Chapter-CHEMISTRY IN EVERYDAY LIFE

Q 16.1

Why do we need to classify drugs in different ways?

Solution:

The following is a list of drug classifications and reasons for classification:

(i) On the basis of pharmacological effect:

This classification offers doctors with a comprehensive list of medications that can be used to address a specific issue. As a result, doctors benefit greatly from this classification.

(ii) On the basis of drug action:

This classification is based on how a medicine affects a specific biological process.

As a result, this classification is essential.

(iii) On the basis of chemical structure:

This classification covers a wide range of medications with similar structural characteristics and pharmacological activity.

(iv) On the basis of molecular targets:

Medicinal chemists can use this classification to find medications that have the same mechanism of action on the same targets. As a result, medicinal chemists find it to be the most useful.

Q 16.2

In medicinal chemistry, define the terms target molecules or drug targets.

Solution:

Drug targets are crucial molecules engaged in various metabolic processes that result in specific diseases, according to medicinal chemistry. Drug targets include carbohydrates, proteins, lipids, and nucleic acids. Drugs are chemical compounds that attach to the active sites of important molecules to inhibit the target molecules.

Q 16.3

Give the names of the macromolecules that have been selected as therapeutic targets.

Solution:

Carbohydrates, lipids, proteins, and nucleic acids are the macromolecules chosen as therapeutic targets.

Q 16.4

Why should drugs not be taken without first contacting a physician?

Solution:

A medication can bind to multiple receptor sites at the same time. As a result, a drug may be harmful to certain receptor sites. Furthermore, when drugs are taken in higher amounts than prescribed, they usually have negative side effects. As a result, drugs in such situations may be poisonous. As a result, drugs should not be taken without first visiting a physician.

Q 16.5

Define the term "chemotherapy" in your own words.

Solution:

Chemotherapy is the use of chemicals for therapeutic purposes. Chemicals, for example, are used in the diagnosis, prevention, and treatment of diseases.

Q 16.6

What forces are at work to keep medicines bound to enzyme active sites?

Solution:

Drugs can be held to the active sites of enzymes by one or more of the factors listed below. (i) Ionic bonding

(ii) Hydrogen bonding

(iii) Dipole − dipole interaction

(iv) van der Waals force

Q 16.7

Why, if antacids and antiallergic medicines interact with histamine function, do they not interfere with each other's function?

Solution:

Specific medications have an effect on specific receptors. Anti-allergic medicines and antacids target separate receptors. Therefore, antacids and anti-allergic medicines do not interact with one other's functions but do interfere with histamines' functions.

Q16.8

Depression is caused by a lack of noradrenaline. What kind of medications are required to treat this condition? Please name two medications.

Solution:

To mitigate the effects of depression, antidepressant medications are required. These medications block enzymes that catalyse the breakdown of noradrenaline, a neurotransmitter. As a result, the essential neurotransmitter is slowly metabolised, allowing it to activate its receptor for longer.

Two anti-depressant drugs are:

(i) Iproniazid

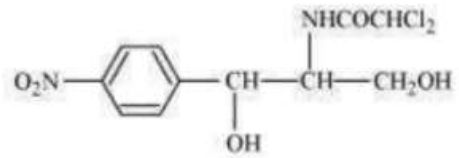
(ii) Phenelzine

Q16.9

What does it imply when you say "wide spectrum antibiotics"? Explain.

Solution:

Antibiotics with a broad spectrum of activity are effective against a large range of gram-positive and gram-negative bacteria. Chloramphenicol is an antibiotic that has a wide range of effects.



Chloramphenicol

It can be used to treat typhoid, dysentery, acute fever, pneumonia, meningitis, and certain forms of urinary infections. Other broad-spectrum antibiotics include vancomycin and ofloxacin. Ampicillin and amoxicillin, which are synthetically modified variants of penicillin, are examples of broad-spectrum antibiotics.

Q 16.10

Antiseptics vs. disinfectants: what's the difference? Give a specific example from each of the categories.

