UNIT V

CARBOXLIC ACID AND ALIPHATIC AMINE

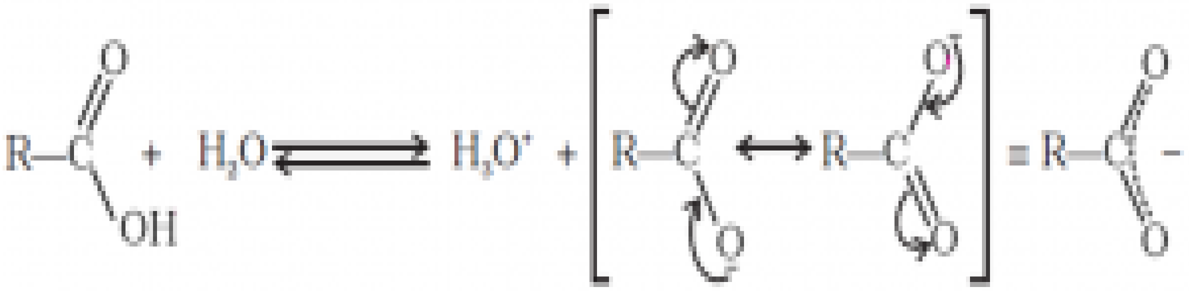
Carboxylic acid is an organic compound containing carboxyl group (COOH) attached to an alkyl or aryl group. They react with metals and alkalis to generate carboxylate ions. These reactions of carboxylic acids indicate their acid nature. Acidity of carboxylic acids is higher in comparison to simple phenols as they react with weak bases like carbonates and bicarbonates to liberate carbon dioxide gas. The **Carboxylic Acid naming** occurs when a substance donates a proton; usually hydrogen to other things. The carboxylic acids are acidic in nature because hydrogen belongs in the -COOH group.

$$2R\text{-}COOH + 2Na \longrightarrow 2R\text{-}CO\bar{O}Na^{+} + H_2$$

$$R\text{-}COOH + NaOH \longrightarrow R\text{-}CO\bar{O}Na^{+} + H_2O$$

$$R\text{-}COOH + NaHCO_3 \longrightarrow R\text{-}CO\bar{O}Na^{+} + H_2O + CO_2$$

Carboxylic acids dissociate in water to form carboxylate ion and hydronium ion. The carboxylate ion formed is stabilized through resonance by effective delocalization of the negative charge.



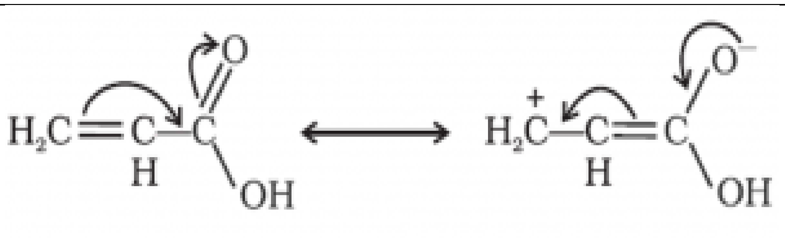
Carboxylic acids are weaker than mineral acids but are strongest among the organic compounds. Acidity of carboxylic acid is higher than alcohols and even phenols. As discussed above, carboxylate ion, the conjugate base of carboxylic acid is stabilized by two equivalent resonance structures in which the negative charge is effectively delocalized between two more electronegative oxygen atoms.

On the other hand in case of phenols, negative charge is less effectively delocalized over one oxygen atom and less electronegative carbon atoms in phenoxide ion. Therefore, the carboxylate ion exhibits higher stability in comparison to phenoxide ion. Hence, the carboxylic acids are more acidic than phenols. Carboxylic acids when react with metals and alkalis form carboxylate ions, which only get stabilized due to resonance. The simplest way to understand carboxyl groups is simply by understanding that withdrawal of electrons leads to the increased acidity of carboxyl groups, whereas donation of an electron leads to the decrease of acidity in carboxyl groups.

The acidity of carboxylic acids further depends on the nature of substituent alkyl or aryl group attached to the carboxyl group. An electron withdrawing group ensures effective delocalization of negative charge through resonance or inductive effect. Thus, electron withdrawing groups increase the stability of the conjugate base formed and hence the acidity of carboxylic acids. On the other hand, electron donating groups destabilizes the conjugate base formed and hence decreases the acidity of carboxylic acids. A general trend can be seen as:

$CF_3COOH > CCl_3COOH > CHCl_2COOH > NO_2CH_2COOH > NC\text{-}CH_2COOH$

Due to the resonance effect, phenyl or vinyl groups to increase the acidity of carboxylic acids in spite of decreasing the acidity due to induction effect.



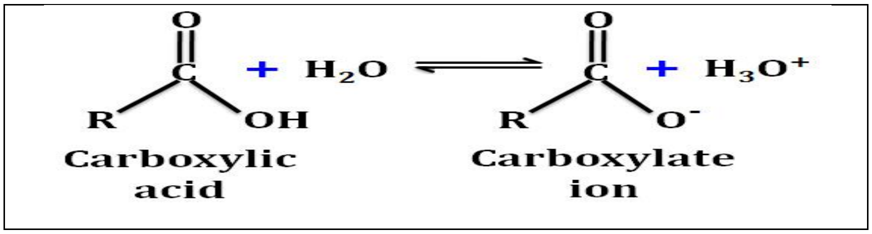
TESTS FOR CARBOXYLIC GROUP

Carboxylic acids are organic compounds containing carboxyl functional group. It is of two types aliphatic and aromatic. Aliphatic acids are soluble in water where as aromatic acids are sparingly soluble in water. Formic acid and acetic acid are the simplest aliphatic acid and benzoic acid is the simplest aromatic acid. Formic acid and acetic acid are liquids. Carboxylic acids such as benzoic acid, oxalic acid, phthalic acid, tartaric acid etc are colourless crystalline solids.

2- QUALIATATIVE TEST.

