



Ranjan Singh
Chemistry Classes

JEE (Main & Advanced) • NEET • XI • XII

Study Package



Ranjan Singh

M.Sc. Bio-Chemistry(P.U)

Ex-Faculty : Narayana & Goal

ORGANIC CHEMISTRY

**CHEMISTRY IN
EVERY DAY LIFE**



Director's Message



Ranjan Singh
M.Sc.(Biochemistry), P.U.

Chemistry plays a central and important role in all competitive examinations as well as in day to day life. For last so many years, I have constantly been in touch with students, guiding them in Chemistry and looking into their difficulties for them to succeed in their board as well as competitive examinations (JEE(Mains & Advance) | NEET).

I have felt a need for a good coaching centre to fulfil the requirements of students. Students need a highly experienced and qualified faculty in chemistry, who can guide them well, clear their doubts, provide them the effective & tricky notes, and make them do much needed practice. More importantly they should also be provided Classroom Monitoring, Periodical & Surprise Tests to guide them in the proper direction. I realize that, it is very important to diagnose the basic weaknesses and problems of students not succeeding in JEE(Mains & Advance) | NEET and Board exams. In fact, as question patterns are changing, now they need to have a different approach for these Examinations.

At RANJAN SINGH CHEMISTRY CLASSES, we have our own way to prepare students for Competitive Examinations as well as Board Examination at a time so they can crack the entrance exam like JEE(Mains & Advance) and NEET as well as 12th Board simultaneously. We act as a medium to provide the simplest, easiest and a comfortable way to make students achieve their target. At RANJAN SINGH CHEMISTRY CLASSES(RSCC), we guide our students with the best motivational classes so weak students are also able to believe that, They can do it.

When you join RANJAN SINGH CHEMISTRY CLASSES you become a part of the powerful force which propels you towards your goal and if you get a position among the rankers with my excellent guidance, I will think that our efforts have borne fruits.

M.Sc(Biochemistry), P.U.

Ex-faculty : Narayana IIT Academy

& Goal Institute

Ranjan Singh

CHEMICALS IN MEDICINES

Chemical substances used for treatment of disease and for reducing the suffering from pain are called medicines or drugs. Chemotherapy is the science in which chemicals are used for the treatment of diseases.

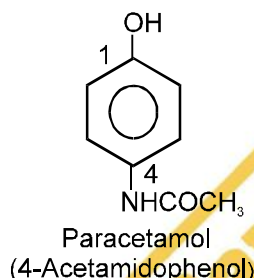
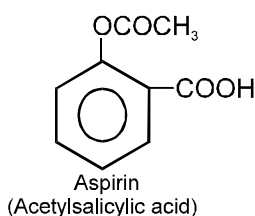
Chemicals used in chemotherapy are frequently classified according to their action. Thus analgesics relieve pain, antipyretics reduce temperature, anti-inflammatories control inflammation and antibiotics kill bacteria and other micro-organisms.

Classification of Medicines :

Medicines are generally classified according to the purpose for which they are used. The different terms thus used along with examples are given below :

Antipyretics :

Chemicals which are used to bring down the body temperature during high fever are called antipyretics. On taking these medicines, the person gets a lot of perspiration. A few well known examples of antipyretics are Aspirin, Phenacetin and Paracetamol,



Novalgine is another well known antipyretic. Quinine has also some antipyretic effect. Paracetamol is preferred over aspirin as an antipyretic since aspirin gets hydrolysed to salicylic acid in the stomach. The salicylic acid thus produced may cause ulcer in the stomach walls where from the bleeding may take place.

Antimalarials :

Chemical substances which are used to bring down the body temperature during malaria fever are called antimalarials. Originally quinine (an alkaloid) was the only drug known to be effective against malaria. Nowadays, a number of synthetic drugs are used for the purpose. These are Chloroquine, Paraquine, Primaquine etc.

