Unit-III, IV and V

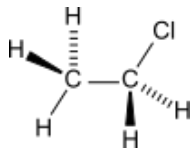
STRUCTURE AND USES OF ORGANIC COMPOUND

ETHYL CHLORIDE (Chloro ethane)

Other names:

Ethyl chloride, Monochloroethane, Chlorene, Muriatic ether and Hydrochloric ether

Structure-



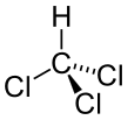
Uses:

- Chloroethane has been used as a refrigerant, an aerosol spray propellant, an anesthetic, and a blowing agent for foam packaging.
- The only remaining industrially important use of chloroethane is in treating cellulose to make ethylcellulose, a thickening agent and binder in paints, cosmetics, and similar products.
- Chloroethane is supplied as a liquid in a spray bottle propelled by its own vapor pressure.
- In dentistry, chloroethane is used as one of the means of diagnosing a 'dead tooth', i.e. one in which the pulp has died. Chloroethane's low boiling point creates a localised chilling effect.

CHLOROFORM (Trichloromethane)

Other names: Chloroform, Methane trichloride, Methyl trichloride, Methenyltrichloride, Freon 20 and Refrigerant-20

Structure:



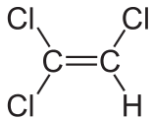
Uses:

- Chloroform is also used in pesticide formulations, as a solvent for fats, oils, rubber, alkaloids, waxes, gutta-percha, and resins, as a cleansing agent, grain fumigant, in fire extinguishers, and in the rubber industry.
- $CDCl_3$ is a common solvent used in NMR spectroscopy.
- The chloroform have anaesthetic qualities.
- As a reagent, chloroform serves as a source of the dichlorocarbene CCl_2 group.
- Chloroform is also used to extract and purify **penicillin.**

TRICHLOROETHYLENE (Trichloroethene**)**

Other names: 1,1, 2-Trichloroethene, 1,1-Dichloro-2-Chloroethylene, 1-Chloro-2,2 -Dichloroethylene, Acetylene Trichloride, Trethylene, Triclene, Trimar, Trilene.

Structure:



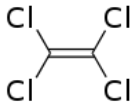
Uses:

- Trichloroethylene is a highly volatile inhalation anesthetic used mainly in short surgical procedures where light anesthesia with good analgesia is required.
- Trichloroethylene is an effective solvent for a variety of organic materials.
- When inhaled, trichloroethylene produces central nervous system depression resulting in general anesthesia.
- Trichloroethylene's major use was to extract vegetable oils from plant materials such as soy, coconut, and palm.
- Other uses in the food industry included coffee decaffeination and the preparation of flavoring extracts from spices.
- It has also been used as a dry cleaning solvent.

TETRACHLOROETHYLENE (Tetra chloroethene**)**

Other names: Perchloroethene; Perchloroethylene etc.

Structure:



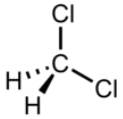
Uses:

- It is a colorless liquid widely used for dry cleaning of fabrics, hence it is sometimes called "dry cleaning fluid".
- Tetrachloroethylene is an excellent solvent for organic materials.
- It is volatile, highly stable, and nonflammable for these reasons, it is widely used in dry cleaning.
- It is also used to degrease metal parts in the automotive and other metalworking industries, usually as a mixture with other chlorocarbons.
- It appears in a few consumer products including paint strippers and spot removers.
- In the early 20th century, Tetrachloroethene was used for the treatment for hookworm infestation.

DICHLOROMETHANE

Other names: Methylene chloride, methylene dichloride, Solmethine, Narkotil, Solaesthin, Di-clo, Refrigerant-30 Freon-30.

Structure:



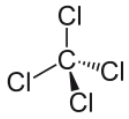
Uses:

- Methylene chloride is primarily used as a solvent in paint removers, but is also used in aerosol formulations, as a solvent in the manufacture of pharmaceuticals,
- As a degreasing agent
- In electronics manufacturing and as an ethane foam blowing agent.
- In the food industry, it has been used to decaffeinate coffee and tea as well as to prepare extracts of flavorings.
- Its volatility has led to its use as an aerosol spray propellant.
- It is also used extensively by model building hobbyists for joining plastic components together.
- It is used in the garment printing industry for removal of heat-sealed garment transfers.