I) LITMUS TEST

Carboxylic acid turns blue litmus red. The hydroxyl group in carboxylic is far more acidic than that in alcohol. The dissociation of carboxylic acid is represented as:



II) Reaction with NaOH:

Carboxylic acids being acidic dissolves in NaOH to form sodium salt.

$$\underset{\text{Solid}}{RCOOH + NaOH} \longrightarrow \underset{\text{Soluble Sodium Salt}}{RCOONa + H_2O}$$

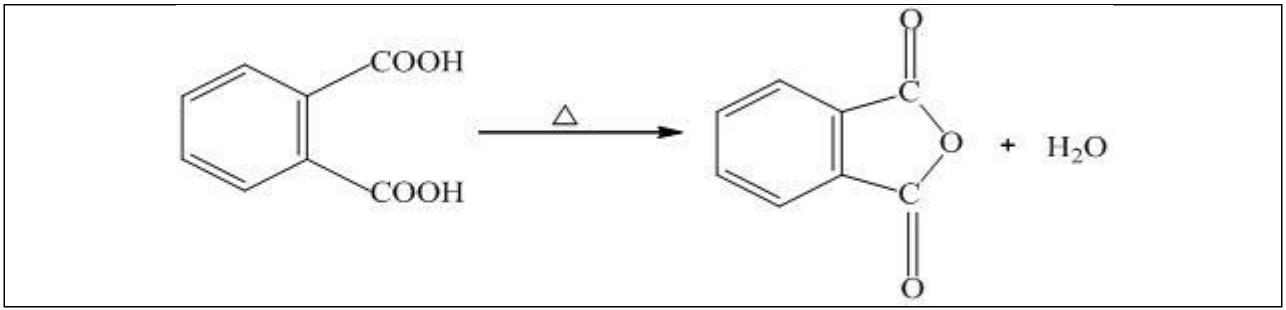
III) Reaction of $NaHCO_3$:

Forms salt with sodium bicarbonate solution with the evolution of carbon dioxide.

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

IV) Anhydride formation:

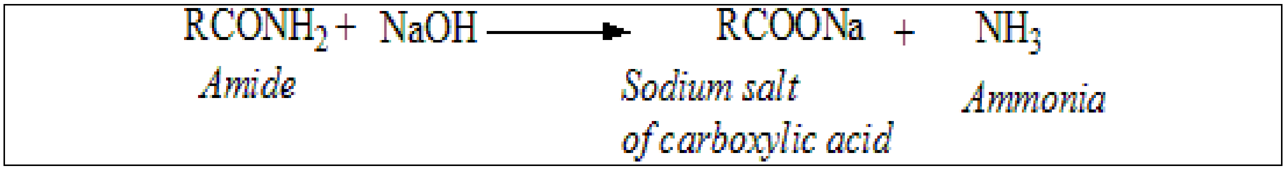
Aromatic 1,2-dicarboxylic acids decomposes to give its anhydride when heated at its melting point.



1. QUALIATATIVE TEST FOR AMIDES:

I) Reaction of NaOH:

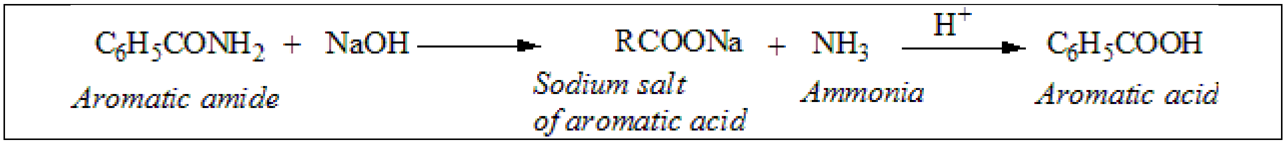
Amides are decomposed by NaOH to evolve ammonia. The gas can be tested by a moist red litmus paper which is then turned blue.



$$RCONH_2 + NaOH \longrightarrow RCOONa + NH_3$$

II-Alkaline hydrolysis of aromatic amides to aromatic acid:

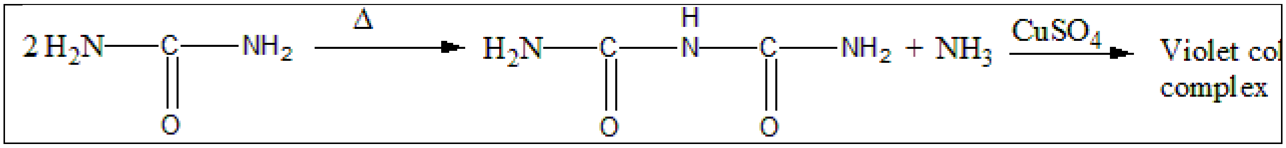
The soluble sodium salt of aromatic acid formed from aromatic amides upon hydrolysis is regenerated as white precipitate in acidic medium.



$$C_6H_5CONH_2 + NaOH \longrightarrow RCOONa + NH_3 \xrightarrow{H^+} C_6H_5COOH$$

III) Biuret Reaction for aliphatic diamide:

When aliphatic diamide is heated at a temperature above its melting point, ammonia is evolved and crystalline biuret is formed. This biuret in alkaline medium gives a violet colour with a drop of copper sulphate solution.

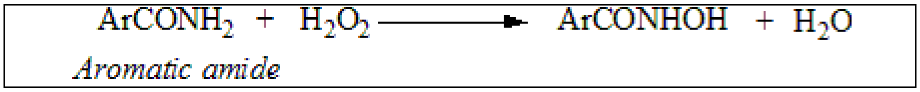


$$2\,H_2N{-}C({=}O){-}NH_2 \xrightarrow{\Delta} H_2N{-}C({=}O){-}NH{-}C({=}O){-}NH_2 + NH_3 \xrightarrow{CuSO_4} \text{Violet col complex}$$

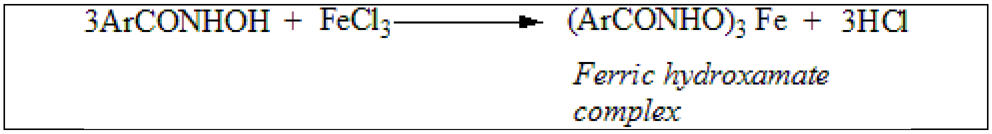
Biuret reaction

IV)-Hydroxamic acid test for aromatic primary amides:

