Chemistry in Everyday Life
Multiple Choice Questions (Type-I)

1. Which of the following statements is not correct.
(i) Some antiseptics can be added to soaps.
(ii) Dilute solutions of some disinfectants can be used as antiseptic.
(iii) Disinfectants are antimicrobial drugs.
(iv) Antiseptic medicines can be ingested.

Ans. (iv)
Explanation: Antiseptics are applied to the living tissues such as wounds, cuts ulcers and diseased skin surfaces. It either kill or prevent the growth of microorganisms. It should not be ingested.

2. Which is the correct statement about birth control pills?
(i) Contain estrogen only.
(ii) Contain progesterone only.
(iii) Contain a mixture of estrogen and progesterone derivatives.
(iv) Progesterone enhances ovulation.

Ans. (iii)
Explanation: Birth control pills essentially contain a mixture of synthetic estrogen and progesterone derivatives. Both of these compounds are hormones. Progesterone suppresses ovulation.

3. Which statement about aspirin is not true
(i) Aspirin belongs to narcotic analgesics.
(ii) It is effective in relieving pain.
(iii) It has antiblood clotting action.
(iv) It is a neurologically active drug.

Ans. (i)
Explanation: Aspirin belongs to the class of non-narcotic analgesics.

4. The most useful classification of drugs for medicinal chemists is _____.
(i) on the basis of chemical structure.
(ii) on the basis of drug action.
(iii) on the basis of molecular targets.
(iv) on the basis of pharmacological effect.

Ans. (iii)
Explanation: Drugs usually interact with biomolecules such as carbohydrates, lipids, proteins and nucleic acids. These are called target molecules or drug target. Drugs possessing some common structural features may have the same mechanism of action on targets. The classification based on molecular targets is the most useful classification for medicinal chemists.

5. Which of the following statements is correct?

(i) Some tranquilisers function by inhibiting the enzymes which catalyse the degradation of noradrenaline.
(ii) Tranquilisers are narcotic drugs.
(iii) Transquilisers are chemical compounds that do not affect the message transfer from nerve to receptor.
(iv) Tranquilisers are chemical compounds that can relieve pain and fever.

Ans. (i)

Explanation: Tranquilisers inhibit the enzymes which catalyse the degradation of noradrenaline. If the enzyme is inhibited, this important neurotransmitter is slowly metabolised and can activate its receptor for longer periods of time, thus counteracting the effect of depression. Iproniazid and phenelzine are two such drugs.

6. Salvarsan is arsenic containing drug which was first used for the treatment of _____.

(i) syphilis
(ii) typhoid
(iii) meningitis
(iv) dysentry

Ans. (i)

Explanation: Paul Ehrlich, a German bacteriologist, conceived this idea. He investigated arsenic based structures in order to produce less toxic substances for the treatment of syphilis. He developed the medicine, arsphenamine, known as salvarsan.

7. A narrow spectrum antibiotic is active against _____.

(i) gram positive or gram negative bacteria.
(ii) gram negative bacteria only.
(iii) single organism or one disease.
(iv) both gram positive and gram negative bacteria.

Ans. (i)

Explanation: Antibiotics which kill or inhibit a wide range of Gram-positive and Gram-negative bacteria are said to be broad-spectrum antibiotics. But antibiotics that are effective against either Gram-positive or Gram-negative bacteria are narrow spectrum antibiotics.

8. The compound that causes general antidepressant action on the central nervous system belongs to the class of _____.

(i) analgesics
(ii) tranquilizers
(iii) narcotic analgesics
(iv) antihistamines

Ans. (ii)

Explanation: Tranquilizers are a class of chemicals compounds used for the treatment of stress, and mild or even severe mental diseases. If the level of noradrenaline is low for some reason, then the signal-sending activity becomes low, and the person suffers from depression. In such situations, antidepressant drugs are required.

9. Compound which is added to soap to impart antiseptic properties is _____.

(i) sodium laurylsulphate
(ii) sodium dodecylbenzenesulphonate
(iii) rosin
(iv) bithional

Ans. (iv)

Explanation: Sodium laurylsulphate and sodium dodecylbenzene-sulphonate are anionic detergent. Whereas, bithional is added to soaps to impart antiseptic properties of soap.

10. Equanil is _____.

(i) artificial sweetener
(ii) tranquilizer
(iii) antihistamine
(iv) antifertility drug

Ans. (ii)

Explanation: Equanil is a tranquilizer that help in controlling depression and hypertension.

11. Which of the following enhances leathering property of soap?

(i) Sodium carbonate
(ii) Sodium rosinate
(iii) Sodium stearate
(iv) Trisodium phosphate

Ans. (ii)

Explanation: A gum called, rosin is added while making them. It forms sodium rosinate which lathers well.

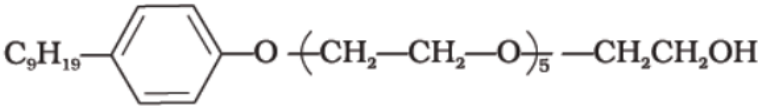
12. Glycerol is added to soap. It functions _____.

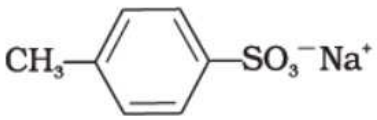
(i) as a filler.
(ii) to increase leathering.
(iii) to prevent rapid drying.
(iv) to make soap granules.

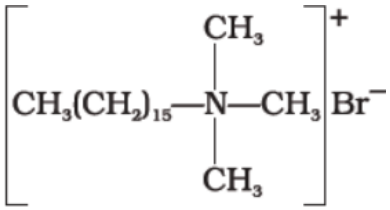
Ans. (iii)

13. Which of the following is an example of liquid dishwashing detergent?

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

(ii) 

(iii) 

(iv) 

Ans. (ii)

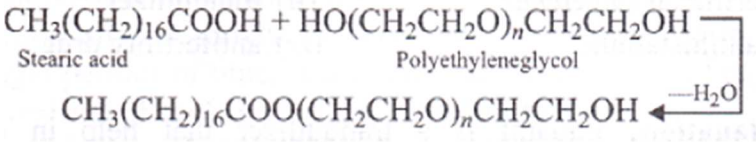
Explanation: Liquid dishwashing detergents are non-ionic type. Mechanism of cleansing action of this type of detergents is the same as that of soaps. These also remove grease and oil by micelle formation.