TETRACHLOROMETHANE (Carbon tetrachloride)

Other names: Benziform, Benzinoform, Carbon chloride, Carbon tet, Freon-10, Refrigerant-10, Halon-104, Methane tetrachloride, Methyl tetrachloride, Perchloromethane, Tetrasol.

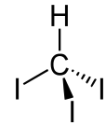
Structure



Uses:

- In organic chemistry, carbon tetrachloride serves as a source of chlorine in the Appel reaction (converts an alcohol into an alkyl chloride using triphenylphosphine and carbon tetrachloride).
- Once was a popular solvent in organic chemistry, but, because of its adverse health effects, it is rarely used today.
- It is sometimes useful as a solvent for infrared spectroscopy, because there are no significant absorption bands > 1600 cm^{-1}.
- Because carbon tetrachloride does not have any hydrogen atoms, it was historically used in proton NMR spectroscopy

IODOFORM (CHI_3)



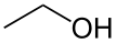
Uses

- The compound finds small-scale use as a disinfectant.
- It was also used in medicine as a healing and antiseptic dressing for wounds and sores.
- Adolf Hitler's mother, Klara Hitler, was treated with iodoform.
- It is the active ingredient in many ear powders for dogs and cats, along with zinc oxide and propionic acid, which are used to prevent infection and facilitate removal of ear hair.

ETHYL ALCOHOL

Other names: Absolute alcohol, alcohol, cologne spirit, drinking alcohol, ethylic alcohol, EtOH, ethyl alcohol, ethyl hydrate, ethyl hydroxide, ethylol, grain alcohol, hydroxyethane, methylcarbinol.

Structure:



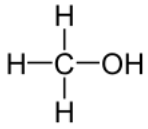
Uses:

- Ethanol is used in medical wipes and most common antibacterial hand sanitizer gels as an antiseptic.
- Ethanol kills organisms by denaturing their proteins and dissolving their lipids and is effective against most bacteria and fungi, and many viruses.
- Ethanol may be administered as an antidote to methanoland ethylene glycol poisoning.
- Liquid preparations of cough and cold remedies, pain medication, and mouth washes.
- Ethanol is present in over 700 liquid preparations of medicine including acetaminophen, iron supplements, ranitidine, furosemide, mannitol, phenobarbital, trimethoprim/sulfamethoxazole and over-the-counter cough medicine.
- As a CNS depressant, ethanol is one of the most commonly consumed psychoactive drugs.
- It can lift mood, cause feelings of euphoria, decrease anxiety.
- The largest single use of ethanol is as an engine fuel and fuel additive.
- It has widespread use as a precursor for other organic compounds such as ethyl halides, ethyl esters, diethyl ether, acetic acid, and ethyl amines.
- Ethanol is miscible with water and is a good general purpose solvent.
- It is found in paints, tinctures, markers, and personal care products such as mouthwashes, perfumes and deodorants.

METHYL ALCOHOL

Other names: Carbinol, Columbian spirits, Hydroxymethane, Methanol, Methyl hydrate, Methyl hydroxide, Methylic alcohol, Methylol, Pyroligneous spirit, Wood alcohol, Wood naphtha and Wood spirit etc.

Structure:



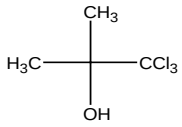
Uses:

- Methanol is used primarily for the manufacture of chemicals, and as a fuel for specialized vehicles. As mentioned above, it is a common denaturing agent.
- As a common laboratory solvent, is especially useful for HPLC, UV/VIS spectroscopy, and LCMS due to its low UV cutoff.

CHLOROBUTANOL (Acetone chloroform; chlorbutanol; chlorbutol; trichloro-tertbutanol;

Beta-trichloro-tert-butyl alcohol**)**

Structure



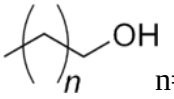
Functional Category

Antimicrobial preservative; plasticizer.

