

CLASS 12 CHEMISTRY CHAPTER 16 CHEMISTRY IN EVERYDAY LIFE

- Chemistry is essentially the study of materials and the development of new materials for the betterment of humanity.
 - In our daily life we use so many substances like toothpaste, soaps, sugar etc. which are made up of chemical compounds.
 - In this lesson we will try to learn the uses and applications of chemistry in our day-to-day life.
 - For Example: - The basic common salt, baking soda, fruits; vegetables all are made up of carbon compounds.
 - Following are important areas where we use chemistry in our life:-
1. **Drugs:** Drugs are chemical of low molecular masses, which interact with macromolecular targets and produce a biological response.
 2. **Chemotherapy:** The use of chemicals for therapeutic effect is called chemotherapy.
 3. **Classification of Drugs:**
 - (i) **On the basis of pharmacological effect:** Drugs for a particular type of problem as analgesics for pain relieving.
 - (ii) **On the basis of drug action:** Action of drug on a particular biochemical process.
 - (iii) **On the basis of chemical action:** Drugs having similar structure, *e.g.*, sulphur drugs.
 4. **On the basis of molecular targets:** Drugs interacting with biomolecules as lipids, proteins.
 5. **Enzymes as Drug Targets:**
 - (i) **Catalytic action of enzymes:**
 - (a) Enzymes have active sites which hold the substrate molecule. It can be attracted by reacting molecules.
 - (b) Substrate is bonded to active sites through hydrogen bonds, ionic bonds, van der Waals or dipole-dipole interactions.
 - (ii) **Drug-enzyme interactions:**
 - (a) Drug compete with natural substrate for their attachments on the active sites of enzymes. They are called competitive

inhibitors.

- (b) Some drugs binds to a different site of the enzyme called allostericsites which changes the shape of active sites.

6. **Antagonists:** The drugs that bind to the receptor site and inhibit its naturalfunction.
7. **Agonists:** Drugs mimic the natural messenger by switching on the receptor.
8. **Antacids:** These are compounds which neutralize excess acid of stomach. *E.g.,* Aluminium hydroxide, magnesium hydroxide, rantidine, cimetidine.
9. **Anti-Histamines:** The drugs which interfere with the natural action of histamines and prevent the allergic reaction. *E.g.,* Rantidine, Bromphenisamine, seldone.
10. **Tranquilizers:** The class of chemical compounds used for the treatment of stress, mild or even severe mental diseases. *E.g.,* depression, Iproniazid, Phenelzine (antidepressant), chlordiazeopoxide, meprobamati (mild tranquilizes), veronal, amytal, seconal, equamil.
11. **Analgesics:** They reduce pain without causing impairment of consciousness, mental confusion or some other disturbance of the nervous system. *E.g.,* Aspirin,seridon, phenacetin.
12. **Antimicrobials:** They tend to prevent/destroy or inhibit the pathogenic action of microbes as bacteria, virus, fungi etc. They are classified as:
 - (i) **Antibiotics:** Those are the chemical substances which are produced bymicro-organisms. *E.g.,* Penicillin, Ofloxacin.

Narrow spectrum antibiotics: These are effective mainly against gram positive or gram-negative bacteria. *E.g.,* Penicillin, streptomycin.

Broad spectrum antibiotics: They kill or inhibit a wide range of micro- organisms. *E.g.,* Chloramphenicol, tetracycline, amoxycillin, ampicillin, oflexauin, vancomyain.

(ii) **Antiseptics or Disinfectant:** These are which either kill/inhibit the growth of micro-organisms.

Antiseptics are applied to the living tissues such as wounds, cuts, ulcers etc. *E.g.*, Furacine, chloroxylenol and terpinol (dettol). Disinfectants are applied to inanimate objects such as floors, drainage system.

E.g., 0.2% solution of phenol is an antiseptic while 1% solution of phenol is a disinfectant.

13. Antifertility drugs: These are the chemical substances used to control the pregnancy. They are also called oral contraceptives or birth control pills. *E.g.*, Mifepristone, norethindrone.

14. Chemicals in Food

Chemicals are added to the food for the following reasons:-

Their preservation

Enhancing their appeal

Adding nutritive value in them.

○ Main categories of food additives are as follows:-

1. Food colours
2. Flavours and sweeteners

Sucrose (Natural sugar)

1. Fat emulsifiers and stabilising agents
2. Flour improvers - antistaling agents and bleaches
3. Antioxidants
 1. Antioxidants prevent damage to the cells, cell proteins and lipids. They neutralize the free radicals which causes aging and degeneration of body.
 2. For example: - Vitamin E and Vitamin C etc. They are electron rich substances so they can donate electrons to free radicals which are causing age degeneration.
 3. They stabilize the age causing radicals.

4. Preservatives
5. Nutritional supplements such as minerals, vitamins and amino acids.

Artificial Sweetening Agents

- Sucrose and fructose are the most widely used natural sweeteners.
- But their intake increases calories in the diet and excess of them can cause tooth decay.
- Ortho-sulphobenzimide, also called saccharin, is the first popular artificial sweetening agent. It is about 550 times as sweet as cane sugar. It appears to be entirely inert and harmless when taken.
- Its use is of great value to diabetic persons and people who need to control intake of calories.

Aspartame

- Aspartame is the most successful and widely used artificial sweetener. It is roughly 100 times as sweet as cane sugar.
- It is methyl ester of dipeptide formed from aspartic acid and phenylalanine.
- Use of aspartame is limited to cold foods and soft drinks because it is unstable at cooking temperature.
- Sucralose is trichloro derivative of sucrose. Its appearance and taste are like sugar. It is stable at cooking temperature. It does not provide calories.

