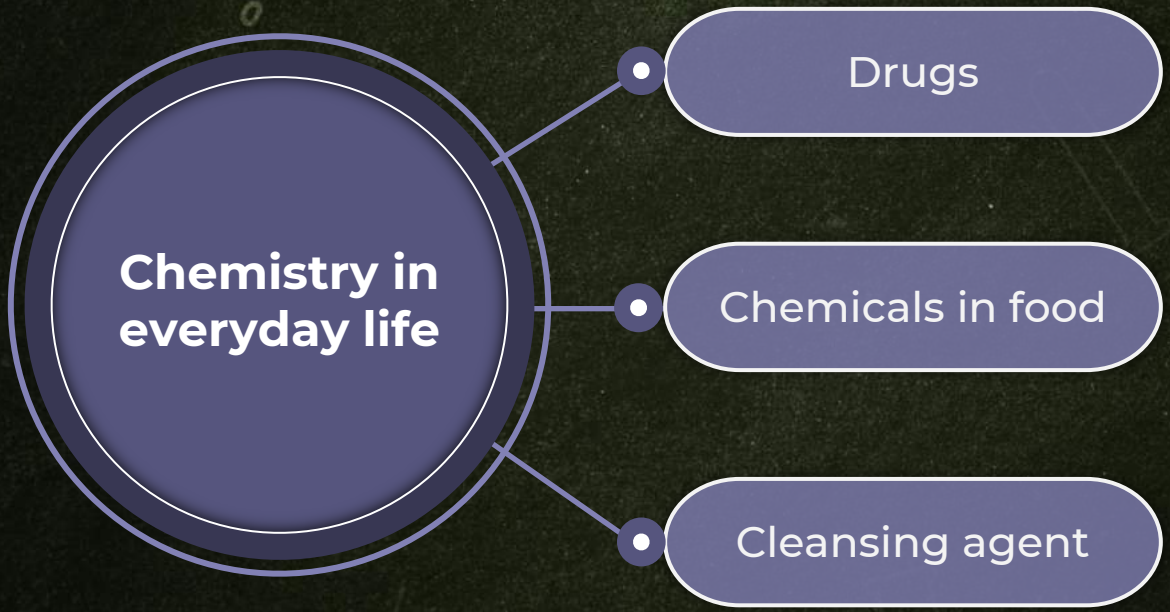
Welcome to

Aakash + BYJU'S LIVE

Chemistry in everyday life

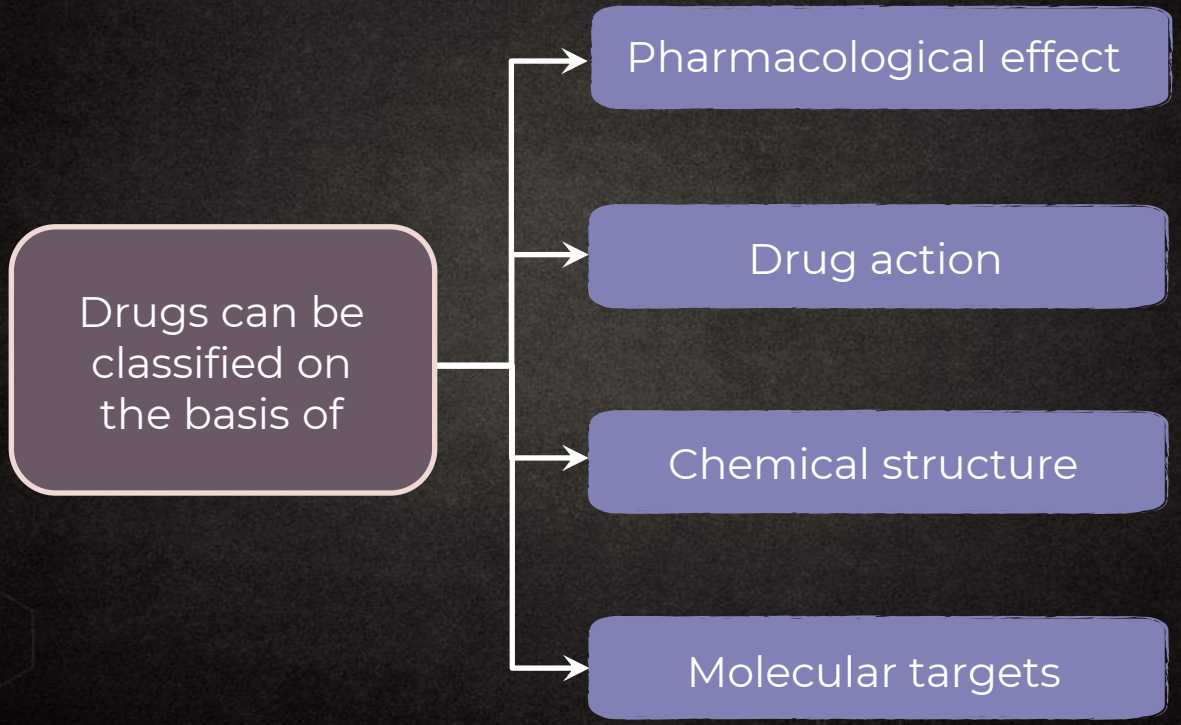

Chemistry in everyday life
Drugs
Chemicals in food
Cleansing agent

Drugs and Medicines

Drugs	Medicines
Chemicals with **low molecular mass** that interact with **macromolecular targets** and produce **biological response**	If **biological** response produced by drug is **therapeutic** and **useful**, the drug is called **medicine**.

~100-500 u

Classification of Drugs



Pharmacological Effect

Useful for doctors as it provides them the **whole range** of drugs available for **treatment.**

For a particular type of **problem**

Example: Antiseptic

Kills the growth of microorganisms

Drug Action

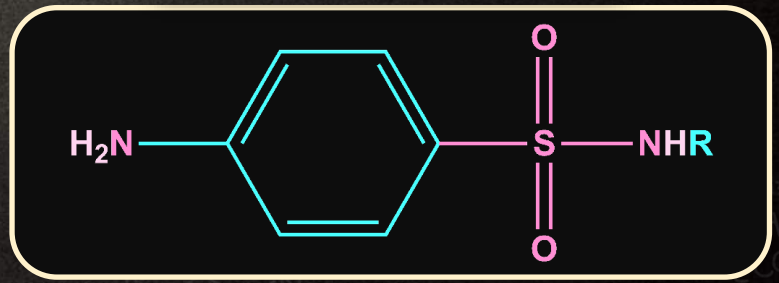
Based on action of drug on a particular biochemical process

The drugs classified share common **structural features** and often similar **pharmacological activities.**

All **antihistamines** inhibit the action of **histamine**.

Causes **inflammation** in the body

Sulphonamides



Molecular Target

Drug possessing some common **structural features**

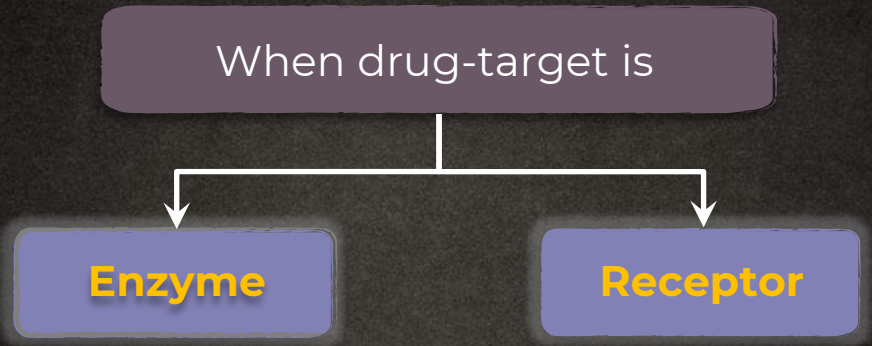
They may have the **same** mechanism of **action** on targets.

Drug usually interact with biomolecules.

Carbohydrates, lipids, proteins and more

Target molecules

Drug-Receptor Interaction



Drug-Enzyme Interaction

Drugs inhibit the activity of enzymes by two ways

1. Drugs **block** the **binding site** of the enzyme

Prevents binding of **substrate**

2. Drugs can **inhibit** the catalytic activity of the **enzyme**

Enzyme Inhibitor

Drug-Enzyme Interaction

Drugs **inhibit** the attachment of **substrates** on the **active site** of the enzyme by

- **Competitive inhibitors**
  - Drugs that **compete** with a **natural substrate** to get attached on an **active site**
- **Using allosteric site**

Allosteric Site

Some drugs bind to a different site of an enzyme.

Allosteric site

It changes the shape of an active site.

