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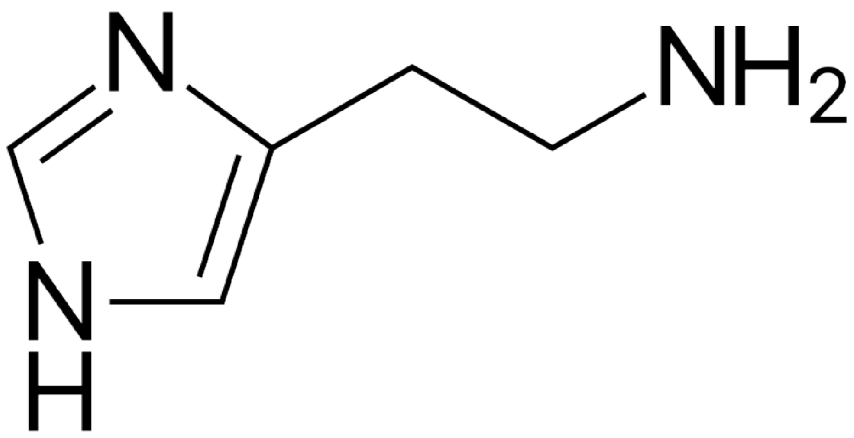
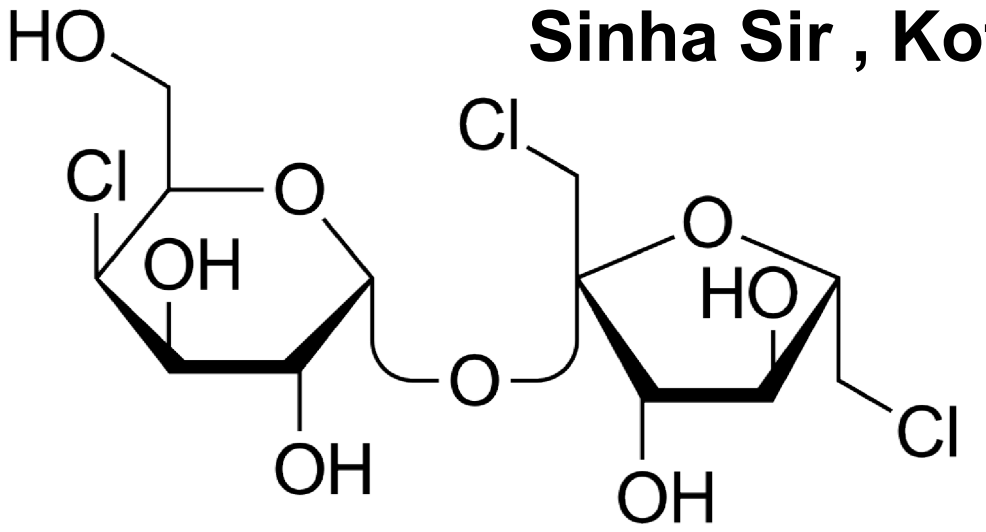
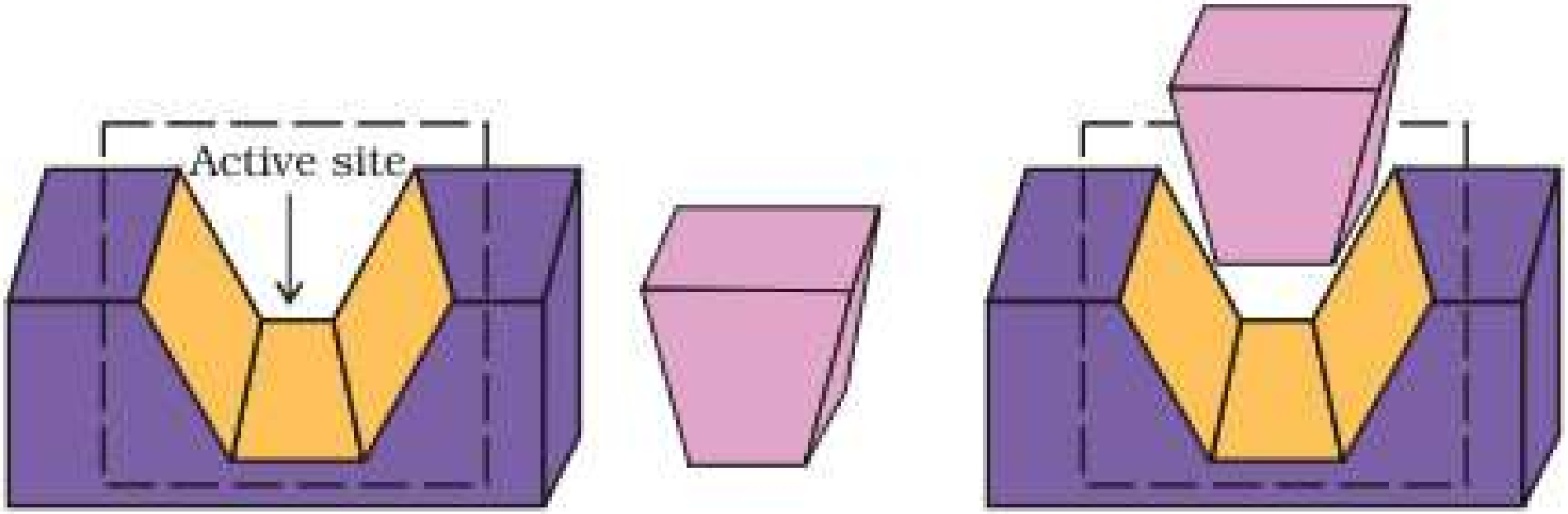




Chemistry in Everyday life



How do enzymes catalyse the reaction

1. Biological processes are **enzyme catalyzed reactions**. Enzymes increases/alter the rate of biological reactions.
2. Carrier proteins carry polar molecules across the cell membrane.

2. Proteins which perform the role of biological catalysts in the body are called enzymes.

3. Proteins ,which are crucial to communication system in the body are called receptors

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How do enzymes catalyse the reaction

1. How do Enzymes catalyse the reaction?
Enzymes perform two major functions:

(i) Role 1: To hold the **substrate** for a chemical reaction. **Active sites** of enzymes hold the substrate molecule in a suitable position, so that it can be attacked by the reagent effectively.

Substrates bind to the active site of the enzyme through a variety of interactions such as ionic bonding, hydrogen bonding, van der Waals interaction or dipole-dipole interaction.

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How do enzymes catalyse the reaction

1. How do enzymes catalyse the reaction?
Enzymes perform two major functions:

(ii) Role 2: to provide functional groups that will attack the substrate and carry out chemical reaction.

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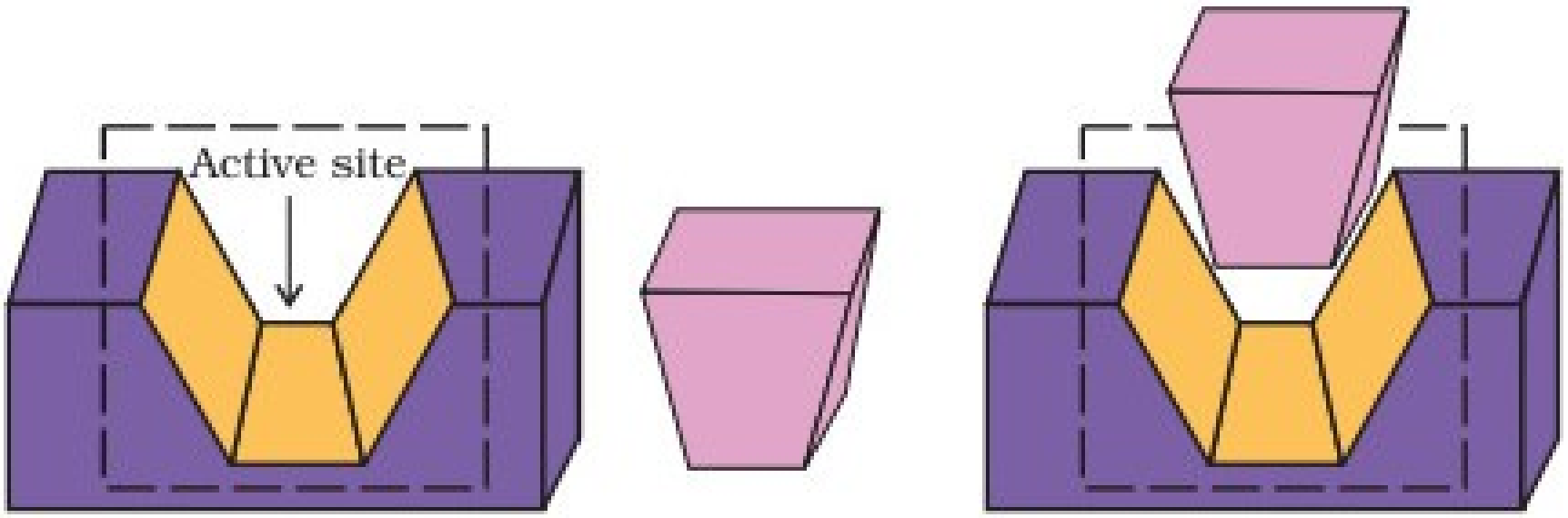
How do enzymes catalyse the reaction

Lock & Key Model



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What the drugs do?

Drugs inhibit any of the above mentioned activities of enzymes.

These can block **the binding site of the enzyme** and prevent the binding of substrate, or can **inhibit the catalytic activity** of the enzyme.

Such drugs are called **enzyme inhibitors.**

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The receptors are highly specialized macromolecules present in tissues that combine chemically with drug. Many biological Receptors are macromolecules , composed of proteins, nucleic acids, lipids, etc.

Action of drugs take place in three steps.

a)Enzyme as drug target

b)Action of drugs

c)Receptor act as drug targets

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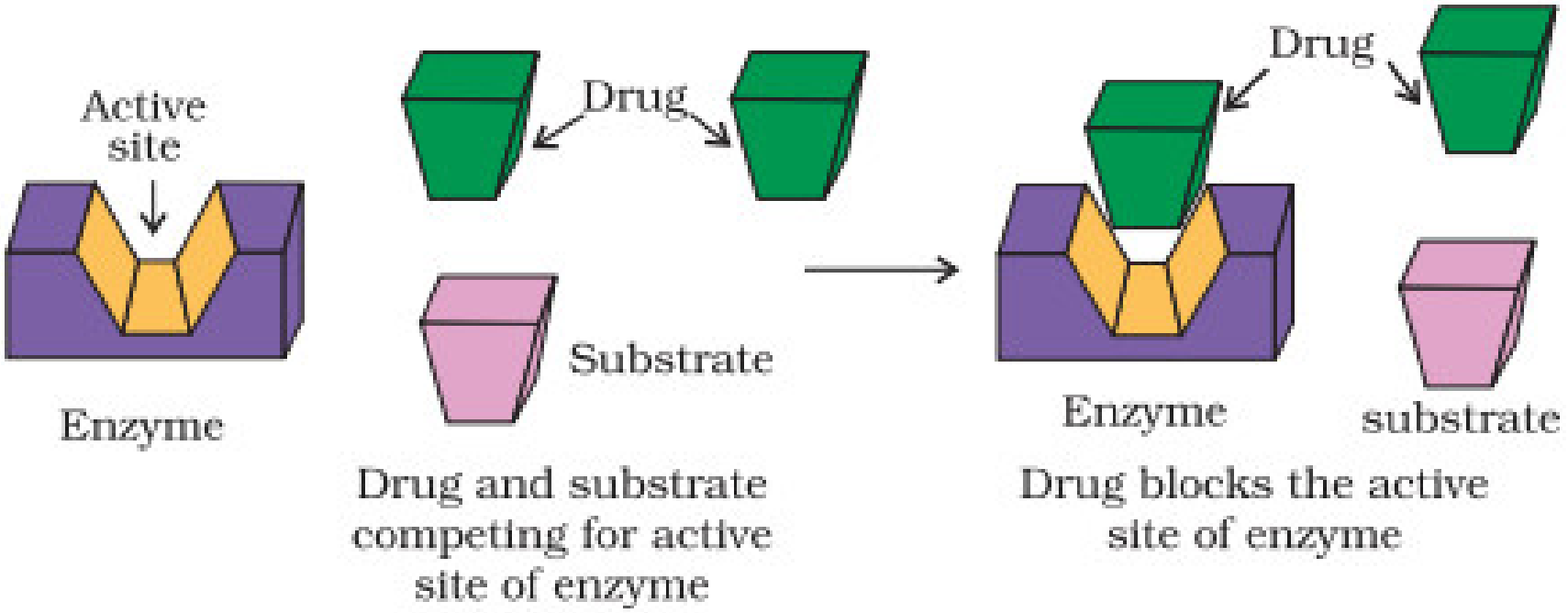
Action of drugs on target

Drugs inhibit the attachment of substrate on active site of enzymes in two different ways;

(i) Drugs compete with the natural substrate for their attachment on the active sites of enzymes. Such drugs are called **competitive inhibitors**

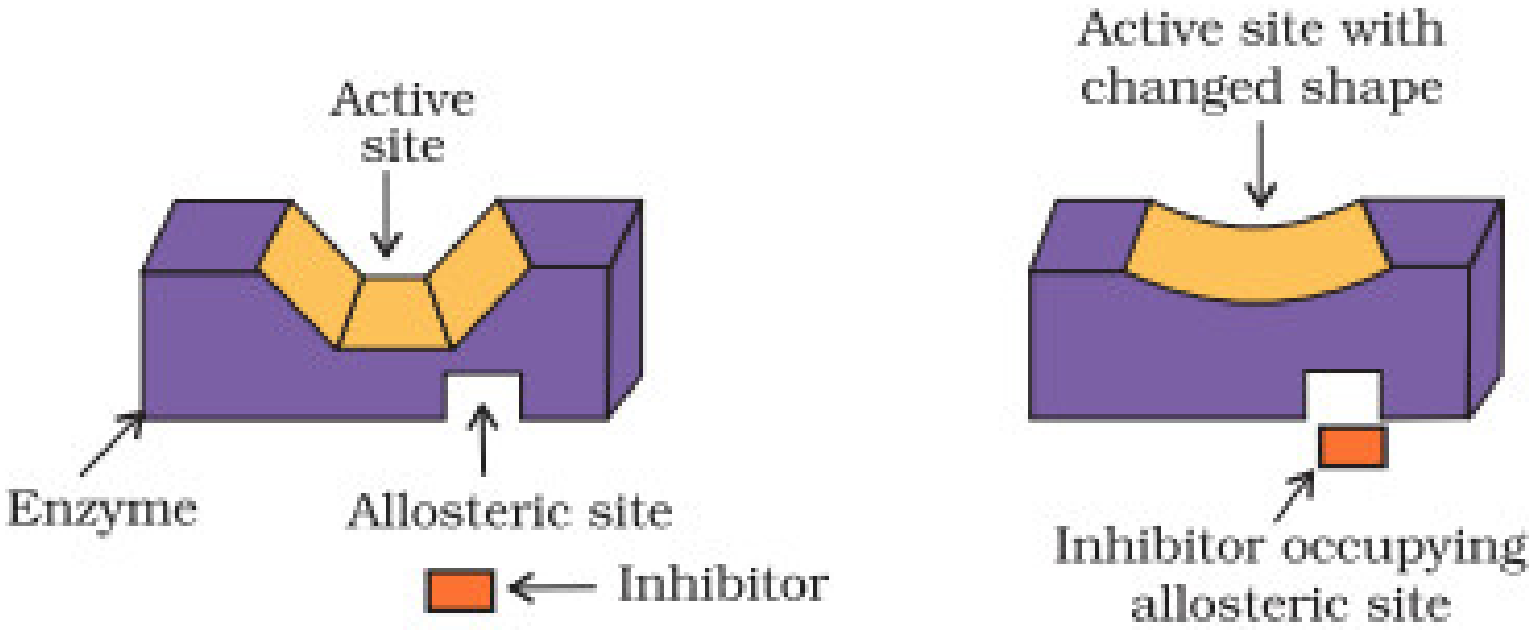


ta

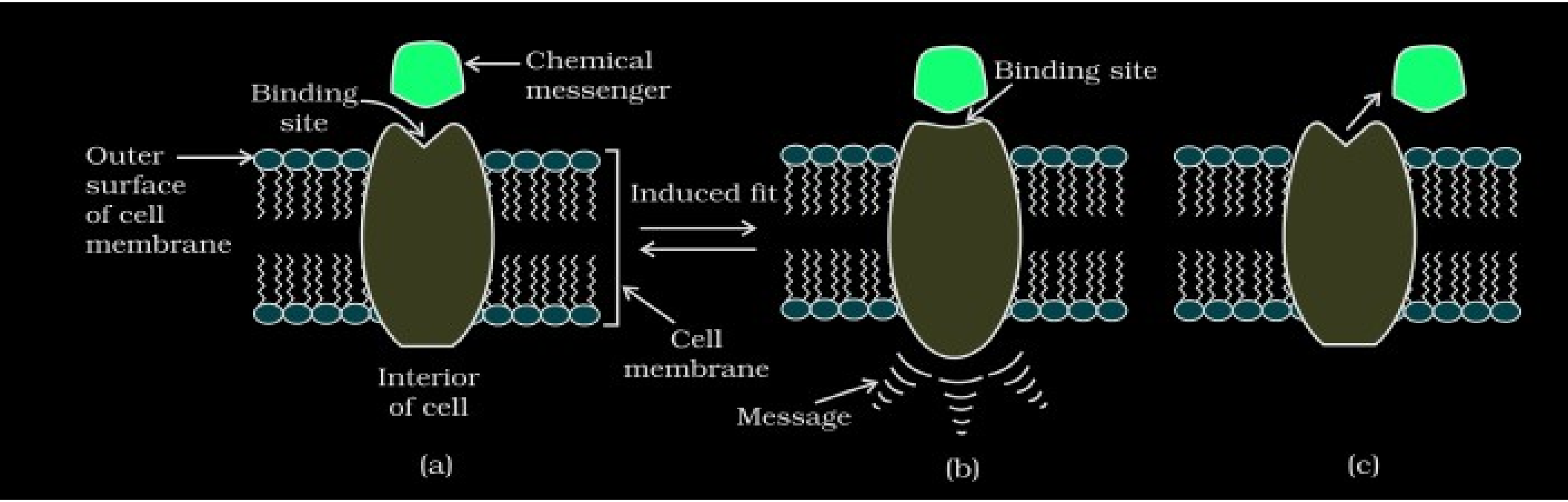
Action of drugs on target

Some drugs do not bind to the enzyme's active site.

