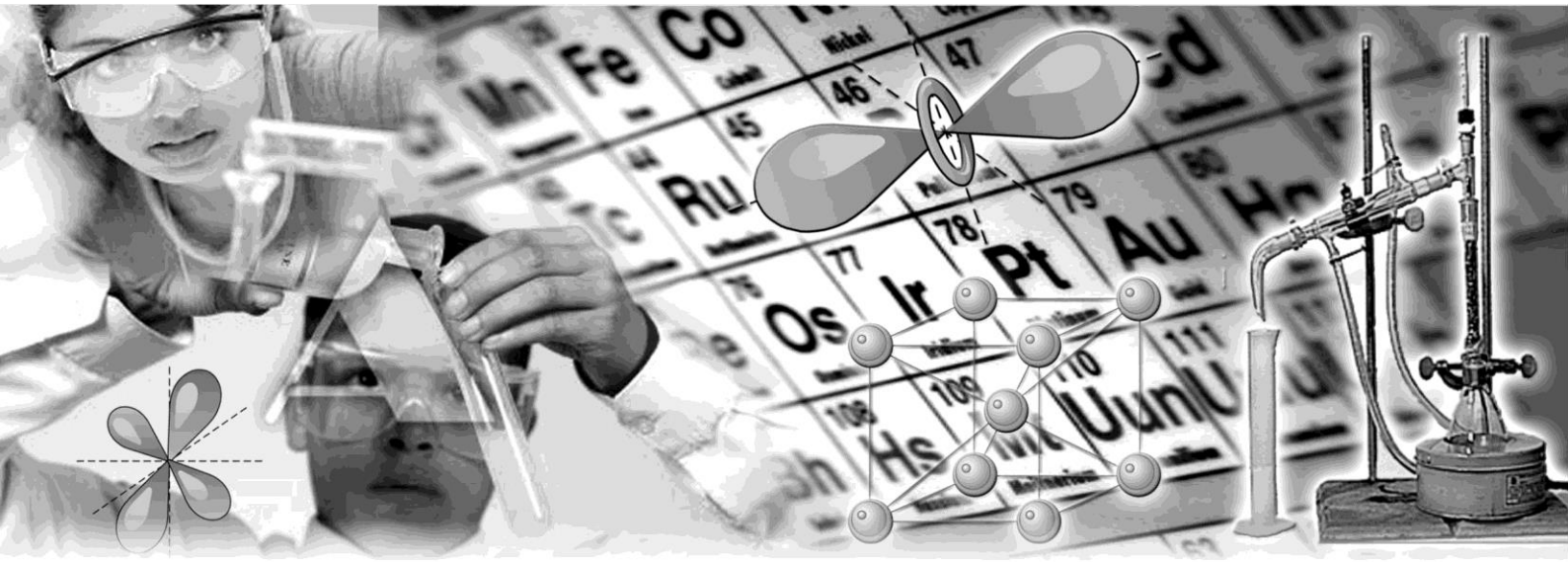


Chapter

32

Chemistry in Action

Chemistry plays very important role in our every day life from the starting, it has been in the service of mankind. Our daily needs of food, clothing, shelter, potable water, medicines etc. are in one or the other manner connected with chemical compounds, processes and principles. We always owe a debt to chemists for their important contributions for giving us life saving drugs, synthetic fibres, synthetic detergents, variety of cosmetics, preservatives for our food, fertilizers, pesticides etc. There is no aspect of our life that is not affected by the developments in chemistry. Thus the mankind owes much to chemistry because it has improved the quality of life.

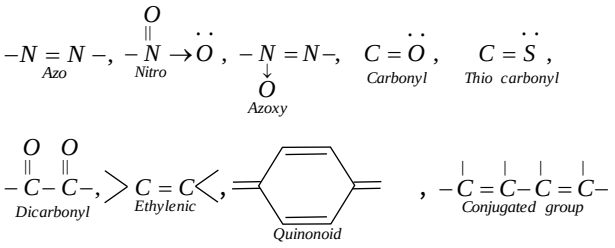
Dyes

Dye is a natural or synthetic colouring matter which is used in solution to stain materials especially fabrics. All the coloured substances are not dyes. A coloured substance is termed as a dye if it fulfils the following conditions,

- ❑ It must have a suitable colour.
- ❑ It can be fixed on the fabric either directly or with the help of mordant.
- ❑ When fixed it must be fast to light and washing, *i.e.*, it must be resistant to the action of water, acids and alkalies, particularly to alkalies as washing soda and soap have alkaline nature.

(1) **Theory of Dyes :** A dye consists of a chromophore group and a salt forming group called **anchoric group. In 1876, Otto witt** put forth a theory as to correlate colour with molecular structure (constitution). The theory is named **'The Chromophore Auxochrome Theory'** and its main postulates are,

(i) The colour of the organic compounds is due to the presence of certain multiple bonded groups called **chromophores**. Important chromophores are,



[Chromophore-Greek word, Chroma = *colour*, Phorein = *to bear*].

The presence of chromophore is not necessarily sufficient for colour. To make a substance coloured, the chromophore has to be conjugated with an extensive system of alternate single and double bonds as exists in aromatic compounds.

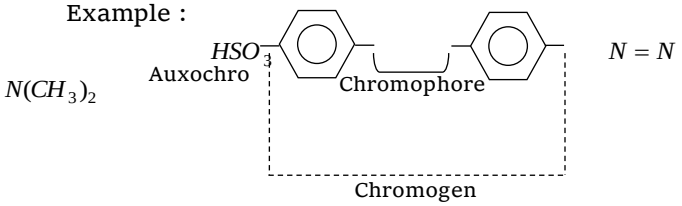
The chromophore part of the coloured substance (dye) absorbs some wavelengths from white light and reflects back the complementary colour. A coloured compound having a chromophore is known as **chromogen**.

(ii) Certain groups, while not producing colour themselves, when present along with a chromophore in an organic substance, intensify the colour. Such colour assisting groups are called **auxochromes** (Greek word, Auxanien = *to increase*; Chrome = *colour*), i.e. they make the colour deep and fast and fix the dye to the fabric. The auxochromes are acidic or basic functional groups. The important auxochromes are,

Acidic : 

Basic : $-NH_2$ (Amino), $-NHR$ (Alkylamino), $-NR_2$ (Dialkylamino)

Example :

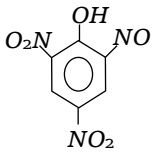


However, Otto witt chromophore-Auxochrome concept fails to explain the colour of certain dye stuffs like indigo.

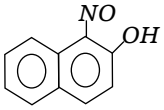
(2) **Classification of Dyes :** Dyes are classified to their chemical constitution or by their application to the fibre.

(i) ***Classification of dyes according to their chemical structure***

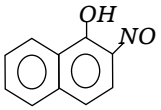
(a) *Nitro and Nitroso dyes* : These dyes contain nitro or nitroso groups as the chromophores and *–OH* as auxochrome. A few example are,



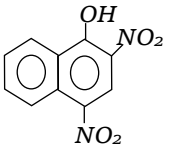
Picric acid (2 : 4 : 6-



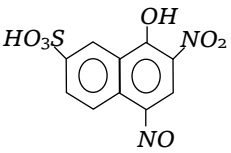
1-Nitroso-2-naphthol



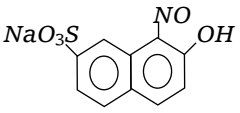
2-Nitroso-1-naphthol



Martius

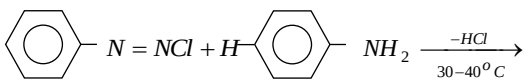


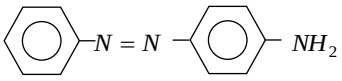
Naphthol



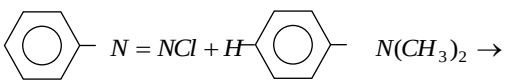
Naphthol green-

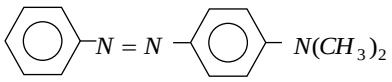
(b) *Azo dyes* : The azo dyes contain one or more azo groups – *N*=*N*–, as the chromophore. Azo dyes constitute the largest and most important group of synthetic dyes. These can be prepared by diazotising an aromatic amine and subsequent coupling with a suitable aromatic phenol or amine.





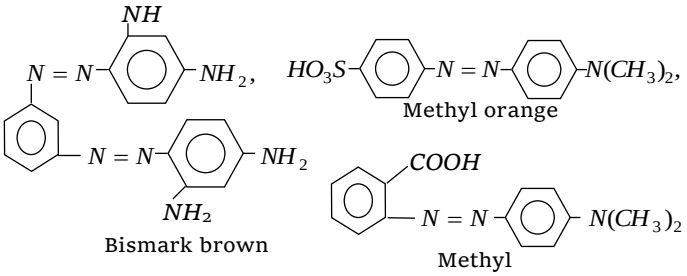
p-Amino azobenzene (Aniline yellow)

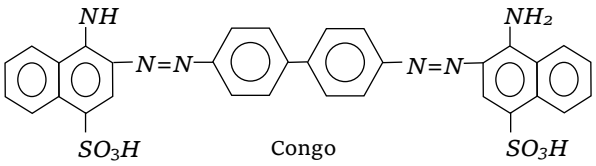




p-Dimethyl amino azobenzene (Butter yellow)

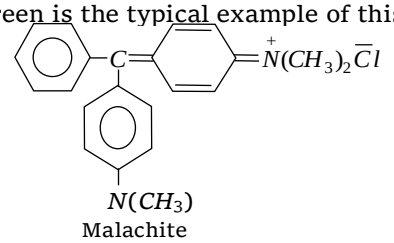
The important azo dyes are the following,





Azo dyes are highly coloured. Azo dyes can be further divided into acid, basic, direct, ingrain or developed dyes, etc., on the basis of mode of application.

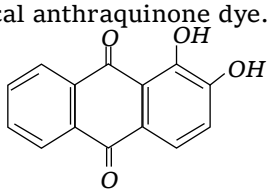
(c) *Tri aryl methane dyes* : In these dyes, the central carbon is bonded to three aromatic rings. One of which is in the quinonoid form (the chromophore). Malachite green is the typical example of this class.



Malachite

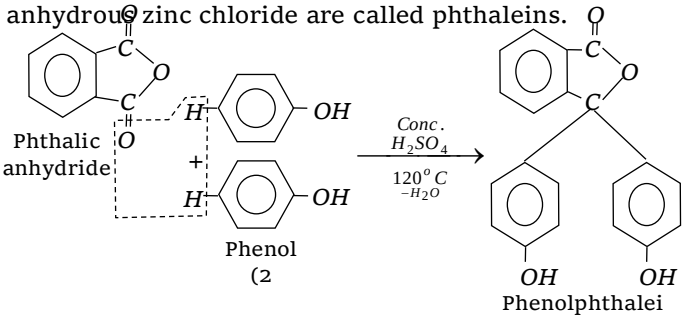
Rosaniline and crystal violet are other two important dyes of this class.

(d) *Anthraquinone dyes* : Para quinonoid chromophore is present in *these* anthracene type dyes. Alizarin is a typical anthraquinone dye.

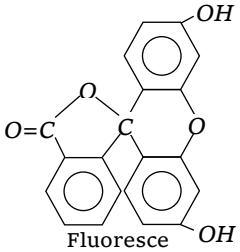


Alizar

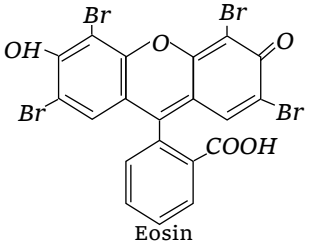
(e) *Phthaleins* : Products obtained by condensation of phthalic anhydride with phenols in presence of dehydrating agents like conc. H_2SO_4 or anhydrous zinc chloride are called phthaleins.



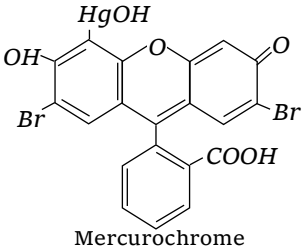
The other important dyes of this class are,



Fluoresce

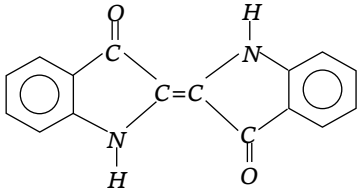


Eosin



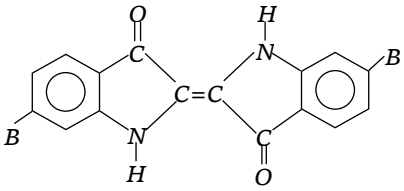
Mercurochrome

(f) *Indigo dyes* : These dyes contain the carbonyl chromophore. Indigo is the oldest known dye.



Indigo (Dark blue crystalline

Another indigo dye is royal blue in colour which is dibromo derivative of indigo. It is called Tyrian blue.



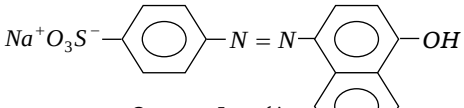
Tyrian purple

❑ Common 'Neel' used as a blueing agent in laundary to remove yellowish tint on white clothes or in whitewashing is not indigo. It is ultramarine blue – an inorganic complex silicate of aluminium and sodium with about 13% sulphur.

(ii) ***Classification of dyes according to their application***

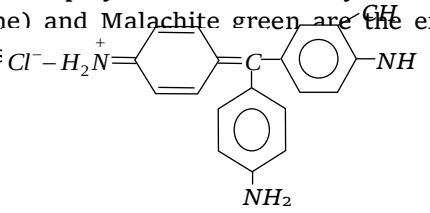
(a) Direct dyes : Direct dyes can be directly applied to the fibre, both animal and vegetable, by dipping in hot aqueous solution of the dye. These dyes are most useful for those fabrics which can form hydrogen bonds, i.e., for cotton, rayon, wool, silk and nylon. Martius yellow and congo red act as direct dyes. Examples : Martius yellow, congo red.

(b) Acid dyes : These are usually salts of sulphonic acids and can be applied to wool, silk and nylon. The presence of sulphonic acid group makes them water soluble. These dyes are applied from an acidic bath. The polar acidic groups interact with the basic groups of the fabric. Orange-1 is an excellent acid dye.



