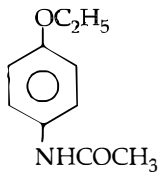
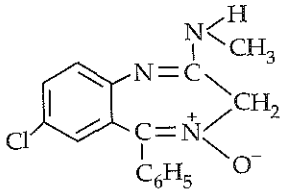
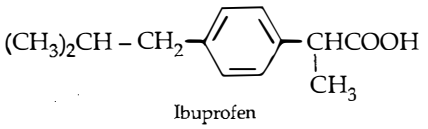
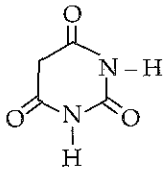
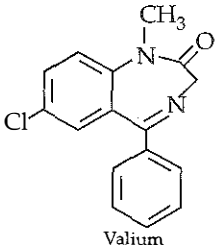
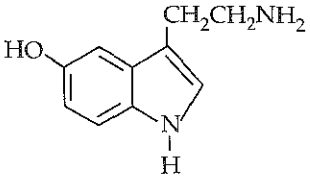

Phenacetin
(4-ethoxyacetanilide)

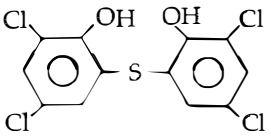

Chlorodiazepoxide

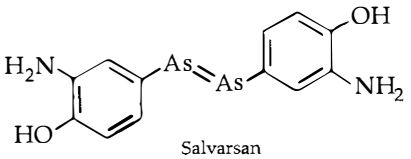

Ibuprofen

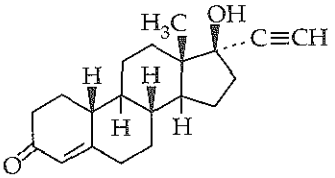

Barbituric acid

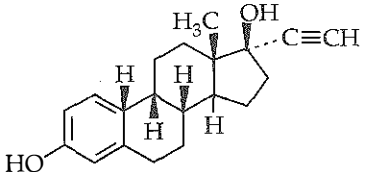

Valium

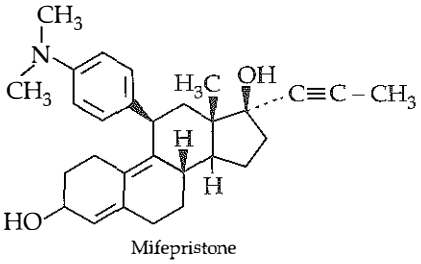

Serotonin

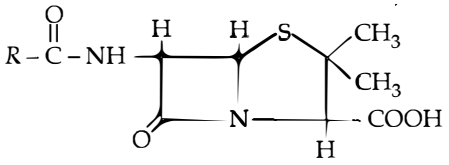

Bithional

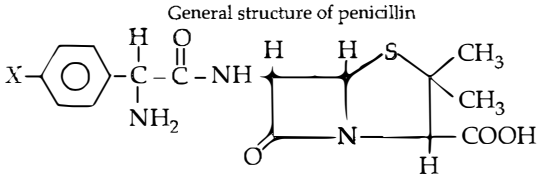

Salvarsan

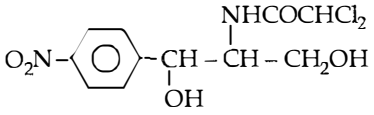

Norethindrone


Ethynylestradiol (novestrol)


Mifepristone


General structure of penicillin


X = H for ampicillin; X = OH for amoxycillin


Chloramphenicol

CHEMICALS IN FOOD

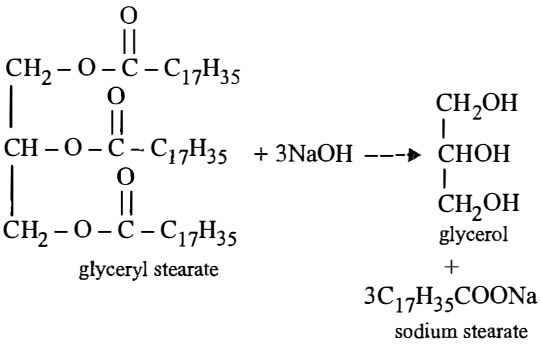
- **Preservatives** are the chemical substances which are added to the food materials to prevent their spoilage and to retain their nutritive value for long periods. These preservatives prevent the rancidity of food and inhibit the growth or kill the micro organisms.
  - The preservation of food by adding sufficient amount of salt to it is called **salting.** Salt prevents the water from being available for microbial growth.
  - The microbial growth in food materials can also be prevented by adding certain chemical substances. The most common preservative used is sodium benzoate (C_6H_5COONa). It is metabolised by conversion to hippuric acid, $C_6H_5CONHCH_2COOH$ which ultimately is excreted through urine.
  - Certain food preservatives such as BHA and BHT are used for edible oils, also act as antioxidants.
- **Artificial sweetening agents :** These are chemical compounds which give sweetening effect to the food and enhance its odour and flavour. *e.g.* saccharin, aspartame, alitame, etc.