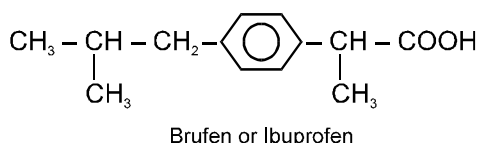
Analgesics :

Medicines used for getting relief from pain are called analgesics. These are of two types

- (i) Narcotics and (ii) Non-narcotics

(i) Narcotics : Drugs which produce sleep and unconsciousness are called narcotics. These are mostly opium products. Opium contains alkaloids such as morphine and codeine which are very effective analgesics. Morphine diacetate (commonly known as Heroin) is the most widely used analgesic.

(ii) Non-narcotics : The most important non-narcotic analgesics are butazolidine and brufen or ibuprofen.



Aspirin, Phenacetin, and Novalgin act both as antipyretic as well as analgesic. They are quite effective and give immediate relief from pain and fever.

Antiseptics and Disinfectants :

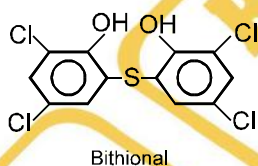
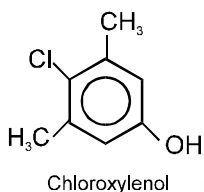
(i) Antiseptics : The chemicals which kill or prevent the growth of micro-organisms are called **antiseptics**. These are not harmful to living tissues and can be safely applied on wounds, cuts, ulcers, diseased skin surfaces. These are also used to reduce odours resulting from bacterial decomposition of the body or in the mouth. They are, therefore mixed with deodorants, face powders and breath furifiers.

(ii) Disinfectants : The chemical substances which are used to kill microorganisms but they cannot be applied on living tissues are called **disinfectants**. These are commonly applied to inanimate objects such as floors, instruments, etc.

The same substance can act as disinfectant as well as antiseptic depending upon its concentration. For example, a 0.2% solution of phenol acts as antiseptic and its 1% solution acts as disinfectant.

The common examples are :

- (i) Cl_2 is used for making water fit for drinking at a concentration 0.2 to 0.4 ppm.
- (ii) Dettol is an antiseptic. It is a mixture of chloroxylenol and terpineol in a suitable solvent.
- (iii) Bithional is antiseptic which is generally added to medicated soaps to reduce the odour produced by bacterial decomposition of organic matter on the skin.
- (iv) Iodine is powerful antiseptic. It is used as a tincture of iodine which is 2 - 3% iodine solution of alcohol-water.
- (v) Some organic dyes are also effective antiseptics. These are used for the treatment of infectious diseases. The common examples of antiseptic dyes are gentian violet and methylene blue.

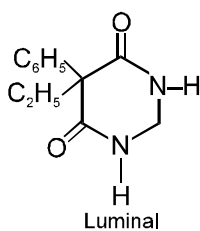
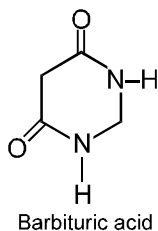


Tranquilizers :

The chemical substances used to cure mental diseases are called **tranquilizers**. These are used to release mental tension and reduce anxiety. These are the constituents of sleeping pills. They act on higher centres of nervous system. These are also called **psychotherapeutic drugs**. These drugs make the patient passive and help to control their emotional distress or depression. These also help to restore confidence and the patients work with full capacities which they already have.

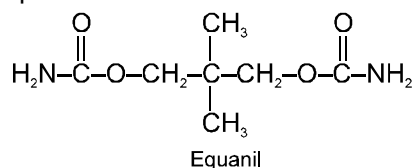
Hypnotics : These are also known as tranquilizers and are used to reduce mental tension and anxiety. These induce sleep. These are components of sleeping pills (sedatives)

Ex.



Non Hypnotics : They reduce tension and anxiety. These do not induce sleep. Equanil is also an important tranquilizer used in depression and hypertension.