Unrecognizable by a substrate

NOTE

01

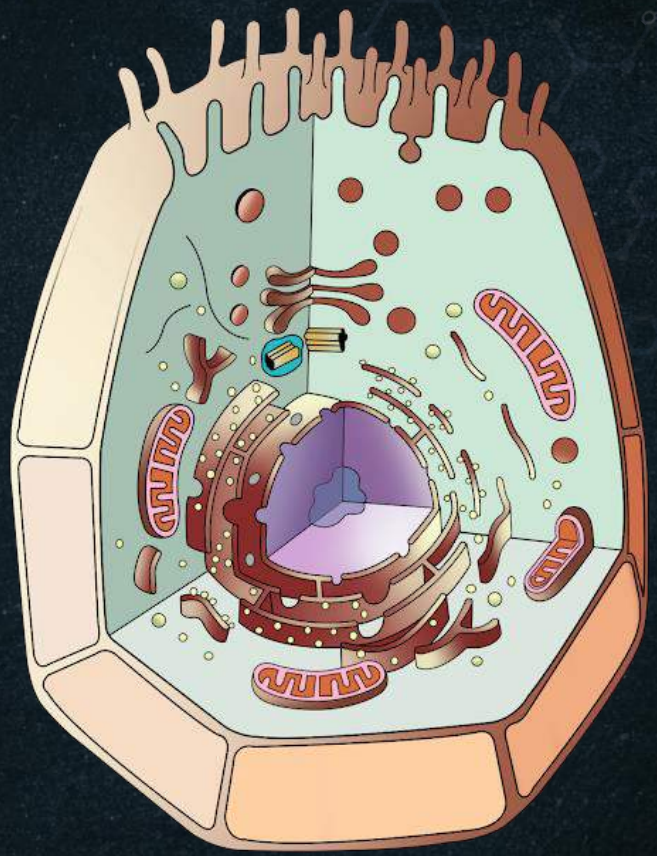
If the bond formed between an **enzyme** and an **inhibitor** is strong covalent bond

Then enzyme gets **permanently blocked**

02

Receptors are embedded in the cell membranes.

Receptors as Drug-Targets

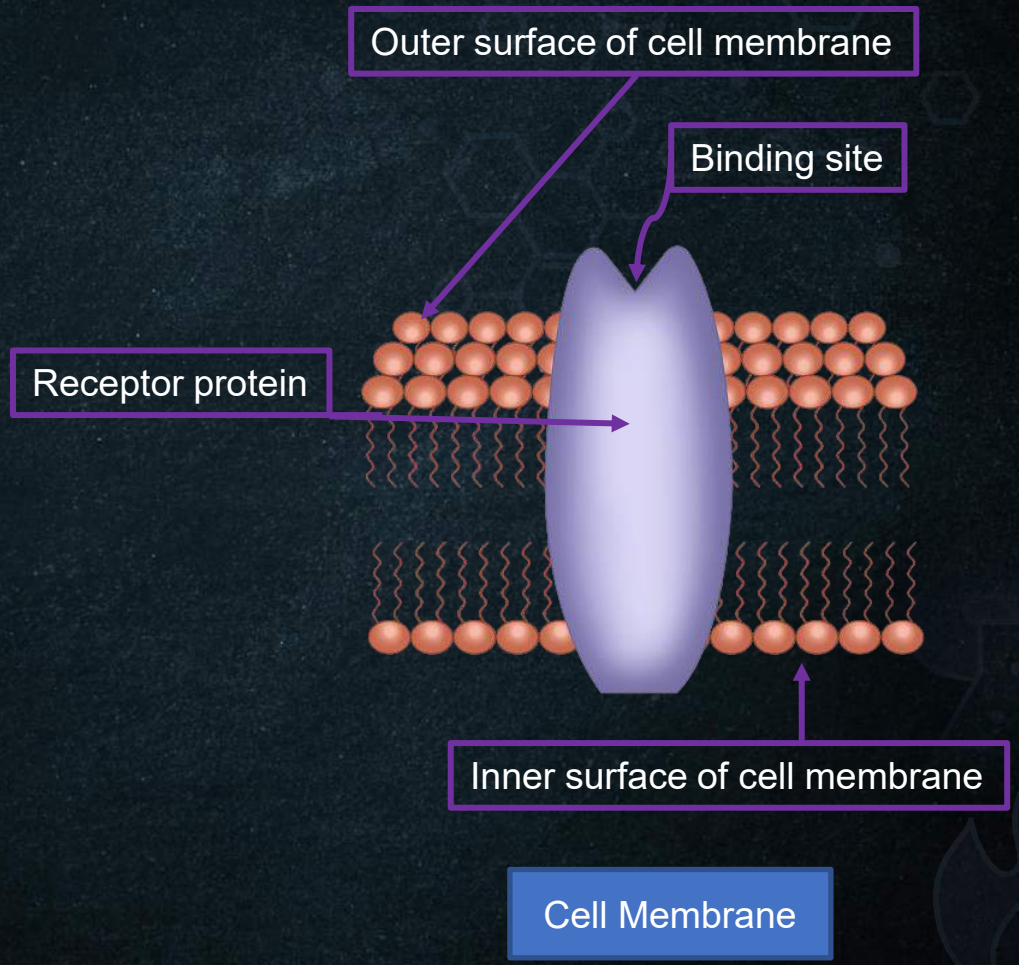


Plasma membrane

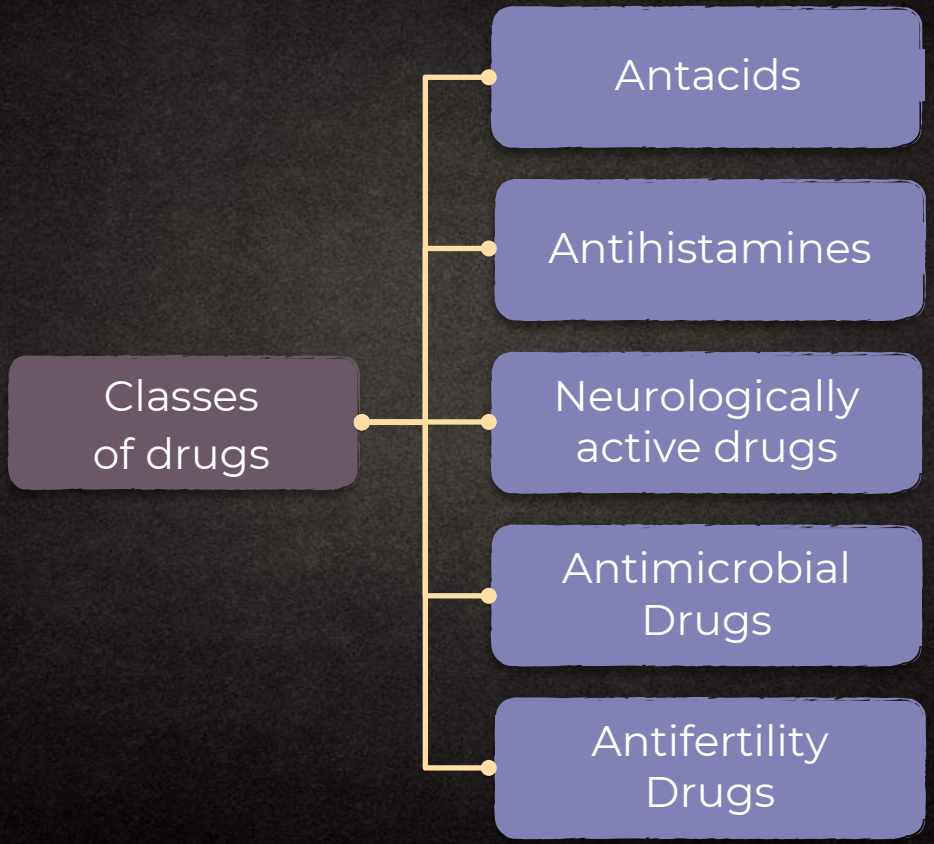
Animal Cell

Receptors as Drug-Targets

Receptors are proteins that are crucial to a 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



Classification of Drugs

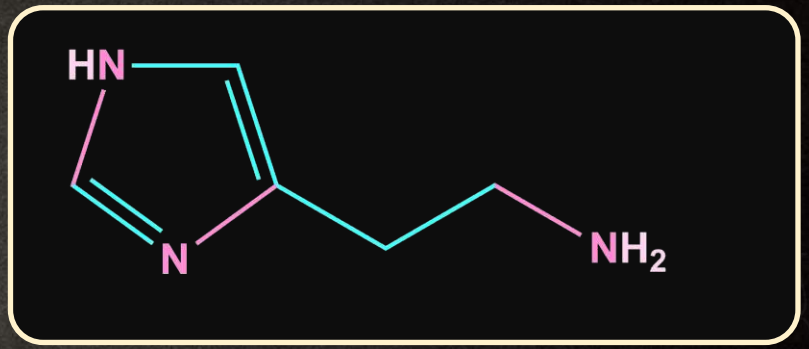


Antacids

Previously, **antacids** such as **$NaHCO_3$** or a mixture of **$Al(OH)_3$** and **$Mg(OH)_2$** were **used.**

Excessive **hydrogen carbonate** can make the **stomach alkaline** and **trigger** the production of even **more acid.**

Histamine



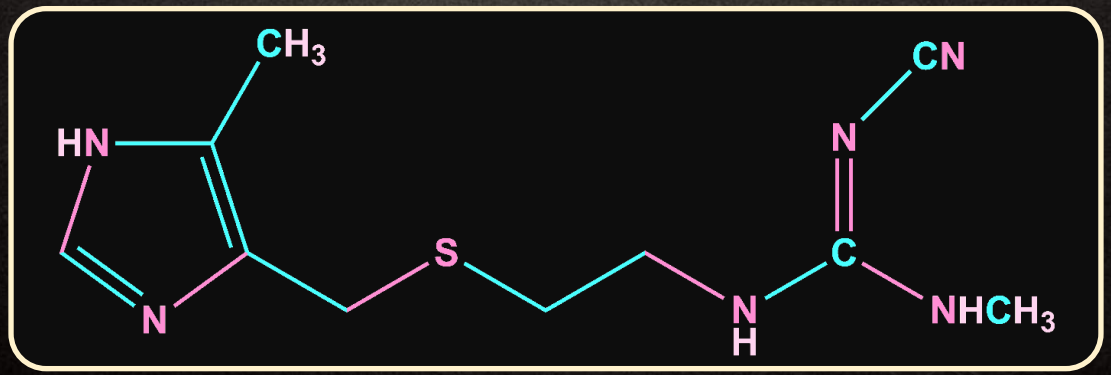
It stimulates the secretion of **pepsin** and **HCl** in the **stomach**

Antacids

Cimetidine (Tegamet)

It **prevents** the interaction of histamine with **receptors** present in the **stomach** wall.