These bind to a different site of enzyme which is called **allosteric site**. This binding of inhibitor at allosteric site changes the shape of the active site in such a way that substrate cannot recognise it.



c)Receptors as drugs target : Receptors are proteins that are crucial to body's communication process. Majority of these are embedded in cell membranes. Receptor proteins are embedded in the cell membrane in such a way that their small part possessing active site projects out of the surface of the membrane and opens on the outside region of the cell membrane



In the body, message between two neurons and that between neurons to muscles is communicated through certain chemicals. These chemicals, known as chemical messengers are received at the binding sites of receptor proteins. To accommodate a messenger, shape of the receptor site changes. This brings about the transfer of message into the cell. Thus, chemical messenger gives message to the cell without entering the cell

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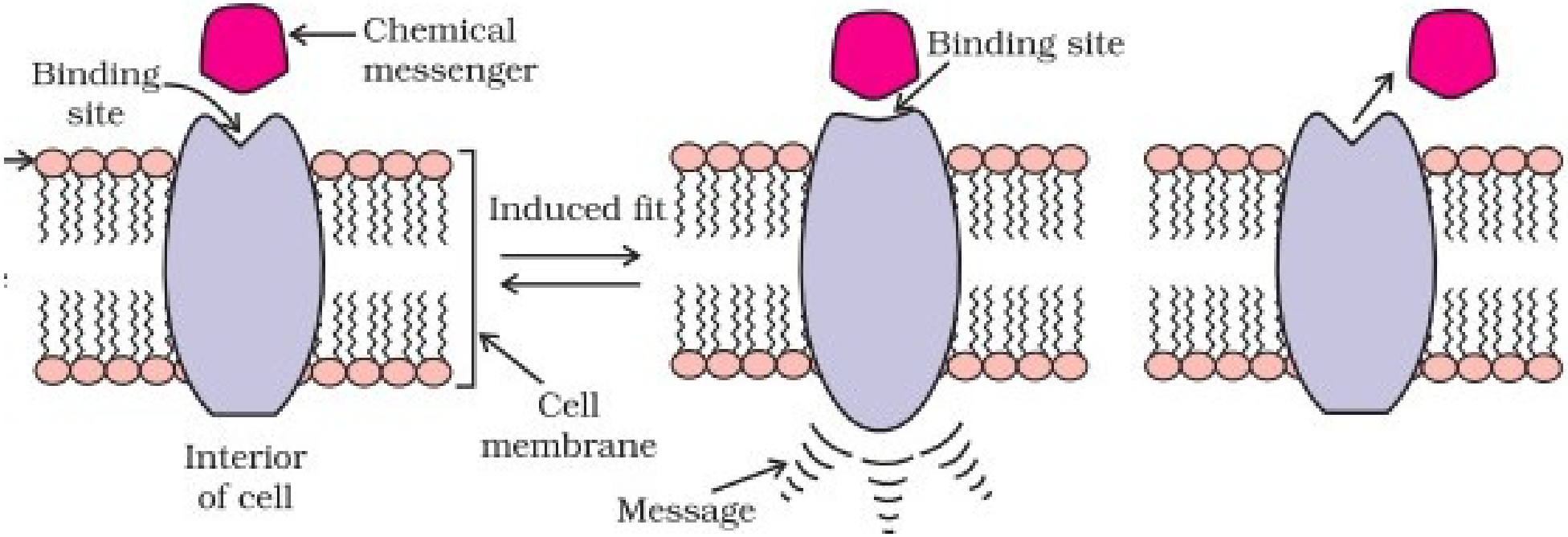

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Most receptors are selective towards chemical messengers.

Antagonists Drugs : Drugs that bind receptor and disturb their functions are called as antagonists

while

Agonists Drugs : that activate receptors are called as agonists.

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Chemicals in medicines

A) Analgesics
B) Tranquilizers
C) Antimicrobials
D) Antifertility drugs
E) Antacids and antihistamine

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Antacids

a)Antacids: It neutralize excess of acid in the stomach. During digestion of food stomach secretes HCl. Sometimes hyperacidity occur due to excessive secretion of HCl.

Sodium bicarbonate (Eno) and **metal hydroxide of magnesium and aluminum** (Digene) are used as antacids which neutralize excess of acid.

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Treatment of hyperacidity: histamine, stimulates the secretion of pepsin and hydrochloric acid in the stomach. The drug cimetidine (Tegamet), was designed to prevent the interaction of histamine with the receptors present in the stomach wall.

Ranitidine, cimetidine prevent the interaction between histamine and receptor in stomach wall ,and hence release less amount of acid. Anti-Histamine

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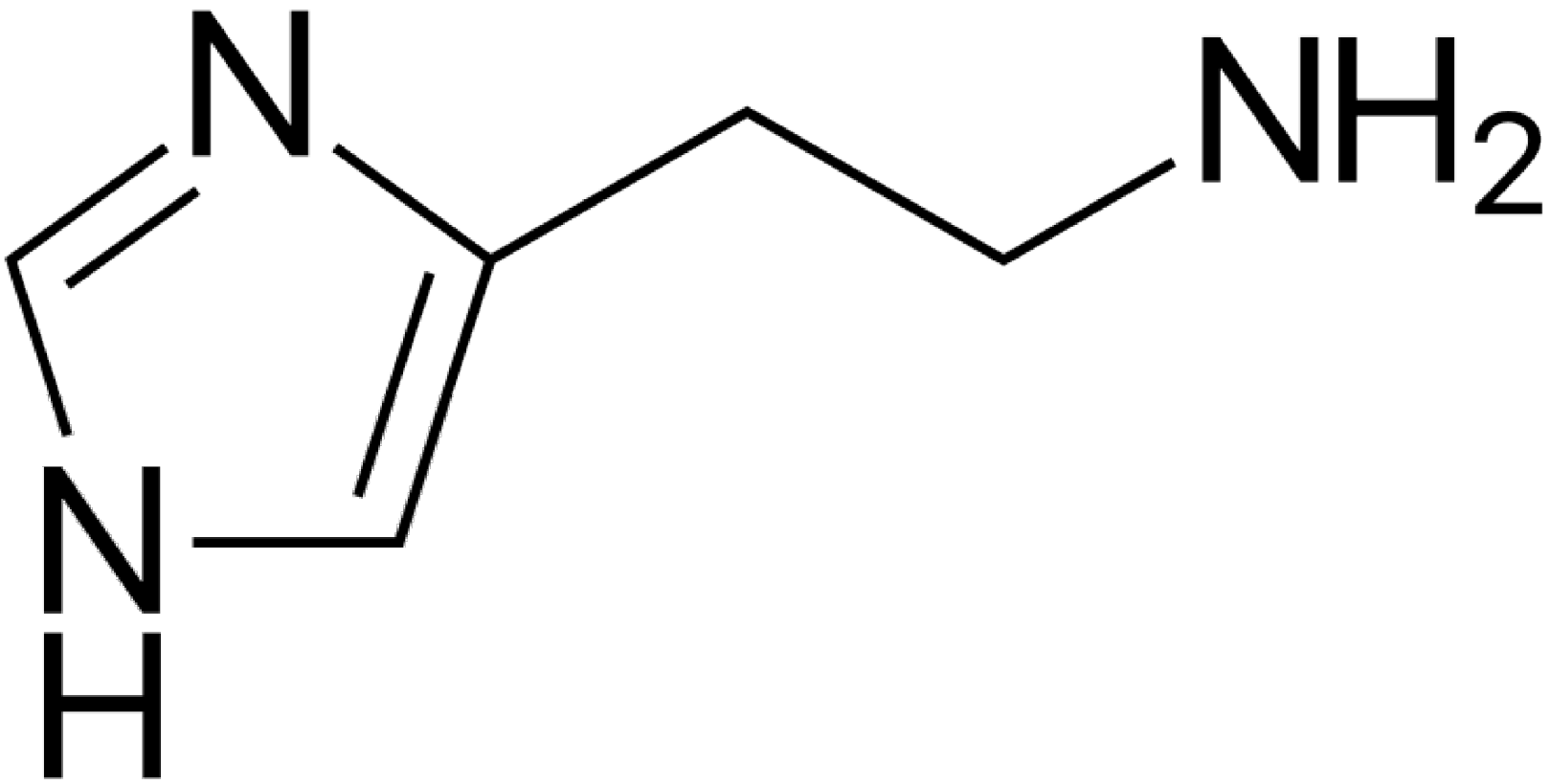
Histamine



Imidazole + ethyl +amine

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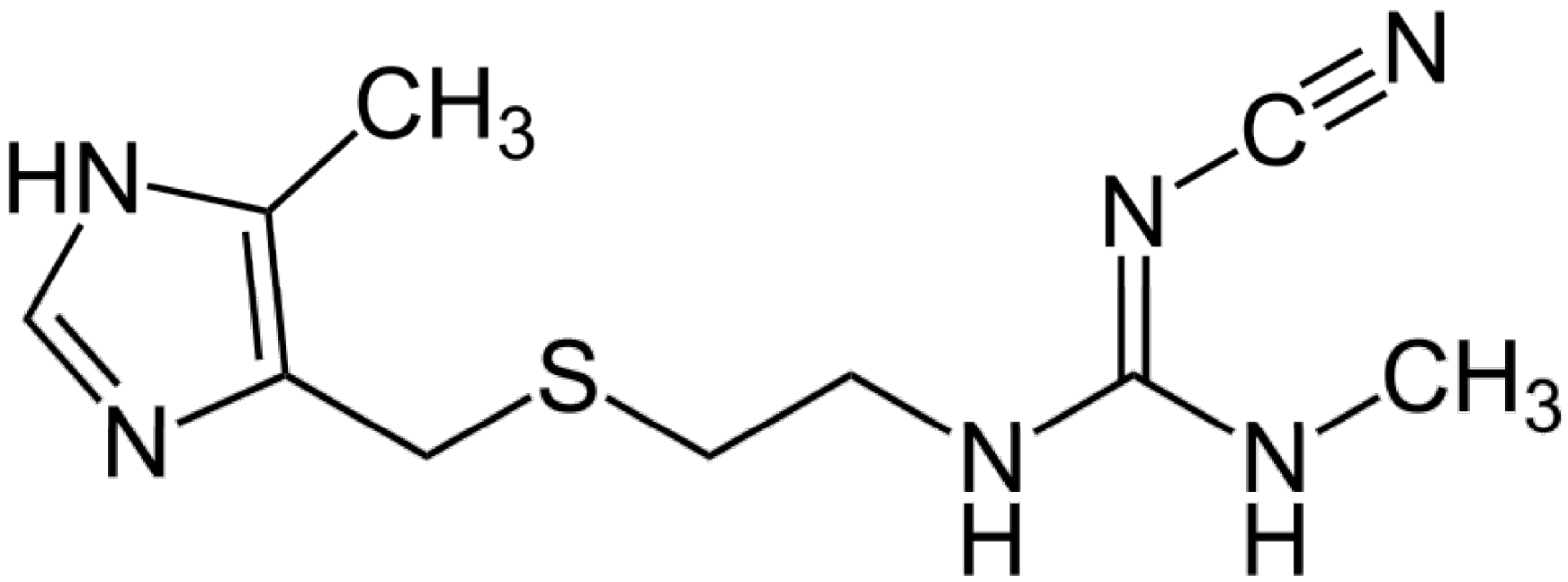
Cimetidine



Imidazole
Guanadine
Cyanide Sulphide

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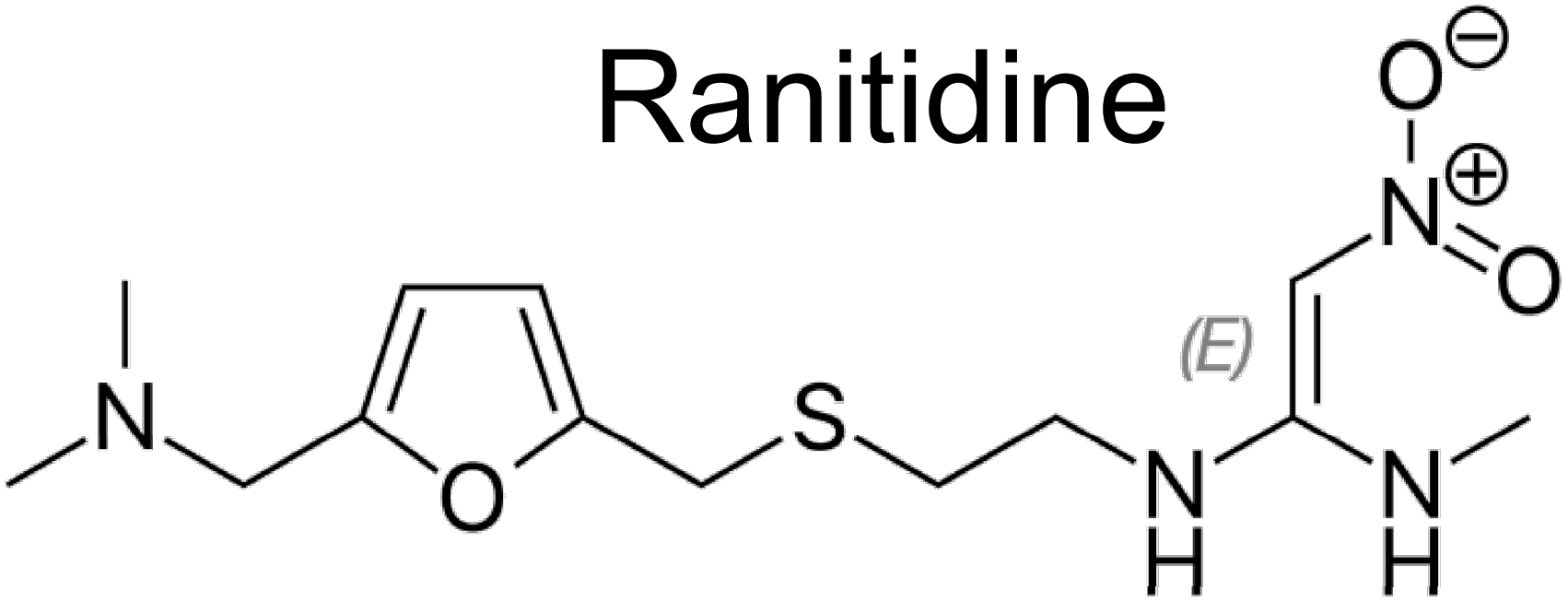
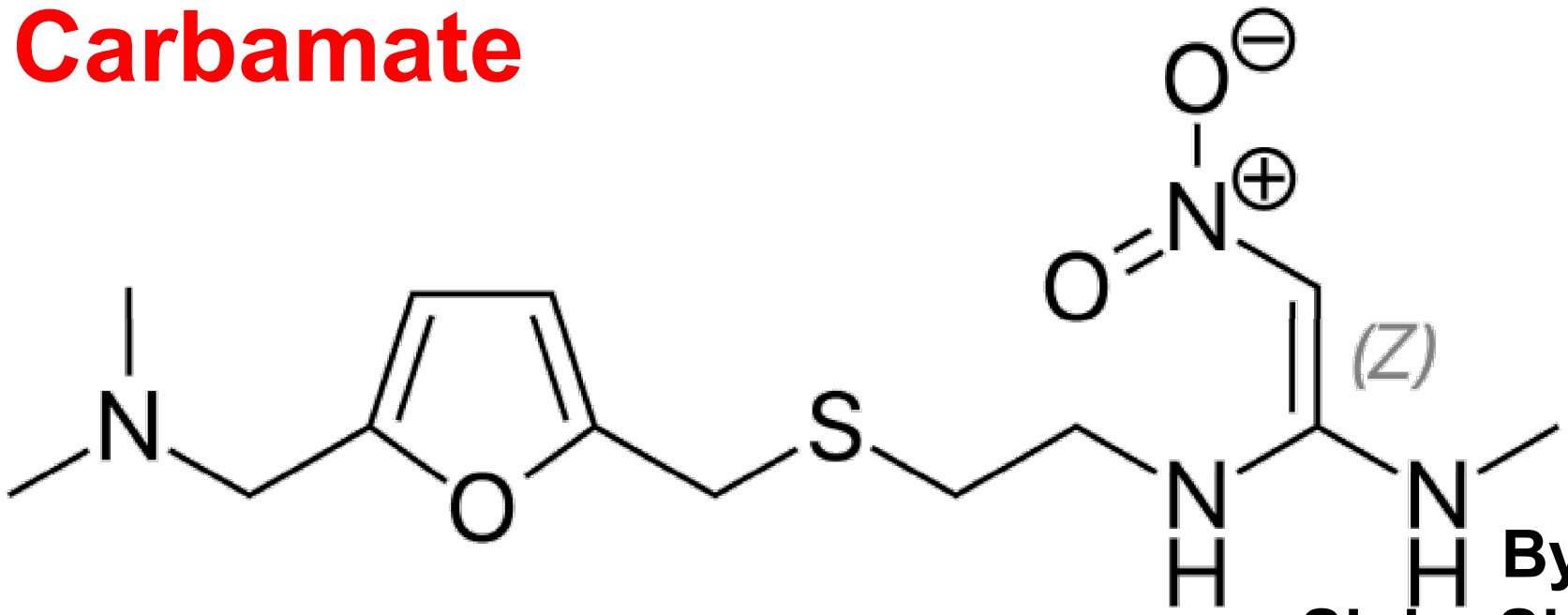
Ranitidine



Carbamate



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Anti Allergic :

Brompheniramine (Dimetapp) and terfenadine (Seldane), act as antihistamines. They are antiallergic and work on different receptors.

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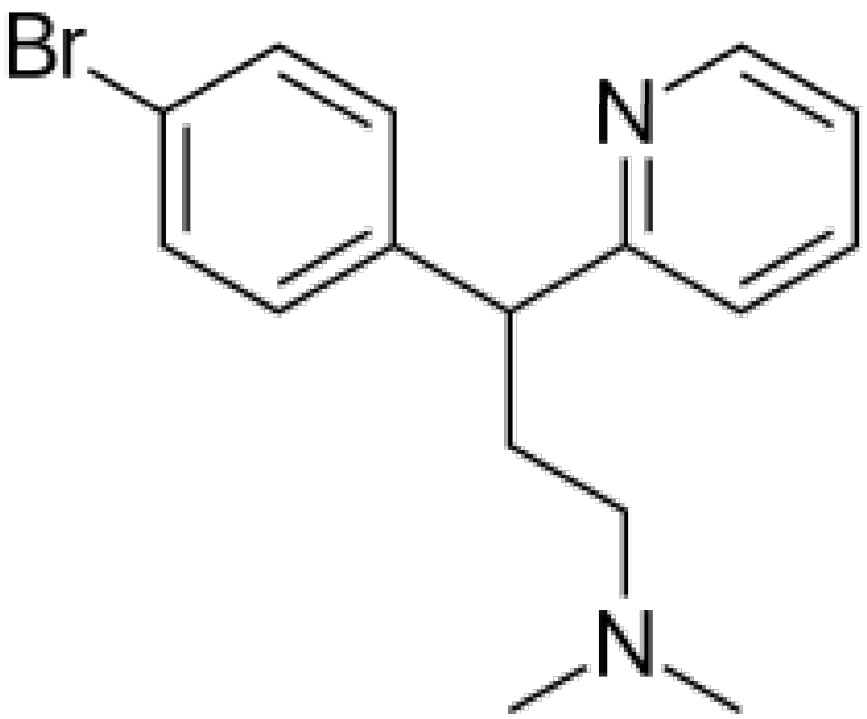
Anti Allergic : Brompheniramine



Bromo Phenyl Pyridine amine

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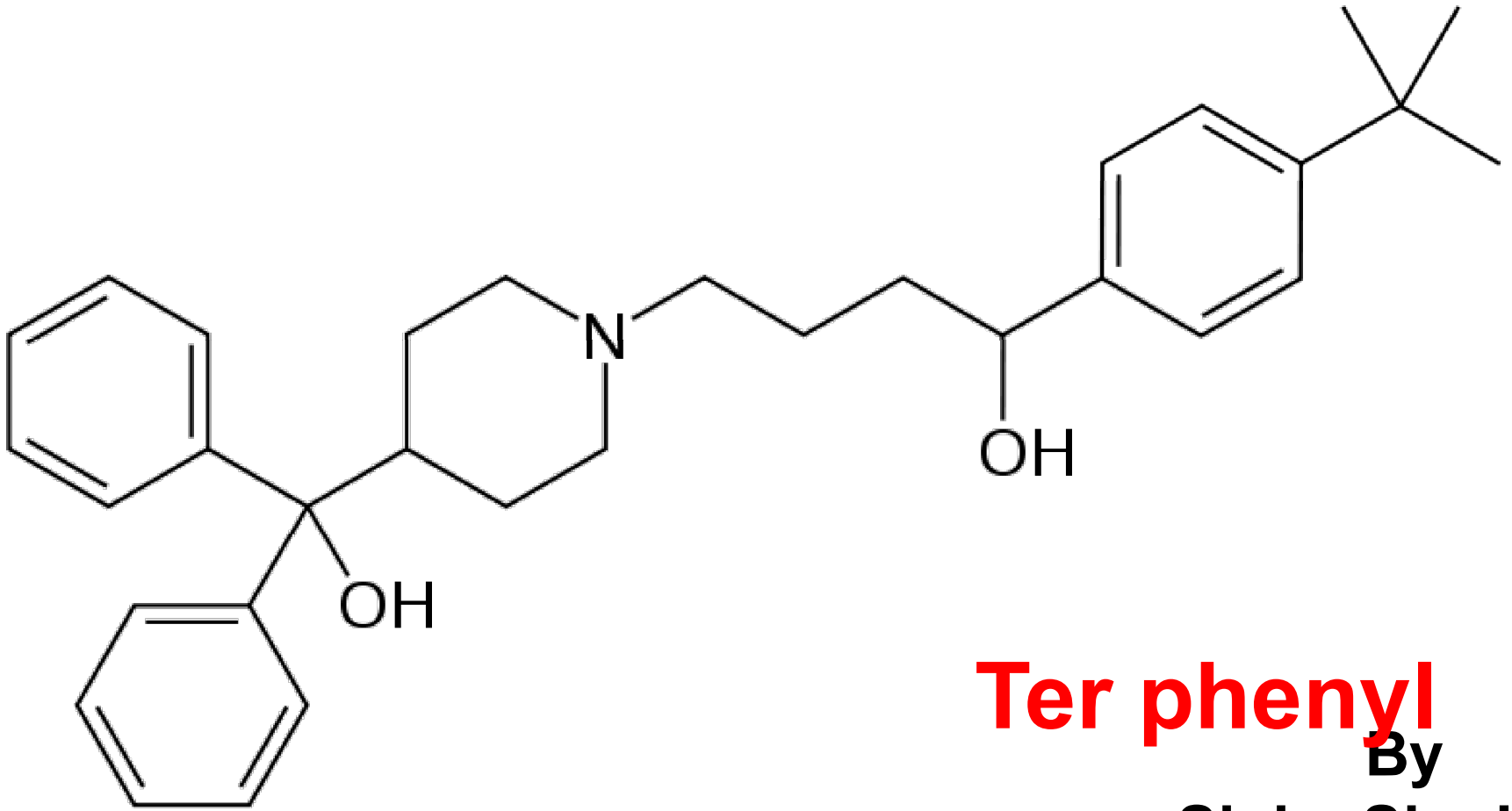
Anti Allergic : Terfenadine

Terfenadine (Seldane), act as antihistamines. They are antiallergic and work on different receptors.