Solution:

Against microorganisms, antiseptics and disinfectants are effective. Antiseptics, on the other hand, are used on live tissues like wounds, cuts, ulcers, and infected skin surfaces, whereas disinfectants are used on inanimate items like floors, drainage systems, equipment, and so on. Disinfectants are toxic to living things. A potent antiseptic is iodine. Iodine tincture (2% iodine solution in alcohol/water mixture) is administered to wounds. As a disinfectant, a 1% solution of phenol is utilised.

Q16.11

Why are cimetidine and ranitidine superior to sodium hydrogen carbonate, magnesium, or aluminium hydroxide as antacids?

Solution:

Antacids like sodium hydrogen carbonate, magnesium hydroxide, and aluminium hydroxide function by neutralising the stomach's excess hydrochloric acid. However, the primary source of the acid

leakage remains unaddressed. Cimetidine and ranitidine are better antacids because they control acidity at its source. These medications stop histamine from interacting with the receptors in the stomach walls. As a result, the amount of acid produced by the stomach decreases. Cimetidine and ranitidine are hence superior to sodium hydrogen carbonate, magnesium hydroxide, and aluminium hydroxide as antacids.

Q16.12

Give an example for a substance that may be used as both an antiseptic and a disinfectant.

Solution:

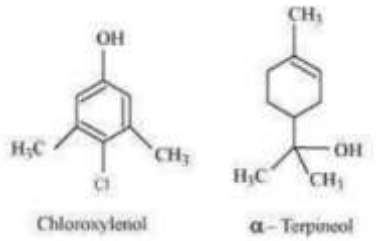
We can use phenol as both antiseptic and as disinfectant. As an antiseptic, 0.2 percent of phenol solution is used and as a disinfectant, we can use 1 percent of phenol solution.

Q16.13

What are the important constituents in dettol?

Solution:

a-terpineol and chloroxylenol are the major constituents of dettol.



Q16.14

What is mean by tincture of iodine? What is the use of tincture of iodine?

Solution:

Tincture of iodine is used as an antiseptic. It is prepared by mixing 2-3 percent of iodine in alcohol-water mixture.

Q16.15

What is known as food preservatives?

Solution:

Chemicals called food preservatives keep food from contamination because of microbial growth. Food preservatives include table salt, sugar, vegetable oil, sodium benzoate, and propanoic acid salts.

Q16.16

Why is aspartame only used in cold foods and beverages?

Solution:

At high temperatures, aspartame becomes unstable. This is why it's only used with cold meals and beverages.

Q16.17

What are artificial sweetening agents, and what do they do? Please provide two examples.

Solution:

Chemicals used to sweeten food are known as artificial sweetening agents. They do not, however, add calories to our bodies, unlike natural sweeteners. They have no negative effects on the human body. Aspartame, saccharin, sucrolose, and alitame are examples of artificial sweeteners.

Q16.18

Name a sweetening chemical that is utilised in the manufacturing of sweets for a diabetic patient.

Solution:

Saccharin, alitame, and aspartame are examples of artificial sweetening chemicals that can be utilised in diabetic sweets.

Q16.19

What issues develop when alitame is used as an artificial sweetener?

Solution:

Alitame is a sweetener with a high potency. When using alitame as an artificial sweetener, it's tough to keep track of how sweet your food is.

Q16.20

What makes synthetic detergents preferable than soap?

Solution:

Soaps are effective in soft water. They are, however, ineffective in hard water. Synthetic detergents, on the other hand, work in both soft and hard water. As a result, synthetic detergents are preferable than soaps.

Q16.21

Using appropriate examples, define the terms below.

(i) Cationic detergents

(ii) Anionic detergents

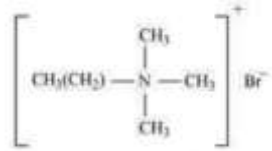
(iii) Non-ionic detergents

Solution:

(i) Cationic detergent

quaternary ammonium compounds of acetates, chlorides, or bromides make up cationic detergents. The cationic part of these detergents has a lengthy hydrocarbon chain and a positive charge on the N atom, which is why they are termed cationic detergents.

