Unit 7

p- BLOCK ELEMENTS:

1. **Classify the following 1 5 th group p-block elements in to nonmetals/metalloids /metal.**

1)Nitrogen 2) Phosphorus 3) Arsenic 4) Antimony 5) Bismuth 1M each

Answer:

Nonmetals: Nitrogen and Phosphorus

Metalloids: Arsenic and Antimony

Metal: Bismuth

2. **Write the formula of** 1M each

1) chile salt petre 2) Indian salt petre 3)apatite mineral 4)chlorapetite 5) Fluorapetite

Answer: 1) $NaNO_3$ 2) $K NO_3$ 3) $Ca_9(PO_4)_6 CaX_2$ 4) $Ca_9(PO_4)_6 CaCl_2$ 5) $Ca_9(PO_4)_6 CaF_2$

3. **Write the valence shell electronic configuration of 15th group elements.** 1M

Answer; $ns^2 np^3$

4. **There is a considerable increase in covalent radius from N to P. However, from As to Bi only small increase in covalent radius is observed. Give reason.** 1M

Answer: This is due to the presence of completely filled d and/or f orbital in heavier members.

5. **Ionization enthalpy decreases down the group 15. Give reason.** 1M

Answer: Due to gradual increase in atomic size.

6. **The ionization enthalpy of the group 15 elements is much greater than that of group 14 and group 16 elements in the corresponding periods. Give reason.** 1M

Answer: Because of the extra stable half-filled p orbital electronic configuration and smaller size.

7. **How does electronegativity of 15th group elements varies down the group?** 1M

Answer: decreases

8. **Mention the common Oxidation states of p block elements.** 1M

Answer: common ox.state of these elements are-3,+3 and +5

9. **How is stability of oxidation states of 15th group elements varies?** 1M

Answer: -3 in their covalent compounds. In addition to the −3 state, N and P also show −1 and −2

All the elements present in this group show +3 and +5 oxidation states. Stability of +5 ox. State decreases and that of +3 ox. State increases due to inert pair effect.

10.Nitrogen atom has five valence electrons but it does not form NCl_5. 1M

Answer: Because of absence of d-orbitals it can't expand its covalency from 3 to 5.

11.Nitrogen does not form pentahalides.Why? 1M

Answer: Nitrogen with n = 2, has s and p orbitals only. It does not have d orbitals to expand its covalence beyond four. That is why it does not form pentahalide.

12.Why is Nitrogen an inert gas? 1M

Answer: Nitrogen exists as triply bonded diatomic non polar molecule. Due to short internuclear distance between two nitrogen atoms the N ≡ N bond strength is very high. It is, therefore, very difficult to break the bond.

13.Why nitrogen exhibits anomalous behavior? **2M**

Answer: Due to smaller size, high electronegativity, high ionisation enthalpy and non-availability of d-orbitals, nitrogen shows anomalous behavior.

14.Mention any three anomalous properties of nitrogen. **3M**

Answer; (any three of the following)

1)Nitrogen forms pπ – pπ bonds where as other members not.

2) nitrogen exists as diatomic molecule with a triple bond

3)The single N−N bond is weaker than P−P bond due to small bond length.

4) lower catenation tendency.

5)cannot form dπ – pπ bonds like phosphorus.

15.Why $R_3P=O$ exist but $R_3N=O$ does not? 1M

Answer: Due to the absence of d orbitals in valence shell of nitrogen, nitrogen cannot form d π–p π bond. Hence $R_3N=O$ does not exist.

16.Catenation property of nitrogen is less than phosphorus. Why? 1M

Answer: Due to strong pπ–pπ overlap in Nitrogen and weaker N-N bond than the single P-P bond.

17.Write the formula of hydrides formed by 15th group elements? 1M

Answer: EH_3

18.How does the stability of 15th group metal hydride varies down the group? 1M

Answer: The stability of hydrides decreases on moving down from NH_3 to BiH_3.

19.Why is NH_3 basic while BiH_3 is only feebly basic. 1M

Answer: NH_3 is basic due to smaller size & high electro negativity of Nitrogen.

20.Ammonia has higher boiling point than Phosphine. Explain. 1M

Answer: Ammonia (NH_3) form hydrogen bond but Phosphine (PH_3) does not. Hence boiling point of ammonia is higher than that of phosphene.

21.Write the formula of two types of oxides formed by 15th group elements? 1M

Answer: E_2O_3 and E_2O_5

22.Out of E_2O_3 and E_2O_5 which is acidic? 1M

Answer: E_2O_5 (oxide with higher oxidation state is more acidic)

23.How does the acidic characters of 15th group metal oxides varies down the group? 1M

Answer; The acidic character decreases on moving down a group.

