

220
JULY

१३ अपाह शुक्ल, शुक्वार, सं० २०७७

Paper - II

185-181 I

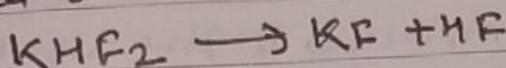
Dr. Sanjay Kumar Yadav

Lecture Notes Series : -

Hydrogen Fluoride

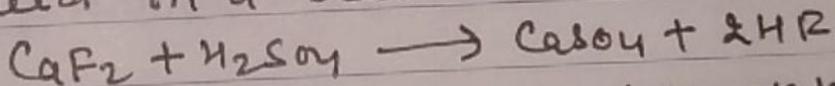
Preparation

On a small scale, hydrogen fluoride (luminous) is obtained by heating dry Potassium-hydrogen fluoride in a copper retort connected with a copper condenser.

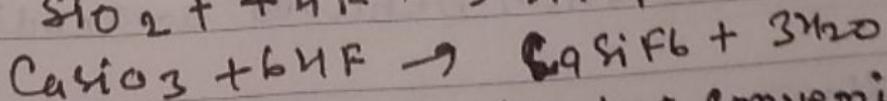
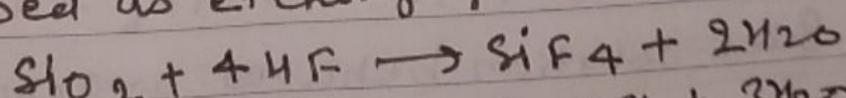


Industrially Preparation

Hydrogen fluoride is obtained by heating fluorspar [CaF_2] with concentrated sulphuric acid in a lead vessel.



Hydrogen fluoride distils over and the vapours are condensed in water taken in lead receivers. Aqueous hydrogen fluoride (or hydrofluoric acid) thus obtained is stored in gutta Percha or wax bottles. It can not be stored in glass or silica bottles as it attacks silicates as well as silic. So it is used as etching glass.



Properties. HF has a wide but convenient

Liquid range
(-83°C to 19.4°C)

S	M	T	W	F	S	S	M	T	W	F	S
-	1	2	3	4	5	6	7	8	9	10	11
20	21	22	23	24	25	26	27	28	29	30	31

04

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SATURDAY

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The disadvantages

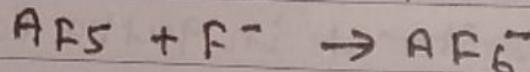
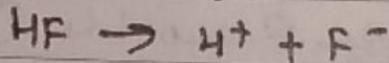
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LIMITED

of using HF as a solvent and reaction Medium are that it can dissolve only relatively few substances without chemical reaction and that it has poisonous character.

Although HF has a rather low specific conductance, its high dielectric constant makes it an excellent ionising solvent. It is regarded as one of the most water like of non-aqueous solvents. It dissolves many inorganic and organic compounds to give highly conducting solns. Inorganic substances are generally more soluble than organic compounds.

The dissolution of a solute in HF takes place by any of the following mechanism.

i) HF may dissociate into H^+ and F^- ion as other ionising solvent.

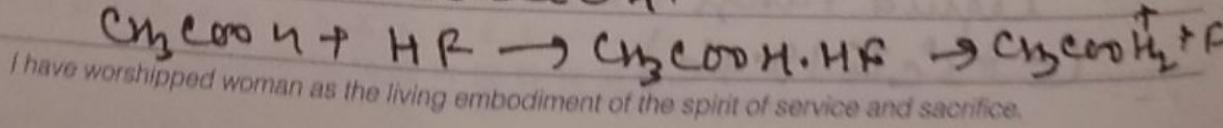


(where A = Sb, As, P)



Such solution behaves as acidic solutions.

ii) Chemical addition of HF to the Soln follows by its dissociation.



I have worshipped woman as the living embodiment of the spirit of service and sacrifice.

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JULY

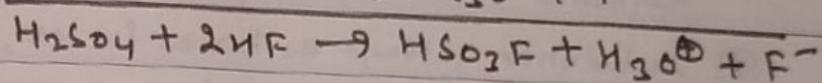
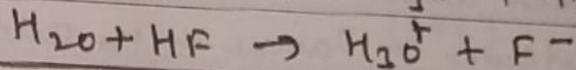
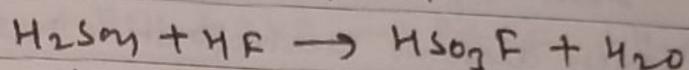
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188-178 | MONDAY

06

०९ श्रावण कृष्ण, सोमवार, सं २०७७ HNO₃ + HF → HNO₃HF → HNO₃H⁺ + F⁻

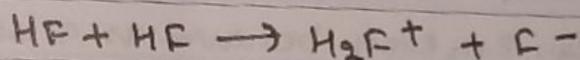
- (iii) The anion of solute may be replaced by F⁻ ion
- $$KCN + HF \rightarrow KF + HCN$$
- $$KI + HF \rightarrow KF + HI$$

- (iv) Chemical reaction involving more than simple replacement may takes place



Auto-Ionisation of HF:

