KJB SCIENCE SCHOOL

A PREMIER INSTITUTE OF EDUCATION

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PRACTICE SHEET:1 [2014-15] CLASS – XII [Chemistry] CHAPTER –> p- BLOCK ELEMENTS

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Q.1 Why are pentahalides more covalent than trihalides?
Ans:In pentahalides, the oxidation state is +5 and in trihalides, the oxidation state is +3. Since the metal ion with a high charge has more polarizing power, pentahalides are more covalent than trihalides.

Q.2 Why is BiH_3 the strongest reducing agent amongst all the hydrides of Group 15 elements?
Ans:As we move down a group, the atomic size increases and the stability of the hydrides of group 15 elements decreases. Since the stability of hydrides decreases on moving from NH_3 to BiH_3, the reducing character of the hydrides increases on moving from NH_3 to BiH_3.

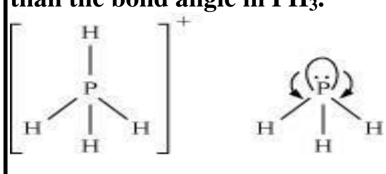
Q.3 Why is N_2 less reactive at room temperature?
Ans: The two N atoms in N_2 are bonded to each other by very strong triple covalent bonds. The bond dissociation energy of this bond is very high. As a result, N_2 is less reactive at room temperature.

Q.4 Mention the conditions required to maximise the yield of ammonia.
Ans:Ammonia is prepared using the Haber's process. The yield of ammonia can be maximized under the following conditions:
(i) High pressure (~ 200 atm)
(ii) A temperature of ~700 K
(iii) Use of a catalyst such as iron mixed with small amounts of K_2O and Al_2O_3.

Q.5 How does ammonia react with a solution of Cu^{2+}?
Ans:NH_3 acts as a Lewis base. It donates its electron pair and forms a linkage with metal ion.

$$\underset{\text{Blue}}{Cu^{2+}_{(aq)}} + 4NH_{3(aq)} \leftrightarrow \underset{\text{Deep blue}}{\left[Cu(NH_3)_4\right]^{2+}_{(aq)}}$$

Q.7 Bond angle in PH_4^+ is higher than that in PH_3. Why?
Ans:In PH_3, P is *sp^3* hybridized. Three orbitals are involved in bonding with three hydrogen atoms and the fourth one contains a lone pair. As lone pair-bond pair repulsion is stronger than bond pair-bond pair repulsion, the tetrahedral shape associated with *sp^3* bonding is changed to pyramidal. PH_3 combines with a proton to form PH_4^+ in which the lone pair is absent. Due to the absence of lone pair in PH_4^+, there is no lone pair-bond pair repulsion. Hence, the bond angle in PH_4^+ is higher than the bond angle in PH_3.



PH_4^+ PH_3

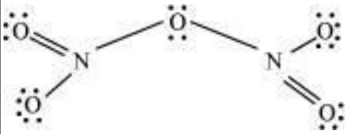
Q.8 What happens when white phosphorus is heated with concentrated NaOH solution in an inert atmosphere of CO_2?
Ans:White phosphorous dissolves in boiling NaOH solution (in a CO_2 atmosphere) to give phosphine, PH_3.

$$P_4 + 3NaOH + 3H_2O \longrightarrow \underset{\text{Phosphine}}{PH_3} + \underset{\text{Sodium hypophosphite}}{3NaH_2PO_2}$$

Q.9 What happens when PCl_5 is heated?
Ans:All the bonds that are present in PCl_5 are not similar. It has three equatorial and two axial bonds. The equatorial bonds are stronger than the axial ones.

Q.6 What is the covalence of nitrogen in N_2O_5?

Ans:



From the structure of N_2O_5, it is evident that the covalence of nitrogen is 4.

Therefore, when PCl_5 is heated strongly, it decomposes to form PCl_3.

$$PCl_5 \xrightarrow{\text{heat}} PCl_3 + Cl_2$$

Q.10 Write a balanced equation for the hydrolytic reaction of PCl_5 in heavy water.

$$PCl_5 + 4D_2O \longrightarrow D_3PO_4 + 5DCl$$

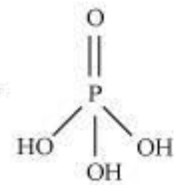
Ans:

Q.11 What is the basicity of H_3PO_4?

Answer :

H_3PO_4

H_3PO_4 =



Since there are three OH groups present in H_3PO_4, its basicity is three i.e., it is a tribasic acid.