Orange-I (Azo

(c) *Basic dyes* : These are the hydrochlorides or zinc chloride salts of colour bases having basic groups. These dyes react with anionic sites present on the fabric to attach themselves. These dyes colour fibers of nylons and polyesters. Aniline yellow. Magenta (Rosaniline) and Malachite green are the examples of basic dyes



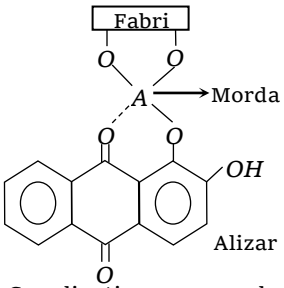
Magent

❑ *Acid and basic dyes are actually direct dyes.*

(d) *Mordant dyes* : These dyes have no natural affinity for the fabric and are applied to it with the help of certain additional substances known as mordants. A mordant (Latin mordere = *to bite*) is any substance which can be fixed to fabric and reacts with the dye to produce colours on fabric. Three types of mordants are commonly used,

- Acidic mordants like tannic acid which are used with basic dyes.
- Basic mordants such as metallic hydroxides or albumin which are used with acidic dyes.
- Metallic mordants like salts of aluminium, chromium, iron, tin, etc., which are used with acidic dyes.

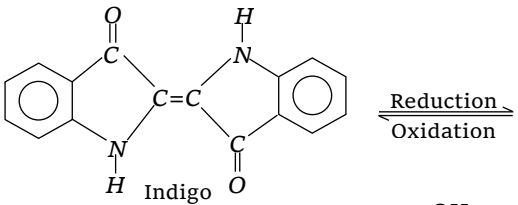
Actually the mordant forms an insoluble coordination compound between the fabric and the dye and binds the two. Alizarin is a typical mordant dye. It gives different colours depending on the metal ion used. For example, *with* Al^{3+}, *alizarin gives a rose red colour; with* Ba^{2+}, *a blue colour; with* Fe^{3+}, *a violet colour and with* Cr^{3-}, *a brownish red colour.*



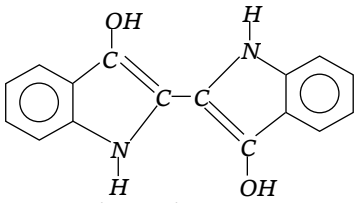
Coordination compound of Alizarin with Al^{3+}

The process of mordant dyeing consists in impregnating the fabric with mordant in presence of wetting agent followed by soaking of the fabric into the solution of dye.

(e) *Vat dyes* : These dyes are insoluble in water and cannot be applied directly. These dyes on reduction with sodium hydrosulphite ($NaHSO_3$) in a vat form a soluble compound which has great affinity for cotton and other cellulose fibres. The cloth is soaked in the solution of a reduced dye and then hung in air or treated with oxidants like perboric acid. As a result, the colourless compound is oxidised to insoluble dye which is now bound to the fabric. *The colourless and reduced state of the dye is called the Leuco base.* The common examples of vat dyes are indigo and tyrian purple. These are mostly used on cotton.



Indigo
(Blue, water insoluble)



Indigo-white, Leucobase
(Colourless water

(f) *Ingrain dyes* (developed dyes) : Ingrain dyes are those which are synthesised directly on the fabric. Examples of this type of dyes are azo dyes. The fabric is immersed in the solution of coupling reagent (usually a phenol or naphthol). Then it is dipped in the solution of suitable diazonium salt. Both react to form the dye whose molecules are adsorbed on the surface of fabric. The ingrain dyeing is particularly suitable for cotton fabrics.

(g) *Disperse dyes* : These dyes are used to colour synthetic fabrics such as nylon, orlon, polyesters and cellulose acetate which have tightly packed structures. The dyes are dispersed in a colloidal form in water. The fabric is immersed in the colloidal dispersion of the dye when fine dye particles are trapped within the polymer structure of the fabric. Examples of this type of dyes are monoazodye and anthraquinone dye.

Drugs and Chemotherapy

Drugs may be a single chemical substance or a combination of two or more different substances. An ideal drug should satisfy the following requirements,

❑ When administrated to the ailing individual or host, its action should be localised at the site where it is desired to act. In actual practice, there is no drug which behaves in this manner.

❑ It should act on a system with efficiency and safety.

❑ It should have minimum side effects.

❑ It should not injure host tissues or physiological processes.

❑ The cell should not acquire resistance to the drug after sometime.

Very few drugs satisfy all the above requirements. Each drug has an optimum dose, below which it has no action and above this level it becomes a poison.

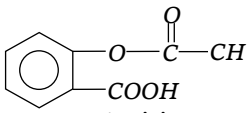
The term *chemotherapy*, which literally means chemical therapy or chemical treatment was coined in 1913 by ***Paul Ehrlich***, the father of modern chemotherapy. **He defined chemotherapy as the use of chemicals (drugs) to injure or destroy infections micro-organisms without causing any injury to the host**.

Chemicals (drugs) used in chemotherapy are usually classified according to their action.

(1) **Antipyretic :** Antipyretic is a drug which is responsible for lowering the temperature of feverish body. The central nervous system, especially the hypothalamus, plays an important role in maintaining the balance between the heat production and heat loss in order to regulate the body temperature. Hypothalamus is, thus, known as the *thermostat* of the body.

The antipyretic drug helps to reset the thermostate at normal temperature. Heat production is not inhibited but heat loss is increased by increased peripheral blood flow which increases the rate of perspiration. This causes body to lose heat and subsequently lowers the body temperature.

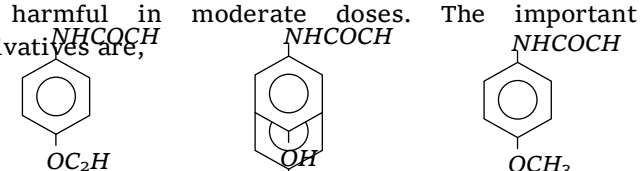
Aspirin is an important antipyretic. The other antipyretics are phenacetin, paracetamol, novalgin and phenyl butazone.



Aspirin
(Acetyl salicylic

Aspirin should not be taken empty stomach. Some persons are allergic to aspirin. The usual allergic reaction is rashes on skin, lowering of blood pressure, profuse sweating, intense thirst, nausea and vomitting. Calcium and sodium salts of aspirin are more soluble and less harmful.

The derivatives of *p*-aminophenol are used as antipyretic. The main limitation of these derivatives is that they may act on red blood cells and thus, they may be harmful in moderate doses. The important derivatives are,

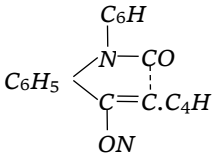


Phenacetin
(4-Ethoxy

Paracetamol
(4-

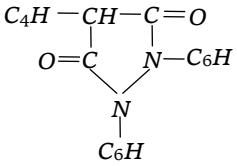
Methacetin
(4-Methoxy

Phenyl butazone is a pyrazolone derivative. Its structure is,



Phenyl butazone

or



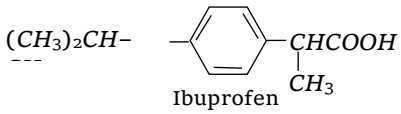
Butazolidine

It is highly toxic and hence not considered as a safe drug. Oxyphenyl butazone is less toxic and is used in place of phenyl butazone.

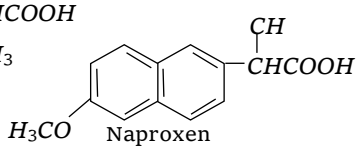
(2) **Analgesics :** Drugs which relieve or decrease pain are termed analgesics. These are of two types,

(i) ***Narcotics*** : These are mainly opium and its products such as morphine, codeine and heroin. These produce analgesia and sleep and in high doses cause unconsciousness. They are very potent drugs and their chronic use leads to addiction.

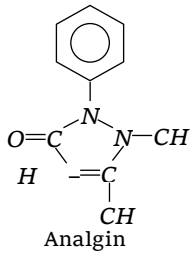
(ii) ***Non-narcotics*** : These are the drugs which are not potent and do not cause addiction. Common drugs are aspirin and analgin. These drugs also have antipyretic properties.



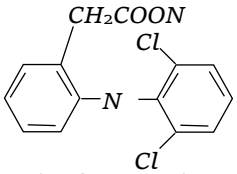
Ibuprofen



Naproxen



Analgin



Diclofenac Sodium

(3) **Antimicrobials :** *These are the chemical substances used to cure infections due to micro-organisms. These are also called microbes.* Any organism which causes disease is called ***pathogen***.

The control of microbial diseases can be achieved by the following three ways,

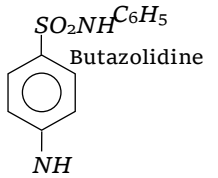
(i) By drugs which kill the organism in the body (**bactericidal**).

(ii) By drugs which inhibit or arrest the growth of the organism (**bacteriostatic**) and

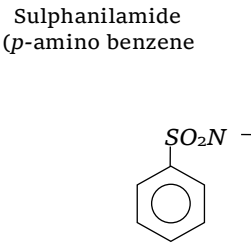
(iii) By increasing immunity and resistance to infection of the body (**immunity**).

Antimicrobial substances may be synthetic chemicals like *sulphonamides, paraamino salicylic acid* or they may be antibiotics like tetracycline, penicillin, chloramphenicol, etc.

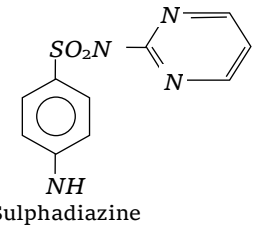
The common example of antimicrobial drug is *sulphanilamides* which are effective in wide range of micro-organisms. These are structural analogues of *p*-amino benzoic acid.



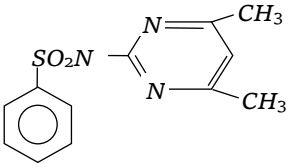
Butazolidine



Sulphanilamide
(*p*-amino benzene



Sulphadiazine



Sulphadimidine

Large number of derivatives of sulphanilamide such as ***sulphadiazine, sulphadimidine, sulphadimethoxine, sulphadoxine, sulphasomidine*** are being used as anti-microbials.

Sulphonamides in combination with ***trimethoprim*** are preferred in the treatment of infections of urinary tract.

(4) **Antiseptics and disinfectants**

(i) ***Antiseptics*** **:** The chemical substances which are used to kill or prevent the growth of micro-organisms are called *antiseptics*. These are not harmful to living tissues and can be safely applied on wounds, cuts, ulcers, diseased skin surfaces. These are also used to reduce odours resulting from bacterial decomposition of the body or in the mouth. They are, therefore mixed with deodorants, face powders and breath purifiers. We all must be familiar with antiseptic creams like *furacin, soframycin* etc.

(ii) ***Disinfectants*** **:** *The chemical substances which are used to kill microorganisms but they cannot be applied on living tissues* are called *disinfectants*. Therefore, disinfectants also kill micro organisms but these are not safe for living tissues. Disinfectants play a major role in water treatment and in public health sanitation. These are commonly applied to inanimate objects such as floors, instruments, etc.

The same substance can act as disinfectant as well as antiseptic depending upon its concentration. For

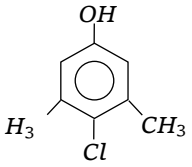
example, *a 0.2% solution of* ***phenol*** *acts as antiseptic and its 1% solution acts as disinfectant.*

The common examples are,

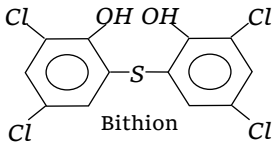
(a) ***Cl_2*** is used for making water fit for drinking at a concentration 0.2 to 0.4 ppm.

(b) ***Dettol*** is an antiseptic. It is a mixture of chloroxylenol and terpeneol in a suitable solvent. Chloroxylenol has both antiseptic and disinfectant properties.

(c) ***Bithional*** is antiseptic which is generally added to medicated soaps to reduce the odour produced by bacterial decomposition of organic matter on the skin.



Chloroxylenol



Bithion

(d) ***Iodine*** is powerful antiseptic. It is used as a tincture of iodine which is 2-3% iodine solution of alcohol-water.

(e) Low concentrations of ***sulphur dioxide*** are used for sterilizing and preservation of squashes.

(f) A dilute aqueous solution of ***boric acid*** is used as a weak antiseptic for eyes. It also forms a part of antiseptic baby talcum powders.

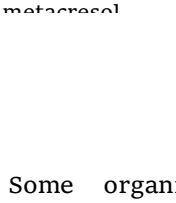
(g) ***Iodoform*** is also used as an antiseptic powder for wounds.

(h) ***Hydrogen peroxide*** is also used as non-irritating strong antiseptic.

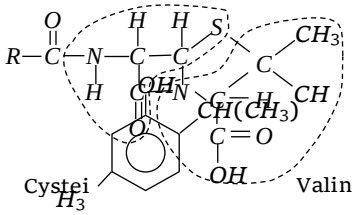
(i) **Hexachlorophene** is mainly used in soaps, creams, dusting powders and emulsions.

(j) ***Amyl metacresol*** (5-methyl-2-pentyl phenol) is an antiseptic which is used commonly as a mouthwash or gargles in infections of the mouth and throat.

(k) A naturally occurring phenol derivative, **thymol** is used as a powerful disinfectant than phenol.



Amyl metacresol



General structure of Penicillins

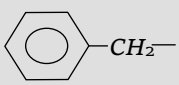
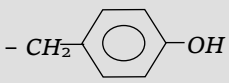
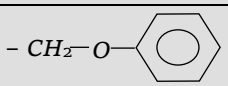
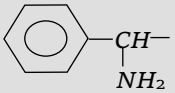
(l) Some organic dyes are also effective antiseptics. These are used for the treatment of infectious diseases. The common examples of antiseptic dyes are ***gention violet*** and ***methylene blue***.

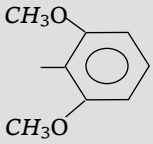
(5) **Antibiotics :** *A chemical substance produced by or derived from living cells which is capable of inhibiting the life processes or even destroying micro-organism* is called ***Antibiotics***.

The first antibiotic, discovered by *Alexander Fleming* in 1929 from the mould *penicillium notatum*, was penicillin. In 1938, *Ernst Chain* and *Howard Florey* isolated penicillin in pure form and proved its effectiveness as an antibiotic. It was introduced into medical practice in 1941. Penicillin is used against large number of infections caused by various cocci, gram positive bacteria, etc. It is an effective drug for pneumonia, bronchitis, sore throat and abcesses.