24.Write the increasing order of acidic character of N_2O_5, P_2O_5, As_2O_5 and Sb_2O_5 1M

Answer: N_2O_5 >P_2O_5 >As_2O_5 > Sb_2O_5

25.How is dinitrogen prepared in the laboratory? **2M**

Answer: In the laboratory, dinitrogen is prepared by treating an aqueous solution of ammonium chloride with sodium nitrite.

$NH_4Cl\ (aq) + NaNO_2\ (aq) \rightarrow N_2\ (g) + 2H_2O\ (l) + NaCl\ (aq)$

26.How is dinitrogen prepared from ammonium dichromate? **2M**

Answer: thermal decomposition of ammonium dichromate gives dinitrogen.

$(NH_4)_2Cr_2O_7 \rightarrow N_2 + 4H_2O + Cr_2O_3$

27.How does dinitrogen reacts with Mg? **2M**

Answer: Dinitrogen reacts with Mg to form magnesium nitride.

$N_2 + 3\ Mg \rightarrow Mg_3N_2$

28.For the manufacture of ammonia by Haber's process, write flow chart and balanced equation along with conditions? **3M**

Answer: On large scale, obtained by Haber's process\

$$N_2(g) + 3H_2(g) \xrightarrow{773k} 2NH_3(g); \qquad \Delta_f H^{\ominus} = -46.1\ kJmol^{-1}$$

Optimum condition:

Pressure = 200×10^5 Pa (about 200 atm)

Temperature ~ 700 K

Catalysts used − Iron oxide with small amounts of K_2O and Al_2O_3 to increase the rate of attainment of

equilibrium.

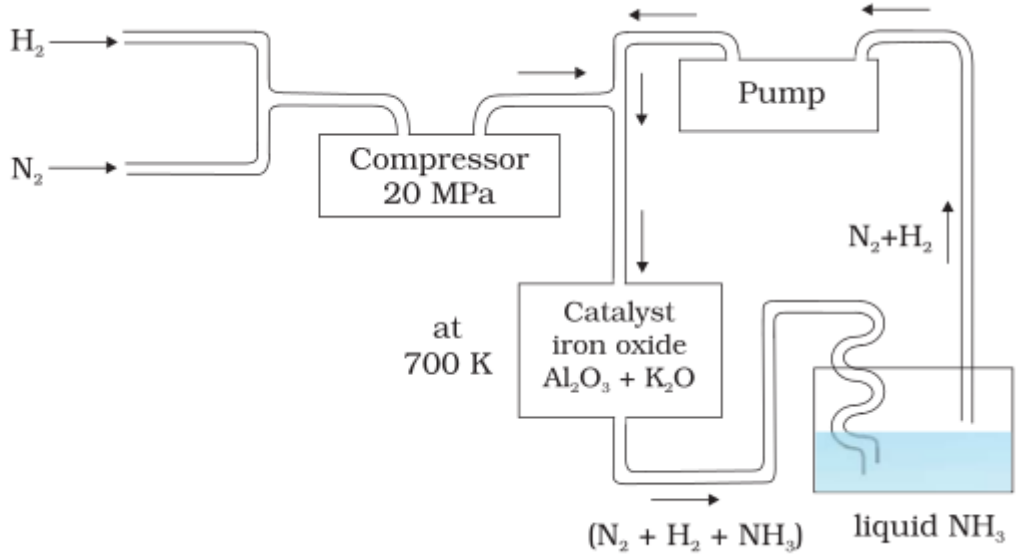


Fig. 7.1
Flow chart for the manufacture of ammonia

29.How does ammonia react with zinc sulphate? **2M**

Answer: Ammonia reacts with zinc sulphate to form white precipitate of zinc hydroxide.

$$ZnSO_{4(aq)} + 2NH_4OH_{(aq)} \rightarrow Zn(OH)_{2(s)} + (NH_4)_2SO_{4(aq)}$$

30.How does ammonia react with cupric ion? **2M**

Answer: With Cu^{2+} ion Ammonia acts as lewis base and forms deep blue colored cuprammonium complex.

$$Cu^{2+}(aq) + 4NH_3(aq) \rightarrow [Cu(NH_3)_4]^{2+}(aq)$$

(blue) (deep blue)

31.How is Nitric acid manufactured by Ostwald process? **3M**

Answer: Nitric acid in Ostwald process manufactured by the oxidation of ammonia.

$$\underset{\text{(from air)}}{4NH_3(g) + 5O_2(g)} \xrightarrow[500\,K,\ 9\,bar]{Pt\ /\ Rh\ gauge\ catalyst} 4NO(g) + 6H_2O(g)$$

Nitric oxide thus formed combines with oxygen giving NO_2.