Ex. Chlordiazepoxide, Meprobamate.



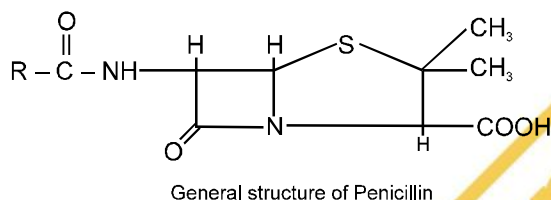
It may be noted that different terms are used for drugs which are used to cure mental diseases.

Antidepressants :

These drugs are given to patients with shattered confidence. These produce a feeling of well being and confidence in the person of depressed mood. Therefore, these are also called mood booster drugs. The common examples are Vitalin, Cocaine, Methedrine etc.

Antibiotics :

These are the chemical substances which are produced by micro-organisms (bacterial, fungi and moduls) and can inhibit the growth or even destroy other micro-organisms. The first successful antibiotic produced was penicilin. It was discovered by Alexander Fleming in 1920. The general formula of penicillin is $\text{C}_9\text{H}_{11}\text{O}_4\text{SN}_2\text{R}$ where R may be different for different members. For example.

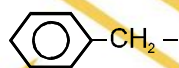


With the substitution of different R groups, about six natural penicillins have been isolated so far. for example.

Penicillin

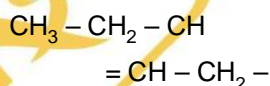
Nature of R

Penicillin G



or Benzyl penicillin

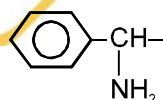
Penicillin F



Penicillin K



Ampicillin



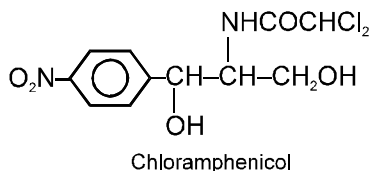
Ampicillin and amoxycillin are some modifications of penicillins. It may be noted that many patients develop allergy to penicillin. Therefore, it is essential to test the patient for sensitivity (allergy) to penicillin before it is administered.

Penicillin has narrow spectrum. These can be used for curing sore throat, gonorrhoea, rheumatic fever, local infections, etc.

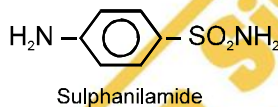
In India the important centres which manufacture Penicillin are – Hindustan Antibiotics, Pimpri and Indian Drugs and Pharmaceuticals, Rishikesh.

Streptomycin is also an antibiotic used for the treatment of tuberculosis, meningitis, pneumonia, local infections, etc.

Broad spectrum antibiotics : These are the antibiotics which are effective against a variety of diseases. The common examples are Tetracycline, Chloromycetin and Chloramphenicol which are effective against a variety of diseases. Therefore, these can be used for curing typhoid, acute fever, dysentery, whooping cough, pneumonia, eye infection, certain urine infection. The structure of chloramphenicol is :



Sulpha drugs : These have great antibacterial powers and are used as medicines for various diseases. These are also antibiotics and protect the body against micro-organisms. These are used against diseases such as pneumonia, tuberculosis, diphtheria, etc. Some important sulpha drugs are sulphadiazine, sulphanimide, etc.



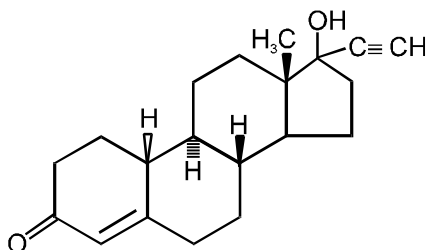
Germicides :

These are the chemical substances used to kill germs, fungi and virus. The common examples of germicides are phenol, cresols, formaldehyde, DDT, potassium permanganate solution, (1%) chlorine, bleaching powder, hydrogen peroxide, etc.

