Class 12

2017-18

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32. CHEMISTRY IN EVERYDAY LIFE

1. DRUGS

1.1 Introduction

Chemistry in everyday life deals with the overall body mechanism, when in the normal and under abnormal conditions faced by it. It also talks about the various drugs to be consumed, their effects, their side-effects and their effects after overconsumption.

The classification of drugs is done on various grounds to highlight their functional areas, throwing light on their mechanism.

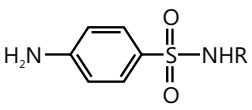
Drugs: Drugs are chemicals of low molecular masses (~100 – 500u), interacting with macromolecular targets to produce a biological response.

Medicines: Medicines are chemicals, useful in diagnosis, prevention and treatment of diseases. A dose consumed higher than the recommended can cause harm.

Therapeutic Effect: It is a desirable or beneficial drug effect like treatment of symptoms and cure of a disease on a living body. Such use of chemicals for therapeutic effect is called **chemotherapy**.

1.2 Classification of Drugs

Table 32.1: Drug classification

On the basis of	Explanation
Pharmacological Effect Greek origin: Pharmakon -poison/drug logia- study of It is concerned with the study of drug action.	This effect is used by the specialists to prescribe a drug for a particular disorder from a whole category of drugs. E.g. Analgesics kill pain while antiseptics kill or arrest a microorganism's growth.
Drug action	Release of a specific compound in a body or a biochemical process under consideration can be treated by various ways by a single category of drug. E.g., Antihistamine inhibits the action of the compound, histamine, which causes inflammation in the body. Thus, various ways exist to block the action of histamines.
Chemical structure	This typically depends on the chemical structure of the drug. Similar functional groups show common pharmacological activity.  E.g., Structure of sulphonamide show the common functional group

On the basis of	Explanation
Molecular targets	Drugs are very specific in action and have their targets decided. They interact with biomolecules such as carbohydrates, lipids, proteins and nucleic acids. Common structural features show same mechanism of action.

1.3 Drug Target Interaction

The interaction between the drug and the target i.e. a part of the body is the major part of the action of a drug. Enzymes-the biological catalyst action serves as the best example for this interaction. These proteins named enzymes hold a major position in the communication system of the body. They are called as receptors which carry polar molecules across the cell membrane. Similarly, nucleic acids have codes for passing on the genetic information across various cells.

1.3.1 Enzymes as Drug Targets

Enzymes, as known to us, are the biological catalysts which have two major functions as seen in the Fig. 32.1.

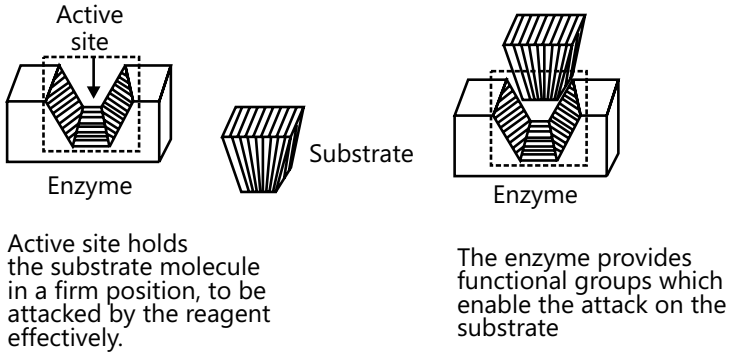


Figure 32.1: Enzyme substrate interaction

Drug Enzyme interaction

When drugs are taken, it either increases or decreases the enzyme catalyzed reactions. Enzyme inhibition is the role of a drug done in two ways-Competitive or Non-competitive. The drug is an enzyme inhibitor which inhibits the catalytic activity of enzymes or blocks the binding site which eventually prevents the binding of substrate with enzyme.

(a) Competitive Inhibition: Competitive Inhibitors are the drugs which attach themselves (as shown in the Fig. 32.2) onto the active site of an enzyme by competing with the substrate for the space.

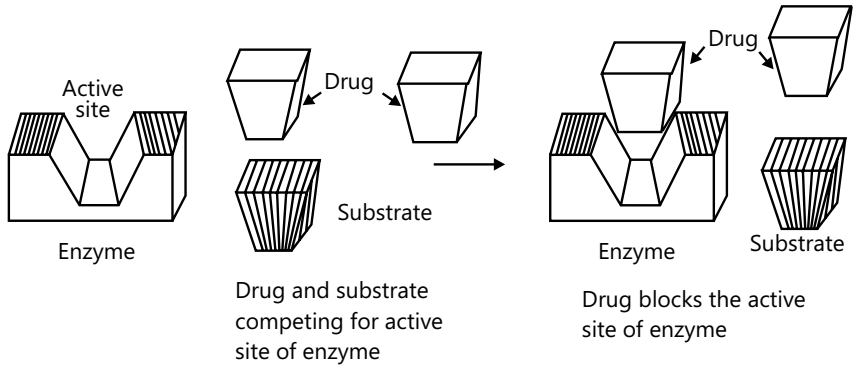


Figure 32.2: Steps involved in competitive inhibition

(b) Non-Competitive Inhibition: Non-competitive drugs change the shape of the active site by binding themselves to an allosteric site, due to which the substrate is unable to identify the active site and is thus disabled to attach itself. The presence of a strong covalent bond between an enzyme and an inhibitor blocks the enzyme. Degradation of this complex gives a new enzyme. Non-competitive inhibitor changes the active site of enzyme after binding at allosteric site.

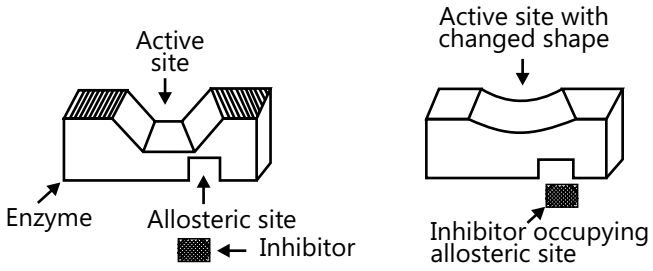


Figure 32.3: Steps involved in non-competitive inhibition

1.3.2 Receptors as Drug Targets

Receptors are selective in nature. Every binding site has a different shape, structure and an amino acid which suits a specific chemical messenger.

