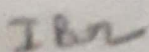
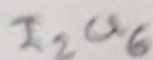
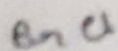
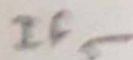
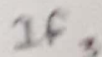
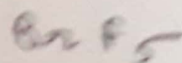
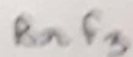
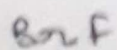
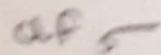
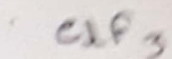
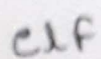


INTERHALOGEN COMPOUNDS

A large number of compounds are formed by union of different halogens called interhalogen compounds. So such compounds may be 1) neutral 2) cationic & 3) anionic. A few covalent organic derivatives like $\text{C}_2\text{I}_2\text{F}_2$ and $\text{C}_6\text{H}_5\text{ICl}_2$ are also known.

Neutral interhalogen molecules:

These are mostly binary compounds of the general formula XX_n where X is the heavier halogen and n is an odd number.



XY type interhalogens:

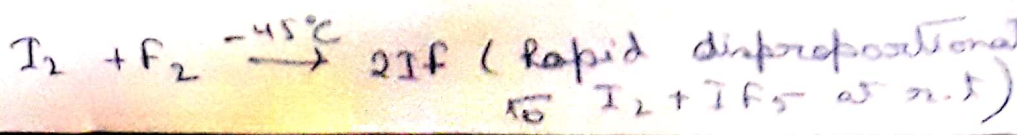
Room temp. prepⁿ:



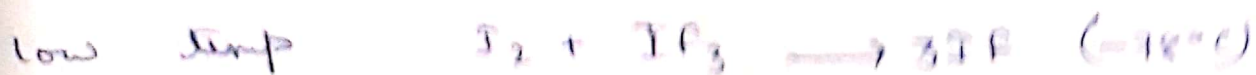
High temperature:



Low temperature:



These interhalogens may also be prepared by reacting a halogen on a higher interhalogen:



The diatomic interhalogens are highly reactive species — usually they are more reactive than the halogens (due to weaker bond). All are extensively hydrolyzed by water



accepting

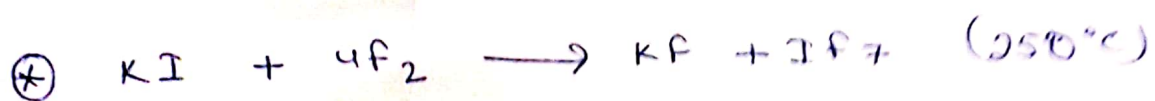
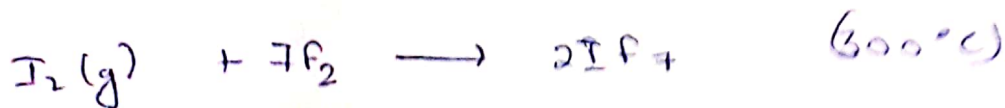
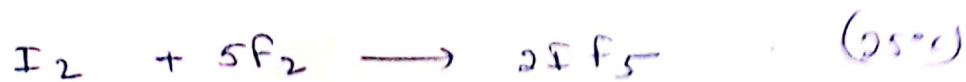
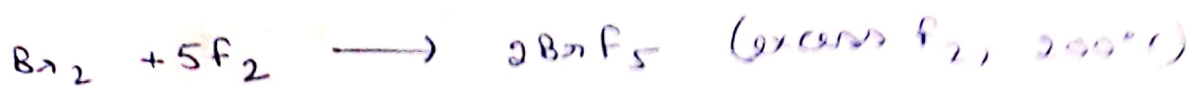
XF_3 type interhalogenes [$ClF_3, BrF_3, IF_3, I_2Cl_6$]

All are formed by direct union of the atoms under appropriate conditions;



(...)

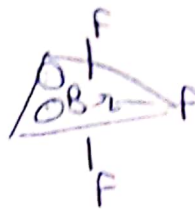
XY_5 & XY_7 type interhalogens ($ClF_5, BrF_5, IF_5, & IF_7$)



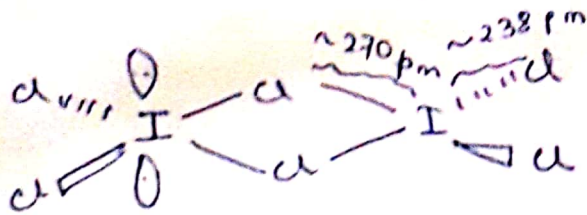
Structure & bonding:

The bonding and molecular shapes of the interhalogen molecules can be successfully described in terms of the VSEPR theory. Thus:

ClF_3



The structure of I_2Cl_4 gas is not known since it decomposes into ICl & Cl_2 . The solid consists of I_2Cl_4 molecules built through two Cl bridges.