Several naturally occurring penicillins have been isolated all of these have the empirical formula, $C_9H_{11}O_4SN_2R$

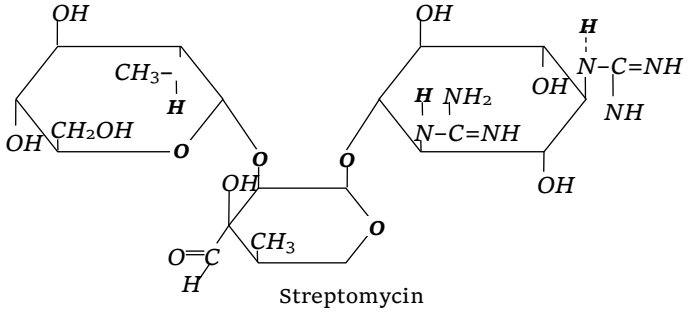
Table : 32.1

Name	Value of *R*	Chemical name
Penicillin-*G* or II		Benzyl penicillin
Penicillin –*F* or I	$-CH_2-CH=CH-CH_2-CH_3$	2-Pentenyl penicillin
Penicillin-*K* or IV	$-(CH_2)_6-CH_3$	*n*-Heptyl penicillin
Penicillin-*X* or III		*p*-Hydroxy benzyl penicillin
Penicillin-*Y* or V		Phenoxy methyl penicillin
Ampicillin		Benzyl amine penicillin

Methicillin		2, 6- dimethoxy phenyl penicillin

The commonly used antibiotics are :

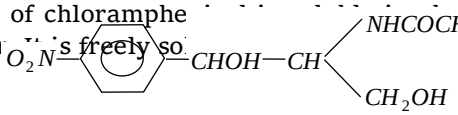
(i) ***Streptomycin*** : ***It was discovered in 1944*** by **Waksman**. It is effective against tuberculosis. It is also used for other common infections like throat, lungs, ears and kidney. *It is very effective in the treatment of meningitis and pneumonia*. Streptomycin is an amino base and forms salts that are very soluble in water. The sulphate and calcium chloride double salts are white amorphous powders. The molecule contains two strongly basic quanido groups and a weakly basic methylamino group.



Streptomycin

Streptomycin is rapidly absorbed after intramuscular injection. Oral administration of streptomycin is of no value in the treatment.

(ii) ***Chloramphenicol*** : *It is a broad spectrum antibiotic*. It was first isolated from a species of *streptomyces*. It has been produced synthetically on commercial basis. It is white or greyish white needle like crystalline substance. It has a bitter taste. One gram of chloramphe[illegible] 400 *ml* of water. It is freely so[illegible]

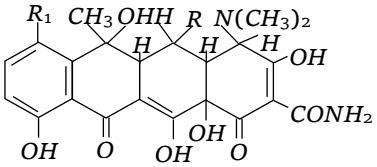


Chloramphenicol

It is effective against certain gram-positive and gram-negative bacteria, some rickettsiae and viruses. It is very effective in the treatment of typhoid fever, para-typhoid fevers, diarrhoea and dysentary. *It is also specific for influenza, meningitis, pneumonia, whooping cough and urinary tract infection*.

Chloramphenicol may cause serious complications and hence it should not be used indiscriminately or for minor infections. Chloramphenicol in high concentrations inhibits the growth of animal and plant cells.

(iii) ***Tetracyclines*** : The tetracyclines contain hydronapht-hacene skeleton as the characteristic structural unit. The structures of tetracyclines are given as follows,



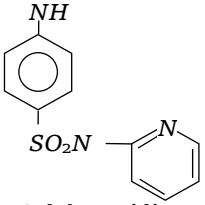
Chlortetracycline (Aureomycin) R_1=Cl, R_2=H

Oxytetracycline (Terramycin) R_1=H, R_2=OH

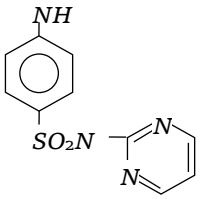
Tetracycline R_1=R_2=H

Tetracyclines are broad spectrum antibiotics and are effective against a number of types of bacteria, larger viruses, protozoa, parasites and typhus fever. These can be given orally.

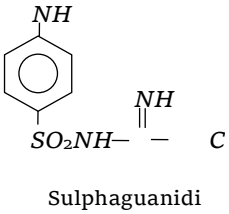
(6) **Sulpha drugs** : These are synthetic chemotherapeutic agents which contain sulphonamide, $-SO_2NH_2$ group in their structure. These were the first effective chemotherapeutic agents to be widely used *for the cure of bacterial infections in humans*. They have also been found to be active against gram-positive and gram negative cocci, bacilli and protozoa. At present sulphanilamides have been largely replaced by antibiotics for the treatment of most of the bacterial diseases. Some successful sulphanilamides are given below,



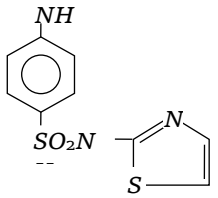
Sulphapyridine



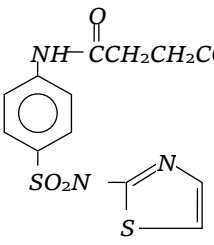
Sulphadiazine



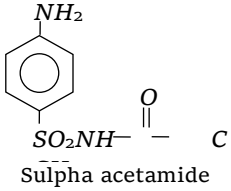
Sulphaguanidi



Sulphathiaz



Succinyl



Sulpha acetamide

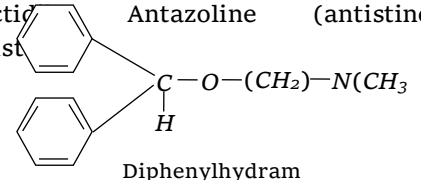
Table : 32.2

Name of drug	Uses
Sulphapyridine	Used to cure pneumonia.
Sulphadiazine	Used to cure pneumonia, throat infections, meningitis,

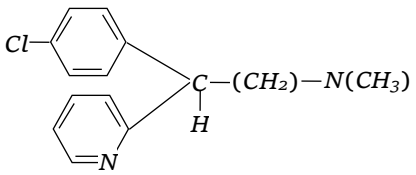
	etc.
Sulphaguanidine	Used to cure bacillary dysentary.
Sulphathiazole	Useful against staphylococcal infections and bubonic plague.
Succinyl sulphathiazole	Useful in intestinal infections such as bacillary dysentary and cholera.
Sulpha acetamide	Used to cure urinary tract infections.

(7) **Antihistamines :** *Antihistamines are chemical substances which diminish or abolish the main actions of histamine released in the body and hence prevent the allergic reactions*. In other words, antihistamines are also called *anti-allergic drugs*.

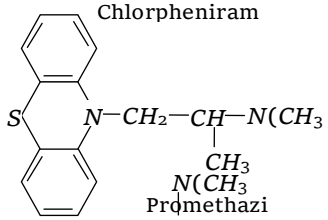
The common antihistamine drugs are *diphenylhydramine (Benadryl), pheniramine maleate (Avil),* chlorpheniramine (Zeet), Promethazine, triprolidine (actic Antazoline (antistine), Dimethindene (forist



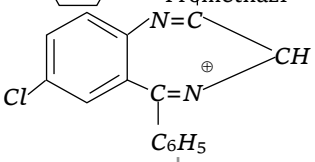
Diphenylhydram



Chlorpheniram

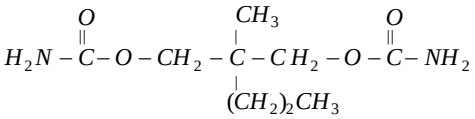


Promethazi



Chlordiazepoxide

For releasing tension



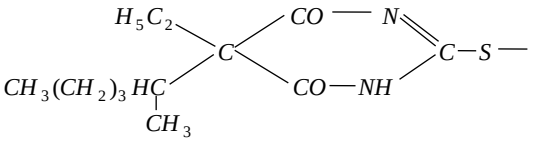
Meprobamate

These derivatives are called as barbiturates.

These are also called *psychotherapeutic drugs*. These drugs make the patient passive and help to control their emotional distress or depression.

(8) **Anaesthetics :** It may be defined as those drugs which produce insensibility to the vital functions of all types of cell especially of nervous system. Anaesthetics may be classified into two groups on the basis of their applications,

(i) ***General anaesthetics*** : These depress the central nervous system to such an extent that all sensitivity to pain or feeling is lost, *i.e.*, they produce unconsciousness all over the body. *These are used for major surgical operations*. These may be used in the form of gas, *e.g.,* nitrous oxide, cyclopropane, ethylene, either or may be given in the injection from, *e.g.*, sodium pentothal.

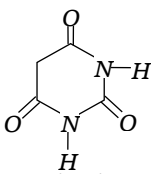


Sodium pentothal

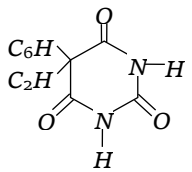
(ii) ***Local anaesthetics*** : These affect only a part of the body insensitive to pain or feeling. Common local anaesthetics are : *xylocaine (used in jelly form), ethyl chloride (used in spray form) and procaine (used in injection)*. These are used *for small surgical operations like tooth extraction, stitching of a wound or incision of an abscess*. Some other modern local anaesthetics are; α-eucaine, orthocaine (orthoform) and dimethisoquin.

(9) **Tranquillizer or Hypnotics :** The chemical substances used for the treatment of stress, mild and severe mental diseases are called ***tranquillizers***. These are used to release mental tension and reduce anxiety.

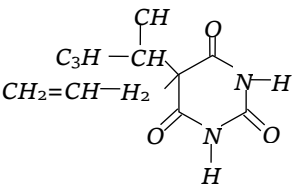
The most commonly used tranquillizers are barbituric acid and its derivatives such as *veronal, amytal, membutal, seconal* and *luminal*.



Barbituric



Lumin



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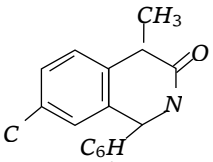
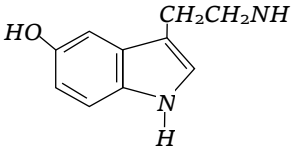
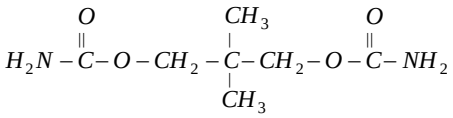

Valiu


Seroton


Equanil
Used in depression and

* It may be noted that different terms are used for drugs which are used to cure mental diseases. Some of these terms are ,

(i) ***Sedatives*** **:** These act as depressant and suppress the activities of central nervous system. They are given to patients who are mentally agitated and violent. Sedatives give a feeling of calmness, relaxation or drowsiness in the body. Their high doses induce sleep. The common sedatives are *valium, barbiturates* (obtained from barbituric acid).

(ii) ***Antidepressants*** **:** These drugs are given to patients with shattered confidence. These produce a feeling of well being and confidence in the person of depressed mood. Therefore, these are also called *mood booster drugs*. The common examples are *vitalin, cocain, methedrine* etc.

(10) **Anti-Malarials :** Malaria is highly wide spread infectious disease, caused by sporozoa of genus plasmodium. It is characterised clinically by periodic fever, anaemia and enlargement of liver and spleen. The four species, *Plasmodium vivax, Plasmodium malariae, Plasmodium ovale* and *Plasmodium falciparum* are responsible for malaria in man. Thus, there are four types of malaria,

Protozoa	Malaria caused
Plasmodium vivax	Fever on alternate days
Plasmodium malariae	Fever once in three days
Plasmodium ovale	Fever once in three days
Plasmodium falciparum	Fever once in four days

The chemotherapy of malaria is connected with different stages in the cycle of malarial parasite. The mosquito injects the parasite into the blood of a human being. It immediately goes to the liver cells where it multiplies. Once the parasites have grown in number, these come to blood and enter the red blood corpuscles where they also multiply. Eventually, the red cells burst liberating the parasites as well as toxins. These toxins cause fever, chills and rigour. The liberated parasites attack the fresh red cells and the cycle continues. Depending upon the periodicity of this cycle in the red cells fever comes on alternate days, once in three days or once in four days. Some of the liberated parasites go back to liver and continue the cycle there.

Choice of an antimalarial drug depends on the point of its action on the life cycle of the malarial parasite. Various drugs used are :

(i) ***Primaquine*** : It destroys sporozites in the liver. It is too toxic, and its long term use is not advisable.

(ii) ***Chloroquine, proquanil and pyrimethamine*** : These kill the parasites in blood.

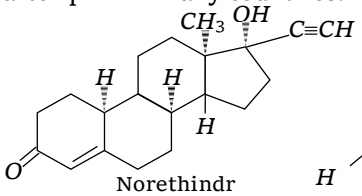
(11) **Antifertility drugs :** *These are the chemical substances used to control the pregnancy*. These are also called *oral contraceptives*. The basic aim of antifertility drugs is to prevent conception or fertilization.

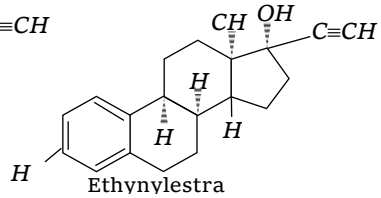
Oral contraceptives belong to the class of natural products known as steroids.

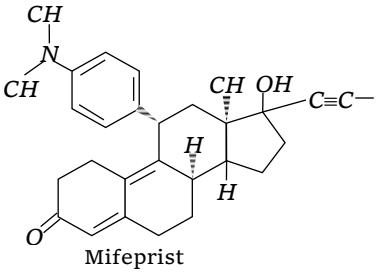
These control the female menstrual cycle and ovulation. The birth control pills are essentially a mixture of esterogen and *progesterone derivatives* which are more potent than the natural hormones.

These common pills are used for a combination of progesterone, norethindrone and estrogen ethynylestradiol.

Mifepristone is a synthetic steroid which blocks the effects of progesterone and is used as a "morning after pill" in many countries.


Norethindr


Ethynylestra


Mifeprist

Ormeloxifene (*Centchroman, Saheli*) has also been developed and tested at the Central Drug Research

Institute, Lucknow as an effective antifertility drug to acceptable degree. The oral contraceptives are commonly known as *pills* or *oral pills* and have been used worldwide for birth control.