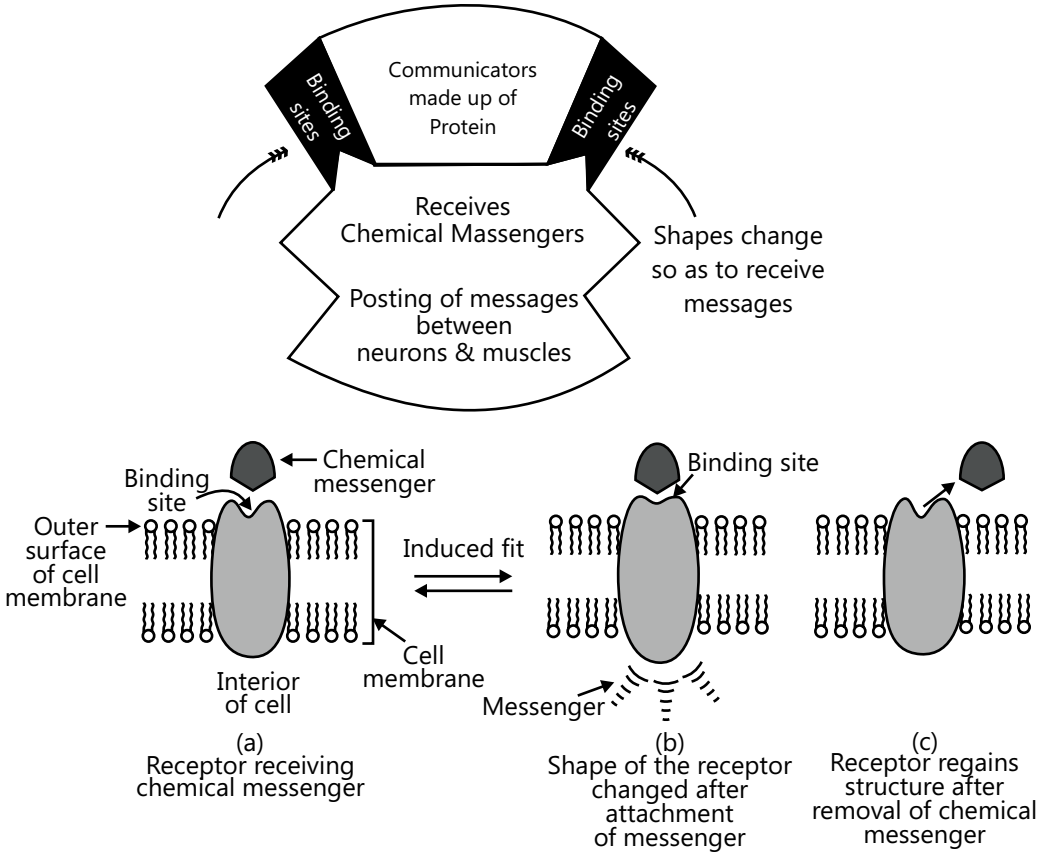
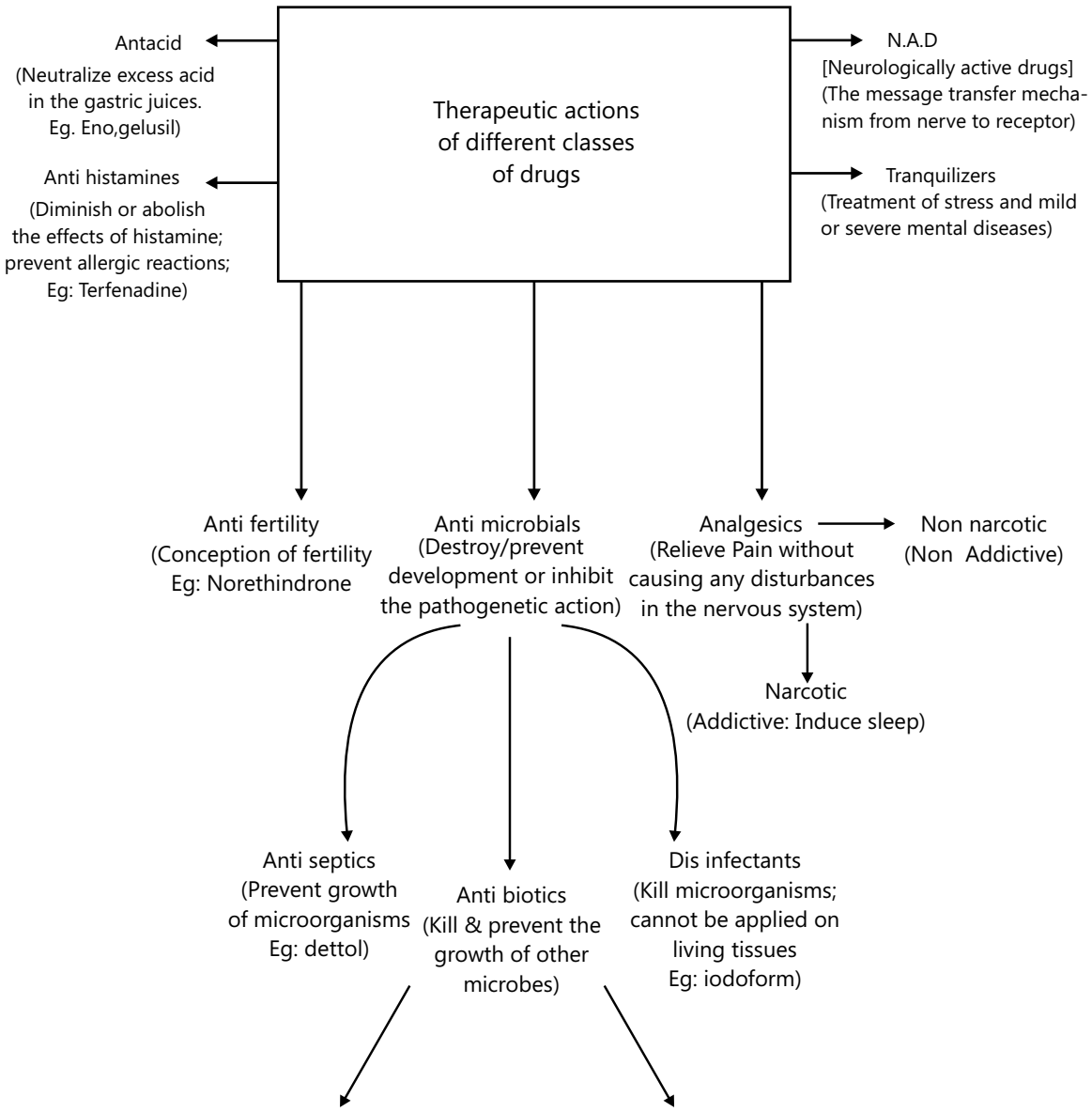


Figure 32.4: Receptors as drug targets

Antagonists are the drugs which bind with the receptor site and inhibits its natural function. These are useful when blocking of message is required. Drugs that mimic the natural messenger by switching on the receptor are called **agonists**. These are useful when there is lack of natural chemical messenger.

1.4 Therapeutic Actions of Different Classes of Drugs



On basis of mode of control of microbial diseases:

Bactericidal	Bacteriostatic
Drugs that kills organisms in body	Drugs that inhibits growth of organisms
Examples: Penicillin, Aminoglycosides, Ofloxacin	Examples: Erythromycin, Tetracycline, Chloramphenicol

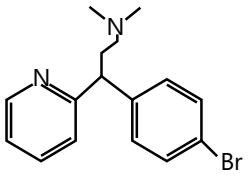
On basis of its spectrum of action:

Brand spectrum antibiotics	Narrow spectrum antibiotics	Limited spectrum antibiotics
Antibiotics which kill or inhibit a wide range of Gram-positive and Gram-negative bacteria	Antibiotics which are effective mainly against Gram-positive or Gram-negative bacteria	Antibiotics effective against a single organism or disease
Examples: Ampicillin and Amoxycillin	Examples: Penicillin G	

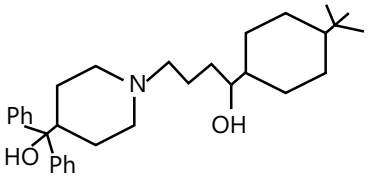
Flowchart 32.1: Classification of drugs and therapeutic action

Antihistamines

Brompheniramine

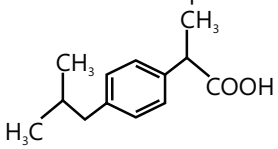


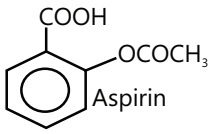
Terfenadine (Seldane) (Dimetapp, Dimetane)



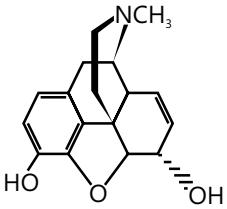
Non-Narcotic Analgesics:

Ibuprofen

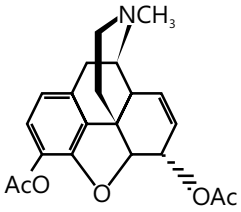




Narcotic Analgesics:

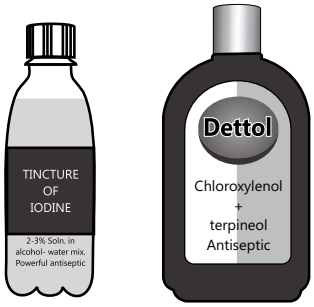


Morphine

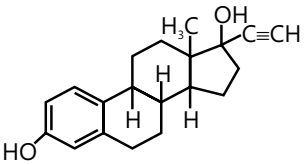


Heroin

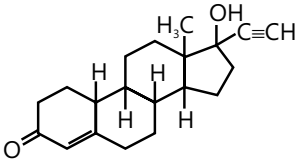
Antiseptics:



Antifertility Drugs



Ethynylestradiol (novestrol)



Norethindrone

2. CHEMICALS IN FOOD / FOOD ADDITIVES

Food additives are the substances added to food to preserve its flavour or improve its taste and appearance

