UNIT-V

✱ CARBOXYLIC Acids :-

- A Carboxylic acid is an organic Compound that Contains a Carboxyl group ($-\overset{\overset{O}{\|}}{C}-OH$).
- The General formula of a Carboxylic acid is ~~R6OH~~ R COOH, with R referring to the rest of the molecule.

General Structure of Carboxylic acid.

Acidity of Carboxylic acids :-

- Carboxylic acids are more acidic than phenols. The Strength of acids depends on extent of ionization which in turn depends on Stability of anions formed.

(1) Effect of electron donating Substituents on the acidity of Carboxylic acid:

Electron donating Substituents ↓es the Stability of Carboxylate ion by intensifying the negative charge and therefore, it decreases the acidity of Carboxylic acid.

(iii) Effect of electron withdrawing Substituents on the acidity of Carboxylic acid.

Electron withdrawing groups increase the Stability of Carboxylate ion by delocalizing the negative charge and therefore, increase the acidity of Carboxylic acids.

- The effect of the following group in increasing order of their acidity is as follows.

$$Ph < I < Br < Cl < F < CN < NO_2 < CF_3$$

★ INDUCTIVE EFFECT:-

- A partial Shift / displacement of electrons towards a more electronegative atom of a bond is known as the inductive effect.
- In Carboxylic acid, an electron withdrawing group withdraws excess electron density from a Conjugate base formed, thus Stabilising it. Hence, acidic strength increases.
- Similarly if an electron donating group is attached to Carboxylic acid, it increase the electron density on the Conjugate base formed. Hence, decresing the acidic Strength.
- Acidic nature of Carboxylic acid.

- $CH_2FCOOH > CH_2ClCOOH > CH_2BrCOOH > CH_2ICOOH$

- $HCOOH > C_6H_5COOH > C_6H_5-CH_2-COOH > CH_3COOH$

Qualitative test for CARBOXYLIC acid :-

1. Litmus test :- Aqueous Solution of Carboxylic acid turn blue litmus to red.

2. Sodium bicarbonate test :- When Carboxylic acid is added to an aqueous Solution of Sodium bicarbonate, brisk effervesence of CO_2 is evolved.
   - To distinguish Carboxylic acid from phenols, this test Can be used.

$$RCOOH + NaHCO_3 \longrightarrow RCOONa + CO_2 + H_2O$$

3. Ester formation test :-
   on warming Carboxylic acid with an alcohol (e.g ethanol) is presence of a Small amount of Conc. Sulphuric acid, a fruity Smell of ester is obtained.

$$RCOOH + R'OH \xrightarrow{Conc.\ H_2SO_4} RCOOR' + H_2O$$

Qualitative test for Ester :-

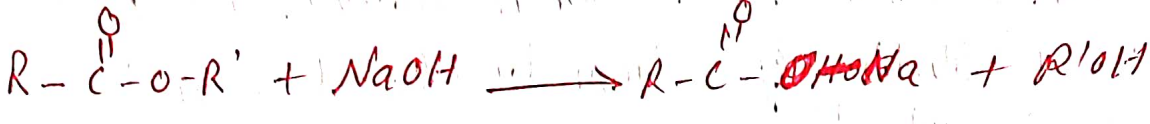
1. Hydroxamic acid test :-
   Esters react with hydroxylamines to yield hydroxamic acids which in their turn form a wine red ferric hydroxamate with ferric ions.

$$R-\overset{O}{\overset{\|}{C}}-OR' + NH_2OH \longrightarrow R-\overset{O}{\overset{\|}{C}}-NHOH + R'OH$$

2. Ester hydrolysis :-

Basic hydrolysis Converts an ester into the Carboxylate Salt of the parent acid and the alcohol from which the easter was formed.

- Acidification of the Carboxylate Salt Solution with HCl leads to recovery of the parent acid.

