to lose e^{-1} s than in the +3 state, elements in +5 state have more tendency to share e^{-1} s and hence pentahalides are more covalent than trihalides.

7.2. Why is BiH_3 the strongest reducing agent amongst all the hydrides of Group 15 elements?

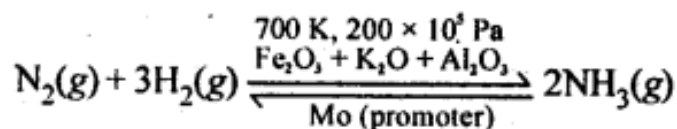
Ans: This is because as we move down the group, the size increases, as a result, length of E-H bond increases and its strength decreases, so that the bond can be broken easily to release H_2 gas. Hence, BiH_3 is the strongest reducing agent.

7.3. Why is N_2 less reactive at room temperature?

Ans: Due to presence of triple bond between two N-atoms ($N \equiv N$), the bond dissociation energy of N_2 is very high. As a result, N_2 becomes less reactive at room temperature.

7.4. Mention the conditions required to maximise the yield of ammonia.

Ans: Ammonia is prepared by Haber's process as given below:

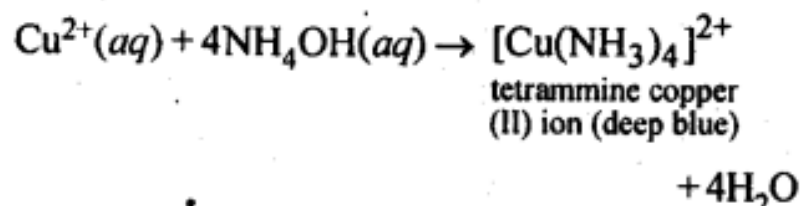


$$\Delta_r H^\circ = -92.4 \text{ kJ mol}^{-1}$$

According to Le Chatelier's principle, to maximise the yield of ammonia, high P and $T \sim 700 \text{ K}$ should be used. The catalyst increases the rate of reaction and Mo promoter increases the efficiency of Fe catalyst.

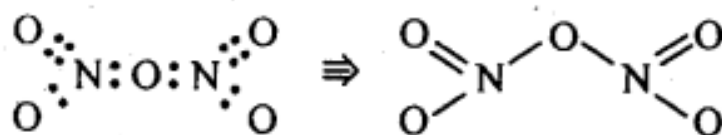
7.5. How does ammonia react with a solution of Cu^{2+} ?

Ans.



7.6. What is the covalence of nitrogen in N_2O_5 ?

Ans: In N_2O_5 , each N-atom has four shared pairs of e^- s as shown:



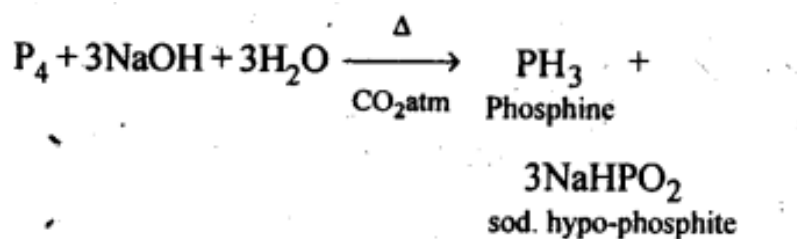
Thus, the covalency of N is 4.

7.7. Bond angle in PH_4^+ is higher than that in PH_3 . Why?

Ans: P in PH_3 is sp^3 -hybridized with 3 bond pairs and one lone pair around P. Due to stronger lp-bp repulsions than bp-bp repulsions, tetrahedral angle decreases from $109^\circ 28'$ to 93.6° . As a result, PH_3 is pyramidal. In PH_4^+ , there are 4 bp's and no lone pair. As a result, there are only identical bp-bp repulsions so that PH_4^+ assumes tetrahedral geometry and the bond angle is $109^\circ 28'$. Hence, bond angle of PH_4^+ > bond angle of PH_3 .

7.8. What happens when white phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2 ?

Ans:



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