Artificial sweetener	Sweetness value in comparison to cane sugar
Aspartame	180
Sucralose	650
Alitame	2000

- **Antioxidants :** These are the chemical substances which prevent oxidation and subsequent spoilage of the food. These act as sacrificial materials, *i.e.,* they are more reactive towards oxygen than the materials they are protecting. They also reduce the rate of involvement of free radicals in the ageing process.

CLEANSING AGENTS

- **Soaps :** They are sodium or potassium salts of higher fatty acids like stearic acid, oleic acid and palmitic acid. Soaps are formed by heating fat with aqueous sodium hydroxide solution. The reaction is called **saponification**.



- Sodium and potassium soaps are soluble in water and are used for cleaning purposes. Potassium soaps are soft to the skin therefore used as bathing soaps.

- **Action of soap in hard water :** Hard water contains Ca^{2+} or Mg^{2+} ions which react with sodium or potassium salt of fatty acid (soap) to form calcium or magnesium salt of fatty acids called scum.

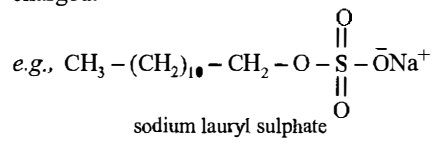
$$2C_{17}H_{35}COONa + Ca^{2+} \rightarrow 2Na^{+} + \underset{\text{insoluble soap or scum}}{(C_{17}H_{35}COO)_2Ca}$$

$$2C_{17}H_{35}COONa + Mg^{2+} \rightarrow 2Na^{+} + (C_{17}H_{35}COO)_2Mg$$

These insoluble soaps stick on to the fibres as gummy mass.

- **Detergents :** These are the materials which are used for cleaning purposes. They are also called soapless soaps.

Anionic detergents : Their polar head is negatively charged.



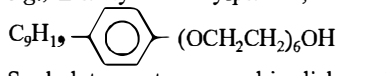
Such detergents are used to wash clothes.

- **Cationic detergents :** Their polar head is positively charged *e.g.,* sapamine,

$[C_{17}H_{33}CONHCH_2NHCH_2CH_2 - \overset{+}{N}(CH_3)_2]_2SO_4^{2-}$.

These are used as fabric softner and hair conditioner.

- **Non-ionic detergents :** Their polar head is neutral. *e.g.,* Ethoxylate nonylphenol,



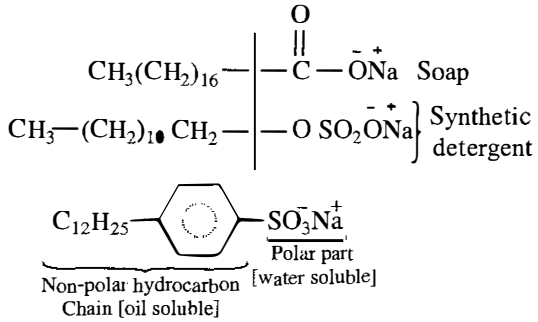
Such detergents are used in dish washers.

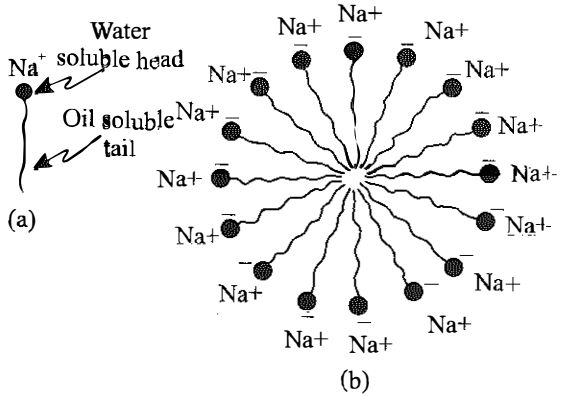
CLEANSING ACTION OF SOAPS AND DETERGENTS

- Soap is an excellent cleanser because of its ability to act as an emulsifying agent. An emulsifier is capable of dispersing one liquid into another immiscible liquid. This means that while oil (which attracts dirt) doesn't naturally mix with water, soap can suspend oil/dirt in such a way that it can be removed.

- The organic part of a natural soap is a negatively charged, polar molecule. Its hydrophilic (water-loving) carboxylate group (COO^-) interacts with water molecules via ion-dipole interactions and hydrogen bonding. The hydrophobic (water-fearing) part of a soap molecule, its long, non-polar hydrocarbon chain, does not interact with water molecules. The hydrocarbon chains are attracted to each other by dispersion forces and cluster together, forming structures called micelles. In these micelles, the carboxylate groups form a negatively charged spherical surface with the hydrocarbon chains inside the sphere. Because they are negatively charged, soap micelles repel each other and remain dispersed in water.

- Grease and oil are non polar and insoluble in water. When soap and soiling oils are mixed, the non-polar hydrocarbon portion of the micelles break up the non-polar oil molecules. A different type of micelle then forms, with non-polar soiling molecules in the center.





(a) A soap molecule (b) Emulsified grease globule