Reaction with hydrocarbon

$CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl + HCl$

$C_2H_4 + Cl_2 \longrightarrow CH_2(Cl)-CH_2(Cl)$

- Chlorine water on standing loses its yellow colour due to the formation of HCl, HOCl. HOCl formed gives nascent oxygen which is responsible for oxidising & bleaching property.

$2FeSO_4 + H_2SO_4 + Cl_2 \longrightarrow Fe_2(SO_4)_3 + 2HCl$

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

$SO_2 + H_2O + Cl_2 \longrightarrow H_2SO_4 + 2HCl$

$I_2 + H_2O + Cl_2 \longrightarrow 2HIO_3 + HCl$

$Cl_2 + H_2O \longrightarrow 2HCl + [O]$

Coloured Substance $+[O] \longrightarrow$ Colourless substance

Hydrogen Chloride

Preparation

$NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$

$NaHSO_4 + NaCl \longrightarrow Na_2SO_4 + HCl$

Properties

- Colourless, pungent
- Liquifies to a colorless liquid & white crystal solid.
- Extremely soluble in water
- $NH_3 + HCl \longrightarrow NH_4Cl$ (white fumes)
- Aqua regia is used to dissolve Au, Pt

$3\,HCl + 1\,HNO_3$

$Au + H^+ + Cl^- + NO_3^- \longrightarrow AuCl_4^- + NO + H_2O$

$Pt + H^+ + Cl^- + NO_3^- \longrightarrow PtCl_6^{-2} + NO + H_2O$

- decomposes salts of weaker acid

$Na_2CO_3 + HCl \longrightarrow NaCl + CO_2$

$NaHCO_3 + HCl \longrightarrow NaCl + CO_2$

$Na_2SO_3 + HCl \longrightarrow NaCl + SO_2$

Halic (I) (Hypohalous)	HOF Hypofluorous	HOCl Hypochlorous	HOBr Hypobromous	HOI Hypoiodous
Halic (III) (Halous)	-	HOClO chlorous	-	-
Halic (V) (Halic)	-	$HOClO_2$ chloric	$HOBrO_2$ bromic	$HOIO_2$ iodic
Halic (VII) (Perhalic)	-	$HOClO_3$ perchloric	$HOBrO_3$ perbromic	$HOIO_3$ periodic

Interhalogen Compounds

Preparation

$Cl_2 + F_2 \longrightarrow 2ClF$ (equal volume)

$Cl_2 + 3F_2 \longrightarrow 2ClF_3$ (excess)

$Br_2 + 3F_2 \longrightarrow 2BrF_3$

$Br_2 + 5F_2 \longrightarrow 2BrF_5$ (excess)

$I_2 + Cl_2 \longrightarrow$ (equimolar)

$I + Cl_2 \longrightarrow 2ICl_3$ (excess)

Properties

- Covalent & diamagnetic
- Physical properties are intermediate between those of constituent halogen except M.P/B.P
- M.P/B.P are usually higher than expected
- Volatile solids & liquids except ClF which is gas
- Bond strength

$X-X' < \begin{matrix} X-X \\ X'-X' \end{matrix}$

except F–F

∴ interhalogen are more reactive than halogen except fluorine.

$XX' + H_2O \longrightarrow HX + HOX$

$XX'_3 + H_2O \longrightarrow HX + HOXO$

$XX'_5 + H_2O \longrightarrow HX + HOXO_2$

$XX'_7 + H_2O \longrightarrow HX + HOXO_3$

Shape

XX'_3 : T-shape

XX'_5 : square pyramidal

XX'_7 : pentagonal bypyramidal

- ClF_3 and BrF_3 are used for the production of UF_6 in the enrichment of ^{235}U

$U + 3ClF_3 \longrightarrow UF_6 + 3ClF$