Applications in Pharmaceutical Formulation or Technology

- Chlorobutanol is primarily used in ophthalmic or parenteral dosage forms as an antimicrobial preservative at concentrations up to 0.5% w/v.
- It is commonly used as an antibacterial agent for epinephrine solutions, posterior pituitary extract solutions, and ophthalmic preparations intended for the treatment of miosis.
- Chlorobutanol is also used as a preservative in cosmetics.
- As a plasticizer for cellulose esters and ethers; and has been used therapeutically as a mild sedative and local analgesic.
- Chlorobutanol has both antibacterial and antifungal properties.

CETOSTERYL ALCOHOL



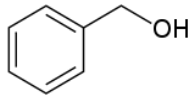
n=14-16

- **Cetostearyl alcohol**, **cetearyl alcohol** or **cetylstearyl alcohol** is a mixture of fatty alcohols, consisting predominantly of cetyl and stearyl alcohols and is classified as a fatty alcohol.

Uses-

- It is used as an emulsion stabilizer, opacifying agent, and foam boosting surfactant, as well as an aqueous and non-aqueous viscosity-increasing agent.
- It imparts an emollient feel to the skin and can be used in water-in-oil emulsions, oil-in-water emulsions, and anhydrous formulations.
- It is commonly used in hair conditioners and other hair products.

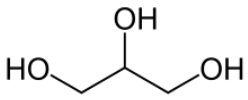
BENZYL ALCOHOL (Benzenemethanol; a-hydroxytoluene; phenylcarbinol; phenylmethanol; a-toluenol.)



Uses in Pharmaceutical Formulation or Technology

- Benzyl alcohol is an antimicrobial preservative used in cosmetics, foods, and a wide range of pharmaceutical formulations, including oral and parenteral preparations,at concentrations up to 2.0% v/v.
- In cosmetics, concentrations up to 3.0% v/v may be used as a preservative.
- Concentrations of 5% v/v or more are employed as a solubilizer, while a 10% v/v solution is used as a disinfectant.
- Benzyl alcohol 10% v/v solutions also have some local anesthetic properties, which are exploited in some parenteral, cough products, ophthalmic solutions, ointments, and dermatological aerosol sprays.
- Benzyl alcohol is used effectively for treating lice infestations as the active ingredient in lotion shampoo with 5% benzyl alcohol.
- Benzyl alcohol has been used as a dielectric solvent for the dielectrophoretic reconfiguration of nanowires

GLYCEROL (Glycerin, Propanetriol, 1, 2, 3-Trihydroxypropane, 1,2,3-Propanetriol, Sugar alcohol**)**



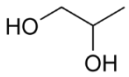
Uses:

- Glycerol is used in medical, pharmaceutical and personal care preparations, mainly as a means of improving smoothness, providing lubrication, and as a humectant.
- It is found in allergen immunotherapies, cough syrups, elixirs and expectorants, toothpaste, mouthwashes, skin care products, shaving cream, hair care products, soaps, and water-based personal lubricants.
- Glycerol is a component of glycerin soap.

- It draws moisture up through skin layers and slows or prevents excessive drying and evaporation.
- Glycerol can be used as a laxative when introduced into the rectum in suppository or small-volume (2–10 ml) (enema) form; it irritates the anal mucosa and induces a hyperosmotic effect.
- Glycerol can cause a rapid, temporary decrease in the internal pressure of the eye. This can be useful for the initial emergency treatment of severely elevated eye pressure.
- In food and beverages, glycerol serves as a humectant, solvent, and sweetener, and may help preserve foods.
- Glycerin, along with propylene glycol, is a common component of e-liquid, a solution used with electronic vaporizers (electronic cigarettes).
- Glycerol is used to produce nitroglycerin, which is an essential ingredient of various explosives such as dynamite, gelignite, and propellants.

PROPYLENE GLYCOL (Propane1,2-diol, α-Propylene glycol, 1,2-Propanediol, 1,2 Dihydroxypropane, Methyl ethyl glycol (MEG), Methylethylene glycol**)**

Structure: Propylene glycol contains an asymmetrical carbon atom, so it exists in two enantiomers. The commercial product is a racemic mixture.