For example: cetyltrimethylammonium bromide



Cetyltrimethylammonium bromide

(ii) Anionic detergents

There are two types of anionic detergents:

1.Sodium alkyl sulphates:

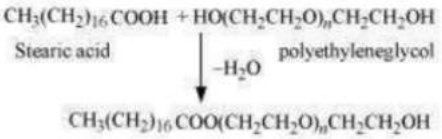
These detergents are long-chain alcohol sodium salts. They're made by mixing concentrated sulphuric acid with these alcohols and then adding sodium hydroxide. Sodium lauryl sulphate($C_{11}H_{23}CH_2OSO_3^-Na^+$) and sodium stearyl sulphate($C_{17}H_{35}CH_2OSO_3^-Na^+$) is an example of one of these detergents.

2.Sodium alkylbenzenesulphonates:

These detergents are sodium salts of alkylbenzenesulphonic acids with lengthy chains. Friedel-Crafts alkylation of benzene with long chain alkyl halides or alkenes produces them. The final product is treated with strong sulphuric acid before being exposed to sodium hydroxide. Sodium 4-(1-dodecy)benzenesulphonate (SDS) is an example of anionic detergents.

3. Non-ionic detergents:

These detergents have no ions in their molecules. These detergents are high-molecular-mass esters of alcohols. Polyethylene glycol and stearic acid are combined to make them.



Q16.23

Why are soaps ineffective in hard water?

Solution:

Soaps are long-chain fatty acid sodium or potassium salts. Calcium and magnesium ions are found in hard water. When soaps are dissolved in hard water, these ions displace sodium or potassium from their salts, resulting in calcium or magnesium salts of fatty acids that are insoluble. As a result of the insoluble salts separating, scum forms.

$$2C_{17}H_{35}COONa + CaCl_2 \longrightarrow 2NaCl + (C_{17}H_{35}COO)_2 Ca$$

Soap — Isoluble calcium stearate (soap)

So, soaps will not work in hard water.

Q16.24

Is it possible to test the hardness of water with soaps and synthetic detergents?

Solution:

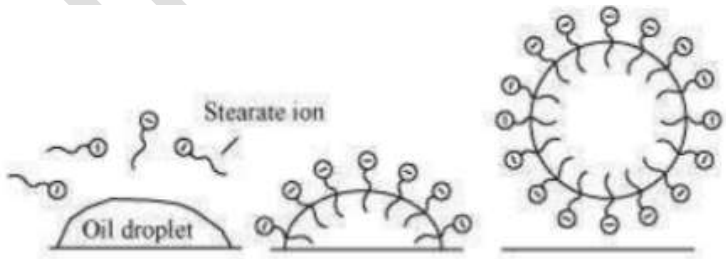
In hard water, soaps precipitate, but not in soft water. Soaps can therefore be used to test the hardness of water. Synthetic detergents, on the other hand, do not precipitate in either hard or soft water. As a result, synthetic detergents cannot be used to test water hardness.

Q16.25

Describe the cleansing action of soap.

Solution:

Soap molecules form micelles around an oil droplet (dirt), with the hydrophobic sections of the stearate ions attaching to the oil droplet and the hydrophilic parts projecting outside. The stearate ions (together with the dirt) are dragged into water by the polar nature of the hydrophilic portions, eliminating the dirt from the cloth.



Q16.26

Out of soaps and synthetic detergents which one will you use for cleaning clothes if water contains calcium hydrogen carbonate?

Solution:

Cleaning garments with synthetic detergents is favoured. When soaps are dissolved in calcium-containing water, the calcium ions produce insoluble salts that are useless. Synthetic detergents, on the other hand, form soluble salts that work as cleansing agents when dissolved in water containing calcium ions.

Q16.27

Label the hydrophilic and hydrophobic parts in the following compounds.

