SOLVED QUESTIONS

1 MARK QUESTIONS

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

   -AMMONIA FORMS INTERMOLECULAR H-BOND.

2. Why BiH_3 the strongest reducing agent amongst all the hydrides of group 15 elements ?

3. Why does PCl_3 fume in moisture ?

   In the presence of (H_2O) , PCl_3 undergoes hydrolysis giving fumes of HCl .

   $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$

4. What Happens when H_3PO_3 is Heated ?

   It disproportionate to give orthophosphoric acid and Phosphine .

   $4H_3PO_3 \rightarrow 3H_3PO_4 + PH_3$

5. Why H_2S is acidic and H_2O is neutral ?

   The S---H bond is weaker than O---H bond because the size of S atomis bigger than that of O atom . Hence H_2S can dissociate to give H^+ Ions in aqueous solution .

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

Phosgene ($COCl_2$) , tear gas (CCl_3NO_2)

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_3^- but F_2 does not form F_3^- ions .why?

   Due to the presence of vacant D-orbitals , I_2 accepts electrons from I-ions to form I_3-ions , but because of d-orbitals F_2 does not accept electrons from F-ions to form F_3 ions.

9. Draw the structure of peroxosulphuricacid .

10. Phosphorous forms PCl_5 but nitrogen cannot form NCl_5. 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 SiO_2 present in glass forming hydrofluorosilicic acid.

$SiO_2 + 6HF \rightarrow H_2SiF_6 + 2H_2O$

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

Nitrous oxide (N_2O) is called laughing gas, because when inhaled it produced hysterical laughter. It is prepared by gently heating ammonium nitrate.

$NH_4NO_3 \rightarrow N_2O + 2H_2O$

3. Give reasons for the following:

(i) Conc.HNO_3 turns yellow on exposure to sunlight.

(ii) PCl_5 behaves as an ionic species in solid state.

Ans- (i)Conc HNO_3 decompose to NO_2 which is brown in colour& NO_2 dissolves in HNO_3 to it yellow.

(ii)It exists as $[PCl_4]^+[PCl_6]^-$ in solid state.

4. What happens when white P is heated with conc.NaOH solution in an atmosphere of CO_2? Give equation.

Phosphine gas will be formed.

$P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

5. How is ozone estimated quantitatively?

When ozone reacts with an excess of potassium iodide solution

Buffered with a borate buffer (Ph9.2), Iodide is liberated which can be titrated against a standard solution of sodium thiosulphate . This is a quantitative method for estimating O_3gas.

6. Are all the five bonds in PCl_5 molecule equivalent? Justify your answer.

PCl5 has a trigonalbipyramidal structure and the three equatorial P-Cl bonds are equivalent, while the two axial bonds are different and longer than equatorial bonds.

7. NO2 is coloured and readily dimerises.Why ?

NO2 contains odd number of valence electrons.It behaves as a typical odd molecules .On dimerization; it is converted to stable N_20_4 molecule with even number of electrons.

8. Write the balanced chemical equation for the reaction of Cl2 with hot and concentrated NaOH .Is this reaction a dispropotionationreaction? Justify:

$3Cl_2+6NaOH \rightarrow 5NaCl+NaClO_3+3H_2O$

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

9. Account for the following.

(i)SF_6 is less reactive than SF_4

(ii) 0f the noble gases only xenon forms chemical compounds.

Ans-(i)In SF_6 there is less repulsion between F atoms than In SF_4.

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

10. With what neutral molecule is ClO^-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 IClmoe reactive than I_2?

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

(ii)Being monoatomic they have weak dispersion forces.

(ii)I-Cl bond is weaker than l-l bond

2. Complete the following equations.

(i)$XeF_4+H_2O\rightarrow$

(ii) $Ca_3P_2+H_2O\rightarrow$

(iii) $AgCl_{(s)}$ +NH3 (aq)$\rightarrow$

Ans-(i) $6XeF_4+12H_2O\rightarrow 4Xe+2XeO_3+24HF+3O_2$

(ii)$Ca_2P_2+6H_2O\rightarrow 3Ca(OH)_2+2PH_3$

(iii)$AgCl_{(s)}+2NH_{3\,(aq)}\rightarrow [Ag(NH_3)_2]Cl_{(aq)}$

3. (i)How is $XeOF_4$ 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_6

$XeF_6+H_2O\rightarrow XeOF_4+2HF$

Structure-square pyramidal. See Fig7.9

(ii) Its reaction with iron produces H_2

$Fe+2HCl\rightarrow FeCl_2+H_2$

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, exhibitparamagnetism.

(iii) HF is associated with intermolecular H bonding.

(iv) Ignition temperature of white phosphorous is very low (303 K). Therefore on explosure 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.

$XNO_3 + H_2SO_4 \rightarrow XHSO_4 + HNO_3$

Salt (conc.)

$Cu + 4HNO_3$ (Conc.) $\rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$

Blue Brown (A)

$2NO_2$ (on cooling) $\rightarrow N_2O_4$Colourless(B)

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

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

(ii)As_2O_3, ClO_2, GeO_3, Ga_2O_3 (Acidity)

(iii)NH_3, PH_3, AsH_3, SbH_3 (HEH bond angle)(iv)HF, HCl, HBr, HI (Acidic strength) (v)MF, MCl, MBr, MI (ionic character)

Ans-

(i)Acidic strength:$HOCl<HClO_2<HClO_3<HClO_4$

(ii)Acidity: $Ga_2O_3<GeO_2<AsO_3<ClO_2$

(iii)Bond angle: $SbH_3<AsH_3<PH_3<NH_3$(iv)Acidic strength: HF<HCl<HBr<HI (v)Ionic character: MI<MBr<MCl<MF