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CLASS XII CHEMISTRY NOTES

CHEMISTRY IN EVERYDAY LIFE

KEY NOTES AND IMPORTANT QUESTIONS WITH ANSWERS



UNIT 16

CHEMISTRY IN EVERYDAY LIFE

Points to Remember

1. **Drugs :** Drugs are chemical of low molecular masses, which interact with macromolecular targets and produce a biological response.

2. **Chemotherapy :** The use of chemicals for therapeutic effect is called chemotherapy.

3. **Classification of Drugs :**

   (i) **On the basis of pharmacological effect :** Drugs for a particular type of problem as analgesics for pain relieving.

   (ii) **On the basis of drug action :** Action of drug on a particular biochemical process.

   (iii) **On the basis of chemical action :** Drugs having similar structure, *e.g.,* sulpha drugs.

   (iv) **On the basis of molecular targets :** Drugs interacting with biomolecules as lipids, proteins.

4. **Enzymes as Drug Targets :**

   (i) **Catalytic action of enzymes :**

   (a) Enzymes have active sites which hold the substrate molecule. It can be attracted by reacting molecules.

   (b) Substrate is bonded to active sites through hydrogen bonds, ionic bonds, van der Waal or dipole-dipole interactions.

   (ii) **Drug-enzyme interactions :**

   (a) Drug complete with natural substrate for their attachments on the active sites of enzymes. They are called competitive inhibitors.

   (b) Some drugs binds to a different site of the enzyme called allosteric sites which changes the shape of active sites.

5. **Antagonists :** The drugs that bind to the receptor site and inhibit its natural function.

6. **Agonists :** Drugs mimic the natural messenger by switching on the receptor.

7. **Antacids :** These are compounds which neutralize excess acid of stomach. *E.g.,* Aluminium hydroxide, magnesium hydroxide.

8. **Anti Histamines :** The drugs which interfere with the natural action of histamines and prevent the allergic reaction. *E.g.,* Rantidine, tegarnet, avil.

9. **Tranquilizers :** The class of chemical compounds used for the treatment of stress, mild or even severe mental diseases. *E.g.,* Idardil, ipronizid, luminal, seconil equanil.

10. **Analgesics :** They reduce pain without causing impairment of consciousness, mental confusion or some other disturbance of the nervous system. *E.g.,* Aspirin, seridon, phenacetin.

11. **Antimicrobials :** They tend to prevent/destroy or inhibit the pathogenic action of microbes as bacteria, virus, fungi etc. They are classified as :

    (i) **Antibiotics :** Those are the chemical substances which are produced by micro-organisms. *E.g.,* Penicillin, Ofloxacin.

    Narrow spectrum antibiotics : These are effective mainly against gram positive or gram negative bacteria. *E.g.,* Penicillin, streptomycin.

    Broad spectrum antibiotics : They kill or inhibit a wide range of micro-organisms. *E.g.,* Chloramphenicol, tetracycline.

    (ii) **Antiseptics or Disinfectant :** These are which either kill/inhibit the growth of micro-organisms.

    Antiseptics are applied to the living tissues such as wounds, cuts, ulcers etc. *E.g.,* Furacine, chloroxylenol and terpinol (dettol). Disinfectant are applied to inanimate objects such as floors, drainage system.

    E.g., 0.2% solution of phenol is an antiseptic while 1% solution is an disinfectant.

12. **Antifertility drugs :** These are the chemical substances used to control the pregnancy. They are also called oral contraceptives or birth control pills. *E.g.,* Mifepristone, norethindrone.

13. **Artificial Sweetening Agents :** These are the chemical compounds which give sweetening effect to the food without adding calorie. They are good for diabetic people. *E.g.,* Aspartame, saccharin, alitame, sucrolose.

14. **Food Preservatives :** They prevents spoilage of food to microbial growth. *E.g.,* Salt, sugar and sodium benzoate.

15. Cleansing Agents :

(i) **Soaps :** They are sodium or potassium salts of long chain fatty acids. They are obtained by the saponification reaction, when fatty acids are heated with aqueous sodium hydroxide. They do not work well in hard water.

