# Unit 9

# Chemistry in Everyday Life

## 9.1 Introduction

Development of chemistry improves quality of human life. Contribution of chemistry is seen in each and every field of human life. Some compounds, such as foods, clothes, potable water, abode, soaps, detergents, drugs, dyes etc. which we are using regularly are mostly made from organic compounds. Moreover, fertilizers and pesticides used in agriculture, polymers, oils, papers, glass, cement, various types of fuels etc. are gifts of chemistry. Synthesis of creative and destructive explosives used in security of nation have become possible through chemistry. In this way, directly or indirectly, chemistry is closely associated with our everyday life. In this unit, we will understand uses of chemistry in three important areas – drugs, foods and cleansing agents.

## 9.2 Drugs

Up to 19th century, plant based natural drugs were used in crude form e.g., powder or boiled drink of bark, roots and leaves of tree etc. available in nature. The bark of cinchona tree and quinine obtained from it, were used for malaria; but for certain diseases no natural or synthetic drug was available during 19th century. Research about applications of such compounds resulted in chemical compounds which were used for treatment of diseases in 20th century. In 1904, a German chemist Paul Ehrlich realized that certain chemicals were more toxic to disease causing organisms to human cells, so these chemicals could be used to control or cure infectious diseases. Ehrlich found certain dyes that used to stain bacteria to make them more visible under a microscope. These dyes stain the nerve cells of bacteria. From this, the idea arose in his mind that if it can be made toxic for organisms, then they

could be used as effective drug for these microorganisms. In this way Ehrlich synthesized arsenic containing compounds (Salvarsan and neo salvarsan) for skin disease like syphilis and for sleeping sickness. For this Ehrlich was awarded the Nobel prize in 1908. Ehrlich gave chemotherapy term for such compounds used in treatment of diseases. Thus, treatment of diseases in which parasites live (virus, fungi, yeast, bacteria, protozoa, worm) are killed and their growth is inhibited by chemicals in body is called **chemotherapy.** Due to successive efforts of Ehrlich about chemotherapy, he is known as father of chemotherapy.

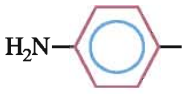
## 9.3 Classification of Drugs

Due to development of chemistry, many drugs are synthesized for various diseases. These drugs can be classified in four types as follows.

**(1) On the basis of pharmacological effect :** Drugs can be classified on basis of their pharmacological effect. This classification is most useful for doctors because they are known as drugs for specific treatment. For example, body pain relieving drugs can be classified as analgesic drugs and the drugs, killing or inhibiting the growth of microorganisms that cause harmful effect on wound or injury can be classified as antiseptic drugs.

**(2) On the basis of drug action :** Drugs can affect particular biochemical process. Drugs can be classified on the basis of specific action of them. Some problems occur in body due to release of histamine such as common cold, acidity, swelling, redness of skin and itching. Therefore, the drugs used to stop the release of histamine are classified as separate class of antihistamines.

**(3) On the basis of chemical structure of drugs :** Drugs can be classified on the basis of chemical structure. Drugs containing similar chemical structure are included in same class. Mostly, drugs containing similar chemical structure have similar drug action. e.g., sulphonamides have common structure as follows :



where, R = aromatic or heterocyclic group

**(4) On the basis of molecular targets of drugs :** Drugs usually interact with biomolecules such as carbohydrates, lipids, proteins and nucleic acids. These biomolecules are called target molecules of drugs. Similar target molecules containing drugs can be put in the same class.

## 9.4 Working Mechanism of Drugs

Macromolecules perform various functions in the body. For example, some proteins perform the role of biological catalysts in the body called **enzymes.** Some proteins are crucial to communication system in the body called **receptors.** Nucleic acids have coded genetic information for the cell. Lipid and carbohydrates are structural parts of the cell membrane.

Enzymes and receptors play an important role in our body. If these two substances show negative effect, then various systems get disturbed in our body, as a result a human being suffers from various diseases. We use specific drugs for protection of these diseases. These drugs stop negative effect of enzymes and receptors by interacting with them.

### 9.4.1 Drug-Enzyme Interaction :

Detailed information about enzymes is given in unit-7. Generally substrate is bound with active site of enzyme. At the end of this reaction product is formed and enzyme is obtained in original form. Information about lock and key model of enzyme, which explains the mechanism of enzyme can be found in unit-2 and 7. Drugs stop this reaction of enzymes; for this, drugs stop the substrate from binding with active site of enzyme. These drugs are called **enzyme inhibitors.** Drugs stop the substrate to bind with active site of enzymes in two ways.

(1) Drugs compete with natural substrate for their attachment on the active site of enzymes as shown in Fig. 9.1; such drugs are called **competitive inhibitors.**

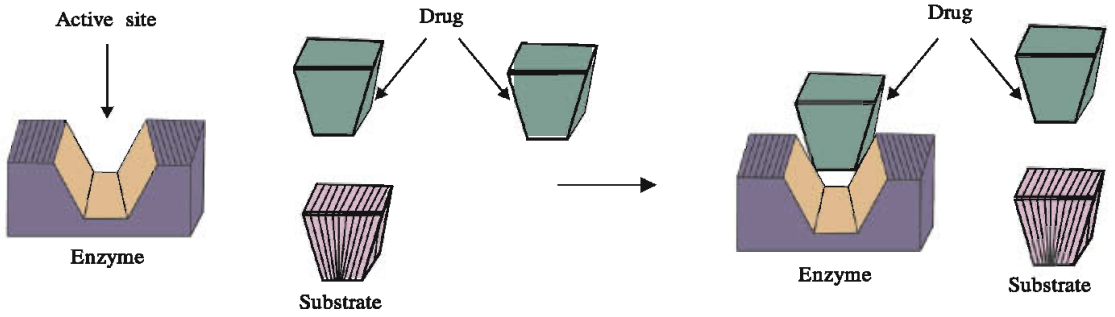



**Fig. 9.1 Competition between drugs and substrate for binding with active site of enzyme**

(2) Some drugs do not bind to the active site of enzyme but bind to a different site. This site is called **allosteric site.** This type of binding of drug with enzyme results in the change in shape of active site as shown in Fig. 9.2, therefore substrate cannot bind with it. If the binding between enzyme and drug is formed by strong covalent bond then it cannot be broken easily, so this enzyme is blocked permanently when body degrades the enzyme-inhibitor complex, and new enzyme is synthesised.