Hydrogen peroxide reacts with aromatic primary amides to form the hydroxamic acid, which then reacts with ferric chloride to form ferric hydroxamate complex having a violet colour.



$$\underset{\text{Aromatic amide}}{ArCONH_2} + H_2O_2 \longrightarrow ArCONHOH + H_2O$$



$$3ArCONHOH + FeCl_3 \longrightarrow \underset{\text{Ferric hydroxamate complex}}{(ArCONHO)_3Fe} + 3HCl$$

Esters

The ester can be reacted with saturated ethanolic hydroxylamine hydrochloride + 20% methanolic KOH and gently heated until boiling. Then mixture acidified with 1M HCl and $FeCl_3$ added dropwise. Deep red or purple colour formed. The test depends on the formation of a hydroxamic acid R–C(=NOH)OH which forms coloured salts with Fe^{3+}.

3- STRUCTURE AND USE (ACETIC ACID)

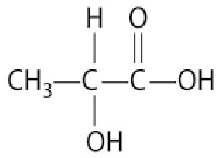
Acetic acid (ethanoic acid) is a colourless liquid organic compound with the chemical formula CH_3COOH (also written as CH_3CO_2H or $C_2H_4O_2$). When undiluted, it is sometimes called *glacial acetic acid*. Vinegar is no less than 4% acetic acid by volume, making acetic acid the main component of vinegar apart from water. Acetic acid has a distinctive sour taste and pungent smell. In addition to household vinegar, it is mainly produced as a precursor to polyvinyl acetate and cellulose acetate. It is classified as a weak acid since it only partially dissociates in solution, but concentrated acetic acid is corrosive and can attack the skin.

USE. Acetic acid is a chemical reagent for the production of chemical compounds. The largest single use of acetic acid is in the production of vinyl acetate monomer, closely followed by acetic anhydride and ester production. The volume of acetic acid used in vinegar is comparatively small.

- Medical use- anticancer and antiseptic.
- Foods- vinegar
- Vinyl acetate monomer
- Ester production
- Acetic anhydride
- Sodium acetate, used in the textile industry and as a food preservative (E262).
- Copper(II) acetate, used as a pigment and a fungicide.
- Aluminium acetate and iron(II) acetate—used as mordants for dyes.
- Palladium(II) acetate, used as a catalyst for organic coupling reactions such as the Heck reaction.

- Chloroacetic acid (monochloroacetic acid, MCA), dichloroacetic acid (considered a by-product), and trichloroacetic acid. MCA is used in the manufacture of indigo dye.
- Bromoacetic acid, which is esterified to produce the reagent ethyl bromoacetate.
- Trifluoroacetic acid, which is a common reagent in organic synthesis.
- **Use as solvent.** Glacial acetic acid is an excellent polar protic solvent, as noted above. It is frequently used as a solvent for recrystallization to purify organic compounds. Acetic acid is used as a solvent in the production of terephthalic acid (TPA), the raw material for polyethylene terephthalate (PET). Acetic acid is often used as a solvent for reactions involving carbocations, such as Friedel-Crafts alkylation. For example, one stage in the commercial manufacture of synthetic camphor involves a Wagner-Meerwein rearrangement of camphene to isobornyl acetate; here acetic acid acts both as a solvent and as a nucleophile to trap the rearranged carbocation

LACTIC ACID



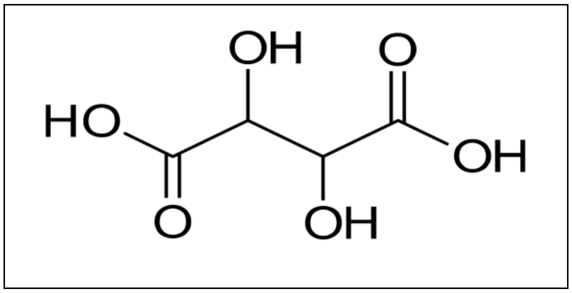
$$CH_3-\overset{H}{\underset{OH}{C}}-\overset{O}{\overset{\|}{C}}-OH$$

Lactic acid

Lactic acid is an organic compound with the formula $CH_3CH(OH)COOH$. In its solid state, it is white and water-soluble. In its liquid state, it is colorless. It is produced both naturally and synthetically. With a hydroxyl group adjacent to the carboxyl group, lactic acid is classified as an alpha-hydroxy acid (AHA). In the form of its conjugate base called **lactate**, it plays a role in several biochemical processes

- Used in the baking industry.
- Introduces calcium into the body in the form of calcium lactate
- Ester of lactic acid used in the food industry as emulsifier.
- For the formation of rye bread.
- Manufacturing of plastic
- Used as flavouring and acidifier and buffering agent.
- Preservative and pickling agent. Addition of lactic acid to the packing of poultry and fish increase their shelf life.

TARTARIC ACID

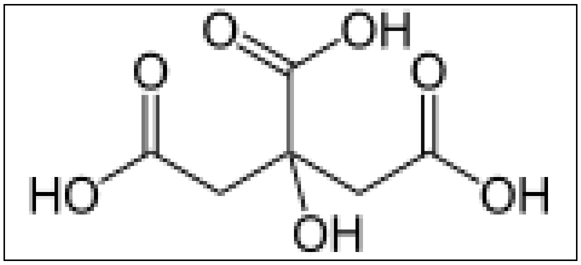


Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Its salt, potassium bitartrate, commonly known as cream of tartar, develops naturally in the process of winemaking. It is commonly mixed with sodium bicarbonate and is sold as baking powder used as a leavening agent in food preparation. The acid itself is added to foods as an antioxidant and to impart its distinctive sour taste.

Tartaric is an alpha-hydroxy-carboxylic acid, is diprotic acid and is a dihydroxyl derivative of succinic acid.