It results in the **release** of **lesser** amount of **acid**.



Functions of Histamines

01 Potent **vasodilator**

02 Relaxes **muscles**

03 Responsible for **nasal congestion**

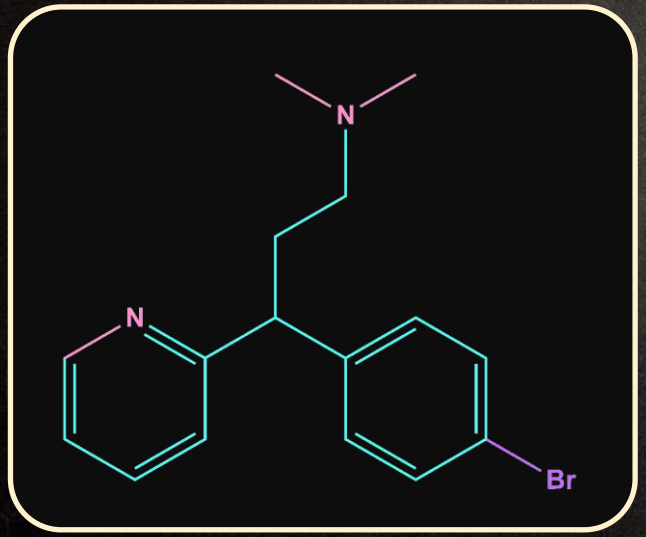
Antihistamines

Drugs that **interfere** with natural action of **histamine** by competing with histamine for the **binding sites** of a **receptor.**

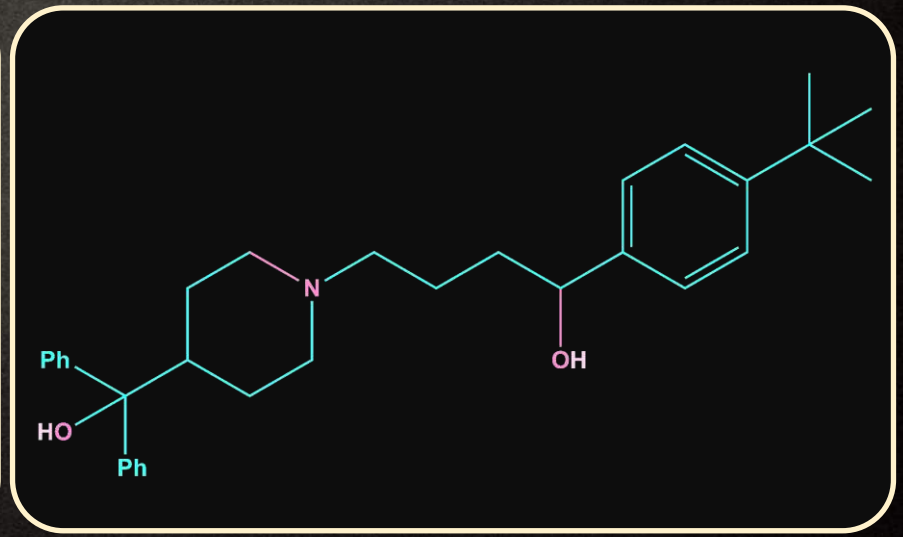
Where **histamine** exerts its effect

Examples of Antihistamines

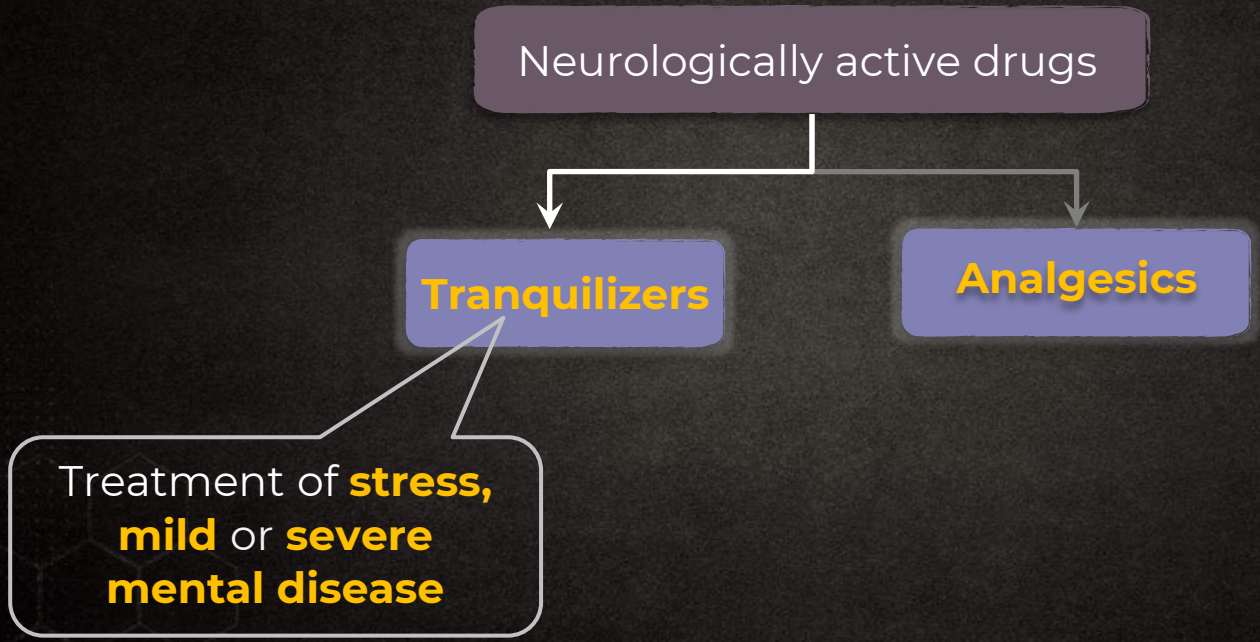
Brompheniramine (Dimetapp, Dimetane)



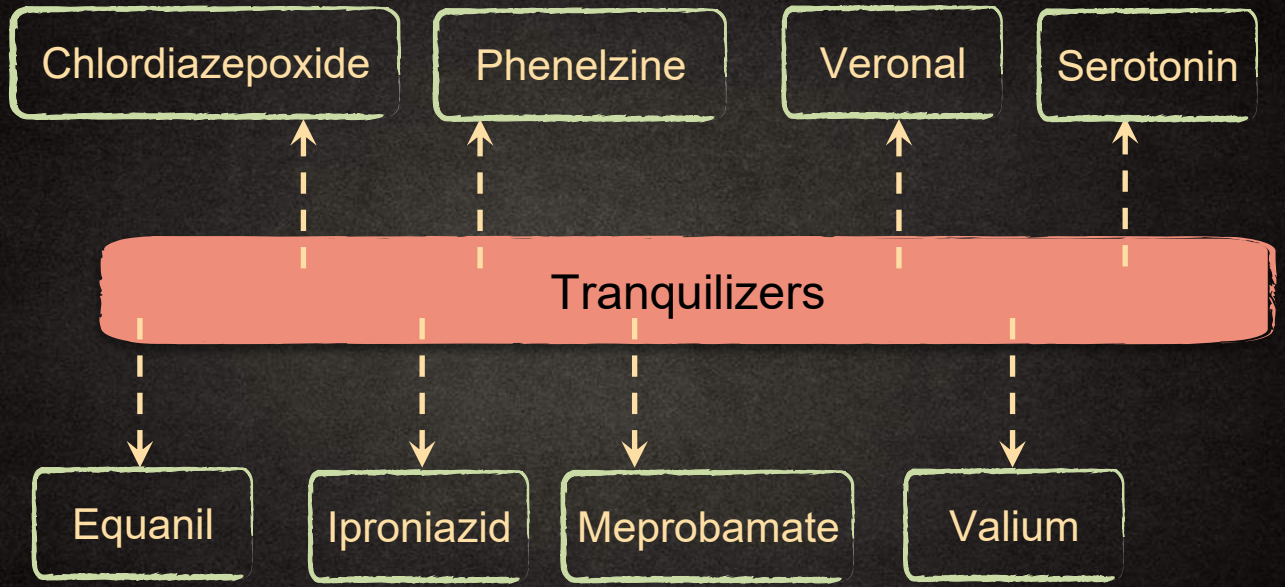
Terfenadine (Seldane)



