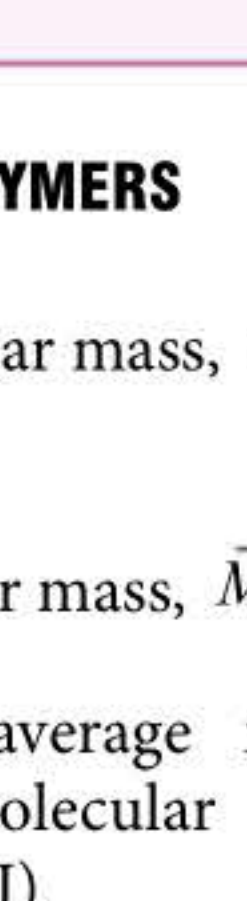



|                                      |  |   |   |
|--------------------------------------|--|---|---|
| Nylon-6, 6                           | HOOC-(CH <sub>2</sub> ) <sub>4</sub> -COOH<br>and H <sub>2</sub> N-(CH <sub>2</sub> ) <sub>6</sub> -NH <sub>2</sub>                        | $\left[ \text{CO}-(\text{CH}_2)_4-\text{CONH}-(\text{CH}_2)_6-\text{NH} \right]_n$  | Synthetic fibres, fishing nets, and tyre industries.        |
| Terylene (Dacron)                    | HOOC-  -COOH<br>and HOCH <sub>2</sub> CH <sub>2</sub> OH | $\left[ \text{O}-\text{CH}_2-\text{CH}_2-\text{O}-\text{C}(=\text{O})-\text{C}_6\text{H}_4-\text{C}(=\text{O}) \right]_n$ | Synthetic fibres, safety belts, tyre cords and tents.       |
| Bakelite (Phenol-formaldehyde resin) |  and HCHO   | $\left[ \text{C}_6\text{H}_2(\text{OH})_2-\text{CH}_2-\text{C}_6\text{H}_2(\text{OH})_2-\text{CH}_2 \right]_n$            | In making gears, protective coatings and electric fittings. |

## MOLECULAR MASS OF POLYMERS

- Number average molecular mass,  $\bar{M}_n = \frac{\sum N_i M_i}{\sum N_i}$
- Weight average molecular mass,  $\bar{M}_w = \frac{\sum m_i M_i}{\sum m_i}$
- The ratio of weight average molecular mass to number average molecular mass is called polydispersity index (PDI).
- Natural fibres usually have PDI equal to 1 while synthetic fibres usually have PDI > 1.

## BIODEGRADABLE POLYMERS

- Biopolymers disintegrate by enzymatic hydrolysis and to some extent by oxidation and hence are biodegradable.

- Synthetic polymers are non-biodegradable and hence create disposal problem. To overcome this, biodegradable synthetic polymers have been developed.
  - Poly -β-hydroxybutyrate - co-β-hydroxyvalerate (PHBV) : It is a copolymer of 3-hydroxybutanoic acid and 3-hydroxypentanoic acid. Used in speciality packaging, orthopaedic devices and in controlled drug release.
  - Poly (glycolic acid) and Poly (lactic acid) or Dextron : A copolymer of PGA and PLA (90 : 10) was the first biodegradable polyester used for stitching of wounds.
  - Nylon-2-Nylon-6 is a step-growth polyamide copolymer of glycine and ε -aminocaproic acid.

