

p-BLOCK ELEMENTS

PREVIOUS YEAR BOARD EXAM QUESTIONS

1 MARK QUESTIONS

1. Draw the structure of XeF_2 .
2. Why is F_2 a stronger oxidising agent than Cl_2 ?
3. Why is nitrogen gas very unreactive, when compared to Phosphorous?
4. Predict the shape of ClF_3 on basis of VSEPR Theory.
5. Write the balanced equation for hydrolysis of XeF_6 .
6. In the ring test for identification of nitrate ion, what is the formula of compound that is responsible for brown ring formed at the interface of two liquids?
7. Write the formulae of any two oxoacids of Sulphur.
8. Why does NO_2 dimerise?
9. "Flourine do not show any positive oxidation state"- Why?
10. Why is Flourine most reactive out of all four common halogens?

11. Why does PCl_3 fume in moisture?

12. Complete the reaction:



13. Justify the statement- "All the bonds in SF_4 are not equivalent".

14. Which is a stronger oxidising agent- SbH_3 or BiH_3 ? Why?

15. On adding NaOH to Ammonium Sulphate, a colourless gas is evolved with pungent odour, which forms a blue coloured complex with Cu^{2+} ions. Identify the gas.

16. Write the formulae of any two oxoacids of Chlorine.

17. On heating Zn granules with conc. Nitric acid, a brown gas is evolved which undergoes dimerization on cooling. Identify the gas.

18. Why do interhalogen compounds have a higher boiling point to that of pure halogens?

19. On heating Copper turnings with conc. Sulphuric Acid, a colourless gas is evolved with a pungent smell,

that decolourises acidified KMnO_4 solution. Identify the gas.

20. "SO₂ is reducing in nature, but TeO₂ is an oxidising agent" –Give reason.

21. What happens when XeF₄ reacts with SbF₅?

22. On heating copper turnings with conc.nitric acid, a brown coloured gas is evolved which on cooling dimerises. Identify the gas.

23. Write the formulae of any two oxoacids of Phosphorous.

24. Arrange the hydrides of Group 15 elements in the increasing order of their basic character.

25. Give reason- "Although H-bonding in HF is more stronger than that in water, yet water has a higher boiling point than HF".

26. Why decomposition of ozone molecule, a spontaneous process?

27. What is the covalency of Nitrogen in N₂O₅ ?

28. Which noble gas is used to fill balloons for meteorological observations?

29. " H_3PO_3 disproportionates, while H_3PO_4 does not"-
Give reason.

30. Which of these is a weaker acid- HOCl or HOI ?
Why?

31. "The two O-O bond lengths in ozone are equal"-
Justify.

32. Why doesn't N and Bi form pentahalides while P forms pentahalides?

33. Draw the structure of HClO_4 .

2 MARK QUESTIONS

1. Justify the statement-"Elements of Group 16 show lower value of first ionization enthalpy compared to corresponding periods of Group 15".

2. Give reason-"There is a large difference between the melting and boiling points of Oxygen and Sulphur".

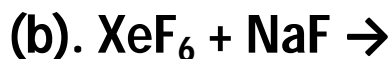
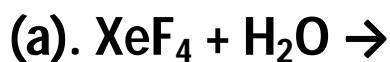
3. Draw the structures of XeO_3 , ClF_3 .

4. Explain:

(a). BiCl_3 is more stable than BiCl_5 .

(b). NO_2 readily forms a dimer.

5. Complete the reactions:



6. Mention four commercial uses of Sulphuric acid.

7. Give reasons:

(a). PCl_5 is more covalent than PCl_3 .

(b). O-O bond has a lower bond dissociation enthalpy than S-S bond.

8. Account for following:

(a). Hypophosphorous acid acts as a reducing agent.

(b). Argon and Fluorine does not form compounds like Xenon-fluorides.

9. Arrange the following in the order of property indicated against each:

(a). $\text{H}_2\text{O}, \text{H}_2\text{S}, \text{H}_2\text{Se}, \text{H}_2\text{Te}$ –Increasing acidic character.

