Race No. => 15

Date
Page

(Solutions)

Q.(1) Ans. => (B)

(A) $N_2O_4 + H_2O \longrightarrow HNO_2 + HNO_3$

(B) $XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$

(C) $PCl_5 + H_2O \longrightarrow POCl_3 + 2HCl$

(D) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$

Q.(2) Ans. => (C)

$$NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$$

$$BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$$

Q.(3) Ans. => (D)

(A) $TeF_6 + 6H_2O \longrightarrow Te(OH)_6 + 6HF$

(B) $SF_6 + H_2O \longrightarrow$ ✗ (Not hydrolysed at room temp. becoz transition state do not exist due to steric crowding)

(C) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$

(D) $NF_3 + 3H_2O \longrightarrow$ ✗ (at room temp.

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hydrolysis is not possible because N(+5) does not have vacant orbital.

Q.(4) Ans. => (A)

(A) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$ (Basic nature)

(B) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$ (acidic nature)

(C) $SF_4 + 3H_2O \longrightarrow H_2SO_3 + 4HF$ (acidic nature)

(D) $P_4O_{10} + 6H_2O \longrightarrow 4H_3PO_4$ (acidic nature)

Q.(5) Ans. => (C)

(A) $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$

(B) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$

(C) $PCl_5 + 4H_2O \longrightarrow H_3PO_4 + 5HCl$

(D) $BiCl_3 + H_2O \longrightarrow BiO^+Cl^- + 2HCl$

$\downarrow$

$BiO^+_{(aq.)} + 3Cl^-_{(aq.)} + 2H^+_{(aq.)}$

Q.(6) Ans. => (B)

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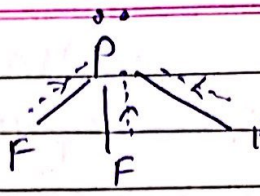
(A) $PCl_3 > PF_3$



'F' is bad leaving group due to additional π-bond character due back bonding.

(B) $BF_3 < BCl_3$: BF_3 undergoes partial hydrolysis -

$$4BF_3 + 3H_2O \longrightarrow H_3BO_3 + 3H[BF_4]$$

but BCl_3 undergoes complete hydrolysis

$$BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$$

(C) $AlCl_3 > MgCl_2$: Charge increases rate of hydrolysis increases.

$$\overset{+3}{Al}Cl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$$

$$\overset{+2}{Mg}Cl_2 + 2H_2O \longrightarrow Mg(OH)_2 + 2HCl$$

(D) $SiCl_4 > SiF_4$: SiF_4 undergoes partial hydrolysis but $SiCl_4$ undergoes complete hydrolysis.

$$3SiF_4 + 4H_2O \longrightarrow H_4SiO_4 + 2H_2[SiF_6]$$

$$SiCl_4 + 4H_2O \longrightarrow H_4SiO_4 + 4HCl$$

Q. (7) Ans. $\Rightarrow$ (A, B)

(A) $BeCl_2 + 2H_2O \longrightarrow Be(OH)_2 + 2HCl$

($Be(OH)_2$ (amphoteric) (in nature))

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(B) $AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$
(Amphoteric)

(C) $BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$
(acidic)

(D) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$
(Basic)

Ans. =>

Q.8 (C, D)

(A) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$

(B) $SbCl_3 + 4H_2O \longrightarrow \underline{SbO^+Cl^\ominus + 2HCl}$

$BiO^+_{(aq.)} + 3Cl^\ominus_{(aq.)} + 2H^+_{(aq.)}$

(C) $SF_4 + 3H_2O \longrightarrow \underline{H_2SO_3 + 4HF}$

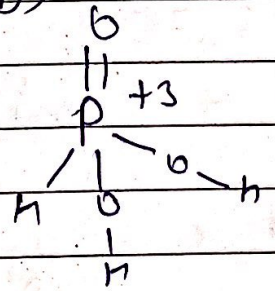
acidic in nature

(D) $PCl_3 + 3H_2O \longrightarrow \underline{H_3PO_3 + 3HCl}$

acidic in nature

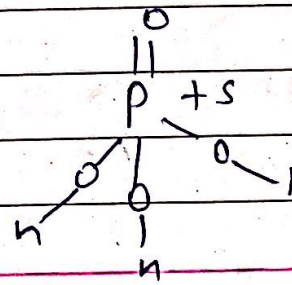
Q.9 Ans. => (A, D)

H_3PO_3 =>



Dibasic & reducing agent becoz 'P' oxidise into +3 to +5

H_3PO_4 =>



tribasic & non reducing agent becoz 'P' already in +5 oxidation State.