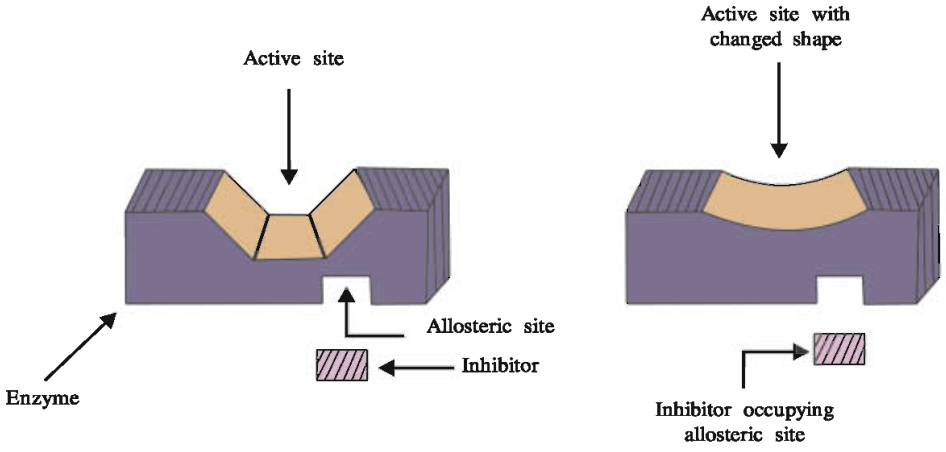



**Fig. 9.2 Change in shape of active site of enzyme and allosteric site**

### 9.4.2 Drug-Receptor Interaction :

Receptors are made from proteins. They play key role in communication process of body. Most of receptors are embedded in cell membrane as shown in Fig. 9.3.

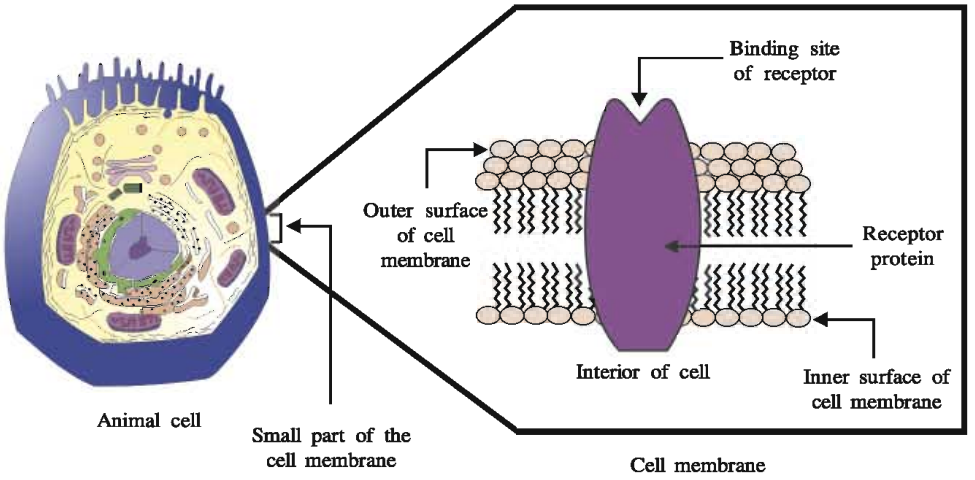



**Fig. 9.3 Receptor in membrane of animal cell**

Small active part of receptor is present on outside region of cell membrane. It is called binding site. In the body, message between two neurons or that between neurons to muscles is communicated through certain chemicals. These chemicals are called **chemical messengers.** When a chemical messenger comes near the binding site of receptor, then the receptor changes shape of its binding site to accept chemical messenger. Messenger gives its message to cell, and it moves away from receptor. Thus, messenger gives message to the cell without entering into the cell as shown in Fig. 9.4

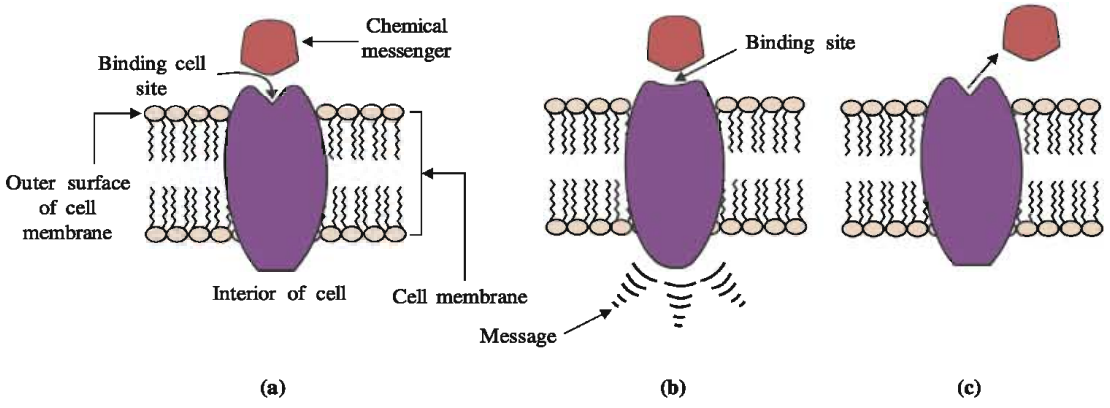



**Fig. 9.4 (a) Receptor receiving chemical messenger**

**(b) Shape of the receptor changed for attachement of messenger**

**(c) Receptor regains structure after removal of chemical messenger**

Many receptors are present in body. They interact with various chemical messengers. Receptors react with specific messenger due to specific shape of its binding site. Instead of messengers, drugs bind to receptor site and stop communication process of cell. These drugs are called **antagonists.** Sometimes, due to defect in natural chemical messenger, the communication process is stopped. At this time, if the messenger shaped drug is used, then receptor accept it, and under the impression of natural messenger the communication process occurs. These drugs are called **agonists.**