14. Polyethyleneglycols are used in the preparation of which type of detergents?

(i) Cationic detergents
(ii) Anionic detergents
(iii) Non-ionic detergents
(iv) Soaps

Ans. (iii)

Explanation: Non-ionic detergents do not contain any ion in their constitution. One such detergent is formed when stearic acid reacts with polyethyleneglycol.



15. Which of the following is not a target molecule for drug function in body?

(i) Carbohydrates
(ii) Lipids
(iii) Vitamins
(iv) Proteins

Ans. (iii)

Explanation: Drugs usually interact with biomolecules such as carbohydrates, lipids, proteins and nucleic acids. These are called drug targets. Vitamins are not a target molecule for drug function in body.

16. Which of the following statements is not true about enzyme inhibitors?

(i) Inhibit the catalytic activity of the enzyme.
(ii) Prevent the binding of substrate.
(iii) Generally, a strong covalent bond is formed between an inhibitor and an enzyme.
(iv) Inhibitors can be competitive or non-competitive.

Ans. (iii)

Explanation: If the bond formed between an enzyme and an inhibitor is a strong covalent bond and cannot be broken easily, then the enzyme is blocked permanently. The body then degrades the enzyme-inhibitor complex and synthesises then new enzyme.

17. Which of the following chemicals can be added for sweetening of food items at cooking temperature and does not provide calories?

(i) Sucrose
(ii) Glucose
(iii) Aspartame
(iv) Sucrolose

Ans. (iv)

Explanation: Sucrolose is trichloro derivative of sucrose. Its appearance and taste are like sugar. It is stable at cooking temperature. It does not provide calories.

18. Which of the following will not enhance nutritional value of food?

(i) Minerals
(ii) Artificial sweeteners
(iii) Vitamins
(iv) Aminoacids

Ans. (ii)

Explanation: Artificial sweetners are non-caloric substitutes for sugar. They are often more sweeter than sugar but do not enhance nutritional value of food.

Chemistry in Everyday Life
Multiple Choice Questions (Type-II)

Note: In the following questions two or more options may be correct.

19. Which of the following statements are incorrect about receptor proteins?
(i) Majority of receptor proteins are embedded in the cell membranes.
(ii) The active site of receptor proteins opens on the inside region of the cell.
(iii) Chemical messengers are received at the binding sites of receptor proteins.
(iv) Shape of receptor doesn't change during attachment of messenger.

Ans. (ii), (iv)
Explanation:
(ii) Receptor proteins are embedded in the cell membrane in such a way that their small part possessing active site projects out of the surface of the membrane and opens on the outside region of the cell membrane.
(iv) To accommodate a messenger, shape of the receptor site changes. This brings about the transfer of message into the cell.

20. Which of the following are not used as food preservatives?
(i) Table salt
(ii) Sodium hydrogencarbonate
(iii) Cane sugar
(iv) Benzoic acid

Ans. (ii), (iii)
Explanation: 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. Cane sugar and sodium hydrogencarbonate are not used as food preservatives.

21. Compounds with antiseptic properties are _____.
(i) $CHCl_3$
(ii) CHI_3
(iii) Boric acid
(iv) 0.3 ppm aqueous solution of Cl_2

Ans. (ii), (iii)
Explanation: Antiseptics are the chemicals which either kill or prevent the growth of microorganisms.
(i) Iodoform is also used as an antiseptic for wounds.
(ii) Boric acid in dilute aqueous solution is weak antiseptic for eyes.

22. Which of the following statements are correct about barbiturates?
(i) Hypnotics or sleep producing agents.
(ii) These are tranquilizers.
(iii) Non-narcotic analgesics.
(iv) Pain reducing without disturbing the nervous system.

Ans. **(i), (ii)**
Explanation: Derivatives of barbituric acid viz., veronal, amytal, nembutal, luminal and seconal constitute an important class of tranquilizers. These derivatives are called barbiturates. Barbiturates are hypnotic, i.e. sleep producing agents.

23. Which of the following are sulpha drugs?
(i) Sulphapyridine
(ii) Prontosil
(iii) Salvarsan
(iv) Nardil

Ans. **(i), (ii)**
Explanation: These drugs inhibit the enzymes which catalyse the degradation of noradrenaline. Sulphapyridine and prontosil contain sulphur and hence are sulpha drugs.

24. Which of the following are antidepressants?
(i) Iproniazid
(ii) Phenelzine
(iii) Equanil
(iv) Salvarsan

Ans. **(i), (ii), (iii)**
Explanation: If the enzyme is inhibited, this important neurotransmitter is slowly metabolised and can activate its receptor for longer periods of time, thus counteracting the effect of depression. Iproniazid, phenelzine and equanil are such drugs.

25. Which of the following statements are incorrect about penicillin?
(i) An antibacterial fungus.
(ii) Ampicillin is its synthetic modification.
(iii) It has bacteriostatic effect.
(iv) It is a broad-spectrum antibiotic.

Ans. **(iii), (iv)**
Explanation: Penicillin is a narrow spectrum antibiotic. Ampicillin and Amoxycillin are synthetic modifications of penicillins. These have broad spectrum. Pencillin kill microbes and hence it has bacteriocidal effect.

26. Which of the following compounds are administered as antacids?
(i) Sodium carbonate
(ii) Sodium hydrogencarbonate
(iii) Aluminium carbonate
(iv) Magnesium hydroxide

Ans. **(ii), (iv)**
Explanation: Treatment for acidity was administration of antacids, such as sodium hydrogencarbonate or a mixture of aluminium and magnesium hydroxide.

27. Amongst the following antihistamines, which are antacids?
(i) Ranitidine

(ii) Brompheniramine
(iii) Terfenadine
(iv) Cimetidine

Ans. **(i), (iv)**

Explanation: The drug cimetidine and ranitidine was designed to prevent the interaction of histamine with the receptors present in the stomach wall.

28. Veronal and luminal are derivatives of barbituric acid which are _____.

(i) Tranquilizers
(ii) Non-narcotic analgesic
(iii) Anti-allergic drugs
(iv) Neurologically active drugs

Ans. **(i), (iv)**

Explanation: Derivatives of barbituric acid viz., veronal, amytal, Nembutal, luminal and seconal constitute an important class of tranquilizers. These derivatives are called barbiturates.