(ii) **Toilet soaps :** That are prepared by using better grade of fatty acids and excess of alkali needs to be removed. Colour and perfumes are added to make them attractive.

(iii) **Medicated soaps :** Substances or medicinal value are added. *E.g.,* Bithional, dettol.

16. **Synthetic Detergents :** They are cleaning agents having properties of soaps, but actually contain no soap. They can be used in both soft and hard water. They are :

(i) **Anionic detergents :** They are sodium salts of sulphonated long chain alcohols or hydrocarbons. *E.g.,* Sodium lauryl sulphonate. They are effective in acidic solution.

$$CH_3(CH_2)CH_2OH \rightarrow CH_3(CH_2)_{10}CH_2OSO_3H \rightarrow CH_3(CH_2)_{10}CH_2OSO_3^-Na^+$$

(lauryl alcohol) (sodium lauryl sulphonate)

(ii) **Cationic detergents :** They are quarternary ammonium salts of amines with acetates, chlorides or bromides. They are expensive used to limited extent. *E.g.,* cetyltrimethylammonium bromide.

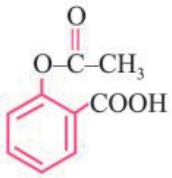
(iii) **Non-ionic detergents :** They do not contain any ions. Some liquid dishwashing detergents are of non-ionic type.

17. **Biodegradable Detergents :** The detergents which are linear and can be attacked by micro-organisms are biodegradable. *E.g.,* Sodium 4-(1-dodecyl) benzene/ sulphonate.

18. **Non-biodegradable Detergents :** The detergents which are branched and cannot be decomposed by micro-organisms are called non-biodegradable. *E.g.,* Sodium 4-(1, 3, 5, 7 tetramethyloctyl-benzene sulphonate. It creates water pollution.

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

Q. 1. Write the formula and IUPAC name of aspirin.

[*Hint :*  [IUPAC name : 2-Acetoxybenzoic acid]

Q. 2. Name the type of drugs having following structural formula :



[*Hint :* Sulpha drugs]

Q. 3. Name two types of the drugs classified on the basis of pharmacological effect.

[*Hint :* Analgesics, Antiseptics.]

Q. 4. What is the role of Bithional in toilet soaps ?

[*Hint :* To impart antiseptic properties to soaps.]

Q. 5. Why is sodium benzoate added to packed containers of jams and pickles ?

[*Hint :* It prevents spoilage of jams and pickles due to microbial growth. It is a food preservative.]

Q. 6. Why the receptors embedded in cell membranes show selectivity for one chemical messenger over the other ?

[*Hint :* The active site of receptor has specific shape and specific functional groups which can bind only specific messenger which fits in.]

Q.7. With reference to which classification has the statement 'Ranitidine is an antacid' been given ?

[*Hint :* Classification based on pharmacological effect.]

Q.8. Give the name of medicine used for the treatment of syphilis.

[*Hint :* Salvarsan.]

Q.9. Give the composition of tincture of iodine.

[*Hint :* 2-3% solution of iodine in alcohol-water mixture.]

Q.10. How does aspirin act as analgesic ?

[*Hint :* Aspirin inhibits the synthesis of prostaglandins which cause pain.]

Q.11. Name the antiseptic agents present in dettol.

[*Hint :* Chloroxylenol and Terpinol.]

Q.12. What precaution should be taken before administrating penicillin to a patient ?

[*Hint :* To confirm beforehand that the patient is not allergic to penicillin.]

Q.13.Explain why aspirin finds use in prevention of heart attacks ?

[*Hint :* Due to anti blood clotting activity.]

Q.14.Mention one use of drug meprobamate.

[*Hint :* Antidepressant drug.]

Q.15.Name the derivative of sucrose which tastes like sugar and can be safely used by weight conscious people.

[*Hint :* Sucrolose.]

Q.16.Why synthetic detergents are preferred over soaps for use in washing machines ?