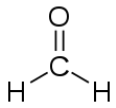
Uses:

- Propylene glycol is used as a humectant, solvent and preservative in food and for tobacco products.
- Vaporizers used for delivery of pharmaceuticals or personal-care products often include propylene glycol among the ingredients.
- Propylene glycol is used as a solvent in many pharmaceuticals, including oral, injectable and topical formulations, such as for diazepam and lorazepam which are insoluble in water.
- Certain formulations of artificial tears, such as Systane, use proplyene glycol as an ingredient.
- Propylene glycol is used in veterinary medicine as an oral treatment for hyperketonemia in ruminants.(A *ruminant* is a mammal that eats and digests plant-based food such as grass).

FORMALDEHYDE (*METHANAL*)

- **Other names:** Methyl aldehyde, Methylene glycol, Methylene oxide, Formalin (aqueous solution), Formol and Carbonyl hydride

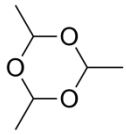
Structure:



Uses-

- An aqueous solution of formaldehyde can be useful as a disinfectant as it kills most bacteria and fungi (including their spores).
- Formaldehyde solutions are applied topically in medicine to dry the skin, such as in the treatment of warts. Many aquarists use formaldehyde as a treatment for the parasites *Ichthyophthirius multifiliis* and *Cryptocaryon irritans*.
- Formaldehyde is used to inactivate bacterial products for toxoid vaccines (vaccines that use an inactive bacterial toxin to produce immunity).
- It is also used to kill unwanted viruses and bacteria that might contaminate the vaccine during production.
- Urinary tract infections are also often treated using a derivative of formaldehyde (methenamine),
- Formaldehyde is also approved for use in the manufacture of animal feeds in the US.
- It is an antimicrobial agent used to maintain complete animal feeds or feed ingredients Salmonella negative for up to 21 days.

Paraldehyde (2,4,6-Trimethyl-1,3,5-trioxane**)**

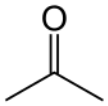


- It is a central nervous system depressant and was soon found to be an effective anticonvulsant, hypnotic and sedative.
- It was included in some cough medicines as an expectorant (though there is no known mechanism for this function beyond the placebo effect).

- It was commonly used to induce sleep in sufferers from delirium tremens but has been replaced by other drugs in this regard.
- Paraldehyde is used to treat certain convulsive disorders.
- It also has been used in the treatment of alcoholism and in the treatment of nervous and mental conditions to calm or relax patients who are nervous or tense and to produce sleep.
- Paraldehyde has generally been replaced by safer and more effective medicines for the treatment of alcoholism and in the treatment of nervous and mental conditions.

ACETONE (Propan-2-one**)**

Structure:



- **Other names** (Acetone Dimethyl Ketone, Dimethyl carbonyl, β-Ketopropane, Propanone, 2-Propanone, Dimethyl formaldehyde, Pyroacetic spirit and Ketone propane).

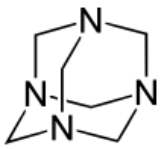
Uses:

- Acetone is used as a solvent by the pharmaceutical industry and as a denaturant in denatured alcohol.Acetone is also present as an excipient in some pharmaceutical drugs.
- Acetone is used in a variety of general medical and cosmetic applications and is also listed as a component in food additives and food packaging and also in nail polish remover.
- Dermatologists use acetone with alcohol for acne treatments to peel dry skin.
- Acetone, Septisol, or a combination of these agents is commonly used in defatting.
- Acetone is often the primary component in cleaning agents such as nail polish remover. Acetone is a component of superglue remover and easily removes residues from glass and porcelain.
- In the laboratory, acetone is used as a polar, aprotic solvent in a variety of organic reactions, such as S_N2 reactions.
- Despite its common use as a supposed drying agent, it is not effective except by bulk displacement and dilution.
- Acetone is fluorescent under ultraviolet light, and its vapor can be used as a fluorescent tracer in fluid flow experiments.

HEXAMINE (1, 3, 5, 7-Tetraazatricyclo decane**)**

Other names: Hexamethyleneteteramine; Methenamine; Urotropine; 1, 3, 5, 7- tetraazaadamantane, Formin, Aminoform.