Ter phenyl

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Tranquilizers Mild
treatment of stress &mental diseases.
relieve anxiety, stress,
component of sleeping pills.
1. Iproniazid and phenelzine are mild

2. Chlordiazepoxide, meprobamate, are relatively mild tranquilizers suitable for relieving tension.

3. Equanil is used in controlling depression and hypertension.

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Derivatives of barbituric acid : **veronal, amytal, nembutal, luminal are hypnotic,** i.e., sleep producing agents.

Some other substances used as tranquilizers are **valium** and **serotonin.**

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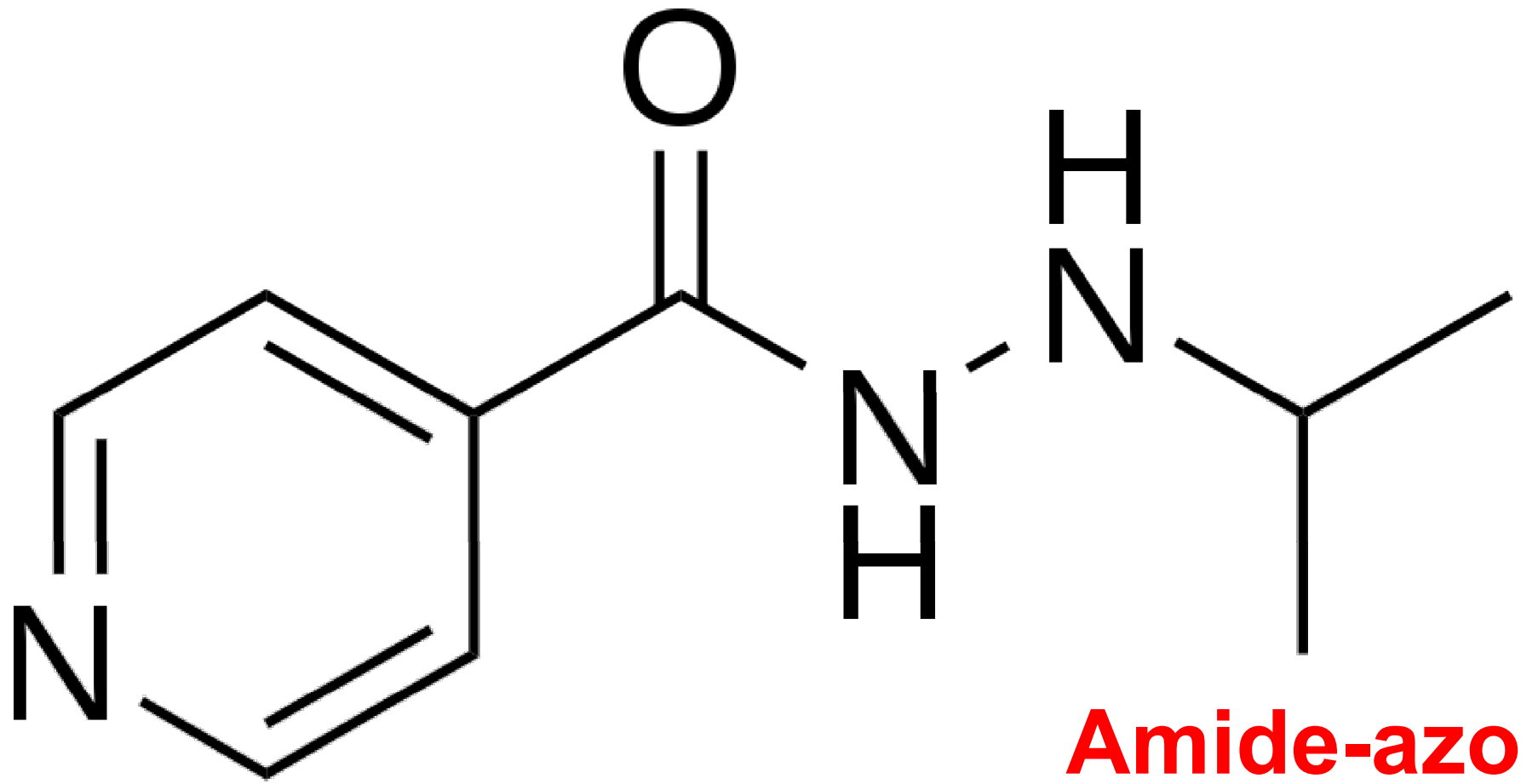
Iproniazid



Amide-azo

Antidepressant drugs

1. Iproniazid

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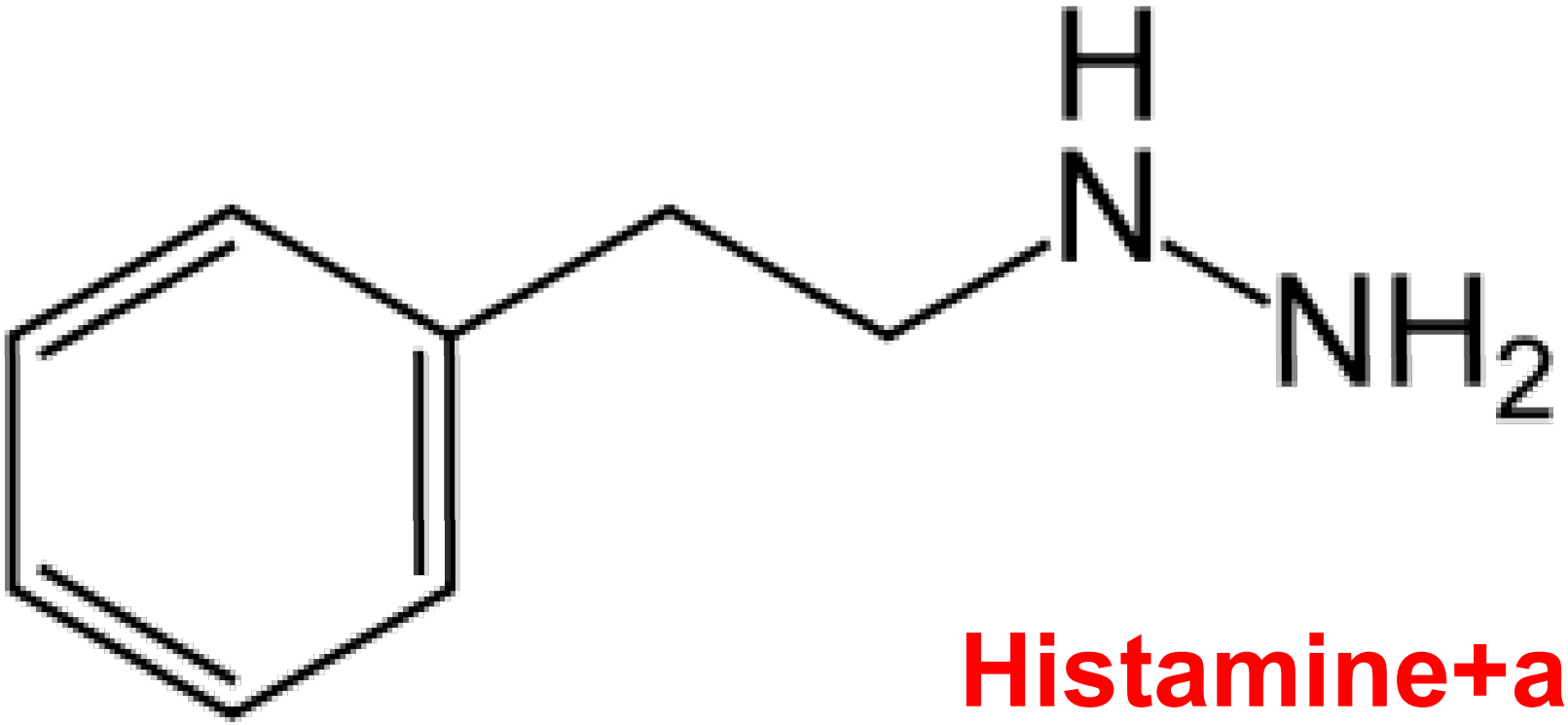
Phenelzine



Histamine+azo

Antidepressant drugs

2. phenelzine

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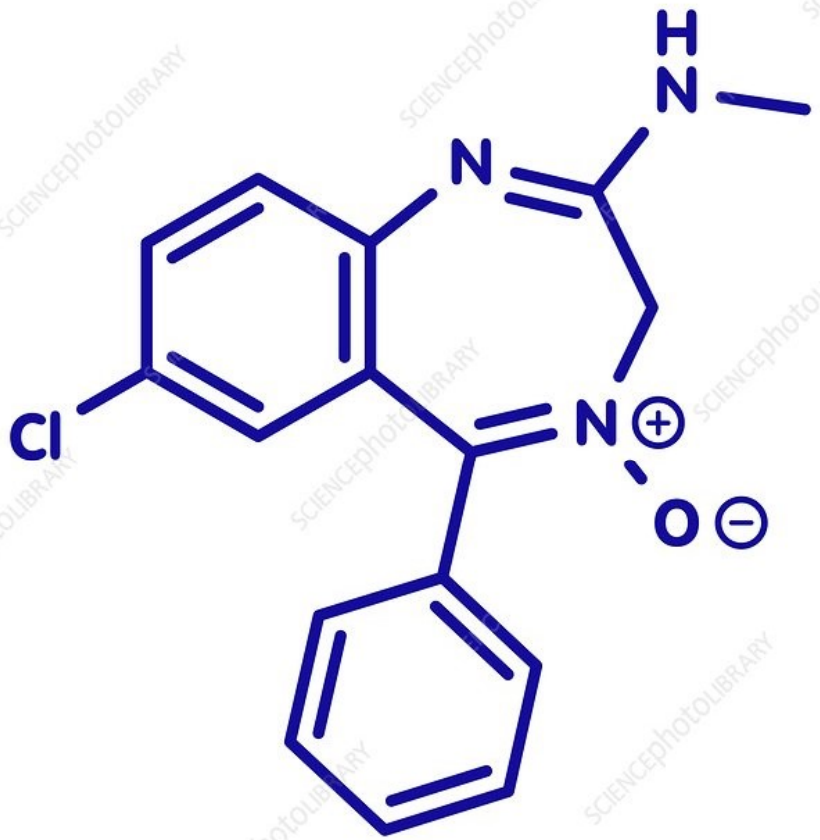
Chlordiazepoxide



mild tranquilizers

Chloro +
Diazo

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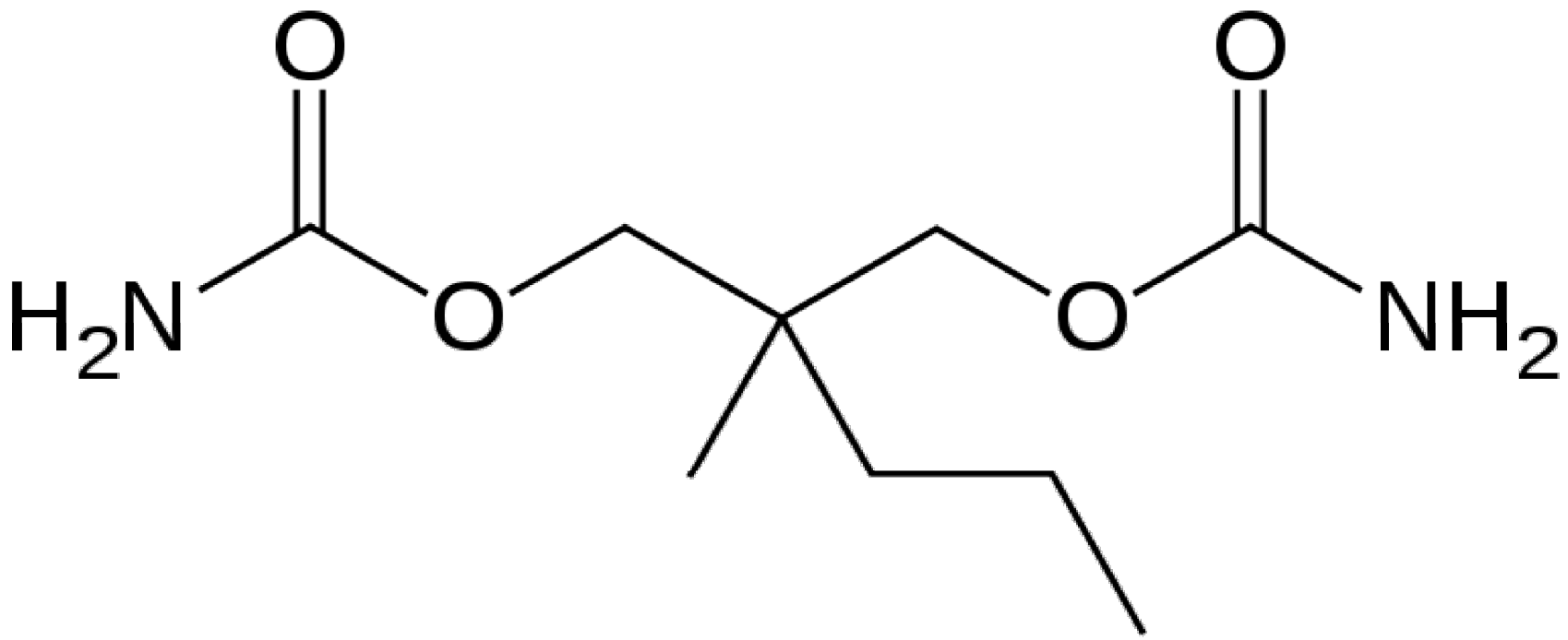
Meprobamate



DiCarbamate

mild tranquilizers

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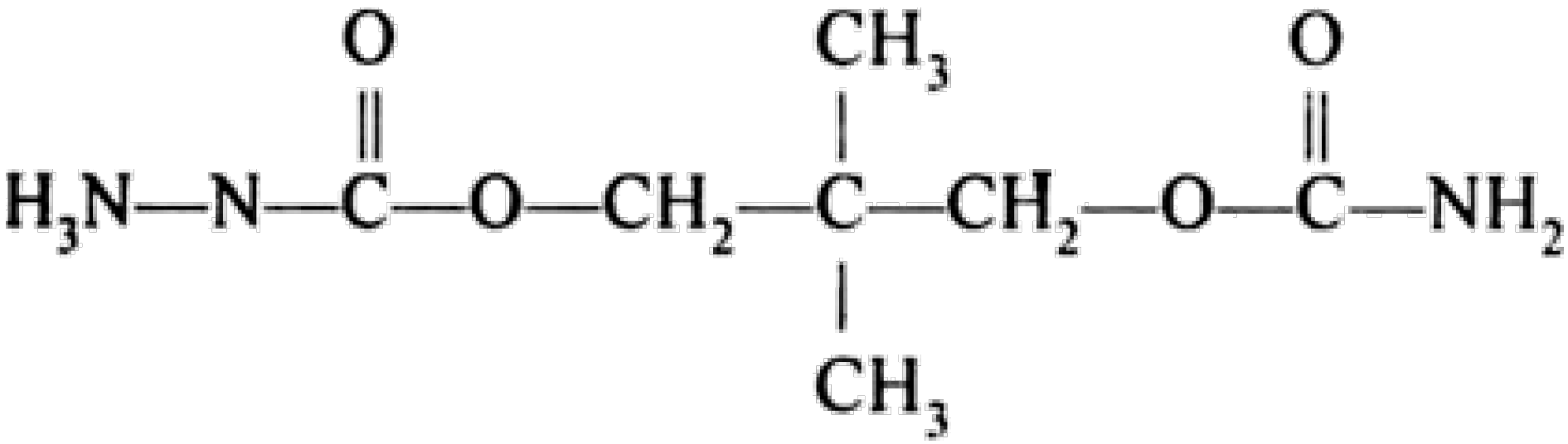
Equanil



Equanil

DiCarbamate

mild tranquilizers

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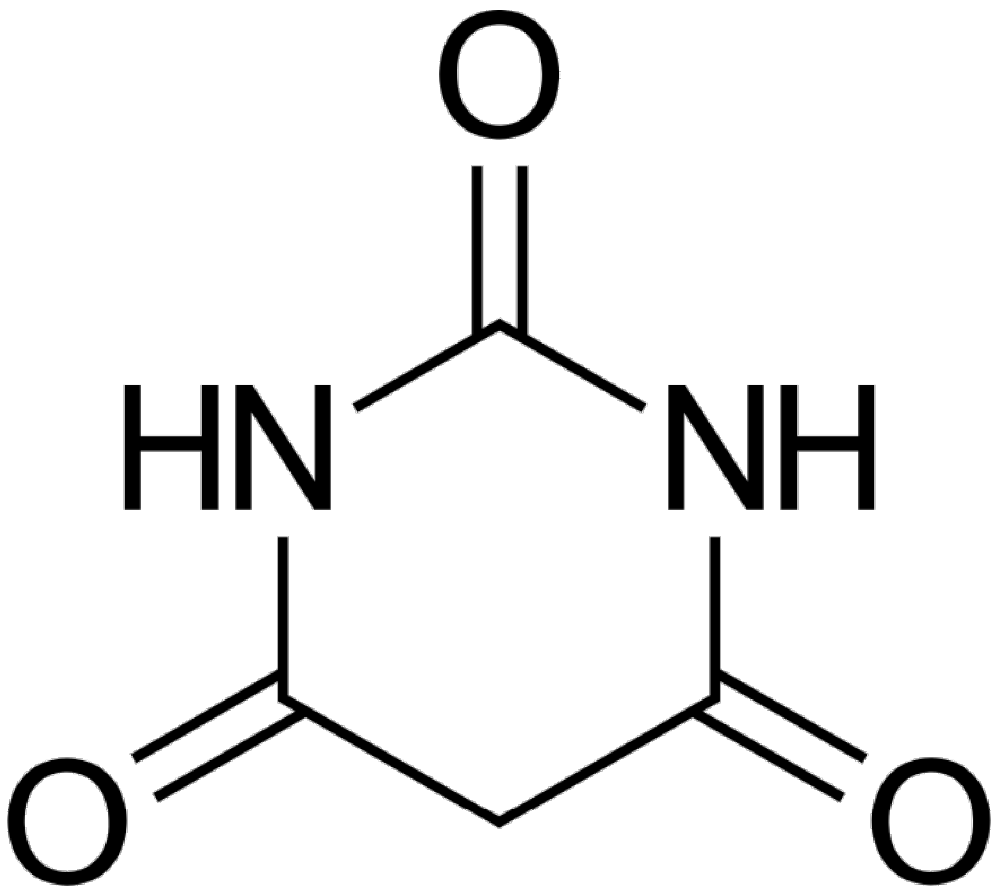
Barbituric-acid