USED- Tartaric acid is found in cream of tartar, which is used in cooking candies and frostings for cakes. Tartaric acid is also found in baking powder, where it serves as the source of acid that reacts with sodium bicarbonate (baking soda). This reaction produces carbon dioxide gas, and lets products "rise," but does so without any "yeasty" taste, that can result from using active yeast cultures as a source of the carbon dioxide gas. Tartaric acid is used in silvering mirrors, tanning leather, and in Rochelle Salt, which is sometimes used as a laxative. Blue prints are made with ferric tartarte as the source of the blue ink. In medical analysis, tartaric acid is used to make solutions for the determination of glucose. Common esters of tartaric acid are diethyl tartrate and dibutyl tartrate, which are made by reacting tartaric acid with ethanol and butanol. In this reaction, the H of the COOH acid group is replaced with a CH_3CH_2 (ethyl) group or ($CH_3CH_2CH_2CH_2$-).

CITRIC ACID

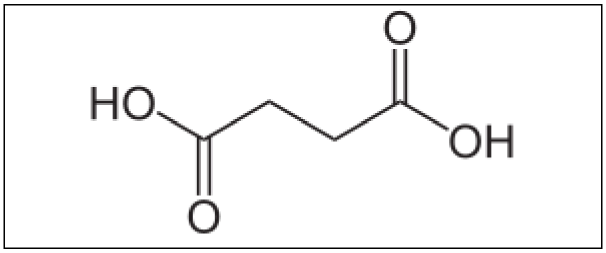


Citric acid is a weak organic acid that has the chemical formula $C_6H_8O_7$. It occurs naturally in citrus fruits. In biochemistry, it is an intermediate in the citric acid cycle, which occurs in the metabolism of all aerobic organisms. It is used widely as an acidifier, as a flavoring and chelating agent.

USE-

- Citric acid is used as an odorless alternative to white vinegar for home dyeing with acid dyes.
- Sodium citrate is a component of Benedict's reagent, used for identification both qualitatively and quantitatively, of reducing sugars.
- Citric acid can be used as an alternative to nitric acid in passivation of stainless steel.
- Citric acid can be used as a lower-odor stop bath as part of the process for developing photographic film. Photographic developers are alkaline, so a mild acid is used to neutralize and stop their action quickly, but commonly used acetic acid leaves a strong vinegar odor in the darkroom.
- Citric acid/potassium-sodium citrate can be used as a blood acid regulator.
- Used AS acidulant in the manufacturing of jellies, jams, sweet, and soft drink,
- Sodium citrte used in cheese manufacturing.
- Sodium citrte used in blood transfusion and bacteriology for the prevention of blood cloting.

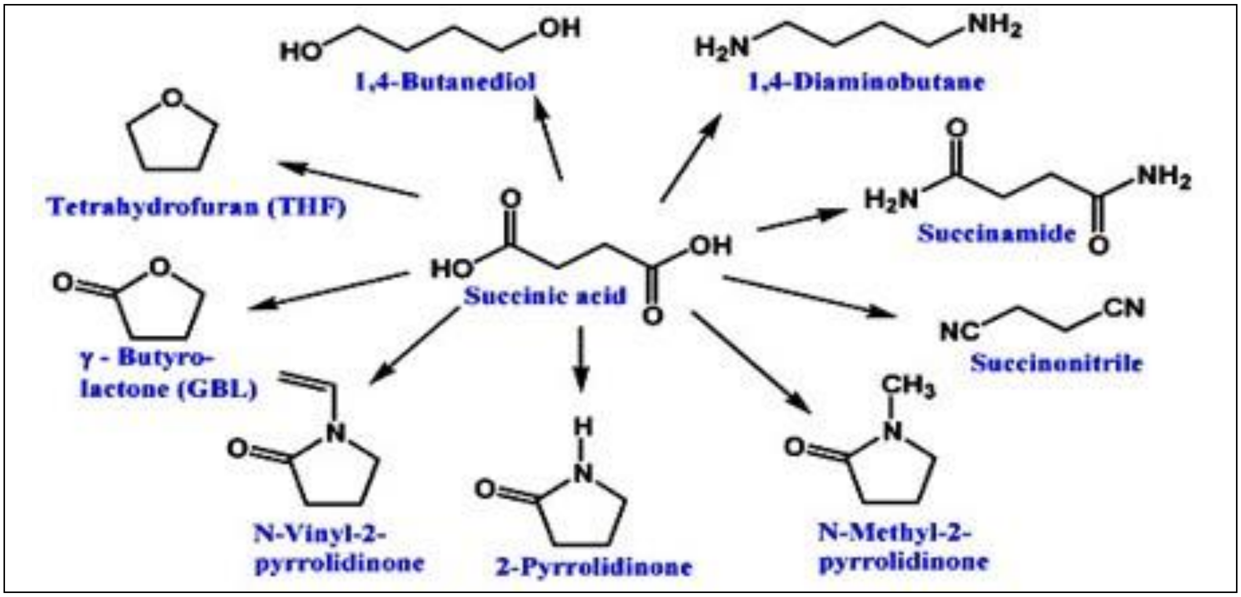
SUCCINIC ACID



Succinic acid is a dicarboxylic acid with the chemical formula $(CH_2)_2(COOH)_2$.The name derives from Latin succinum, meaning amber. In living organisms, succinic acid takes the form of an anion, succinate, which has multiple biological roles as a metabolic intermediate being converted into fumarate by the enzyme succinate dehydrogenase in the electron transport chain which is involved in making ATP, and as a signaling molecule reflecting the cellular metabolic state. Succinate is generated in mitochondria via the tricarboxylic acid cycle (TCA), an energy-yielding process shared by all organisms.. As such, succinate links cellular metabolism, especially ATP formation, to the regulation of cellular function.

USEs- synthesis of various compound .

- Precursor to polymers, resins, and solvents
- Food and dietary supplement used as acidity regulator
- Biosynthesis- key intermediate in TCA cycle.



<u>OXALIC ACID</u>

[HOOC-COOH]

Oxalic acid is an organic compound with the formula $C_2H_2O_4$. It is a colorless crystalline solid that forms a colorless solution in water. Its condensed formula is HOOCCOOH, reflecting its classification as the simplest dicarboxylic acid.

