



Iodine and Bromine

Starting from Sea weeds how is Iodine extracted in pure form. Discuss its reaction with phosphorus, conc. HNO_3 , $\text{K}_2\text{Cr}_2\text{O}_7$. Why H_2 or H_2S is not prepared as HCl prepare in the lab.

Starting from Carnallite how is Bromine industrially prepared discuss its reaction with (1) KOH (2) $\text{K}_2\text{Cr}_2\text{O}_7$ (3) H_2S . Mention its uses

Sea weeds has become very good source to prepare Iodine in industrial scale.

Deep sea weeds containing high percent of Iodine are collected and dried. The dry weeds are then very carefully burnt so that no Iodine is lost by decomposition. The ash called kelp is obtained which contains Sodium Iodide - Chloride - Sulphate and - Carbonates.

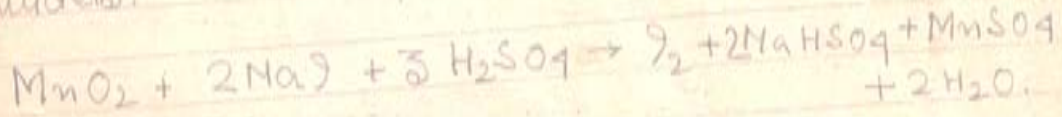
It is lixiviated (adding water slowly) with water in a big pan. The clear solution is taken by filtration. It is then fractionally crystallised. When the sulphates, chlorides and carbonates steeply crystallize out. The mother liquor contains mainly Sodium Iodide.

The mother liquor is mixed with conc. H_2SO_4 and MnO_2 in a

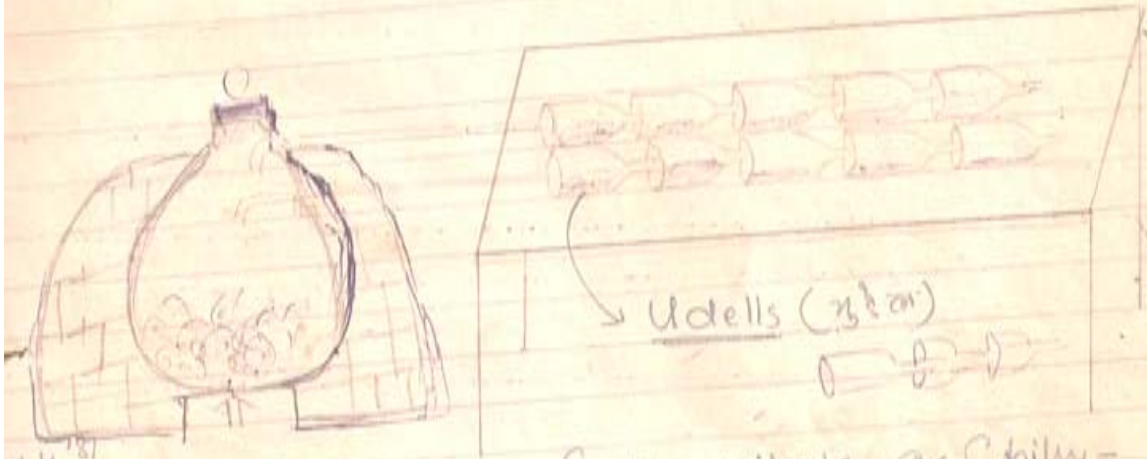
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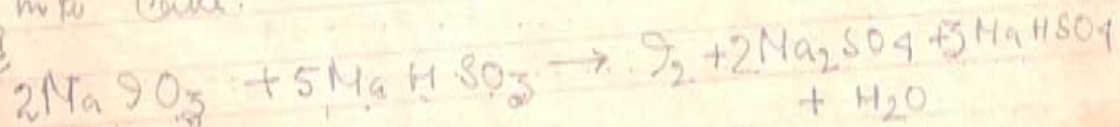
Iron still (pan) having lead head and connected with another wave receiver known as ascudels as shown in the figure. Iodine is liberated which sublimates and condenses inside the ascudels.



Purification:- It is purified by re sublimation.
Other =



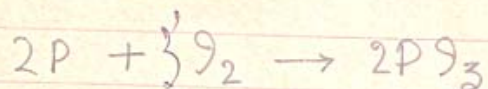
Other Method: When Sodium nitrate or Chiley-salt petre containing a little impurity NaIO_3 (Sodium iodate) is treated with water and allowed to crystallise, NaNO_3 crystals are obtained at first, leaving behind NaIO_3 in the mother liquor. This NaIO_3 is treated with required quantity of NaHSO_3 solⁿ when Iodine separates out in the solid form which is filtered and pressed into cake.