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$

Nitrogen dioxide so formed, dissolves in water to give HNO_3.

$3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$

Dilute nitric acid on distillation followed by dehydration using conc. sulphuric acid gives 98% nitric acid.

32.How is nitric acid prepared in laboratory? 2M

Answer: Nitric acid is prepared in the laboratory by heating KNO_3 or $NaNO_3$ with concentrated H_2SO_4 in glass retort.

$$NaNO_3 + H_2SO_4 \rightarrow NaHSO_4 + HNO_3$$

33.How does dilute nitric acid with copper? **2M**

Answer: Dil. Nitric acid reacts with copper to form cupric nitrate with the liberation of nitric oxide.

$3Cu + 8\ HNO_3(dilute) \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

34.How does concentrated nitric acid with copper? **2M**

Answer: Conc.Nitric acid reacts with copper to form cupric nitrate with the liberation of nitrogen dioxide.

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

35.How does dilute nitric acid with zinc? **2M**

Answer: Dil. Nitric acid reacts with zinc to form zinc nitrate with the liberation of nitrous oxide.

$4Zn + 10HNO_3(dilute) \rightarrow 4\ Zn\ (NO_3)_2 + 5H_2O + N_2O$

36.How does concentrated nitric acid with zinc? **2M**

Answer: Conc.Nitric acid reacts with zinc to form zinc nitrate with the liberation of nitrogen dioxide.

$Zn + 4HNO_3(conc.) \rightarrow Zn\ (NO_3)_2 + 2H_2O + 2NO_2$

37.How does concentrated nitric acid with iodine? **2M**

Answer: Conc.Nitric acid oxidizes iodine to form iodic acid.

$I_2 + 10HNO_3 \rightarrow 2HIO_3 + 10NO_2 + 4H_2O$

38.How does concentrated nitric acid with carbon? **2M**

Answer: Conc.Nitric acid oxidizes carbon to carbon dioxide

$C + 4HNO_3 \rightarrow CO_2 + 2H_2O + 4NO_2$

39.What is passivity? 1M

Answer: Some metals like aluminium and chromium do not dissolve in concentrated nitric acid due to the formation of a protective layer of oxide on the surface of the metal. This phenomena is called passivity of metals.

40.explain Brown ring test with equations . **3M**

Answer: Dilute $FeSO_4$ solution is added to an aqueous solution of nitrate ion. concentrated H_2SO_4 is then added along the sides of the test tube. A brown ring is observed at the interface between the solution and H_2SO_4 layers indicates the presence of nitrate ion in the solution.

$NO_3^- + 3Fe^{2+} + 4H^+ \rightarrow NO + 3Fe^{3+} + 2H_2O$

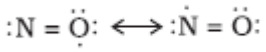
$[Fe\ (H_2O)_6\ ]^{2+} + NO \rightarrow [Fe\ (H_2O)_5\ (NO)]^{2+} + H_2O$

(brown)

41.Write the resonance structurs of a) NO b) NO_2 c) N_2O_5 **1M each**

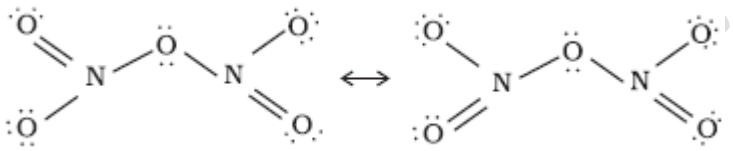
Answer:

a) Structure of NO:



b) Structure of NO_2 :

c) Structure of N_2O_5 :



42. Distinguish between white and red phosphorus. 2M

Answer: (any two)

White phosphorus	Red Phosphorus
It is a soft and waxy solid.	It is a hard and crystalline solid.
It is poisonous.	It is non-poisonous.
It is insoluble in water but soluble in carbon disulphide.	It is insoluble in both water and carbon disulphide.
Highly reactive	It is relatively less reactive.
In both solid and vapour states, it exists as a P_4 molecule.	It exists as a chain of tetrahedral P_4 units.
Less stable	More stable

43. How is Phosphine prepared in the laboratory form white phosphorous? 2M

Answer: In the laboratory phosphene is prepared by heating white phosphorus with concentrated NaOH solution in an inert atmosphere of CO_2.

