

## SOLVED QUESTIONS

### 1 MARK QUESTIONS

1. Ammonia has higher boiling point than phosphine. Why?

-AMMONIA FORMS INTERMOLECULAR H-BOND.

2. Why BiH<sub>3</sub> the strongest reducing agent amongst all the hydrides of group 15 elements ?

3. Why does PCl<sub>3</sub> fume in moisture ?

In the presence of (H<sub>2</sub>O) , PCl<sub>3</sub> undergoes hydrolysis giving fumes of HCl .



4. What Happens when H<sub>3</sub>PO<sub>3</sub> is Heated ?

It disproportionate to give orthophosphoric acid and Phosphine .



5. Why H<sub>2</sub>S is acidic and H<sub>2</sub>O is neutral ?

The S---H bond is weaker than O---H bond because the size of S atom is bigger than that of O atom . Hence H<sub>2</sub>S can dissociate to give H<sup>+</sup> Ions in aqueous solution .

6. Name two poisonous gases which can be prepared from chlorine gas ?

Phosgene (COCl<sub>2</sub>) , tear gas (CCl<sub>3</sub>NO<sub>2</sub>)

7. Name the halogen which does not exhibit positive oxidation state .

Flourine being the most electronegative element does not show positive oxidation state .

8. Iodine forms I<sub>3</sub><sup>-</sup> but F<sub>2</sub> does not form F<sub>3</sub><sup>-</sup> ions .why?

Due to the presence of vacant D-orbitals , I<sub>2</sub> accepts electrons from I-ions to form I<sub>3</sub><sup>-</sup> ions , but because of d-orbitals F<sub>2</sub> does not accept electrons from F-ions to form F<sub>3</sub><sup>-</sup> ions.

9. Draw the structure of peroxosulphuric acid .

10. Phosphorous forms PCl<sub>5</sub> but nitrogen cannot form NCl<sub>5</sub>. Why?

Due to the availability of vacant d-orbital in p.

### 2 MARK QUESTION (SHORT ANSWER TYPE QUESTION)

1. Why is HF acid stored in wax coated glass bottles?

This is because HF does not attack wax but reacts with glass. It dissolves  $\text{SiO}_2$  present in glass forming hydrofluorosilicic acid.



2. What is laughing gas? Why is it so called? How is it prepared?

Nitrous oxide ( $\text{N}_2\text{O}$ ) is called laughing gas, because when inhaled it produced hysterical laughter. It is prepared by gently heating ammonium nitrate.



3. Give reasons for the following:

(i) Conc.  $\text{HNO}_3$  turns yellow on exposure to sunlight.

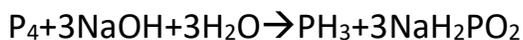
(ii)  $\text{PCl}_5$  behaves as an ionic species in solid state.

Ans- (i) Conc  $\text{HNO}_3$  decompose to  $\text{NO}_2$  which is brown in colour &  $\text{NO}_2$  dissolves in  $\text{HNO}_3$  to it yellow.

(ii) It exists as  $[\text{PCl}_4]^+[\text{PCl}_6]^-$  in solid state.

4. What happens when white P is heated with conc.  $\text{NaOH}$  solution in an atmosphere of  $\text{CO}_2$ ? Give equation.

Phosphine gas will be formed.



5. How is ozone estimated quantitatively?

When ozone reacts with an excess of potassium iodide solution

Buffered with a borate buffer (pH 9.2), Iodide is liberated which can be titrated against a standard solution of sodium thiosulphate. This is a quantitative method for estimating  $\text{O}_3$  gas.

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

$\text{PCl}_5$  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.

7.  $\text{NO}_2$  is coloured and readily dimerises. Why?

NO<sub>2</sub> contains odd number of valence electrons. It behaves as a typical odd molecule. On dimerization; it is converted to stable N<sub>2</sub>O<sub>4</sub> molecule with even number of electrons.

8. Write the balanced chemical equation for the reaction of Cl<sub>2</sub> with hot and concentrated NaOH. Is this reaction a disproportionation reaction? Justify:



Yes, chlorine from zero oxidation state is changed to -1 and +5 oxidation states.

9. Account for the following.

(i) SF<sub>6</sub> is less reactive than SF<sub>4</sub>

(ii) Of the noble gases only xenon forms chemical compounds.

Ans-(i) In SF<sub>6</sub> there is less repulsion between F atoms than in SF<sub>4</sub>.

(ii) Xe has low ionisation enthalpy & high polarising power due to larger atomic size.