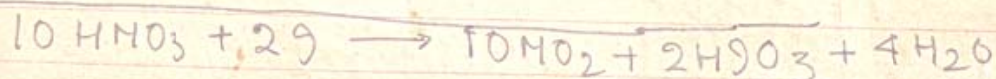
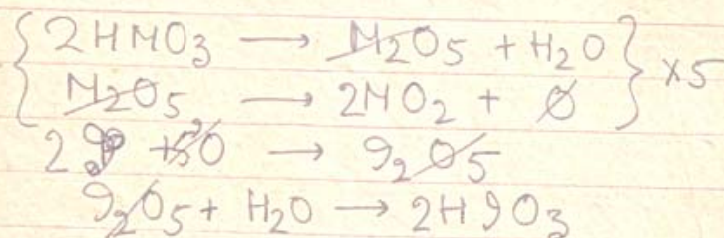
Properties :-

(1) With Phosphorus.

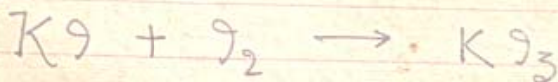


When a piece of white P_4 is brought in contact with Iodine it catches fire due to heat of reaction forming PI_3 only.

(2) With HNO_3 :-



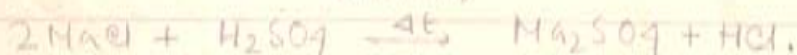
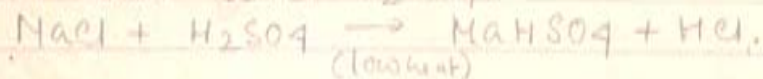
(3) With KI :- When Iodine is added to KI solution it dissolves and the solution is known as tincture Iodine used as antiseptic. (When I_2 is dissolved in C_6H_6 is called tincture benzene medicine)



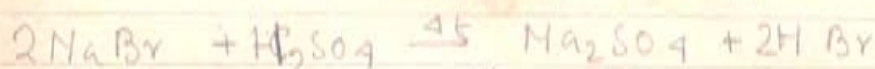


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Ans. In the lab. HCl is prepared by heating NaCl and Conc. H_2SO_4 .



Similarly if NaBr/NaI is heated with Conc. H_2SO_4 we get HBr/and HI momentarily. This HI/HBr decomposes into I_2/Br_2 and this reaction is called secondary reaction.



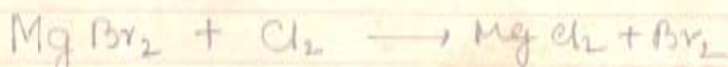
parallel reaction is with NaI.

This is the reason why HBr/HS is not prepared as HCl.

Q. 2 Ans. Carnallite has the formula $MgCl_2 \cdot KCl \cdot 6H_2O$ which is considered the ore of magnesium. It contains $MgBr_2$ as impurity which impurity is the source of commercial Bromine.

The ore is crushed into powder and dissolve in water. The solution is concentrated on heating when crystals of KCl are obtained and are removed the mother liquor, known as bittern which contains $MgCl_2$ and $MgBr_2$.

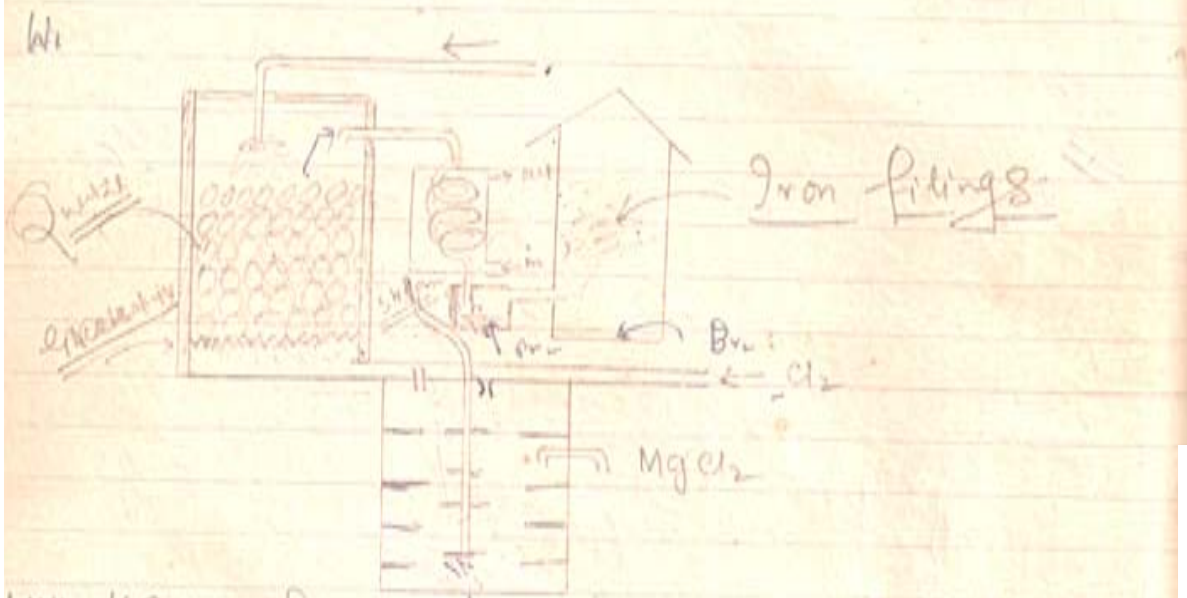
The hot mother liquor newly at $60^\circ C$ is allowed to slowly come down in a tower filled with quartz/earthen ware bottles and connected to a tank below. Chlorine gas is passed from the bottom into the tower to knock out Br_2 .