$P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2 PO_2$

44. Give a reaction to support Basic nature of phosphine. 2M

Answer: Phosphine react with hydrogen bromide and forms phosphonium bromide.

$PH_3 + HBr \rightarrow PH_4 Br$

45. How is Phosphorous trichloride is obtained from phosphorous and chlorine? 2M

Answer: Phosphorus tri chloride is obtained by passing dry chlorine over heated white phosphorus.

$P_4 + 6Cl_2 \rightarrow 4PCl_3$

46. How is Phosphorous pentachloride is obtained from phosphorous and chlorine? 2M

Answer: Phosphorus pentachloride is prepared by the reaction of white phosphorus with excess of dry chlorine.

$P_4 + 10Cl_2 \rightarrow 4PCl_5$

47.How does Phosphorous trichloride react with water? 2M

Answer: PCl_3 hydrolyses in the presence of moisture to give phosphorus acid.

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

48.How does Phosphorous pentachloride react with water? 2M

Answer: PCl5 in presence of water hydrolyses to $POCl_3$ and finally gets converted to phosphoric acid.

$PCl_5 + H_2O \rightarrow POCl_3 + 2HCl$

$POCl_3 + 3H_2O \rightarrow H_3PO_4 + 3HCl$

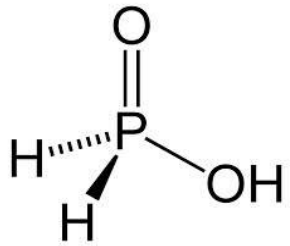
49.Write the formula, structure ,reducing property and basicity of Hypophosphorus acid. 3M

Answer:

Formula- H_3PO_2

Reducing property: Reducing agent as it contains two P – H linkage

structure:



Basicity: one(as it contains only one P-OH linkage)

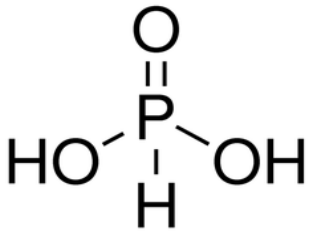
50.Write the formula, structure ,reducing property and basicity of Orthophosphorus acid. 3M

Answer:

Formula- H_3PO_3

Reducing property: Reducing agent as it contains one P – H linkage

structure:



Basicity: Two(as it contains two P-OH linkage)

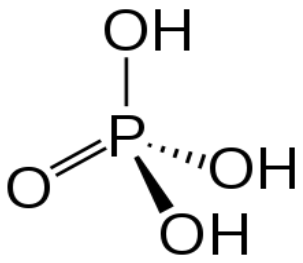
51.Write the formula, structure ,reducing property and basicity of Orthophosphoric acid. **3M**

Answer:

Formula- H_3PO_4

Reducing property: Not a Reducing agent as it does not have P – H linkage

structure:



Basicity: Three(as it contains three P-OH linkage)

52.How do you account for the reducing behavior of H_3PO_2 on the basis of its structure? **1M**

Answer: In H_3PO_2, two H atoms are bonded directly to P atom which imparts reducing character to the acid.

53.Classify the following 1 6 th group p-block elements in to nonmetals/metalloids / metal.

1)Oxygen 2) Sulphur 3) selenium 4) Tellurium 5) Polonium 1M each

Answer:

Nonmetals: Oxygen and Sulphur

Metalloids: selenium and Tellurium

Metal: Polonium

54.Name the 16^{th} group p-block element which is radioactive in nature. **1M**

Answer: Polonium

55.Write the valence shell electronic configuration of 16^{th} group elements. **1M**

Answer; $ns^2\ np^4$

56.Mention the Oxidation state of oxygen. **1M**

Answer; Oxygen exhibits the oxidation state of−2 in metal oxides, −1 (H_2O_2), zero (O_2 and O_3) and +2 (OF_2).

57.Write a note on Anomalous Behavior of Oxygen. **3M**

It **is** due to its Small size, High electronegativity and absence of d-orbitals oxygen shows anomalous properties.

1. Strong hydrogen bonding is present in H_2O, which is not found in H_2S.
2. Absence of d-orbitals in oxygen limits its covalence to four and in practice rarely exceeds two. On the other hand, other elements of the group can expand their covalence beyond four.