Drugs or Medicines from plants

❑ Bark of willow tree which contains salicyclic acid. It is used to get relief from pain and fever.

❑ Alkaloid Reserpine from *Rauwolfia serentina* for high blood pressure (hypertension).

❑ Alkaloid Quinine from Cinchona tree for Malaria.

Table : 32.3

Chemicals in Medicines		
Analgesics	Relieve pain	Aspirin, ibuprofen, diclofenac sodium, naproxen, narcotics (morphine, codeine, heroin).
Antipyretics	Lower body temperature	Aspirin, paracetamol, phenacetin.
Antiseptics and disinfectants	Kill or prevent the growth of micro-organisms.	0.2% phenol (antiseptic), 1% phenol (disinfectant), chlorine, dettol (chloroxylenon and terpeneol), bithional, iodine, boric acid.
Tranquilizers	Treatment of stress, mental diseases	Derivatives of barbituric acid (veronal, amytal, membutal, luminal, seconal), chlordiazepoxide, meprobamate, valium, serotonin.
Antimicrobials	Cure infections due to micro-organisms (microbes)	Antibiotics, Sulphonamides
Anti fertility drugs	Birth control	Oral contraceptives, estrogen (ethynylestradiol) and progesterone (norethnidrone), mifepristone.
Antibiotics	Produced by micro-organisms and can inhibit the growth of other micro-organisms.	Penicillin, tetracycline, chloramphenicol, ampicillin, amoxicillin Sulpha drugs (sulphanilamide, sulphadiazine, sulphaguanidine)
Antacids	Remove excess acid in stomach	Magnesium hydroxide, magnesium carbonate, magnesium trisilicate, aluminium hydroxide gel, sodium bicarbonate, aluminium phosphate, prazole, lansoprazole.

Rocket Propellant

Rocket propellants consist of rocket engines powered by propellants. These are used both in space vehicles as well as in offensive weapons such as missiles. The propellants are chemical substances which on ignition provide thrust for the rocket to move forward. These substances are called ***rocket propellants***. A propellant is a combination of ***an oxidiser*** and ***a fuel*** which when ignited undergoes combustion to release large quantities of hot gases. The passage of hot gases through the nozzle of the rocket motor provides the necessary thrust for the rocket to move forward according to Newton's third law of motion.

The function of a rocket propellant is similar to that of petrol in a motor car except that in the later case, the oxygen needed for burning the fuel is taken from the atmospheric air.

(1) **Types of rocket propellants :** Depending upon the physical state, propellants can be classified as :

(i) ***Solid propellants*** **:** The solid propellants are mixtures of solid fuel and a solid oxidiser. These are further divided into two classes,

(a) *Composite propellants* : These are solid propellants which use polymeric binder such as polyurethane or polybutadiene as a fuel and a solid oxidiser such as ammonium perchlorate, nitrate or chlorate. The performance of these propellants can be increased by using some additives such as finely divided magnesium or aluminium metal along with the fuel.

(b) *Double base propellants* : These are solid propellants which mainly use nitroglycerine and nitrocellulose. The nitrocellulose gels in nitroglycerine set in as a solid mass.

The main *disadvantage* of solid propellants is that these propellants once ignited will continue burning with predetermined rate. These cannot be regulated.

(ii) ***Liquid propellants*** **:** These consist of an oxidizer such as liquid oxygen, nitrogen tetroxide (N_2O_4) or nitric acid and a fuel such as kerosene,

alcohol, hydrazine or liquid hydrogen. These are further classified as,

(a) *Monopropellants* : The propellants in which a single chemical compound acts as fuel as well as oxidizer are called monopropellants. For example, hydrazine, nitromethane, methyl nitrate, hydrogen peroxide, etc. Except hydrazine, the other compounds contain both the oxidizer and the fuel elements in the same molecule.

(b) *Bipropellants* : These are propellants in which the fuel and oxidiser are stored separately but are allowed to combine at the time of combustion. For example, kerosene and liquid oxygen.

❑ *Hydrazine can act both as a monoliquid as well as a biliquid propellant. Hydrazine* (H_2N-NH_2) acts as a monoliquid propellant as it decomposes exothermally into hot gaseous mixture of N_2 and H_2,

$$H_2N-NH_2 \rightarrow N_2+2H_2+\text{heat}$$

As a biliquid propellant with liquid oxygen as oxidiser,

$$H_2N-NH_2+O_2 \rightarrow N_2+2H_2O+\text{heat}$$

Advantages of Biliquid Propellants over Solid Propellants

❑ The biliquid propellants give higher thrust than solid propellants.

❑ The thrust generated by liquid propellants can be controlled by switching on and off the flow of propellants. On the other hand, the thrust cannot be controlled in solid propellants.

(iii) ***Hybrid propellants*** **:** These are the propellants which consist of solid fuel and a liquid oxidiser. For example, liquid N_2O_4 (liquid oxidiser) and acrylic rubber (solid fuel).

(2) **Examples of Propellants used in Different Rockets**

(i) ***Saturn booster rocket*** of American space programme used a mixture of kerosene and liquid oxygen as the propellant in the initial stage whereas liquid oxygen and liquid hydrogen were used as propellant in high altitudes.

(ii) Russian rockets such as ***Proton*** used a liquid propellant consisting of kerosene and liquid oxygen.

(iii) The Indian satellites SLV-3 and ASLV used composite solid propellants.

(iv) The rocket PLSV will use solid propellant in the first and third stages and liquid propellant in second and fourth stages. The liquid propellant will consist of N_2O_4 and unsymmetrical dimethyl hydrazine (UDMH) and N_2O_4 and monomethyl hydrazine (MMH) respectively.

(3) **Calculation of specific impulse of propellant**

The function of rocket propellant is based on specific impulse which measures the kinetic energy producing ability of the propellant. The specific impulse (I_s) can be calculated from the following equation,

$$I_s=\frac{1}{g}\sqrt{\left(\frac{2\gamma}{\gamma-1}\right)\left(\frac{gRT_c}{M}\right)\left(1-\frac{p_c}{p_e}\right)^{\frac{\gamma-1}{\gamma}}}$$

Where,

γ = Ratio of specific heat at constant pressure to specific heat at constant volume.

T_c = Combustion chamber temperature.

M=Average molecular mass of exhaust products.

P_e=External pressure

P_c = Chamber pressure, and

R = Gas constant

The above equation shows that the conditions favouring high specific impulse are high chamber temperature and pressure, low molecular mass of exhaust products and low external pressure.

The higher the temperature and pressure achieved in the chamber, the higher the kinetic energy of the gases escaping through the nozzle.

Chemical in cosmetics

The word cosmetics is derived from the Greek word *Kosmetikos*. It means decorating. beautifying or improving complexion of skin. In India from the ancient times *Henna* has been used to decorate hands and some other parts of the body. Some of the cosmetics which find use in daily life are discussed below,

(1) **Creams** : Creams are used for facial make-up. These are often classified as : cleansing creams, cold creams, vanishing creams, sunburn creams and bleach creams.

(i) ***Cleansing creams*** : Remove facial make up, surface grime, lipstic and oil.

(ii) ***Cold creams*** : Lubricate the skin and prevent roughness and chaffing.

(iii) ***Vanishing creams*** : Keep the skin cool and oily.

(iv) ***Sunburn creams*** : Save the skin from sunburn in summer.

(v) ***Bleach cream*** : Exert a bleaching effect on dark skin.

(2) **Perfumes** : Perfumes are the materials, used to provide fragrance. Several requirements have to be fulfilled to make a good perfume and any material, which just gives good smell, may not be a perfume.

A perfume invariably consists of three ingredients : a vehicle, fixative and odour producing substance.

(i) ***Vehicle*** : The vehicle is also called solvent. The role of the solvent is to keep the odour-producing

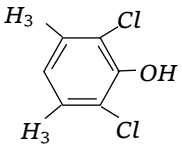
substances in solution. Ethanol and water mixture is the most common vehicle used in perfumery.

(ii) ***Fixative*** : The function of the fixative is to equalize the rate of evaporation of various odouriferous components of the perfume by suitably adjusting their volatility. *Sandalwood oil* finds use as fixative. Other substances used as fixative are b*enzoin, glyceryl diacetate* and esters of cinnamyl alcohol.

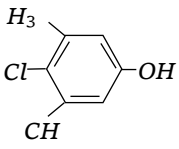
(iii) ***Odourous substances*** : Both natural and synthetic substances are used to impart odour to a perfume. For example, terpenoids like linalool which occur in essential oils are natural odour producing compounds, while anisaldelyde (*p*-methoxybenzaldehyde), is a synthetic odour producing compound.

(3) **Talcum powder** : Talcum powder is used to reduce irritation of the skin. Talcum powders like face powders contain talc ($Mg_3(OH)_2Si_4O_{10}$). Chalk, zinc oxide, zinc stearate and a suitable perfume act as the other main constituents of talcum powder. Often specific ingredients like antiseptic and cooling agents are added. The role of the talc is to act as a powder base and to make skin smooth. Chalk absorbs secretion (perspiration) without showing any evidence of such absorption. Zinc oxide masks enlarged pores and minor blemishes, whereas zinc stearate makes powder adhere to skin. Baby talcum powders contain considerable amounts of zinc stearate for adhesiveness and boric acid, for antiseptic purposes. Talcum powders need to be dusted with care to prevent inhalation of the fine particles, which irritate the lungs.

(4) **Deodorants** : As the name suggests, deodorants are applied primarly to mask the body odour. The body odour results from the bacterial action following perspiration. A deodorant must therefore, possess anti-bacterial properties. Aluminium salts, have been found to possess excellent antibacterial properties. In addition to aluminium salts, ZnO, ZnO_2 and $(C_{17}H_{35}COO)_2Zn$ also find use in deodorant preparations because they are astringents as well as antiseptics. Phenolic antibacterials, which have figured as effective body deodorant are parachlorometaxylenol and dichlorometaxylenol having following structures.



Dichlorometaxyle



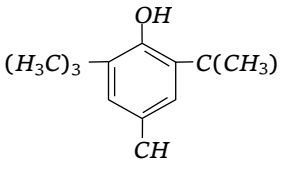
p-

Powder formulations generally have deodorants.

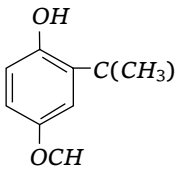
Chemicals in food

Many chemicals are added to food for their preservation and enhancing their appeal. These include flavourings, sweeteners, dyes, antioxidants, fortifiers, emulsifiers and antifoaming agents. With the exception of the preservatives, fortifying agents, antioxidants and artificial sweeteners, the remaining classes of chemicals mentioned above are added either for ease in processing or for cosmetic purposes, in the real sense these have no nutritive value.

(1) **Antioxidants** : Antioxidants are the important and necessary food additives. These compounds retard the action of oxygen on the food and thereby help in its preservation. These act as sacrificial materials, *i.e.*, these are more reactive towards oxygen than are the materials they are protecting. They also reduce the rate of involvement of free radicals in the aging process. The two most familiar antioxidants used are *butylated hydroxy toluene (BHT) and butylated hydroxy anisole (BHA)*. The addition of *BHA* to butter increases its storage life from months to years. The two have the following structures.



(BHT



(BHA

Sometimes *BHT* and *BHA* are added in combination with citric or ascorbic acids to produce a more active synergietic effect. Sulphur dioxide and sulphite are useful antioxidants for wine and beers, sugars syrups and cut peeled or dried fruits and vegetables.

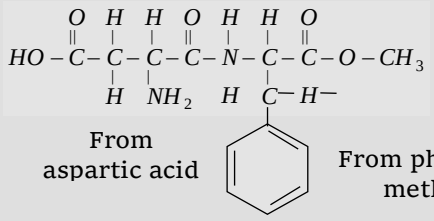
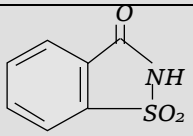
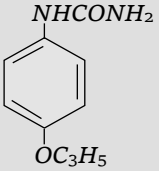
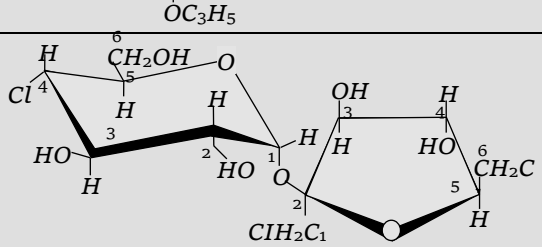
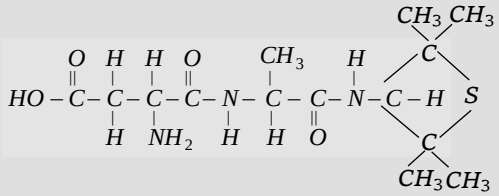
(2) **Preservatives** : The preservatives prevent spoilage of food due to microbial growth. The most common preservative used is sodium benzoate, C_6H_5COONa. It is metabolized by conversion to hippuric acid, $C_6H_5CONHCH_2COOH$ which ultimately is excreted in the urine. Salts of propionic acid and sorbic acid are also used as preservatives.

(3) **Artificial sweetener** : The artificial sweeteners are another type of food additives. The first popular artificial sweetener was saccharin. It was marketed as its water soluble sodium or calcium salt. Saccharin is approximately 300 times sweeter than cane sugar. It has proved to be a lifesaver for countless diabetics and is of great value to people who need to control intake of calories.

Besides saccharin, the other commonly marketed artificial sweeteners are described here.

Aspartame is unstable at cooking temperatures, limiting its use as a sugar substitute to cold foods and soft drinks. Alitame is more stable than aspartame during cooking. One potential problem with alitame and similar type of high-potency sweetners is the difficulty in controlling sweetness of food. Sucralose is predicted to become a great commercial success.

Table : 32.4

Artificial Sweetner	Structural Formula	Sweetness value in comparison to cane sugar
Aspartame		160
Saccharin		300
Dulcin		500
Sucralose		650
Alitame		2000

(4) **Edible colours** : Edible colours used for food are essentially dyes. The use of food dyes is extremely wide spread. They are used to colour everything from meat to fruit. For example, dyes are used to dye orange peels so that oranges retain their colour. Colour is one of the ingredients in fruit juices. There is a great deal of controversy over the potential harm the dyes may cause. This controversy becomes more meaningful particularly keeping in view the fact that food dyes add nothing to the nutritive value of food. The use of azo dyes has raised considerable anxiety in that some of them are dangerous for young children and asthma patients. Tetrazine, a very widely used dye is especially a suspect. However, natural dyes like *Carotene* are safe food edible colours. For protection of consumer interests, the government of India have passed Prevention of Food Adulteration act (PFA).