(i) $CH_3(CH_2)_{10}CH_2OSO_3^-Na^+$

(ii) $CH_3(CH_2)_{15}\overset{+}{N}(CH_3)_3\overset{-}{Br}$

(iii) $CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$

Solution:

(i) $\underbrace{CH_3(CH_2)_{10}CH_2}_{\text{hydrophobic part}}\underbrace{OSO_3^-Na^+}_{\text{hydrophilic apart}}$

(ii) $\underbrace{CH_3(CH_2)_{15}}_{\text{hydrophobic part}}\underbrace{\overset{+}{N}(CH_3)_3\overset{-}{Br}}_{\text{hydrophilic part}}$

(iii) $\underbrace{CH_3(CH_2)_{16}}_{\text{hydrophobic part}}\underbrace{COO(CH_2CH_2O)_nCH_2CH_2OH}_{\text{hydrophilic part}}$

Intext Question

Q16.1

Doctors prescribe sleeping medications to patients who are unable to sleep, however it is not suggested that they be taken without first consulting with a physician. Why?

Solution:

When medications are taken in higher dosages than prescribed, they can have negative side effects and possibly cause death. As a result, before taking any medication, you should always visit a doctor.

Q16.2

Which classification has the term "ranitidine is an antacid" been applied to?

Solution:

The given statement is about the classification of a drug's pharmacological effects. This is because an antacid is a medicine that is used to neutralise the effects of too much acid in the stomach.

Q16.3

Why do we need artificial sweeteners?

Solution:

Diseases such as diabetes and obesity affect a vast number of people. These people are unable to consume regular sugar, such as sucrose, because it is toxic to them. As a result, artificial sweetening agents that do not increase a person's calorie intake are necessary. Artificial sweeteners include saccharin, aspartame, and alitame, to name a few.

Q16.4

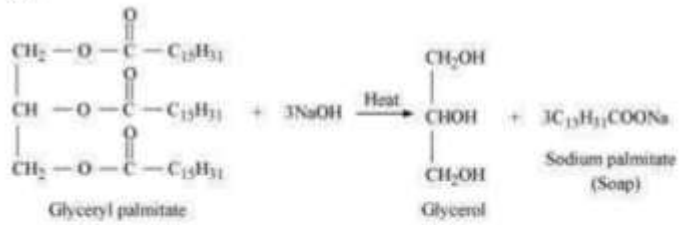
Write the chemical formula for sodium soap made from glyceryl oleate and glyceryl palmitate. These compounds' structural formulas are listed below.

(i) $(C_{15}H_{31}COO)_3C_3H_5$ – Glyceryl palmitate

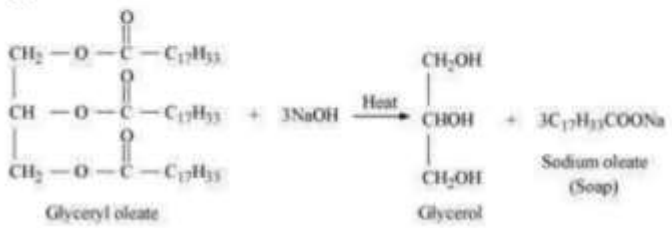
(ii) $(C_{17}H_{33}COO)_3C_3H_5$ – Glyceryl oleate

Solution:

(i)



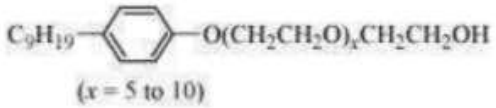
(ii)



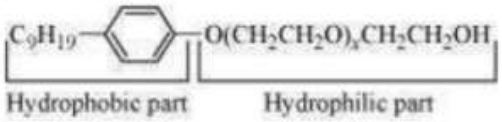
Q16.5

Liquid detergents, emulsifying agents, and wetting agents contain the following types of nom-ionic detergents. The hydrophilic and hydrophobic portions of the molecule should be labelled. Determine the functional group(s) the molecule contains.

Solution:



Answer



In the molecule, the functional groups are as follows:

(i)Ether, and

(ii)Primary alcoholic group