58.How is Oxygen obtained from potassium chlorate? 2M

Oxygen can be obtained by heating potassium chlorate in presence of MnO_2.

$$2KClO_3 \xrightarrow[MnO_2]{Heat} 2KCl + 3O_2$$

59.Write the chemical equation for the reaction of Oxygen with aluminum /carbon /methane. 1M each

Answer:

$$4Al + 3O_2 \longrightarrow 2Al_2O_3$$
$$C + O_2 \longrightarrow CO_2$$
$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

60.What are acidic oxides? What type of oxides are acidic in nature? Give example. 3M

Answer: Acidic oxides are those oxides which combine with water to give an acid.

Non-metal oxides and Oxides of some metals in higher oxidation state are acidic in nature.

Example for non metal acidic oxides– SO_2, Cl_2O_7, CO_2, N_2O_5

Examples for metal oxides which are acidic – Mn_2O_7, CrO_3, V_2O_5

61.What are basic oxides? What type of oxides are basic in nature? Give example. 3M

Answer: Basic oxides are those oxides which combine with water to give bases.

Metal oxides are basic in nature.

Examples for metal oxides which are basic- Na_2O, CaO, BaO

62.What are amphoteric oxides? Give example. 2M

Answer: Amphoteric oxides are those oxides which show the characteristics of both acidic as well as basic oxides .

Example – Al_2O_3

63.Illustrate amphoteric nature of Al_2O_3 with suitable reactions. 2M

Answer:

$$Al_2O_{3(s)} + 6HCl_{(aq)} + 9H_2O_{(l)} \longrightarrow 2\left[Al(H_2O)_6\right]^{3+}_{(aq)} + 6Cl^-_{(aq)}$$
$$Al_2O_{3(s)} + 6NaOH_{(aq)} + 3H_2O_{(l)} \longrightarrow 2Na_3\left[Al(OH)_6\right]_{(aq)}$$

64.What are neutral oxides? Give example. 2M

Answer: Neutral oxides arethose oxides which are neither acidic nor basic.

Examples – CO, NO, N_2O

65.How is Ozone prepared from oxygen? 2M

Answer: A slow dry stream of oxygen is passed through a silent electrical discharge. Oxygen partially gets converted into ozone.

$$3O_2 \longrightarrow 2O_3; \Delta H^{\ominus}(298\,K) = +142\,kJ\,mol^{-1}$$

66.Why is high concentrations of ozone can be explosive? 2M

Answer: High concentrations of ozone can be explosive because the decomposition of O_3 to O_2 results in the liberation of heat (ΔH = – ve) and an increase in entropy (ΔS = + ve), leading to large negative value of ΔG.

67.How does ozone react with PbS? write equation. **2M**

Answer: Ozone oxidizes lead sulphide to lead sulphate.

$PbS + 4O_3 \rightarrow PbSO_4 + 4O_2$

68.How does ozone react with NO? write equation. **2M**

Answer: Nitric oxides reacts with ozone to give nitrogen dioxide and oxygen

$O_3 + NO \rightarrow NO_2 + O_2$

69. In the preparation of H_2SO_4 by Contact Process, why is SO_3 not absorbed directly in water to form H_2SO_4? 1M

Answer: SO_3 is not dissolved in water directly as the process is highly exothermic & the H_2SO_4 obtained is in the form of a mist which cannot be condensed easily.

70. Which form of the sulphur is stable at room temperature? 1M

Answer: Rhombic sulphur. (α sulphur)

71. Which form of the sulphur is stable above 369K? 1M

Answer: Monoclinic sulphur(β sulphur)

72. Explain the laboratory method of preparation of SO_2 from SO_3^{2-}. 2M

Answer: sulphites are treated with dil H_2SO_4 to get SO_2

i) $SO_3^-(aq) + 2H^+(aq) \rightarrow H_2O + SO_2$

73., What happens when Sulphrur dioxide is treated with (2 Marks)

i)NaOH

ii) Cl_2

Answer:i) $2NaOH + SO_2 \rightarrow Na_2SO_3 + H_2O$

$Na_2SO_3 + H_2O \rightarrow 2NaH\,SO_3$

ii) $SO_2 + Cl_2 \rightarrow SO_2Cl_2$(Salphuryl chloride)

74.Give any two reactions to show that SO_2 is a reducing agent. 2M

Answer: $2Fe^{3+} + SO_2 + 2H_2O \rightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$