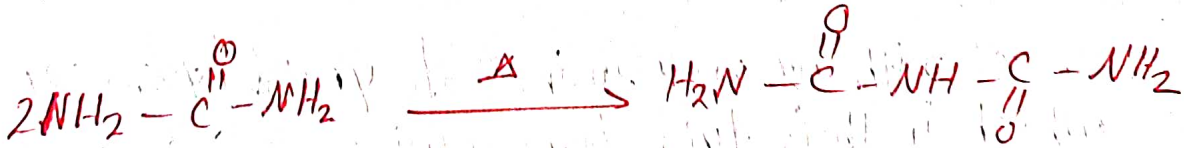


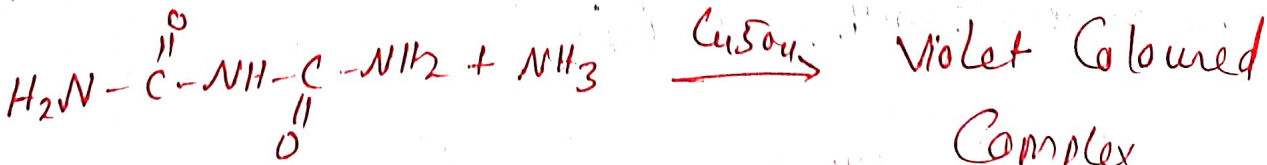
Qualitative test for Amide :-

1. Alkali test :- Simple primary amide Can be decomposed by boiling with alkali and thereby evolving ammonia

2. Biuret test :-

When aliphetic diamide is heated at temperature above its melting point, ammonia is evolved, this biuret in alkali Medium gives Violet Colour with a drop of Copper Sulphate Solution.





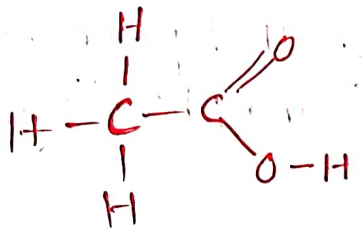
kataria pharmacy

✱ Structure and use of different Carboxylic acid Compound :-

① Acetic Acid :-

Structure –

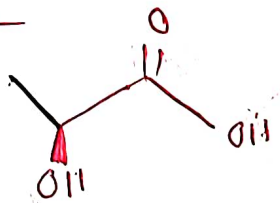
(CH_3COOH)



Use :-
1. Used in the production of vinyl acetate monomer.
2. Used in ester production
3. Used in the preparation of acetic anhydride.
4. Used as Solvent.

② Lactic acid :-

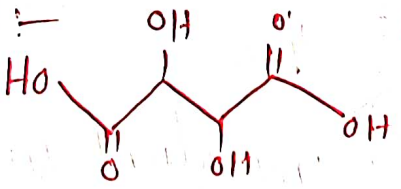
Structure :-



Use :- 1. use as pharmaceutical and Cosmetic application.
2. use in food industry.
3. Used as detergents

③ Tartaric acid :-

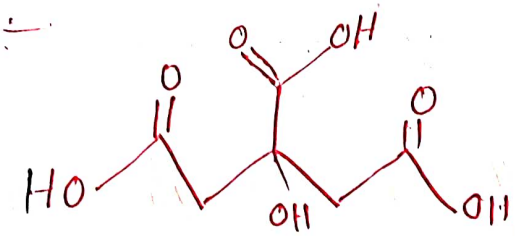
Structure :-



Use :- Use as pharmaceutical
- Used in farming and metal industry.

(4) Citric acid :-

Structure :-

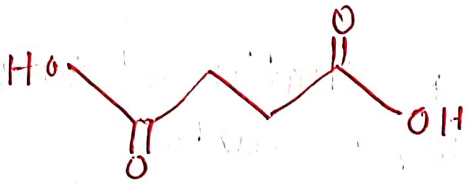


Use :-

1. Used as a flavoring and preservative in food and beverages
2. Use as cleaning and chelating agent.

(5) Succinic Acid :-

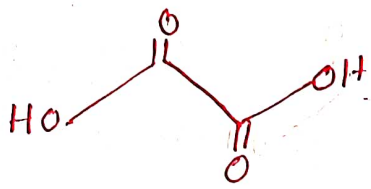
Structure :-



Uses :- 1. Use as a precursor to polymer, resins, and Solvents.
2. Used as food and dietary supplement.