Barbiturates are hypnotic, sleep producing agents



Barbituric type
Malonic acid
+Urea

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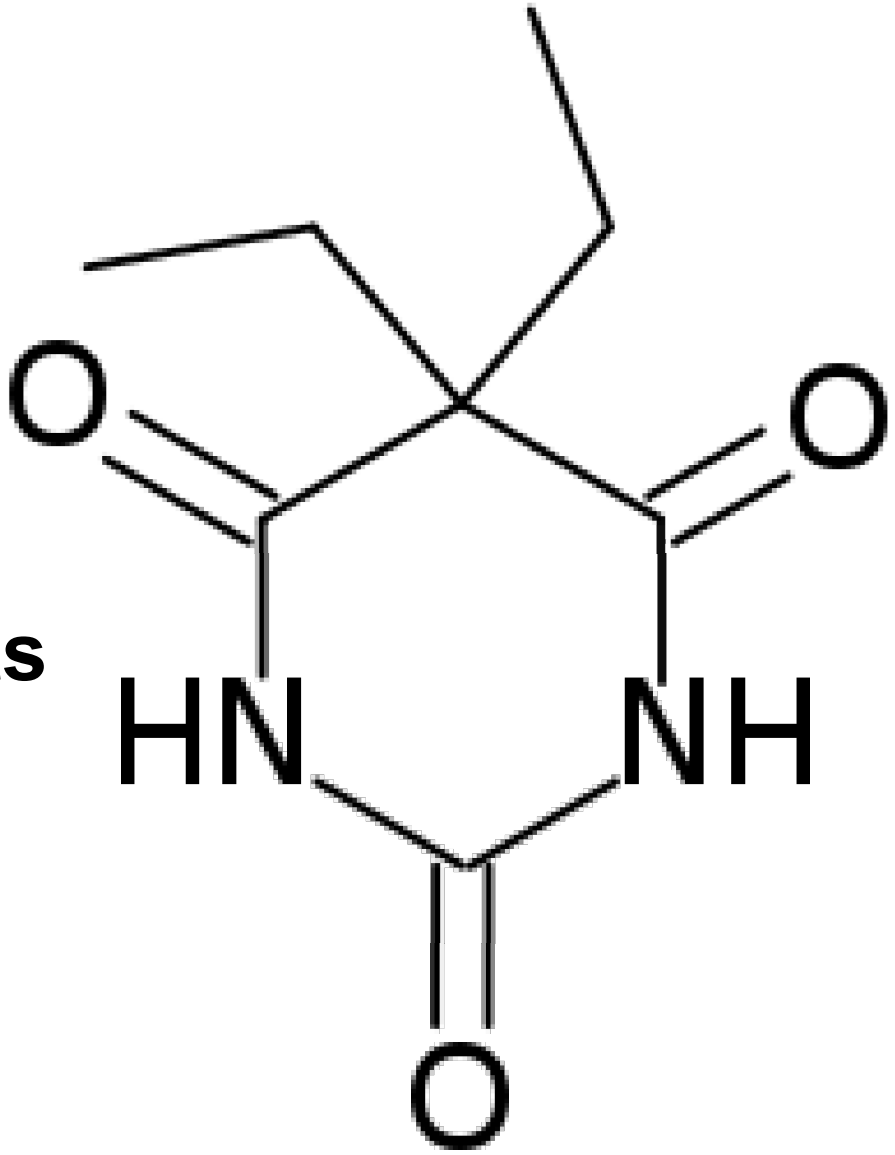
Barbital- Veronal

Barbiturates are hypnotic, sleep producing agents



Barbituric type
Malonic acid
+Urea

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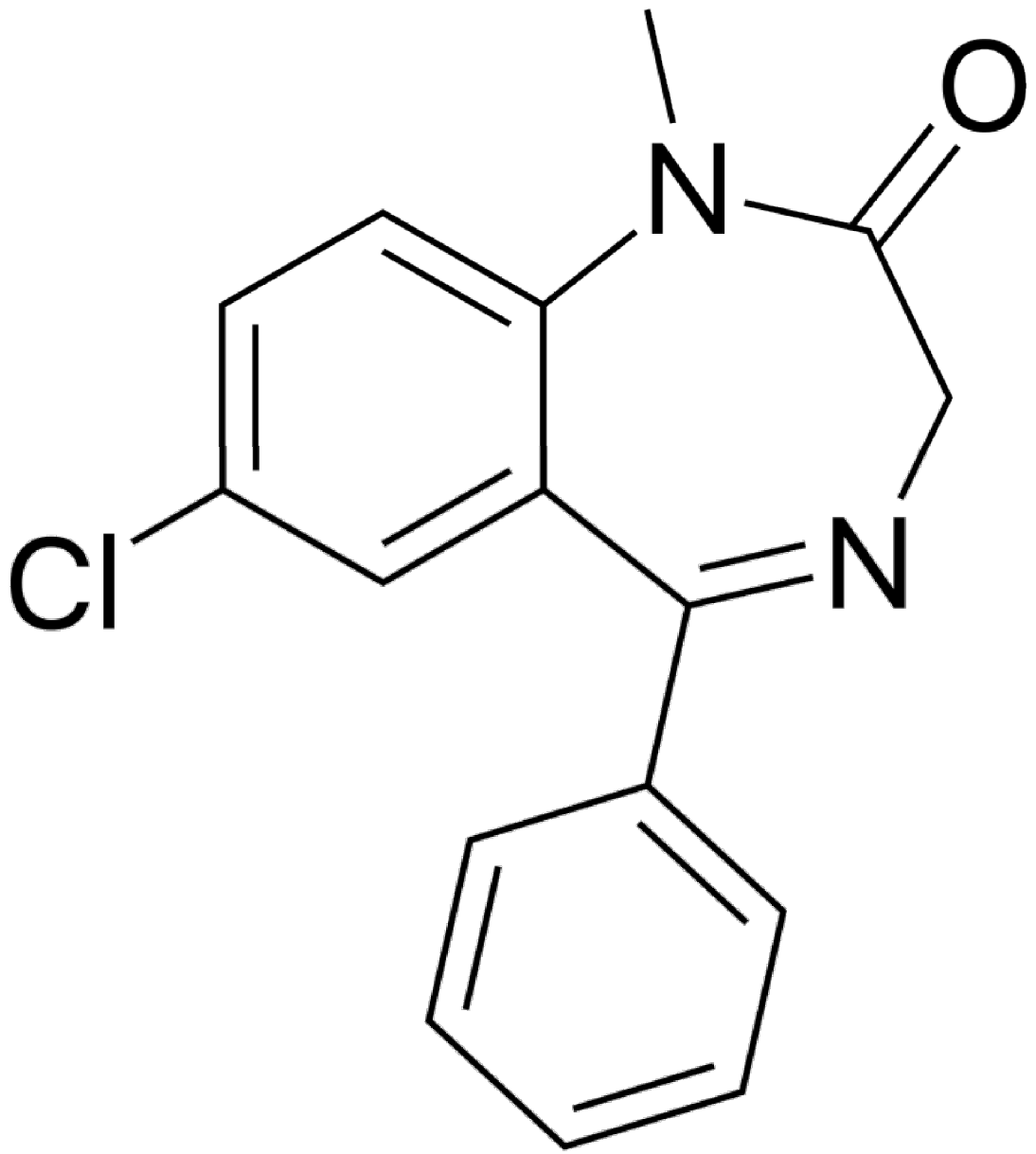
Diazepam_valium



Barbituric type

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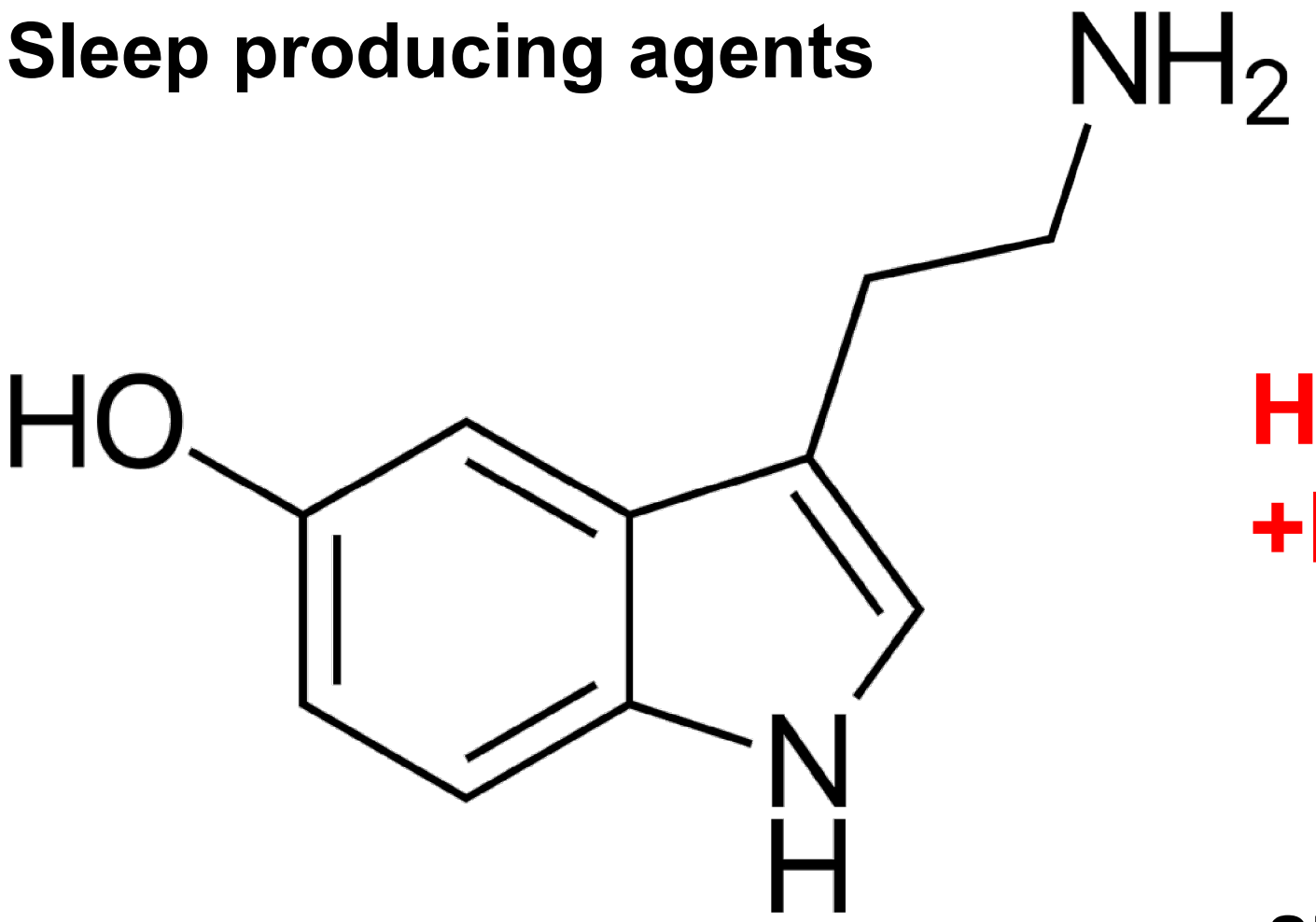
Serotonine

Tranqualizers
Mood Elevator
Sleep producing agents



Histamine
+Phenol

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Analgesics: Analgesics reduce or abolish pain without causing impairment of consciousness,

Aspirin is the most familiar example. Aspirin inhibits the synthesis of chemicals known as prostaglandins which stimulate inflammation in the tissue and cause pain

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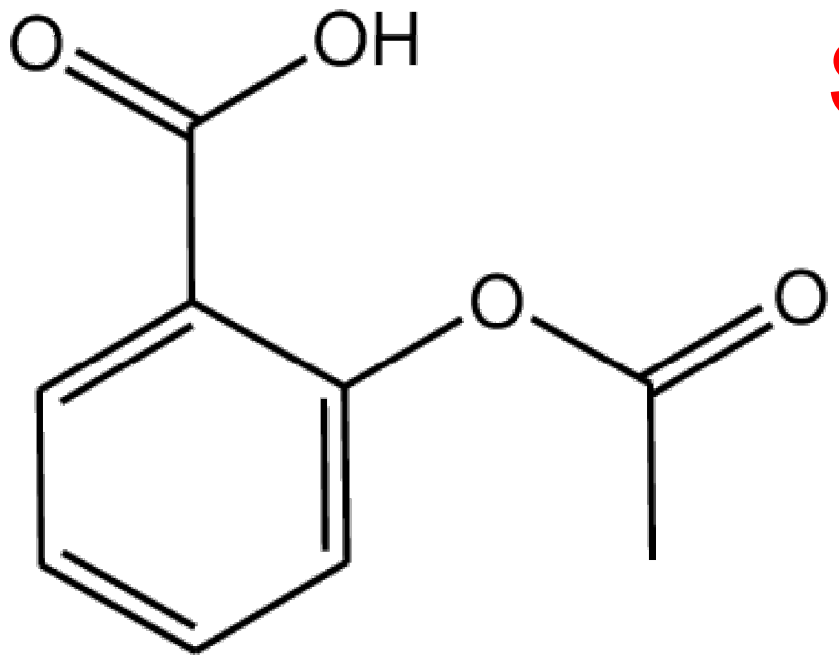
Aspirin (Acetylsalicylic Acid) is also antipyretic and preventing platelet coagulation. Because of its anti blood clotting action, aspirin finds use in prevention of heart attacks.



Acetyl on Salicylic acid

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Narcotic analgesics: Morphine, Codeine , Heroin narcotics (opiates)

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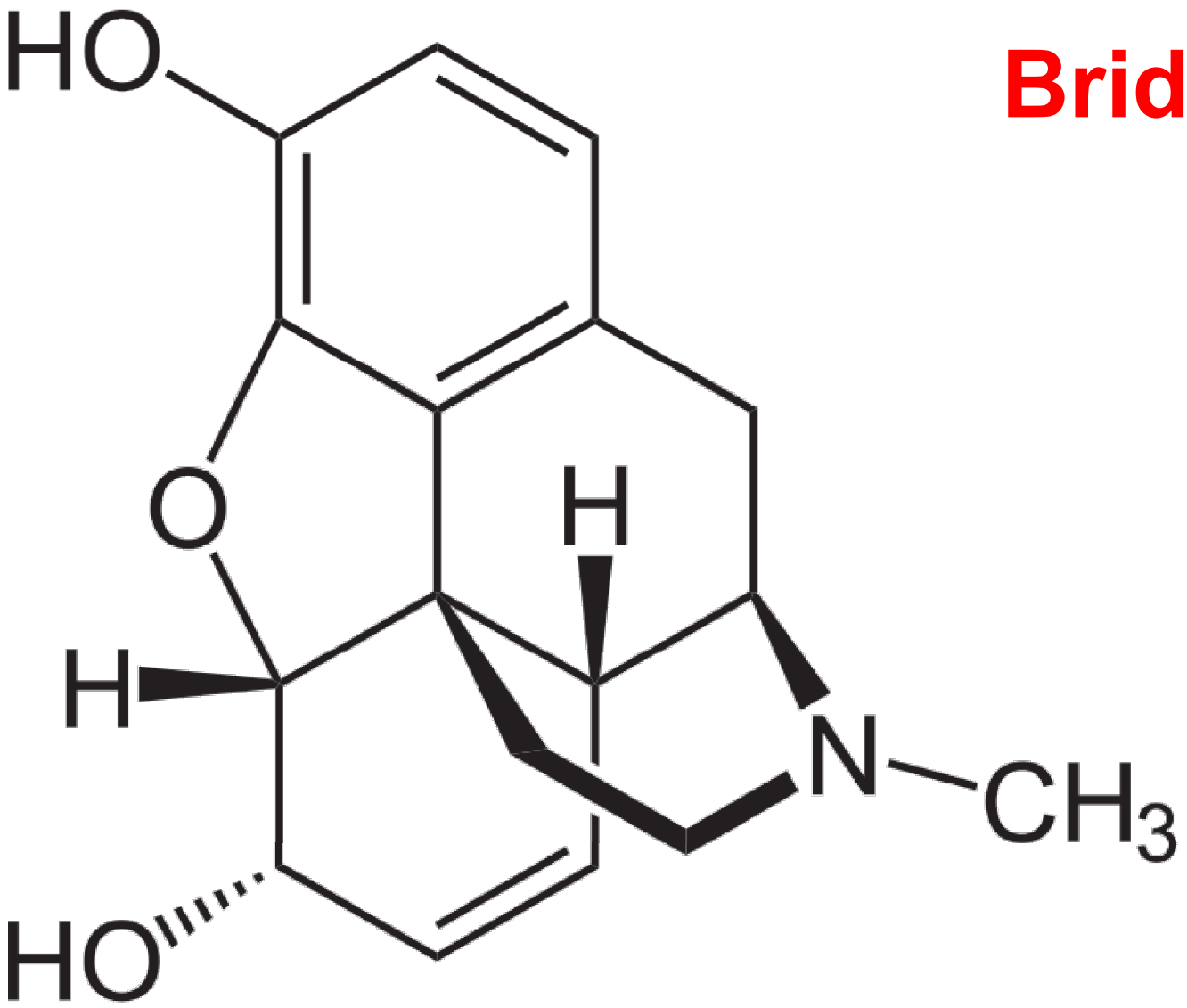
Morphine