Structure:



Uses:

- This drug is particularly suitable for long-term prophylactic treatment of urinary tract infection, because bacteria do not develop resistance to formaldehyde.
- It should not be used in the presence of renal insufficiency.
- Methenamine in the form of cream and spray is successfully used for treatment of excessive sweating and concomitant odour.
- Hexamethylene tetramine or hexamine is also used as a food additive as a preservative.
- It is used in the Duff reaction (formylation of arenes), the Sommelet reaction (converting benzyl halides to aldehydes),and in the Delepine reaction (synthesis of amines from alkyl halides).

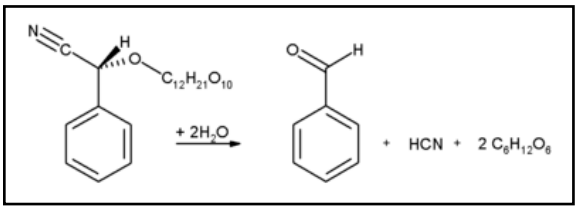
BENZALDEHYDE

Other names:Benzenecarboxaldehyde, Phenylmethanal and Benzoic aldehyde.

- Benzaldehyde (C_6H_5CHO) is an organic compound consisting of a benzene ring with a formyl substituent.
- It is the simplest aromatic aldehyde and one of the most industrially useful.
- It is a colorless liquid with a characteristic almond-like odor.
- Benzaldehyde is the primary component of bitter almond oil and can be extracted from a number of other natural sources.

Uses

- Benzaldehyde and similar chemicals occur naturally in many foods. Most of the Benzaldehyde that people eat is from natural plant foods, such as almonds.
- Almonds, apricots, apples and cherry kernels contain significant amounts of amygdalin.
- This glycoside breaks up under enzyme catalysis into Benzaldehyde, hydrogen cyanide and two molecules of glucose.

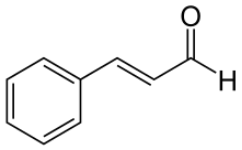


- Benzaldehyde is commonly employed to confer almond flavor to foods and scented products. It is sometimes used in cosmetics products.

CINNAMALDEHYDE (3-PHENYLPROP-2-ENAL)

Other names: Cinnamaldehyde, Cinnamic aldehyde, *trans*-Cinnamaldehyde

Structure:



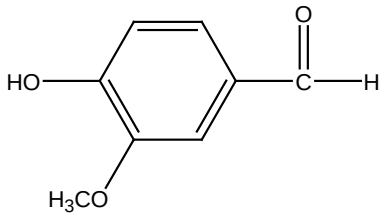
Uses:

- Cinnamaldehyde is also used as a fungicide.
- Its scent is also known to repel animals, such as cats and dogs.
- It has been tested as a safe and effective insecticide against mosquito larvae.
- Trans-Cinnamaldehyde works as a potent fumigant and practical repellant for adult mosquitoes.
- Cinnamaldehyde also has antimicrobial properties.

VANILIN

(4-Hydroxy-m-anisaldehyde; p-hydroxy-m-methoxybenzaldehyde; 3-methoxy-4-hydroxybenzaldehyde; methylprotocatechuic aldehyde; Rhovanil; vanillic aldehyde.)

Structure



Functional Category: Flavoring agent.

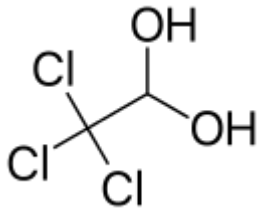
Uses in Pharmaceutical Formulation or Technology

- Vanillin is widely used as a flavor in pharmaceuticals, foods, beverages, and confectionery products, to which it imparts a characteristic taste and odor of natural vanilla.
- It is also used in perfumes, as an analytical reagent and as an intermediate in the synthesis of a number of pharmaceuticals, particularly methyldopa.
- Additionally, it has been investigated as a potential therapeutic agent in sickle cell anemia and is claimed to have some antifungal properties.
- In food applications, vanillin has been investigated as a preservative.

- As a pharmaceutical excipient, vanillin is used in tablets, solutions (0.01–0.02% w/v), syrups, and powders to mask the unpleasant taste and odor characteristics of certain formulations, such as caffeine tablets and polythiazide tablets.
- It is similarly used in film coatings to mask the taste and odor of vitamin tablets.
- Vanillin has also been investigated as a photostabilizer in furosemide 1% w/v injection, haloperidol 0.5% w/v injection, and thiothixene 0.2% w/v injection.
- The WHO has allocated an estimated acceptable daily intake for vanillin of up to 10 mg/kg body-weight.