$5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$

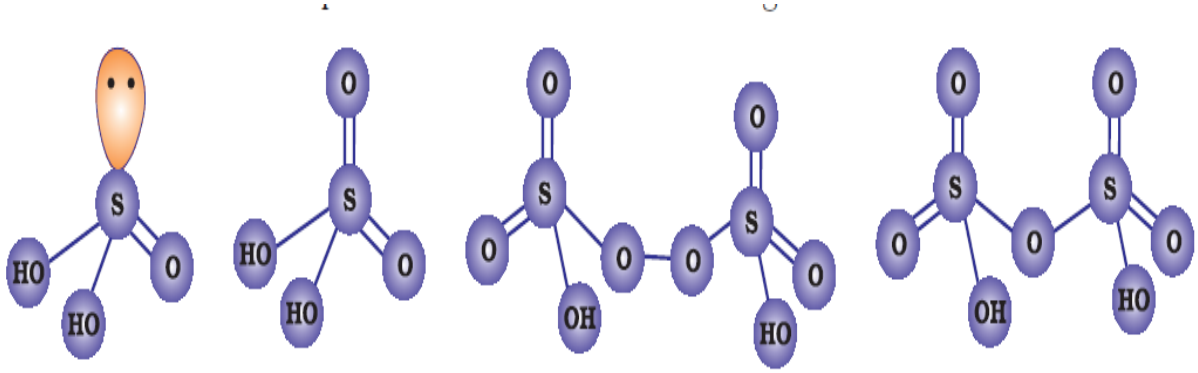
75.How is the presence of SO_2 detected?

Answer: SO_2 discharges pink colour of $KMnO_4$ due to the reaction

$5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$

76.Draw the structure of i) Sulphurus acid ii) Sulphuric acid (iii)peroxo sulphuric acidiv) pyrosulphuric acid(oleum). 1M each

Answer:(i) (ii) (iii) (iv)



77.Name the catalyst used in the manufacture of sulphuric acid by contact process 1M

Answer: V_2O_5

78.Write chemical equations in the manufacture of sulphuric acid by contact process with the conditions required. (3 Marks)

Answer: $2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$ At 720K, temperature & 2 bar pressure.

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

79.Explain the manufacture of H_2SO_4 by contact process from purified SO_2. 3M

Answer: Purified SO_2 is passed through catalytic converter containing V_2O_5 at 720K,and 2 bar pressure. SO_3 is obtained.

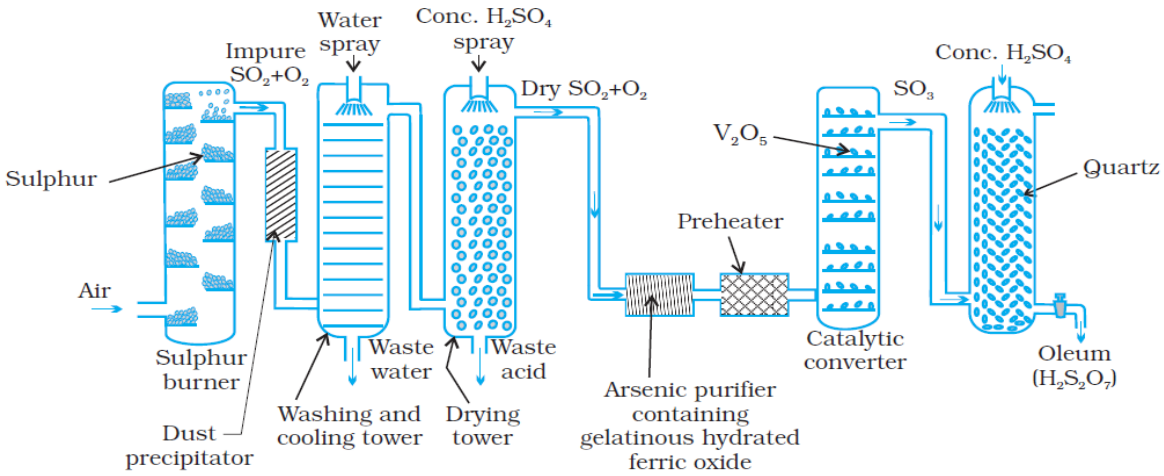
$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$

SO_3 obtained is dissolved in to get oleum in absorption tower.

$SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

Oleum is carefully diluted with water to get sulphuric acid.

80.Draw the flow chart for manufacture of H_2SO_4 by contact process 2M



81.What happens when Concentrated H_2SO_4 is added to 2M Each

i)CaF_2.

ii) Sugar.

