

**Class: 11**  
**Subject: Chemistry**  
**Topic: p-block elements**  
**No. of Questions: 25**

Q1. Though nitrogen exhibits +5 oxidation state, it does not form pent halide.  
Give reason.

Sol. Nitrogen valence electronic configuration  $ns^2np^3$  due to absence empty d- orbitals, it cannot extend its valence to 5.

Q2. Why do  $PH_3$  has lower boiling point than  $NH_3$ ?

Sol. Unlike  $NH_3$ ,  $PH_3$  molecules are not associated through hydrogen bonding in liquid state. That is why the boiling point of  $PH_3$  is lower than  $NH_3$ .

Q3. Why are pent halides more covalent than trihalides?

Sol. Higher the positive oxidation state of central atom, more will be its polarizing power which, in turn, increases the covalent character of bond formed between the central atom and the other atom.

Q4. Why is  $BiH_3$  the strongest reducing agent amongst all the hydrides of Group 15 Elements?

Sol. Among hydrides of group 15 from  $NH_3$  to  $BiH_3$  as size of central atom increases M-H bond strength decreases. Hence it act as strong reducing agent.

Q5. Write the reaction of thermal decomposition of sodium azide.

Sol.  $2 NaN_3 \rightarrow 2 Na + 3 N_2(g)$

Q6. Why is  $N_2$  less reactive at room temperature?

Sol. Due to its high  $N \equiv N$  bond dissociation energy.

Q7. Why does  $NH_3$  act as a Lewis base?

Sol. Due to presence of one lone pair of electron present on Nitrogen.

Q8. Mention the conditions required to maximize the yield of ammonia

Sol. Optimum Pressure & Optimum Temperature & Removal of ammonia by cooling.

Q9. How does ammonia react with a solution of  $\text{Cu}^{2+}$ ?

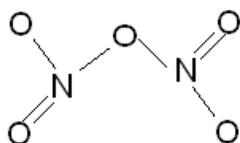
Sol.  $\text{Cu}^{2+} + 4 \text{NH}_3 \rightarrow [\text{Cu}(\text{NH}_3)_4]^{+2}$  and this is deep blue in color.

Q10. Why does  $\text{NO}_2$  dimerise?

Sol. Due to presence of one odd electron on Nitrogen of  $\text{NO}_2$ .

Q11. What is the covalence of nitrogen in  $\text{N}_2\text{O}_5$ ?

Sol. Covalency is 4 because N is bonded with 4 bonds.



Q12. In what way can it be proved that  $\text{PH}_3$  is basic in nature?

Sol. Phosphine is weakly basic and like ammonia, gives phosphonium compounds with acids  
e.g.,  $\text{PH}_3 + \text{HBr} \rightarrow \text{PH}_4\text{Br}$   
Due to lone pair on phosphorus atom,  $\text{PH}_3$  is acting as a Lewis base in the above reaction.

Q13. Bond angle in  $\text{PH}_4^+$  is higher than that in  $\text{PH}_3$ . Why?

Sol. Both are  $\text{sp}^3$  hybridized. In  $\text{PH}_4^+$  all the four orbitals are bonded whereas in  $\text{PH}_3$  there is a lone pair of electrons on P, which is responsible for lone pair-bond pair repulsion in  $\text{PH}_3$  reducing the bond angle to less than  $109^\circ 28'$ .

Q14. Why does  $\text{PCl}_3$  fume in moisture?

Sol.  $\text{PCl}_3$  reacts with moisture and gives HCl vapours.  
 $\text{PCl}_3 + 3 \text{H}_2\text{O} \rightarrow \text{H}_3\text{PO}_3 + 3 \text{HCl}$

Q15. Which of the following are metalloids?

- (A) Si
- (B) Ge
- (C) As
- (D) All of the above

Sol. (D)

Elements which show characteristics of both metals and non-metals and are called metalloids.

Q16. Are all the five bonds in  $\text{PCl}_5$  molecule equivalent? Justify your answer.

Sol.  $\text{PCl}_5$  has a trigonal bipyramidal structure and the three equatorial P-Cl bonds are equivalent, while the two axial bonds are different and longer than Equatorial bonds.

Q17. Why does boron trifluoride behave as a Lewis acid?

Sol. The electric configuration of boron is  $ns^2 np^1$ . It has three electrons in its valence shell. Thus, it can form only three covalent bonds. This means that there are only six electrons around boron and its octet remains incomplete. When one atom of boron combines with three fluorine atoms, its octet remains incomplete. Hence boron trifluoride remains electron-deficient and acts as a Lewis acid.

Q18. Write a balanced equation for the hydrolytic reaction of  $\text{PCl}_5$  in heavy water.

Sol.  $\text{PCl}_5 + \text{D}_2\text{O} \rightarrow \text{POCl}_3 + 2\text{DCl}$

Q19. How do you account for the reducing behaviour of  $\text{H}_3\text{PO}_2$  on the basis of its Structure?

Sol. In  $\text{H}_3\text{PO}_2$ , two H atoms are bonded directly to P atom which imparts reducing Character to the acid.

Q20. What is the basicity of  $\text{H}_3\text{PO}_4$ ?

Sol. Three P-OH groups are present in the molecule of  $\text{H}_3\text{PO}_4$ . Therefore, its Basicity is three.

Q21. Phosphorous in solid state is ionic, why?

Sol. In the solid state it exists as an ionic solid,  $[\text{PCl}_4]^+[\text{PCl}_6]^-$  in which the cation,  $[\text{PCl}_4]^+$  is tetrahedral and the anion,  $[\text{PCl}_6]^-$  octahedral.

Q22. Elements of Group 16 generally show lower value of first ionization enthalpy compared to the corresponding periods of group 15. Why?

Sol. Due to extra stable half-filled p orbital electronic configurations of Group 15 elements, larger amount of energy is required to remove electrons compared to Group 16 elements.

Q23.  $\text{H}_2\text{S}$  is less acidic than  $\text{H}_2\text{Te}$ . Why?

Sol. Due to the decrease in bond (E-H) dissociation enthalpy down the group, acidic Character increases.

Q24. List the important sources of sulphur.

Sol. Traces of sulphur occur as hydrogen sulphide in volcanoes. Organic materials such as eggs, proteins, garlic, onion, mustard, hair and wool contain sulphur.

Q25. Which of the following does not react with oxygen directly?

- (A) Zn
- (B) Ti
- (C) Pt
- (D) Fe

Sol. (c)

Pt is a noble metal which does not react with any atmospheric gases.