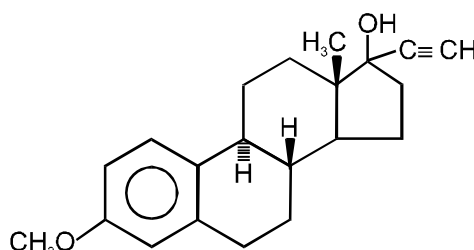
Anti-fertility drugs :

Chemical substances which are used to check pregnancy in women are called anti-fertility drugs or birth control drugs or oral contraceptives.

All these drugs contain chemicals related to female sex hormones having a steroid ring structure. Most of these contain a combination of an estrogen and a progesterone. For example, a common brand name Enovid E contains norethindrone (a progestin) mestranol or ethinylestradiol monomethyl ether (an estrogen). All such drugs are expected to have side effects and hence should be used only under proper medical advice.



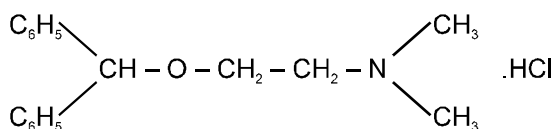
Norethindrone



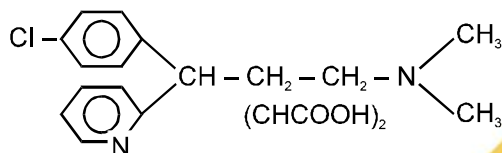
Mestranol

Antihistamines :

The drugs which have been used to fight allergy are called **antihistamines**. These are so called because they check the production of histamines. Thus, antihistamines are widely used for treatment to hay fever, conjunctivitis, nasal discharges, irradiation sickness, motion sickness (air, sea, road), nausea in pregnancy and post operative vomiting. The antihistamine drugs which are widely used are diphenhydramine hydrochloride, Cetrizine, Chlorpheniramine, Promethazine hydrochloride etc. The structure of some of these are given below :



Diphenhydramine hydrochloride



Chlorpheniramine maleate

Antacids :

Antacids are substances that decrease gastric acidity by neutralising hydrochloric acid. They are compared quantitatively in terms of their acid-neutralising capacity. These usually contain salts of Al, Mg and Na. These are of the following two types :

- (a) Systemic antacid (b) Non-systemic antacid

(a) Systemic antacids : Systemic antacids like sodium bicarbonate decrease acidity but cause systemic alkalosis due to absorption of bicarbonate. Hence acid-base balance is disturbed. Further excess sodium may cause oedema and cardiac failure in patients with renal or cardiac dysfunction.

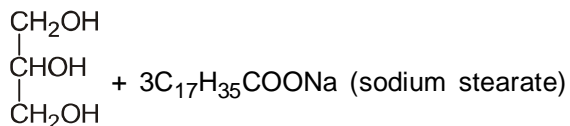
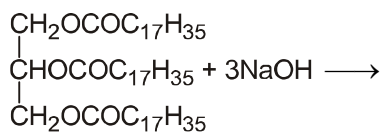
(b) Non-systemic antacids : These may contain one or more of the following compounds : $\text{Al}(\text{OH})_3$, $\text{Mg}(\text{OH})_2$, MgCO_3 , CaCO_3 , magnesium trisilicate, magaldrate etc. These antacids are not absorbed after administration and hence acid-base imbalance is minimal.

SOAPS & DETERGENTS

INTRODUCTION

- ◆ Sodium salts of higher fatty acids like stearic acid, oleic acid, palmitic acid etc. are called hard soaps and the potassium salts of these fatty acids are called soft soaps.
- ◆ Soaps are prepared by hydrolysis of higher fatty acids.
- ◆ A higher proportion of salts of saturated acids (palmitic, stearic etc.) gives Hard soaps, while a higher proportion of salts of unsaturated acids (oleic acid) yields soft soaps.

- ◆ Alkaline hydrolysis of oils or fats by NaOH or KOH gives glycerol and sodium or potassium salt of the fatty acid. This reaction is known as **saponification**.