29. Which of the following are anionic detergents?

(i) Sodium salts of sulphonated long chain alcohol.
(ii) Ester of stearic acid and polyethylene glycol.
(iii) Quarternary ammonium salt of amine with acetate ion.
(iv) Sodium salts of sulphonated long chain hydrocarbons.

Ans. **(i), (iv)**

Explanation: Anionic detergents are sodium salts of sulphonated long chain alcohols or hydrocarbons.

30. Which of the following statements are correct?

(i) Cationic detergents have germicidal properties
(ii) Bacteria can degrade the detergents containing highly branched chains.
(iii) Some synthetic detergents can give foam even in ice cold water.
(iv) Synthetic detergents are not soaps.

Ans. **(i), (iii) and (iv)**

Explanation: Cationic detergents have germicidal properties and are expensive, therefore, these are of limited use. Synthetic detergents are cleansing agents which have all the properties of Soap, but which actually do not contain any soap. These can be used both in soft and hard water as they give foam even in hard water.

Chemistry in Everyday Life
Matching Type

Note: Match the items given in Column I with the items given in Column II.

78. Match the medicines given in Column I with their use given in Column II.

Column I	Column II
(i) Ranitidine	(a) Tranquilizer
(ii) Furacine	(b) Antibiotic
(iii) Phenelzine	(c) Antihistamine
(iv) Chloramphenicol	(d) Antiseptic
	(e) Antifertility drug

Ans. (i)- (c)
(ii)- (d)
(iii)- (a)
(iv)- (b)

Explanation:

Column I	Column II
(i) Ranitidine	Ranitidine was designed to prevent the interaction of histamine with the receptors present in the stomach wall.
(ii) Furacine	Furacine is applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces.
(iii) Phenelzine	Phenelzine is an important neuro-transmitter. It is slowly metabolized and can activate its receptor for longer periods of time, thus counteracting the effect of depression.
(iv) Chloramphenicol	Chloramphenicol, isolated in 1947, is a broad-spectrum antibiotic.

79. Match the soaps given in Column I with items given in Column II.

Column I	Column II
(i) Soap chips	(a) dried miniature soap bubbles
(ii) Soap granules	(b) small broken pieces of soap formed from melted soaps
(iii) Soap powder	(c) soap powder + abrasives + builders (Na_2CO_3, Na_3PO_4)
(iv) Scouring soap	(d) soap powder + builders like Na_2CO_3 and Na_3PO_4

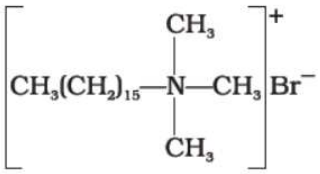
Ans. (i)- (b)
(ii)- (a)
(iii)- (d)
(iv)-(c)

Explanation:

Column I	Column II
(i) Soap chips	Soap chips are made by running a thin sheet of melted soap onto a cool cylinder and scraping off the soaps in small broken pieces.
(ii) Soap granules	Soap granules are dried miniature soap bubbles.

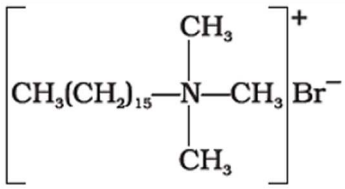
(iii) Soap powder	Soap powders contain some soap, and builders like sodium carbonate and trisodium phosphate
(iv) Scouring soap	Scouring soaps contain some soap, a scouring agent (abrasive) such as powdered pumice or finely divided sand, and builders like sodium carbonate and trisodium phosphate.

80. Match structures given in Column I with the type of detergents given in Column II.

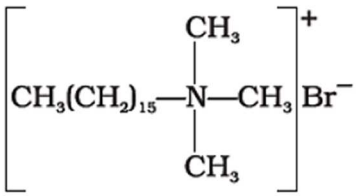
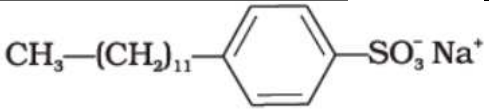
Column I	Column II
(i) $CH_3(CH_2)_{16}COO(CH_2CH_2O)_n CH_2CH_2OH$	(a) Cationic detergent
(ii) $C_{17}H_{35}COO^-Na^+$	(b) Anionic detergent
(iii) $CH_3-(CH_2)_{10}CH_2SO_3^-Na^+$	(c) Nonionic detergent
(iv) 	(d) Soap

Ans. (i)- (c)
(ii)- (d)
(iii)- (b)
(iv)- (a)

Explanation:

Column I	Column II
(i) Nonionic detergent	$CH_3(CH_2)_{16}COO(CH_2CH_2O)_nCH_2CH_2OH$
(ii) Soap	$C_{17}H_{35}COO^-Na^+$
(iii) Anionic detergent	$CH_3-(CH_2)_{10}CH_2SO_3^-Na^+$
(iv) Cationic detergent	

81. Match the detergents given in Column I with their uses given in Column II.

Column I	Column II
(i) 	(a) Dishwashing powder
(ii) 	(b) Laundry soap

(iii) $C_{17}H_{35}COO^{-}N^{+}a + Na_2CO_3 + \text{Rosin}$	(c) Hair conditioners
(iv) $CH_3(CH_2)_{16}COO(CH_2CH_2O)_n$ CH_2CH_2OH	(d) Toothpaste

Ans. (i)- (c)
(ii)- (d)
(iii)- (b)
(iv)- (a)

82. Match the class of compounds given in Column I with their functions given in Column II.

Column I	**Column II**
(i) Antagonists	(a) Communicate message between two neurons and that between neurons to muscles
(ii) Agonists	(b) Bind to the receptor site and inhibit its natural function
(iii) Chemical messenger	(c) Crucial to body's communication process
(iv) Inhibitors	(d) Mimic the natural messenger
(v) Receptors	(e) Inhibit activities of enzymes.

Ans. (i)- (b)
(ii)- (d)
(iii)- (a)
(iv)- (e)
(v)- (c)

Explanation:

Column I	**Column II**
(i) Antagonists	Drugs that bind to the receptor site and inhibit its natural function are called antagonists. These are useful when blocking of message is required.
(ii) Agonists	Compounds that mimic the natural messenger by switching on the receptor, these are called agonists.
(iii) Chemical messengers	Chemical messengers are received at the binding sites of receptor proteins. To accommodate a messenger, shape of the receptor site changes. This brings about the transfer of messenge into the cell. Thus, chemical messenger gives message to the cell without entering the cell.
(iv) Inhibitors	These can block the binding site of the enzyme and prevent the binding of substrate, or can inhibit the catalytic activity of the enzyme.
(v) Receptors	Receptors are proteins that are crucial to body's communication process.