## 9.5 Therapeutic Action of Different Classes of Drugs

Let us discuss therapeutic action of some important classes of drugs :

**(1) Antacids :** Due to overeating or indigestion, much acid is released in stomach. It is known as acidity. Acidity causes irritation and pain in stomach. In severe cases, ulcers are developed in stomach. Sodium hydrogen carbonate or mixture of aluminium hydroxide and magnesium hydroxide are used as **antacids** for treatment of acidity. Metal hydroxides are insoluble so they do not increase the pH higher than neutral value in stomach. While excessive sodium hydrogen carbonate can make the stomach fluid alkaline; due to this side effects can occur in stomach. Antacids give relief only from the symptoms but they do not control the causes, so they are not called drugs.

**(2) Antihistamines :** In our body, release of histamine stimulates the secretion of pepsin and hydrochloric acid in stomach, therefore, acidity develops in stomach. The drug cimetidine (Tegamet) prevents the interaction of histamine with the receptors present in stomach wall. It results in release of lesser amount of acid. Thus, this drug acts like antacid and prevents the causes of release of acid. Moreover, similar type of drug- ranitidine (zantac) is more used nowadays.

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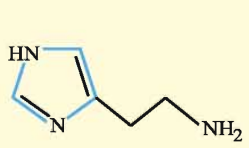
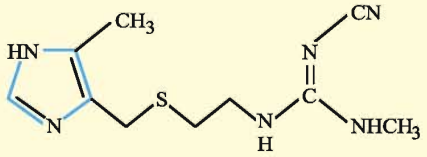
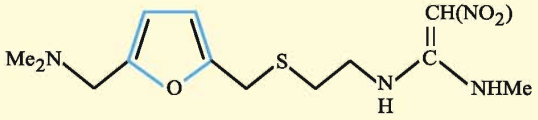



Histamine




Cimetidine




Ranitidine

Histamine causes common cold, redness of skin and allergy like itching in body. For this synthetic drugs brompheniramine (Dimetapp) and terfenadine (seldane) are used as antihistamines. These drugs are also known as **antiallergenic drugs.** These drugs prevent interaction between histamine in binding with receptor. Thus, these drugs protect the body from negative effect of histamine. We cannot use the antacids as antiallergenic drugs or antiallergenic drugs as antacids because both types of drugs work on different receptors.

**(3) Neurologically active drugs :** Tranquilizers and analgesics are neurologically active drugs. These drugs affect mainly the message transfer mechanism between nerve and receptor.

**(A) Tranquilizers :** Tranquilizers are a class of chemical compounds used in treatment of stress, mild and severe mental diseases. They relieve anxiety, stress, irritability or excitement. They are essential components in sleeping pills. There are various types of tranquilizers. Their functions are also different. For example, noradrenaline is one of the neurotransmitter that means neuro messenger. It changes the mood of person. If the level of noradrenaline is low for some reason then the message signal sending activity becomes slow, due to this person feels depressed. In such situation antidepressant drugs are required. These drugs inhibit catalytic effect of enzyme for degradation reaction of noradrenaline. Thus, these drugs act as enzyme inhibitors. Therefore important neurotransmitter noradrenaline is released and after a long period it activates its receptor. Thus, person comes out of depression gradually. Iproniazid and phenelzine are this type of drugs.

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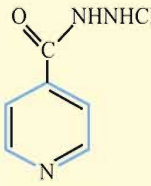
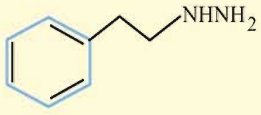


Iproniazid



Phenelzine

Some tranquilizers namely chlordiazepoxide and meprobamate are relatively mild tranquilizers. They relieve tension. Equanil drug relieves from depression and hypertension.

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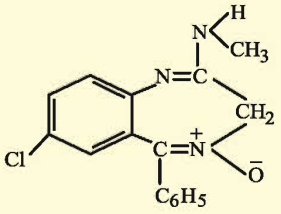
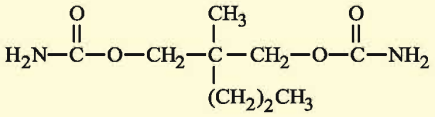
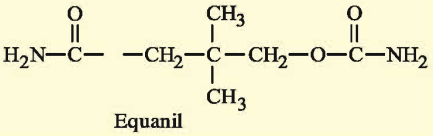


Chlordiazepoxide



Meprobamate



Equanil

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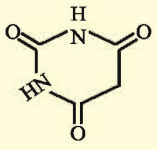
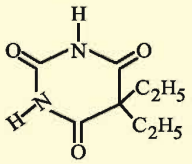


Barbituric acid



Veronal

Derivatives of barbituric acid such as veronal, amytal, nembutal, luminal, seconal are important tranquilizers. These barbituric acid derivatives are called barbiturates. They are sedatives (sleep producing agents).