SOAPS

Types of soaps :

- ◆ **Hard soaps** – These are obtained from cheap oils and fats using sodium hydroxide. These contains free alkali and are used for washing purposes.
- ◆ **Soft soaps** – These are obtained from good oils using potassium hydroxide. These do not contain free alkali and are used as toilet soaps, shaving cream, in shaving sticks and shampoo.
- ◆ **Transparent soaps** : These are formed by dissolving toilet soaps in alcohol and evaporating the filtrate. They contain glycerol.
- ◆ **Medicated soaps** : Toilet soaps containing some medicinal important substance are called medicated soaps.
- ◆ **Metallic soaps** : These are soaps of metals other than sodium and potassium.

Manufacture of soap :

Generally three processes are adopted for manufacture of soap.

The cold process : The soap of good quality is not obtained by this method as glycerol, alkali and oil remain with the soap. This is an expensive method. In this method oil is taken in an iron vessel and heated to about 50°C. Calculated amount of sodium hydroxide is added to it slowly by stirring the mixture. The whole mixture is kept overnight which gets solidified and then is cut into pieces. Glycerol remains in the mixture in this method.

The hot process : The following processes are involved in this method :

Saponification : A mixture of oil and alkali is heated in iron vessels by steam coils. The oil gets hydrolysed and a mixture of soap, glycerol, oil and water is obtained.

Salting out of soap : A saturated solution of sodium chloride is added to the mixture obtained above. Due to common ion effect soap separates out and floats on surface of the solution. Soap is separated from the solution and glycerol is recovered from the mother liquor. The mother liquor is known as **spent-lye**. Soap so obtained is washed with a small amount of water to remove the alkali. After some time it solidifies and then it is cut into pieces.

Modern method :- Glycerides of fatty acids are hydrolysed by water at higher temperatures in presence of catalyst to give glycerol and higher fatty acids. These are separated and fatty acids are reacted with NaOH or Na₂CO₃ at higher temperature to form its sodium salt. When lime or ZnO are used as catalyst, the method is known as **Itner process** and if sulphuric acid or aromatic sulphonic acids are used as catalyst it is called **Twitchell method**.

Cleansing Action of Soap : When soap is rubbed with the greasy surface of clothes with water, it forms an emulsion and the dirt particles separate out from the greasy surface. Soap forms colloidal solution with water, which separate the dirt particles by absorbing them and escape out on washing with water.

DETERGENTS

The synthetic detergents, soapless, deter-gents, soapless soaps or syndets are substitutes of soaps. Unlike soaps, they are derived from purely synthetic chemicals rather than from chemicals obtained from natural sources like oils/fats. However, like soaps they contain both hydrophilic (water-soluble) and hydrophobic (oil-soluble) parts. Synthetic detergents are mainly of two types.

Sodium alkyl sulphates : These are the half esters of an inorganic acid (H_2SO_4) rather than an organic acid and a higher primary alcohol, e.g. lauryl alcohol ($C_{12}H_{25}OH$). Sodium lauryl sulphate is the most important detergent of this type.

Ex. $CH_3(CH_2)_{10}CH_2OSO_2O^-Na^+$
sodium lauryl sulphate

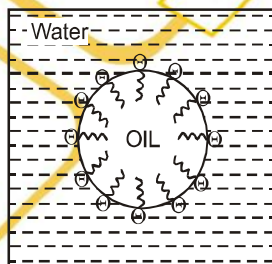
Sodium alkyl aryl sulphates : These are the sodium salts of long chain (linear) alkyl substituted benzene sulphonic acids (LAB) and are most widely used. The most common is *sodium dodecylbenzene sulphate*.

Ex. $CH_3(CH_2)_{10}CH_2—SO_2O^-Na^+$

Since in these detergents, the active portion is negatively charged, these are commonly known as anionic detergents.