10. With what neutral molecule is ClO<sup>-</sup> isoelectronic? Is that molecule a Lewis base?

ClF. Yes, it is Lewis base due to presence of lone pair of electron.

### 3 MARK QUESTIONS

1(i) why is He used in diving apparatus?

(ii) Noble gases have very low boiling points. Why?

(iii) Why is ICl more reactive than I<sub>2</sub>?

Ans-(i) It is not soluble in blood even under high pressure.

(ii) Being monoatomic they have weak dispersion forces.

(iii) I-Cl bond is weaker than I-I bond

2. Complete the following equations.

(i)  $\text{XeF}_4 + \text{H}_2\text{O} \rightarrow$

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

(iii)  $\text{AgCl}_{(s)} + \text{NH}_3_{(aq)} \rightarrow$

Ans-(i)  $6\text{XeF}_4 + 12\text{H}_2\text{O} \rightarrow 4\text{Xe} + 2\text{XeO}_3 + 24\text{HF} + 3\text{O}_2$

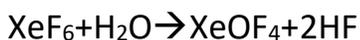
(ii)  $\text{Ca}_3\text{P}_2 + 6\text{H}_2\text{O} \rightarrow 3\text{Ca}(\text{OH})_2 + 2\text{PH}_3$

(iii)  $\text{AgCl}_{(s)} + 2\text{NH}_3_{(aq)} \rightarrow [\text{Ag}(\text{NH}_3)_2]\text{Cl}_{(aq)}$

3. (i) How is XeOF<sub>4</sub> prepared? Draw its structure.

(ii) When HCl reacts with finely powdered iron, it forms ferrous chloride and not ferric chloride. Why?

(i) Partial hydrolysis of XeF<sub>6</sub>



Structure-square pyramidal. See Fig 7.9

(ii) Its reaction with iron produces H<sub>2</sub>



Liberation of hydrogen prevents the formation of ferric chloride.

### 5 MARK QUESTION

1. Account for the following.

(i) Noble gas form compounds with  $F_2$  &  $O_2$  only.

(ii) Sulphur shows paramagnetic behavior.

(iii) HF is much less volatile than HCl.

(iv) White phosphorous is kept under water.

(v) Ammonia is a stronger base than phosphine.

Ans-(i)  $F_2$  &  $O_2$  are best oxidizing agents.

(ii) In vapour state sulphur partly exists as  $S_2$  molecule which has two unpaired electrons in the antibonding  $\pi^*$  orbitals like  $O_2$  and, hence, exhibit paramagnetism.

(iii) HF is associated with intermolecular H bonding.

(iv) Ignition temperature of white phosphorous is very low (303 K). Therefore on exposure to air, it spontaneously catches fire forming  $P_4O_{10}$ . Therefore to protect it from air, it is kept under water.

(v) Due to the smaller size of N, lone pair of electrons is readily available.

2. When Conc.  $H_2SO_4$  was added to an unknown salt present in a test tube, a brown gas (A) was evolved. This gas intensified when copper turnings were added in to test tube. On cooling gas (A) changed in to a colourless gas (B).

(a) Identify the gases 'A' and 'B'

(b) Write the equations for the reactions involved

The gas 'A' is  $NO_2$  whereas 'B' is  $N_2O_4$ .



Salt (conc.)



Blue      Brown (A)



3. Arrange the following in the increasing order of the property mentioned.

(i) HOCl,  $HClO_2$ ,  $HClO_3$ ,  $HClO_4$  (Acidic strength)

(ii)  $\text{As}_2\text{O}_3$ ,  $\text{ClO}_2$ ,  $\text{GeO}_3$ ,  $\text{Ga}_2\text{O}_3$  (Acidity)

(iii)  $\text{NH}_3$ ,  $\text{PH}_3$ ,  $\text{AsH}_3$ ,  $\text{SbH}_3$  (HEH bond

angle)(iv)  $\text{HF}$ ,  $\text{HCl}$ ,  $\text{HBr}$ ,  $\text{HI}$  (Acidic

strength) (v)  $\text{MF}$ ,  $\text{MCl}$ ,  $\text{MBr}$ ,  $\text{MI}$  (ionic

character)

Ans-

(i) Acidic

strength:  $\text{HOCl} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$

(ii) Acidity:  $\text{Ga}_2\text{O}_3 < \text{GeO}_2 < \text{AsO}_3 < \text{ClO}_2$

(iii) Bond angle:  $\text{SbH}_3 < \text{AsH}_3 < \text{PH}_3 < \text{NH}_3$  (iv) Acidic strength:  $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$  (v) Ionic character:

$\text{MI} < \text{MBr} < \text{MCl} < \text{MF}$