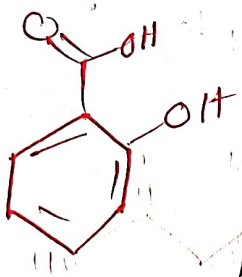
(6) Oxalic Acid :-

Structure :-



Uses :- 1. Used for the purpose of Cleaning.
2. Used in extractive metallurgy

(7) Salicylic acid :-



Structure -

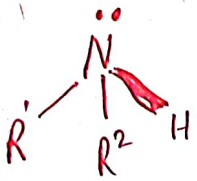
Uses :-

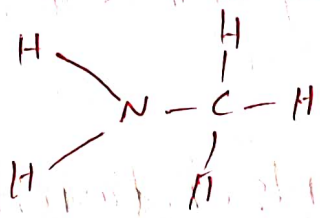
1. Used as important ingredient in medicinal preparation
2. Used as plant hormones.

kataria pharmacy

☆ Aliphatic Amines:-

Amines are the Compounds that Contain an essential nitrogen particle with a solitary Combined.





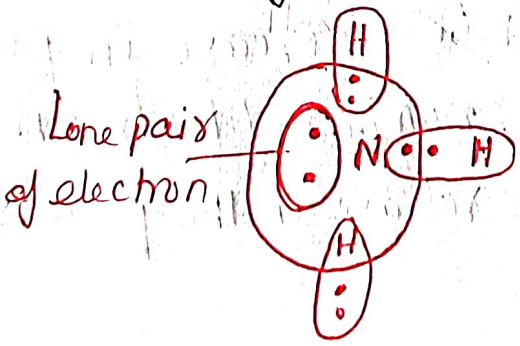
(Methylamine)

Basicity of Amines:-

- Amines are bases because of the solitary Combine of electrons on the nitrogen particles of amine.
- These responds with water and give hydroxide particles.
- Base are those species that give $\bar{O}H$ particles.
- More effectively is the accessibility of the hydroxyl particles more is the basicity of the amine.

~~Amm~~ Ammonia and Alkylamines:-

The nitrogen atom in both alkyl amines and Smelling Salt has a Solitary Combine of Electron.



- On Comparing the basicity of aliphatic amines that is Primary, secondary and tertiary amines and then primary amines.

But actually this is not. So, The order of basicity is:

NH_3 < primary amine < tertiary < Secondary Amine

EFFECT OF Substituents on basicity :-

(i) Steric Hindrance :-

The basicity of Molecule depends upon the degree of steric hindrance. As we know that the size of alkyl group is more than that of a hydrogen atom, thus an alkyl group will produce more steric hindrance and obstruct to attack a hydrogen atom, therefore decresing the basicity of the Molecule.

Primary amine > Secondary > tertiary amine

(ii) Solvation of ions :-

Amines will be protonated when they are dissolved in water As a result of this, their will be increase in possibilities of hydrogen bonding. More the number of hydrogen bonding more is the hydration that is release in the process of formation of hydrogen bonds.

NH_3 < primary < tertiary < Secondary Amine.

☆ Qualitative testes for Amines :-

1. Solubility test :-

Since, amines are basic in nature they are easily dissolved in water and form Corresponding Salts.

$$C_6H_5NH_2 + HCl \longrightarrow C_6H_5NH_3^+Cl^-$$

Aniline — Anilinium Chloride.

2. Litmus test :-

Due to basic Character of amines, when they are dissolved in water the Solution becomes alkaline and thus the red litmus turns blue.

$$CH_3CH_2NH_2 + H_2O \rightleftharpoons CH_3CH_2NH_3^+ + OH$$

3. Carbylamine test :-

When primary amine is treated with alcoholic potassium hydroxide and Chloroform an ~~effective~~ offensiv Smelling isocyanide is formed.

$$RNH_2 + CHCl_3 + 3KOH \longrightarrow RCN + 3KCl + 3H_2O$$

primary amine — Chloroform — Isocyanide.

kataria pharmacy

✡ Structure and use of ethanolamine :-

$$NH_2 - CH_2 - CH_2 - OH$$

Use :- 1. Used as gas stream scrubbing agent.
2. For the preparation of emulsion.

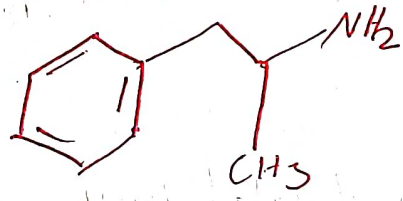
✡ Ethylenediamine :-

Structure :- 

Use :- 1. Used as Chelating agent
2. Used as a Fungicidal agent.

✡ Amphetamine :-

Structure



use :-

1. Used for medicinal purpose.
2. Athletic performance-enhancing effect.

KATARIA PHARMACY