83. Match the classes of drugs given in Column I with their action given in Column II.

Column I	**Column II**

(i) Analgesics	(a) Inhibit the growth of microorganisms can be given orally.
(ii) Antiseptics	(b) Treatment of stress
(iii) Antihistamines	(c) Applied to inanimate objects
(iv) Antacids	(d) Prevents the interaction of histamine with its receptor
(v) Tranquilizers	(e) Pain killing effect
(vi) Antibiotics	(f) Applied to diseased skin surfaces
(vii) Disinfectants	(g) Treatment of acidity

Ans. (i)- (e)
(ii)- (f)
(iii)- (d)
(iv)- (g)
(v)- (b)
(vi)- (a)
(vii)- (c)

Explanation:

Column I	Column II
(i) Analgesics	Analgesics reduce or abolish pain without causing impairment of consciousness, mental confusion, in coordination or paralysis or some other disturbances of nervous system.
(ii) Antiseptics	Antiseptics are applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces.
(iii) Antihistamines	to prevent the interaction of histamine with the receptors present in the stomach wall.
(iv) Antacids	Treatment for acidity was administration of antacids.
(v) Tranquilizers	Tranquilizers are a class of chemical compounds used for the treatment of stress, and mild or even severe mental diseases.
(vi) Antibiotics	Antibiotics were classified as chemical substances produced by microorganisms that inhibit the growth or even destroy microorganism.
(vii) Disinfectants	Disinfectants are applied to inanimate objects such as floors, drainage system, instruments, etc.

Chemistry in Everyday Life
Assertion and Reason Type

Note: In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(i) Assertion and reason both are correct statement but reason does not explain assertion.
(ii) Assertion and reason both are correct and reason explains the assertion.
(iii) Both assertion and reason are wrong statement.
(iv) Assertion is correct statement reason is wrong statement.
(v) Assertion is wrong statement reason is correct statement.

84. **Assertion:** Penicillin (G) is an antihistamine
Reason: Penicillin (G) is effective against gram positive as well as gram negative bacteria.
Ans. (iii)
Explanation: Penicillin G is an antibiotic and it has a narrow spectrum.

85. **Assertion:** Sulpha drug contain sulphonamide group.
Reason: Salvarsan is a sulpha drug.
Ans. (iv)
Explanation: Salvarsan is antibacterial.

86. **Assertion:** Receptors are crucial to body's communication process.
Reason: Receptors are proteins.
Ans. (i)
Explanation: Receptors are proteins that are crucial to body's communication process. Message between two neurons and that between neurons to muscles is communicated through certain chemicals. These chemicals, known as chemical messengers are received at the binding sites of receptor proteins.

87. **Assertion:** Enzymes have active sites that hold substrate molecule for a chemical reaction.
Reason: Drugs compete with natural substrate by attaching covalently to the active site of enzyme.
Ans. (iv)
Explanation: Substrates bind to the active site of the enzyme through a variety of interactions such as ionic bonding, hydrogen bonding, van der Waals interaction or dipole-dipole interaction.

88. **Assertion:** Chemical messengers are chemicals that enable communication of message between two neurons or between neurons and muscles.
Reason: Chemicals enter the cell through receptor.
Ans. (iv)
Explanation: Binding sites of receptor proteins. To accommodate a messenger, shape of the receptor site changes. This brings about the transfer of message into the cell.

89. **Assertion:** Transparent soaps are made by dissolving soaps in ethanol.
Reason: Ethanol makes things invisible.

Ans. (iv)
Explanation: Ethanol helps scattering the light as it removes air and moisture.

90. **Assertion:** Sodium chloride is added to precipitate soap after saponification.
Reason: Hydrolysis of esters of long chain fatty acids by alkali produces soaps in colloidal form.
Ans. (ii)

91. **Assertion:** Competitive inhibitors compete with natural substrate for their attachment on the active sites of enzymes.
Reason: In competitive inhibition, inhibitor binds to the allosteric site of the enzyme.
Ans. (iv)
Explanation: In competitive inhibition, inhibitor binds to the active sites of the enzymes.

92. **Assertion:** Non-competitive inhibitor inhibits the catalyic activity of enzyme by binding with its active site.
Reason: Non-competitive inhibitor changes the shape of the active site in such a way that substrate can't recognise it.
Ans. (v)
Explanation: This binding of inhibitor at allosteric site changes the shape of the active site.

93. **Assertion:** Chemical messenger gives message to the cell without entering the cell.
Reason: Chemical messenger is received at the binding site of receptor proteins.
Ans. (ii)

94. **Assertion:** Receptor proteins show selectivity for one chemical messenger over the other.
Reason: Chemical messenger binds to the receptor site and inhibits its natural function.
Ans. (iv)
Explanation: Chemical messenger bind receptors and gives message to the cell without entering the cell.

95. **Assertion:** All chemicals added to food items are called food preservatives.
Reason: All these chemicals increase the nutritive value of the food.
Ans. (iii)
Explanation: These are added to increase the shelf life of stored food and they do not add nutritive value to food.

96. **Assertion:** Preservative are added to food items.
Reason: Preservatives inhibit the growth of microorganisms.
Ans. (ii)

97. **Assertion:** Artificial sweeteners are added to the food to control the intake of calories.
Reason: Most of the artificial sweeteners are inert and do not metabolise in the body.
Ans. (ii)

Chemistry in Everyday Life
Short Answer Type

31. What is the average molecular mass of drugs?

Ans. Drugs are chemicals of low molecular masses (~100-500u). These interact with macromolecular targets and produce a biological response.

32. Write the uses of medicines.

Ans. Medicines are used in diagnosis, prevention and treatment of diseases. If taken in doses higher than those recommended, most of the drugs used as medicines are potential poisons.

33. What are antiseptics?

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

34. Which type of drugs come under antimicrobial drugs?

Ans. An antimicrobial tends to destroy or prevent development or inhibit the pathogenic action of microbes such as bacteria (antibacterial drugs), fungi (antifungal agents), virus (antiviral agents), or other parasites (antiparasitic drugs) selectively. Antibiotics, Antiseptics and disinfectants are antimicrobial drugs.