Bridge N

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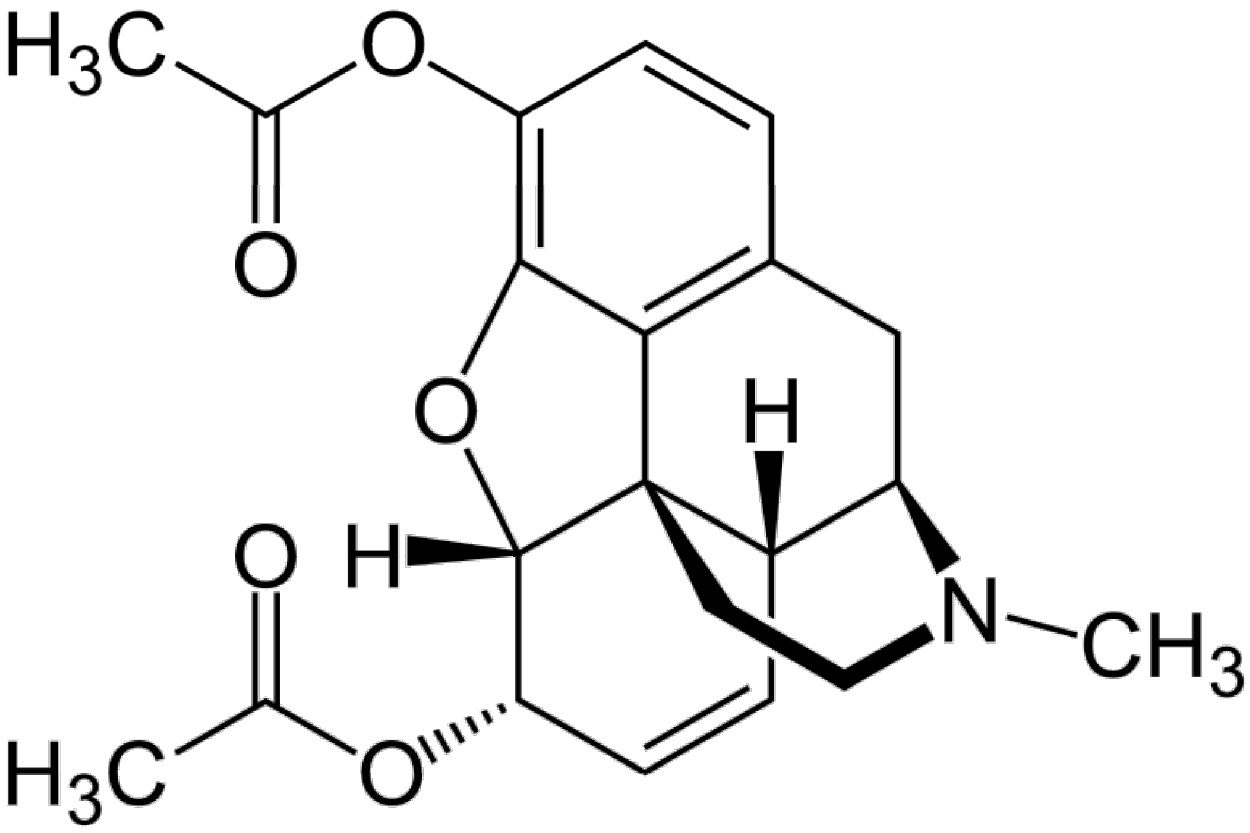
Heroin

Bridge N



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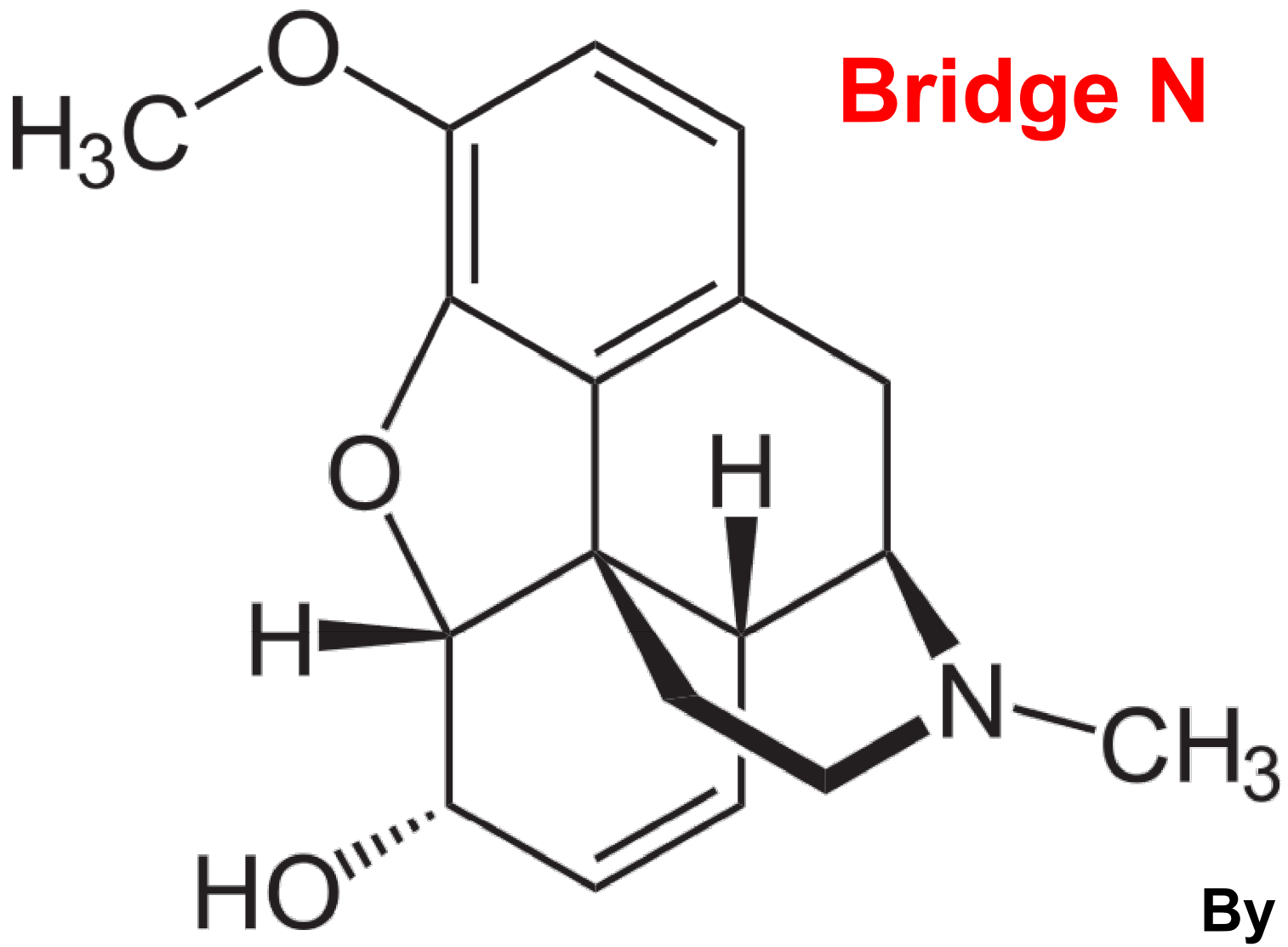
Codein



Bridge N

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Antifertility drugs

Birth control pills contain a mixture of synthetic Estrogen and Progesterone derivatives.

Both of these compounds are hormones.

progesterone suppresses ovulation.

Norethindrone : A synthetic progesterone

Ethynylestradiol (novestrol). : Estrogen derivative

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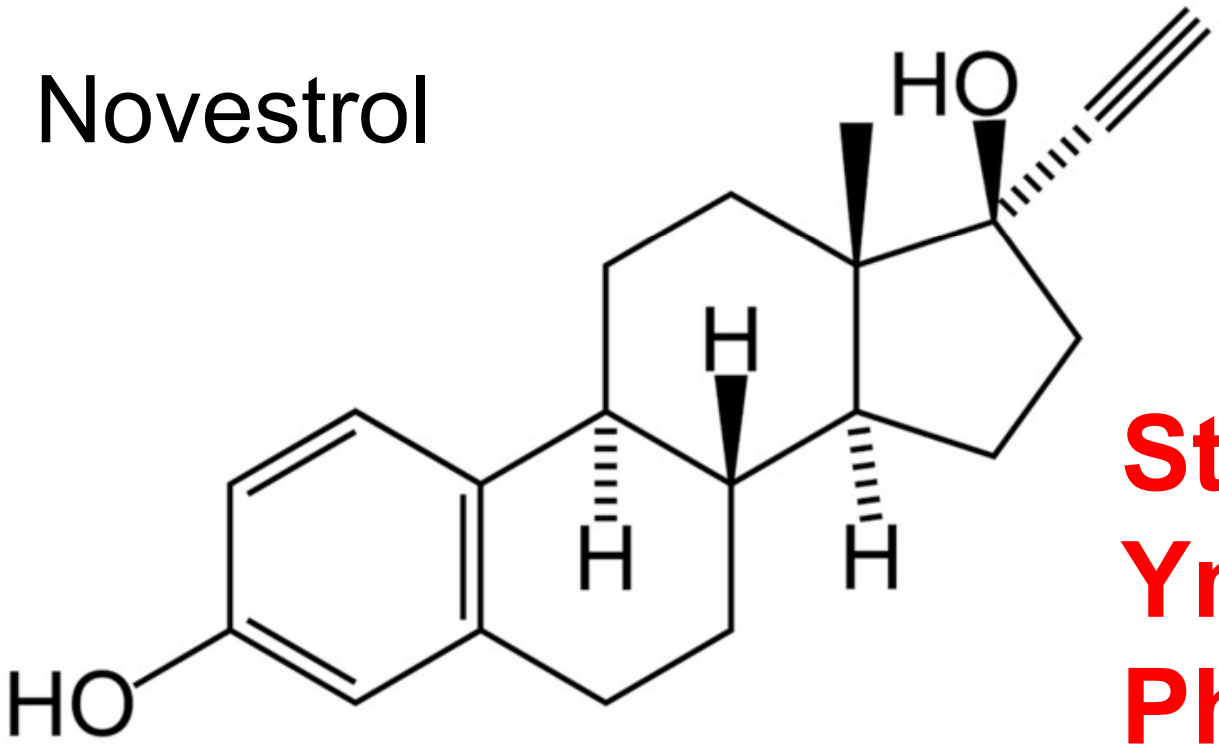
Antifertility Drugs

Novestrol



Steroid
Yne
Phenol

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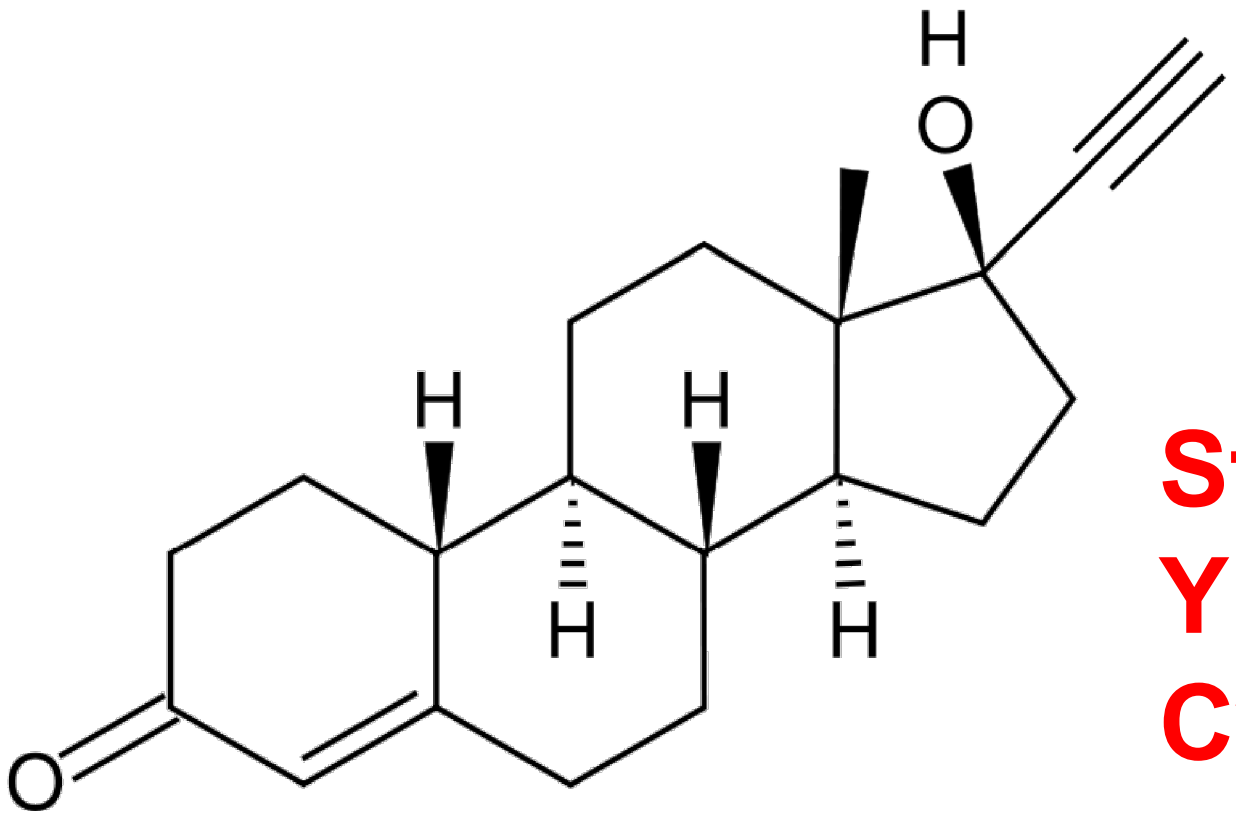
Antifertility Drugs

Norethindrone



Steroid

Steroid
Yne
Cyclohexene one

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Antibiotic

Antibiotic: A substance produced wholly or partly by chemical synthesis, which in low concentrations inhibits the growth or destroys microorganisms by intervening in their metabolic processes

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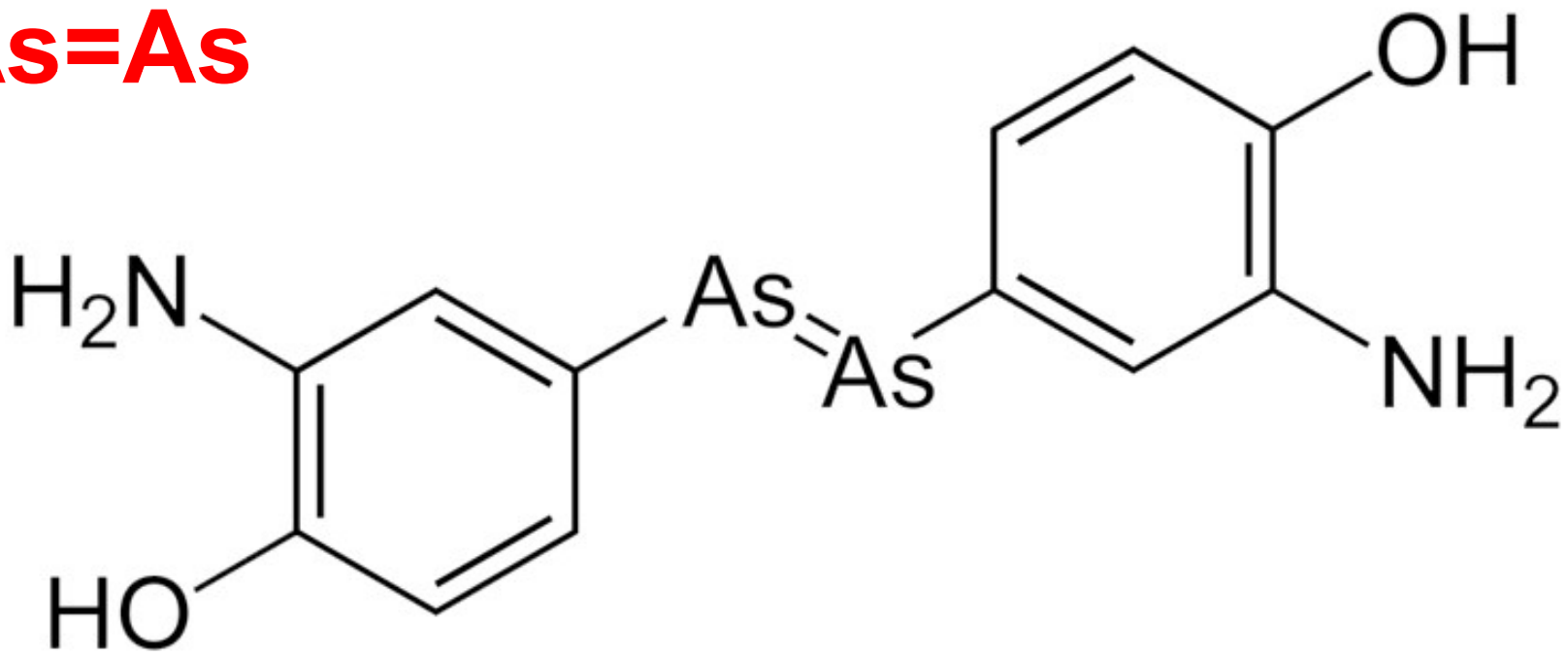
salvarsan

Arsphenamine, known as salvarsan.
discovered for Syphilis.
Arsenic drug : Poisonous to human also

Arsan=

As=As



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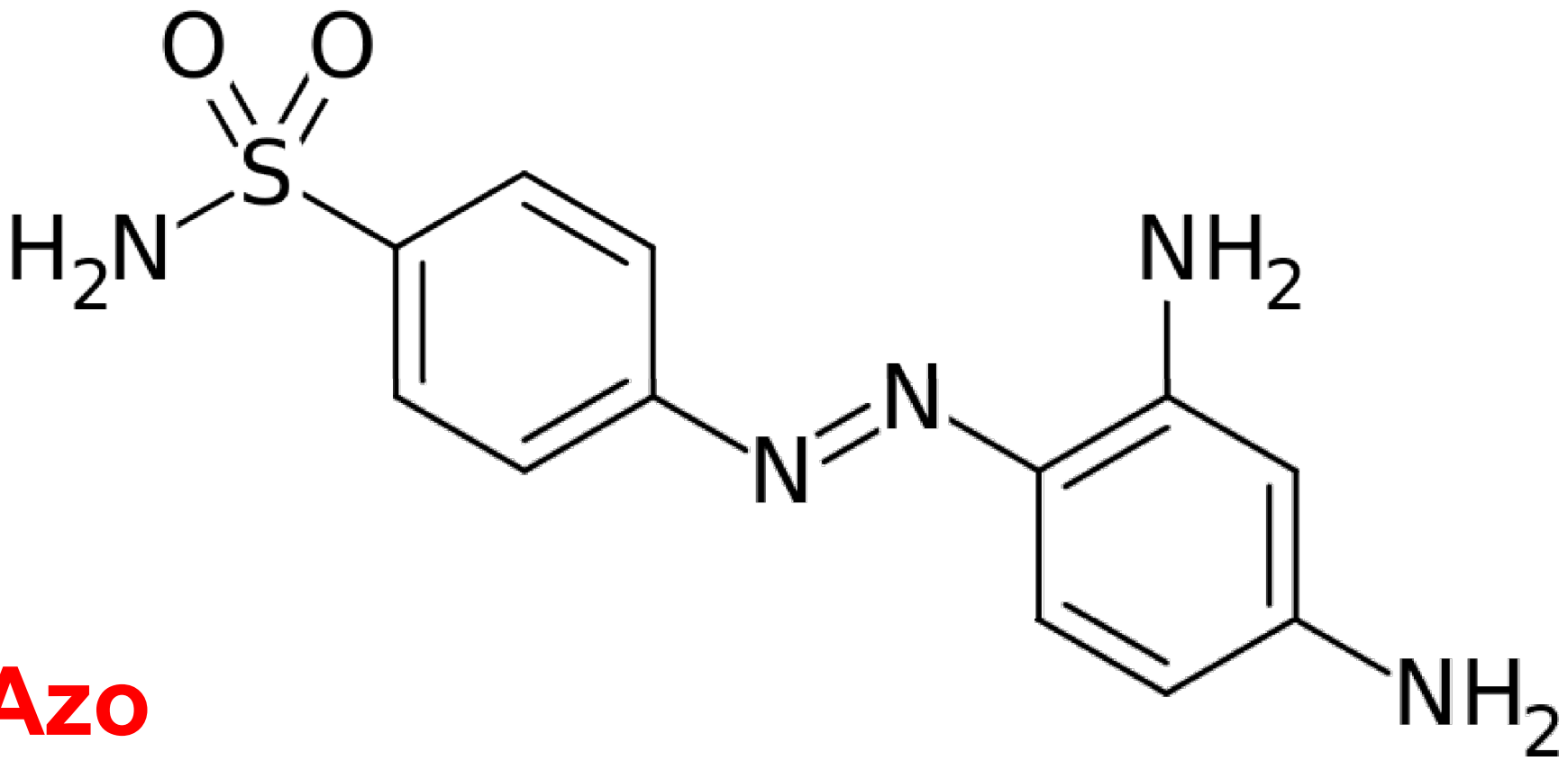
Prontosil