[*Hint :* They work well even with hard water and not form any scum.]

Q.17.While antacids and antiallergic drugs interfere with the function of histamines, why do these not interfere with the function of each other ?

[*Hint :* Antacids and antiallergic drugs bind to the different receptor sites. Therefore, they do not interfere with the function of each other.]

Q.18.Which of the following two compounds can be used as a surface agent and why ?

[*Hint :* Compound (i) acts as a surface agent because its one end is hydrophobic while the other end is hydrophilic in nature.]

Q.19.What type of drug is chloramphenicol ?

[*Hint :* Bacteriostatic broad spectrum antibiotic.]

Q.20.Name a chemical used as an antiseptic as well as disinfectant.

[*Hint :* Phenol. (0.2% solution antiseptic and 1% solution disinfectant)]

Q.21.Give two examples of antidepressants.

[*Hint :* Iproniazid, Phenelzine.]

Q.22.Name the antioxidants commonly used to increase the storage of butter.

[*Hint :* BHA (Butylated Hydroxy anisole).]

Q.23. Give the name of medicine having – As = As – linkage.

[*Hint :* Arsphenamine.]

Q.24.Which antibiotic is supposed to be toxic towards certain strains of cancer cells ?

[*Hint :* Dysidazirine.]

Q.25.Name one antioxidant used in wine, butter and beers.

[*Hint :* BHA, BHT.]

Q.26.Hair shampoos belong to which class of synthetic detergent ?

[*Hint :* They belong to cationic detergents. E.g., Cetyltrimethyl-ammonium bromide.]

Q.27.Dishwashing soaps are synthetic detergents. What is their chemical nature ?

[*Hint :* They are non-ionic detergents. *E.g.,* Polyethylene glycol-stearate.]

Q.28.What is the cause of a feeling of depression in human beings ? Name a drug which can be useful in treating depression.

[*Hint :* Low level of noradrenaline, a neurotransmitter causes depression in human beings. Antidepressant drugs are Iprniazid, Phenelzine.]

Q.29.How is acidity cured with cimetidine or ranitidine ?

[*Hint :* Cimetidine or Ranitidine prevents the interaction of histamine with the receptors present in stomach walls and therefore, secretion of acid is prevented.]

SHORT ANSWER-I TYPE QUESTIONS (2 Marks)

Q. 1. What are antihistamines ? Give two examples.

[*Hint :* The group of compounds which destroy histamine produced in the body by allergens. *E.g.,* Bromopheniramine, seldane.]

Q. 2. What are narcotic and non-narcotic analgesics ? Give one example of each.

[*Hint :* Non-narcotics are the drugs which relieve or decrease pain without causing unconsciousness. Example, Aspirin.

Nartotics analgesics are those drugs which relieve pain, but produce sleep and unconsciousness. Example, Morphine.]

Q. 3. Explain the following terms as used in medicinal chemistry :

(i) Target molecules **(ii) Enzyme inhibitors**

[*Hint :* (i) Drugs that interact with biomolecules such as lipids, carbohydrates, proteins and nucleic acids, are called target molecules.

(ii) They inhibit the catalytic activity of the enzyme.]

Q. 4. Give one important use of each of the following :

(i) Equanil **(ii) Morphine**

[*Hint :* (i) Tranquilizer (antidepressant).

(ii) Narcotic analgesics]

Q. 5. What are neurologically active drugs ? Give two examples.

[*Hint :* Tranquilizers and analgesics are neurologically active drugs. Example : Equanil, morphine.]

Q. 6. (i) What are antibiotics ?

(ii) What is meant by the term broad spectrum antibiotic ?

[*Hint :* (i) A substance produced wholly or partly by chemical synthesis which in low concentration inhibits the growth or destroys microorganism by interfering with their metabolic processes.

(ii) Antibiotics which kills or inhibits wide range of bacteria.]

