

CHEMISTRY IN ACTION

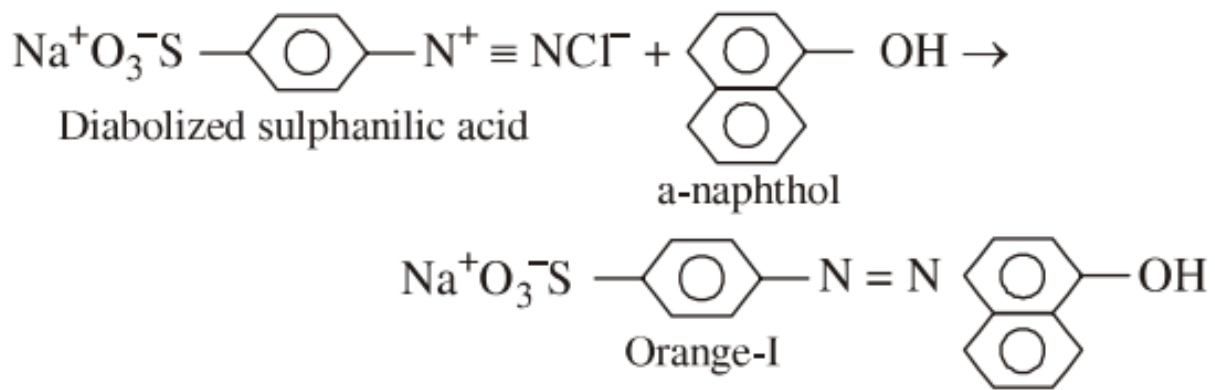
Dyes

These are coloured chemical substances used to impart colours to the textile fibres, food stuffs, plastic materials, silk, wool, paper, leather and other materials.

Classification of Dyes

A. Classification of dyes based on application

- I. **Acid dyes** : These dyes are usually sodium salts of sulphonic acid ($-\text{SO}_3\text{H}$) or phenolic compounds. These are used to colour wool, natural silk and nylon. They cannot be used to colour cotton.
Examples : martius yellow, naphthol blue, methyl red, methyl orange, orange I, orange II etc.



II. Direct dyes : It can be applied by immersing fibre in hot aqueous solution of dye. These are suitable for fabrics which can form hydrogen bonds like nylon, rayon, cotton, wool and silk. *Example :* martius yellow, congo red, direct black etc.

III. Basic dyes : Basic dyes contain amino group and are used to dye nylons and polyesters. *Examples :* malachite green, aniline yellow, methyl violet etc.

IV. Ingrain dyes : These dyes are produced within the fabric by coupling of phenol or naphthol adsorbed on the surface of fabric with diazonium salt. These are used to dye silk, cotton, polyester and nylon. *Examples :* azo dyes.

V. Mordant dyes : These dyes cannot be used directly and require another substance called as mordant to bind fabric and dye. A metal ion is used as mordant, *Example* : alizarin dye.

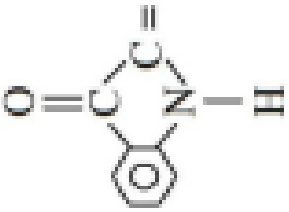
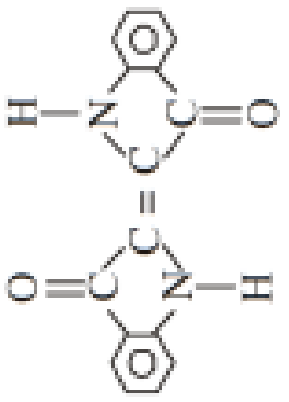
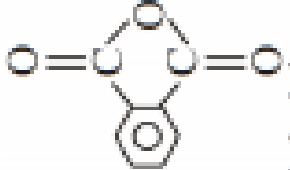
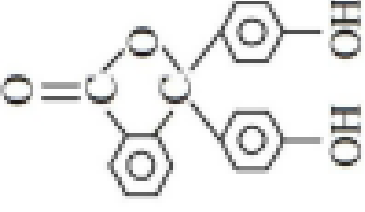
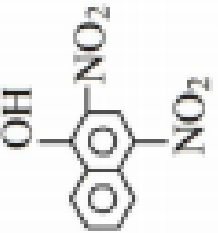
VI. Fibre reactive dye : These dyes form permanent chemical bonds with hydroxy or amino group of the fibres of cotton, wool or silk. Examples : derivatives of 2, 4-dichloro-1, 3, 5-triazine.

VII. Vat dyes : These dyes are applied to the fabric in reduced state in which dye is soluble and colourless and then oxidized to insoluble coloured dye. *Example* : indigo.

