Group 17 Halogen family (9)

F Cl Br I At

F_2 & Cl_2 are gases Br_2 → liquid at room temp. I_2 → Solid

All halogens are coloured (F_2 → pale yellow, Cl_2 → greenish yellow, Br_2 → Reddish Brown, I_2 → dark violet)

- Ionisation energy → ↓ down the group
- E.N. ↓

Hydrolysis of interhalogen compounds →

$ClF_3 + 3H_2O \rightarrow 3HF + HClO_3$

$BrF_5 + 5H_2O \rightarrow 5HF + HBrO_5$

$IF_7 + 7H_2O \rightarrow 7HF + HIO_4$

Pseudo halogens: CN^-, CNS^-, SCN^-, $SeCN^-$ etc.

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$ (extreme oxidising product of S_2, SO_2)

(Black powder) → greenish yellow Cl_2 → greenish yellow

electron affinity: Cl > F > Br > I (But molecular affinity $F_2 > Cl_2 > Br_2 > I_2$)

& most in whole P.T.

Bond dissociation energy: $Cl_2 > Br_2 > F_2 > I_2$

Hydration energy ∝ $\frac{1}{\text{size}}$

$F_2 > Cl_2 > Br_2 > I_2$

Oxidising Strength → energy

Displacement Rxn → more E.N. halogen displaces less E.N.

$2KBr + Cl_2 \rightarrow 2KCl + Br_2$

Thermal Stability → HF > HCl > HBr > HI

Deacon's process: HCl + Ka oxidⁿ with pungent smell.

$4HCl + O_2 \xrightarrow{CuCl_2} 2Cl_2 + 2H_2O$

Hydrolysis of Brine Solution (NaCl) → F has great affinity for H_2

$P_4 + Cl_2 \rightarrow PCl_3$

$S_8 + Cl_2 \rightarrow S_2Cl_2$

$H_2S + Cl_2 \rightarrow 2HCl + S$ (Black powder).

$C_6H_6 + Cl_2 \rightarrow C_6H_6Cl_6$

(Cl_2 + cold dil. NaOH → NaCl + NaOCl)

Acidic strength: HI > HBr > HCl > HF

Oxo acids of Chlorine → $HClO$ (hypochlorous acid)

$HClO_2$ (Chlorous acid) $HClO_3$ (Chloric acid) $HClO_4$ (Perchloric acid)

Chlorous acid

- F has no d-orbitals, thus it has most E.N. & most stable
- Thermal Stability: $HClO < HClO_2 < HClO_3 < HClO_4$ ($HClO_5$)
- Oxon ion → no. of $p\pi$-$d\pi$ bonds.

(Cl_2 + hot conc. NaOH → NaCl + $NaClO_3$)

Br_2 gives same Rxn

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

Bleaching powder → $CaCl_2 \cdot Ca(OCl)_2$

$Ca(OH)_2 \cdot 2H_2O$ or CaO_2Cl_2

Cl_2 → Bleaching action

Impurity of moisture

Chemistry has no FeSO4 → $Fe_2(SO_4)_3$

Cl_2

$S^{-2} \rightarrow SO_4^{-2}$

$I_2 \rightarrow IO_3^-$

$SO_2 \rightarrow H_2SO_4$

He is Gluteum odorum. Pink Cu compounds in cells (Mitochondria)

Yp. 18 (Halogen family)

(Gaseous State) Ast → most abundant

Oxides in higher O.S. are more stable than the oxides with lower O.S. for the same oxidn state of halogen

Stability of oxides follow (Ioxide > Cl oxide > Br oxide)

- ClO_2 → Used in Bleaching Industry
- I_2O_5 → Used in estimation of carbon monoxide

These oxides are powerful O.A. also.

Ionic interhalogen → $IF_2^\ominus$, $ICl_2^\ominus$, $IF_6^\ominus$

Covalent interhalogen → Are compounds and Volatile Solids or Liquids except Cl-F

M.P., B.P., ease of liquification, Solubility in water → ↓ down the group.

E gain Enthalpy → Ne > Ar > Xe > Kr > Rn

$Xe + Pt + F_2 \rightarrow Xe[PtF_6]$ (1st compound of Noble gas)

Noble Gas Butterfly

$Xe + F_2 \rightarrow XeF_2$ (1:5)

$Xe + 2F_2 \rightarrow XeF_4$ (1:2)

$Xe + 3F_2 \rightarrow XeF_6$ (1:20)

All these compounds are Volatile

XeF_2 & XeF_4's hydrolysis is a Redox Rxn

XeF_6 hydrolysis is not a R.

XeF_6 → XeO_3 + $XeOF_4$

Fluorinating agents.

$XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$

$XeF_4 + 2H_2O \rightarrow 4Xe + 4HF + 3O_2$

$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF$

$XeOF_4 + H_2O \rightarrow XeO_2F_2 + 2HF$

$XeO_2F_2 + H_2O \rightarrow XeO_3 + 2HF$

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

$XeF_6 + SiO_2 \rightarrow XeOF_4 + SiF_4$

$XeF_6 + 4H_2O \rightarrow H_4XeO_6 + 6HF$

$XeF_6 + 2NaF \rightarrow Na_2XeF_8$

$XeF_6 + NaF \rightarrow Na[XeF_7]$

$XeF_6 + BaF_2 \rightarrow Ba[XeF_8]$

$XeF_6 + AlF_3 \rightarrow Al[XeF_7]_3$

$XeF_6 + 2CsF \rightarrow Cs_2[XeF_8]$

$XeF_6 + CsF \rightarrow Cs[XeF_7]$

XeF_6 are more F donating & Fluorinating compounds than interhalogen but less than F_2

XeF_6 can react with Steel in glass bottles

Xe is Inert gas

Preview from Notesale.co.uk
Page 4 of 4