**(B) Analgesic drugs :** Physical pain reducing compounds are known as **analgesic drugs.** These drugs can be classified in to two classes as follows :

(i) Non-narcotic analgesic drugs

(ii) Narcotic analgesic drugs

**(i) Non-narcotic analgesic drugs :** Aspirin and paracetamol are well known examples of non-narcotic analgesic drugs. Due to these drugs, a person does not suffer from sleepiness or excitement, so they are called **non-narcotic analgesic drugs.** In body, released prostaglandins chemical causes inflammation and pain in the tissue. Aspirin inhibits synthesis of prostaglandins in body, which results in removal of pain in body. These drugs relieve from skeletal pain such as that caused by arthritis. These drugs reduce body temperature which means they are fever relievers. Therefore, these drugs are known as **antipyretics.** Aspirin prevents coagulation of blood, due to this it is more useful to patient of heart diseases.

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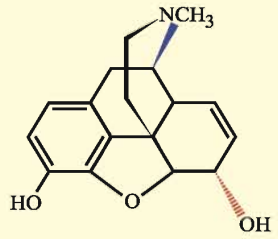


Morphine

**(ii) Narcotic analgesic drugs :** When morphine and many of its homologues are used as drugs, then they relieve pain and produce sleep. Due to these drugs, excitement occurs before sleep. It is called euphoria. If a person starts enjoying this situation frequently, then person has to take it regularly and becomes an addict. This is the most negative side of such drugs. These drugs produce excitement and sleep. Due to this, they are called **narcotic analgesic drugs.** If large amount of morphine is used, then it acts as poison instead of drug. Large amount of morphine produces stupor, coma, convulsions and ultimately death. These drugs are used when there is no option for them. Many efforts have been made to find out alternative of morphine and these efforts are continuing till today.

**(4) Antimicrobial drugs :** Diseases occur in human being and animals due to different types of microorganisms such as bacteria, virus and fungi. The drugs which are used to prevent and to inhibit the pathogenic action of these microorganisms are called **antimicrobial drugs.** The specific chemical is used to prevent and to inhibit the pathogenic action of bacteria, fungi, virus and other parasite is called antibacterial agent, antifungal agent, antiviral agent and antiparasitic agent, respectively. Generally, antibiotics, antiseptics and disinfectants are called antimicrobial drugs.

**(A) Antibiotics :** The chemical substances produced by living organisms to inhibit the growth or to kill microorganisms are called **antibiotics,** e.g., penicillin, tetracycline, chloramphenicol, etc. Penicillin produced by microorganisms is first antibiotic that acts as drug. In 1945, Alexander Fleming, Howard Florey and Ernst Boris Chain were awarded the Nobel prize in the field of physiology and medicine, to encourage their joint efforts in this field. Antibiotics that kill microorganisms are called **microbicidal** and antibiotics that inhibit the growth of microorganisms are called **microbiostatic.** For example, penicillin, aminoglycosides, ofloxacin etc. are bactericidal and erythromycin, tetracycline, chloramphenicol etc. are bacteriostatic.

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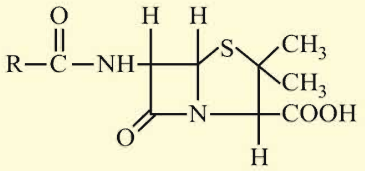
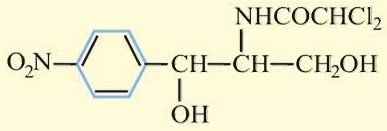


General structure of Pencillin



Chloramphenicol

Nomenclature methods of antibiotics is also interesting. Names of some antibiotics were derived from the names of bacteria, e.g., Pencillin from penicillium notatum, streptomycin from streptomyces griseus. Some names were decided from name of place from where soil samples were first collected e.g., Angolamycin from Angola. Some names were decided from name of laboratory or factory, e.g., Hemycin from Hindustan Antibiotics Ltd. Some names were derived from the names of relatives, patients, secretary of discoverer-scientist. e.g., Halinin from name of a scientist's wife, seramycetin from name of mother-in-law, vernamycin from name of secretary, bacitracin from a patient named Tarcey (microorganisms were collected from wound of Tracey).

**(B) Antiseptics and disinfectants :** Antiseptics and disinfectants are such chemicals that kill or inhibit the growth of microorganisms. **Antiseptics are useful in making tissues free from microorganisms.** Antiseptics are used in making mouth free from microorganisms by gargling and they can be used by applying on wounds. Potassium permanganate, furacine and soframycine are the examples of antiseptics. Like antibiotics it does not take them in abdomen. Dettol used as an antiseptic is a mixture of chloroxylenol and terpineol. Bithionol is added to soaps to develop the antiseptic properties. Iodine is a powerful antiseptic. Its 2-3 % solution prepared in alcohol-water mixture is known as tincture of iodine. It is applied on wounds for making them free from microorganisms. Dilute aqueous solution of boric acid act as weak antiseptic. It is used as washing solution for eyes to free them from microorganisms.

Generally, **disinfectants are applied to inanimate objects for making them free from microorganisms.** 0.2 to 0.4 ppm concentration containing aqueous solution of chlorine and very low concentration of sulphur dioxide can act as disinfectants. Activity of disinfectants is expressed by **phenol coefficient.** If the value of this coefficient is 10, then it means it has 10 times more disinfectant activity than phenol. Generally, this type of activity is checked on salmonella typhosa bacteria. Same compound acts as antiseptic or disinfectant at its different concentrations. e.g., 0.2% of phenol solution acts as antiseptic and 1% of phenol solution acts as disinfectant.