Table 32.2: Different types of food additives

No.	Name of food additive	Examples
1	**Artificial Sweetening Agents:** These chemical compounds give a sweetening and flavouring effect to the food.	Aspartame, Sucralose and Alitame
2	**Food preservatives:** These chemical substances on adding to food material prevents its spoilage due to microbial growth.	Sugar, Salts, Sodium benzoate

No.	Name of food additive	Examples
3	**Food colours:** These substances adds to the attractiveness and acceptability in the market.	Allura Red AC, Tartrazine
4	**Nutritional supplements:** These substances improves the nutritional value of the food.	Vitamins, minerals etc.
5	**Fat emulsifiers and stabilizing agents:** These agents give stability and a good consistent nature to the food.	Egg yolk (where the main emulsifying chemical is Lecithin)
6	**Antioxidants:** These agents prevent the oxidation of food materials.	Butylated Hydroxy Toluene (BHT), Butylated Hydroxy Anisole (BHA)

3. SOAPS AND DETERGENTS

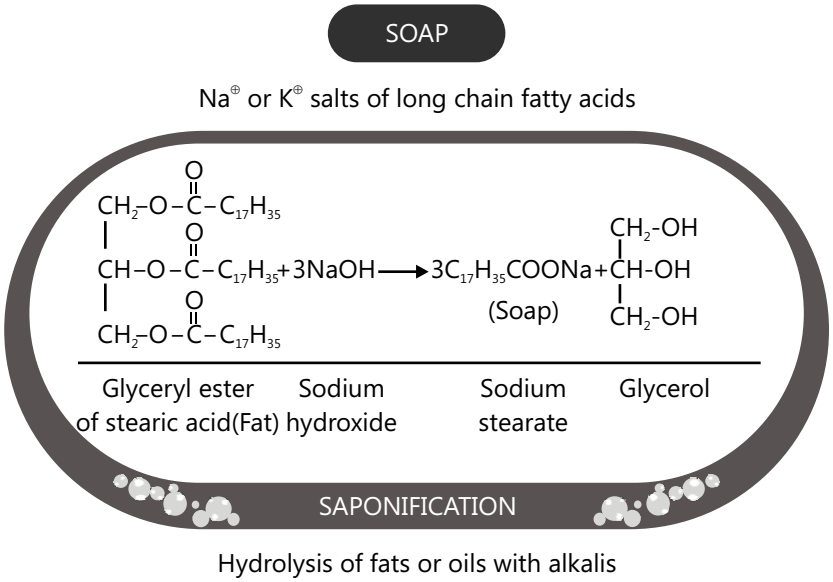


Figure 32.5: Saponification

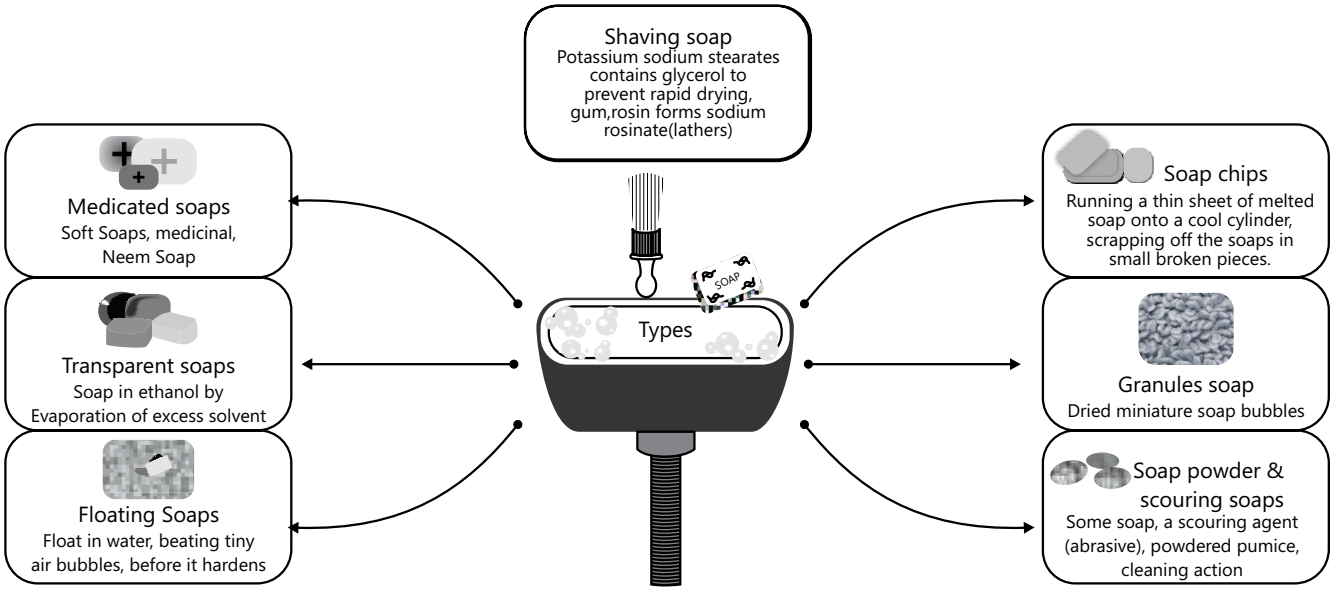


Figure 32.6: Different types of soap

Table 32.3: Advantages and disadvantages of soap

Advantages of using soaps:	Disadvantages of using soaps:
(a) Being a good cleanser, it is 100% biodegradable i.e. oxidation of the soap by the micro-organisms in the sewage water. (b) Does not cause pollution.	(a) Use in hard water gives the formation of white precipitate with the Ca^{2+} and Mg^{2+} ions present in the water. $2\underset{\text{Soap}}{C_{17}H_{35}COONa} + CaCl_2 \rightarrow 2NaCl + \underset{\text{Insoluble calcium Stearate (Soap)}}{(C_{17}H_{35}COO)_2Ca}$ $2\underset{\text{Soap}}{C_{17}H_{35}COONa} + MgCl_2 \rightarrow 2NaCl + \underset{\text{Insoluble Magnesium stearate (Soap)}}{(C_{17}H_{35}COO)_2Mg}$ Due to the formation of precipitates, the soap is unable to perform its function of removing the oil from the clothes. The gum-like precipitates stick to the fibres of the cloth. (c) The insoluble free fatty acids get precipitated in acidic medium and stick to the fabric blocking the oil-removing ability of the soaps.