15. Artificial Sweetening Agents: These are the chemical compounds which give sweetening effect to the food without adding calorie. They are good for diabetic people. *E.g.*, Aspartame, saccharin, alitame, sucralose.

16. Food Preservatives

- Food preservatives prevent spoilage of food due to microbial growth. The most commonly used preservatives include table salt, sugar, vegetable oils and sodium benzoate, C_6H_5COONa .
- Sodium benzoate is used in limited quantities and is metabolised in the body. Salts of sorbic acid and propanoic acid are also used as preservatives.
- There are 3 categories of food preservatives:-
 - **Anti-microbial**
 - It inhibits the growth of bacteria.
 - **Anti-oxidant**

- They prevent damage to the cells, cell proteins and lipids. They neutralize the free radicals which causes aging and degeneration of body.
- For Example: - BHT(butylated hydroxytoluene) and BRA(Butylated hydroxyanisole).
- **Anti-ripening**
 - It will remove the oxygen from the substance. It is used to preserve fruits and vegetables.

17. Antioxidants: They help in food preservation by retarding the action of oxygen on food. e.g., Butylated hydroxy toluene (BHT) Butylated hydroxyanisole (BHA), SO₂, sulphite used as antioxidant for wine and beer.

18. Cleansing Agents:

- (i) **Soaps:** They are sodium or potassium salts of fatty acids. They are obtained by the saponification reaction, when fatty acids are heated with aqueous sodium hydroxide. They do not work well in hard water.

Preparation of Soap:

Soaps containing sodium salts are formed by heating fat (i.e., glyceryl ester of fatty acid) with aqueous sodium hydroxide solution. This reaction is known as saponification.

In saponification esters of fatty acids are hydrolyzed and the soap is obtained remains in colloidal form.

It is then precipitated from the solution by adding sodium chloride.

The solution left after removing the soap contains glycerol, which can be recovered by fractional distillation.

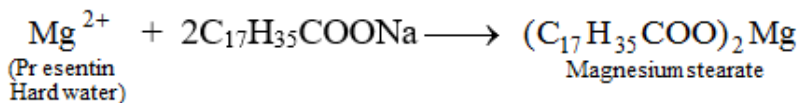
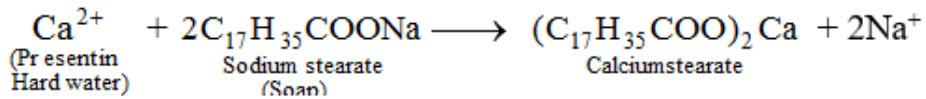
Only sodium and potassium soaps are soluble in water and are used for cleaning purposes.

As compared to sodium, potassium soaps are soft to the skin. These can be prepared by using potassium hydroxide solution in place of sodium hydroxide.

- (ii) **Toilet soaps:** That are prepared by using better grade of fatty acids and excess of alkali needs to be removed. Colour and perfumes are added to make them attractive.
- (iii) **Medicated soaps:** Substances of medicinal value are added. *E.g.*, Bithional, dettol.

Why Soaps don't work in hard water

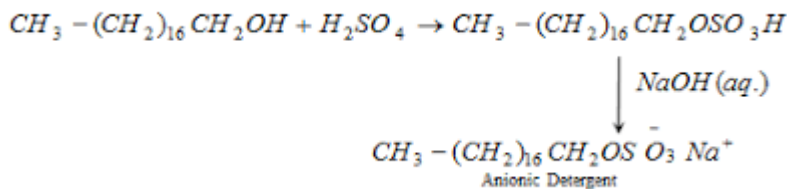
- Hard water contains calcium and magnesium ions. These ions form insoluble calcium and magnesium soaps respectively when sodium or potassium soaps are dissolved in hard water.



- These insoluble soaps separate as scum in water and are useless as cleansing agent. In fact these are hindrance to good washing, because the precipitate adheres onto the fibre of the cloth as gummy mass.
- Soaps cannot be used in acidic solutions since acids precipitate the insoluble free fatty acids which stick to the fabrics and thus reduce the ability of the soaps to remove oil and grease from fabrics.
- Hair washed with hard water looks dull because of this sticky precipitate. Dye does not absorb evenly on cloth washed with soap using hard water, because of this gummy mass.

19. Synthetic Detergents: They are cleaning agents having properties of soaps, but actually, contain no soap. They can be used in both soft and hard water. They are:

(i) **Anionic detergents:** They are sodium salts of sulphonated long chain alcohols or hydrocarbons. *E.g.*, Sodium lauryl sulphonate. They are effective in acidic solution.



(ii) **Cationic detergents:** They are quaternary ammonium salts of amines with acetates, chlorides or bromides. They have germicidal properties and expensive used in hair conditioners $\text{CH}_3(\text{CH}_2)_{16}\text{COO}(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{CH}_2\text{OH}$. *E.g.*, cetyltrimethylammonium bromide.

(iii) **Non-ionic detergents:** They do not contain any ions. Some liquid dishwashing detergents are of non-ionic type.

17. Biodegradable Detergents: The detergents which are linear and can be attacked by micro-organisms are biodegradable. *E.g.*, Sodium 4-(1-dodecyl) benzene/sulphonate.

18. Non-biodegradable Detergents: The detergents which are branched and cannot be decomposed by micro-organisms are called non-biodegradable. *E.g.*, Sodium 4-(1, 3, 5, 7 tetramethyloctyl-benzene sulphonate. It creates water pollution.