## CHEMISTRY IN EVERYDAY LIFE

### CHEMICALS IN MEDICINES

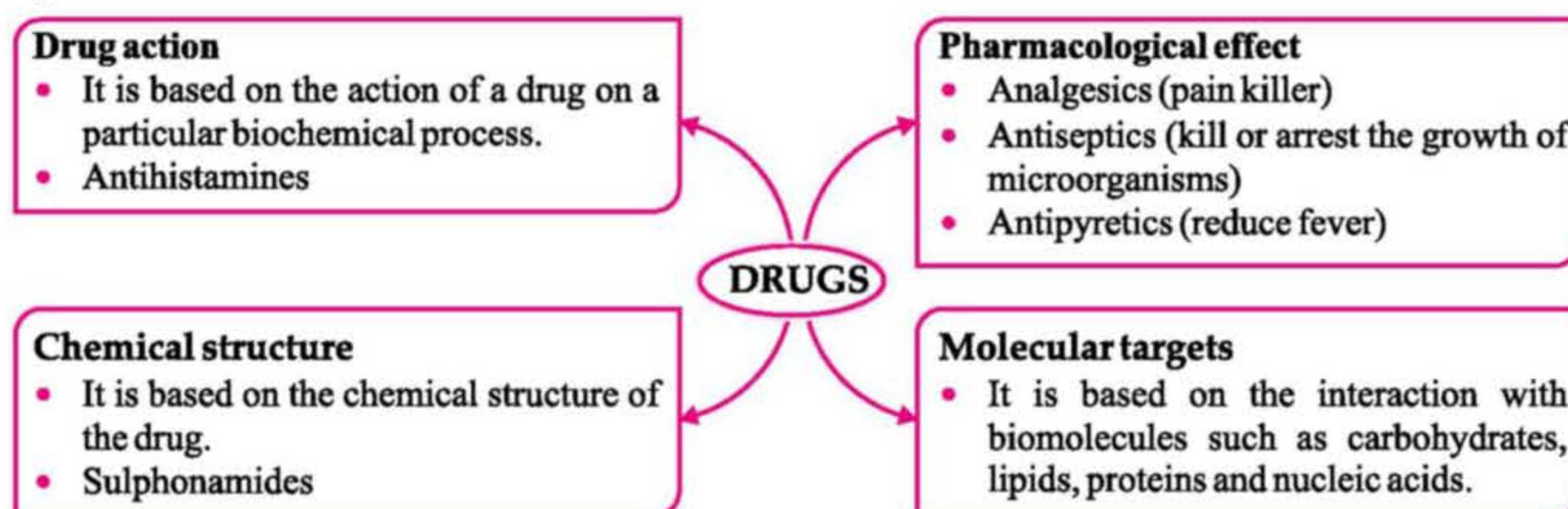
- Drugs are the chemicals of low molecular masses (~ 100-500 u) which interact with macromolecular

targets and produce a therapeutic and useful biological response. These chemicals are called medicines.

- Use of chemicals for therapeutic effect is called chemotherapy.

### Classification of Drugs

- Drugs are classified on the basis of



## Drug Target Interaction

- **Enzymes as drug target :** Drugs inhibit any of the two activities of the enzymes, they can block the binding site of the enzyme and prevent the binding of substrate or they can inhibit the catalytic activity of enzyme.
- **Receptors as drug target :** Proteins which transmit communication to the different parts of the body are called *receptors*. Receptor proteins are embedded in the cell membrane and it changes its shape to accommodate a chemical messenger which brings about transfer of message into the cell.

## Drug interact with receptors in two ways :

- Drugs bind to their receptor sites and inhibit its natural function (antagonists). These are useful when blocking of message is required.
- Some drugs mimic the natural messenger by switching on the receptor (agonists). These are useful when there is lack of natural chemical messenger.

## Therapeutic action of different classes of drugs :

- **Antacids :** These are chemicals which neutralise excess in the gastric juice and give relief from acid indigestion, acidity, heart burns and gastric ulcers, *e.g.*, magnesium hydroxide, calcium carbonate, etc.
- **Antihistamines :** They diminish or abolish the main action of histamine released in the body and hence, prevent allergic reactions *e.g.*, diphenylhydramine (benadryl), pheniramine maleate (avil), etc.
- **Tranquilizers :** These are chemical substances used for the treatment of stress, mild and severe mental diseases. They are neurologically active drugs *e.g.*, veronal, amytal, seconal, equanil, chlordiazepoxide, etc.
- **Analgesics :** These are chemical substances which reduce pain. They are classified as :
  - **Non-narcotic analgesics :** Aspirin and paracetamol belong to this class of drugs. They are effective in relieving skeletal pain such as due to arthritis.
  - **Narcotic analgesics :** These are mainly used for the relief of post operative pain, cardiac pains and pains of terminal cancer.

- **Antimicrobials :** These are chemical substances used to cure infections due to microorganisms, *e.g.*, sulphadiazine, sulphadoxine, etc. Antibiotics, antiseptics and disinfectants are antimicrobial drugs.

- **Antibiotics :** The antibiotics may be either *bacteriocidal* (kill the organisms in the body) *e.g.*, penicillin, ofloxacin, etc., or *bacteriostatic* (inhibit the growth of organisms), *e.g.*, erythromycin, chloramphenicol, etc.

- **Antiseptics :** These are chemicals which either kill or prevent the growth of microorganisms and are applied to the living tissues such as wounds, cuts, ulcers and diseased skin.

Dettol is a commonly used antiseptic.