Neurologically Active Drugs

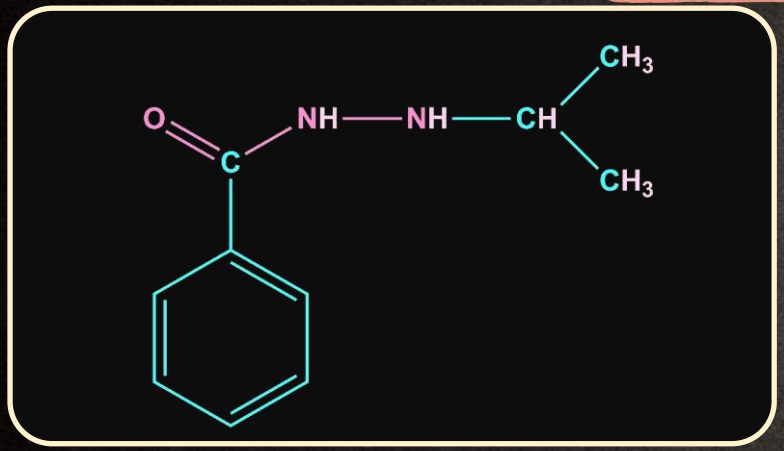


Tranquilizers

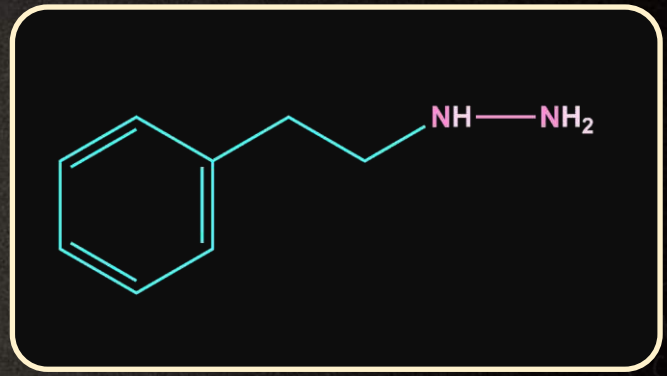


Iproniazid and Phenelzine

Antidepressant drugs



Iproniazid



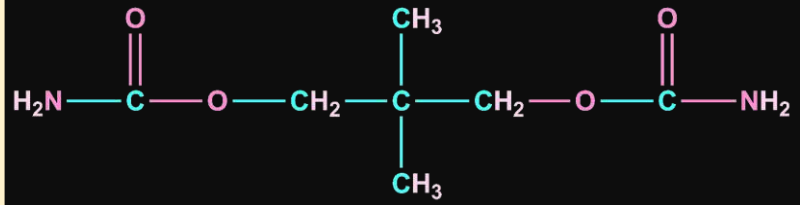
Phenelzine

Nardil

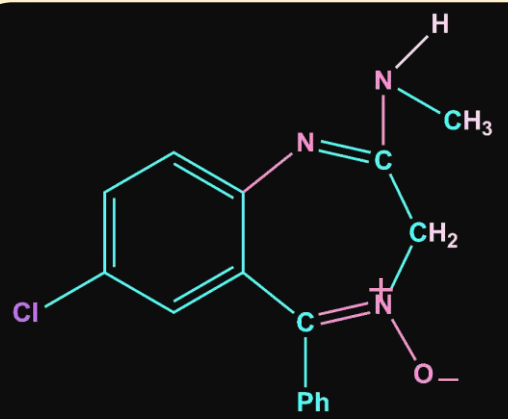
Equanil and Chlordiazepoxide

Used in controlling the **depression** and **hypertension**

Mild tranquilizer for **reducing tension**



Equanil



Chlordiazepoxide

Barbiturates

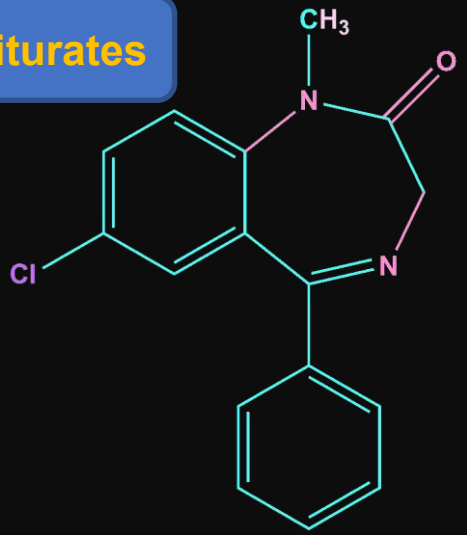
EXAMPLES

Hypnotic

Sleep-producing

Derivatives of Barbiturates

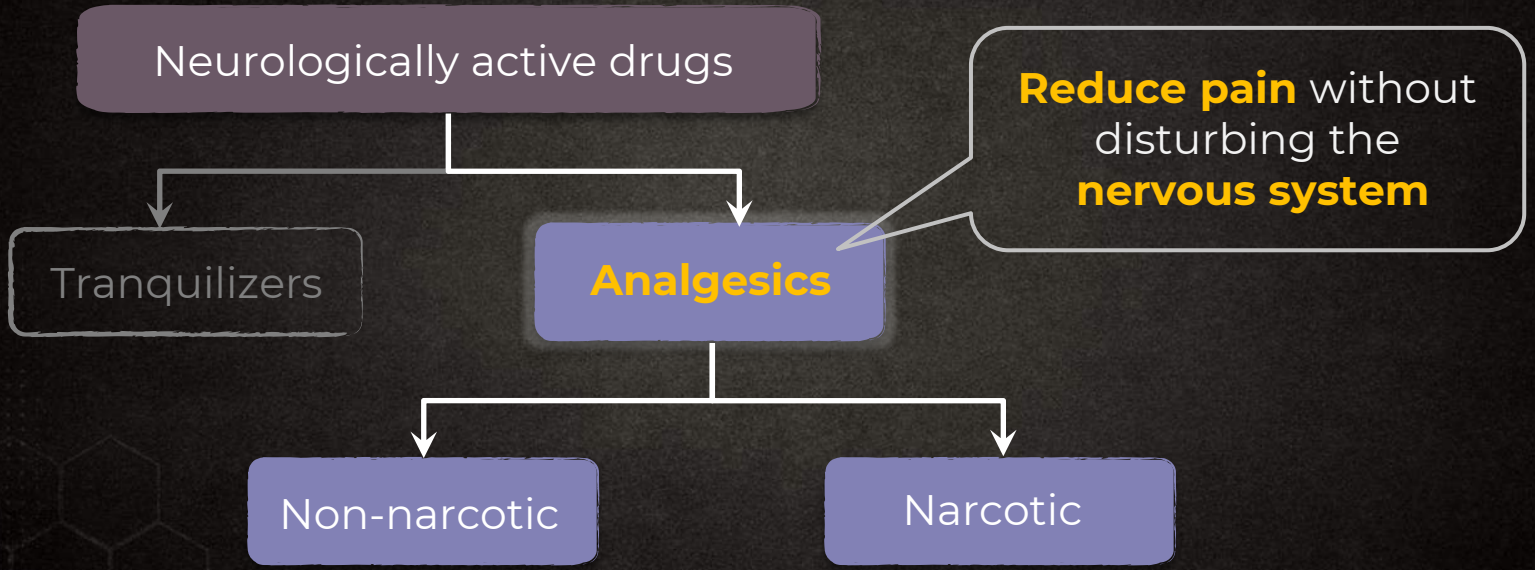
Veronal



Valium

Serotonin

Neurologically Active Drugs



Non-Narcotic Drugs

01 Relieve **skeletal pain**

02 Reduce **fever**

Antipyretic

Aspirin and Paracetamol

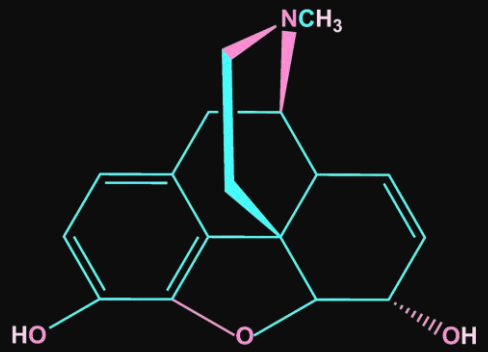
Narcotic Drugs

01 **Relieve pain** and **produce sleep**

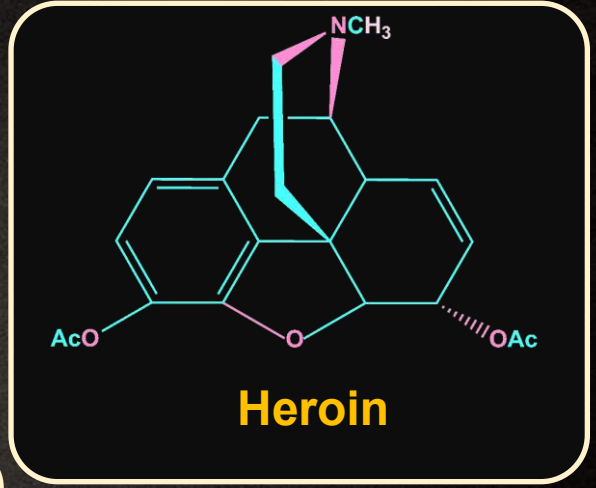
02 In poisonous doses, produce **stupor, coma,** and **ultimately death**

Morphine and many of its **homologues**

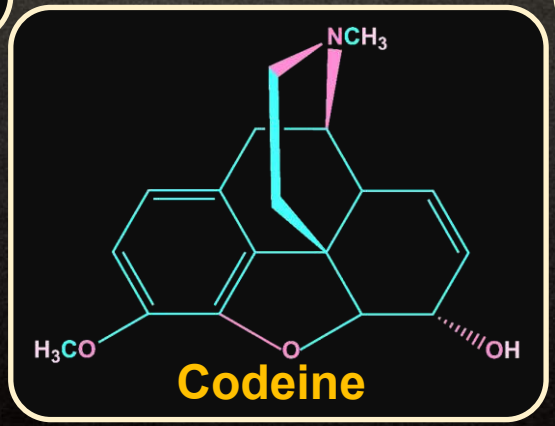
Narcotic Drugs



Morphine



Heroin



Codeine

Antimicrobial Drugs

Disease in **human beings** and **animals** may be caused by a variety of **microorganisms.**