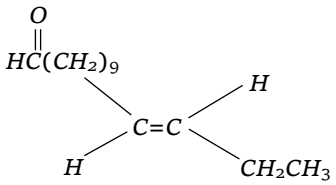
Pheromones, Sex Attractants

A major drawback with chemical insecticides is their lack of specificity. Non-specificity of insecticides may kill helpful insects, such as honeybees, which aid in pollination. The more specific we make our insect control, the less we will disrupt the environment. Although, in the past, it looked as if specific control was beyond the scope of chemistry, but some developments have shown that it is entirely possible to control populations of certain insects very effectively and specifically using substances known as ***pheromones***.

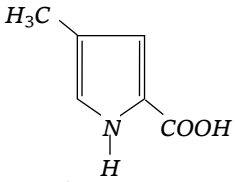
Pheromones provide chemical means of establishing communication. There are sex, trail and defense pheromones to mention a few. One of the most important roles pheromones play is as *sex attractants*. Sex pheromones tell the honeybee which flower to pollinate. The sex pheromones are remarkably powerful. A few hundred molecules may be all that are necessary to invoke a response. In addition to this fascinating parameter, it has been claimed that the sex attractants in some species can attract males from over two miles away. (The sex attractants are usually emitted by the females, although there are some male insects which also produce them). By baiting a trap with a small amount of sex attractant of an insect pest,

one can collect all the males in the vicinity. They may then be disposed of or sterilized. Since mating cannot take place, the reproductive cycle is halted and the pest is controlled. The advantages to this method are immediately obvious. It is very specific since, (except in very rare instances), each insect has its own attractant. There is no spraying, hence no pesticide residues. In addition, the concentration of the attractants is so small that there would be no effect on any other species, even indirectly. For example, the gypsy moth attractants, attracts male moths in the area when a trap is baited with only $1\times10^{-9}g$. Gypsy moths are highly voracious eaters and will completely denude trees if they go unchecked.

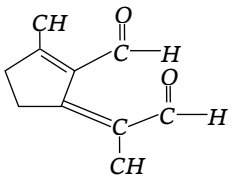
Names and structures of some pheromones



Sex pheromone of the spruce budworm



Trail



Defense pheromone of larvae of Chrysomelid beetle

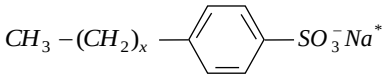
Plant Growth Hormones

These are the organic substances which are synthesized in minute quantities in one part of the plant body and are transported to another part where they influence specific physiological processes to regulate growth, differentiation and development.

Plant growth hormones are grouped into two main types : (i) growth promoters (*e.g.*, auxins, gibberellines, cytokinins etc.) and (ii) growth inhibitors (*e.g.* ethylene, abscisic acid, maleic hydrazide etc.) Many of these hormones, especially the synthetic ones are now-a-days widely used in agricultural practices *e.g.*, as weedicides (2, 4-Dichlorophenoxyacetic acid or 2, 4-D), as rooting hormones (Naphthalene acetic acid or N.A.A. etc.), to induce flowering in certain plants (*e.g.*, N.A.A., I.B.A.), to prevent pre-mature fruit drop (*e.g.*, 2, 4-D, I.A.A., I.B.A., etc.), for storage of potato tubers–where they prevent sprouting (*e.g.*, N.A.A.), to increase sweetness of fruits (*e.g.*, I.B.A.), to increase yield of certain crops (*e.g.* gibberellins increase yield of pea, bean tomatoes, pepper, cucumber, lettuce, cabbage, etc.), in tissue culture (*e.g.* cytokinins), artificial ripening fruits like banana, mango (*e.g.* ethylene).

Detergents

As a result of high dissolving power, the naturally occurring water always contains dissolved materials, particularly ionic substances. Hard water contains certain metal ions, such as Ca^{2+} and Mg^{2+}. These ions react with soap. (sodium salts of stearic and similar organic acids), to produce a curdy precipitate of calcium and magnesium salts. This precipitate adheres to clothing and blocks the ability of soaps to remove oil and grease from fabrics. Synthetic detergents are very similar to the salts of fatty acids found in soap, except that they are manufactured chemically from materials others than animal fats, Examples include salts called ***sodium alkylbenzenesulphonates*****,** which have the general structure.

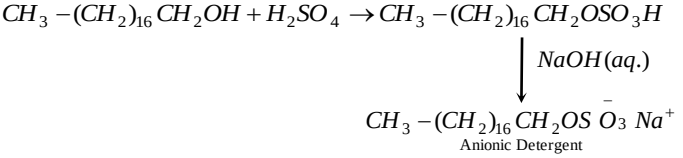


Sodiumalkylbenzenesulpho

❑ *The anions of synthetic detergents donot precipitate in the presence of* Ca^{+2}/Mg^{+2}*, so their cleansing action is not affected by hard water.*

Types of detergents

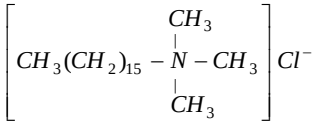
(1) **Anionic detergent** : Long chain alcohols are used in the manufacture of some of the synthetic anionic detergents. The long chain alcohols are treated with concentrated sulphuric acid to form alkyl hydrogen sulphates of high molecular mass and finally the alkyl sulphates are neutralized with alkali to form salts.



Anionic Detergent

❑ *The single anionic detergents is largest use today in household detergents is alkylbenzene-sulphonate.*

(2) **Cationic detergent** : These are mostly acetates or chlorides of quaternary amines. Being more expensive than the anionic detergents they find limited use. Such detergents however, possess germicidal properties and are used quite extensively as germicides. ***Cetyltrimethyl-ammonium chloride,*** is an example.



Cationic Detergent

(3) **Non ionic detergent** : Esters of high molecular mass formed by reactions between polyethylene glycol and stearic acid.

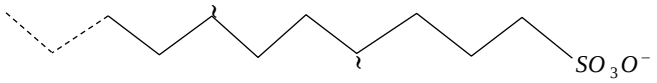
$$HOCH_2 - CH_2OH + n\,CH_2 - CH_2 \rightarrow HO(CH_2CH_2O)_n CH_2CH_2OH$$

Ethyleneglycol — Ethyleneoxide

$$CH_3(CH_2)_{16}COOH + HO(CH_2CH_2O)_n CH_2CH_2OH \xrightarrow{-H_2O} CH_3(CH_2)_{16}COO(CH_2CH_2O)_n CH_2CH_2OH$$

Nonionic Detergent

Some liquid dishwashing detergents are of nonionic type.



Detergent molecules associated with branched hydrocarbon tail which is a source of pollution.

The hydrocarbon side chain stops bacteria from attacking and breaking the chains. This results in slow degradation of detergent molecules leading to their accummulation. These days the amount of branching can be kept to a minimum. Unbranched chains are more prone to attack by bacteria so the detergents are more easily biodegraded and pollution is prevented.

New High Performance Materials

(1) **Carbon fibres** : These fibres are stronger than steel, stiffer than titanium and lighter than aluminium. Carbon fibres are produced in a number of ways, and from a variety of starting materials or precursors such as viscose rayon, polyacrylonitrile, pitch, resins, gases such as (methane, and benzene). Their characteristics are strongly influenced by the manufacturing techniques employed.

Carbon fibres reinforced in a light weight matrix, generally an epoxy resin, polyester resin or polyamide, are called Carbon Fibre Reinforced Plastics (CFRP). When the carbon fibres are reinforced in a carbon matrix, they are known as Carbon Fibre Reinforced Carbon (CFRC), commonly known as carbon-carbon composites.

On the basis of the characteristics of carbon fibres, carbon firbre reinforced plastics (CFRP) and carbon fibre reinforced carbons (CFRC), their applications can be broadly classified into three categories,

(i) High technology sector including aerospace, military and nuclear fields.

(ii) General engineering sector including sports, transportation and chemical fields.

(iii) Biomedical sector.

Carbon fibres in India are mainly used in defence sector as nose tips and head shields of missiles (like 'Agni') by DRDO, Hyderabad, and in the aerospace sector by ISRO and other aerospace organizations for producing components parts, nozzles of rockets/missiles.

(2) **Ceramics** : The term ceramics comes from the Greek word keramikos which means burnt stuff, indicating thereby, that desirable properties of these materials are normally achieved through a high-temperature heat treatment process called firing. In the past, the most important materials in this class were the traditional ceramics, prepared from clay, (kaoloinite) a silicate. In the category of traditional ceramics we have porcelain, bricks, tiles, glass and temperature resistant ceramics.

Most ceramic materials fall into an application-classification scheme which is given below,

(i) ***Clay products*** : Porcelain, pottery, tablewares, sanitary fittings, building bricks, tiles and sewer pipes.

(ii) ***Glass ceramics*** : Kitchenware.

(iii) ***Refractory materials*** : Refractory bricks used as furnace linings.

(iv) ***Abrasive ceramics*** : Cutting and grinding tools. (familiar examples are silicon and tungsten carbides).

Recently, a family of ceramics have been found to be superconductors with high critical temperatures. One such material is yttrium, barium, copper oxide, which has a critical temperature of about 92 *K*. New super conduction ceramic materials reported to have even higher critical temperatures have been and are currently being developed. Several of these materials and their critical temperatures are listed below,

Super conducting ceramic materials and their critical temperatures.

Material	Elements present in the material	Critical temp./*K*
$YBa_2Cu_3O_7$	*Y, Ba, Cu, O*	92
$Bi_2Sr_2Ca_2Cu_3O_{10}$	*Bi, Sr, Ca, Cu, O*	110
$TI_2Ba_2Ca_2Cu_3O_{10}$	*TI, Ba, Ca, Cu, O*	125
$HgBa_2Ca_2Cu_2O_8$	*Hg, Ba, Ca, Cu, O*	153

Numerous applications of super conducting materials exist. Some of these are,

- *Electrical power transmission.*
- *Magnets for high energy particle accelerators.*
- *High speed switching and signal transmission for computer.*

Tips & Tricks

✍ APC mixture contains Aspirin, phenacetin and caffeine.

✍ India launched its first satellite Arya bhatta in March-1978.

✍ Microalloys are materials obtained by adding small amounts of alloying material to steel to improve its mechanical properties. The common microalloying elements are vanadium, titanium, tellurium, boron etc.

Ordinary Thinking

Objective Questions

Dyes and Pigment

1. An azo dye is fixed on fabrics by the process applicable in
(a) Vat dyes (b) Mordant dyes
(c) Developed dyes (d) Substantive dyes

2. Red ink is prepared from
(a) Phenol (b) Aniline
(c) Congo red (d) Eosin

3. The blue print process involves the use of
(a) Indigo dyes (b) Vat dyes
(c) Iron compounds (d) Zinc compounds

4. An azo dye is formed by interaction of an aromatic diazonium chloride with
(a) A phenol
(b) An aliphatic primary amine
(c) Benzene
(d) Nitrous acid

5. Alizarin belongs to the class of
(a) Vat dyes (b) Mordant dyes
(c) Substantive dyes (d) Reactive dyes

6. An insoluble coloured compound formed by action of metallic salts on dyes is known as
(a) Lake (b) Mordant
(c) Dye intermediate (d) None of these

7. Alizarin dye obtained from the root of madder plant is anthraquinone derivative. Its structure corresponds to
(a) 1, 2-dihydroxy anthraquinone
(b) 2, 3-dihydroxy anthraquinone
(c) 1, 4-dihydroxy anthraquinone
(d) 1-hydroxy anthraquinone

8. To which class of dyes does phenolphthalein belong
(a) Azo dyes
(b) Nitro dyes
(c) Triphenyl methane dyes
(d) Phthalein dyes

9. Alizarin a mordant dye is not used in **[CPMT 1990]**
(a) Cotton dyeing
(b) Printing
(c) Painting
(d) Chromium lakes for wood dyeing

10. The rose odour from an ester is formed by the action of *HCOOH* on
(a) Pine oil (b) Olive oil
(c) Geraniol (d) Turpentine oil

11. Which of the following is dye
(a) Methyl orange (b) Orange I
(c) Aniline yellow (d) All of these

12. Which of the following is an example of basic dye
(a) Alizarin (b) Malachite green
(c) Indigo (d) Orange I

13. Which of the following is a direct dye
(a) Phenolphthalein (b) Congo red
(c) Alizarin (d) Indigo

14. Which of the following is a vat dye and often used in dyeing jeans
(a) Indigo (b) Alizarin
(c) Picric acid (d) Crystal violet

15. Which of the following is not a chromophore
(a) $-N=N-$ (b) $-NO$
(c) $-NO_2$ (d) $-NH_2$

16. The compounds used to fix a dye to the fabric is known as
(a) Mordant (b) Azeotrope
(c) Bleaching agents (d) Lake

17. Which one is disperse dye
(a) Congo red (b) Alizarin
(c) Celliton (d) None of these

18. Malachite green is a direct dye for silk and wool. It is prepared by condensing

(a) Benzaldehyde and dimethyl aniline

(b) Carbonyl chloride and dimethyl aniline

(c) Benzene diazonium chloride with dimethyl aniline

(d) None of the above

19. Fluorescin, a well known dye is obtained by the reactions of

(a) Phthalic anhydride and phenol

(b) Phthalic anhydride and resorcinol

(c) Succinic acid and resorcinol

(d) Phthalic anhydride and catechol

20. Indigo shows *cis-trans* isomerism. Which is the stable form of Indigo

(a) Cis (b) Trans

(c) Either cis or trans (d) Both of the above

21. Which is the wrong statement with regards to Indigo

(a) Indigo was extracted in India from plants of the 'Indigo ferra' group

(b) The chemical structure of Indigo was determined by Baeyer, a German chemist who also synthesized it