(b). $\text{HF}, \text{HCl}, \text{HBr}, \text{HI}$ –Increasing bond dissociation enthalpy.

10. Give reasons:

- (a). Structures of Xenon fluorides cannot be explained by Valence Bond Theory.
- (b). O_2 and F_2 both stabilise higher oxidation states of metals, but O_2 exceeds F_2 in doing so.
- 11.(a). "Amongst all noble gases, only Xenon is known to make compounds with O_2 and F_2 "-Why?
- (b). Why are interhalogen compounds less reactive than halogens?
12. Ozone acts as a powerful oxidising agent. Give two reactions to justify this.
- 13.(a). Suggest a quantitative method for estimation of gas which protects us from UV rays of Sun.
- (b). "Nitrogen oxides emitted from the exhaust system of supersonic jet aeroplanes slowly deplete the concentration of ozone layer in upper atmosphere"-Comment on this.
14. Draw the structure of Phosphinic acid. Write a chemical reaction for its use as a reducing agent.
15. When conc. H_2SO_4 was added to an unknown salt present in a test tube, a brown gas(A) was evolved. This gas was intensified when copper turnings were

also added into test tube. On cooling, gas(A) changed to colourless gas(B).

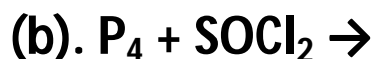
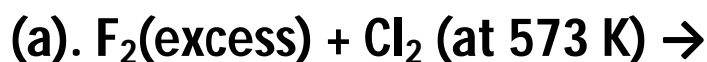
Identify (A) and (B) and Write the equations involved.

16. Draw the structures of White phosphorous and Red phosphorous. Which one of two is more reactive? Why?

17. Name the two most important allotropes of Sulphur. Which one of the two is stable at room temperature? What happens when the stable form is heated above 370 K?

18. Write the conditions to maximise the yield of H_2SO_4 by Contact process. Why is $K_{a1} \gg K_{a2}$ for H_2SO_4 in water?

19. Complete the following reactions :



3 MARK QUESTIONS

1. Draw the structures of N_2O_5 , XeF_4 and H_2SO_3 .

2. Write chemical equations for following:

(a). Chlorine reacts with a hot concentrated solution of NaOH.

(b). Orthophosphorous acid is heated.

(c). Xenon and PF_6 are heated together.

3. Give reasons:

(a). Chlorine water has both oxidising and bleaching properties.

(b). On addition of ozone gas on KI solution, violet vapours are obtained.

(c). H_3PO_2 and H_3PO_3 are good reducing agents, while H_3PO_4 is not.

4. Complete the reactions:

(a). $\text{F}_2 + \text{H}_2\text{O} \rightarrow$

(b). $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \rightarrow$

(c). $\text{Cu}^{2+}(\text{aq}) + \text{NH}_3(\text{aq})(\text{excess}) \rightarrow$

5. Account for following:

(a). Among halogens, Fluorine is the strongest oxidising agent.

(b). Fluorine exhibits only -1 oxidation state whereas, other halogens exhibit higher positive oxidation states.

(c). Acidity of oxoacids of Chlorine is of order $\text{HOCl} < \text{HOClO} < \text{HOClO}_2 < \text{HOClO}_3$.

6. Describe the Contact process for manufacture of Sulphuric acid, with special reference to reaction conditions, catalysts used and the yield in the process.

7. (a). Complete the equation- $\text{PbS} + \text{O}_3 \rightarrow$

(b). Give reasons:

(i). Bond angle decreases from H_2O to H_2Te .

(ii). Halogens have maximum negative electron gain enthalpy.

8. (a). Why helium gas is used in diving apparatus?

(b). What happens when:

(i). PCl_5 is heated (ii). H_3PO_3 is heated?

Write the reactions involved.

9. Give reasons:

(a). H_2S has a lower boiling point than H_2O

(b). Reducing character decreases from SO_2 to TeO_2 .

(c). H_2Te is the strongest reducing agent amongst all hydrides of Group 16 elements.