Virus, bacteria, fungi, and more

Antimicrobial tend to **destroy/prevent** the development or inhibit the action of **microbes.**

Antimicrobial Drug

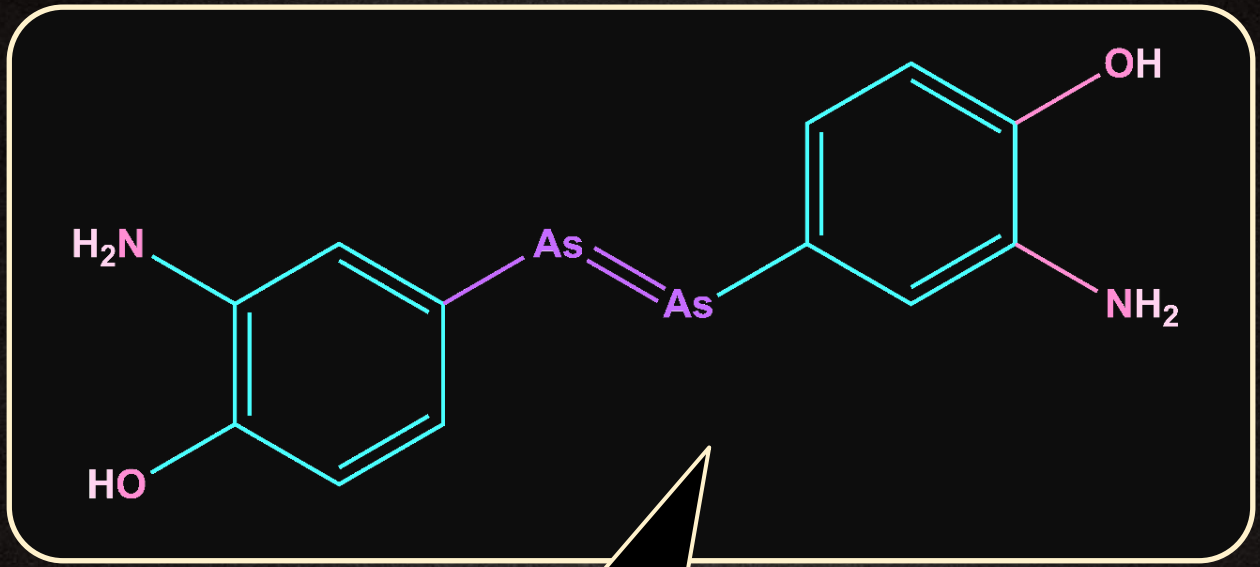
Antimicrobial drugs

Antibiotic

Antiseptic/ Disinfectant

Drugs required to treat **infections** because of **low toxicity** for **human** and **animals.**

Salvarsan



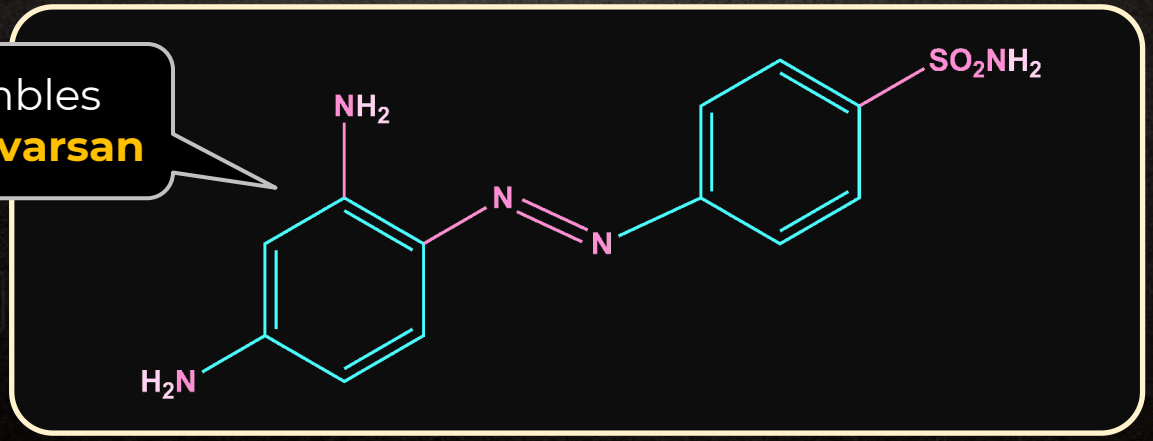
First effective drug for treatment of **syphilis**

Antibiotics

In **1932**, **Paul Ehrlich** succeeded in preparing the **first antibacterial drug.**

Prontosil

Resembles with **Salvarsan**

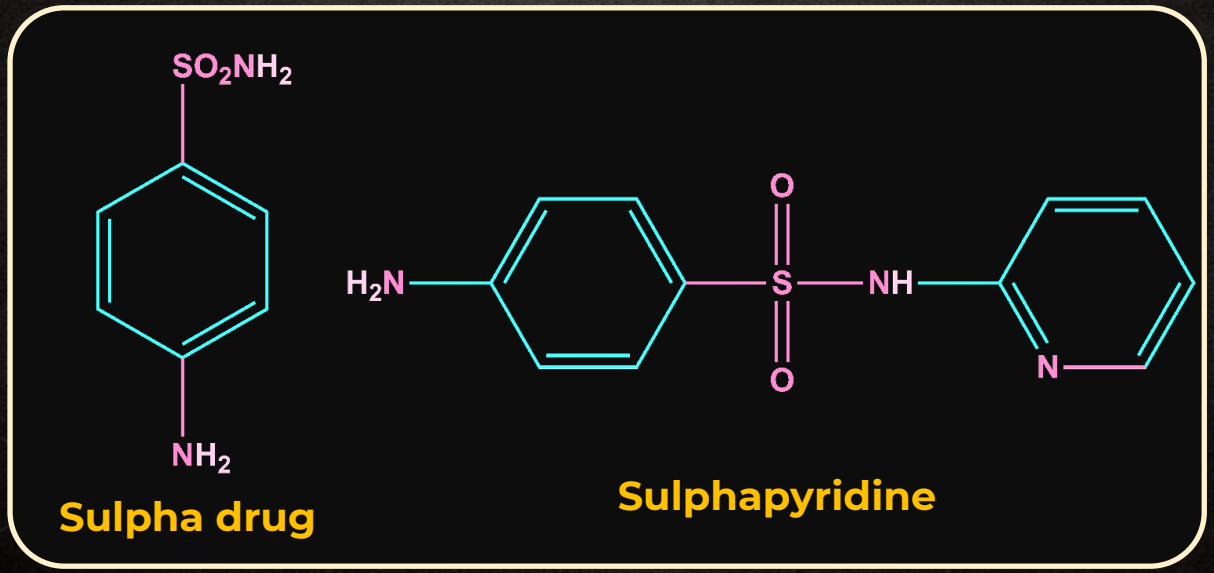


Note!!

Later, it was discovered that prontosil converts to a compound called **sulphanilamide.**

Real **active** compound

Sulphanilamides



Note!!

The real revolution in **antibacterial** therapy began with the discovery of **antibacterial properties** of ***Penicillium* fungus.**

By **Alexander Fleming** in **1929**

Effects of Antibiotics

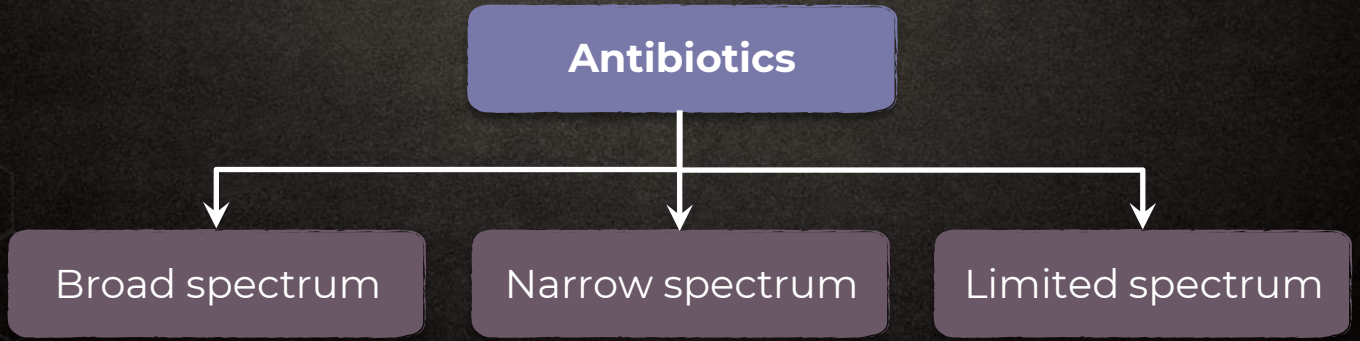
Antibiotics may have

- Cidal (killing effect)
- Static (inhibitory effect)

The range of a bacteria or a microorganism that is affected by a certain antibiotic is called **Spectrum of Action**.