3.1 Detergents

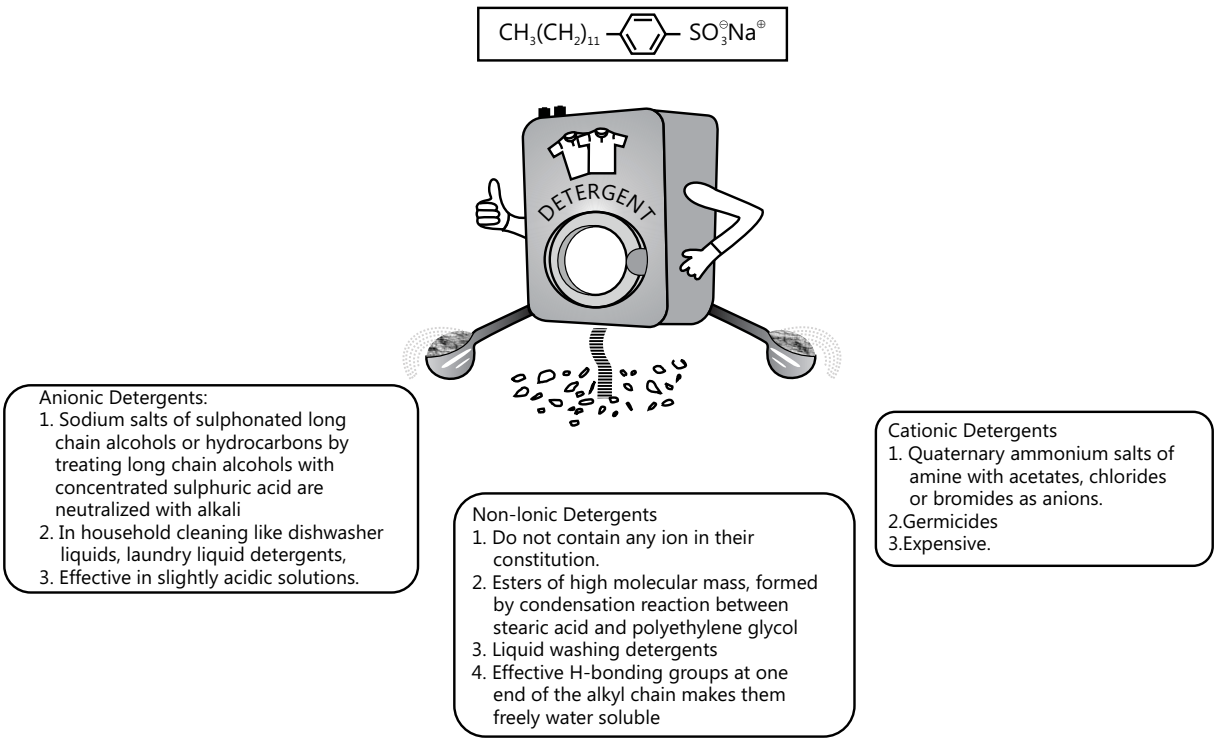
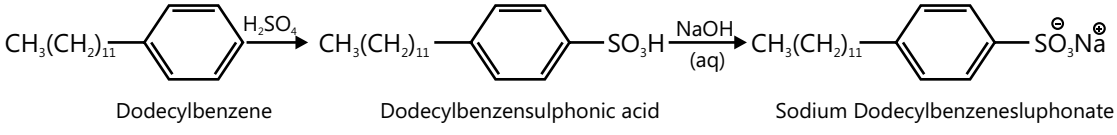


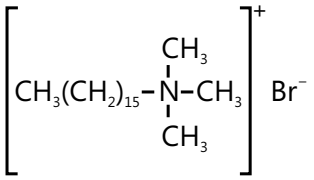
Figure 32.7: Classification of detergents

Anionic detergents:

$$\underset{\text{Lauryl alcohol}}{CH_3(CH_2)_{10}CH_2OH} \xrightarrow{H_2SO_4} \underset{\text{Laurylhydrogensulphate}}{CH_3(CH_2)_{10}CH_2OSO_3H} \xrightarrow{NaOH(aq)} \underset{\substack{\text{Sodium laurylsulphate}\\ \text{(Anionic detergent)}}}{CH_3(CH_2)_{10}CH_2OS\overset{-}{O}_3\overset{+}{N}a}$$



Cationic detergents:



Cetyltrimethylammonium bromide

Non-ionic detergents:

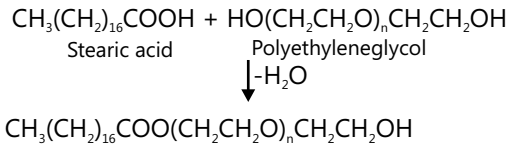
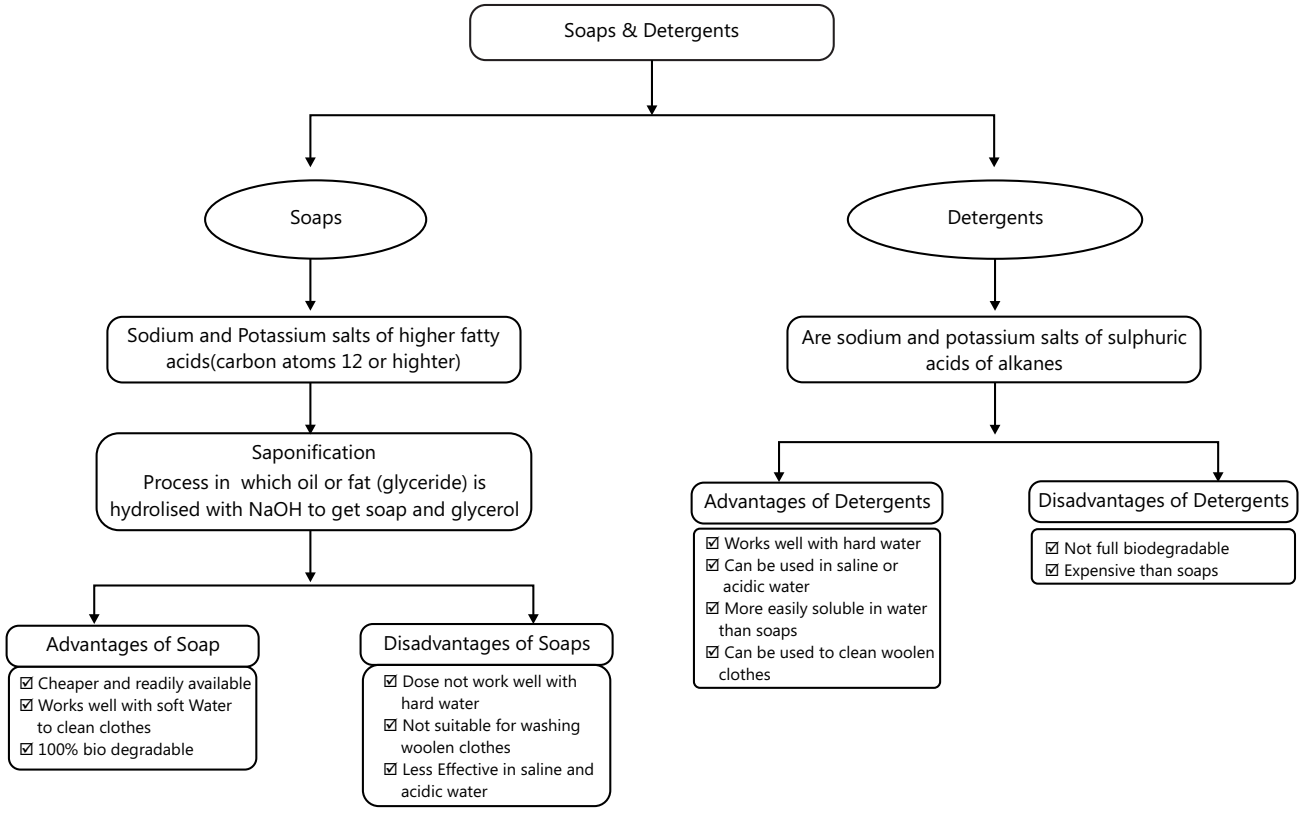


Table 32.4: Difference between biodegradable and non-biodegradable detergents

Biodegradable detergents	Non-Biodegradable detergents
1. Have straight hydrocarbon chains. 2. They can be easily decomposed by microorganisms. **Example:** Sodium lauryl sulphate	1. Have branched hydrocarbon chains 2. They cannot be easily decomposed by microorganisms.



Flowchart 32.2: Difference between soaps and detergents

POINTS TO REMEMBER

Sr. No	Terms	Description
1	**Drugs**	Drugs are chemicals of low molecular masses (~100 – 500u). These interact with macromolecular targets and produce a biological response.
2	**Medicines:**	Medicines are chemicals that are useful in diagnosis, prevention and treatment of diseases
3	**Therapeutic Effect**	Desirable or beneficial effect of a drug like treatment of symptoms and cure of a disease on a living body is known as therapeutic effect.
4	**Enzymes**	Proteins which perform the role of biological catalysts in the body are called enzymes.
5	**Receptor**	Those which are crucial to communication system in the body are called receptors
6	**Competitive Inhibition**	Competitive Inhibitors are the drugs that compete with the natural substrate for their attachment on the active sites of enzymes
7	**Non-Competitive Inhibition**	Some drugs do not bind to the enzyme's active site, instead bind to a different site of enzyme called allosteric site. This binding of inhibitor at allosteric site changes the shape of the active site in such a way that substrate cannot recognize it.
9	**Cationic Detergents**	Quaternary ammonium salt of amines with halide or acetate as anions.
10	**Non-ionic detergents**	Do not contain any ion, they are esters of high molecular mass.