Activity of detergents :

There are two parts in detergents – one is long chain hydrocarbon part and other is ionic part. Hydrocarbon part is soluble in oils or greasy materials and insoluble in water while the ionic part is insoluble in oily or greasy substances and soluble in water. Detergents form colloidal solution in water, the hydrocarbon part of which forms big clusters with dirt particles and the ionic part goes into water. In this way on washing with water the whole part washes away with water.



CIRCLE (⊖) REPRESENTS POLAR GROUP
(COO^-Na^+) WAVY LINE (〰) REPRESENTS
NON-POLAR GROUP (R-)

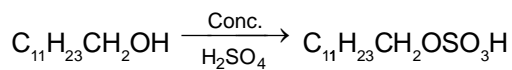
Types of detergents :

Detergents are of three types :

- Anionic detergents
- Cationic detergents
- Non-ionic detergents.

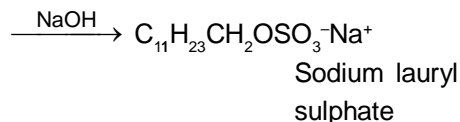
(a) Anionic detergents. These are so called because a large part of their molecules are anions. These are of two types.

- ◆ Sodium alkyl sulphates. example of this type of detergents is : sodium lauryl sulphate, $C_{11}H_{23}CH_2OSO_3^-Na^+$

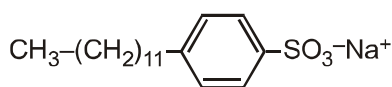


n-Lauryl alcohol

n-Lauryl hydrogen sulphate

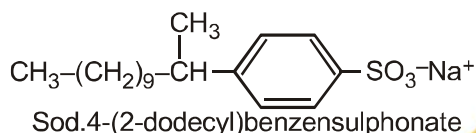


- ◆ Alkylbenzenesulphonates. example sodium 4-(1-dodecyl)benzenesulphonate (SDS).



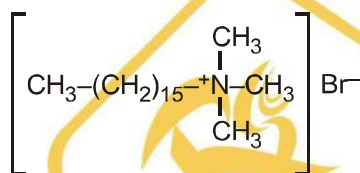
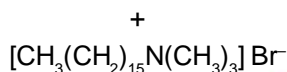
Sod. 4-(1-dodecyl)benzenesulphonate

Another important example is sod. 4-(2-dodecyl)benzenesulphonate



(b) Cationic detergents :

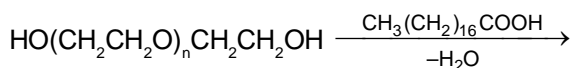
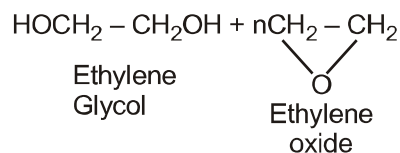
e.g., cetyltrimethylammonium bromide, i.e.,



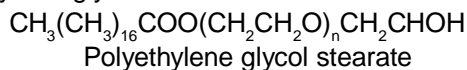
Cetyltrimethylammonium bromide
(Cationic detergent used in hair conditioner)

(c) Non-ionic detergents :

Example



Polyethylene glycol



(A non-ionic detergent)