Azo

N=N

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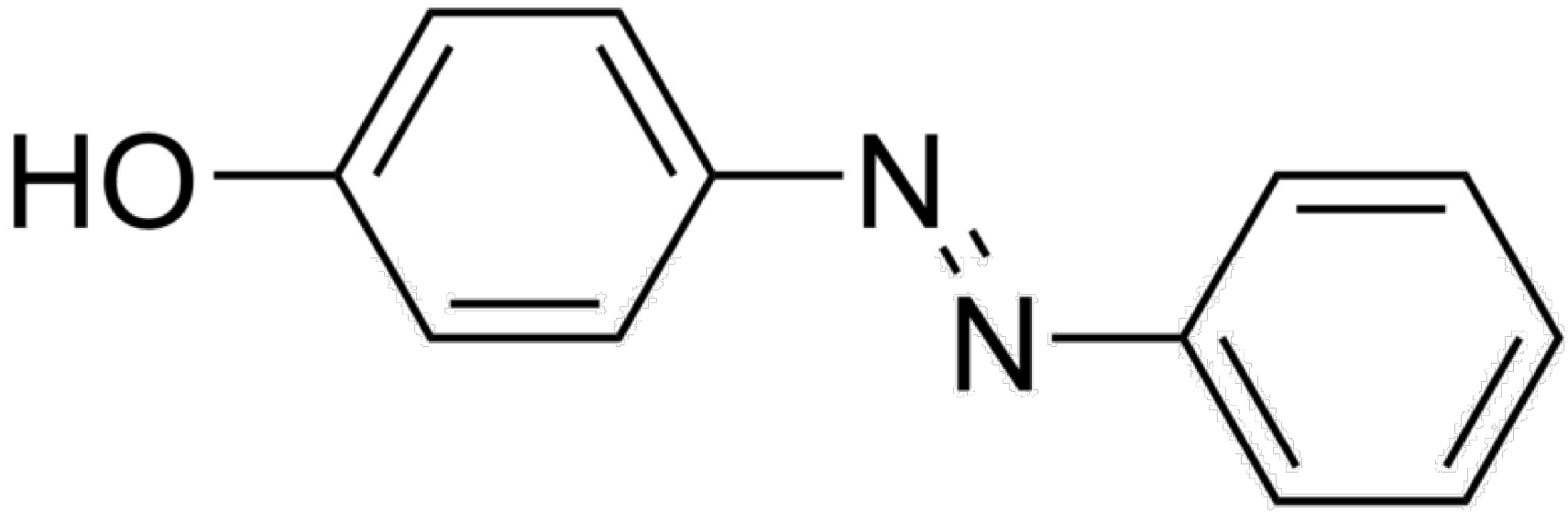
4-hydroxyphenylazobenzene



Azo

N=N

By
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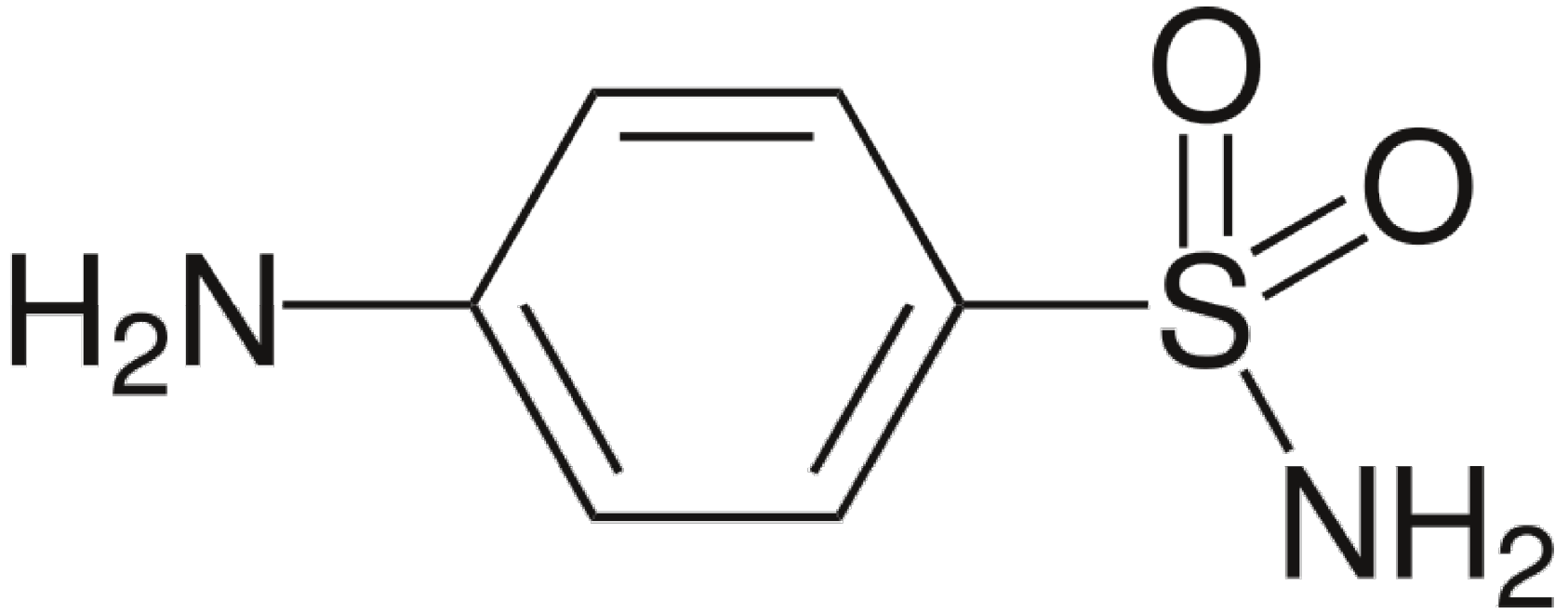
Sulfanilamide



Sulpaanilic acid amide

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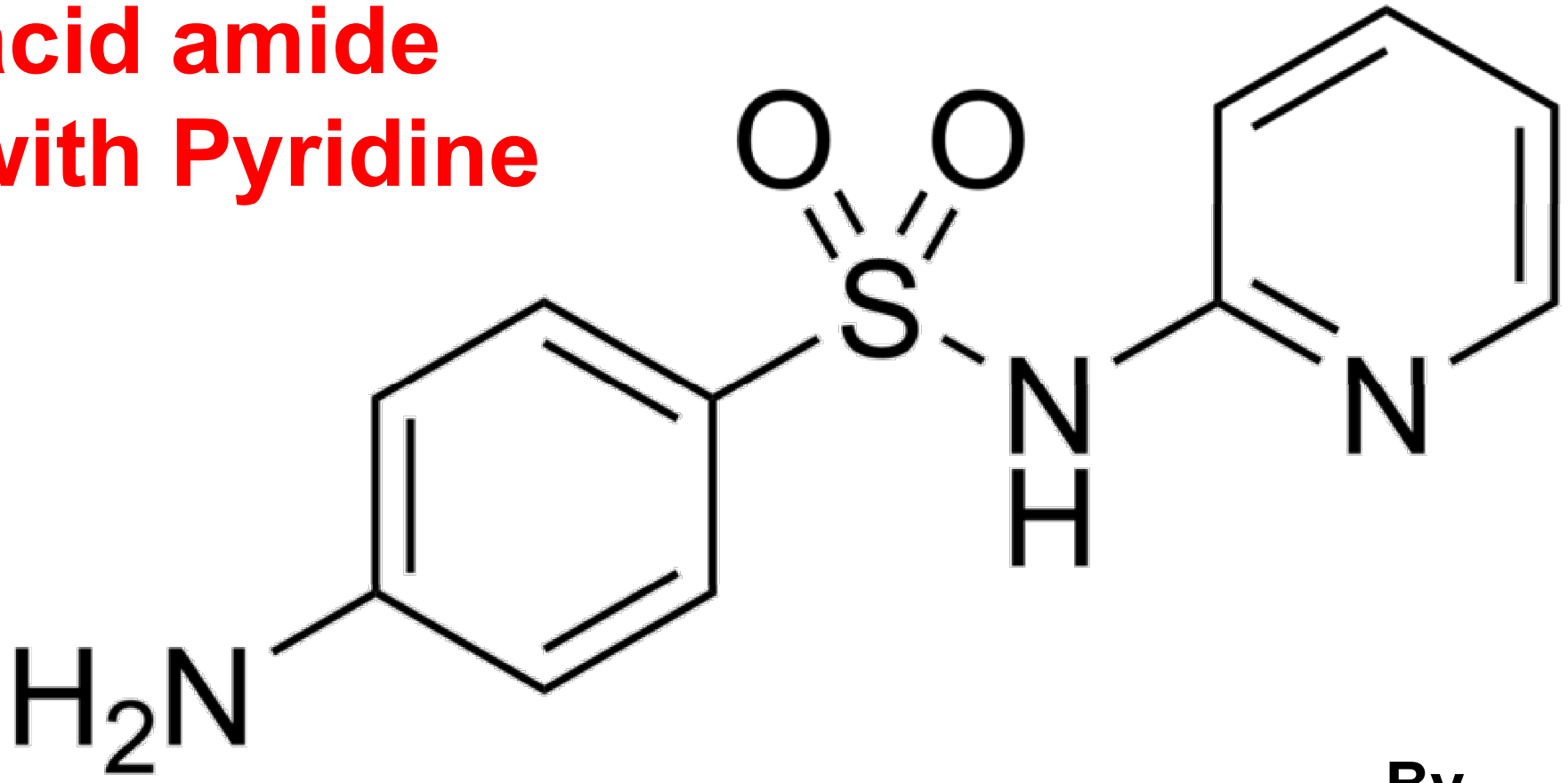
Sulfapyridine

Sulpaanilic acid amide with Pyridine



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Antibiotic

Antibiotics have either cidal (killing) effect or a static (inhibitory) effect on microbes. A few examples of the two types of antibiotics are as follows:

Bactericidal

Penicillin

Aminoglycosides

Ofloxacin

Bacteriostatic

Erythromycin

Tetracycline

Chloramphenicol

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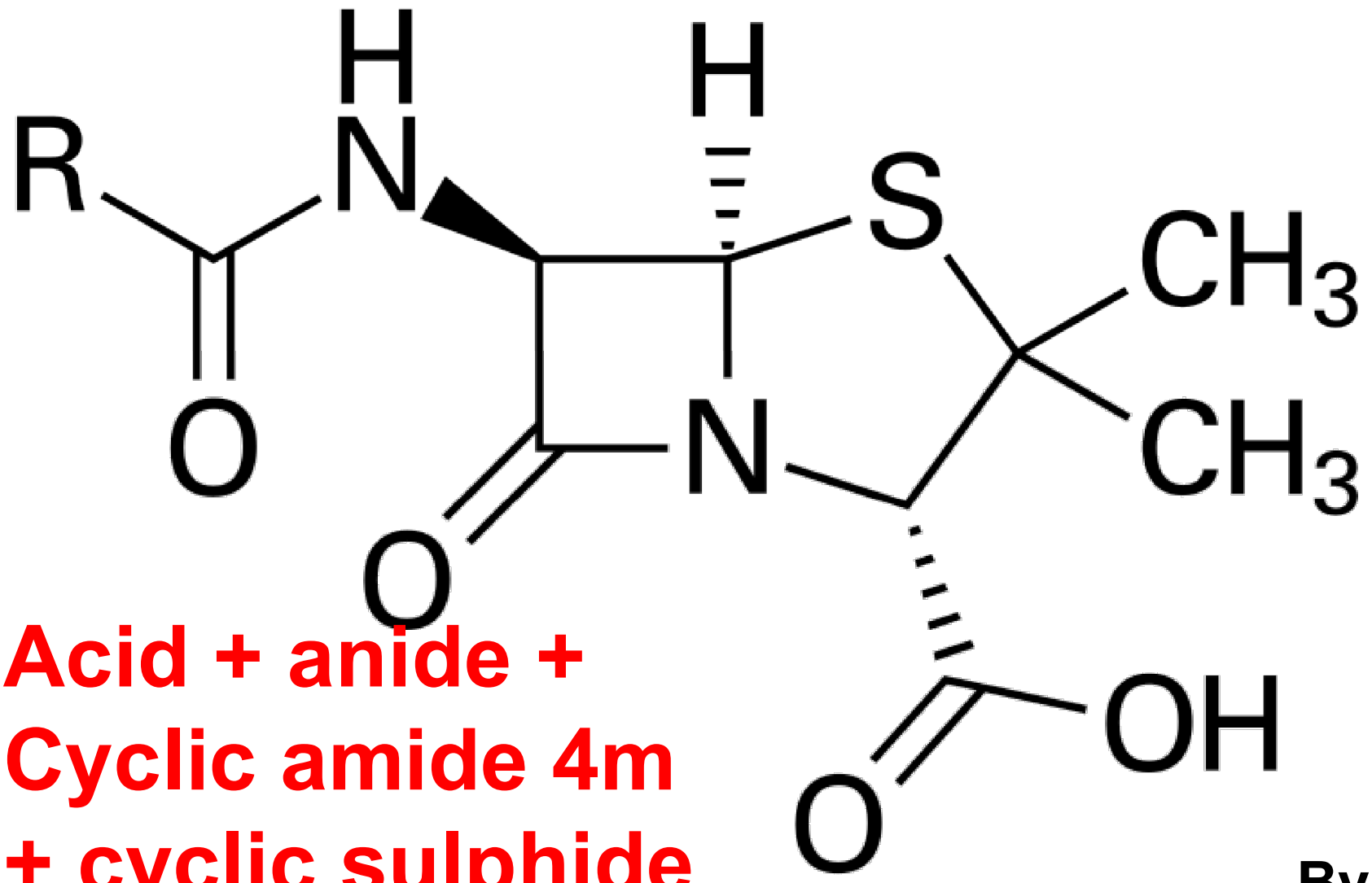
Penicillin_core



Acid + anide +
Cyclic amide 4m
+ cyclic sulphide

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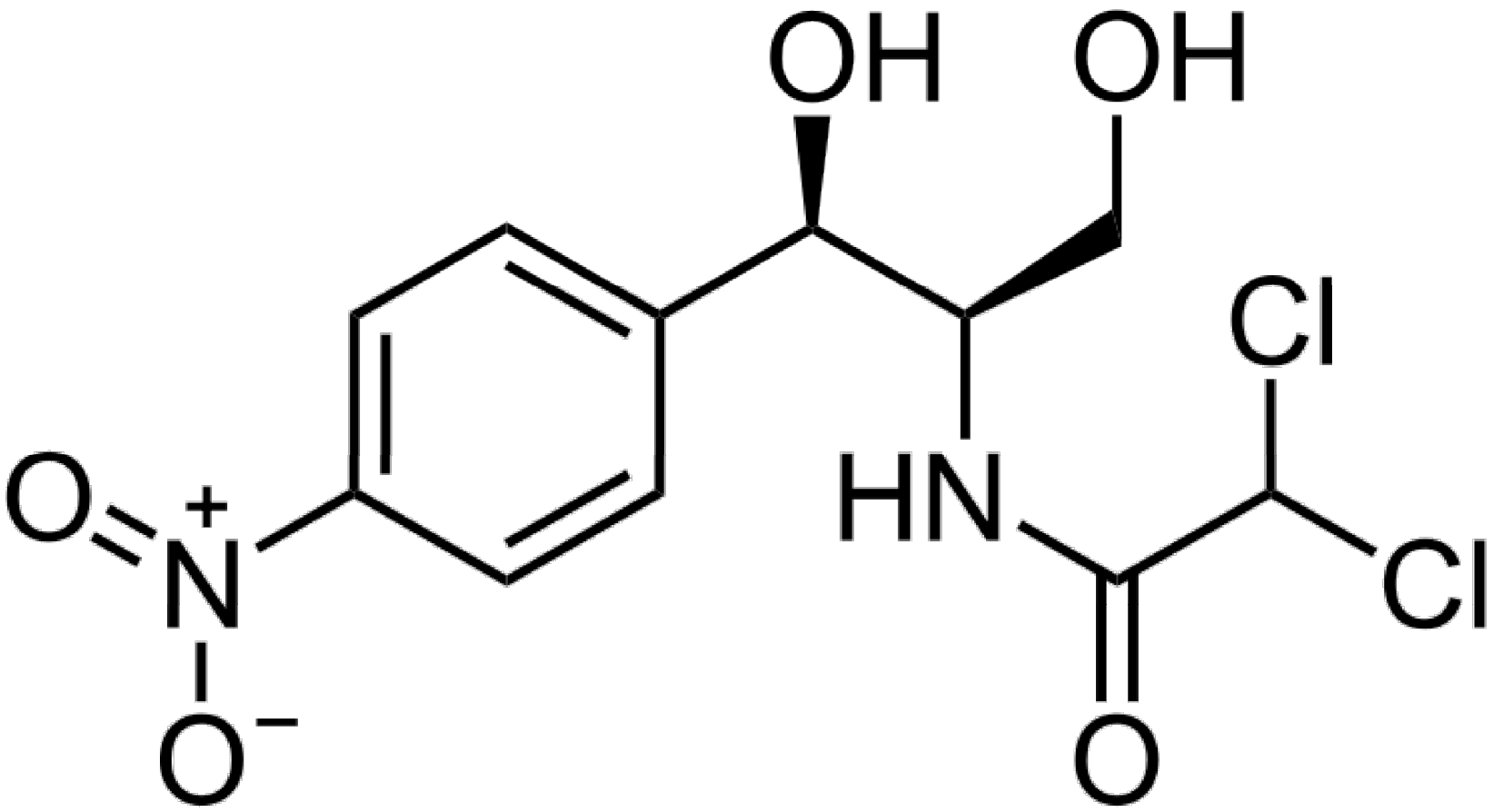
Chloramphenicol



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Antiseptics

Antiseptics : (External). applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces
Examples
furacine,
Soframicine
dettol is a mixture of chloroxylenol and terpineol.
Bithionol : Used in soaps to impart antiseptic properties.
tincture of iodine : 2-3 per cent solution of I2 in alcohol It is applied on wounds.
Iodoform : antiseptic for wounds.
Boric acid: dil. Aq. solution is weak antiseptic for eyes.