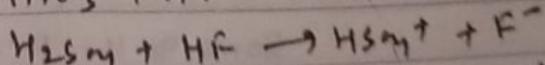
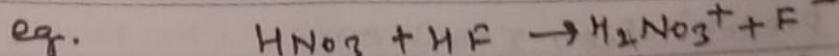
- * The auto-ionisation of HF can be represented as



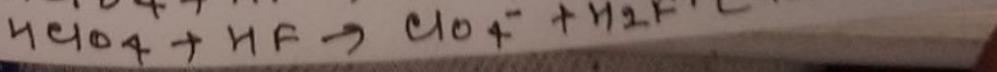
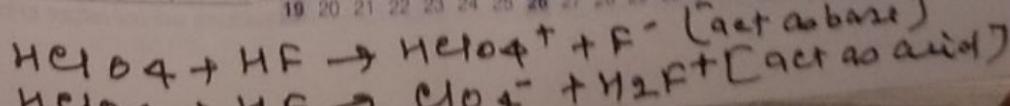
[Fluoronium (Fluoride ion)
^{ion}]

According to theory of solvent system any substance capable of giving H₂F⁺ ions will behave as an acid in this solvent, whereas any substance giving F⁻ ion will act as base.

- * There are only a few substances which can donate protons readily to HF. Thus the substance like HNO₃, H₂SO₄ etc which can behave as strong acids in aqueous solution, behave as bases in HF.



- * HClO₄ which is probably the strongest acid in aqueous SO₂ is amphoteric in HF



M	T	W	T	F	S	S	M	T	W	F	S	S	M	T	W	F	S
19	20	21	22	23	24	25	26	27	28	29	30	31					

07

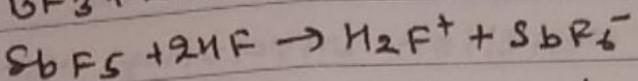
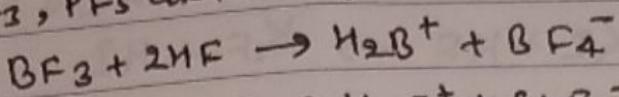
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TUESDAY

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* The Compounds

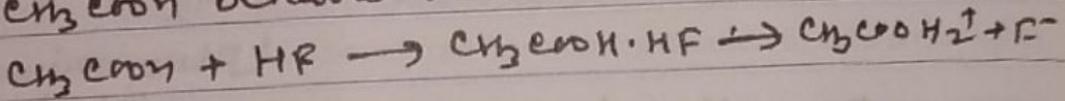
acting as acids in liq HF are
certain electron-acceptor fluorides [eg- BF_3 ,
 ASF_3 , PF_5 and SbF_5)



These acceptor molecules dissolve in HF to give solns
which dissolve electropositive metals like mg, this
evidence in favour of the acidic nature of these solutes

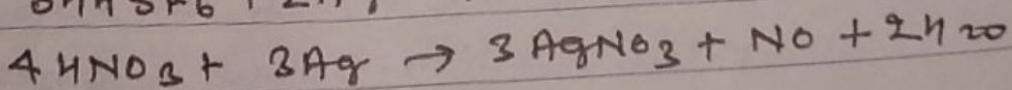
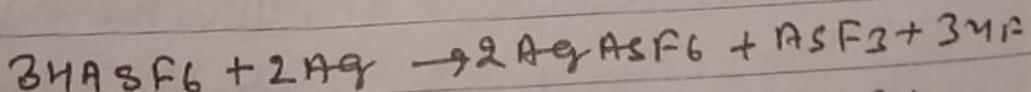
* Substances acting as bases in HF, which increase
the concentration of F^- ions and decrease that of
 H_2F^+ ions

* Weak acids in other system behaves as in HF,
eg. CH_3COOH behaves as a base in HF



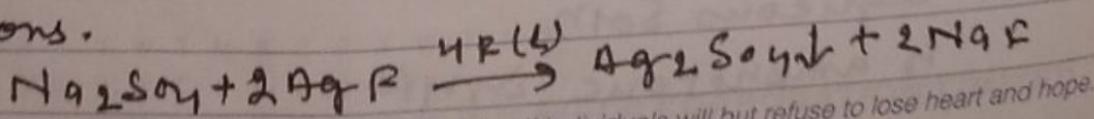
Oxidation-reduction reaction.

Oxidation-reduction reactions between
hydrofluoroacids and metals in HF are not
generally different from those taking place
between HNO_3 and metals in the aqueous system
eg.



Precipitation reaction.

Some of the precipitation reactions
occurring in liq HF exemplified by the following
reactions.

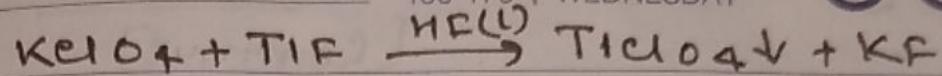


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The Precipitation reaction resulting in the formation of Silver tetrafluoroborate $AgBF_4$ is the most important. $AgBF_4$ is obtained as a precipitate when $AgNO_3$ and $BF_3 \cdot SO_2$ in HF are mixed.