Its acid strength is much greater than that of acetic acid. Oxalic acid is a reducing agent and its conjugate base, known as oxalate .oxalic acid occurs as the dihydrate with the formula $C_2H_2O_4 \cdot 2H_2O$.

It occurs naturally in many foods, but excessive ingestion of oxalic acid or prolonged skin contact can be dangerous.

USE- About 25% of produced oxalic acid will be used as a mordant in dyeing processes. It is used in bleaches, especially for pulpwood. It is also used in baking powder and as a third reagent in silica analysis instruments.

1.CLEANING

Oxalic acid can be used as a bleaching agent for both wood and stone. Wood, when exposed to the elements, can turn gray. When oxalic acid is applied on an old and graying wood floor, it brings back the wood floor’s natural white color. Actually, this acid is often used when preparing to stain old wood floors. It is also used by furniture manufacturers to lighten heavily stained areas of wood furniture in preparation for refinishing.

2. REMOVING STAINS

Oxalic acid effectively removes ink, food stains, and many other types of stains. It is a gentle stain remover that eats the stain but leaves the base surfaces, such as wood, intact. You can use oxalic acid to remove most stains found on stone, brick, linoleum, wood, and vinyl surfaces. However, do not use oxalic acid if your flooring is sealed as it will eat through the finishing.

Although you can also use oxalic acid to remove stains from fabrics such as linen and cotton, it will take a lot of time, so it is better to have your fabrics dry cleaned instead.

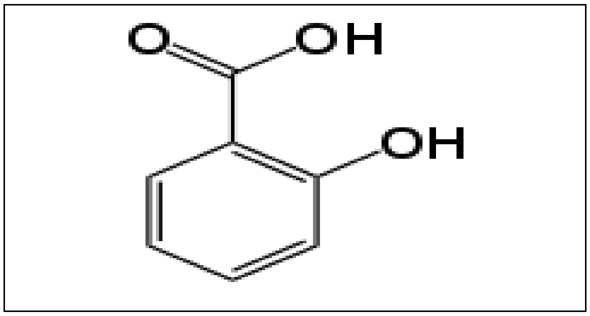
3. REMOVING RUSTS

Oxalic acid is also used to remove rusts that are commonly found on plumbing pipes and kitchen countertops, and is a major ingredient found in commercial rust removers for sinks, tubs, and metal rust stains.

4. OTHER USES

Aside from bleaching, rust removing, and stain removing, oxalic acid is also used as a reducing agent in developing photographic film. You can also find it used in wastewater treatment as well since oxalic acid can effectively remove calcium from wastewater. And lastly, oxalic acid is also used as a grinding agent when polishing marble.

SALICYLIC ACID

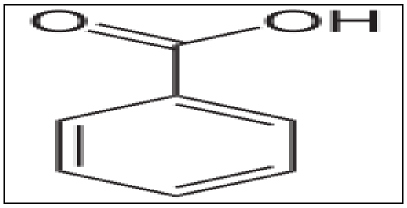


Salicylic acid (from Latin salix, willow tree) is a lipophilic monohydroxybenzoic acid, a type of phenolic acid, and a beta hydroxy acid (BHA). It has the formula $C_7H_6O_3$. In addition to serving as an important active metabolite of aspirin (acetylsalicylic acid), which acts in part as a prodrug to salicylic acid, it is probably best known for its use as a key ingredient in topical anti-acne products. The salts and esters of salicylic acid are known as salicylates.

- Salicylic acid is used as a food preservative, a bactericidal and an antiseptic.
- Salicylic acid used as antipyretic.

- Used as key ingredient in many skin care product for the treatment of seborrhoea dermatitis, acne, psoriasis, and warts.
- Used in the production of 4-amino salicylic acid, sulpiride.

BENZOIC ACID

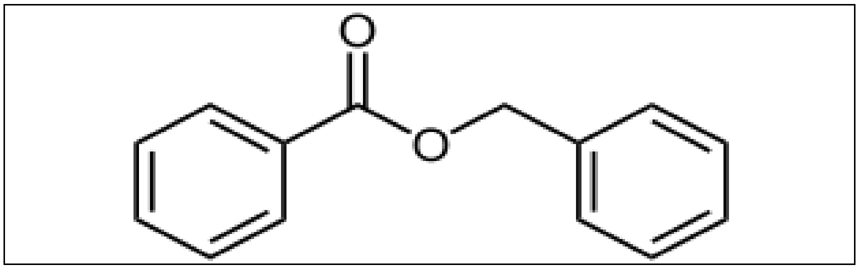


Benzoic acid $C_7H_6O_2$ (C_6H_5COOH), is a colourless crystalline solid and a simple aromatic carboxylic acid. The name is derived from gum benzoin, which was for a long time its only known source. Benzoic acid occurs naturally in many plants. and serves as an intermediate in the biosynthesis of many secondary metabolites. Salts of benzoic acid are used as food preservatives and benzoic acid is an important precursor for the industrial synthesis of many other organic substances. The salts and esters of benzoic acid are known as **benzoate.**

USES

- Sodium benzoate use as preservative.
- **Fungistatic,** expectorant, analgesic, antiseptic.

BENZYL BENZOATE



It is an organic compound with the formula $C_6H_5CH_2O_2CC_6H_5$. It is the ester of benzyl alcohol and benzoic acid. It forms either a viscous liquid or solid flakes and has a weak, sweetbalsamic odour. It occurs in a number of blossoms (e. g. tuberose, hyacinth) and is a component of Balsam of Peru and Tolu balsam.

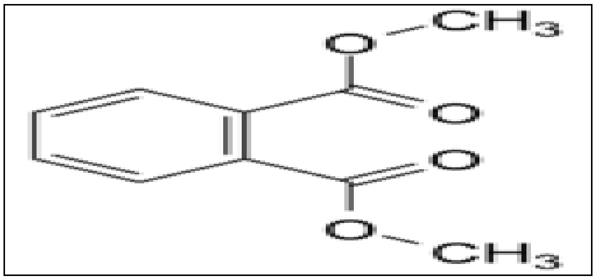
USES. MEDICAL

- Benzyl benzoate is an effective and inexpensive topical treatment for human scabies.
- **vasodilating and spasmolytic effects** and is present in many asthma and whooping cough drugs.
- Benzyl benzoate is used as a topical **acaricide, scabicide, and pediculicide** in veterinary hospitals.