10. Complete the reactions:

(a). $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow$

(b). $\text{Ag} + \text{PCl}_5 \rightarrow$

(c). $\text{CaF}_2 + \text{H}_2\text{SO}_4 \rightarrow$

11. Give reasons:

(a). The bleaching effect of Chlorine is permanent.

(b). The H-E-H bond angle of hydrides of group 15 elements decrease as we move down the group.

(c). PCl_5 acts as an oxidising agent.

12. Complete the reactions:

(a). $\text{P}_4 + \text{NaOH} + \text{H}_2\text{O} \rightarrow$

(b). $\text{Xe}(\text{g})(\text{excess}) + \text{F}_2(\text{g})$ [at 673 K, 1 bar] \rightarrow

(c). $\text{NaNO}_2 + \text{NH}_4\text{Cl} \rightarrow$

13. Predict the shape and the asked bond angle (is it 90, more than 90 or less than 90) in each of following cases:

(a). XeF_2 and the angle F-Xe-F

(b). SO_3^{2-} and the angle O-S-O

(c). ClF_3 and the angle F-Cl-F

14. Give reasons:

(a). Thermal stability of water is much higher than that of H_2S .

(b). Conc. H_2SO_4 is a strong dehydrating agent.

(c). Ammonia acts as a ligand.

15. How is XeO_3 obtained? Write related chemical equations. Draw the structure of XeO_3 .

16. Account for following:

(a). All halogens are coloured

(b). Phosphorus has a greater tendency for catenation than nitrogen.

(c). Oxygen is a gas, but Sulphur is a solid.

16. Write balanced equations for following reactions:

(a). Reaction of gold with aqua regia

(b). When phosphine is passed through Mercuric chloride solution.

(c). Dimeric Selenium chloride undergoes disproportionation.

17. Draw the structures of XeF_2 , H_3PO_4 and HOClO_2 .

18. Account for following:

(a). Fluorine do not play the role of central atom in interhalogen compounds.

(b). Noble gases have very low boiling points.

(c). What is the basicity of H_3PO_3 ? Why?

19. Complete the reactions:

(a). $\text{HgCl}_2 + \text{PH}_3 \rightarrow$

(b). $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow$

(c). $\text{Fe}^{3+}(\text{aq}) + \text{SO}_2 \rightarrow$

20. An element 'A' exists as a yellow solid in standard state. It forms a volatile hydride 'B' which is a foul smelling gas and extensively used in qualitative analysis of salts. When heated with Oxygen, 'B' forms an oxide 'C' which is a colourless pungent smelling gas. This gas when passed through acidified KMnO_4 solution, decolourises it. 'C' gets oxidised to another oxide 'D' in presence of a heterogenous catalyst.

Identify A,B,C,D. Give the chemical equation for reaction of 'C' with acidified KMnO_4 solution.

21. Account for following:

- (a). ICl is more reactive than I_2 .
- (b). NO_2 dimerises to form N_2O_4 .
- (c). CN^- ion is known, but CP^- ion is unknown.

22. Write the equations for hydrolysis of XeF_4 and XeF_6 . Which of these two reactions is a redox reaction?

23.(a). Draw the structures of Red phosphorous and XeOF_4 .

(b). "Unlike Xenon, no other noble gases form compounds with Flourine and oxygen" –Why?

5 MARK QUESTIONS

1.(a). Using VSEPR Theory, predict the structures of N_2O_3 and BrF_3 .

(b). Arrange the following groups of substances in the increasing order of property indicated against each other:

(i). $\text{F}_2, \text{Cl}_2, \text{Br}_2, \text{I}_2$ – Bond dissociation enthalpy

(ii).NH₃,PH₃,AsH₃,SbH₃ –Boiling points

(iii).O,S,Se,Te –Electron gain enthalpy with negative sign.

2.(a). Account for following:

(i). The oxidising power of oxoacids of chlorine follows the order- HClO >HClO₂ >HClO₃ >HClO₄.