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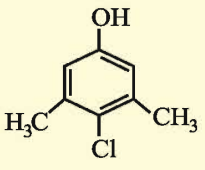
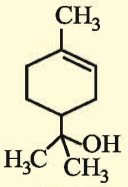
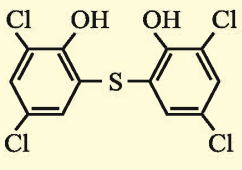


Chloroxylenol



Terpineol



Bithionol

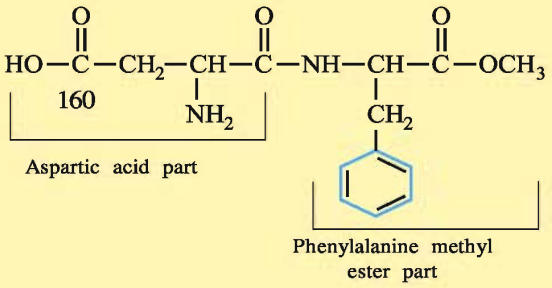
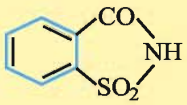
**(5) Antifertility drugs :** Average human life has increased due to modern drugs and good health, therefore, population increases. Increased population causes social problems such as limited resources of foods, clothes and abode, pollution and unemployment. Due to this, each and every person has to worry about how to control the population. For this, remedies should be used to control births. The chemicals used for prevention of impregnation are called **antifertility drugs.** Estrogen and progesterone possess this type of ability. For this, mixture of estrogenic and progestogenic compounds are used in pill form. They are known as antifertility pills or birth control pills. Females can take these pills in orally. In such type of compounds, mixture of mestranol (estrogenic) and norethindrone (progestogenic) is used.

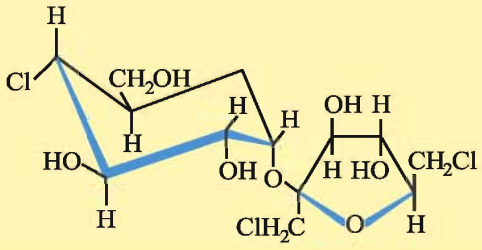
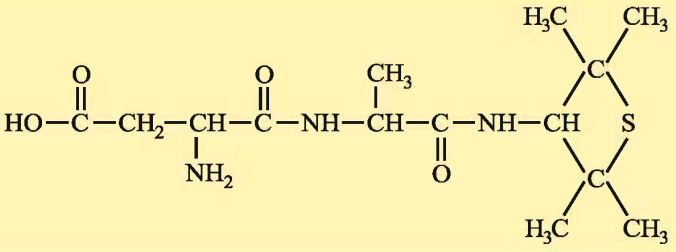
## 9.6 Chemicals in Food

Specific chemicals are added to foods for their preservation, enhancing their appeal and improving nutritive value in them. These compounds are food colours, flavours and sweeteners, fat and stabilising agents, antioxidants, preservatives, nutritional supplements such as minerals, vitamins and aminoacids. Let us study about some important compounds in this topic.

**(1) Artificial sweetening agents :** Many people suffer from fatness or obesity. Obesity causes many diseases. To reduce the obesity, use of non-caloric artificial sweeteners instead of sugar in food has increased. Aspartame, saccharin, sucrolose and alitame are well known artificial sweetening agents. Their sweetness values are 160, 550, 600, 2000 times more, respectively than that of sucrose but they give less calories to body. Aspartame is used only for cold foods and soft drinks because they are unstable at cooking temperature. Appearance and taste of sucrolose are like sugar. It is stable at cooking temperature. Structures of important artificial sweeteners are given in table 9.1

Table 9.1 Artificial sweeteners

| Artificial sweetener | Structural formula (For information only) | Sweetness value in comparison to sucrose |
|---|---|---|
| Aspartame |   | 160 |
| Saccharin |  | 550 |

| | | |
|---|---|---|
| Sucrolose |  | 600 |
| Alitame |  | 2000 |

**(2) Food preservatives :** The chemicals used to prevent food from spoiling by microorganisms like fungi or to preserve food for a long time, are called **food preservatives.** Generally, we use table salt, table sugar and vegetable oil as food preservative in daily life for domestic purposes. Moreover, sodium benzoate, sodium metasulphite and salts of propionic acid or sorbic acid are used as preservatives in food industry.

**(3) Antioxidants :** Addition of some chemical compounds to food causes slow activity of oxygen; so that the food is preserved for a long time. These types of chemical compounds are called **antioxidants.** Antioxidants are more active towards oxygen. Due to this, the foods are preserved. Citric acid, ascorbic acid, butylated hydroxy toluene (BHT) and butylated hydroxy anisole (BHA) are important antioxidants.

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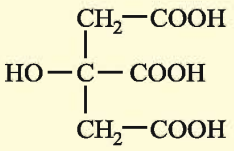
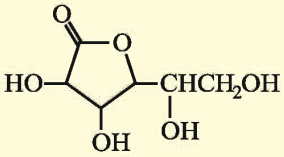
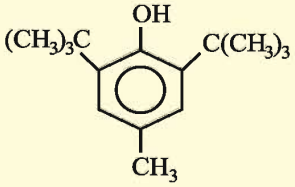


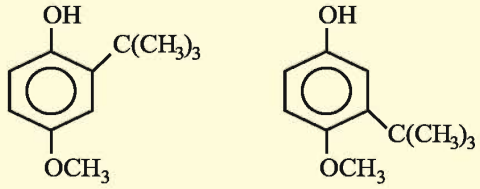
Citric acid



Ascorbic acid



Butylated hydroxy toluene (BHT)



Butylated hydroxy anisole (BHA)
(BHA is mixture of two isomers )