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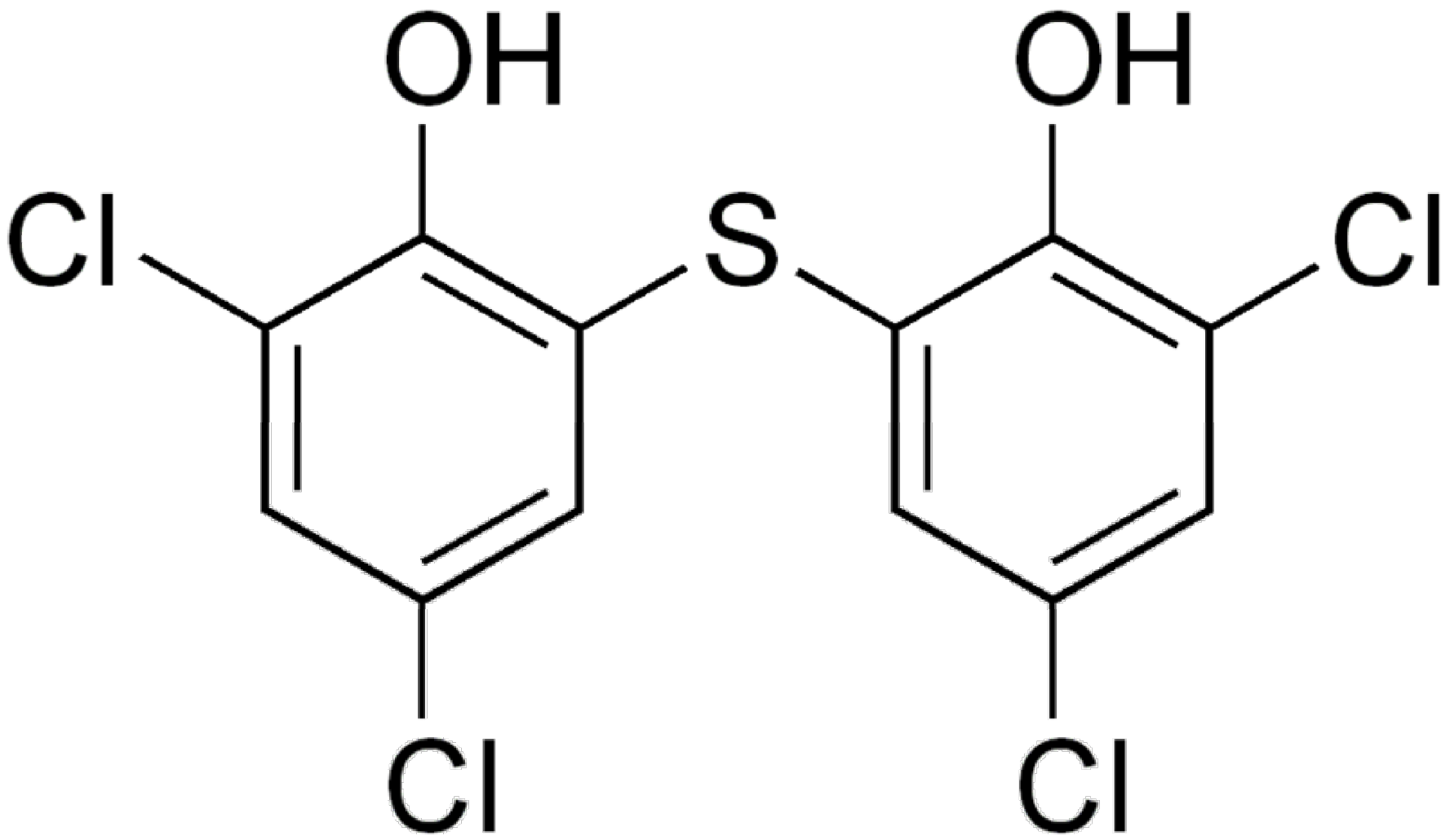
Bithionol



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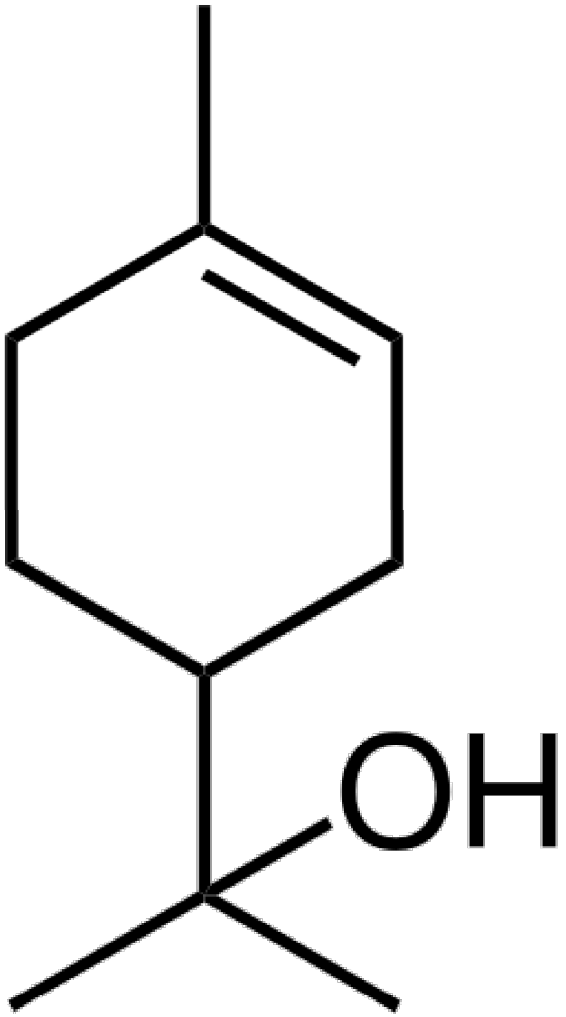
Terpineol



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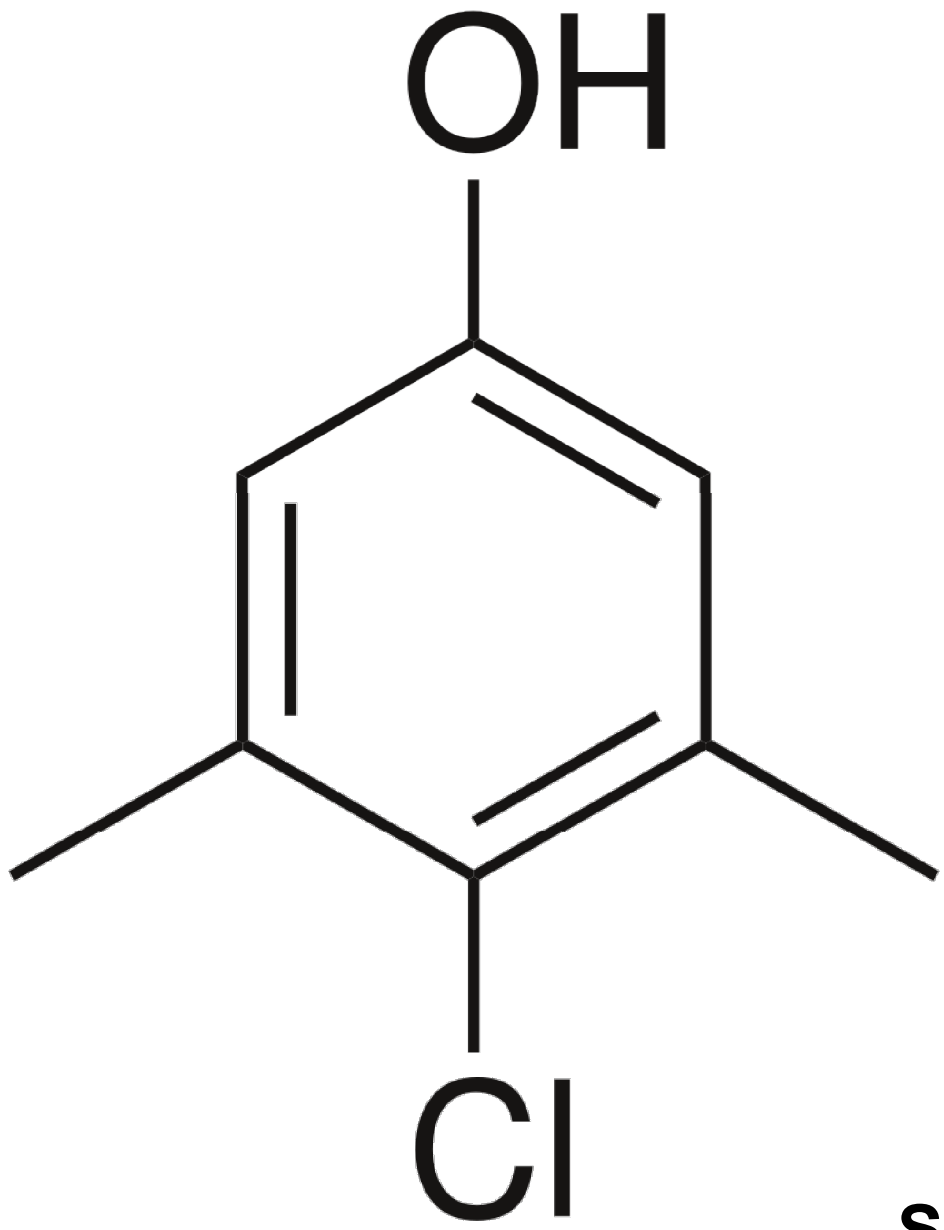
Chloroxylenol



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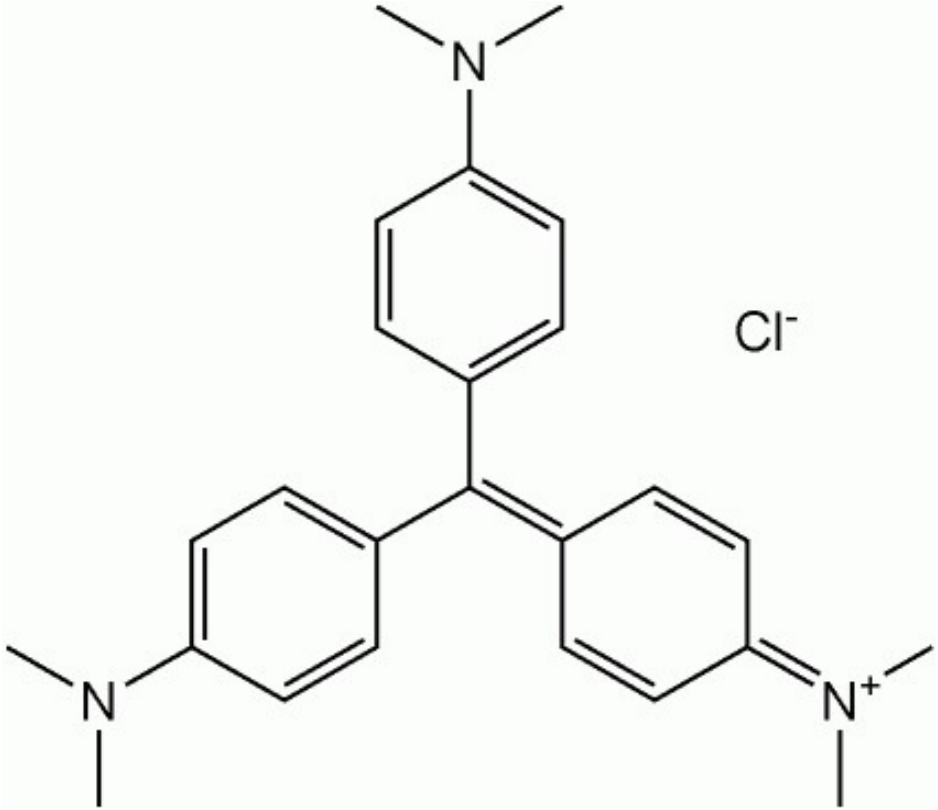
Methyl_Violet



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Disinfectants

Disinfectants: Chemicals applied to nonliving object to kill/prevent microorganisms.

Phenol : 0.2 per cent solution of phenol is an antiseptic while its one percent solution is disinfectant.

Chlorine: 0.2 to 0.4 ppm in aqueous solution and sulphur dioxide in very low concentrations, are disinfectants.

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Food preservatives

Food preservatives :
prevent spoilage of food due to microbial growth. Commonly used preservatives :
table salt, sugar, vegetable oils and sodium benzoate,
Salts of sorbic acid and propanoic acid

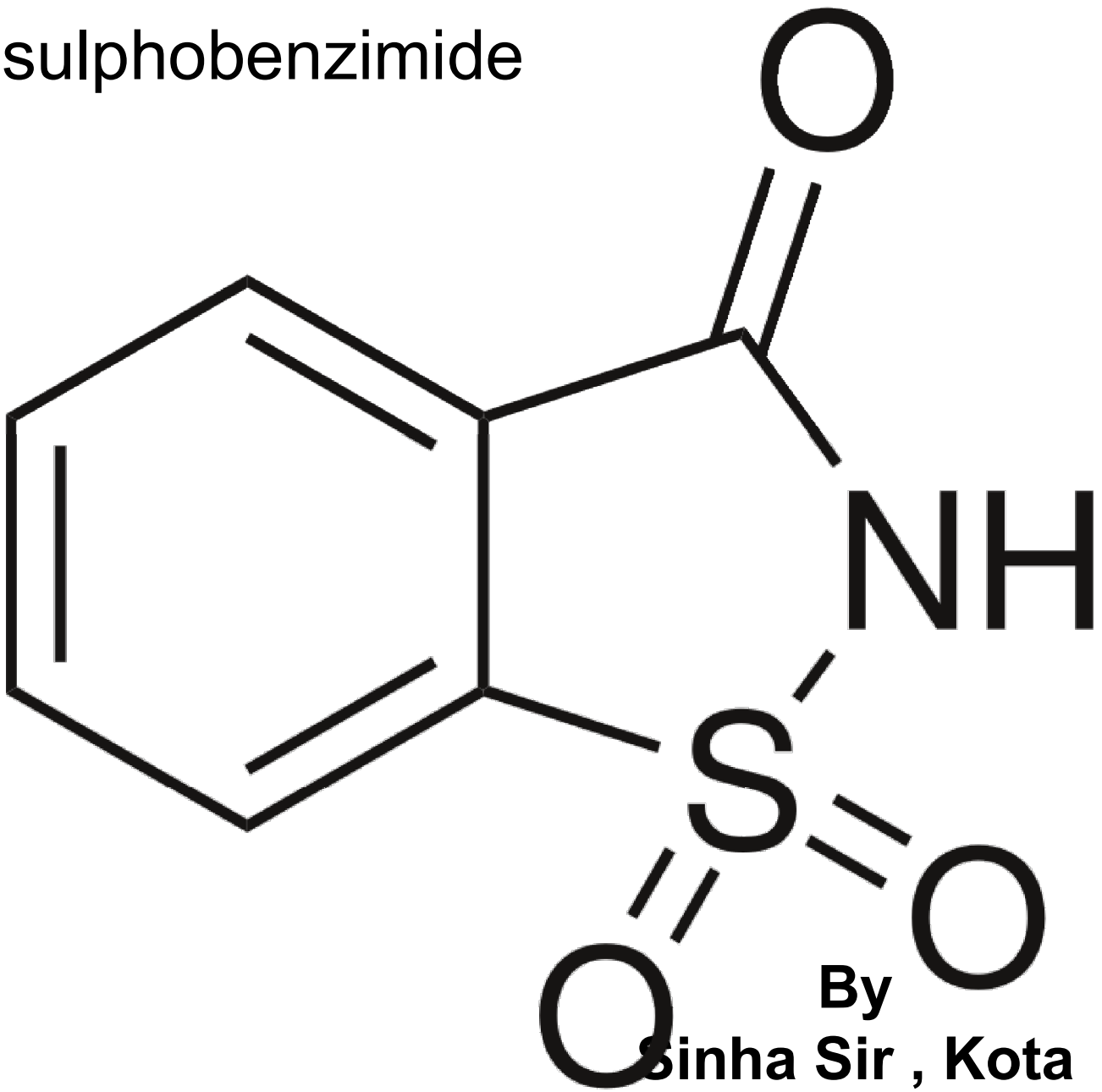
By
Sinha Sir , Kota

Sweeteners

By
Sinha Sir , Kota

Saccharin

Saccharine : Ortho-sulphobenzimide



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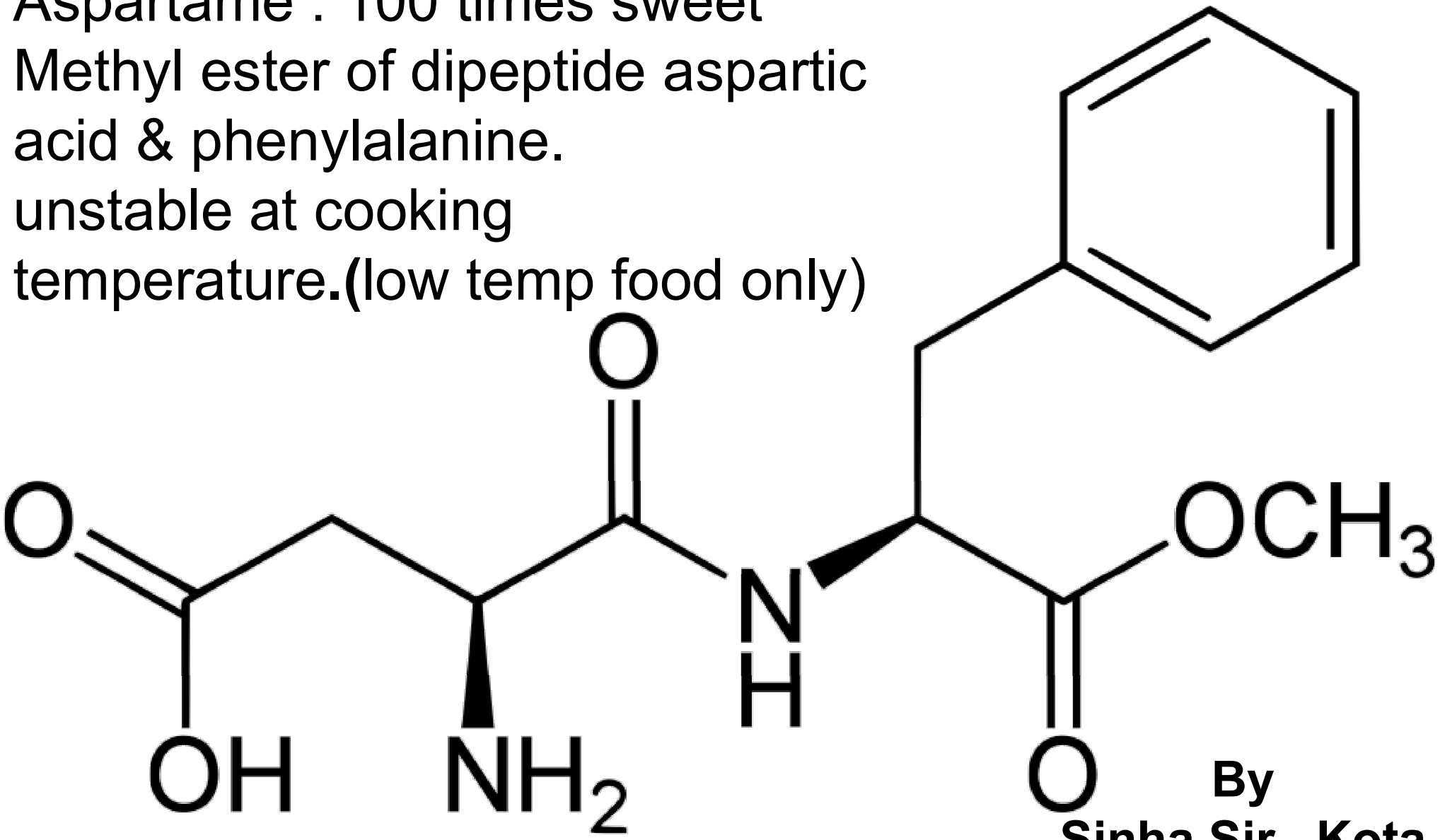
Aspartame

Aspartame : 100 times sweet
Methyl ester of dipeptide aspartic acid & phenylalanine.
unstable at cooking temperature.(low temp food only)