- **Disinfectants :** These are also used to kill microorganisms, but they are applied to inanimate objects.

- Some substances can act as antiseptic as well as disinfectant by varying the concentration.
- **Antifertility drugs :** Chemical substances used to prevent conception or fertilization are called *antifertility drugs*. *e.g.*, mifepristone, ormeloxifene, etc.

## CHEMICAL IN FOOD

- Chemicals which are added to food for their preservation or enhancing their appeal, flavour, etc. are known as *food additives*.
- **Food preservatives :** These 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 microorganisms. The most common preservative used is sodium benzoate ( $C_6H_5COONa$ ).
- **Artificial sweetening agents :** These are chemical compounds which give sweetening effect to the food and enhance its odour and flavour.

| Artificial Sweetener | Sweetness Value in Comparison to Cane Sugar |
|----------------------|---|
| Aspartame            | 100   |
| Saccharin            | 550   |
| Sucralose            | 600   |
| Alitame              | 2000  |

- **Antioxidants** : These are the chemical substances which prevent oxidation and subsequent spoilage of the food by retarding the action of oxygen on food. They act as sacrificial materials as they are more reactive towards oxygen than the materials they are protecting.

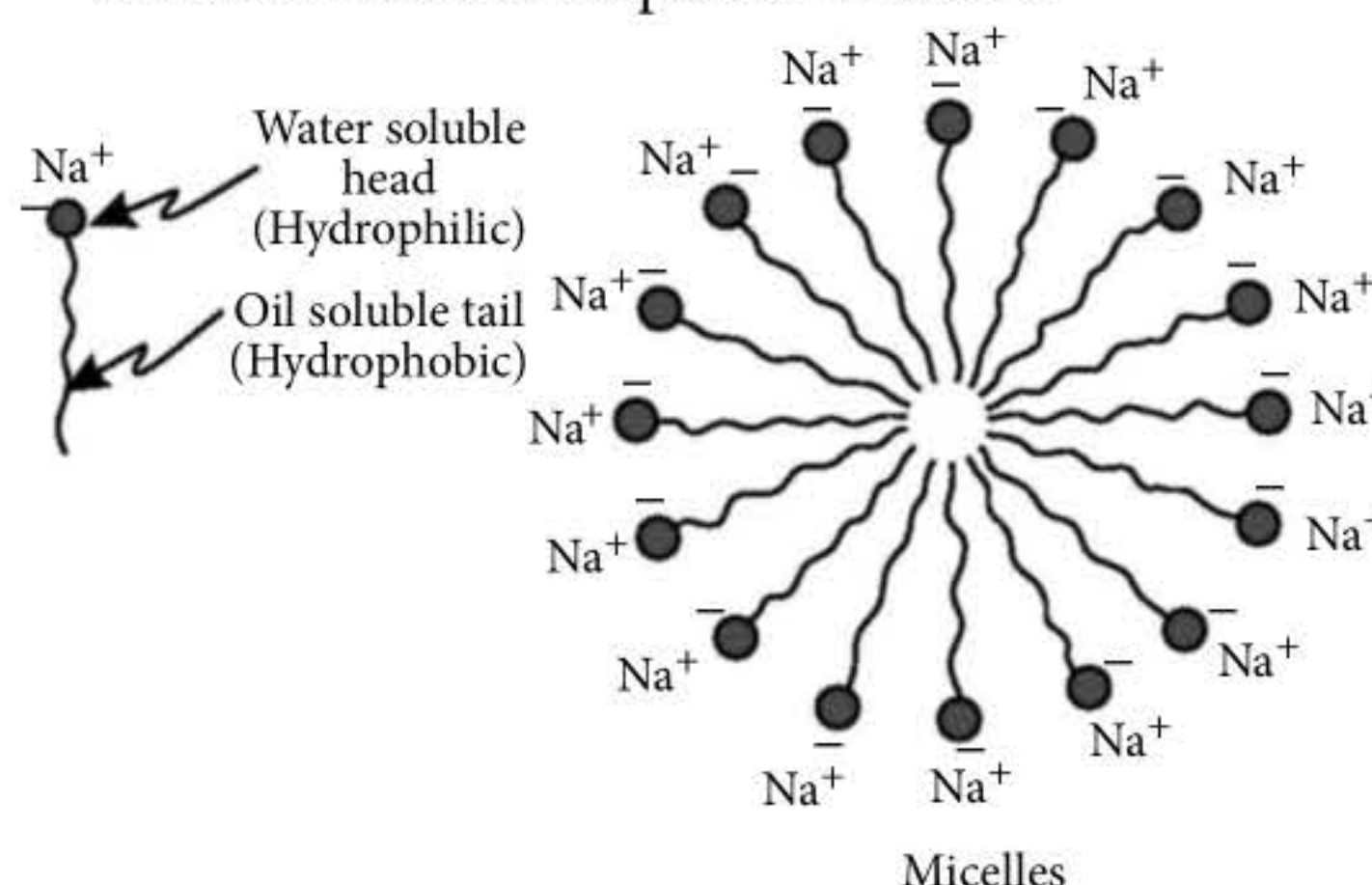
## CLEANSING AGENTS

- **Soaps** : These are sodium or potassium salts of higher fatty acids (with 12-18 carbon atoms) e.g., salts of  $C_{15}H_{31}COOH$  (palmitic acid),  $C_{17}H_{35}COOH$  (stearic acid),  $C_{17}H_{33}COOH$  (oleic acid),  $C_{17}H_{31}COOH$  (linoleic acid), etc.