CHLORAL HYDRATE

Structure:



Uses:

- Chloral Hydrate is a synthetic monohydrate of chloral with sedative, hypnotic, and anticonvulsive properties.
- Chloral hydrate is converted to the active compound trichloroethanol by hepatic alcohol dehydrogenase.
- The agent interacts with various neurotransmitter-operated ion channels, thereby enhancing gamma-aminobutyric acid (GABA)-A receptor mediated chloride currents and inhibiting amino acid receptor-activated ion currents.
- In addition, chloral hydrate enhances the agonistic effects of glycine receptors, inhibits AMPA-induced calcium influx in cortical neurons, and facilitates 5-HT3 receptor-mediated currents in ganglionic neurons. Overall, this results in a depressive effect on the central nervous system.
- Chloral hydrate is a mild hypnotic that is used to treat simple insomnia.
- Despite many years of use, chloral hydrate has not been implicated in causing serum enzyme elevations or clinically apparent liver injury.

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.

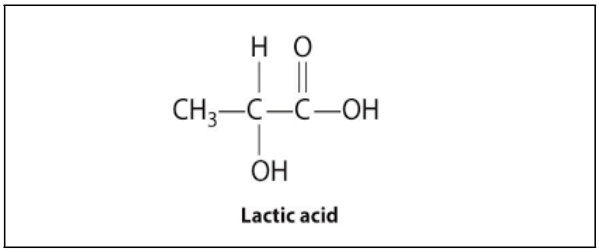
- Medical use- anticancer and antiseptic.
- Foods- vinegar
- Vinyl acetate monomer

Ester production

- Acetic anhydride
- Sodium acetate, used in the textile industry and a food preservative
- 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

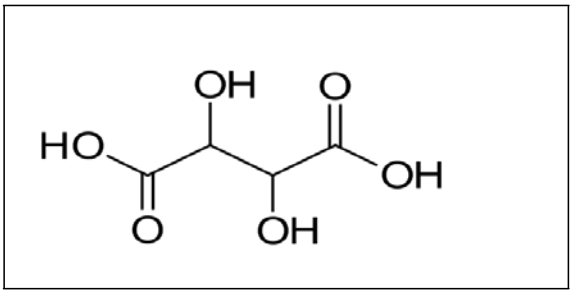


Lactic acid

Lactic acid is an organic compound with the formula CH3CH(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



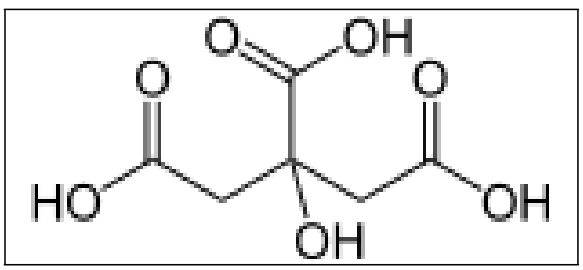
Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Its salt, potassium bitartrate, commonly known as cream of tartar, develops naturally in the process of winemaking. It is commonly mixed with sodium 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_3 $CH_2CH_2CH_2$-).

CITRIC ACID

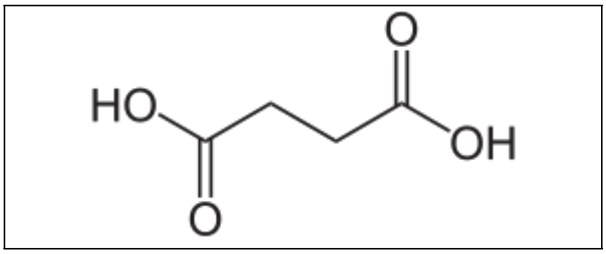


Citric acid is a weak organic acid that has the chemical formula $C_6H_8O_7$. It occurs naturally in citrus fruits. In biochemistry, it is an intermediate in the citric acid cycle, which occurs in the metabolism of all aerobic organisms. It is used widely as an acidifier, as a flavoring and chelating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

US
E-

- 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.