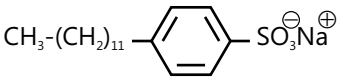
Solved Examples

JEE Main/Boards

Example 1: In order to wash clothes with water containing dissolved calcium hydrogen carbonate, which cleaning agent will you prefer and why: soaps or synthetic detergents? Give one advantage of soaps over synthetic detergents?

Sol: Calcium salts of soaps are soluble in water thus lot of soap is wasted.

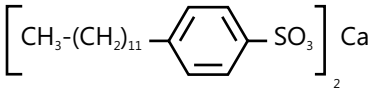
- Hard water contains salt of calcium and magnesium.
- Thus water containing calcium hydrogen carbonate is hard water.
- In order to wash cloths with hard water detergents are preferred over soaps
- This is because calcium salts of detergents are soluble in water while calcium salts of soaps are insoluble.



Sodium-4-(-dodecyl) benzene sulphonate (synthetic detergent)

+

$Ca(HCO_3)$(Hard water)



Calcium 4-(1-dodecyl) benzene sulphonate

+

$2NaHCO_3$

As a result, lot of soap is wasted.

$$\underset{\text{Sodium stearate (soap)}}{2C_{17}H_{35}COONa} + \underset{\text{Cal. hydrogen carbonate}}{Ca(HCO_3)_2}$$
$$\text{(Soluble)} \qquad \text{(From hard water)}$$
$$\longrightarrow \underset{\text{Cal. stearate}}{(C_{17}H_{35}COO)_2Ca}\downarrow + 2NaHCO_3$$
$$\text{(insoluble)}$$

Advantage of soaps : Soaps are biodegradable they do not cause pollution i.e microorganism present in sea water completely oxidizes soap while detergents having branched hydrocarbon chains are not biodegradable and hence cause water pollution in rivers and waterways.

Example 2: Account for the following:

(i) Aspirin drug helps in the prevention of heart attack.

(ii) Diabetic patients are advised to take artificial sweeteners instead of natural sweeteners.

(iii) Detergents are non-biodegradable while soaps are biodegradable.

Sol: (i)

- Heart attack is caused due to blood clotting in the coronary arteries.
- In order to prevent heart attack aspirin is used.
- Aspirin (Acetyl salicylic acid) helps to make the blood thinner and thus prevents the formation of blood clots in the coronary arteries there by preventing heart attacks.

(ii)

- This is because Diabetic patients do not produce enough insulin to metabolize the natural sugar.
- Because of this the sugar remains in the blood and affects liver, heart and kidneys.
- Therefore, diabetic patients are advised to take artificial sweeteners.
- Artificial sweeteners contains saccharin.
- It is not metabolized in the body and is excreted as such through urine without affecting the heart, liver and kidneys.

(iii)

- Soaps have a structure of straight hydrocarbon chains which are easily degraded by microorganisms or bacteria present in the sewage water and hence do not cause water pollution.
- On the other hand, detergents have branched hydrocarbon chains which are either not attacked or attacked only slowly by bacteria. As a result, detergents remain undegraded in rivers and waterways and thus cause water pollution.

Example 3: What are antihistamines? Give two examples. Explain how do they act on the human body?

Sol:

- The hypersensitivity towards certain drugs (penicillin, sulpha drugs), dust, pollen grains, cat fur, a particular food or fabric, etc. is called as allergy.
- Allergy is caused by release of a substance called histamine is the body.
- Antihistamines are drugs which either reduce or inhibit the action of histamine in the body there by preventing allergy.
- Two important antihistamine or anti-allergic drugs are Brompheniramine and Terfenadine.

Mode of action:

- Histamines interact with the binding sites of receptor in the body to produce allergy.
- Antihistamines compete with histamines for these binding sites of receptor and thus do not allow histamine to produce allergy.
- Thus, antihistamines are drugs which interfere with the natural action of histamine by competing for histamine binding sites of receptor.

Example 4: Sleeping pills are recommended by doctors to the patients suffering from sleeplessness but it is not advisable to take doses without consultation with the doctor. Why?

Sol: Slipping pills are habit forming**.** Most of drugs taken in doses higher than recommended may produce harmful effects and, act as a poison and even cause death. Therefore, a doctor must always be consulted before taking the drug.

Example 5: Write the chemical equation for preparing sodium soap from glyceryl oleate and glyceryl palmitate. Structures of these compounds are given below.

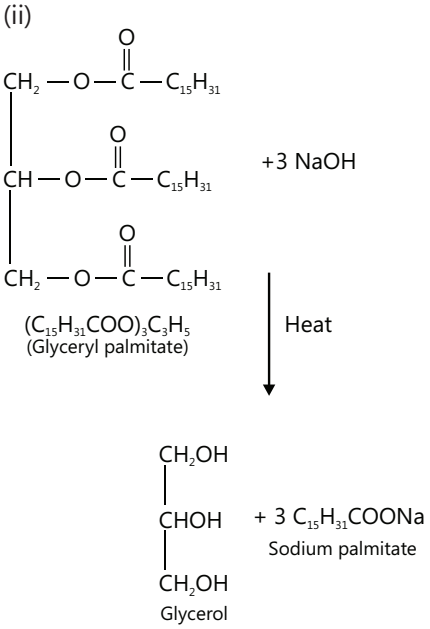
(i) $(C_{17}H_{33}COO)_3C_3H_5$— Glyceryl oleate.

(ii) $(C_{15}H_{31})COO)_3C_3H_5$— Glyceryl palmitate

Sol: (i)

$$\underset{\text{(Glyceryl oleate)}}{(C_{17}H_{33}COO)_3C_3H_5} + 3NaOH \xrightarrow{\Delta} \underset{\text{(Glycerol)}}{C_3H_5(OH)_3} + 3\,\underset{\text{Sodium oleate}}{C_{17}H_{33}COONa}$$

(ii)



Example 6: If a soap has high alkali content it irritates skin. How can the amount of excess alkali be determined? What can be the source of excess alkali?

Sol: Amount of alkali can be determined by acid-base titration i.e., titrating a solution of soap with standard hydrochloric acid using phenolphthalein as indicator. The source of this excess alkali is the alkali left unused when the soap is prepared by hydrolysis of oils.

Example 7: What is the scientific explanation for the feeling of depression?

Sol:

- Noradrenaline is a neurotransmitter which plays an important role in mood changes.
- If a person has low level of noradrenaline, then the message transfer process becomes slow and the person suffers from depression.

JEE Main/Boards

Exercise 1

Q.1 Alkaloids are poisonous and habit forming yet many of them are used as potent medicines. Can you name the alkaloid used for the treatment of (i) hypertension, (ii) malaria fever and (iii) severe pain?

Q.2 Sulpha drugs work like antibiotics but they are not antibiotics. Is this a valid statement and why?

Q.3 Pick out the odd ones from among the following compounds on the basis of their medicinal properties.

(i) Luminal, seconal, phenacetin, equanil

(ii) Chlorxylenol, phenol, chloramphenicol, bithional.

Q.4 Explain the term, target molecules or drug targets as used in medicinal chemistry.

Q.5 While antacids and anti-allergic drugs interfere with the function of histamines, why do not these not interfere with the function of each other?

Q.6 Why are cimetidine and ranitidine better antacids than sodium hydrogen carbonate or magnesium or aluminium hydroxide?

Q.7 Explain the following terms with suitable examples.

(i) Cationic detergents (ii) Anionic detergents

(iii) Neutral detergents

Q.8 Give one important use of each of the following in pharmacy?

(i) Equanil (ii) Morphine

Q.9 Give one example of an artificial sweetener used by the diabetic patients

Q.10 Why certain drugs are called enzyme inhibitors?

Q.11 What are biodegradable and non-biodegrable detergents. Give one example of each.

Q.12 Why do soaps not work in hard water?

Q.13 Name a substance which can be used as an antiseptic as well as disinfectant.

Q.14 What are main constituents of dettol?

Q.15 What is tincture of iodine? What is its use?

Q.16 How do antiseptics differ from disinfectants ? Give one examples of each.

Exercise 2

Single Correct Choice Type

Q.1. Which of the following can possibly be used as an analgesic without causing addiction and modification?

(A) Acetylsalicylic acid

(B) N-Acetyl-para-aminophenol

(C) Phenyl salicylate

(D) Methyl salicylate

Q.2 Which among the following is not an antibiotic?