(c) Indigo is a dark blue solid soluble in water giving a blue solution

(d) Indigo is fixed to fabrics by the vat process

22. Which of the following structures represents a colourless substance

(a) $C_6H_5 - N = \underset{\displaystyle O}{\underset{|}{N}} - C_6H_5$

(b) $C_6H_5 - N = N - C_6H_5$

(c) $C_6H_5 - NH - NH - C_6H_5$

(d) None of these

23. Identify the wrong statement regarding alizarin

(a) Alizarin was extracted from the roots of the madder plant

(b) It's chemical name is 1, 2-dihydroxy anthraquinone

(c) It is fixed to fabrics by using mordants like aluminium sulphate giving fast red colour

(d) It has red crystal soluble in alkalies and the solution imparts red colour to fabrics

24. Methyl orange is an indicator in acid-alkali titration. It gives

(a) Yellow colour in alkaline medium

(b) Red colour in acid medium

(c) Yellow colour in acid medium

(d) Yellow colour in alkaline medium and red colour in acid medium

25. A dye imparts red colour on fabric. What colour of light was absorbed by the dye

(a) Blue (b) Red

(c) Green (d) Orange

26. Which of the following is an azo dye **[Delhi CEE 1996]**

(a) Orange-I (b) Phenolphthalein

(c) Malachite green (d) Methylene blue

27. An example of anthraquinone dye is **[Haryana CEET 1999]**

(a) Alizarin (b) Basic acid

(c) Methylene blue (d) Phenolphthalein

28. Which of the following is a basic dyes **[Pb. PMT 1998; AFMC 2004]**

(a) Congo Red (b) Aniline Yellow

(c) Alizarin (d) Indigo

29. The dyes which are applied to the fabric in the colourless reduced state and then oxidised to coloured state are called **[DPMT 2004]**

(a) Vat dyes (b) Disperse dyes

(c) Triphenyl methane dye (d) Azo dyes

Drugs and Medicines

1. An antibiotic with a broad spectrum **[AFMC 2001]**

(a) Kills the antibodies

(b) Acts on a specific antigen

(c) Acts on different antigens

(d) Acts on both the antigens and antibodies

2. Penicillin was first discovered by

(a) A. Fleming (b) Tence and Salke

(c) S.A. Waksna (d) Lewis Pasteur

3. A medicine which promotes the secretion of urine is called

(a) Uretic (b) Monouretic

(c) Diuretic (d) Triuretic

4. An example of a psychedelic agent is **[BHU 1986]**

(a) DNA (b) LSD

(c) DDT (d) TNT

5. Veronal, a barbiturate drug is used as

(a) Anaesthetic (b) Sedative

(c) Antiseptic (d) None of these

6. Acetoxy benzoic acid is **[Kurukshetra CET 1998]**

(a) Antiseptic (b) Aspirin

(c) Antibiotic (d) Mordant dye

7. Antiseptic chloroxylenol is **[KCET 2005]**

(a) 4-chloro-3, 5-dimethylphenol

(b) 3-chloro-4, 5-dimethylphenol

(c) 4-chloro-2, 5-dimethylphenol

(d) 5-chloro-3, 4-dimethylphenol

8. Which of the following is an insecticide
(a) Bakelite (b) TNT
(c) BHC (d) Aspirin

9. Which of the following drugs is an analgesic
(a) Sulphaguanidine (b) Paludrin
(c) Analgin (d) Iodex

10. Aspirin is **[AMU (Aligarh) 1985, BHU 1998, 2005]**
(a) Antibiotic (b) Antipyretic
(c) Sedative (d) Psychedelic

11. Which of the following drugs is a tranquilizer and sedative
(a) Sulphadiazine (b) Papaverine
(c) Equanil (d) Mescaline

12. Which of the following is a hypnotic drug
(a) Luminal (b) Salol
(c) Catechol (d) Chemisol

13. An antipyretic is **[BHU 1986; CET 1998]**
(a) Quinine (b) Paracetamol
(c) Luminal (d) Piperazine

14. The drug used as an antidepressant is **[BHU 1986, 87]**
(a) Luminol (b) Tofranil
(c) Mescaline (d) Sulphadiazine

15. Chloramine-T is a
(a) Disinfectant (b) Antiseptic
(c) Analgesic (d) Antipyretic

16. Streptomycin is effective in the treatment of
(a) Tuberculosis (b) Malaria
(c) Typhoid (d) Cholera

17. Which of the following is not an antiseptic drug
(a) Iodoform (b) Dettol
(c) Gammexane (d) Genatian violet

18. Which is used for sterilization of water in water supply system of cities
(a) Chlorine (b) Sulphurdioxide
(c) Potassium permanganate (d) DDT

19. A drug effective in the treatment of pneumonia, bronchitis, etc, is
(a) Streptomycin (b) Chloramphenicol
(c) Penicillin (d) Sulphaguanidine

20. Aspirin is obtained by the reaction of CH_3COCl with
(a) Phenol (b) Benzoic acid
(c) Salicylic acid (d) Benzaldehyde

21. Salol can be used as
(a) Antiseptic (b) Antipyretic
(c) Analgesic (d) None of these

22. The drug which is effective in curing malaria is
(a) Quinine (b) Aspirin
(c) Analgin (d) Equanil

23. Morphine is
(a) Anaesthetic (b) Analgesic
(c) Antiseptic (d) Antibiotics

24. Which of the following is a hallucinogenic drug
(a) Methedrine (b) Calmpose
(c) LSD (d) Seconal

25. Heroin is a derivative of
(a) Cocaine (b) Morphine
(c) Caffeine (d) Nicotine

26. The first viral disease detected in human being was
(a) Cold (b) Influenza
(c) Small pox (d) Yellow fever

27. The formulation of dettol contains
(a) Chloroxylenol (b) Terpineol
(c) Alcohol (d) All of these

28. Interferon is – Connected with
(a) Tonic (b) Virus
(c) Carbohydrate (d) Ore of iron

29. Measles is a disease which belongs to the category of
(a) Bacterial disease (b) Viral disease
(c) Veneral disease (d) Protozoan disease

30. Which are insecticides
(a) Baygon (b) Savine
(c) Methoxy chlor (d) All of these

31. Which one is a bacterial disease
(a) Amoebic dysentery (b) Gonorrhoea
(c) Cholera (d) Mumps

32. Which of the following is an alkaloid
(a) Nicotine (b) Piperine
(c) Coniine (d) All of these

33. Which of the following is not antibiotic
(a) Tetracyclin (b) Neomycin
(c) Carbomycin (d) Cyclohexane

34. Phenacetin is used as
(a) Antipyretic (b) Antiseptic
(c) Antimalarial (d) Analgesic

35. Morphine is
(a) An alkaloid (b) An enzyme
(c) A carbohydrate (d) A protein

36. Substance used for bringing down temperature in high fever are called **[DCE 2002; AIEEE 2005]**
(a) Pyretics (b) Antipyretics

(c) Antibiotics (d) Antiseptics

37. A large number of antibiotics have been isolated from

(a) Bacteria actinomycetes

(b) Acids

(c) Alkanals

(d) Bacteria rhizobium

38. Hydrazine as a drug is also used in the treatment of

(a) Typhoid (b) Cholera

(c) Malaria (d) Tuberculosis

39. Arsenic drugs are mainly used in the treatment of **[AIIMS 1992]**

(a) Jaundice (b) Typhoid

(c) Syphilis (d) Cholera

40. The substances which effect the central nervous system and induce sleep are called

(a) Tranquillizers (b) Antipyretics

(c) Analgesics (d) None of these

41. Which one is communicable disease

(a) Scurvy (b) Diabetes

(c) Beri-Beri (d) Chollera

42. An antibiotic contains nitro group attached to aromatic nucleus. It is

(a) Penicillin (b) Streptomycin

(c) Tetracycline (d) Chloramphenicol

43. 2, 4-dichloro phenoxyacetic acid is used as a

(a) Fungicide (b) Insecticide

(c) Herbicide (d) Moth repellent

44. Sulpha drugs are used for

(a) Precipitating bacteria

(b) Removing bacteria

(c) Decreasing the size of bacteria

(d) Stopping the growth of bacteria

45. 'Placedo' is often given to patients. It is

(a) An antidepressant

(b) A broad spectrum antibiotic

(c) A sugar pill

(d) A tonic

46. Bithional is an example of

(a) Disinfectant (b) Antiseptic

(c) Antibiotic (d) Analgesic

47. Various phenol derivatives, tincture of iodine (2–3% I_2 in water / alcohol) and some dyes like methylene blue are

(a) Antiseptics (b) Disinfectants

(c) Analgesics (d) Antipyretics

48. Which of the following is not an antipyretic

(a) Aspirin (b) Paracetamol

(c) Barbituric acid (d) Phenacetin

49. The insecticide containing 99% γ – isomer of benzene hexachloride is known as

(a) Lindane (b) TNT

(c) Malathion (d) Methoxychlor

50. Which of the following is not a chlorinated insecticide

(a) DDT (b) Methoxychlor

(c) Parathion (d) BHC

51. Sulphaguadine is used for

(a) Dysentery

(b) Urinary infections

(c) Antiseptic

(d) Antipyretic

52. Which is correct about vanillin

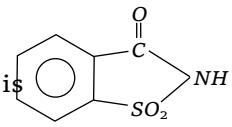
(a) A flavouring agent having vanila flavour

(b) *o*-hydroxy-*m*-methoxy benzaldehyde

(c) A food additive

(d) All of these

53. Which is correct about saccharin

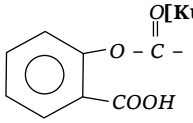
(a) It is 

(b) It is 600 times sweeter than sugar

(c) It is used as sweetening agent

(d) All of these

54. The following compound is used as **[Kurukshetra CET 1996; AIEEE 2002]**



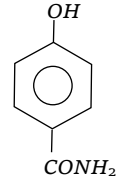
(a) An anti-inflammatory compound

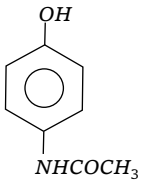
(b) Analgesic

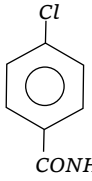
(c) Hypnotic

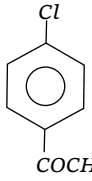
(d) Antiseptic

55. The correct structure of the drug paracetamol is **[DCE 2001**

(a) 

(b) 

(c) 

(d) 

56. An ester used as medicine is **[KCET 2002]**

(a) Ethyl acetate (b) Methyl acetate

(c) Methyl salicylate (d) Ethyl benzoate

57. The use of chemicals for treatment of diseases is called as **[Kerala PMT 2002]**

(a) Homoeotherapy (b) Isothermotherapy
(c) Angiotherapy (d) Physiotherapy
(e) Chemotherapy

58. Substance used for the preservation of coloured fruit juices is

(a) Benzene (b) Benzoic acid
(c) Phenol (d) Sodium meta bisulphite

59. Which of the following acts as an antioxidant in edible oils

(a) Vitamin *B* (b) Vitamin *C*
(c) Vitamin *D* (d) Vitamin *E*

60. Amoxillin is semi-synthetic modification of **[Pb. PMT 1998]**

(a) Penicillin (b) Streptomycin
(c) Tetracycline (d) Chloroampheniol

61. Which of the following is an antidiabatic drug **[KCET 1998]**

(a) Insulin (b) Penicillin
(c) Chloroquine (d) Aspirin

62. Which of these is a hypnotic **[AFMC 2001, 05]**

(a) Metaldehyde (b) Acetaldehyde
(c) Paraldehyde (d) None of these

63. Which one is an antibiotic

(a) Aspirin (b) Chloromycetin
(c) Chloroquin (d) Madribon

64. Which of the following term means pain killing

(a) Antibiotic (b) Analgesic
(c) Antipyretic (d) Penicillin

65. 2-Acetoxy benzoic acid is used as an **[KCET 2004]**

(a) Antimalarial (b) Antidepressant
(c) Antiseptic (d) Antipyretic

66. Which of the following is used as an antibiotic **[Pb. CET 2002]**

(a) Ciprofloxacin (b) Paracetamol
(c) Ibuprofen (d) Tocopherol

67. When salicyclic acid is treated with acetic anhydride we get **[DCE 2002]**

(a) Aspirin (b) Paracetamol
(c) Salol (d) None of these

68. Which of the following is not an antibiotic **[BVP 2004]**

(a) Penicillin (b) Sulphaguanidine
(c) Chloramphenical (d) None of these

69. Which of the following is not a broad spectrum antibiotic **[DPMT 2005]**

(a) Tetracycline (b) Chloromycetin
(c) Penicillin (d) None of these

Rocket - Propellant and Other

1. A biliquid propellant contains

(a) Liquid hydrazine
(b) A mixture of liquid fuel and a liquid oxidizer
(c) A solid rocket fuel
(d) A liquid fuel which can also act as an oxidizer

2. A hybrid rocket propellant uses

(a) A liquid oxidizer and a solid fuel
(b) A composite solid propellant
(c) A biliquid propellant
(d) A solid, liquid and gas as a propellant

3. Which of these is not used as a fuel in the rocket propellants

(a) Liquid *He* (b) Liquid hydrogen
(c) Kerosene (d) Liquid hydrazine

4. A space rocket is propelled by

(a) An automobile engine (b) Rocket propellant
(c) Nuclear submarine (d) Steam engine

5. The propellant in the proposed PSLV rocket of the Indian space programme shall consist of

(a) A composite solid propellant
(b) Biliquid propellants such as N_2O_4 + unsymmetrical dimethyl hydrazine (UDMH) and N_2O_4 monomethyl hydrazine (MMH)
(c) Both (a) and (b) in different stages of rocket propulsion
(d) Kerosene and liquid oxygen

6. Which of the following is not used in rocket propellants

(a) $H_2(l)$ (b) $O_2(l)$
(c) $N_2H_4(l)$ (d) All of these

7. Thrust imparted to the rocket is governed by the

(a) Third law of thermodynamics
(b) Gravitational law
(c) Newton's third law
(d) None of these

8. A space rocket is propelled by

(a) An automobilic engine
(b) Nuclear engine
(c) Steam engine
(d) Mixture of fuel and oxidiser called propellant

9. A composite solid propellant consists of

(a) Polyurethane or polybutadiene and ammonium perchlorate
(b) Nitroglycerine and nitrocellulose
(c) Hydrazine and N_2O_4
(d) Kerosene and liquid oxygen