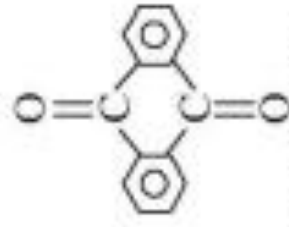
VIII. Disperse dyes : These are water insoluble dyes and are dispersed by suitable reagent before application on synthetic fibre. These are usually meant for nylon, polyester and polyacrylonitrile. Examples : anthraquinone dye, mono-azo dye etc.

B. Classification of dyes based on chemical constitution

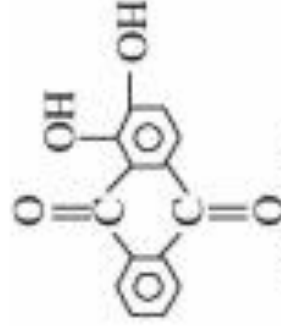
These dyes are as follows :

Name of dye	Structural unit	Example
I. Azo dyes	$-N=N-$ Azo group	$Na^+O_3^-S-C_6H_4-N=N-C_6H_4-OH$ Orange I
II. Indigoid dyes	 Indigoid group	 Indigo
III. Phthalein dyes	 Phthalein group	 Phthalein group
IV. Nitro dyes	$-N \begin{matrix} \nearrow O \\ \searrow O \end{matrix}$ Nitro group	 Martius yellow

V. Anthraquinone dyes

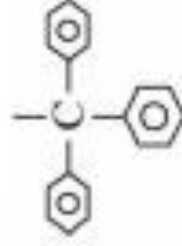


Anthraquinone group

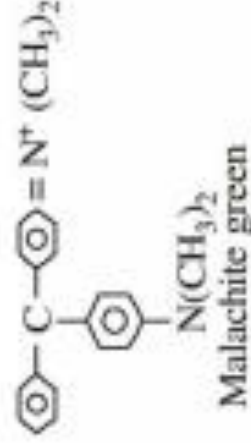


Alizarin

VI. Triphenyl methane dyes



Triphenyl methane group

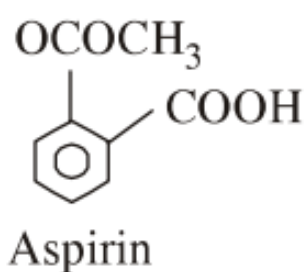


Malachite green



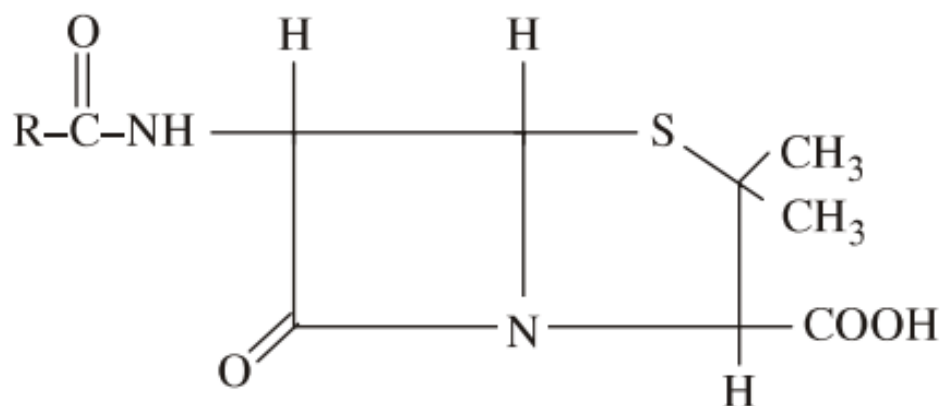
Medicines or drugs are chemical substances which are used to prevent or cure diseases.

I. Antipyretics : These are the substances used to bring down body temperature in high fever such as, aspirin, paracetamol and phenacetin.



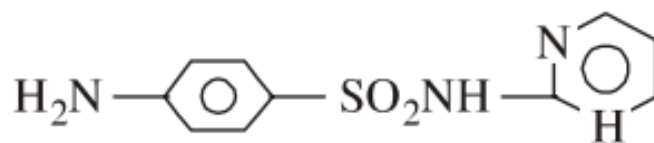
- II. Antiseptics :** These are applied on living tissues to kill or prevent the growth of micro-organisms, such as, tincture of iodine, dettol, bithional used in medicated soaps, genation violet, emthylene blue etc.
- III. Analgesics :** These are the substances used to relives pains, such as, aspirin, novalgin etc. Certain narcotics like morphine, marijuane, codeine and heroin are also used as analgesics.
- IV. Antibiotics :** These are the substances produced by micro-organisms to destroy or

inhibit the growth of other micro-organisms, such as, penicillin is used for bronchitis, pneumonia, sore throat and access etc. Streptomycin is used for tuberculosis and tetramycin is used in typhoid fever, meningitis and local infections etc.



