

They occur in nature in combined state. Their main natures of occurrence are

Fluorine: Fluorspar (CaF_2), cryolite (Na_3AlF_6), fluorapatite $\text{Ca}_3(\text{PO}_4)_2$, CaF_2

Chlorine: Sea water (NaCl), rocksalt (KCl), carnalite $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$

Bromine: sea water and salt lakes (NaBr , KBr , MgBr_2), Impurities in carnallite (MgBr_2)

Iodine: Alkali metal iodides in sea weeds, sodium iodate NaIO_3 in Chile saltpeter.

ii. With bromine

a. With cold and dilute alkalies

Bromine reacts with cold and dilute alkali solution to give sodium bromide and sodium hypobromite.



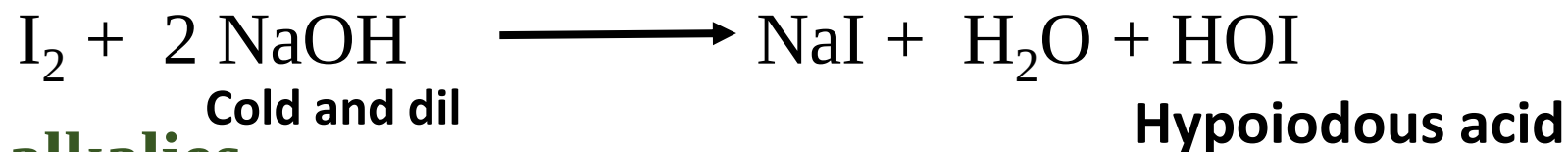
b. With hot and conc. alkalies

Bromine reacts with hot and conc. alkali solution to bromide and bromate.



iii. With iodine

a. With cold and dilute alkalies



b. With hot and conc. alkalies



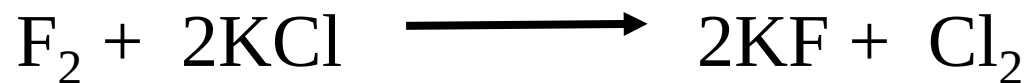
2. Oxidizing nature of halogen:

All halogens are good oxidizing agents. The oxidizing power is in the order



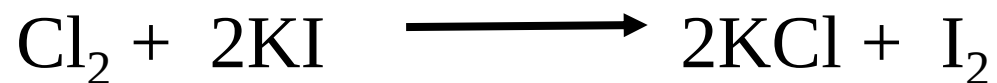
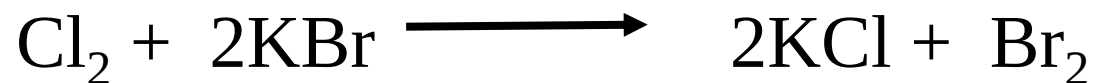
i. Displacement reaction

Fluorine being strong oxidizing agent, it can displace other halogens (Cl_2 , Br_2 , I_2) from their aqueous salt.

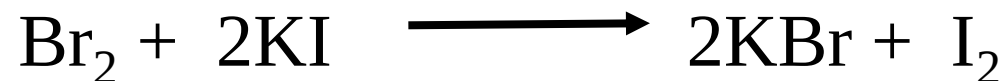


Similarly,

Cl_2 displaces Br_2 and I_2 and Br_2 displaces I_2 .



And

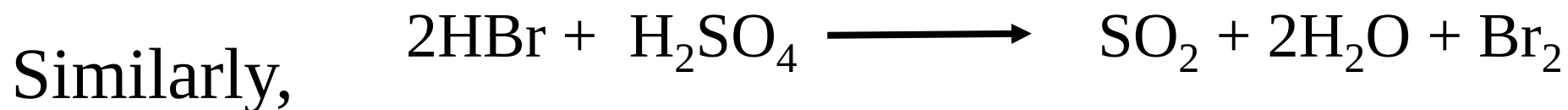


Uses of Chlorine

- It is used as disinfectant for sterilization of drinking water.
- Used as bleaching agent for cotton, fabric, paper, rayon, etc.
- Used in the manufacture of bleaching powder, chlorates, hydrochloric acid, chloroform, carbon tetrachloride, PVC (polyvinyl chloride), BHC (benzene hexa chloride), DDT (dichlorodiphenyl trichloroethane) and a number of organic compounds.
- Used in the preparation of poisonous gases like phosgene, mustard gas, tear gas etc.
- Used in the metallurgy of gold and platinum.
- Used as chlorinating agent in organic reactions.

Note:

HBr and HI can not be prepared in the same way as HCl by heating bromide and iodide salt with conc. H_2SO_4 respectively. Because both HBr and HI evolved are strong reducing agent. The order of reducing properties of halogen acids is as $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$. Therefore, they reduce conc. H_2SO_4 to SO_2 and themselves get oxidized to Br_2 and I_2 respectively.

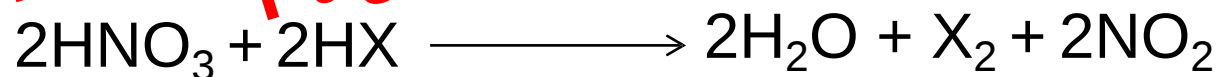


Q. Why can not HBr and HI be prepared by treating conc H_2SO_4 with bromide and iodide ?

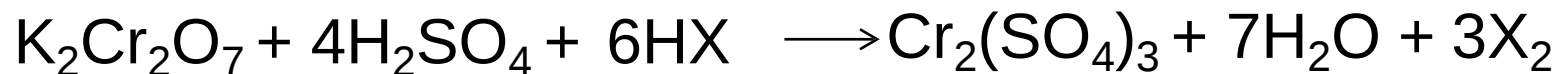
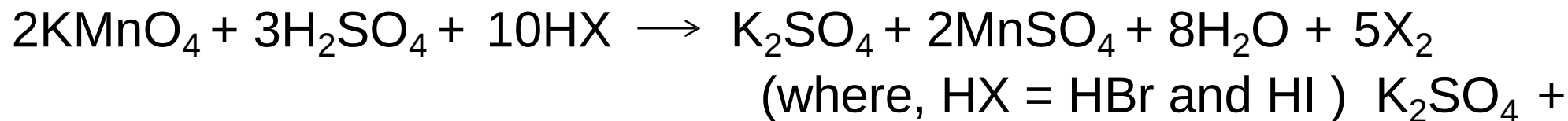
- HBr and HI are stronger reducing agent and can reduce other compounds besides above reaction shown by HCl.



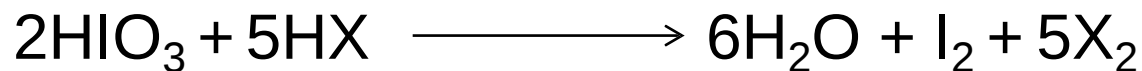
(where, HX = HBr and HI)



(where, HX = HBr and HI)



(where, HX = HBr and HI)



(iodic acid)

(where, HX = HBr and HI)

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- HI, being the strongest reducing agent among the hydrogen halides, can also reduce CuSO_4 and FeCl_3 solution.