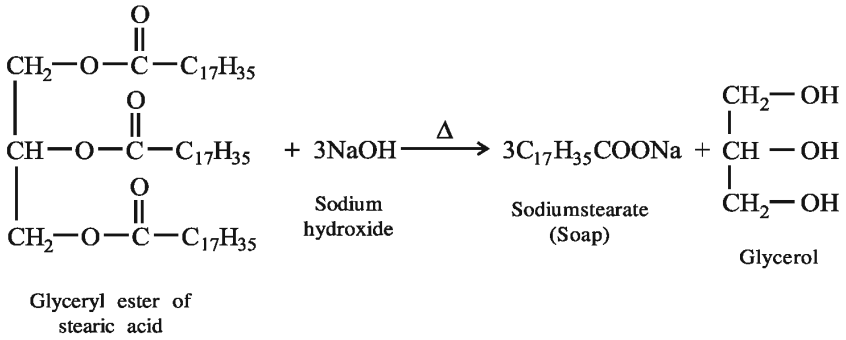
**(4) Food colours :** Some chemical compounds added to food are dyes and as a result food becomes colourful. These type of chemical compounds are called **food colours.** β-carotene, caramel, tetrazine, arneto are food colours.

## 9.7 Cleansing Agents

The chemical compounds used to remove dirt or oily materials from surfaces are called **cleansing agents.** These compounds also improve cleansing property of water.

### 9.7.1 Soap :

Soap is sodium or potassium salt of fatty acid (stearic acid, oleic acid, palmitic acid). Vegetable oils or animal fats are glyceryl ester of the fatty acids. They are heated with aqueous solution of sodium hydroxide or potassium hydroxide which results in formation of sodium salt of fatty acid and glycerol. This reaction of formation soap is called **saponification.**




We use various types of soaps every day, for example, bath soap, washing soap, shaving soap, medicated soap, etc. In preparation of these types of soaps, some specific chemicals are additionly added to main reactants (fats and alkali). For preparation of bath soap, fat or oil having good quality and potassium hydroxide as alkali are used, because this type of soap is soft and they make the soap smooth in comparison to sodium soap. Care should be taken about the removal of excess alkali during preparation of bath soap. Moreover, colours and fragrant materials are also added to it. Glycerol is added during preparation of shaving soap, due to this, soap and its foam do not dry up rapidly. Additionally rosin is added while preparing them. It forms sodium rosinate which foams well. Deodorants are added during preparation of medicated soap. It prevents the body odour due to sweat. **Quality of bath soap can be decided on the basis of presence of TFM (Total Fatty Matters).** If a soap has high proportion of TFM, then its quality is good. Very low proportion TFM containing soap makes skin dry and produces burning sensation. BIS (Bureau of Indian Standards) has established standard values of TFM for deciding the quality of bath soap. As per BIS, grade-1 is given to soap if it contains 76 % or more TFM, grade-2 is given to soap if it contains 65 % or more but less than 76 % of TFM, grade-3 is given to soap if it contains 60 % or more but less than 65 % of TFM. The percentage value of TFM or grade of soap is compulsory to mention on bath soaps. Dear students, kindly read this information on wrapper of a soap that you use and decide its quality yourself.

**Limitations of soap :**

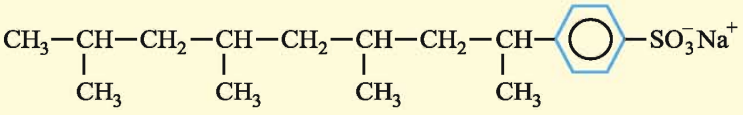
- Soap is converted to free fatty acids in acidic medium. This fatty acid is insoluble in water and it does not act as cleansing agent.

$$\underset{\text{(Soap)}}{C_{17}H_{35}COONa} + H^+ \rightarrow \underset{\text{Fatty acid}}{C_{17}H_{35}COOH} + Na^+$$

- Soap does not produce foam with hard water, because it reacts with calcium and magnesium present in hard water and forms calcium and magnesium salts of fatty acid. Thus, soap is wasted when it is used with hard water, and does not satisfy the purpose of cleanliness.

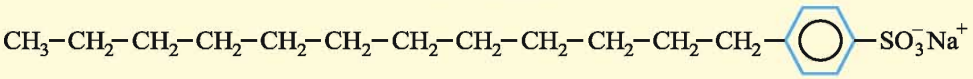
### 9.7.2 Synthetic Detergents :

To combat with the limitations of soap, the compounds are developed possessing similar cleanliness ability of soap called synthetic detergents. **Chemically synthetic detergents are sodium salts of organic sulphonic acid.** Synthetic detergents show the cleanliness ability in acidic medium or even with hard water. Sodium salts of branched alkyl benzene sulphonate (ABS) and linear alkyl benzene sulphonate (LAS) are examples of synthetic detergents. These detergents contain 10 to 14 carbon atoms in chain attached to aromatic ring.



Branched sodium dodecylbenzene sulphonate

(ABS detergent)



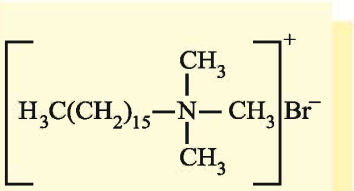
Linear sodium dodecylbenzene sulphonate

(LAS detergent)

**Classification of Detergents :** Detergents are classified into three categories depending upon the structural position of their molecules in aqueous medium (i) anionic detergents (ii) cationic detergents and (iii) non-ionic detergents.

**(i) Anionic detergents :** The detergents which are in negative ion (anionic) form in their aqueous solutions are called anionic detergents. They are effective also in dilute acidic medium. These type of detergents are used more for domestic purposes. ABS and LAS are **anionic detergents.**

**(ii) Cationic detergents :** The detergents which are in positive ion (cationic) form in their aqueous solution are called cationic detergents. These type of detergents being germicidal are used in hospitals and in preparation of cosmetics. Cetyl trimethyl ammonium bromide and its similar quaternary amines are **cationic detergents.** They are used in hair conditioner.