NON-MEDICAL-

Benzyl benzoate is used as a repellent for chiggers, ticks, and mosquitoes. It is also used as a dye carrier, solvent for cellulose derivatives, plasticizer, and fixative in the perfume industry.

DIMETHYL PHTHALATE



Dimethyl phthalate is an organic compound with molecular formula $(C_2H_3O_2)_2C_6H_4$. The methyl ester of phthalic acid, it is a colourless liquid that is soluble in organic solvents.

USE-

Dimethyl phthalate is used in solid rocket **propellants, lacquers, plastics, safety glasses, rubber coating agents, molding powders, insect repellants, and pesticides**.

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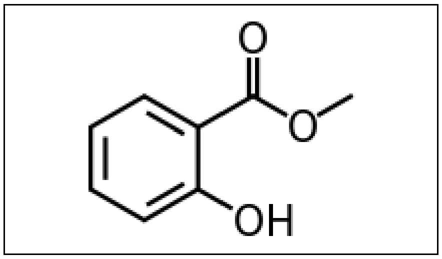
METHYL SALICYLATE



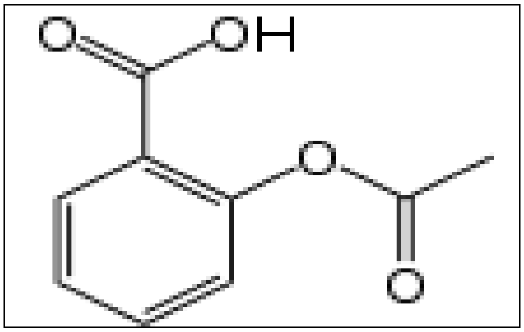
Methyl salicylate (**oil of wintergreen** or **wintergreen oil**) is an organic compound with the formula $C_6H_4(OH)(CO_2CH_3)$. It is the methyl ester of salicylic acid. It is a colorless, viscous liquid with a sweet odor. It is produced by many species of plants, particularly wintergreens. It is also synthetically produced, used as a fragrance, in foods and beverages, and in liniment.

USES.

It is used as a **rubefacient and analgesic.**

- It is used in low concentrations (0.04% and under) as a flavoring agent in chewing gum and mints.
- It is used in restoring (at least temporarily) the elastomeric properties of old rubber rollers, especially in printers.
- It is used as a penetrating oil to loosen rusted parts.

ACETYLSALICYLIC ACID (ASA) (ASIPIRIN)



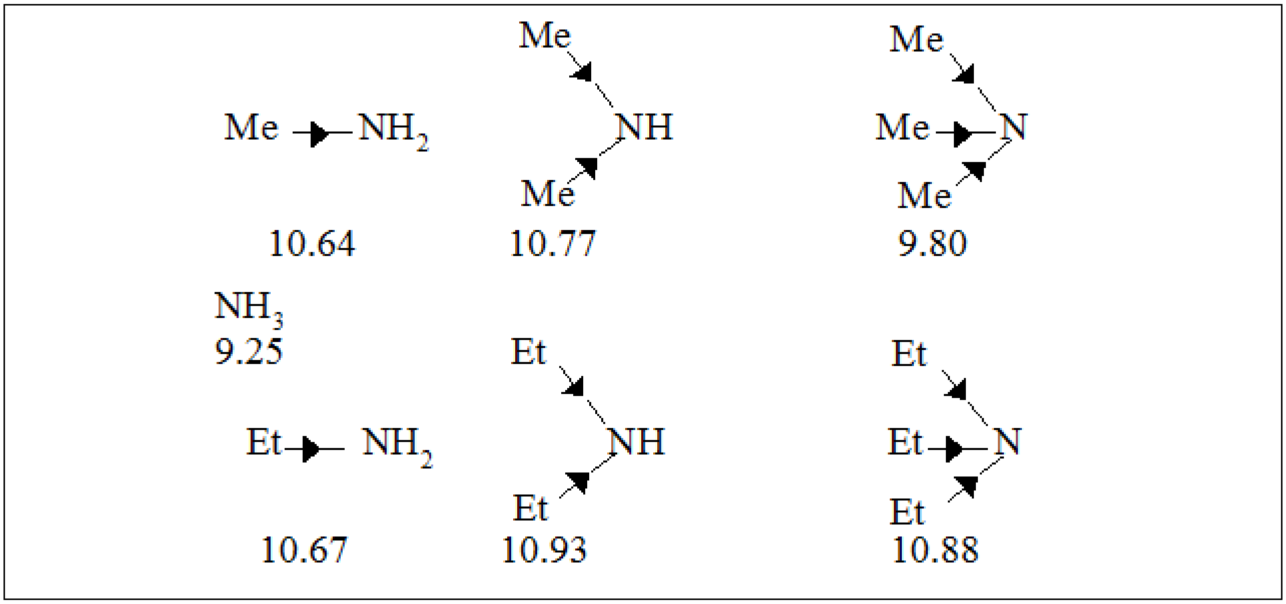
Acetylsalicylic acid (ASA) (asipirin)) is an organic compound with the formula $C_9H_8O_4$.

Uses

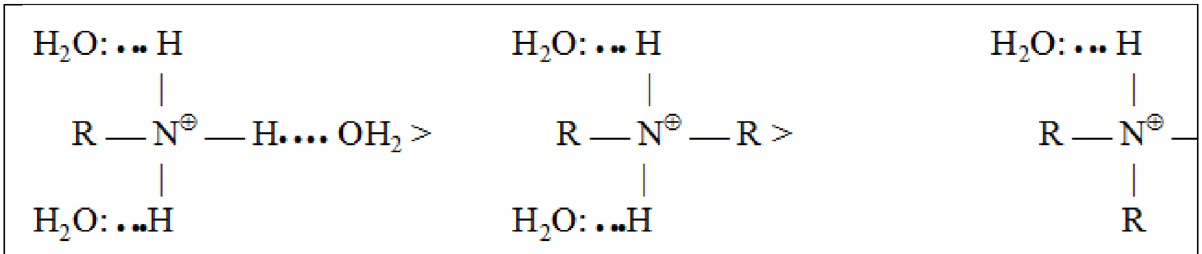
- Antiplatelet , myocardial infraction
- Analgesic
- Antipyretic, anti-inflammatory.
- Rheumatoid arthritis..