35. Where are receptors located?

Ans Receptor proteins are embedded in the cell membrane in such a way that their small part possessing active site projects out of the surface of the membrane and opens on the outside region of the cell membrane.

36. What is the harmful effect of hyperacidity?

Ans. Over production of acid in the stomach causes irritation and pain. In severe cases, ulcers are developed in the stomach.

37. Which site of an enzyme is called allosteric site?

Ans. Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called allosteric site.

38. What type of forces are involved in binding of substrate to the active site of enzyme?

Ans. Substrates bind to the active site of the enzyme through a variety of interactions such as ionic bonding, hydrogen bonding, van der Waals interaction or dipole-dipole interaction.

39. What is the commonality between the antibiotic arsphenamine and azodye?

Ans. Similarly, in structures of salvarsan and azodyes. The-As=As-linkage present in arsphenamine resembles the –N=N-linkage present in azodyes in the sense that arsenic atom is present in place of nitrogen. He also noted tissues getting coloured by dyes selectively.

40. Which class of drugs is used in sleeping pills?

Ans. Tranquilizer drugs are used in sleeping pills. Tranquilizers are a class of chemical compounds used for the treatment of stress, and mild or even severe mental diseases. These relieve anxiety, stress, irritability or excitement by inducing a sense of well-being.

41. Aspirin is pain relieving antipyretic drug but can be used to prevent heart attack. Explain.

Ans. Aspirin inhibits the synthesis of chemicals known as prostaglandins which stimulate inflammation in the tissue and cause pain. These drugs are effective in relieving skeletal pain such as that due to arthritis. Aspirin prevents platelet coagulation and thus has anti blood clotting action, therefore can prevent blood clogging in heart.

42. Both antacids and antiallergic drugs are anithistamines but they cannot replace each other. Explain why?

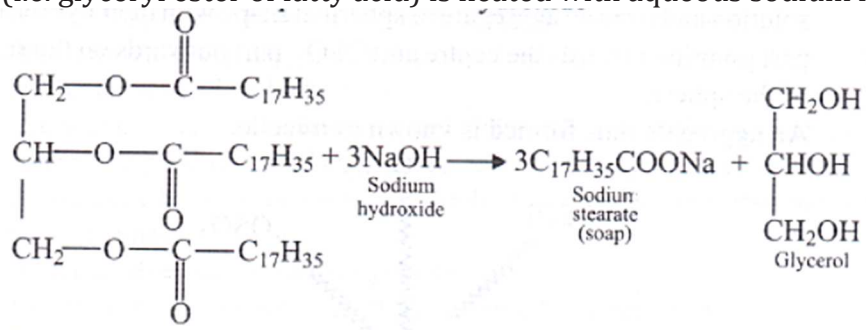
Ans. Antiallergic and antacid drugs work on different receptors. Therefore, anithistamines remove allergy while antacid remove acidity.

43. What is a soft soap?

Ans. Only sodium and potassium soaps are soluble in water and are used for cleaning purposes. Generally, potassium soaps are soft to the skin than sodium soaps. Hence known as soft soaps.

44. If 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?

Ans. A solution of soap is titrated with standard hydrochloric acid. It is an acid-base titration. In this titration, phenolphthalein is used as an indicator. During the preparation of soap, fat (i.e. glyceryl ester of fatty acid) is heated with aqueous sodium hydroxide



Glyceryl ester of stearic acid (Fat)

Thus, the source of this excess alkali (which irritates skin) is the alkali left unused when the soap is prepared by hydrolysis of fat.

45. Explain why some times foaming is seen in river water near the place where sewage water is poured after treatment?

Ans. Slow degradation of detergents leads to their accumulation. Effluents containing such detergents reach the rivers, ponds, etc. These persist in water even after sewage treatment and cause foaming in rivers, ponds and streams and their water gets polluted.

46. Which category of the synthetic detergents is used in toothpaste?

Ans. Anionic detergents are used in toothpastes. The anionic part of the molecule is involved in the cleansing action. Sodium salts of alkylbenzenesulphonates are important class of anionic detergents. They are mostly used for household work.

47. Hair shampoos belong to which class of synthetic detergent?

Ans. Cationic detergents are used in shampoos. Cationic part possess a long hydrocarbon chain and a positive charge on nitrogen atom. Hence, these are called cationic detergents. Etyltrimethylammonium bromide is a popular cationic detergent and is used in hair conditioners.

48. Dishwashing soaps are synthetic detergents. What is their chemical nature?

Ans. Liquid dishwashing detergents are non-ionic type. Mechanism of cleansing action of this type of detergents is the same as that of soaps. These also remove grease and oil by micelle formation.

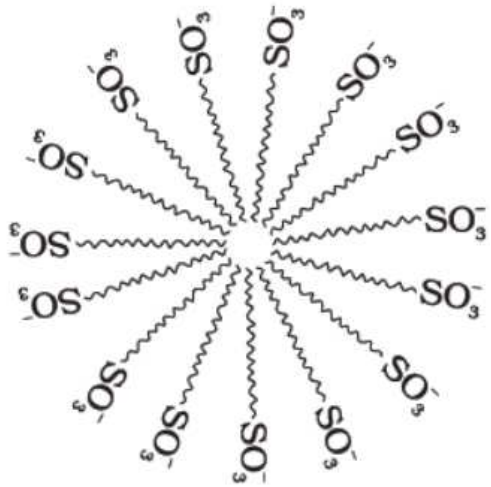
49. Draw the diagram showing micelle formation by the following detergent.

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

Ans. Sodium lauryl sulphate, $CH_3(CH_2)_{10}CH_2OSO_3Na$ is an example of anionic detergent.
When added to water, it dissociates as follows:

$$CH_3-(CH_2)_{10}-CH_2OSO_3^-Na^+ \xrightarrow{H_2O} CH_3-(CH_2)_{10}CH_2-OSO_3^- + Na^+$$

These anions are present on the surface with their $-OSO_3^-$ groups in water and hydrocarbon part staying away from it and remain at the surface.
At higher concentration, these anions are pulled into the bulk of the solution and form an aggregate of spherical shape with their hydrocarbon part pointing towards the centre and OSO_3^- part outwards on the surface of the sphere.
An aggregate thus formed is known as micelle.



50. How does the branching of hydrocarbon chain of synthetic detergents affect

their biodegradability?