(A) Penicillin (B) Oxytocin

(C) Erythromycin (D) Tetracycline

(E) Ofloxacin

Q.3 Which of the following can disperse benzene is water?

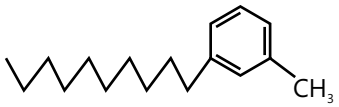
(A)



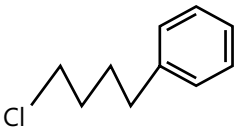
(B)



(C)



(D)



Q.4 The organic detergents that is used in hair conditioners is

(A) Sodium dodecylbenzene sulphonate

(B) Sodium lauryl sulphate

(C) Tetramethylammonium chloride

(D) Sodium stearly sulphate

(E) Cetyltrimethylammonium bromide

Q.5 Cetyltrimetyl ammonium bromide is a popular

(A) Anionic detergent (B) Cationic detergent

(C) Non-ionic detergent (D) Sweetener

(E) Antioxidant

Q.6 The role of phosphate in detergent powder is to

(A) Control pH level of the detergent water mixture

(B) Form solid detergents as phosphate less detergents are liquid in nature

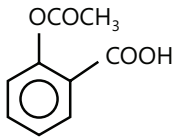
(C) Provide whiteness to the fabrics

(D) None of the above

Q.7 Which of the following is not a neurotransmitters?

(A) Acetylcholine (B) Adrenaline

(C) Noradrenalin (D) Serotonin

Q.8 The compound 

is used as

(A) Antiseptic (B) Antibiotic

(C) Analgesic (D) Pesticide

Q.9 2-acetoxybenzoic acid is used as

(A) Antimalarial (B) Antidepressant

(C) Antiseptic (D) Antipyretic

Q.10 Aspirin is an acetylation product of

(A) p-dihydroxybenzene

(B) o-hydroxybenzoic acid

(C) o-dihydroxybenzene

(D) m-hydroxybenzoic acid

Q.11 An antibiotic contains nitro group attached to aromatic nucleus its structure. It is

(A) Penicillin (B) Streptomycin

(C) Tetracyclin (D) Chloramphenicol

Q.12 Which of the following is not a surfactant?

(A) $CH_3\text{-}(CH_2)_{15}\text{-}N^+(CH_3)_3Br^-$

(B) $CH_3\text{-}(CH_2)_{14}\text{-}CH_2NH_2$

(C) $CH_3-(CH_2)_{16}-CH_2OSO_2^-Na^+$

(D) $OHC\text{-}(CH_2)_{14}-CH_2\text{-}COO^-Na^+$

Q.13 The detergent which is used as a germicide is

(A) Sodium Lauryl sulphate

(B) Cetyltrimethylammonium chloride

(C) Lauryl alcohol ethoxylate

(D) Sodium-2-dodecylbenzenesulphonate

Q.14 Which of the following sets of reactants is used for preparation of paracetamol from phenol?

(A) HNO_3, H_2/Pd, $(CH_3CO)_2O$

(B) H_2SO_4, H_2/Pd, $(CH_3CO)_2O$

(C) $C_6H_5N_2Cl$, $SnCl_2$/HCl, $(CH_3CO)_2O$

(D) Br_2/H_2O, Zn/HCl, $(CH_3CO)_2O$

Q.15 In the following sets of compounds, the one which contains only medicinal compounds is

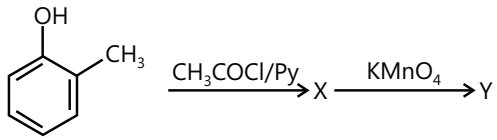
(A) Alizarin, phenacetin, morphine

(B) Aspirin, gention violet, phenolphthalein

(C) Boric acid, chloramphenicol, aspirin

(D) 9-oxodecanoic acid, boric acid, morphine

Q.16



The final product 'Y' is medicine. Which of the following is incorrect regarding 'Y'?

(A) It has analgesic as well as antipyretic properties

(B) It helps to prevent heart attack

(C) It has anti-blood clotting action

(D) It suppresses the gastric anomalies

Q.17 Aspartame is one of the good artificial sweeteners whose use is limited to cold foods and soft drinks because

(A) It has very low boiling point

(B) It gets dissociated at cooking temperature

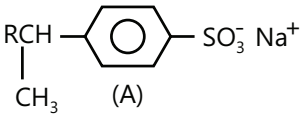
(C) It is sweetener at low temperature only

(D) It is insoluble at higher temperatures

Q.18 For the preparation of a detergent 'A' (given below) from benzene, the following steps are involved

I. $\xrightarrow[\text{HF, Friedel–Crafts}]{RCH=CH_2}$

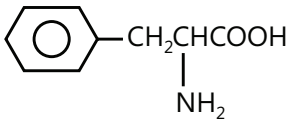
II. $\xrightarrow{H_2SO_4/SO_3}$

III. $\xrightarrow{NaOH}$ 

These steps should be in sequence

(A) I, II, III (B) II, I, III (C) II, III, I (D) I, III, II

Q.19 Aspartame is a non-nutritive sweetener. Assuming that both, amide and ester bonds are hydrolysed in the stomach, the amino acids obtained is

(A) 

(B) $H_2N-\underset{\displaystyle COOH}{\underset{|}{C}HCH_2COOH}$

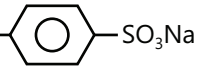
(C) Both (A) and (B)

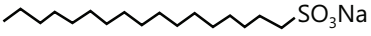
(D) None of these

Q.20 Which detergent can cause maximum pollution?

(A) $CH_3CH(C_4H_9) - H_2CH_2CH(C_4H_9)$

$(CH_2)_3CH(C_4H_9)CH_2CH_2SO_3Na$

(B) $CH_3(CH_2)_{11}$  SO_3Na

(C)  SO_3Na

(D) Detergents are always pollution free

Q.21 Which of the following is known as invert soap?

(A) Pentaerythritol monostearate

(B) Sodium stearyl sulphate

(C) Trimethyl stearyl ammonium bromide

(D) Ethoxylated non-phenol

Q.22 Antiseptics are different from disinfectants as .

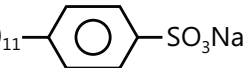
(A) Antiseptic merely inhibit, the growth and disinfectant kill the microorganisms

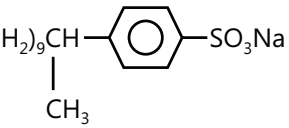
(B) Antiseptic are used against 'microorganisms while disinfectants are used against insects

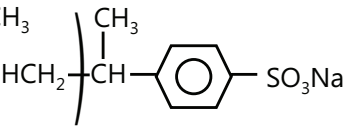
(C) Antiseptic are used only over skin disinfectants can be taken orally also

(D) Antiseptic are used over living tissues while disinfectants cannot be used over living tissues

Q.23 Which of the following is an example of non-biodegradable detergent?

(A) 

(B) 

(C) 

(D) $CH_3(CH_2)_{10}CH_2OSO_3Na$

Q.24 Morphine on alkylation and acetylation gives, respectively

(A) Heroin, codeine (B) Heroin, meperidine

(C) Codeine, heroin (D) Meperidine, heroin

Q.25 Which of the following statement is not true about the drug barbital?

(A) It causes addiction

(B) It is a non-hypnotic drug

(C) It is a tranquilizer

(D) It is used in sleeping pills

Q.26 Select the incorrect statement.

(A) Equanil is used to control depression and hypertension.

(B) Mifepristone is a synthetic steroid used as "morning after pill"

(C) 0.2 percent solution of phenol is all antiseptic while its 1.0 percent solution is a disinfectant

(D) A drug which kills the organism in the body is called bacteriostatic.

Q.27 Which set has different class of compounds?