ALIPHATIC BASES(ALIPHATIC AMINE)

As increasing strength in nitrogenous bases is related to the readiness with which they are prepared to take up protons, and therefore, to the availability of the unshared electron pair on nitrogen, we might expect to see an increase in basic strength on going : NH_3 ® RNH_2 ® R_2NH® R_3N, due to the increasing inductive effect of successive alkyl groups making the nitrogen atom more negative. An actual series of amines was found to have related values as follows, however.



it will be seen that the introduction of an alkyl group into ammonia increases the basic strength markedly as expected. The introduction of a second alkyl group further increases the basic strength, but the net effect of introducing the second alkyl group is very much less marked than with the first. The introduction of a third alkyl group to yield a tertiary amine, however, actually decreases the basic strength in both the series quoted. This is due to the fact that the basic strength of an amine in water is determined not only by electron - availability on the nitrogen atom, but also by the extent to which the cation, formed by uptake of a proton, can undergo solvation, and so become stabilized. The more hydrogen atoms attached to nitrogen in the cation, the greater the possibilities of powerful solvation *via* hydrogen bonding between these and water.



Decreasing stabilisation by solvation

Thus on going along the series, NH_3 ® RNH_2 ® R_2NH ® R_3N, the inductive effect will tend to increase the basicity, but progressively less stabilisation of the cation by hydration will occur which will tend to decrease the basicity. The net replacing effect of introducing successive alkyl groups thus becomes progressively smaller, and an actual changeover takes place on going from a secondary to a tertiary amine. If this is the real explanation, no such changeover should be observed if measurements of basicity are made in a solvent in which hydrogen - bonding cannot take place; it has, indeed, been found that in chlorobenzene the order of basicity of the butylamines is

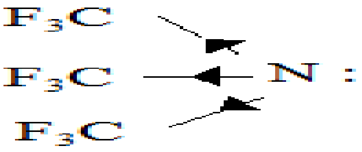
$$BuNH_2 < Bu_2NH < Bu_3N$$

Tetralkylammonium salts, e.g. $R_4N^{\text{Å}}\ I^-$, are known, on treatment with moist silver oxide, AgOH, to yield basic solution comparable in strength with the mineral alkalis. This is readily understandable for the base so obtained, $R_4N^{+}\,{}^{-}OH$, is bound to be completely ionised as there is no possibility, as with tertiary amines, etc.,

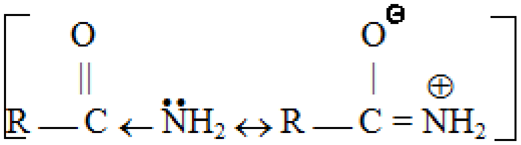
$R_3NH^{++} + {}^{-}OH \rightarrow R_3N\mathbf{:} + H_2O$

of reverting to an unionised form.

The effect of introducing electron withdrawing groups, e.g. Cl, NO_2, close to a basic center is to decrease the basicity, due to their electron withdrawing inductive effect. Thus the amine is found to be virtually non - basic, due to the three powerfully electron withdrawing CF_3 groups. This can well be explained on the basis of more ‘s’ character on lone pair of N.



The change is also pronounced with C=O, for not only is the nitrogen atom, with its electron pair, bonded to an electron withdrawing group through an sp^2 hybridised carbon atom but an electron withdrawing mesomeric effect can also operate:



$$\left[R-\overset{\overset{O}{\|}}{C}\leftarrow \ddot{N}H_2 \leftrightarrow R-\overset{\overset{O^{\ominus}}{|}}{C}=\overset{\oplus}{N}H_2 \right]$$

Thus amides are found to be only very weakly basic in water [pK_a for ethanamide(acetamide) is » 0.5], and if two C=O groups are present the resultant imides, far from being basic, are often sufficiently acidic to form alkali metal salts, e.g. benzene - 1, 2 – dicarboximide.

QUALITATIVE TEST

TEST FOR AROMATIC AMINES (PRIMARY)

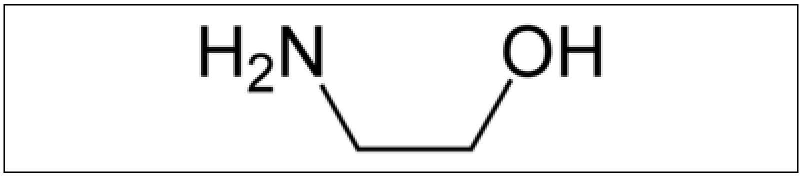
Test for aliphatic amines (primary):

To 0.3 mL or 300 mg of unknown substance in a test tube add 5 mL of 10% NaOH solution and 0.4 mL of benzenesulfonyl chloride. Close the test tube with a cork and shake the mixture vigorously. Test the solution to make sure that it is still alkaline using litmus paper.	Soluble in base.	Presence of aliphatic primary amines**.**
Cool the solution & add 10% HCl solution dropwise.	A precipitate is formed.	Presence of aliphatic primary amines**.**

Nitrous acid Test	Make a solution of about 1 g of sodium nitrite in about 5 ml distilled water in a test tube and cool it in an ice bath. In a separate test tube, dissolve a small quantity of the given compound in about 1 ml of conc. sulphuric acid and cool this also in ice bath. Mix both the solutions.	Bubbles of nitrogen gas.	Presence of primary aliphatic amine.
		Formation of a yellow oily layer.	Presence of secondary amine.
		No visible change.	Presence of tertiary amine.
Hinsberg Test	Take a small quantity of the given compound in a clean test tube, add about 2 ml of 25% NaOH, 2 ml of water and 1 ml of benzene sulphonyl chloride. Shake the mixture for about 10 minutes and then cool under tap water and note the formation of precipitate. Treat the precipitate with 2 ml of conc.HCl.	No precipitate (clear solution). On addition of conc. HCl, insoluble material is seen.	Presence of primary amine.
		Precipitate is formed in the test tube. It does not dissolve in conc. HCl.	Presence of secondary amine.
		Precipitate is formed in the test tube. It dissolves in conc. HCl.	Presence of tertiary amine.