Ans. Highly branched hydrocarbon chains cannot be degraded by bacteria easily. Slow degradation of detergents leads to their accumulation. Effluents containing such detergents reach the rivers, ponds, etc. These persist in water even after sewage treatment and cause foaming in rivers, ponds and streams and their water gets polluted. Less branching leads to easy biodegradability.

51. Why is it safer to use soap from the environmental point of view?

Ans. Unbranched chains can be biodegraded more easily and hence pollution is prevented. Therefore, soap is preferred more than detergent.

52. What are analgesics?

Ans. Analgesics reduce or abolish pain without causing impairment of consciousness, mental confusion, incoordination or paralysis or some other disturbances of nervous system.

53. What is the scientific explanation for the feeling of depression?

Ans. Noradrenaline is one of the neurotransmitters that plays a role in mood changes. If the level of noradrenaline is low for some reason, then the signal-sending activity becomes low, and the person suffers from depression. In such situations, antidepressant drugs are required.

54. What is the basic difference between antiseptics and disinfectants?

Ans. Antiseptics are applied to the living tissues such as wounds, cuts, ulcers and diseased skin surfaces. Whereas, disinfectants are applied to inanimate objects such as floors, drainage system, instruments, etc. Same substances can act as an antiseptic as well as disinfectant by varying the concentration. For example, 0.2 per cent solution of phenol is an antiseptic while its one percent solution is disinfectant.

55. Between sodiumhydrogencarbonate and magnesium hydroxide which is a better antacid and why?

Ans. Excessive hydrogencarbonate can make the stomach alkaline and trigger the production of even more acid. Metal hydroxides are better alternatives because of being insoluble, these do not increase the pH above neutrality.

56. Which analgesics are called opiates?

Ans. Morphine narcotics are sometimes referred to as opiates, since they are obtained from the opium poppy. Morphine and many of its homologues, when administered in medicinal doses, relieve pain and produce sleep. In poisonous doses, these produce stupor, coma, convulsions and ultimately death.

57. What is the medicinal use of narcotic drugs?

Ans. These analgesics are chiefly used for the relief of postoperative pain, cardiac pain and pains of terminal cancer, and in child birth.

58. What are antagonistic drugs?

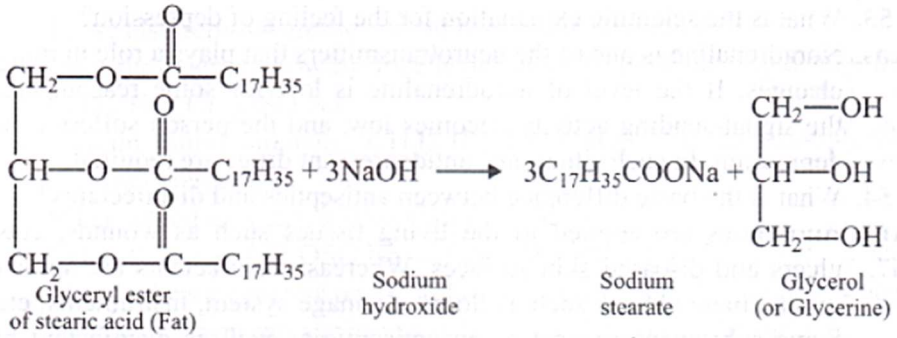
Ans. Drugs that bind to the receptor site and inhibit its natural function are called antagonists. These are useful when blocking of message is required.

59. What is the mode of action of antimicrobial drugs?

Ans. An antimicrobial tends to destroy/prevent development or inhibit the pathogenic action of microbes such as bacteria (antibacterial drugs), fungi (antifungal agents), virus (antiviral agents), or other parasites (antiparasitic drugs) selectively.

60. What is the side product of soap industry? Give reactions showing soap formation.

Ans. Soaps are the detergents used since long. Soaps used for cleaning purpose are sodium or potassium salts of long chain fatty acids, e.g., stearic, oleic and palmitic acids. Soaps containing sodium salts are formed by heating fat (i.e., glyceryl ester of fatty acid) with aqueous sodium hydroxide solution.



61. What is the difference between bathing soap and washing soaps?

Ans. Only sodium and potassium soaps are soluble in water and are used for cleaning purposes. Generally, potassium soaps are soft to the skin than sodium soaps. These can be prepared by using potassium hydroxide solution in place of sodium hydroxide.
Bathing soaps are potassium salts of long chain fatty acids while washing soaps are sodium salts of long chain fatty acids.

62. How are transparent soaps manufactured?

Ans. Transparent soaps are made by dissolving the soap in ethanol and then evaporating the excess solvent.

63. What is the advantage of using antihistamines over antacids in the treatment of acidity?

Ans. Antacids control only symptoms, and not the cause. Therefore, with these metal salts, the patients cannot be treated easily. In advanced stages, ulcers become life threatening and its only treatment is removal of the affected part of the stomach. Whereas, antihistamines in the treatment of hyperacidity came through the discovery according to which a chemical, histamine, stimulates the secretion of pepsin and hydrochloric acid in the stomach. The drug cimetidine was designed to prevent the interaction of histamine with the receptors present in the stomach wall. This resulted in release of lesser amount of acid.

64. What are the functions performed by histamine in the body?

Ans. Histamine is a potent vasodilator. It has various function. It contracts the smooth muscles in the bronchi and gut and relaxes other muscles, such as those in the walls of fine blood vessels. Histamine is also responsible for the nasal congestion associated with common cold and allergic response to pollen.

65. With the help of an example explain how do tranquilizers control the feeling of depression?

Ans. Tranquilizers are a class of chemical compounds used for the treatment of stress, and mild or even severe mental diseases. These relieve anxiety, stress, irritability or excitement by inducing a sense of well-being. For example, noradrenaline is one of the neurotransmitters that plays a role in mood changes. If the level of noradrenaline is low for some reason, then the signal-sending activity becomes low, and the person suffers from depression.

66. Why are certain drugs called enzyme inhibitors?

Ans. This can block the binding site of the enzyme and prevent the binding of substrate, or can inhibit the catalytic activity of the enzyme. Such drugs are called enzyme inhibitors.

67. What are fillers and what role these fillers play in soap?

Ans. Some substances are added to soap to affect the properties in order to make it useful for a particular application. Example, glycerol is added in shaving soaps to prevent it from drying. A gum called, rosin is added to soaps while making them. It forms sodium rosinate which lathers well. Laundry soaps contains fillers like sodium rosinate, sodium silicate, borax and sodium carbonate.