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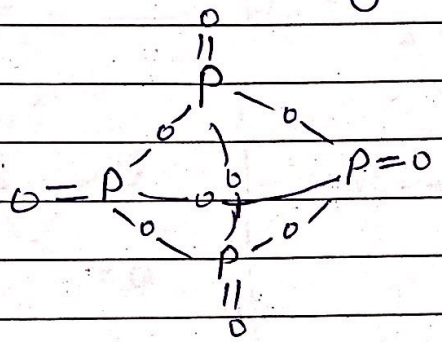
Date
Page

Paragraph for Q. No. 10 to 11

P_4 (white phosphorous) $+ 10\,Cl_2$ (excess) $\xrightarrow{\Delta}$ PCl_5 (A) (sp^3d hybridised State) $\xrightarrow{\text{on Complete hydrolysis}}$ H_3PO_4 (B) (oxy acid)

Q. (10) Ans. => (D) Anhydride of H_3PO_4 is

P_4O_{10}.



Q. (11) Ans. => (B)

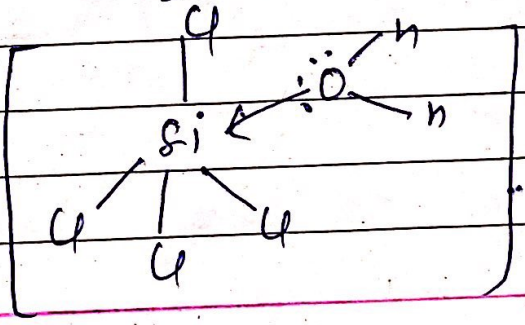
$2\,H_3PO_4 \equiv H_6P_2O_8 \xrightarrow{-H_2O} H_4P_2O_7$

oxy acid (C)

Q. (12) Ans. => (3) : $SiCl_4, PCl_3, AsCl_3$

(i) $CCl_4 + H_2O \longrightarrow \times$ (does not hydrolysed becoz C (+4) does not have vacant orbital)

(ii) $SiCl_4 + 4H_2O \longrightarrow H_4SiO_4 + 4HCl$



Si => sp^3d.

T.S.

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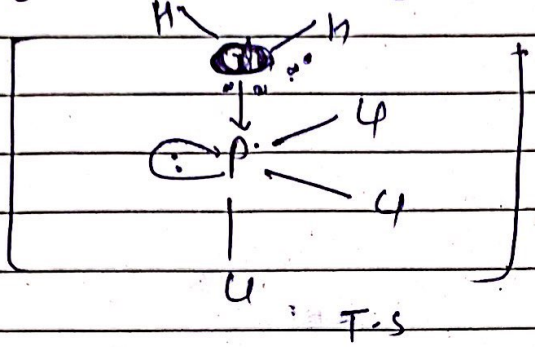
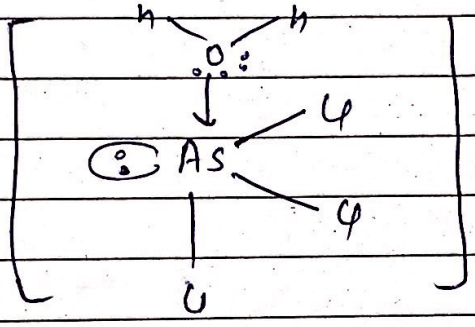
(iii) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$



P ⇒ sp^3d.

T.S

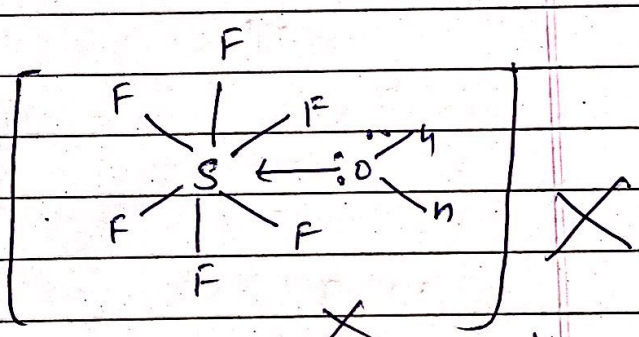
(iv) $AsCl_3 + 3H_2O \longrightarrow H_3AsO_3 + 3HCl$



As ⇒ sp^3d.

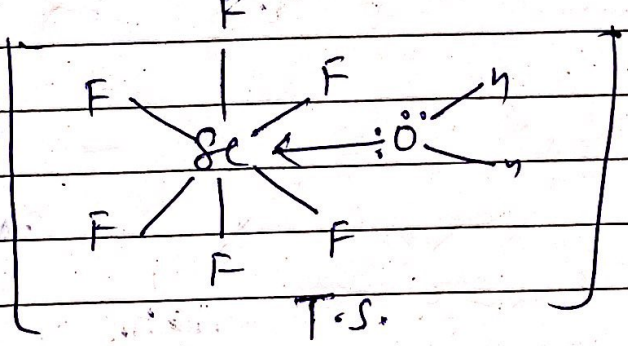
T.S.

(v) $SF_6 + H_2O \longrightarrow$



T.S. do not exist due to steric crowding

(vi) $SeF_6 + 4H_2O \longrightarrow H_2SeO_4 + 6HF$



Se ⇒ sp^3d^3

T.S.

T.S. exist due to Se has large size.

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