Q. 7. From the given examples – ciprofloxacin, phenelzine, morphine, ranitidine – choose the drug used for :

(i) treating allergic conditions **(ii) to get relief from pain**

[*Hint :* (i) Ranitidine (ii) Morphine]

Q. 8. Why a drug should not be taken without consulting a doctor ? Give two reasons.

[*Hint :* (i) To avoid side effects caused by drug.

(ii) To have the advice for proper dose of drug.]

Q. 9. State the main difference between bacteriostatic and bactericidal antibiotics. Give one example of each.

[*Hint :* Bacteriostatic antibiotics have inhibitory effect while bactericidal antibiotics have killing effect on microbes.

Example : Bacteriostatic antibiotic : Tetracycline

Bactericidal antibiotic : Ofloxacin]

Q.10.What are antifertility drugs ? Name the constituents of an oral contraceptive.

[*Hint :* Drugs used to check pregnancy in women to control birth rate. Oral contraceptives contains a mixture of synthetic estrogen and progesterone derivatives.]

Q.11.What do you mean by non-biodegradable detergents ? How can we make biodegradable detergents ?

[*Hint :* Detergents which cannot be degraded by nature. Biodegradable detergents can be prepared by minimising the branching of the hydrocarbon chain, as unbranched chains can be biodegraded.]

Q.12.If water contains dissolved calcium hydrogencarbonate, which out of soap and detergent, will you prefer to use ? Why ?

[*Hint :* We will use detergent because it will not form insoluble precipitate with Ca^{2+}.]

Q.13.What are barbiturates ? What is the action of barbiturates on human body ?

[*Hint :* Barbaturic acid derivatives are called barbiturates. They are highly effective pain relieving agents.]

Q.14.Write the structures of soaps obtained by the hydrolysis of the following fats :

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

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

[*Hint :* (i) $C_{15}H_{31}COO^-Na^+$ (ii) $C_{17}H_{33}COO^-Na^+$]

Q. 15. What are antagonists and agonists ?

[*Hint :* Drugs which bind to the receptor site and inhibits its natural function. They are useful when blocking of message is required.

Agonists are the drugs which imitate (mimic) the natural messenger by switching on the receptor. They are useful when there is lack of natural chemical messenger.]

Q. 16. What is the advantage of using antihistamines over antacids in the treatment of acidity ?

[*Hint :* Antihistamines prevent the interaction of histamine with the receptors present in stomach wall and thus lesser amount of HCl is released.]

Q. 17. Write two side effects of Aspirin.

[*Hint :* (i) It is toxic to liver.

(ii) It also causes bleeding from stomach sometimes, thus it is a gastric irritant.]

Q. 18.What are sulpha drugs ? Give two examples.

[*Hint :* A group of drugs which are derivatives of sulphanilamide and are used in place of antibiotics is called sulpha drugs. E.g., sulphadiazine, sulphanilamide.]

Q. 19.What forces are involved in holding the active sites of enzymes ?

[*Hint :* The forces involved in holding the active sites of enzymes are hydrogen bonding, ionic bonding, dipole-dipole attractions or van der Waal's forces of attraction.]

SHORT ANSWER-II TYPE QUESTIONS (3 Marks)

Q. 1. (i) Why are artificial sweetening agents harmless when taken ?

(ii) Name one such artificial sweeting agent.

(iii) Why is the use of aspartame as an artificial sweetener limited to cold foods ?

[*Hint :* (i) Because they are not metabolized by body and excreted from the body in urine unchanged.

(ii) Aspartame.

(iii) Because it is unstable at cooking temperature.]

Q. 2. Pick out the odd one amongst the following on the basis of their medicinal properties. Give suitable reason :

(i) Luminal, seconal, terfenadine, equanil.

(ii) Chloroxylenol, phenol, chloamphenicol, bithional.

(iii) Sucralose, aspartame, alitame, sodium benzoate.

[*Hint :* (i) Terfenadine is antihistamine other three are used as tranquilizers.

(ii) Chloramphenicol is a broad spectrum antibiotic. Other three have antiseptic properties.

(iii) Sodium benzoate is a food preservative. Other three are artificial sweetners.]

