

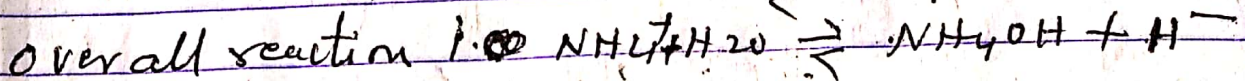
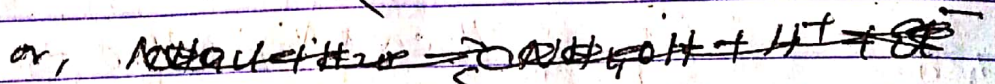
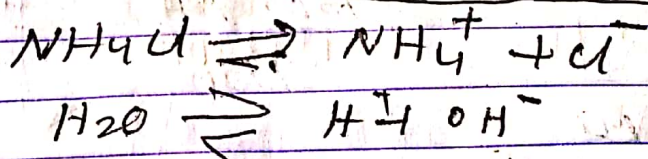
## Salt Hydrolysis

The reaction of cations or anions of the salt with water to produce acidic or basic medium is called salt hydrolysis. Let us consider the following four cases of salt hydrolysis.

(i) Salt of strong acid and strong base: —  
$$\text{NaCl} + \text{H}_2\text{O} \rightarrow \text{Na}^+ + \text{Cl}^-$$
$$\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$$

Here there is no hydrolysis because  $\text{NaCl}$  is only dissociated in  $\text{Na}^+$  and  $\text{Cl}^-$  and there is no reaction of  $\text{H}_2\text{O}$  i.e. formation of neutral medium solution.

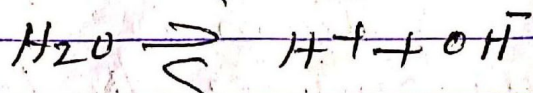
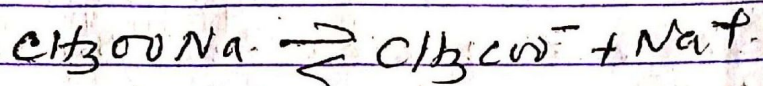
(ii) Salt of strong acid and weak base —



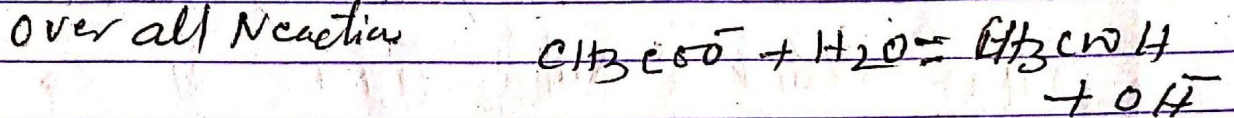
this is called

cationic hydrolysis because cation react with water.

salt of  
(iii) Strong base and weak acid: —



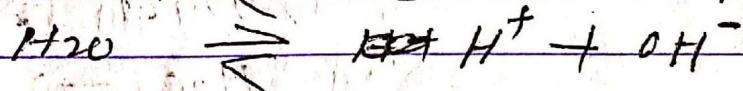
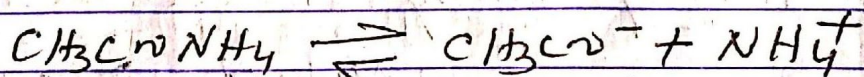
Overall Reaction



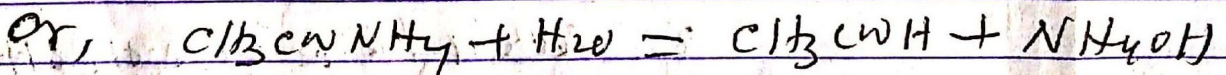
Here  $\text{CH}_3\text{COO}^-$  anion reacts with water to form  $\text{CH}_3\text{COOH}$  and resulting solution is basic in nature and hence this type of reaction is called anionic

Salt Hydrolysis

(iv) Salt of weak acid and weak base: —



or,

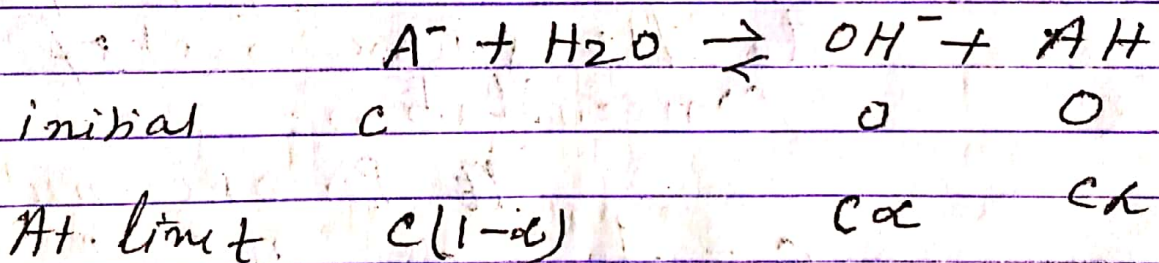


This type of hydrolysis is called anionic and cationic hydrolysis. Because both anion ( $\text{CH}_3\text{COO}^-$ ) and cation ( $\text{NH}_4^+$ ) react with water to form acidic and basic solution.

Degree of hydrolysis :- The percentage or fraction of the ~~salt~~ total salt hydrolysed is called the degree of hydrolysis of that salt.

If 90% of a salt is hydrolysed then degree of hydrolysis is .9 or 90%.

If  $c$  moles/litre is the molar concentration and  $\alpha$  is the degree of hydrolysis then we have.



Here, Hydrolysis constant

$$K_h = \frac{c\alpha \cdot c\alpha}{c(1-\alpha)}$$

$$K_h = \frac{c\alpha^2}{1-\alpha}$$

$$\text{As } K_h = \frac{[OH^-][AH]}{[A^-]}$$

Q98  $\alpha \ll 1$  Then

$$K_h = C\alpha^2 \quad \text{--- (i)}$$

$$\alpha^2 = \frac{K_h}{C}$$

$$\alpha = \sqrt{\frac{K_h}{C}} \quad \text{--- (ii)}$$

$$\alpha \propto \frac{1}{\sqrt{C}} \quad \text{--- (iii)}$$

Thus the degree of hydrolysis of a salt of weak acid and strong base is inversely proportional to the square root of its molar concentration.

Q99 For one molar solution  $C = \frac{1}{V}$  and therefore from eq<sup>n</sup> i

$$\alpha = \alpha \sqrt{K_h \cdot V} \quad \text{--- (iv)}$$

As  $K_h = \frac{K_w}{K_a}$

equation (i) will be  $\alpha = \sqrt{\frac{K_w \cdot V}{K_a}} \quad \text{--- (v)}$

$$\alpha = \sqrt{\frac{K_w}{K_a \cdot C}} \quad \text{--- (vi)}$$

where  $K_w$  = ionic product of water and  $K_a$  is the dissociation constant of acid.