Cetyltrimethyl
ammonium bromide

**(iii) Non-ionic detergents :** The detergents which are neither in cationic nor in anionic form in their aqueous solution are called **non-ionic detergents.** They are used for cleaning the glass and ceramic wares. Polyethylene glycol and ester of stearic acid are these type of detergents.

$$CH_3(CH_2)_{16}COOH + HO(CH_2CH_2O)_nCH_2CH_2OH \xrightarrow{-H_2O} CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$$

Stearic acid — Polyethylene glycol — Non-ionic detergents

**Biosoft and Biohard Detergents :** Detergents used in everyday life are collected through gutters in the sewage farm. Microorganisms degrade organic compounds of sewage farm. Due to this degradation, organic compounds are converted into simple inorganic molecules and ions. The detergents easily degraded by microorganism are called **biosoft detergents.** The detergents not easily degraded or very slowly degraded by microorganisms are called **biohard detergents.** LAS is easily degraded by microorganisms because it contains linear alkyl group, therefore it is known as biosoft detergents; while ABS contains branched alkyl group so it is not degraded by microorganisms, therefore it is known as biohard detergent. Biohard detergents cause water pollution.

## SUMMARY

- Directly or indirectly, chemistry is closely associated with our everyday life. By now we have understood applications of chemistry in drugs, foods and cleansing agents.

### Drugs

- Research about applications of chemical compounds resulted in chemical compounds which were used for treatment of diseases during the twentieth century.
- The treatment in which diseases causing parasites (virus, fungi, yeast, bacteria, protozoa, worm) are killed and inhibited their growth by chemicals in body is called chemotherapy.
- Ehrlich has synthesized arsenic containing compounds for skin diseases like syphilis and for sleeping disorder. For this work Ehrlich was awarded the Nobel prize in 1908.
- Due to successive efforts of Ehrlich about chemotherapy, he is known as father of chemotherapy.
- Drugs can be classified (1) on the basis of pharmacological effect (2) on the basis of drug action (3) on the basis of chemical structure of drugs and (4) on the basis of molecular targets of drugs.
- Enzymes and receptors play an important role in our body. Drugs stop negative effect of enzymes and receptors by interacting with them.

**Therapeutic action of different classes of drugs**

| Sr. | Drug | Uses | Example | Note |
|---|---|---|---|---|
| (1) | Antacids | Prevents acidity | Sodium hydrogen carbonate, mixture of aluminium hydroxide and magnesium hydroxide | Give relief only for the symptoms but do not control the causes |
| (2) | Antihistamine Drugs | In treatment of acidity | As antacids : cimetidine, ranitidine.<br>As antiallergenic drugs : brompheniramine, terfenadine | Act as antihistamine drugs, the antacids cannot be used as antiallergenic drugs or the antiallergenic drugs cannot be used as antacids. |
| (3) | Neurologically Active Drugs | | | They affect mainly the message transfer mechanism between nerve and receptor. |
| | (A) Tranquilizers | Relief from anxiety, stress, irritability. | Iproniazid, phenelzine, chlordiazepoxide, meprobamate, derivatives of barbituric acid such as veronal, amytal, nembutal, luminal, seconal | These drugs are sedative (sleep producing) |
| | (B) Analgesic drugs | | | |
| | (i) Non-Narcotic | In treatment of body pain, fever, coagulation of blood | Paracetamol, aspirin | Patient does not suffer from sleepiness or excitement. |
| | (ii) Narcotic | In treatment of body pain | Morphine | Patient suffers from sleepiness and excitement |
| (4) | Antimicrobial Drugs | | | To prevent and to inhibit the pathogenic action of microorganisms |
| | (A) Antibiotics | To prevent and inhibit the growth of microorganism | Penicillin, tetracycline chloramphenicol, amino glycosides, ofloxacin, erythromycin | |

| | | | | |
|---|---|---|---|---|
| | (B) Antiseptic Drugs | In making tissues free from micro-organisms | Potassium permanganate, tincture iodine, furacine, soframicine, boric acid, 0.2% aqueous solution of phenol | |
| | (C) Disinfectants | In making inanimate objects free from micro organism | Chlorine water having 0.2 to 0.4 ppm concentration, dilute solution of sulphur dioxide, 1% of aqueous solution of phenol | |
| (5) | Antifertility Drugs | Prevention of impregnation | Mixture of mestranol (estrogenic) and norethin-drone (progestogenic) | These drugs are for females, these pills are taken orally. |

**Food**

- Specific chemicals are added to food for their preservation, enhancing their appeal and improving nutritive value.

**Some important compounds are added to food**

| Sr. | Compounds | Examples | Importance |
|---|---|---|---|
| (1) | Artificial sweetening agents | Aspartame, saccharin, sucrolose, alitame | Their sweetness is higher than table sugar but they give less calories to body |
| (2) | Food preservatives | Table salt, table sugar, vegetable oil, sodium benzoate, sodium meta-bisulphite, salt of propionic acid, salt of sorbic acid | To prevent food from spoilage by microorganisms |
| (3) | Antioxidants | Citric acid, ascorbic acid, butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA) | They cause slow activity of oxygen and resulting food is preserved for long time. |
| (4) | Food colours | β-Carotene, caramel, tetrazine, arneto | They make food colourful. |

**Cleansing Agents**

- The chemical compounds used to remove dirt or oily materials from surfaces are called cleansing agents.
- Soaps and synthetic detergents are important cleansing agents.

- Vegetable oil or Animal fat + Sodium hydroxide or Potassium hydroxide $\xrightarrow[\text{Saponification}]{\Delta}$ Sodium salt of fatty acid (Soaps) + Glycerol
- Soaps produce insoluble compounds in acidic medium and with hard water. In these cases soap is wasted and it does not satisfy the purpose of cleansing.
- Sodium salt of organic sulphonic acid is called synthetic detergents. e.g., sodium salts of branched alkyl benzene sulphonate (ABS) and linear alkyl benzene sulphonate (LAS).