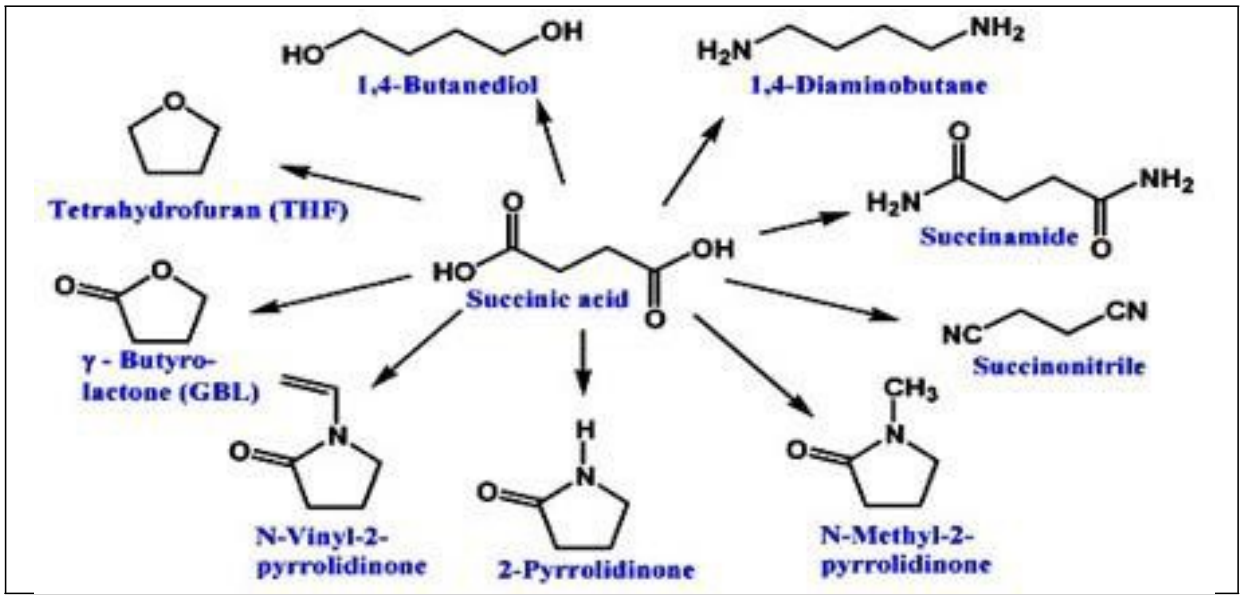
SUCCINIC ACID



- **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.



OXALIC ACID

[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.CLEANIN G

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.

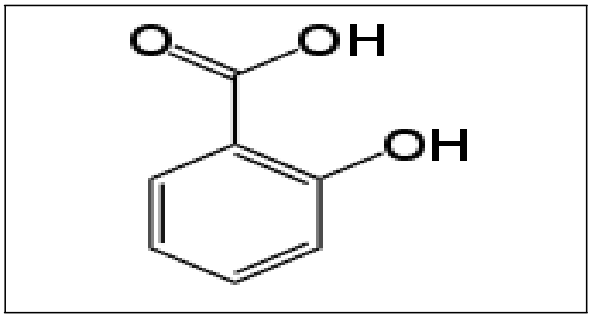
3. REMOVING RUSTS

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

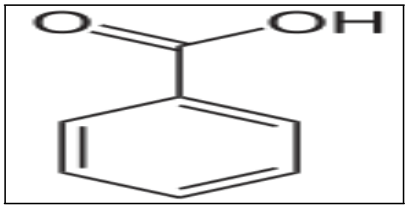
Aside from bleaching, rust removing, and stain removing, oxalic acid is also used as a reducing agent in developing photographic film. You can also find it used in wastewater treatment as well since oxalic acid can effectively remove calcium from wastewater. And lastly, oxalic acid is also used as a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