(A) Tranquilizers: Equanil, heroin, valium

(B) Antiseptics: Bithional, dettol, boric acid

(C) Analgesics: Naproxen, morphine, aspirin

(D) Bactericidal: Penicillin, aminoglycosides, ofloxacin

Q.28 Baby talcum powders contain

(A) Benzoin, glyceryl diacetate

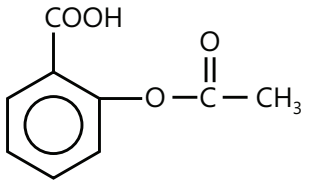
(B) Zinc acetate, glyceryl diacetate

(C) Zinc stearate, boric acid

(D) Zinc stearate, cinnamic ester

Previous Years' Questions

Q.1 The compound is used as ***(2002)***

Aspirin 

Acetyl salicylic acid

(A) Pesticide (B) Antibiotic

(C) Analgesic (D) Antiseptic

Q.2 Which one of the following types of drugs reduces ***(2005)***

(A) Analgesic (B) Antipyretic

(C) Antibiotic (D) Tranquilizer

Q.3 Insulin production and its action in human body are responsible for the level of diabetes. This compound belongs to which of the following categories? ***(2004)***

(A) A co-enzyme (B) An antibiotic

(C) An enzyme (D) A hormone

Q.4 Which of the following compounds is not an antacid? ***(2005)***

(A) Aluminium hydroxide

(B) Cimetidine

(C) Phenelzine

(D) Ranitidine

Q.5 Aspirin is known as: ***(2012)***

(A) Acetyl salicylic acid

(B) Phenyl salicylate

(C) Acetyl salicylate

(D) Methyl salicylic acid

PlancEssential Questions

JEE Main/Boards

Exercise 1

Q.1 Q.3 Q.4 Q.6 Q.8 Q.10

Exercise 2

Q.3 Q.6 Q.10 Q.13 Q.19

Previous Years' Questions

Q.1 Q.5

Answer Key

JEE Main/Boards

Exercise 2

Single Correct Choice Type

Q.1 B	**Q.2** B	**Q.3** A	**Q.4** B	**Q.5** B	**Q.6.** A
Q.7 B	**Q.8** C	**Q.9** D	**Q.10** B	**Q.11** D	**Q.12** B
Q.13 B	**Q.14** A	**Q.15** C	**Q.16** D	**Q.17** B	**Q.18** A
Q.19 C	**Q.20** A	**Q.21** C	**Q.22** D	**Q.23** C	**Q.24** C
Q.25 B	**Q.26** D	**Q.27** A	**Q.28** C		

Previous Years' Questions

Q.1 C **Q.2** B **Q.3** D **Q.4** C **Q.5** A

Solutions

JEE Main/Boards

Exercise 1

Sol 1: (i) Hypertension: Reserpine ; (ii) Malaria fever : Quinine and (iii) Severe pain : Morphine.

Sol 2: This is a valid statement since sulpha drugs like antibiotics kill microorganisms. However, sulpha drugs are purely synthetic but antibiotics may be either wholly or partially obtained from microorganisms. For example, penicillin is wholly obtained from microorganisms while amoxcillin and ampicillin are semi-synthetic.

Sol 3: (i) Phenacetin is an antipyretic while the remaining three are tranquillisers.

(ii) Chloramphenicol is an antibiotic while the remaining three are antiseptics.

Sol 4: A knowledge of the physiological function of the drug in the body helps us to choose a compound called lead compounds and drugs are designed from these compounds. Drugs interact with macromolecules like proteins, carbohydrates, lipids and nucleic acid and hence these are called target molecules or drug targets. Proteins perform several roles in the body. Proteins which act as biological catalysts are called enzymes, those which are involved in communication system are called receptors. Carrier proteins carry polar molecules across the cell membrane. Nucleic acids have coded genetic information in the cell and, lipids and carbohydrates form structural part of cell membranes.

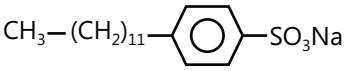
Sol 5: Drugs designed to cure some ailment in one organ in the body do not affect the other because they work on different receptors. For example, secretion of histamine cause allergy. It also causes acidity. Due to release of hydrochloric acid in the stomach, since anti allergic and antacids drugs work on different receptors, therefore, antihistamines remove allergy while antacids remove acidity.

Sol 6: Sodium hydrogen carbonate or magnesium or aluminum hydroxide neutralize the excess HCl and raise the pH to an appropriate level in stomach. Therefore, these antacids control only the symptoms and not the cause. In contrast, cimetidine and ranitidine are better antacids because they prevent the interaction of histamine with the receptors present in the stomach wall and thus release lesser amount of HCl.

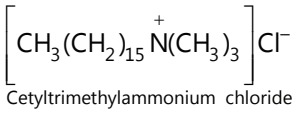
Sol 7: Anionic detergents. These are so called because a large part of their molecules are anions. These are of two types:

(i) Sodium alkyl sulphates. For example, sodium lauryl sulphate, $C_{11}H_{23}CH_2OSO_3Na$.

(ii) Sodium alkylbenzenesulphonates. The most widely used domestic detergent is sodium 4-(1-dodecyl) benzenesulphonate (SDS).

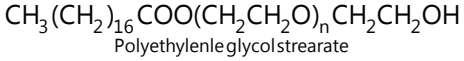


Cationic detergents. These are quaternary ammonium salts. For example, cetyltrimethylammonium chloride.



Cetyltrimethylammonium chloride

Neutral or Non-ionic detergents:These are esters of high molecular mass alcohols with fatty acids. For example, polyethylene glycol stearate.

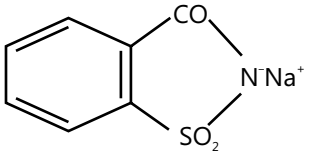


Polyethylenle glycol strearate

Sol 8: (i) Equine is a tranquillizer. It is used for removing depression and hypertension.

(ii) Morphine is an alkaloid. It is used as an analgesic.

Sol 9: Saccharin (in form of its sodium salt) is taken as artificial sweetener by diabetic patients.



Sodium salt of saccharin

Sol 10: Enzymes have active sites which bind the substrate for carrying out chemical reactions quickly and effectively. The functional groups present at the active site of enzyme interact with functional groups of substrate through ionic bonding, hydrogen bonding, vander Waals interactions, etc. Some drugs interfere

with this interaction by blocking the binding site of enzyme thereby preventing the binding of actual substrate with the enzyme. As a result, catalytic activity of enzyme is inhibited and the drugs which inhibit the catalytic activity of enzymes are called inhibitors.

Sol 11: Detergents having straight hydrocarbon chains are easily degraded (or decomposed) by microorganism and hence are called Biodegradable detergents while detergents containing branched hydrocarbon chains are not easily degraded by the microorganisms and hence are called non-biodegradable detergents. Consequently, non-biodegradable detergents accumulate in rivers and other waterways there by causing severe water pollution. Examples of biodegradable detergents are: sodium lauryl sulphate, sodium 4-(1-dodecyl) benzene- sulphonate and sodium 4-(2-dodecyl) benzenesulphonate. An example of non-biodegradable detergent is sodium 4-(1, 3, 5, 7-tetramethyloctyl) benzene sulphonate.

Sol 12: Hard water contains calcium and magnesium salts. Therefore, in hard water, soaps get precipitated as calcium and magnesium soaps which being insoluble stick to the clothes as gummy mass.

Sol 13: 0.2 % solution of phenol acts an antiseptic while its 1% solution acts as a disinfectant.

Sol 14: 2-3% solution of iodine in alcohol and water is called tincture of iodine. It is a powerful antiseptic. It is applied on wounds.

Sol 15: The main constituents of Dettol are chloroxylenol and α terpineol.

Sol 16: Antiseptics are chemical substances which prevent the growth of microorganisms and may even kill them but are not harmful to human or animal tissues. For example, dettol and savlon. They are generally applied on wounds, cuts, ulcers and diseased skin surfaces. Furacin and soframycin are well known antiseptic creams. Disinfectants are chemical substances which kill microorganisms but are not safe to be applied to the living tissues. These are generally used to kill microorganisms present in the drains, toilets, floors, etc. Some common example of disinfectants are phenol ($\geq$ 1% solution) and chlorine (0.2 to 0.4 ppm).

Exercise 2

Sol 1: (B) N-Acetyl-Para-aminophenol is also called paracetamol.

Sol 2: (B) Oxytocin is a hormone (Nano peptide) which contracts uterus after the child birth and produces lactation in the mammary glands.

Sol 3: (A) A surfactant has a polar head and non-polar tail, and hence can disperse benzene in water, i.e., option (a) is correct.