(ii). The acidic strength of these compounds increases in the order- PH₃ <H₂S <HCl

(iii). Sulphur exhibits paramagnetic behaviour in vapour state.

(b). Complete the reactions:

(i). XeF₄ + O₂F₂ →

(ii). P₄ + NaOH + H₂O →

3.(a). How Ammonia is prepared on a large scale? Name the process used and also mention the optimum conditions for production by this process.

(b). Give Reasons:

(i). Ammonia is more basic than Phosphine.

(ii). Sulphur has a greater tendency for catenation compared to Oxygen.

(iii). H_2S is more acidic than water.

4.(a). Assign reasons for the following:

(i). SF_6 is kinetically inert.

(ii). HCl is stronger acid than HF , though fluorine is more negative than Chlorine.

(iii). NF_3 is an exothermic compound, whereas NCl_3 is not.

(b). Write the formula and describe the structure of noble gas species that are isostructural with:

(i). BrO_3^-

(ii). IBr_2^-

5.(a). Give reasons:

(i). Bi is a strong oxidising agent in +5 state.

(ii). Iron dissolves in HCl to form FeCl_2 and not FeCl_3 .

(iii). PCl_5 is known, but NCl_5 is unknown.

(b). Draw the structures of $\text{H}_2\text{S}_2\text{O}_8$ and HClO_3 .

6. Account for the following:

- (a). The stability of +5 oxidation state decreases down the group in group 15 elements.**
- (b). The value of electron gain enthalpy with negative sign is higher for Sulphur than in water.**
- (c). ClF_3 has a T-shaped structure and not a trigonal planar one.**
- (d). Halogens are oxidising agents.**
- (e). Solid phosphorous pentahalide has an ionic structure.**

7. Give reasons:

- (a). XeF_2 is a linear molecule with no bend.**
- (b). The electron gain enthalpy with negative sign for fluorine is less than that for Chlorine, but still fluorine is a better oxidising agent than chlorine.**
- (c). H_2S is more acidic than H_2O .**
- (d). Both O_2 and F_2 stabilise high oxidation states, but the ability of oxygen to stabilise exceeds that of fluorine.**
- (e). The N-O bond in NO_3^- is longer than that in NO_2^- .**

- 8.(a). Write the formula of first noble gas compound prepared by N.Bartlett. What inspired him to prepare this compound?
- (b). Justify-“ HClO_4 is a stronger acid than HClO ”.
- (c). Which poisonous gas is evolved when white phosphorous is heated with NaOH ? Write the equation.
- (d). Why does NH_3 have a shorter bond angle than in NH_4^+ ?
- 9.(a). Write balanced chemical equations for disproportionation of orthophosphorous acid.
- (b). Draw the structure of a noble gas species that is isostructural with BrO_3^- .
- (c). Explain:
- (i). H_3PO_3 is diprotic.
- (ii). SF_6 is inert towards hydrolysis.

(iii). HF is a weaker acid than HCl in aqueous medium.

10.(a). Compare the oxidising action of F_2 and Cl_2 by considering parameters such as bond dissociation enthalpy, electron gain enthalpy and hydration enthalpy.

(b). Draw the structure of BrF_5 .

(c). "Flourine only forms one oxoacid"- Why?

11. Give reasons:

(a). Noble gases have very low boiling points.

(b). $Bi(V)$ is a stronger oxidising agent than $Sb(V)$.

(c). Sulphur dioxide is an air pollutant.

(d). $SnCl_4$ is more covalent than $SnCl_2$.

(e). $(CH_3)_3P=O$ exists but $(CH_3)_3N=O$ does not.

12.(a). Arrange the following in the decreasing order of property indicated for each set:

(i). Xe, He, Kr, Rn, Ne –Electron gain enthalpy

(ii). HCl, HI, HBr, HF –Thermal stability

(b). A white solid 'A' on treating with caustic soda gives a pungent smelling gas 'B', which on catalytic oxidation forms 'C'. 'C' gives brown fumes of gas 'D', on further oxidation which on dissolving in water forms HNO_3 .

Identify A, B, C, D. Give the sequence of reactions involved.