68. Sugar is the main source of energy as it produces energy on metabolic decomposition. But these days low calorie drinks are more popular, why?

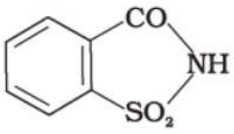
Ans. Natural sweeteners, e.g., sucrose add to calorie intake and therefore many people prefer to use artificial sweeteners. These artificial sweetening agents do not metabolise and hence do not produce any energy. Ortho-sulphobenzimide, also called saccharin, is the first popular artificial sweetening agent.

69. Pickles have a long shelf life and do not get spoiled for months, why?

Ans. Food preservatives prevent spoilage of food due to microbial growth. The most commonly used preservations include table salt, sugar, vegetable oils and sodium benzoate, C_6H_5COONa. Plenty of salt and cover of oil act as preservative. These do not allow bacteria to thrive on them.

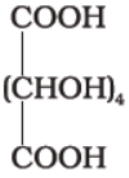
70. What is the difference between saccharin and saccharic acid?

Ans. Ortho-sulphobenzimide, also called saccharin, is the first popular artificial sweetening agent.



Saccharin
(Artificial sweetener)

Whereas saccharic acid is obtained from oxidation of glucose by concentrated HNO_3.



Saccharic acid
(obtained from oxidation of glucose by conc. HNO_3)

71. Name an artificial sweetener which is derivative of sucrose.

Ans. Sucrolose is trichloro derivative of sucrose. Its appearance and taste are like sugar. It is stable at cooking temperature. It does not provide calories.

72. Name two α-amino acids which form a dipeptide which is 100 times more sweet than cane sugar?

Ans. 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.

73. Aspartame is unstable at cooking temperature, where would you suggest aspartame to be used for sweetening?

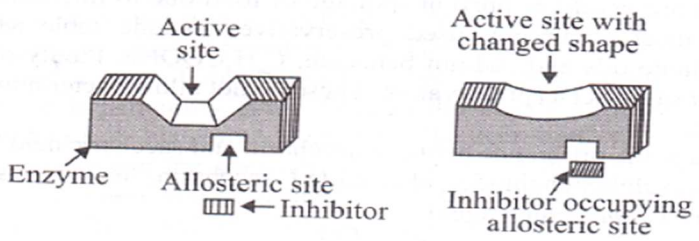
Ans. Cold foods and soft drinks because it is unstable at cooking temperature.

74. Sodium salts of some acids are very useful as food preservatives. Suggest a few such acids.

Ans. Food preservatives prevent spoilage of food due to microbial growth. Sodium salts of benzoic acid, sorbic acid and propanoic acid can be used as preservatives.

75. Explain the role of allosteric site in enzyme inhibition?

Ans. Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called allosteric site. This binding of inhibitor at allosteric site changes the shape of the active site in such a way that substrate cannot recognise it.



76. How are receptor proteins located in the cell membrane?

Ans. Receptor proteins are embedded in the cell membrane in such a way that their small part possessing active site projects out of the surface of the membrane and opens on the outside region of the cell membrane.

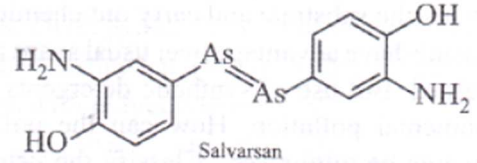
77. What happens when the bond formed between an enzyme and an inhibitor is a strong covalent bond?

Ans. If the bond formed between an enzyme and an inhibitor is a strong covalent bond and cannot be broken easily, then the enzyme is blocked permanently. The body then degrades the enzyme-inhibitor complex and synthesises the new enzyme.

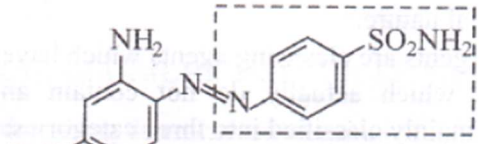
Chemistry in Everyday Life
Long Answer Type

98. In what respect do prontosil and salvarsan resemble. Is there any resemblance between azo dye and prontosil? Explain.

Ans. Prontosil, which resembles in structure to the compound, salvarsan. Soon it was discovered that in the body prontosil is converted to a compound called sulphanilamide, which is the real active compound.

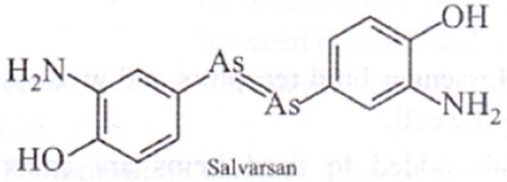


Salvarsan

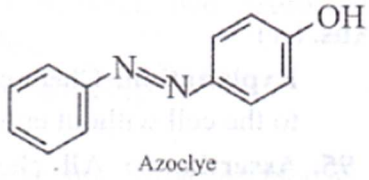


Prontosil

There is similarity in structures of salvarsan and azodyes. The –As=As-linkage present in arsphenamine resembles the –N=N- linkage present in azodyes in the sense that arsenic atom is present in place of nitrogen.



Salvarsan



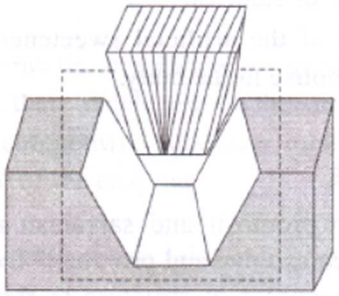
Azoclye

99. How do enzymes catalyse a chemical reaction in the living system? Explain drug target interaction taking the example of enzyme as target.

Ans. In their catalytic activity, enzymes perform two major functions:

(i) The first function of an enzyme is to hold the substrate for a chemical reaction. Active sites of enzymes hold the substrate molecule in a suitable position, so that it can be attacked by the reagent effectively.

Substrates bind to the active site of the enzyme through a variety of interactions such as ionic bonding, hydrogen bonding, van der Waals interaction or dipole-dipole.