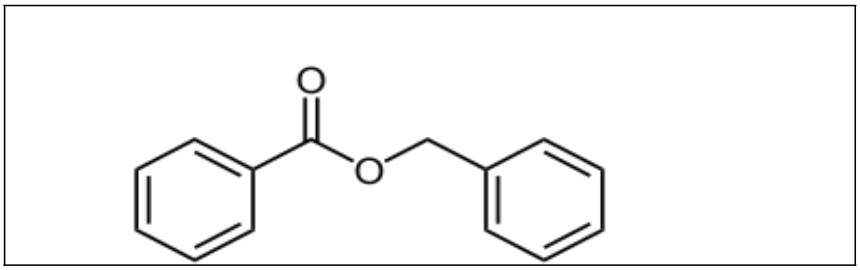


Benzoic acid $C_7H_6O_2$ (C_6H_5COOH), is a colourless crystalline solid and a simple aromatic carboxylic acid. The name is derived from gum benzoin, which was for a long time its only known source. Benzoic acid occurs naturally in many plants. and serves as an intermediate in the biosynthesis of many 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, sweet-balsamic odour.
- It occurs in a number of blossoms (e. g. tuberose, hyacinth) and is a component of Balsam of Peru and Tolu balsam.

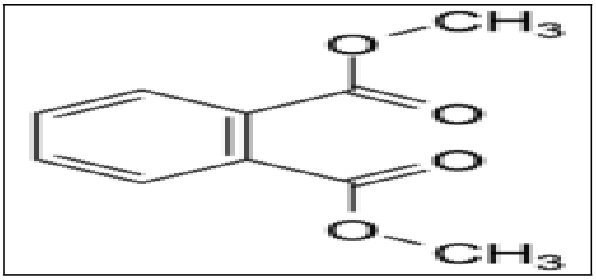
USES. MEDICAL

- 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

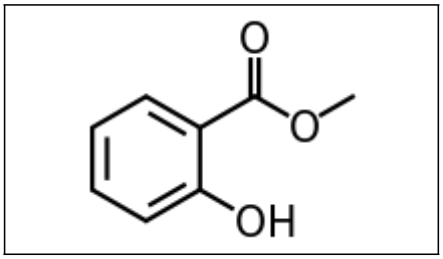


Dimethyl phthalate is an organic compound with molecular formula $(C_2H_3O_2)_2C_6H_4$. The methyl ester of phthalic acid, it is a colourless liquid that is soluble in organic solvents.

USE-

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

METHYL SALICYLATE



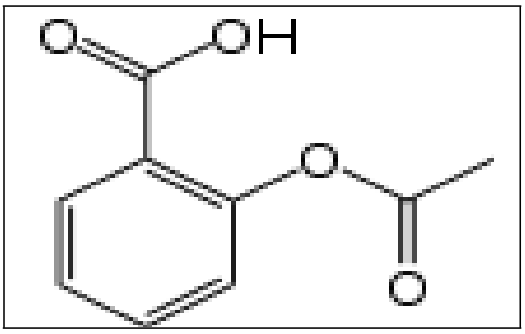
Methyl salicylate (**oil of wintergreen** or **wintergreen oil**) is an organic compound with the formula $C_6H_4(OH)(CO_2CH_3)$. It is also synthetically produced, used as a fragrance, in foods and beverages, and in liniment.

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)

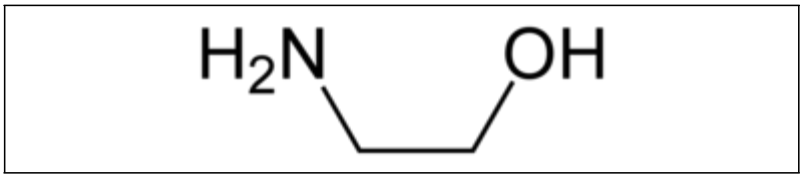


- Acetylsalicylic acid (ASA) (asipirin)) is an organic compound with the formula $C_9H_8O_4$.

Uses

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

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.

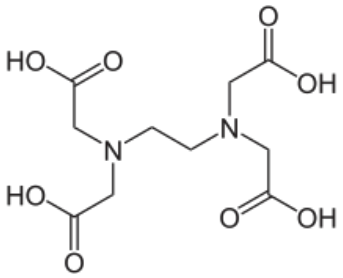
USES-

- 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**

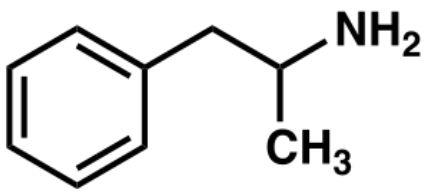
USES

- 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.
- 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