Antibiotics

Bactericidal	Bacteriostatic
Penicillin	Erythromycin
Aminoglycosides	Tetracycline
Ofloxacin	Chloramphenicol



Broad Spectrum Antibiotics

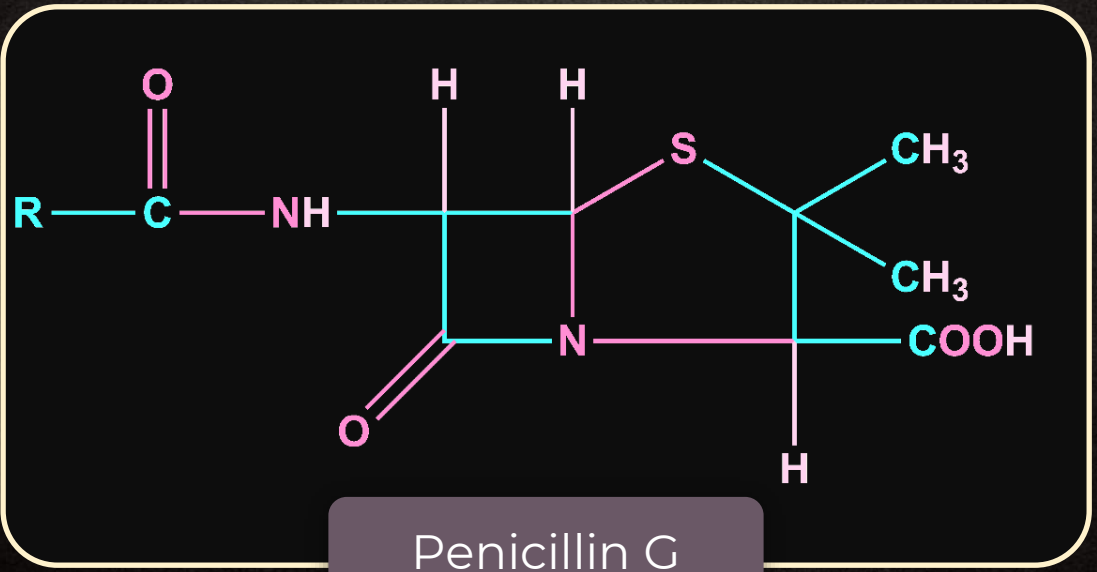
Antibiotics that kill or inhibit a wide range of **gram–positive** and **gram–negative** bacteria.

Chloramphenicol, Vancomycin, Ofloxacin

Narrow Spectrum Antibiotics

These **antibiotics** are effective mainly against gram–positive **or** gram–negative bacteria.

EXAMPLE



Penicillin G

Antiseptics

Applied to **living tissues**

Wounds, cuts, ulcers, and more

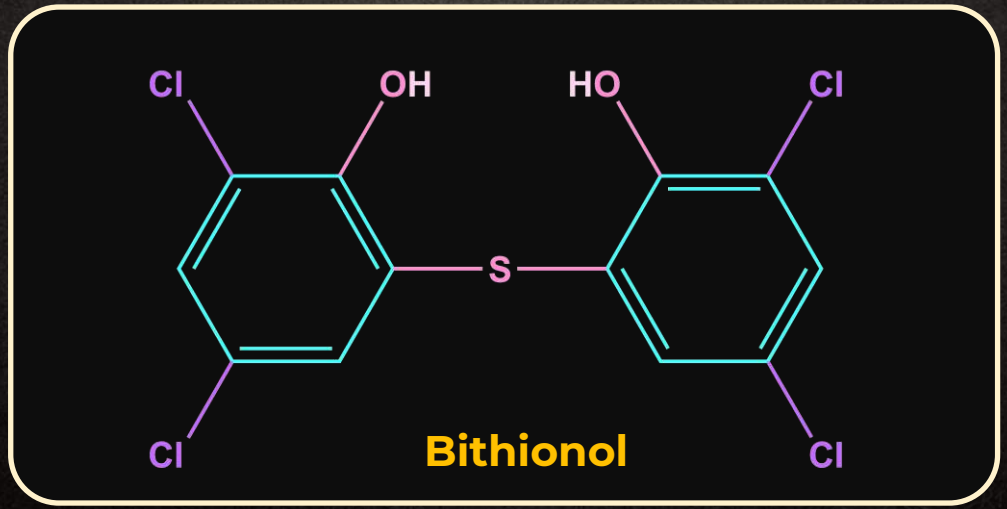
Furacine, Soframycin, and more

Bithionol

Also known as **bithional**

Bithionol is added to **soaps.**

To impart **antiseptic properties**



Antiseptics

Tincture of Iodine is a mixture of **2-3 % iodine** solution in an **alcohol–water** mixture.

Powerful antiseptic

Dettol as antiseptic

Mixture of chloroxylenol and terpineol

Disinfectants

Disinfectants are applied to **inanimate objects**.

Floor, drainage systems, and more

Chlorine

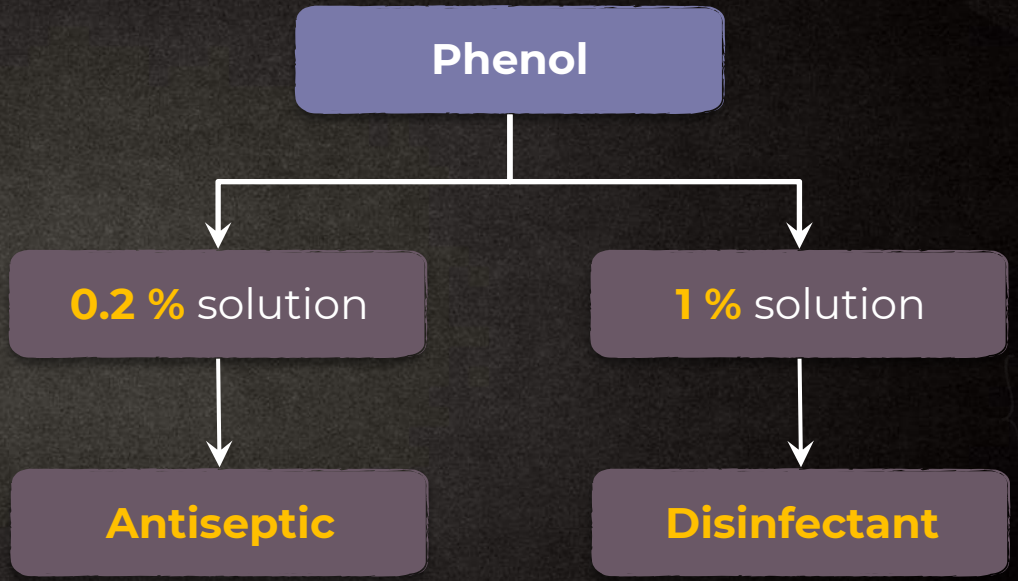
0.2–0.4 ppm in aqueous solution

Low concentration

SO_2

Antiseptics and Disinfectants

Some substance can act as an antiseptic as well as a disinfectant (By varying the concentration)



Antifertility Drugs

To **control overpopulation**, the concept of family planning came into the picture.

Antifertility drugs are **used** for this purpose.

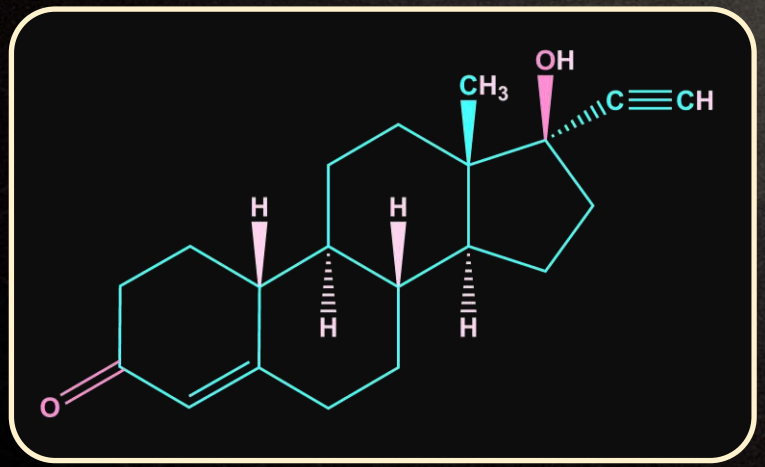
Antifertility Drugs

Suppresses ovulation

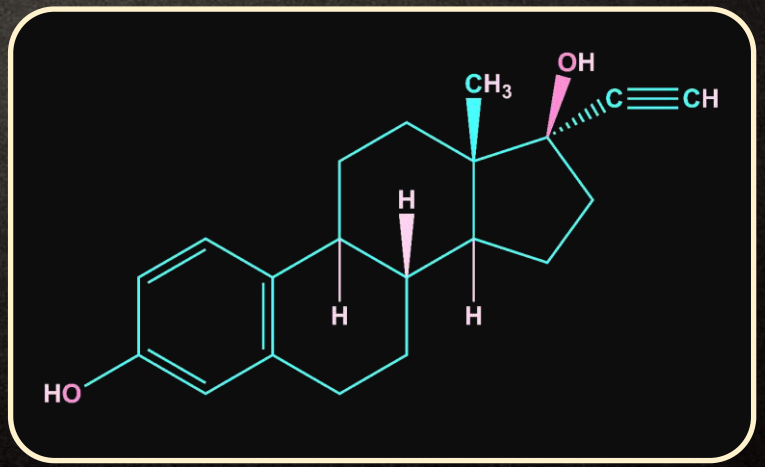
Norethindrone

↓

Synthetic **progesterone**



Ethynylestradiol (Novestrol)