Q. 3. Give the main function of following in the body of human beings :

(i) Enzymes

(ii) Receptor proteins

(iii) Neurotransmitter

[*Hint :* (i) Catalyse biochemical reactions.

(ii) Important for the communication system of the body.

(iii) They control mood changes in organisms.]

Q. 4. Identify the class of drug :

(i) Phenelzine (Nardin)

(ii) Aspirin

(iii) Cimetidine

[*Hint :* (i) Antidepressant drug (ii) Analgesics and antipyretic

(iii) Antihistamine]

Q. 5. Give the pharmacological function of the following type of drugs :

(i) Analgesics (ii) Tranquilizers (iii) Antifertility drugs

[*Hint :* (i) Which reduce or abolish pain.

(ii) They are neurologically active drugs used to treat mental diseases.

(iii) Drugs used to check pregnancy in women to control birth rate.]

Q. 6. Give the name of medicine used in the treatment of following diseases :

(i) Typhoid

(ii) Join pain (in Arthritis)

(iii) Hypertension

[*Hint :* (i) Antibiotics (ii) Non-narcotic analgesics (iii) Tranquilizers]

Q. 7. Give the class of drugs to which these substances belong :

(i) Bithional (ii) Amoxycillin (iii) Salvarsan

[*Hint :* (i) Antiseptic (ii) Broad spectrum antibiotic

(iii) Antimicrobial (antibacterial)]

Q. 8. How are antiseptics different from disinfectants ? How does an antibiotic different from these two ? Give one example of each of them.

[*Hint :* Antiseptics may kill or stop the growth of microbes and safe for living tissues, where an disinfectants kill microbes but not safe for living tissues. While antibiotic are produced by micro-organism, can inhibit the growth of other micro-organism.

Example : Antiseptic : 0.2% phenol, Disinfectant : 1% phenol, Antibiotic : Penicillin]

Q. 9. Explain the following terms with suitable examples :

(i) Cationic detergents

(ii) Anionic detergents

(iii) Non-ionic detergents

[*Hint :* (i) Those in which cationic part of the molecule is involved in cleansing action. E.g., cetyltrimethyl ammonium bromide.

(ii) Those in which anionic part of the molecule is involved in cleansing action. *E.g.,* sodium laurylsulphate.

(iii) Which do not contain any ion in their constitution. *E.g.,* Lauryl alcohol ethoxylate.]

Q.10. Classify the following as cationic detergents, anionic detergents or non-ionic detergents :

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

(ii) $[CH_3 - (CH_2)_{15}N(CH_3)_3]^+Br^-$

(iii) 

Where ($n = 5 - 10$)

[*Hint :* (i) Anionic detergent (ii) Cationic detergent

(iii) Non-ionic detergent]

Q. 11. How do enzyme inhibitors work ? Distinguish between competitive and non-competitive enzyme inhibitors.

[*Hint :* An enzyme inhibitor either blocks the active site of enzyme or changes the shape of the active site by binding at an allosteric site. They are of two types :

(i) Competitive enzyme inhibitor competes with natural substance for their attachment on the active sites of enzymes.

(ii) Non-competitive enzyme inhibitor binds at allosteric site and changes the shape of the active site in such a way that the substrate cannot recognize it.]

Q. 12.(i) What class of drug is Ranitidine ?

(ii) If water contains dissolved Ca^{2+} ions, out of soaps and synthetic detergents, which will you use for cleaning clothes ?

(iii) Which of the following is an antiseptic :

0.2% phenol or 1% phenol

LONG ANSWER TYPE QUESTIONS (5 Marks)

Q. 1. (i) Discuss two ways in which drugs prevent the attachment of native substrate on active site of an enzyme.

(ii) What are antibiotics ? Distinguish between narrow spectrum and broad spectrum antibiotics. Classify the following into bactericidal bacteriostatic antibiotics :

Tetracycline, Penicillin, Ofloxacin and Chloramphenicol.

Q. 2. What are detergents ? How are they classified ? Why are detergents usually preferred to soaps for washing clothes ? Give an example of detergents.