Answer: i) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

ii) $C_{12}H_{22}O_{11} \xrightarrow{H_2SO_4} 12C + 11\ H_2O$(Charring of sugar- Dehydrating property)

82.Give an example to show that Conc H_2SO_4 is a strong oxidizing agent. 1M Each

Answer: $Cu + 2\ H_2SO_4$(Hot ,Conc) $\rightarrow CuSO_4 + SO_2 + 2H_2O$

$3S + 2\ H_2SO_4$(Hot ,Conc) $\rightarrow 3\ SO_2 + 2H_2O$

$C + 2\ H_2SO_4$(Hot ,Conc) $\rightarrow CO_2 + 2SO_2 + 2H_2O$

83.Name the halogens 1M

Answer: Flourine, Chlorine,bromine,iodine,asyatine.

84.Which is the radioactive halogen? 1M

Answer: Astatine

85.Name the halogen present in sea weeds. 1M

Answ: Iodine.

86.Write the outermost electronic configuration of halogens. 1M

Answer: ns^2np^5.

87.Give reason (1 M each)

i) Halogens have very high ionization enthalpy in the corresponding period.

ii) Halogens have Maximum negative electron gain enthalpy in the corresponding period

iii) Negative electron gain enthalpy of fluorine is less than that of chlorine.

iv) Enthalpy of dissociation of F_2 is less than Cl_2.

v) Fluorine is stronger oxidizing agent than chlorine.

vi) Fluorine exhibits only -1 oxidation state.

Answer: i) Due to the ns^2np^5 configuration, they have little tendency to loose electrons.

ii) They have only one electron less than the stable noble gas configuration.

iii) Due the very small size of fluorine atom.

iv) Due the very small size of fluorine.

v) Due to the high electro negativity of fluorine atom it readily accepts an electron.

vi) Due to non availability of d- orbital.

88.Write the chemical equation 1M Each

i) When F_2 is treated with Cl^-,Br^- & I^-

ii) When Cl_2 is treated with Br^- & I^-

iii) When Br_2 is treated with I^-

iv) When F_2 is treated with H_2O

v) When Cl_2 is treated with H_2O

Answer: i) $F_2 + 2X^- \rightarrow 2F^- + X_2$ (X= Cl, Br, or I)

ii) $Cl_2 + 2X^- \rightarrow 2Cl^- + X_2$ (X= Br, or I)

iii) $Br_2 + 2I^- \rightarrow 2Br^- + I_2$ (X= Cl, Br, or I)

iv) $2F_2 + 2H_2O \rightarrow 4H^+(aq) + 4F^-(aq) + O_2$.

v) $2Cl_2 + 2H_2O \rightarrow 4HCl(aq) + HOCl(aq)$

89.Mention the three reasons for the anomalous behavior of fluorine. 3M

Answer: Due to its small size, highest electro negativity, low F—F bond dissociation enthalpy & non- availability of d- orbitals in the valence shell of fluorine.

90.Give any three examples to show anomalous behavior of fluorine. 3M.

Answer: i) ionisation enthalpy, electronegativity, electrode potential are higher for F

ii) Ionic & covalent radii, m.pt, b.pt, bond dissociation enthalpy,electron gain enthalpy lower than expected.

iii) F forms only one halo acid

iv) HF is liquid, other hydrogen halides are gases.

91.How is chlorine prepared from $KMnO_4$. Write the chemical equations involved. 2M

Answer: By the action of HCl on $KMnO_4$,

$2KMnO_4 + 16\ HCl \rightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$

92. What happens when Concentrated chlorine is treated with

i)Alluminium ii) sulphur S_8

iii) H_2S iv) excess of NH_3 v) cold & dilute NaOH

vi) hot & concNaOH vii) Dry slaked lime. 1M each

Answer: (i)with Al: $2Al + 3\ Cl_2 \rightarrow 2AlCl_3$

(ii) with S: $S_8 + 4\ Cl_2 \rightarrow 2S_2Cl_2$

(iii) With H_2S: $H_2S + Cl_2 \rightarrow 2HCl + S$

(iV) With NH_3: $8NH_3 + 3Cl_2 \rightarrow 6NH_3Cl + N_2$

(excess)

$NH_3 + 3Cl_2 \rightarrow 6NCl_3 + 3HCl$

(excess)

(v) With NaOH:

$2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$

(cold & dil) (hypochlorite)

(vi) $6NaOH + 3Cl_2 \rightarrow 5NaCl + NaOCl_3 + 3H_2O$

(hot & conc) (chlorate)

(vii) With $Ca(OH)_2$:

$2Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O$

(dry slaked lime) (bleaching powder)

93.Give any one example for oxidizing property of chlorine with $FeSO_4$, Na_2SO_3. (2M each)

Answer: $2\ FeSO_4 + H_2SO_4 + Cl_2 \rightarrow Fe_2(SO_4)_3 + 2HCl$

(Ferrous) (Ferric)

$Na_2SO_3 + Cl_2 + H_2O \rightarrow Na_2SO_4 + 2HCl$

(Sulphite) (Slphate)

94.Give the reason for the bleaching action of chlorine. 1M

Answer: Due to the oxidation

$Cl_2 + H_2O \rightarrow 2HCl + O$

Coloured sub + O →Colourles substance.