Sol 4: (B) The organic detergents that is used in hair conditioners is Sodium lauryl sulphate

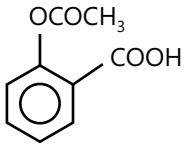
Sol 5: (B) Cetyltrimetyl ammonium bromide is a popular cationic detergent

Sol 6: (A) The role of phosphate in detergent powder is to control pH level of the detergent water mixture

Sol 7: (B) Adrenaline is a hormone but not a neurotransmitter.

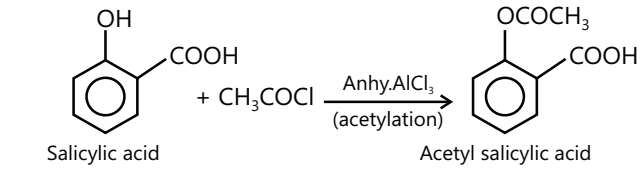
Sol 8: (C) The name of given compound is acetyl salicylic acid which is also known as aspirin, a well known analgesic.

Sol 9: (D) The structure of 2-acetoxy benzoic acid is as follows



It is commonly called aspirin, which is used as analgesic as well as antipyretic.

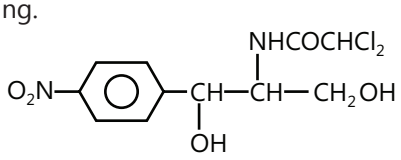
Sol 10: (B)



Salicylic acid or α-hydroxybenzoic acid

Acetyl salicylic acid (Aspirin)

Sol 11: (D) Among the given antibiotics, only chloramphenicol contains a nitro group attached to aromatic ring.

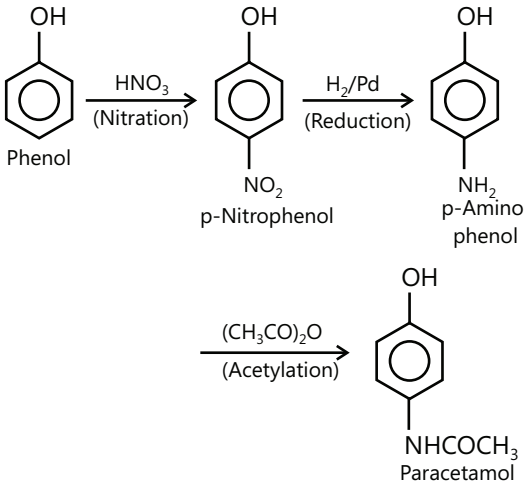


Chloramphenicol

Sol 12: (B) Every surfactant contains two parts viz a hydrophobic part and a hydrophilic part. The compound $CH_3(CH_2)_{14}CH_2NH_2$ contains only hydrophobic part but no hydrophilic part, hence it is not a surfactant.

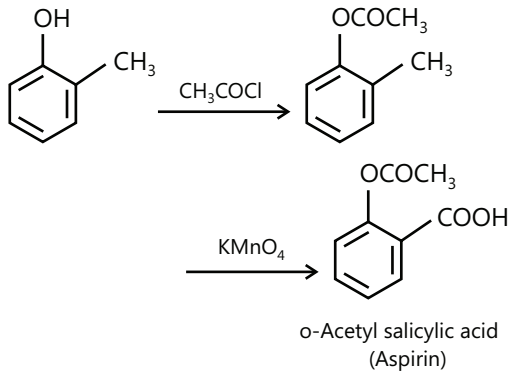
Sol 13: (B) Cationic detergents are used as germicides. Cationic detergents are usually quaternary ammonium salts. Thus, cetyltrimethyl ammonium chloride, a quaternary ammonium salt is a cationic detergent and used as a germicide

Sol 14: (A)



Sol 15: (C) Boric acid is a mild antiseptic, chloramphenicol is an broad spectrum antibiotic and aspirin is an analgesic as well as antipyretic.

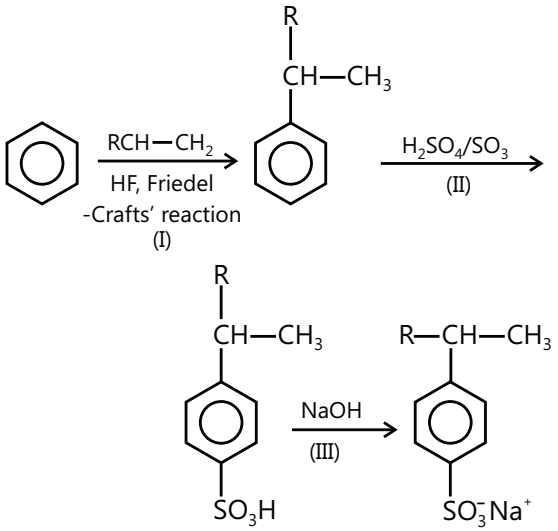
Sol 16: (D)



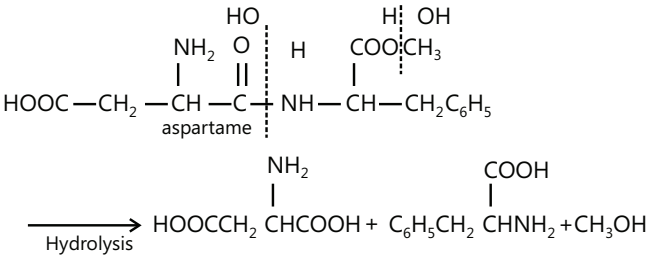
o-Acetyl salicylic acid
(Aspirin)

Sol 17: (B) Aspartame gets dissociated at cooking temperature.

Sol 18: (A)



Sol 19: (C)



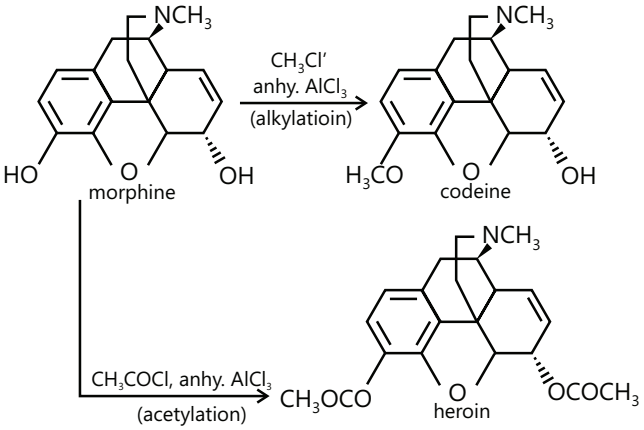
Sol 20: (A) Greater the branching, greater is the non-biodegradability of a detergent. A non-biodegradable detergent cause maximum pollution.

Sol 21: (C) Cationic detergents are also called invert soaps. Tri methyl steady ammonium bromide, being a quaternary ammonium salt is a cationic detergent.

Sol 22: (D) Antiseptics and disinfectants both inhibit and kill the microorganisms but disinfectants are not safe to apply over living tissues.

Sol 23: (C) Branched alkyl groups are not dissociated easily and that's why such compounds are non-biodegradable.

Sol 24: (C)



Sol 25: (B) Barbital or vernal is a sleep producing , ie hypnotic tranquilizer. It is used in sleeping pills and causes addiction.

Sol 26: (D) Bacteriostatic drugs inhibit the growth of organism while bactericidal drugs kill the microorganisms.

Sol 27: (A) Heroin is not a tranquilizer, it is a narcotic analgesic.

Sol 28: (C) In baby talcum powders, boric acid is used as antiseptic.

Previous Years' Questions

Sol 1: (C) The given compound is aspirin and it is used as analgesic.

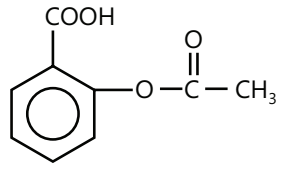
Sol 2: (B) Antipyretic are the class of drugs which reduces the body temperature during fever.

Sol 3: (D) A hormone is responsible for Insulin production and its action in human body.

Sol 4: (C) Phenelzine is tranquilizer. It is not an antacid.

Sol 5: (A)

Aspirin



Acetyl salicylic acid

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