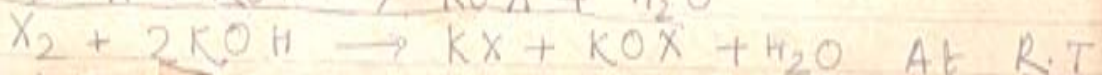
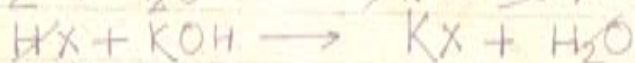


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Bromine thus liberated is converted into vapours, travels up and escape by means of an outlet at the top. It is then condensed into a liquid by cooling arrangement the last trace of Br_2 is absorbed by iron fillings to get by products MgFeCl_2 and FeBr_2 as these halogens are dangerously poisonous which cause pollution. A little Br_2 may dissolve within water and come down to the tank at the bottom. By blowing steam into it the dissolved bromine is knocked out and carried by Cl_2 gas which goes to the lower.



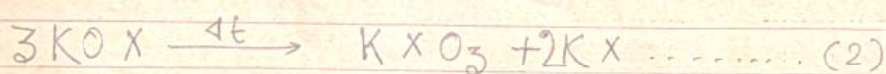
With KOH : It reacts with KOH in cold giving KBr and KOB and at high temperature gives KBrO_3 .
General reaction of halogens with alkali: (halogen)



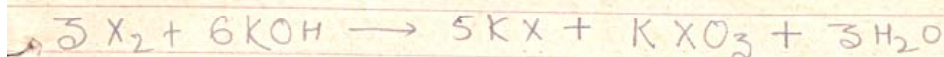


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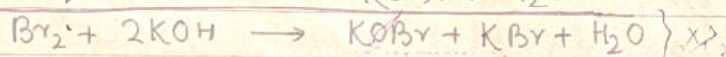
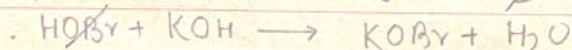
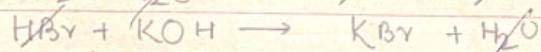
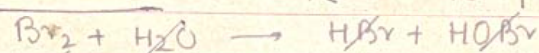
At high temperature :-



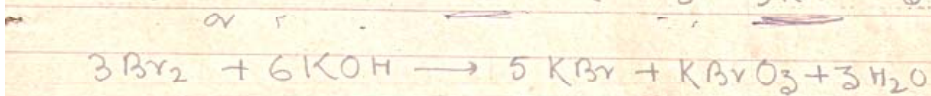
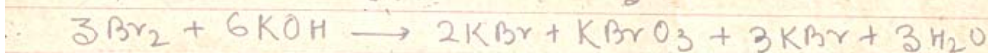
Multiplying eqⁿ ① by (3) and adding with eqⁿ ② we get the following product at high temperature



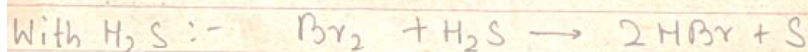
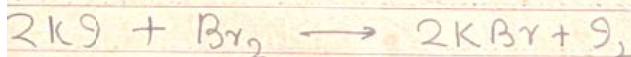
H.W $\text{Br}_2 + \text{KOH}$ At Room temperature :



at high temperature:



with $\rightarrow \text{K}_9$



Uses

It is highly used in photography and in medicine to prepare Organic compound. x