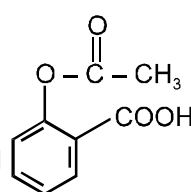
TOPIC WISE MCQS

Medicine

- Which of the following is not a narcotic-
(A) Codeine (B) Brown Sugar
(C) Diclofenac (D) Morphine
- Which of the following medicine is required for malaria-
(A) Aspirin (B) Penicillin
(C) Chloroquine (D) Paracetamol
- Streptomycin is an example of
(A) Antibiotic (B) Analgesic
(C) Antipyretic (D) Anaesthetic.
- Which of the following is not a narcotic drug-
(A) Opium (B) Heroin
(C) Pethidine (D) Bithional
- Chloroxylenol is an important component of
(A) Soap
(B) Antibiotics
(C) Dettol
(D) Pain killing ointments
- Which of the following is an antidepressants-
(A) Chloroxylenol (B) Bithional
(C) Cocaine (D) Penicillin -G
- Which of the following is used as pain killers-
(A) Antibiotic (B) Analgesic
(C) Antipyretic (D) Penicillin
- Which one is a broad spectrum antibiotic-
(A) Chloramphenicol (B) Penicillin
(C) Paracetamol (D) Ampicillin
- The drug used for treatment of typhoid is
(A) Chloromycetin (B) Novalgin
(C) Paracetamol (D) Quinine
- Penicillin is an
(A) Antibiotic (B) Antipyretic
(C) Hormone (D) Vitamin
- Aspirin is an
(A) Antipyretic (B) Antiseptic
(C) Antimalarial (D) Narcotic.
- Which of the following can bring down the body temperature-
(A) Aspirin (B) Chloroquine
(C) Penicillin (D) Quinine
- Which of the following can be used as an analgesic-
(A) Paracetamol (B) Penicillin
(C) Chloramphenicol (D) Streptomycin.
- Vernol, a barbituric drug is used as a-
(A) Anaesthetic (B) Sedative
(C) Antiseptic (D) Antipyretic.
- Which of the following is a hypnotic drug-
(A) Catechol (B) Luminal
(C) Phenol (D) Tincture iodine
- Morphine is used then as an
(A) Antipyretic (B) Antiseptic
(C) Analgesic (D) Insecticide.
- A substance which can act both as an analgesic and antipyretic is
(A) Quinine (B) Aspirin
(C) Penicillin (D) Insulin.
- Sulpha drugs are derivatives of
(A) Benzene sulphonic acid
(B) Sulphanilic acid
(C) Sulphanilamide
(D) P- Aminobenzenzoic acid
- Which of the following is not an antipyretic ?
(A) Asprin (B) Paracetamol
(C) Barbituric acid (D) Phenacetin
- The drug that relieve or decrease pain is called
(A) Analgesic (B) Antipyretic
(C) Tranquillizer (D) Hypnotics
- Which of the following is used for the treatment of tuberculosis ?
(A) Veronal (B) Aspirin
(C) Chloroquine (D) Streptomycin
- Which of the following is an analgesic ?
(A) Chloramphenicol (B) Penicillin
(C) Paracetamol (D) Streptomycin
- Which of the following is a hypnotic drug ?
(A) Luminal (B) Diclofenac
(C) Brufen (D) Phenol
- Various phenol derivatives, tincture of iodine (2 – 3% I₂ in water/alcohol) and some dyes like methylene blue are
(A) Antiseptics (B) Disinfectants
(C) Analgesics (D) Antipyretics

25. Which of the following is a broad spectrum antibiotic ?
 (A) Streptomycin (B) Penicillin
 (C) Ampicillin (D) Chloremphenicol
- Soap and Detergents**
26. Soap is-
 (A) Sodium stearate (B) Calcium stearate
 (C) Sodium acetate (D) Sodium benzoate
27. The polar head of sodium stearate is-
 (A) Na⁺ (B) H⁺
 (C) -COO⁻ (D) CH₃(CH₂)₁₆
28. Detergents.....the surface tension of water-
 (A) Reduces (B) Increases
 (C) Keeps constant (D) Slightly increases
29. The term LABS abbreviates as-
 (A) Laboratory
 (B) Lauryl acidic benzene sulphate
 (C) Linear alkyl benzene sulphonate
 (D) None
30. Hard soaps are-
 (A) Sodium salts of higher fatty acids
 (B) Potassium salts of higher fatty acids
 (C) Calcium salts of higher fatty acids
 (D) Magnesium salts of higher fatty acids
31. Sodium dodecyl benzene sulphonate is used as a-
 (A) Pesticide (B) Soap
 (C) Fertilizer (D) Detergent