10. Which of the following represents a biliquid propellant

(a) Nitroglycerine + nitrocellulose
(b) N_2O_4 + acrylic rubber

(c) N_2O_4 +unsymmetrical dimethyl hydrazene

(d) None of these

11. What type of a propellant is used in rocket SLV-3 which was fired by India

(a) Solid propellant

(b) Monomethy hydrazine + liquid N_2O_4

(c) Unsymmetrical dimethyl hydrazine liquid N_2O_4

(d) Liquid oxygen

12. Which of the following is used as an oxidiser in rocket propellants

(a) Kerosene (b) Nitric acid

(c) Liquid oxygen (d) Liquid hydrogen

13. A combination of nitrocellulose and nitroglycerine is a propellant of the type

(a) Hybrid propellant

(b) Mono propellant

(c) Double base propellant

(d) Biliquid propellant

14. Which is the relation between the specific I_s impulse and the critical temperature T_c attained in a rocket blast

(a) $I_s \geq T_c$ (b) I_s and T_c^2

(c) $I_s \geq T_c^{1/2}$ (d) $I_s \geq 1/T_c$

15. The chemical compounds released by one species of animals in order to influence the behaviour of the other members of the same species are called

(a) Pheromones (b) Hormones

(c) Nucleic acid (d) Steroids

16. Structurally biodegradable detergent should contain **[AIIMS 1994]**

(a) Normal alkyl chain (b) Branched alkyl chain

(c) Phenyl side chain (d) Cyclohexyl side chain

17. Which of the following is not used in rocket propellants

(a) $H_2(l)$ (b) $O_2(l)$

(c) Methane (d) $N_2H_4(l)$

18. Which of the following is not used in nail polish

(a) Acetone (b) Cellulose nitrate

(c) Red dye (d) Benzene

19. One of the oxidants used with liquid propellants is **[Kerala PMT 2001]**

(a) Ammonium perchlorate

(b) Nitrocellulose

(c) Sulphuric acid

(d) Dinitrogen tetraoxide (N_2O_4)

(e) Phosphorus pentoxide

20. Detergents are prepared by the action of H_2SO_4 followed by neutralization by starting with **[MP PMT 1990]**

(a) Cholesterol (b) Lauryl alcohol

(c) Cyclohexanol (d) *p*-Nitrophenol

21. Pheromones are chemicals

(a) Formed by fermentation process of fungi

(b) Secreted by endocrine glands of man

(c) Secreted outside the body of insects

(d) Plant growth hormones

22. Which of the following could act as a propellant for rocket **[CBSE PMT 2003]**

(a) Liquid hydrogen + Liquid nitrogen

(b) Liquid oxygen + Liquid argon

(c) Liquid hydrogen + Liquid oxygen

(d) Liquid nitrogen + Liquid oxygen

23. Sodium alkyl benzene sulphonate is used as **[MP PMT 2004]**

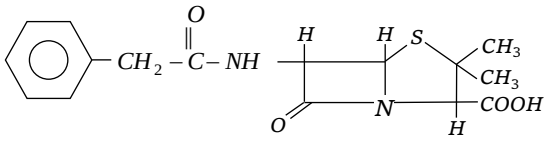
(a) Soap (b) Fertilizers

(c) Pesticides (d) Detergents

Critical Thinking

Objective Questions

1. The structure given below is known as **[Kerala (Med.) 2003**



(a) Penicilline *F* (b) Penicillin *G*

(c) Penicillin *K* (d) Ampicillin

(e) Sulphadiazine

2. Aspirin is chemically **[CPMT 1989; AMU (Aligarh) 1992; DCE 2004]**

(a) Methyl salicylate (b) Ethyl salicylate

(c) Acetyl salicylic acid (d) *o*-hydroxy benzoic acid

3. Which of the following can possibly be used as analgesic without causing addiction and any modification **[CBSE 1997]**

(a) Morphine

(b) *N*-acetylparaaminophenol

(c) Diazepam

(d) Tetra hydrocatenol

4. Further growth of cancerous cells in the body is arrested by

(a) Physiotherapy (b) Chemotherapy

(c) Electrotherapy (d) Psychotherapy

5. Which one of the following is known as broad spectrum antibiotics **[BHU 1987; AMU (Aligarh) 1992; Haryana CET 1999; Pb. CET 2001]**

(a) Streptomycine (b) Ampicillin

(c) Chloramphenicol (d) Penicillin *G*

6. Which of the following is a local anaesthetic **[Pb. CET 2003]**

(a) Diazepam (b) Procaine

(c) Mescaline (d) None of the above

7. Which of the following is molecular disease

(a) Allergy

(b) Cancer

(c) German measeles

(d) Sickel-cell-anaemia

8. Which statement is false **[CBSE PMT 1994]**

(a) Some disinfectants can be used antiseptics at low concentration

(b) Sulphadiazine is a synthetic antibacterial

(c) Ampicillin is a natural antibiotic

(d) Aspirin is analgesic and antipyratic both

9. Tranquilisers are substances used for the treatment of **[Kerala PMT 2002]**

(a) Cancer (b) AIDS

(c) Mental diseases (d) Physical disorders

(e) Blood infection

10. Which one is acidic dye **[DCE 1996]**

(a) Methyl orange (b) Methyl red

(c) Phenolphthalein (d) All of these

11. Alizarin gives a red colour by mordanting it with the sulphate of a metal. The metal ion involved is

(a) Cr^{3+} (b) Fe^{3+}

(c) Al^{3+} (d) Sn^{2+}

12. SLV-3 rockets use

(a) Solid propellants

(b) Liquid propellants

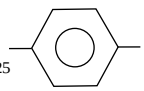
(c) Hybrid propellants

(d) Composite solid propellants

13. Which of the following represents a synthetic detergent

(a) $C_{15}H_{31}COOK$

(b) $CH_3[CH_2]_{16}COONa$

(c) $C_{12}H_{25}$–  –SO_3Na

(d) None of these

14. Which of the following groups is not an auxochrome

(a) $-N(CH_3)_2$ (b) $-OH$

(c) $-OCH_3$ (d) $>C=N$

15. Specific impulse of a rocket and the critical temperature of the fuel reacted in the motor of the rocket has the relationship

(a) $I_s \propto T_c$ (b) $I_s \propto 1/T_c$

(c) $I_s \propto \sqrt{(T_c)}$ (d) $I_s \propto \sqrt{(1/T_c)}$

16. Parathion is **[JIPMER 2001]**

(a) An organic phosphorus compound

(b) Chlorinated aromatic compound

(c) Chlorinated aliphatic compound

(d) Benzene derivative

17. The principal buffer present in human blood **[Kerala PMT 2004]**

(a) $NaH_2PO_4 + Na_2HPO_4$

(b) $H_3PO_4 + NaH_2PO_4$

(c) $CH_3COOH + CH_3COONa$

(d) $Na_2HPO_4 + Na_3PO_4$

(e) $H_2CO_3 + HCO_3^-$

18. Which of the following represents soap **[DCE 2004]**

(a) $C_{17}H_{35}COOK$ (b) $C_{17}H_{35}COOH$

(c) $C_{15}H_{31}COOH$ (d) $(C_{17}H_{35}COO)_2Ca$

19. Asthma patient use a mixture of ..... for respiration **[DCE 2003]**

(a) O_2 and N_2O (b) O_2 and He

(c) O_2 and NH_3 (d) O_2 and CO

A R Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Fluorescein is an adsorption indicator.

Reason : Fluorescein indicator is a dye. **[AIIMS 1994]**

2. Assertion : The drugs which act on the central nervous system and help in reducing anxiety are called antibiotics.

Reason : Pencillin is an antibiotic.

3. Assertion : Equanil is a tranquilizer.
   Reason : Equanil is used to cure depression and hypertension.
4. Assertion : Tetracyclin is a broad spectrum antibiotic.
   Reason : Tetracyclin is effective against a number of types of bacteria, large viruses and typhus fever.
5. Assertion : Antiseptics are applied to living tissues.
   Reason : Iodine is a powerful antiseptic.
6. Assertion : Sedatives are given to patients who are mentally agitated and violent.
   Reason : Sedatives are used to suppress the activities central nervous system.

Answers

Dyes and Pigment

1	c	2	d	3	c	4	a	5	b
6	a	7	a	8	d	9	c	10	c
11	d	12	b	13	b	14	a	15	d
16	a	17	c	18	a	19	b	20	b
21	c	22	c	23	d	24	d	25	c
26	a	27	a	28	b	29	a		

Drugs and Medicines

1	c	2	a	3	c	4	b	5	b
6	b	7	a	8	c	9	c	10	b
11	c	12	a	13	b	14	b	15	b
16	a	17	c	18	a	19	c	20	c
21	a	22	a	23	b	24	c	25	b
26	d	27	d	28	b	29	b	30	d
31	c	32	d	33	d	34	a	35	a
36	b	37	a	38	d	39	c	40	a
41	d	42	d	43	c	44	d	45	c
46	a	47	a	48	c	49	a	50	c
51	a	52	d	53	d	54	b	55	b
56	c	57	e	58	b	59	d	60	a
61	a	62	c	63	b	64	b	65	d
66	a	67	a	68	b	69	c		

Rocket - Propellant and Other

1	b	2	a	3	a	4	b	5	c
6	d	7	c	8	d	9	a	10	c
11	a	12	b	13	c	14	c	15	a
16	b	17	c	18	d	19	d	20	b
21	c	22	c	23	d				

Critical Thinking Questions

1	b	2	c	3	c	4	b	5	c
6	b	7	b	8	c	9	c	10	a
11	c	12	a	13	c	14	d	15	c
16	a	17	e	18	a	19	b		

Assertion & Reason

1	b	2	e	3	a	4	a	5	b
6	a								

AS Answers and Solutions

Dyes and Pigment

1. (c) In grain or developed dyes are those which are synthesised directly on the fabric *e.g.* azo dyes. Ingrain dyeing is particularly suitable for cotton fabric.

2. (d) Eosin is Red dyes.

3. (c) The blue print process involve the use of iron compound.

4. (a) $C_6H_5N_2Cl$ + $OH \rightarrow$

Benzene diazonium chloride + Phenol → $N =$ OH

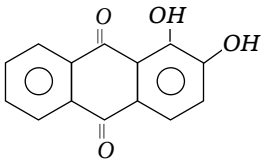
p-hydroxy azo

This is coupling reaction in which benzene diazonium chloride react with phenol or aromatic amine to give dyes.

5. (b) A mordant is any substance which can be fixed to the fibre and which can be dyed later on mostly hydroxide or basic salts of chromium aluminium and iron are used as mordant. A dye which imparts different colours in the presence of different mordant is referred to as a mordant dye. For ex. alizarin is a mordant dye when mordanted with aluminium salt solution. It imparts rose red colour to fabric but the same fabric is dyed blue when it is mordanted with barium salt and it dyes violet is mordant with Ferric salt.

6. (a) The process is called lake.

7. (a) Alizarin is 1,2 dihydroxy anthraquinone *i.e.,*



8. (d) It belong to phthalein dyes.

9. (c) It is the mordant dye so not use in painting.

10. (c) $C_{10}H_{17}OH$ (Geraniol) a liquid terpene alcohol forms ester of rose odour with *HCOOH*.

12. (b) Basic dyes contain NH_2 or $-NR_2$ groups as colour bearing group or colour enhancing groups they are generally used for Wool, cotton, leather, paper, polyester, nylon etc. *e.g.* aniline yellow, crysodine G, butter yellow, malachite green etc.

13. (b) Direct dyes stick to the fibre through hydrogen bonding. They belong to the class of azo dyes. They are used to dye the fabric directly by placing it in not aqueous solution of dye e.g. martius yellow, Congored etc.

14. (a) Vat dyes are insoluble compounds which up on reduction give soluble (lencoform) product. The product may be either coloured or colourless and have affinity for specific fabrics e.g. Indigo.

15. (d) A dye molecule is made up of two different part (i) Chromophore (ii) Auxochrome. The groups which produce colour in a compound *i.e.*, chromophores are usual unsaturated groups like nitro, nitroso, azo, azoxy, carbonyl and olefinic bonds Auxochrome are usually acidic / basic functional group like $-OH$, $-COOH$, $-SO_3H$, $-NH_2$, $-NHR$, $-NR_2$.

A compound containing only a chromophore may be coloured material but not a dye. For example azo benzene is red coloured but not a dye. Where as para amino azobenzene (aniline yellow) is a dye.

$N = N$ NH

p-amino azo benzene

17. (c) Disperse dye are usually applied in the form of dispersion of finely divided dye in a soap solution in the presence of Phenol, Cresol, Benzoic acid etc. They are mainly used to dye decron, nylon, synthetic fibre. Example Celliton (blue).

18. (a) Malachite green prepared by the condensation of Benzaldehyde and dimethyl aniline.

19. (b) Fluorescin is obtained by the reaction of Phthalic anhydride and resorcinol.

20. (b) Trans form of Indigo is more stable.

21. (c) Indigo is dark blue solid insoluble in water.

24. (d) Methyl orange is yellow in alkaline medium and red in acedic medium.

25. (c) Green is the complimentary colour of red.

26. (a) Orange-I is an acid azodye.

27. (a) Alizarin is an example of anthraquinon dye.

28. (b) Aniline yellow is a basic dyes.

29. (a) Vat dyes are insoluble compounds which reduction give soluble (leucoform) product. The product may be either coloured or colourless a have affinity for specific fabrics *e.g.* Indigo.

Drugs and Medicines

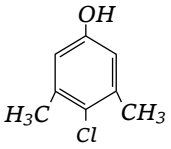
1. (c) Broad spectrum antibiotics act on different antigens.

2. (a) A. Fleming discovered penicillin in 1929.

4. (b) A psychedelic drug produce visual and auditory hallucinotions *e.g.* Lysergic and diethyl amide (LSD)

6. (b) Acetyl salicylic acid is also called acetoxy benzoic acid

7. (a)



Chloroxyleno
(4-chloro-3, 5-

8. (c) *BHC i.e.,* benzene hexachloride is an insecticide.

9. (c) An analgesic drugs is one which relieves or decrease the pain e.g., analgin, aspirin (belongs to non-narcotics and morphine, codein, heroin (belongs to narcotics class)

10. (b) Aspirin is antipyretic *i.e.,* a drug which is responsible for lowering the temperature of Feverish organism to normal, other antipyretic drugs are paraacetamol, Phenacetin.

11. (c) Tranquilizers reduce anxiety and tension they are also called psychototropic drugs. These are of two type.