STRUCTURE AND USES

ETHANOLAMINE



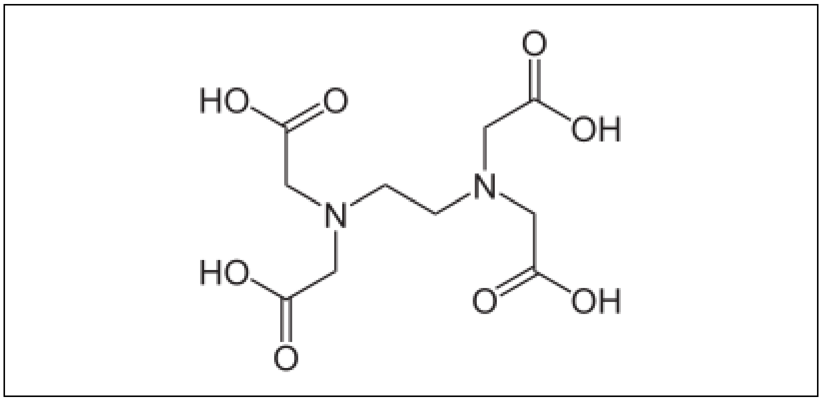
Ethanolamine (**2-aminoethanol**, **monoethanolamine**, **ETA**, or **MEA**) is an organic chemical compound with the formula $HOCH_2CH_2NH_2$. The molecule is bifunctional, containing both a primary amine and a primary alcohol. Ethanolamine is a colorless, viscous liquid with an odor reminiscent to that of ammonia. Its derivatives are widespread in nature; e.g., lipids.

The ethanolamines comprise a group of amino alcohols. A class of antihistamines is identified as ethanolamines, which includes carbinoxamine, clemastine, dimenhydrinate, diphenhydramine, and doxylamine.

USES- It is used as feedstock in the production of detergents, emulsifiers, polishes, pharmaceuticals, corrosion inhibitors, chemical intermediates.

- It is precursor of E.D.T.A.
- MEA is used primarily for buffering or preparation of emulsions.
- MEA can be used as pH regulator in cosmetics
- Ethanolamine is often used for alkalinisation of water in steam cycles of power plants, including nuclear power plants with pressurized water reactors.

EDTA), ETHYLENEDIAMINETETRAACETIC ACID



Ethylenediaminetetraacetic acid is an aminopolycarboxylic acid and a colorless, water-soluble solid. Its conjugate base is **ethylenediaminetetraacetate.** used for both industrial and medical purposes.

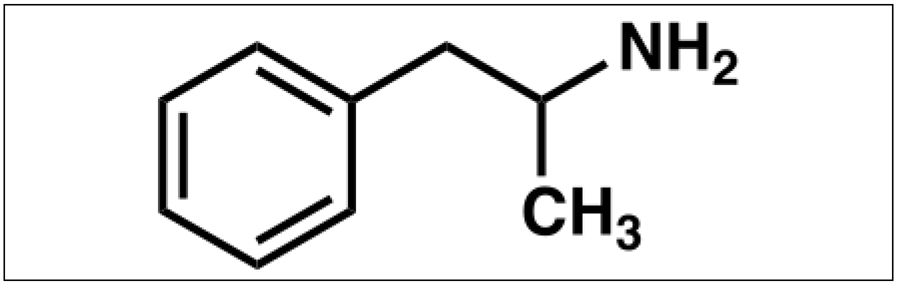
It is hexadentate ligand and chelating agent, *i.e.*, its ability to sequester metal ions such as Ca^{2+} and Fe^{3+}. After being bound by EDTA into a metal complex, metal ions remain in solution but exhibit diminished reactivity. EDTA is produced as several salts, notably **disodium EDTA** and **calcium disodium EDTA**

USES

- Treatment of cancer, rheumatoid arthritis, osteoarthritis, an eye condition called macular degeneration, diabetes, Alzheimer's disease, multiple sclerosis, Parkinson's disease, and skin conditions including scleroderma and psoriasis.
- EDTA is used in the muscle for lead poisoning and related brain damage.
- EDTA is sometimes used as an ointment for skin irritations produced by metals such as chromium, nickel, and copper.
- Eye drops containing EDTA are used to treat calcium deposits in the eye.
- In foods, EDTA bound to iron is used to “fortify” grain-based products such as breakfast cereals and cereal bars. EDTA is also used to help preserve food; and to promote the color, texture, and flavor of food.

- In manufacturing, EDTA is used to improve stability of some pharmaceutical products, detergents, liquid soaps, shampoos, agricultural chemical sprays, contact lens cleaners and cosmetics. It is also used in certain blood collection tubes used by medical laboratories.
- In shampoos, cleaners, and other personal care products, EDTA salts are used as a sequestering agent to improve their stability in air.

AMPHETAMINE



Amphetamine is a methyl homolog of the mammalian neurotransmitter phenethylamine with the chemical formula $C_9H_{13}N$. The carbon atom adjacent to the primary amine is a stereogenic center, and amphetamine is composed of a racemic 1:1 mixture of two enantiomers. This racemic mixture can be separated into its optical isomers: levoamphetamine and dextroamphetamine. At room temperature, the pure free base of amphetamine is a mobile, colourless, and volatile liquid with a characteristically strong amine odor, and acrid, burning taste. Frequently prepared solid salts of amphetamine include amphetamine aspartate, hydrochloride, phosphate, saccharate, and sulfate, the last of which is the most common amphetamine salt. Amphetamine is also the parent compound of its own structural class, which includes a number of psychoactive derivatives.

USES-

- Amphetamines are central nervous system (CNS) stimulants.
- They are used to treat ADHD and narcolepsy.
- Treat Obesity