MISCELLANEOUS QUESTIONS

1. Dettol consist of
 (A) Xylenol + Terpeneol
 (B) Chloxylenol + Terpeneol
 (C) Cresol + ethanol
 (D) None
2. Which of the following drugs combination is not correct ?
 (A) Bithinal - Tranquilizer
 (B) Chloremphenicol- antibiotics
 (C) Equanil -Antidepressant
 (D) Phenacetin - Antipyretic .
3. A drug that is antipyretic as well as analgesic is
 (A) Chlorpromazine hydrochloride
 (B) 2 Acetobenzoic acid
 (C) Chloroquine
 (D) Penicillin
4. Match list with list II and select the correct answer using the codes given below the lists
- | List I | List II |
|----------------------|-------------------|
| (i) Iodoform | (A) Antibiotic |
| (ii) Novestrol | (B) Antiseptic |
| (iii) Chloroquine | (C) Antimalarial |
| (iv) Aminoglycosides | (D) Antifertility |
- Codes :**
 (A) I -B, II -D, III - C, IV- A
 (B) I -D, II -B, III - A, IV- C
 (C) I -B, II -D, III - A, IV- C
 (D) I -C, II -A, III - D, IV- B
5. Amoxycillin is semi-synthetic modification of:
 (A) penicillin (B) streptomycin
 (C) tetracycline (D) chloremphenicol
6. Which of the following is an antidiabetic drug-
 (A) insulin (B) penicillin
 (C) chloroquine (D) aspirin
7. Substances which bring body temperature down are known as:
 (A) antipyretic (B) analgesics
 (C) antibiotics (D) hypnotics
8. 2-Acetoxybenzoic acid is called-
 (A) antiseptic (B) aspirin
 (C) antibiotic (D) mordant dye
9. The drug given during hypertension is-
 (A) streptomycin (B) chloxylenol
 (C) equanil (D) aspirin
10. A broad spectrum antibiotic is-
 (A) paracetamol (B) penicillin
 (C) aspirin (D) chloramphenicol
11. The compound  is used as -
 (A) Antiseptic (B) Antipyretic
 (C) Antiallergic (D) Antibiotic

12. Which of the following could act as a propellant for rockets-
- (A) Liquid hydrogen + liquid oxygen
(B) Liquid nitrogen + liquid oxygen
(C) Liquid hydrogen + liquid nitrogen
(D) liquid oxygen + liquid argon
13. Which one of the following types of drugs reduces fever -
- (A) Antipyretic (B) Analgesic
(C) Tranquiliser (D) Antibiotic



ANSWER KEY

TOPIC WISE MCQS

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	C	C	A	D	C	C	B	A	A	A	A	A	A	B	B	C	B	C	C	A
Q.No.	21	22	23	24	25	26	27	28	29	30	31									
Ans.	D	C	A	A	D	A	C	A	C	A	D									

MISCELLANEOUS QUESTIONS

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13		
Ans.	B	A	B	A	A	A	A	B	C	D	B	A	A		

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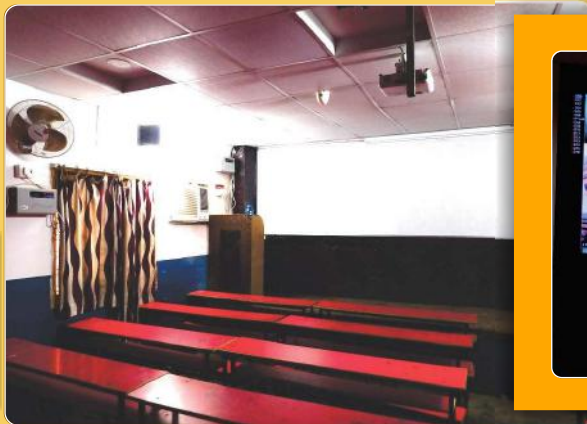
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