(a) Sedative the drugs used for violent and mentaly agitated patient e.g., Equanil and diazepam.

(b) Antidepressant – The drug are used to patients who are highly depressed and lose self confidence *e.g.* tofranil vitalin, amphetamine etc.

12. (a) These drugs produce sleep and are habit forming common example of hypnotic drugs are Luminal and Saconal.

13. (b) Paracetamol is an antipyretic.

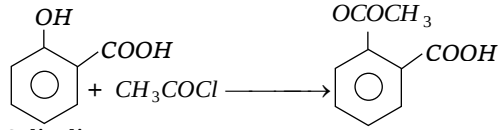
15. (b) Antiseptic drugs causes destruction of micro-organism that produce septic disease *e.g.* Dettol, Savlon acriflavin, Boric acid, Phenol Iodoform, $KMnO_4$ and some dyes such as Chloramine T, methylene blue.

16. (a) It is the very effective antibiotics for tuberculosis.

17. (c) It is an insecticide.

19. (c) Penicillin is an effective medicine for Pneumonia disease.

20. (c)



Salicylic

Acetyl Salicylic acid or

21. (a) Salol is Phenyl Salicylate used as antiseptic.

22. (a) Substance used for the treatment of malaria are antimalarial *e.g.* Quinine, chloroquine.

23. (b) Morphine is analgesic.

25. (b) Heroin is acyl derivative of morphine.

26. (d) Yellow fever was the first viral disease detected in human being.

27. (d) Dettol (antiseptic) is a mixture of 4.8% chloroxylenol + 9.9% tepineol and absolute alcohol.

30. (d) All are insecticides.

32. (d) All these are alkaloids.

33. (d) Rest all are antibiotic.

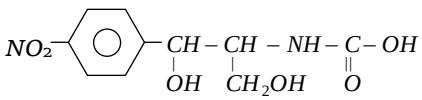
35. (a) It is an alkaloid a class of organic compound basic nature of plant origin containing atleast one nitrogen atom in a ring structure of molecule.

36. (b) It is antipyretic *i.e.,* a drug which is responsible for lowering the temperature of feverish organism to normal.

39. (c) Arsenic drugs are poisonous for syphilis.

41. (d) T.B., Chollera etc. are Communicable diseases.

42. (d) Chloramphenicol is



43. (c) It is herbicide (kill herbs)

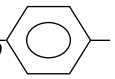
44. (d) Sulpha drugs (antibacterial and nonantibiotic) are group of drugs which are derivative of sulphanilamide.

46. (a) Bithional has disinfectant nature (kill bacteria)

47. (a) Antiseptic drugs cause destruction of micro-organism that produce septic disease *e.g.* Dettol, Savlon, Boric acid, Phenol, Iodoform $KMnO_4$ and some dye such as Chloramine T methylene blue, genation violet.

48. (c) Rest all are antipyretic, Barbituric acid is tranquilizer.

49. (a) Lindane or gammexane is γ isomer of BHC.

50. (c) Parathion is $(C_2H_5)_2 - \underset{\underset{S}{\|}}{P} - O$  NO

52. (d) All are characteristics of Vanillin.

53. (d) All are characteristics of Saccharin.

54. (b) It is acetyl salicylic acid *i.e.,* aspirin analgesic and antipyretic.

55. (b) Paracetamol act as analgesic and antipyretic.

56. (c) Oil of winter green or methyl Salicylate is used as medicine.

58. (b) Benzoic acid used as preservative as a Sodium Benzoate.

59. (d) Vitamin E is an antioxidant present in edible oils.

60. (a) Amoxillin is semisynthetic modification of Penicillin

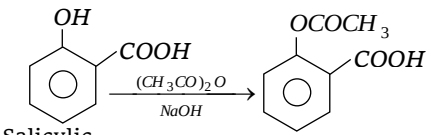
61. (a) Insulin is an antidiabatic drug.

62. (c) Paraldehyde is a hypnotic.

63. (b) Chloromycetin is an antibiotic.

64. (b) Analgesic means Painkiller.

66. (a) Ciprofloxacin is used as antibiotic while Paracetamol, Ibuprofen and tocopherol are respectively antipyretic, pain killer and Vit. *E*.

67. (a) 

Salicylic

Acetyl Salicylic acid (Aspirin)

68. (b) Antibiotics are those drugs, which act against bacterial and viral infections *e.g.*, Chloramphenicol Streptomycin, Penicillin, Tetracycline etc. Sulphaguanidine is a Sulphadrug.

69. (c) Penicillinis not a broad spectrum antibiotic since it is active against infections caused by gram positive bacteria only.

Rocket – Propellant and Other

1. (b) Biliquid Propellant – A double base propellant is a high strength, high modulus gel of cellulose nitrate (gun cotton) in glyceryl trinitrate or a similar solvent.

2. (a) Hybrid Propellant – A hybrid propellant consists of a solid fuel and liquid oxidizer to provide propulsion energy and working substance e.g. Solid acrylic rubber and liquid N_2O_4

4. (b) Rocket propellant are used as fuel for space rock.

6. (d) All are fuel.

7. (c) It is based on Newton's third law.

14. (c) When specific impulse is greater than critical temperature, then rocket blast takes place. So the condition $I_s \geq T_c^{1/2}$ is right.

16. (b) Structurally biodegradable detergent contain normal (or Linear) alkyl chain.

17. (c) Methane is not used as a rocket propellant.

18. (d) Benzene (a Carcinogenic) is not used as a solvent in nail polish.

19. (d) Dinitrogen tetraoxide is used as an oxidant with liquid propellant.

20. (b) Detergents can be obtained by the sulphonation of Lauryl alcohol followed by neutralisation.

21. (c) Pheromones are chemical secreted outside the body of the insects.

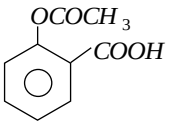
22. (c) Liquid hydrogen + Liquid oxygen Could act as a propellant or rocket.

23. (d) It is used as detergents.

Critical Thinking Questions

1. (b) It is the known structure of penicillin *G*

2. (c) Aspirin an antibiotic chemically Acetyl Salicylic acid



3. (c) "Diazepam" can be used as analgesic without addition and modification.

4. (b) Paul Ehrlich, the father of chemotherapy defined it to injure or destroy infection micro-organism by the use of drugs without causing any injury to the host.

5. (c) Chloramphenicol is broad spectrum antibiotic used in the treatment of typhoid, dysentry, acute fever.

6. (b) The anaesthetics produce temporary insensitibility to the vital function of all type of cells, specially of nervous system and are used during surgical operations.

These are classified as (a) General anasthetic – producing unconsciousness all over the body e.g. N_2O, Cyclo propane, chloroform (b) Local anasthetic – effect only the part of body e.g. Xylocaine, Procain etc.

7. (b) "Cancer" is known as molecular disease.

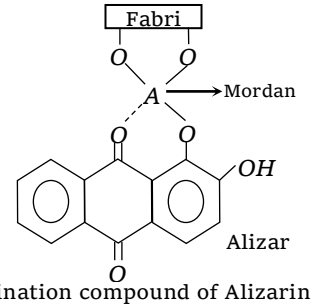
8. (c) Ampicillin is a synthetic antibiotic.

9. (c) "Tranquillisers" are medicines used to treat mental diseases. They are called psychotherapeutic drugs.

10. (a) Acid dyes are characterised by the presence of $-COOH$, $-SO_3H$ or Phenolic group. They are applied in the presence of acidic solution. They are usually applied to Wool, Silk, Nylon. They have affinity for cotton. Common examples are Orange I, Orange II, Methyl red etc.

11. (c) "Alizarin" is a typical mordant dye gives different colours depending on the metal ion used, for example with Al^{+3}, alizarin gives a rose red colour.

Co-ordination compound of alizarin with Al^{+3} as follow



Coordination compound of Alizarin with

12. (a) Solid propellants or composite propellants are mixture of polymeric binders (such as polyurethane or polybutadiene as fuel) and ammonium per chlorate as oxidiser.

These are used in SLV-3 and ASLV rockets.

13. (c) The most widely used domestic detergent is the sodium dodecyl benzene sulphonate (SDS).

$CH_3-(CH_2)_{11}$  SO_3Na

(Sodium dodecyl benzene sulphonate)

14. (d) $>C=N$ is not an auxochrome.

15. (c) The energy of propellant is measured in terms of a specific impulse. Is inside the motor of the rocket. It depend up on the flame temperature and average molecular mass of the gaseous products coming out of the rocket nozzle. The specific impulse is given by the following relationship with the average molecular mass *M* and the flame temperature, T $I_s=\sqrt{T_c/M}$.

16. (a) "Parathion" is an organic phosphorus compounds.

17. (e) H_2CO_3 + HCO_3^- buffer present in human blood, which maintain *pH* of blood.

18. (a) Soaps are the sodium or potassium salt of higher fatty acids. e.g., $C_{17}H_{37}COOK$ (Potassium stearate). These are obtained by alkaline hydrolysis of oils and fats. The reaction is called saponification.

19. (b) A mixture of O_2 and *He* is used for respiration as helium is inert and light gas and diffuse rapidly.

Assertion & Reason

1. (b) It is correct that fluorescein is an absorption indicator. It is also true that fluroescein indicator is a dye. Therefore, both assertion and reason are true but reason is not a correct explanation for assertion.

2. (e) The drugs which act on the central nervous system and help in reducing anxiety are called tranquilizers.

3. (a) Tranquilizers are chemicals which are used to cure mental diseases.

4. (a) Broad spectrum antibiotics are those medicines which are effective against several different types of harmful micro organisms.

5. (b) Antiseptics are those chemicals which kill or prevent the growth of micro organism. Antiseptics do not harm the living tissues and can be applied on cuts and wounds. They help to reduce odours resulting from the bacterial decomposition in the mouth on the body.

6. (a) A small does of sedative produces a feeling of relaxation, calmness and drowsiness.

Chemistry in Action

SET Self Evaluation Test - 32

1. Chloramphenicol is used in the treatment of which of the following **[MP PET 2000]**

(a) Typhoid

(b) Pneumonia

(c) Headache and fever

(d) Bronchitis

2. A substance which can act both as antiseptic and disinfectant is **[MGIMS Wardha 2001]**

(a) Aspirin

(b) Chloroxylenol

(c) Bithional

(d) Phenol

3. Cocaine is

(a) Vitamin

(b) Poison

(c) Medicine

(d) Antipyretic

4. Penicillin is a

(a) Hormone

(b) Antibiotic

(c) Antipyretic

(d) Vitamin

5. One of the most widely used drug in medicine, iodex is **[CPMT 1989]**

(a) Methyl salicylate

(b) Ethyl salicylate

(c) Acetyl salicylic acid

(d) *o*-hydroxy benzoic acid

6. Which of the following is a natural dye

(a) Martius yellow

(b) Alizarin

(c) Phenolphthalein

(d) Orange I

7. Which is an explosive

(a) Toluene

(b) R.D.X.

(c) *p*-Nitrophenol

(d) All of these

8. A certain dye was prepared from a plant grown on a large scale in India. Name the dye

(a) Malachite green

(b) Congo red

(c) Indigo

(d) Turmeric

9. Paracetamol is/are **[KCET 1997]**

(a) Both antipyritic and analgesic

(b) Analgesic

(c) Antipyritic

(d) Antimalaric

10. Which is plant growth inhibitor

(a) Ethylene

(b) IAA

(c) Abscisic acid

(d) Auxins

11. Indigo belongs to the class of **[Pb. CET 1998]**

(a) Mordant dyes

(b) Vat dye

(c) Direct dye

(d) Disperse dye

12. Aspirin is a/an **[Pb. CET 2000]**

(a) Analgesic and antipyretic

(b) Antibiotic

(c) Insecticide

(d) Herbicide

13. Artificial sweetener used in soft drinks is **[DCE 2002]**

(a) Aspartame

(b) Cellulose

(c) Fructose

(d) Glucose

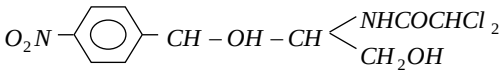
14. During glycolysis acetyl co-enzyme is formed from **[DCE 2002]**

(a) Pyruvate with a loss of carbonyl group
(b) Citric acid cycle
(c) Directly from glucose
(d) None of these

Answers and Solutions

(SET -32)

1. (a,b) It is a broad spectrum antibiotic. It is effective against certain gram-positive and gram-negative bacteria and some rickettsiae and viruses. It is very effective in the treatment of typhoid fever, gitis, pneumonia, whooping cough.



chloramphenicol

2. (d) Phenol has antiseptic as well as disinfectant (Kill Bacteria) quality.

3. (c) "Cocaine" is used as medicine to produce general or local insensibility to pain and other sensations.

4. (b) Penicillin is broad spectrum antibiotic. It is first antibiotic, discovered by A. Fleming in 1929. From penicillium notatum fungi.

5. (a) Methyl salicylate also known as oil of wintergreen is used as medicine iodex in treatment of rheumatic pains are remedy for aches, sprains and bruises.

6. (b) Dyes are the natural or synthetic chemical used to impart colour to Fabric Plastic., paper etc. including food item. For their pleasent appearance. Alizarin (orange red) is extracted from the root of maddar plant also synthesized now a day.

7. (b) RDX is an explosive.

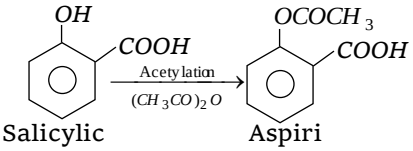
8. (c) Indigo is obtained in India by plants.

9. (a) It is acetyl salicylic acid and used as analgesic and antipyratic.

10. (c) Abscisic acid is a plant growth Inhibitor.

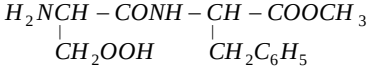
11. (b) It is Vat dyes which are insoluble compounds which up on reduction give soluble (Leucoform product). The product may be either coloured or colourless and have affinity for specific fabrics *e.g*. Indigo.

12. (a) Aspirin in an acetyl derivative or salicylic acid It is an analgesic and antipyretic drugs.



Salicylic Aspiri

13. (a) Artificial sweetener is "Aspartame". Its chemical formula is



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14. (a) During glycolysis acetyl *CO* – enzyme is obtained from pyruvate with a loss of carbonyl group.