95.Give the composition of bleaching powder. 1M

Answer: $Ca(OCl)_2.CaCl_2.\ Ca(OH)_2\ .2H_2O$.

96.How is HCl is prepared in the laboratory? 2M

Answer: $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ at 420K

$NaHSO_4 + NaCl \rightarrow Na_2SO_4 + HCl$ at 823K

HCl is dried using Conc H_2SO_4

97.Give the composition of aqua regia? Write the ionic equation when it is treated with gold/ platinum. 3M

Answer: Aqua regia: 3:1 part conc HCl & conc HNO_3

Dissolves noble metals

$Au + 4H^+ + NO_3^- + 4Cl^- \rightarrow AuCl_4^- + NO + 2H_2O$

$3Pt + 16H^+ + 4NO_3^- + 18Cl^- \rightarrow 3PtCl_6^- + 4NO + 8H_2O$

98. What happens when hydrochloric acid is treated with NH_3 1M

Answer: $NH_3 + HCl \rightarrow NH_4Cl$ (White fumes)

99. Write the structure of

i) Hypochlorus acid ii) Chlorus acid iii) Chloric acid

iv) Perchloric acid. 1Meach

Answer:

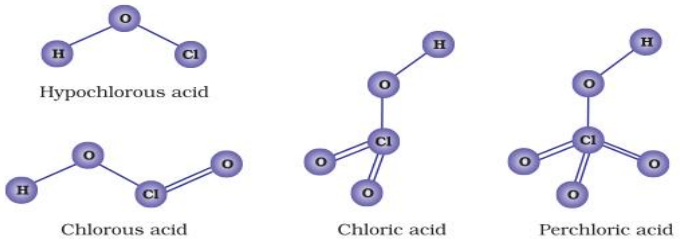


Fig. 7.8 The structures of oxoacids of chlorine

Answer:

100. What are interhalogen compounds? Give an example. Why they are more reactive than individual halogen. 3M

Answer: When two different halogen atoms react inter halogen compounds are formed. Eg: ClF_3, ICl, BrF_5 ,IF_7 Reactivity is more compared with halogens because X-X' bond is weaker than X-X bond in pure halogens.

101. How is following interhalogen compound prepared?

i) ClF_3 ii) ICl_3 iii) BrF_5 1Meach

Answer:

i) $Cl_2 + F_2 \xrightarrow{473K} 2ClF_3$

ii) $I_2 + Cl_2 \rightarrow 2ICl$

iii) $Br_2 + 5F_2 \rightarrow 2BrF_5$ (excess)

102. Name i) the radioactive noble gas ii) most abundant noble gas. 1M

Answer: i) Radon ii) Argon

103. Why noble gases are chemically inert? 1M

Answer: Stable completely filled orbitals are there.

104. Why noble gases have maximum ionization enthalpy in the corresponding period. 1M

Answer: Stable completely filled orbitals are there

105. Why noble gases have positive electron gain enthalpy . 1M

Answer: Stable completely filled orbitals are there

106. Which is the first noble gas compound synthesized? 1M

Answer: $Xe^{+}PtF_6^{-}$

107. Who prepared first noble gas compound? 1M

Answer: Neil Bartlett

108. Write the chemical equations to prepare following compounds with the conditions required.

i) XeF_6 ii) XeO_3 iii) XeO_2F_2. 1M each

Answer: i) $Xe(g) + 3F_2(g) \xrightarrow{573K,\ 60\text{-}70\ bar} 3XeF_6(s)$

ii) $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

iii) $XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

109. Write/ Name the structure of

i) $Xe F_2$ ii) XeF_4 iii) XeF_6 iv) $XeOF_4$ v) XeO_3. 1M each

Answer: i) linear ii) sqare panar iii) Distorted octa hedral

iV) Square pyramidal) trigonal pyramidal

110. Noble gases have very low boiling point .Why? 1M

Answer: They are mono atomic due to weak dispersion forces, hence have low boiling points.