- **Soapless soaps or synthetic detergents** : These are sodium salts of long chain alkyl hydrogen sulphates or the sodium salts of long chain benzene sulphonic acids.
  - **Cationic detergents** : These are quaternary ammonium salts of amines with acetates or halides as anions. e.g., trimethylstearylammmonium chloride,  $CH_3(CH_2)_{17}N^+(CH_3)_3Cl^-$
  - **Anionic detergents** : These contain anionic hydrophilic groups e.g., sodium lauryl sulphate,  $C_{12}H_{25}OSO_3^-Na^+$

- **Non-ionic detergents** : These are esters of high molecular mass and do not contain ions e.g., polyethylene glycol stearate,  $CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$

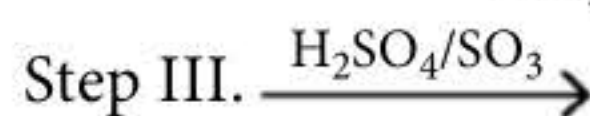
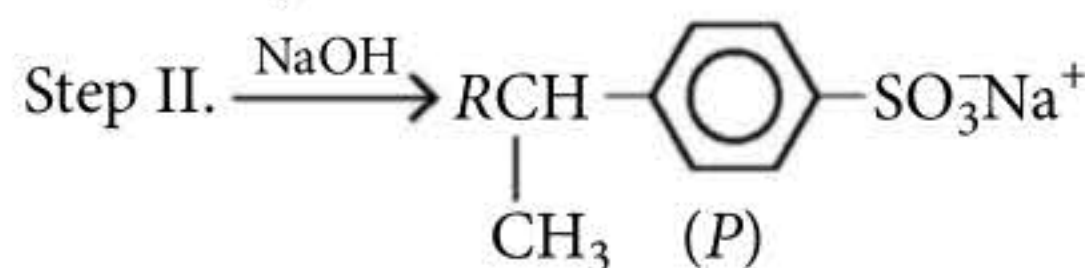
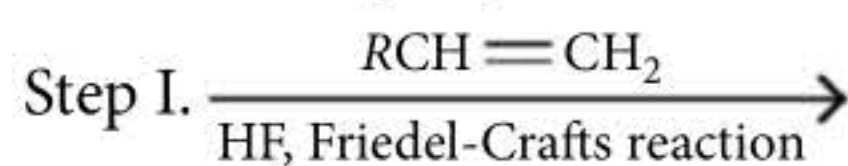
## Cleansing Action of Soaps and Detergents

- The hydrophilic carboxylate group interact with water molecules while the hydrophobic long non-polar hydrocarbon chain does not interact.
- The hydrocarbon chains cluster together forming structure called *micelles*.
- In the micelles, the carboxylate groups form a negatively-charged spherical surface, with the hydrocarbon chains inside the sphere.
- Being negatively charged, soap micelles repel each other and remain dispersed in water.



# SPEED PRACTICE

1. For the preparation of a detergent 'P' from benzene, the following steps are involved :



These steps should be in sequence of

- (a) I, II, III                      (b) II, I, III  
 (c) II, III, I                      (d) I, III, II
2. Which of the following substances is not an organophosphorus insecticide?
 

(a) Malathion                      (b) Parathion  
 (c) Phosdrin                      (d) Rotenone

3. The copolymer formed by addition polymerization of styrene and acrylonitrile in the presence of peroxide is