Enzymes holding substrate

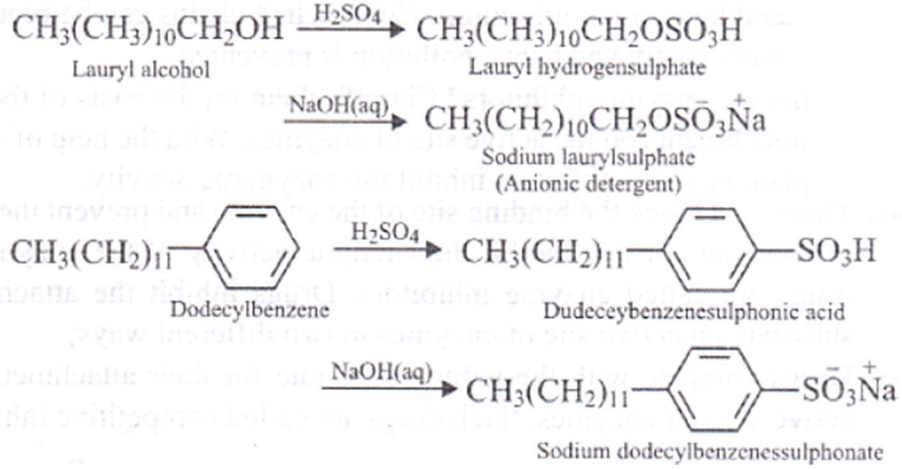
(ii) The second function of an enzyme is to provide functional groups that will attack the substrate and carry out chemical reaction.

100. Synthetic detergents have advantage over usual soaps as far as cleansing power is concerned. But use of synthetic detergents over a long time creates environmental pollution. How can the pollution caused by synthetic detergents be minimised? Classify the detergents according to their chemical nature.

Ans. Synthetic detergents are cleansing agents which have all the properties of soaps, but which actually do not contain any soap. Synthetic detergents are mainly classified into three categories:

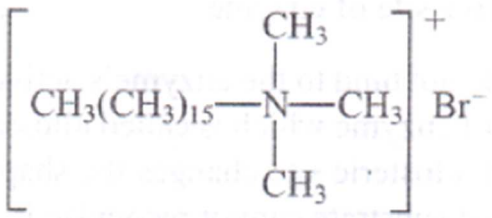
(i) Anionic detergents (ii) Cationic detergents and (iii) Non-ioinic detergents.

(i) **Anionic detergents:** Anionic detergents are sodium salts of sulphonated long chain alcohols or hydrocarbons. Alkyl hydrogen-sulphates formed by treating long chain alcohols with concentration sulphuric acid are neutralised with alkali to form anionic detergents.



In anionic detergents, the anionic part of the molecule is involved in the cleansing action. They are mostly used for household work. Anionic detergent are also used in toothpastes.

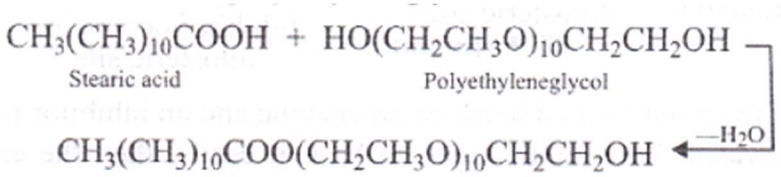
(ii) **Cationic detergents:** Cationic detergents are quarternary ammonium salts of amines with acetates, chlorides or bromides as anions. Cationic part possess a long hydrocarbon chain and a positive charge on nitrogen atom. Hence, these are called cationic detergents.



Cetyltrimethyl ammonium bromide

Cationic detergents have germicidal properties and are expensive, therefore, these are of limited use.

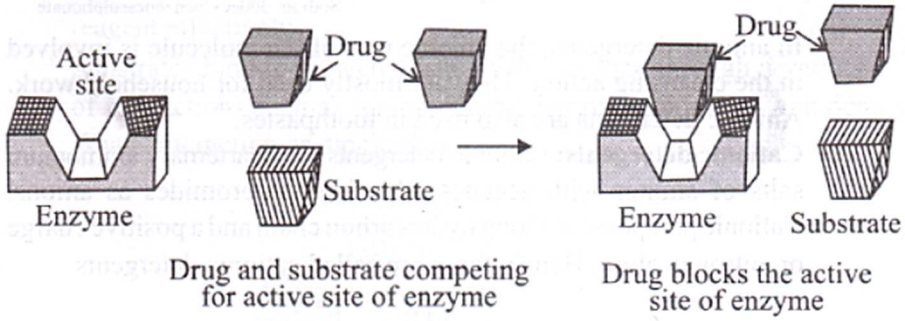
(iii) **Non-ionic Detergents:** Non-ionic detergents do not contain any ion in their constitution. One such detergent is formed when stearic acid reacts with polyethyleneglycol.



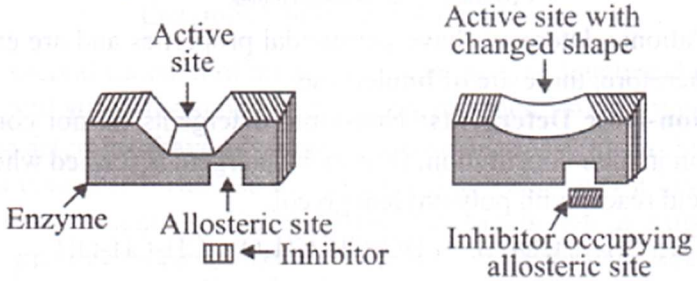
Liquid dishwashing detergents are non-ionic type:
Main problem that appears in the use of detergents is that if their hydrocarbon chain is highly branched, then bacteria cannot degrade this easily. Slow degradation of detergents leads to their accumulation. These persist in water even after sewage treatment and cause foaming in rivers, ponds and streams and their water gets polluted.
These days the branching of the hydrocarbon chain is controlled and kept to the minimum. Unbranched chains can be biodegraded more easily and hence pollution is prevented.

101. What are enzyme inhibitors? Classify them on the basis of their mode of attachments on the active site of enzymes. With the help of diagrams explain how do inhibitors inhibit the enzymatic activity.

Ans. These can block the binding site of the enzymes and prevent the binding of substrate, or can inhibit the catalytic activity of the enzyme. Such drugs are called enzyme inhibitors.
Drugs inhibit the attachment of substrate on active site of enzymes in two different ways:
(i) Drugs complete with the natural substrate for their attachment on the active sites of enzymes. Such drugs are called competitive inhibitors.



(ii) Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called allosteric site. This binding of inhibitor at allosteric site changes the shape of the active site in such a way that substrate cannot recognise it.



If the bond formed between an enzyme and an inhibitor is a strong covalent bond and cannot be broken easily, then the enzyme is blocked permanently. The body then degrades the enzyme-inhibitor complex and synthesises the new enzyme.