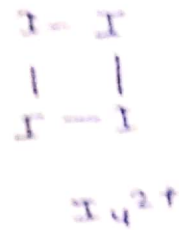
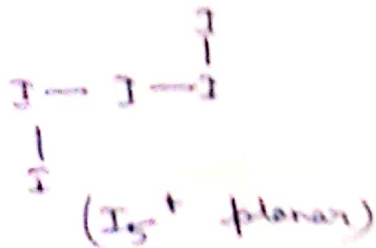
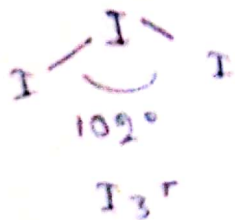


The Polyhalogen and interhalogen cations:

Polyhalogen compounds: cations:

Removal of an electron from the highest occupied π^* m.o. of the halogens molecules give rise to X_2^+ cations. Various salts containing I_2^+ & Br_2^+ are known. Few other cationic X_n^{2+} ($n=3, 5$) & I_4^{2+} are known.

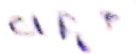
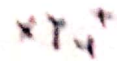
I_2^+ , I_3^+ , I_5^+ & I_4^{2+} can be generated by oxidizing I_2 in fluoro sulphonic acid FSO_3H with the very powerful oxidising agent bis(fluoro sulphury peroxide) ($FO_2SO_2FO_2$) ($SO_3 + F_2$, $160^\circ C$, AgF_2 catalyst)



Interhalogen cations:

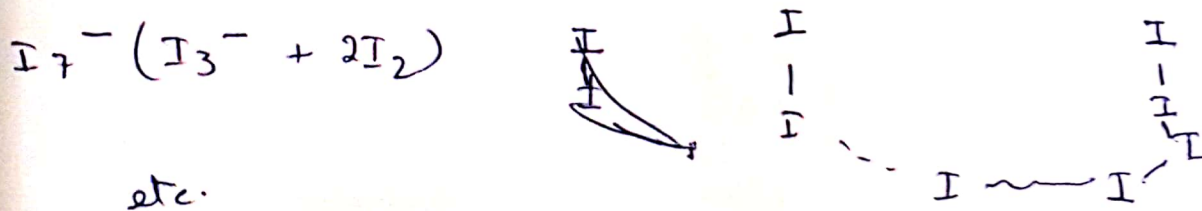
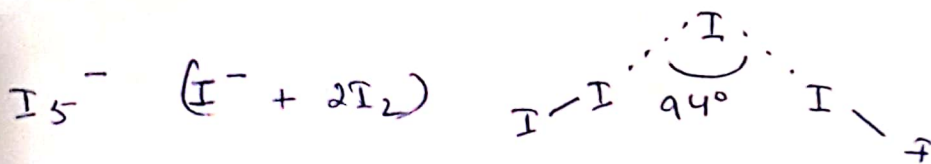
At least 15 interhalogen cations are known, all of them are unipositive & except I Br Cl^+ , they consist of only two different halogens.

Type:



Polyhalide ions:

The dihalogens and several inter-halogens may act as Lewis acids by accepting an electron pair into their LUMO. When the donor Lewis base is also a halide ion, ~~the~~ adduct is a polyhalide ion. Polyiodides $[(I_2)_n I^-]$ formed by I_2 as the Lewis acid & I^- or I_3^- as the Lewis base are the most interesting polyhalide anions.



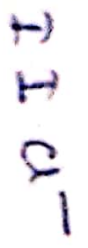
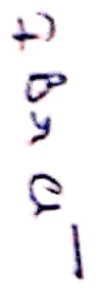
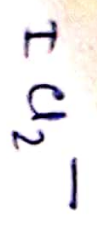
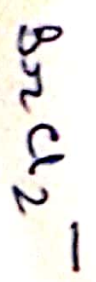
Atomonuclear to multimeric polyhalides O_3^- & B_3

also known:

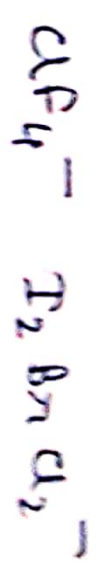
General halonuclear interhalogen anions are also known, the central atom being mostly the

heavier halogen:

Trinuclear



Pentanuclear



Heptanuclear