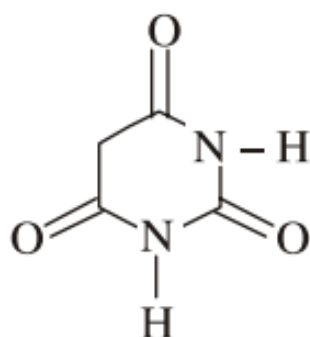
General structure of penicillin

- V. Disinfectants :** These are also used to kill micro-organisms while it cannot be applied on living tissues e.g. phenol.
- VI. Sulpha drugs :** Sulphadiazine, sulphani-
amide, sulphathiozole, sulphaguanidine,
sulphaacetamide etc. are sulpha drugs.
They possess powerful antibacterial
property.

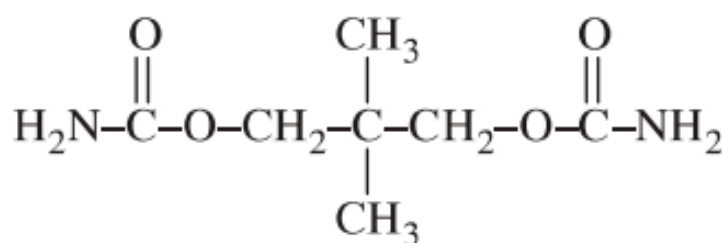


Sulphadiazine

VII. Tranquilizers : These are used to cure mental diseases like mental tension, depression etc. They act on higher centres of nervous system and are the constituents of sleeping pills, such as, barbituric acid and its derivatives like luminal and seconal.



Barbituric acid



Equanil

Equanil is used in depression and hypertension.

VIII. Anaesthetics : These are used to produce general or local insensibility to pains and other sensations. Cocaine and novocaine are commonly used local anaesthetics.

IX. Antimalarial drugs : These drugs are used to treat malaria, such as, quinine, chloroquine etc.

X. Germicides : These are the chemical substances used to kill germs, virus and

fungi, such as, phenol, cresols, formaldehyde, DDT, KMnO_4 solution (1%), bleaching powder, chlorine, hydrogen peroxide etc.

Rocket Propellants

A propellant is a combination of an oxidizer and fuel that when ignites undergoes combustion to release large quantities of hot gases. The passage of hot gases through the nozzle of the rocket motor gives necessary thrust for the rocket to move forward.

Types of Rocket Propellants

- I. **Solid propellants** : The two types of solid propellants are :
 - (a) **Composite propellants** : These are composed of fuel such as polyurethane or polybutadiene, oxidizer such as ammonium perchlorate, nitrate or chlorate and some additive like finely divided aluminium or magnesium metal.
 - (b) **Double base propellants** : They consist of nitroglycerine and nitrocellulose. Their ignition cannot be regulated.

II. Liquid propellants : The two types of liquid propellants are :

(a) Monopropellants : These contain single chemical compound that acts as a fuel as well as oxidiser, such as hydrazine, hydrogen peroxide, nitromethane, methyl nitrate etc.

(b) Bipropellants : These contain liquid fuel and liquid oxidizer separately and are allowed to combine if required such as kerosene and liquid oxygen, N_2O_4 and unsymmetrical dimethyl hydrazine (UDMH) and N_2O_4 and monomethyl hydrazine (MMH), liquid H_2 and liquid O_2 etc.

III. Hybrid propellants : It consist of solid fuel and liquid oxidizer, such as acrylic rubber (solid fuel) and liquid N_2O_4 (liquid oxidizer).

Some Important Facts

- I. Alizarin (red) and indigo (blue) were probably the earliest dyes. These are obtained from plants.
- II. Chromophore are responsible for selective absorption of light.

- III. The dye consists of chromogen and auxochrome.
 - IV. Azo dyes are the largest class of synthetic dyes.
 - V. Vat dyes are water insoluble dyes so applied to the fabric in reduced state.
 - VI. Auxochrome normally deepens the colour of a chromogen.
 - VII. Important manufacturing units of penicilline are Hindustan Antibiotics Ltd, Pimpri and Indian Drugs and Pharmaceuticals Ltd. Rishikesh.
 - VIII. The first antibiotic was penicillin, it was discovered by Alexander Fleming.
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