Chemical In Food

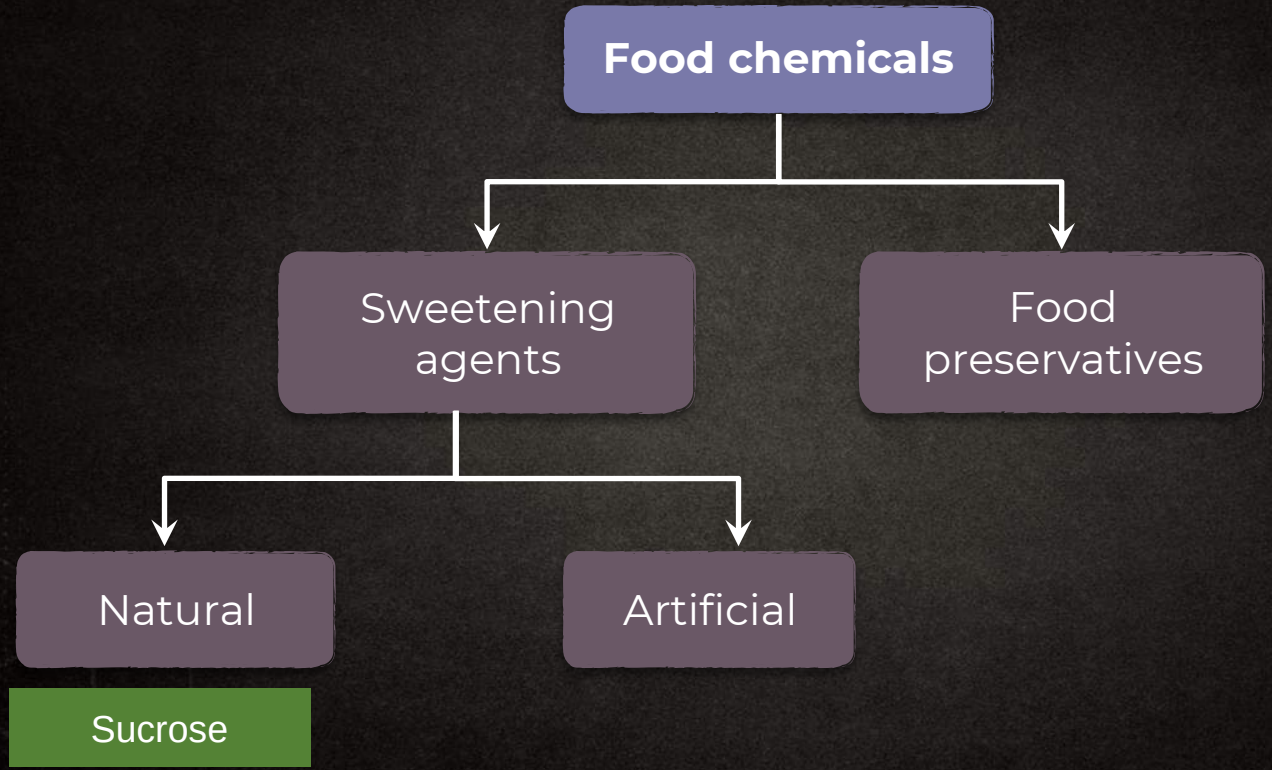
Chemicals are added to **food** for:

01 **Preserving**

02 Enhancing **appeal**

03 Adding **nutritive value**

Chemical In Food



Artificial Sweeteners

Trick to remember artificial sweeteners

Saccharin

Sucralose

As Shiny As Sun

Aspartame

Alitame

Aspartame

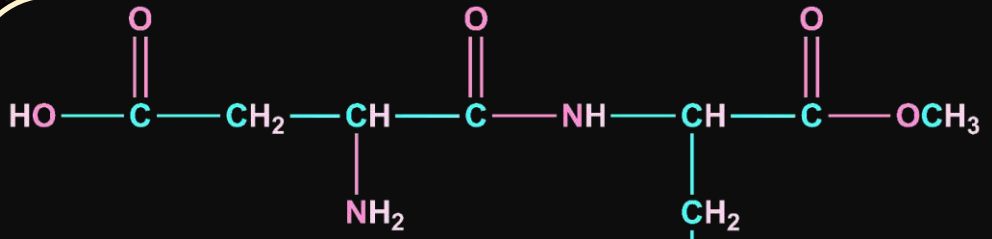
100 times as sweet as cane sugar

Aspartame is the most successful and widely used **artificial sweetener.**

Aspartame is **methyl ester** of **dipeptide**

Created from **aspartic acid** and **phenylalanine**

Structure and Uses of Aspartame



Aspartic acid part

Phenylalanine methyl ester part

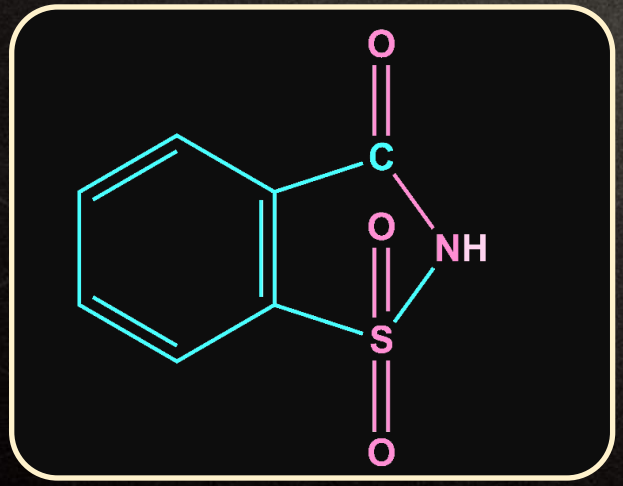
Aspartame is limited to **cold foods** and **soft drinks.**

Unstable at cooking temperatures

Saccharin

It is the first popular **artificial sweetening agent.**

550 times sweeter than cane sugar



Saccharin is excreted from the body in an unchanged form through **urine**.

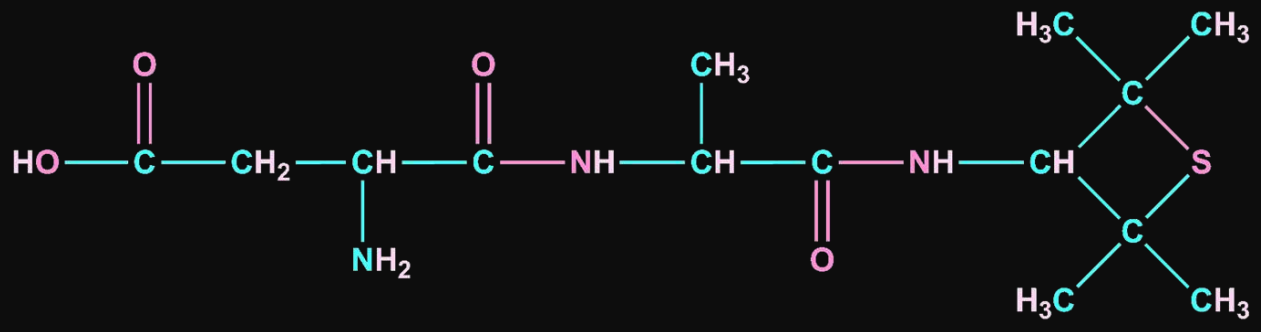
Alitame

It is a potent sweetener that is **more stable** than aspartame.

However, it is difficult to control the **sweetness** while using it.

Alitame is **2000 times** sweeter than cane sugar.

Structure of Alitame

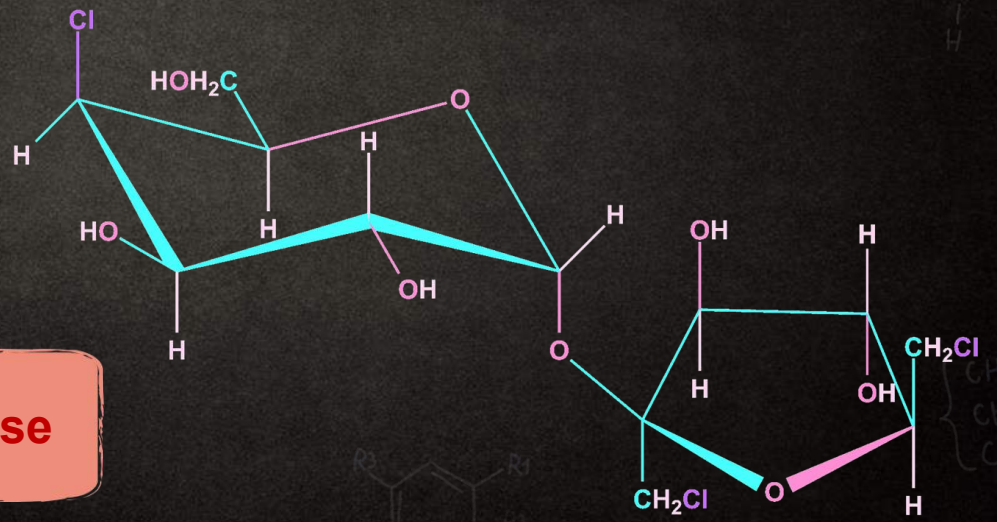


Alitame

Sucralose

600 times sweeter than cane sugar

Sucralose is **stable** at cooking temperature and does **not** add **calories.**



Trichloro derivative of **sucrose**

Sucralose

Food Preservatives

They **prevent** the spoilage of food due to **microbial growth**.