**Synthetic detergents**

| Anionic detergents e.g., | Cationic detergents e.g., | Non-ionic detergents e.g., |
|---|---|---|
| • Sodium salt of branched alkyl benzene sulphonate<br>• Sodium salt of linear alkyl benzene sulphonate | • Cetyl trimethyl ammonium bromide | • Ester formed from the polyethylene glycol and stearic acid |

- The detergents easily degraded by microorganism are called biosoft detergents e.g., LAS detergents.
- The detergents not easily degraded or very slowly degraded by microorganisms are called biohard detergents. e.g., ABS detergents. These detergents cause water pollution.

## EXERCISE

**1. Select the proper choice from the given multiple choices :**

(1) Who is known as the father of chemotherapy ?

(A) Alexander Fleming (B) Howard Florey

(C) Paul Ehrlich (D) Ernst Boris Chain

(2) What are the drugs called that kill or inhibit the growth of microorganisms which cause bad effect to wounds or injury ?

(A) Tranquilizers (B) Antibiotics (C) Antiseptics (D) Disinfectants

(3) Which statement is true from the following ?

(A) Drugs bind to receptor site instead of messengers and stop communication process of cell are called agonists.

(B) The receptors which accept drugs in impression of natural messenger and communication process occurs are called antagonists.

(C) Drugs bind to different sites instead of active site of enzyme; this site is called allosteric site.

(D) Drugs helped in binding of substrate with active site of enzyme are called enzyme inhibitors.

(4) Which type of class of drugs does ranitidine belong to ?

(A) Antihistamines (B) Neurologically active drugs

(C) Antimicrobial drugs (D) Antifertility drugs.

(5) Which of following solutions acts as disinfectant ?

(A) Aqueous solution containing 1 % of phenol

(B) Aqueous solution containing 0.2 % of phenol

(C) Aqueous solution containing 2-3 % of iodine

(D) Dilute aqueous solution of boric acid

(6) Which order from the following is true on the basis of sweetness values ?

(A) Aspartame > Sucrolose > Alitame > Saccharine

(B) Aspartame > Saccharine > Sucrolose > Alitame

(C) Alitame > Sucrolose > Saccharine > Aspartame

(D) Saccharine > Aspartame > Alitame > Sucrolose

(7) Which of the following two pairs are proper ?

(a) Food preservative - Sodium benzoate

(b) Antioxidant - Propionic acid

(c) Food colour - β-carotene

(d) Artificial sweetening agent-Arneto

(A) a, b (B) a, c (C) a, d (D) b, d

(8) LAS is .....

(A) Cationic detergent (B) Nonionic detergent

(C) Biosoft detergent (D) Biohard detergent

(9) ABS is .....

(A) Anionic detergent (B) Cationic detergent

(C) Nonionic detergent (D) Biosoft detergent

(10) Which of the following drugs is analgesic drug ?

(A) Barbiturates (B) Penicillin (C) Ranitidine (D) Paracetamol

## 2. Write the answers of the following questions in brief :

(1) Which chemical produced in body causes inflammation or pain in the tissue ?

(2) What is tincture of iodine ?

(3) Write the example of weak antiseptic.

(4) Write the example of powerful antiseptic.

(5) How can the activity of disinfectant be expressed ?

(6) Mention the name of artificial sweetening agent which is stable at cooking temperature.

(7) Which compound is added in shaving soap as a well-foam maker ?

(8) Write definition of following terms :

| | | | |
|---|---|---|---|
| (i) | Chemotherapy | (ii) | Enzyme inhibitor |
| (iii) | Competitive inhibitors | (iv) | Allosteric site |
| (v) | Chemical messenger | (vi) | Antagonists |
| (vii) | Agonists | (viii) | Antacids |
| (ix) | Non-narcotic analgesic drug | (x) | Narcotic analgesic drug |
| (xi) | Antipyretics | (xii) | Antimicrobial drugs |
| (xiii) | Antibiotics | (xiv) | Microbicidal |
| (xv) | Microbiostatic | (xvi) | Antiseptics |
| (xvii) | Disinfectants | (xviii) | Antifertility drugs |
| (xix) | Food preservatives | (xx) | Antioxidants |
| (xxi) | Food colours | (xxii) | Cleansing agents |
| (xxiii) | Soaps | (xxiv) | Synthetic detergents |
| (xxv) | Anionic detergents | (xxvi) | Cationic detergents |
| (xxvii) | Nonionic detergents | (xxviii) | Biosoft detergents |
| (xxix) | Biohard detergents | (xxx) | Antivirus agents |

## 3. Write the answers of the following questions :

(1) Mention two points of difference :

(i) Narcotic – Non narcotic analgesic drugs

(ii) Antiseptic drugs – Disinfectants

(iii) Soap – Synthetic detergents

(iv) Anionic – Cationic detergents

(v) Biosoft – Biohard detergents

(2) Write two examples of each of the following compounds :

| | |
|---|---|
| (i) Antacids | (ii) Antiallergenic drugs |
| (iii) Tranquilizers | (iv) Antibiotics |
| (v) Artificial sweetening agents | (vi) Food preservatives |
| (vii) Antioxidants | (viii) Food colours |

## 4. Write answers of the following questions in detail :

(1) Which four points are taken into consideration in classifying the drugs ? Explain.

(2) Explain drug- enzyme interaction.

(3) Describe drug- receptor interaction.

(4) Discuss about food preservatives and antioxidants added in food.

(5) What is saponification ? Write its chemical equation. Mention the names of compounds which are added during the preparation of bath soap, washing soap and medicated soap.

(6) Explain classification of detergents with examples.