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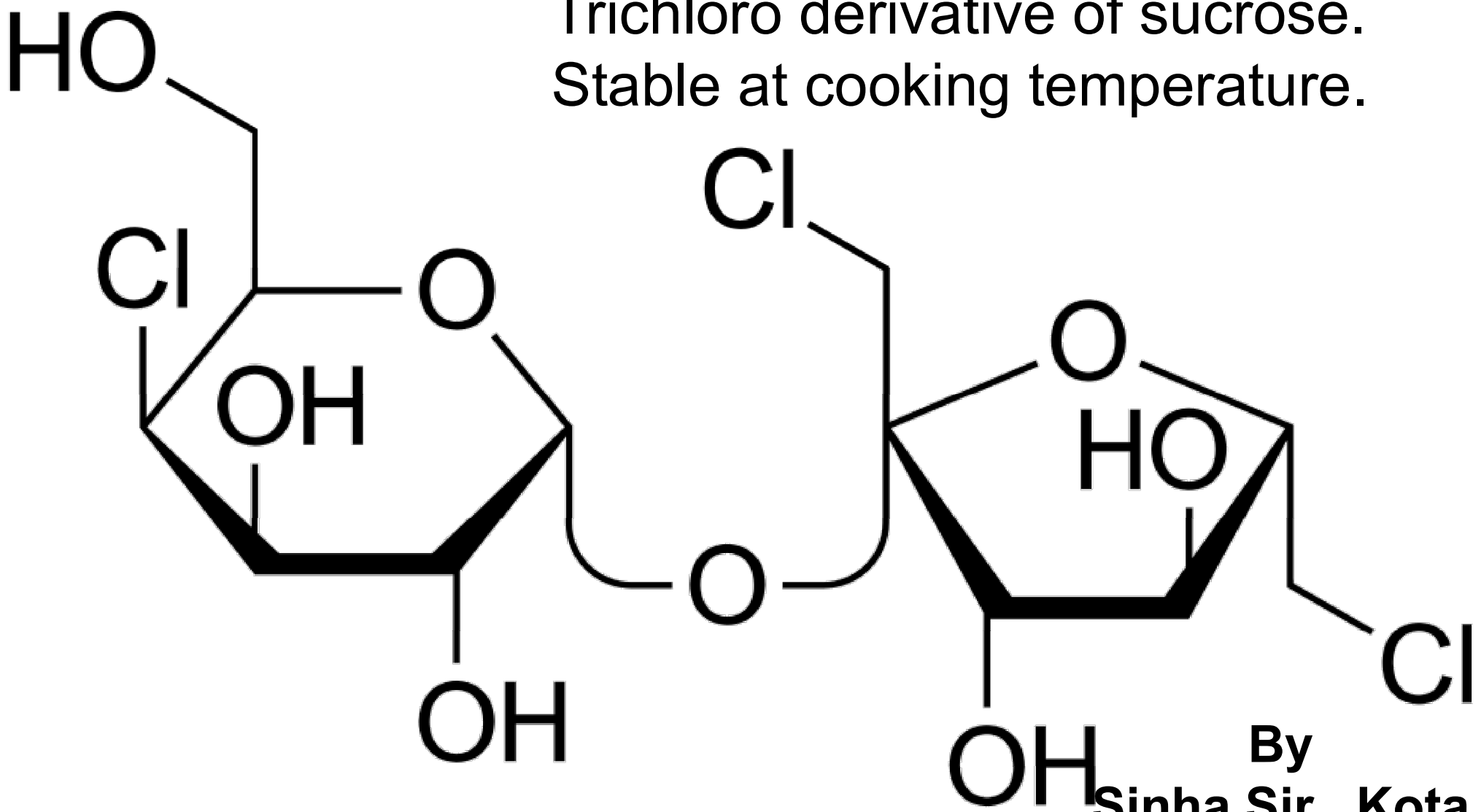
Sucralose

Sucralose : 600 times sweet
Trichloro derivative of sucrose.
Stable at cooking temperature.



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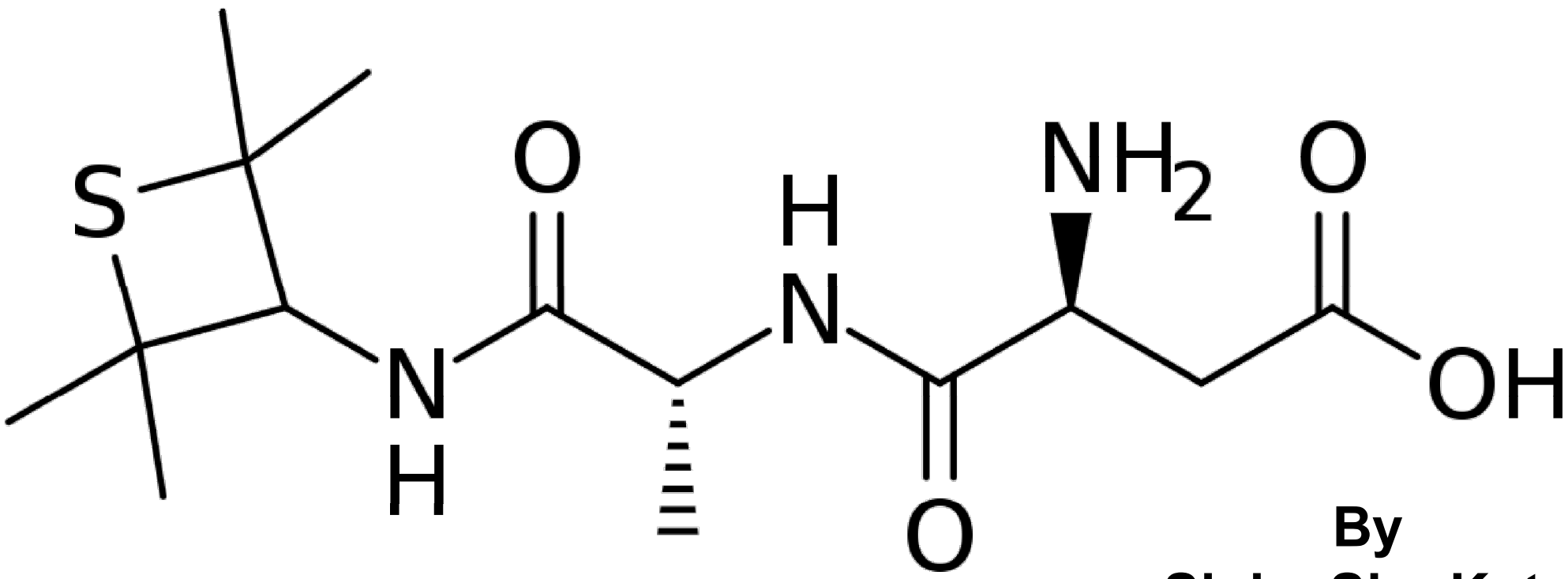
Alitame

Alitame : 2000 times sweet high potency sweetener, more stable than aspartame



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Cleansing agents:

Soaps and detergents are examples of cleansing agents.

1)Soaps
2)Detergents.

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Soap

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1)Soaps : These are sodium or potassium salts of higher fatty acids containing more than twelve carbon atom.

Potassium soaps are softer than sodium soaps.

shampoo,
shaving cream,
bathing soaps,
etc.

toilet soaps,
washing
purposes, etc.

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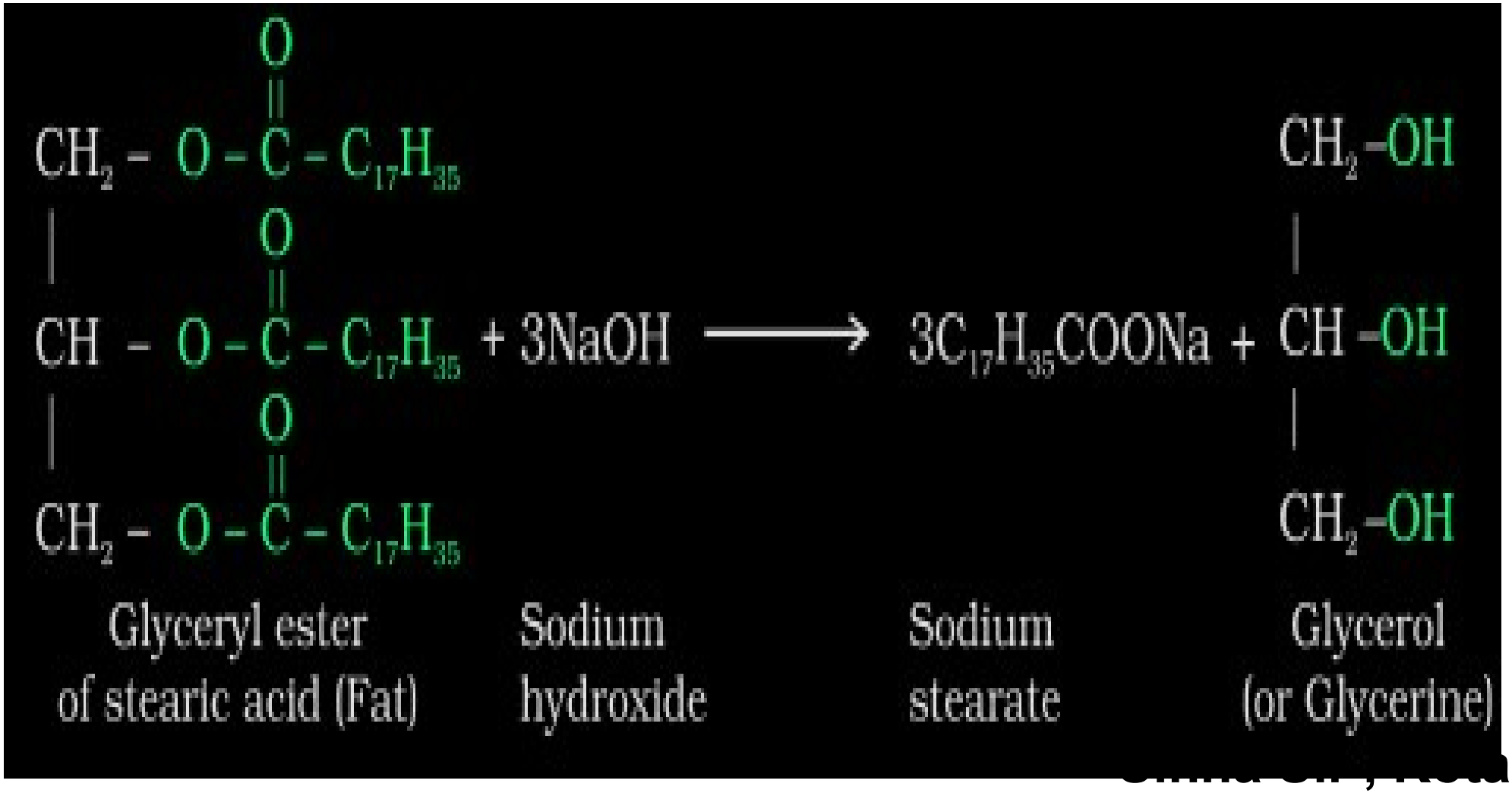
Preparation soap

- **Soaps-** made by boiling fats or oils with suitable soluble hydroxide



Soaps

- Soap in hard water-

$$2C_{17}H_{35}COONa + CaCl_2 \longrightarrow (C_{17}H_{35}COO)_2Ca + 2NaCl$$

$$2C_{17}H_{35}COONa + MgCl_2 \longrightarrow (C_{17}H_{35}COO)_2Mg + 2NaCl$$

Hard water contains calcium and magnesium ions.Soap react with these ions to produce calcium and magnesium salts which are insoluble in water.

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Cleansing agents

2)Detergents- **P**rimarily sodium salts alkyl hydrogen sulphate or long chain alkyl benzene sulphonic acid.

Detergents are superior to soaps,

Three types

- Anionic detergents
- Cationic detergents
- Non-ionic detergents

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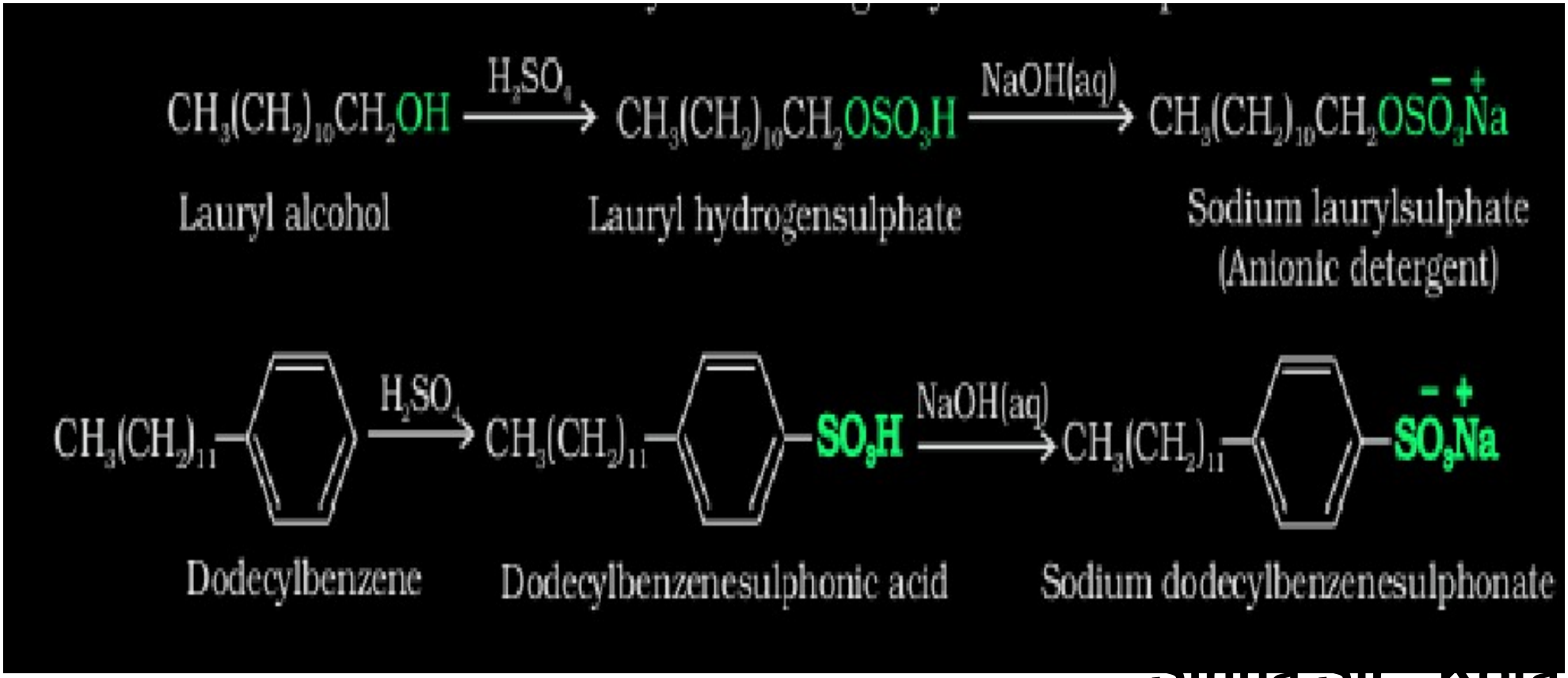
1) Anionic detergents : They have anions at the water soluble end of chains .These are prepared from long chain hydrocarbons or alcohols with conc. Sulphuric acid followed by neutralization using sodium hydroxide to produce sodium lauryl sulphate

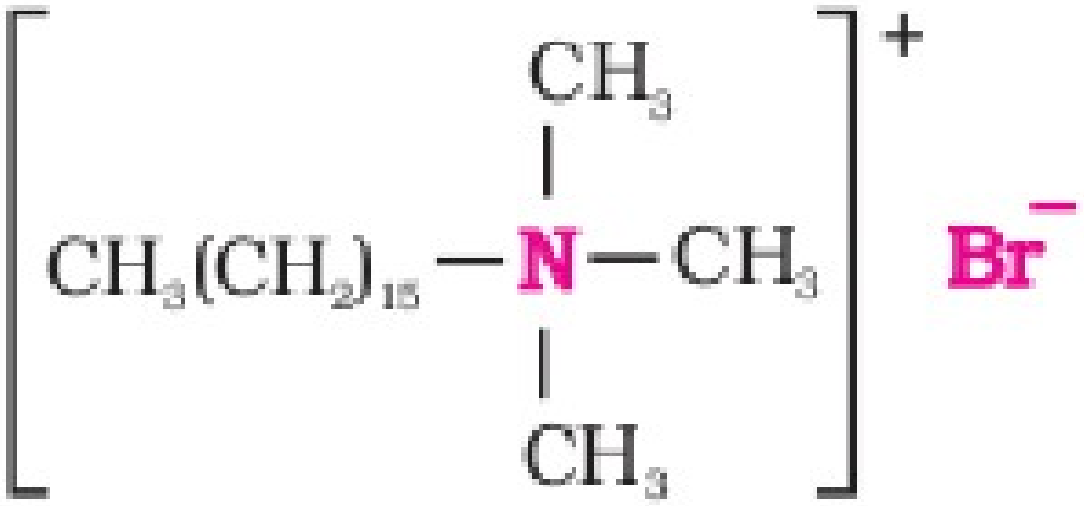


2)Cationic detergents: Are quaternary ammonium salts of amines with chlorides, acetate or bromides. They have cations at water soluble ends. Anions are chlorides, acetates, or bromide and cations are long chain hydrocarbons having +ve charge on nitrogen atom.

Eg.n-hexadecyl trimethyl ammonium bromide

(cetyltrimethyl ammonium bromide)

The cetyltrimethyl ammonium chloride is used in hair conditioners.



Cetyltrimethyl ammonium bromide

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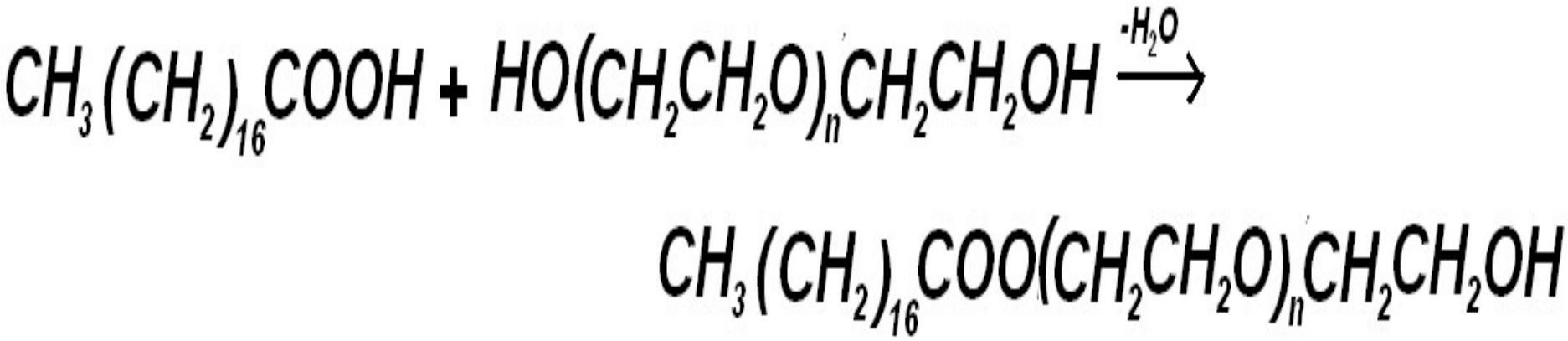
3) Non ionic detergents: They have hydrogen bonding group at soluble ends of chain. These detergents are monoesters of polyhydric alcohols.eg.pentaaerythrityl stearate

Non-ionic detergents



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Cleansing action of soap

Soap molecules has two parts, a long chain hydrocarbon tail soluble in oil and other part head water soluble end.

eg. Sodium sterate.

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On addition of soap over stain, hydrocarbon part of soap molecules dissolves in oil , while water soluble end dissolve in water. Big molecules of oil and soap break by rubbing into small emulsified oil droplets in water

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As a result, a stable emulsion of oil in water is formed, which can be washed away by stream of water. The anions of emulsion repel each other hence do not precipitate.

Soaps and detergents have similar mechanism of cleaning action. The detergents available in market contain 20% active ingredients and remaining are sodium sulphate, inorganic phosphate ,foaming agents, etc.

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