- **Table salt**
- **Sugar**
- **Vegetable oil**
- **Sodium benzoate**
- **Salts of sorbic acid and propanoic acid**

Food Preservative

Vegetable oil

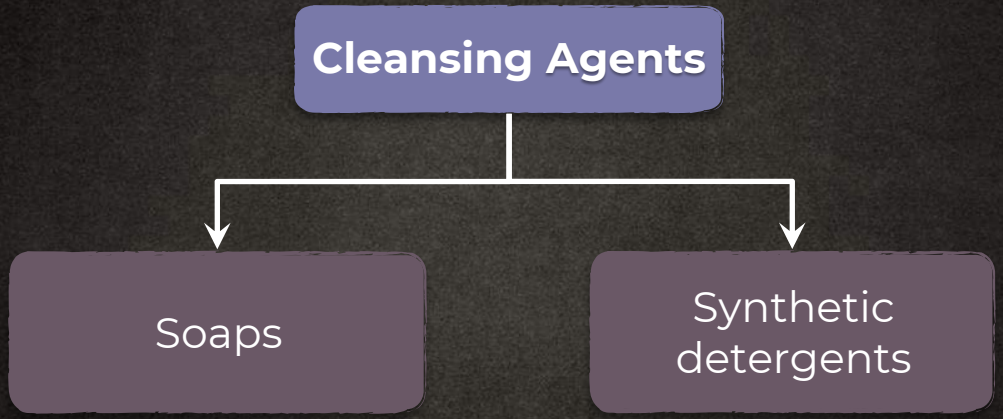
Sugar

Sodium benzoate

Sodium salt

Food preservatives prevent spoilage of food due to microbial growth. The most commonly used preservatives include table salt, sugar, vegetable oils, and sodium benzoate.

Cleansing Agents



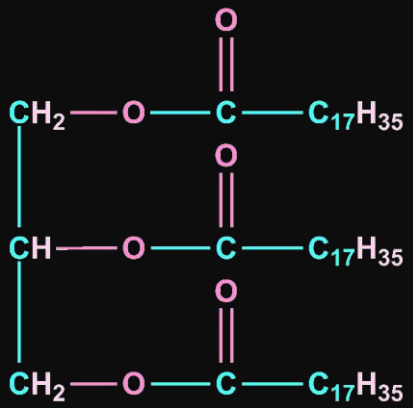
Soaps

Soaps are **sodium** or **potassium salts** of long chain **fatty acids.**

Stearic, Oleic, and **palmitic acid**

Saponification Reaction

Preparation

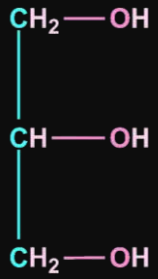


Glyceryl ester of stearic acid (fat)

$$+\ 3NaOH \longrightarrow 3C_{17}H_{35}COONa +$$

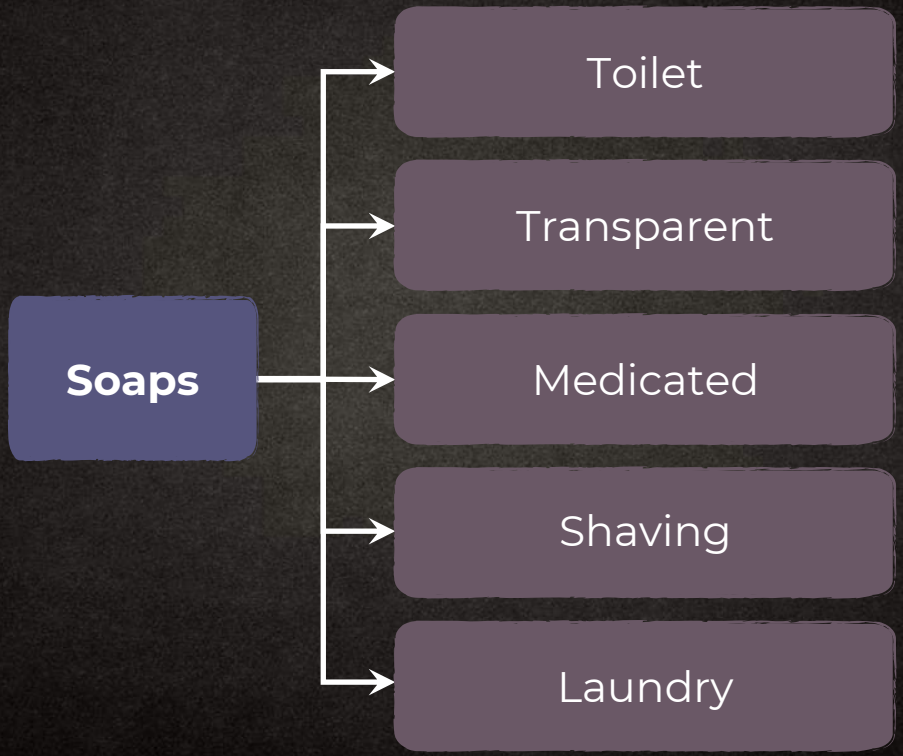
Sodium hydroxide

Sodium stearate



Glycerol (or glycerine)

Types of Soaps



Toilet Soap

To **remove** excess of **alkali**

These are prepared by using better grades of **fats** and **oils**.

Perfumes and **colors** are added to make them **more attractive**.

Transparent Soap

They are made by **dissolving** soap in **ethanol** and then **evaporating** the excess solvent.

Medicated Soap

They are made by adding **substances** of **medicinal** value.

Shaving Soap

It contains **glycerol** to **prevent** rapid drying.

Forms **sodium rosinate,** which lathers well

Rosin gum is added while making such soaps.

Laundry Soap

They contain **fillers**.

Sodium rosinate, sodium silicate, borax, Na_2CO_3, and more

Synthetic Detergents

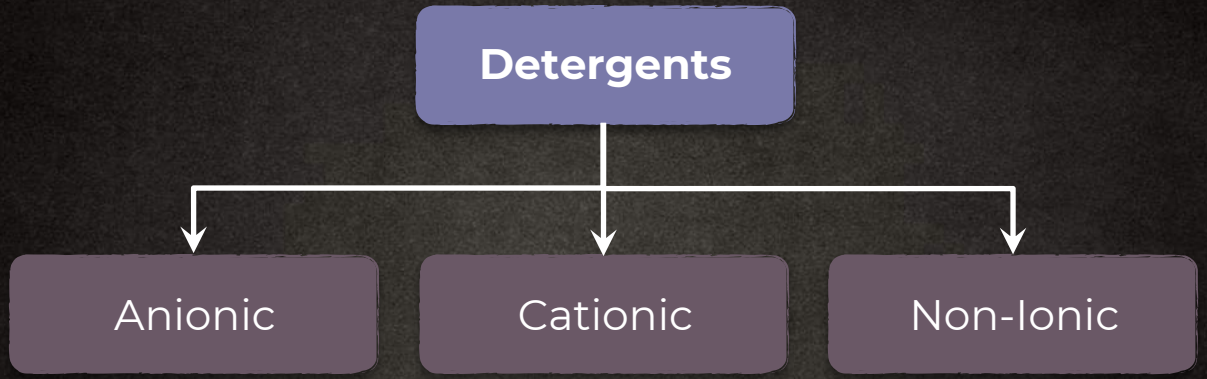
Synthetic detergents are **cleansing agents** that have all **properties** of soaps.

But

They, actually, **do not** contain any **soap.**

They can be used in **soft** and **hard water**

Detergents



Anionic Detergents

Preparation

$CH_3(CH_2)_{10}CH_2OH \xrightarrow{H_2SO_4} CH_3(CH_2)_{10}CH_2OSO_3H$

Lauryl alcohol

Lauryl hydrogensulphate

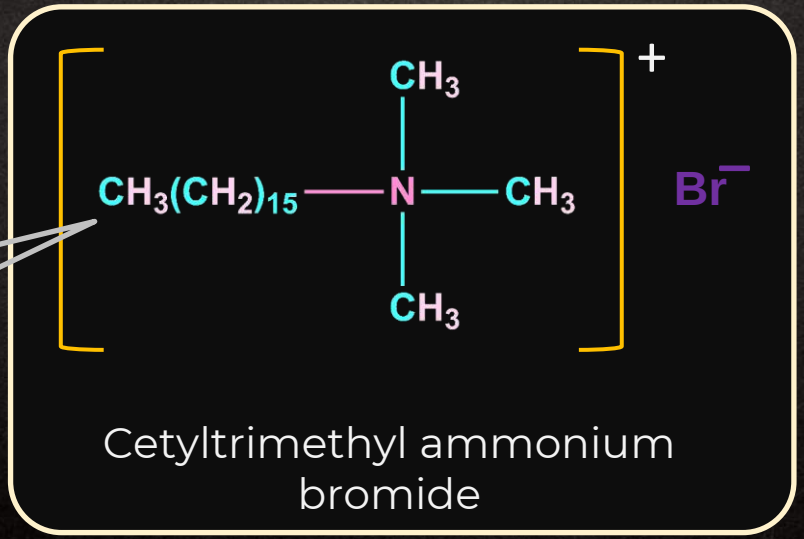
$\xrightarrow{\text{aq. NaOH}}$

$CH_3(CH_2)_{10}CH_2OSO_3^-Na^+$

Sodium laurylsulphate (anionic detergent)

Cationic Detergents

Cationic part possess a **long hydrocarbon chain** and possess **positive** charge on **nitrogen** atom



Used in **hair conditioner**

Non-Ionic Detergents

They do not contain any ion.

Example:

Liquid dish washing detergents

Disadvantages:

If their hydrocarbon chain is highly branched,

Bacteria cannot degrade easily

Non-Ionic Detergents

Preparation