

Chemical Properties

Chemistry in Everyday Life

→ Substances of low molecular masses of about 100 to 500 u interact with macromolecular targets are drugs.

→ Drugs $\left\{ \begin{array}{l} \text{Pharmacological effect} - \text{interact with particular problem} \\ \text{molecular targets} - \text{interact with biomolecules} \end{array} \right.$

→ Based on therapeutic action, drugs are

i) Analgesics - body pain relievers

① Narcotic - causes effect on CNS, among analgesics.

② Non-narcotic - no effect on CNS

ii) Antipyretics - body temp. reducers

iii) Antimalarial - malarial fever reducing substances

iv) Antimicrobials - kill & stop growth of disease causing microorganisms.

v) Antiseptics - kill microorganisms & prevent their growth

vi) Antibiotics - microorganism killing substances.

vii) Tranquilizers - medicines for management of psychoses & neuroses.

viii) Antihistamines - interact with natural action of histamine and prevent acidity.

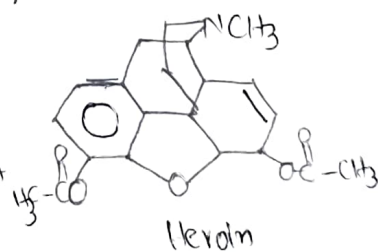
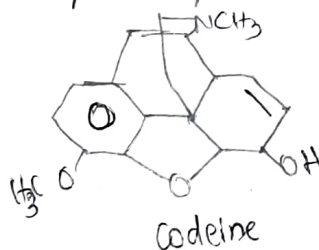
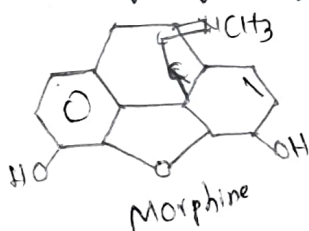
ix) Antacids - removes excess of acid in stomach & maintain pH.

⇒ i) Analgesics - reduce pain

① Narcotic - causes depression on nervous system & tend to produce euphoria (feeling of being happiness which a factor for their addictive properties)

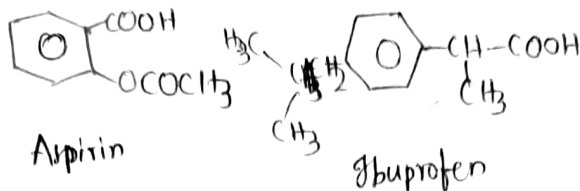
→ Modify reaction towards emotion (pain), morphine & related are derivatives of opium poppy.

→ Mostly given for post operative pain.



Morphine has uses like check diarrhoea, ease dyspnea, cough & induce sleep.

(b) Non-narcotics - Aspirin, aniline, aminophenol, Recommended for headache, backache & such pain.



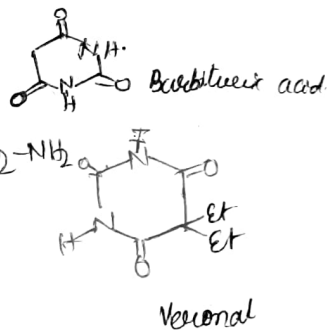
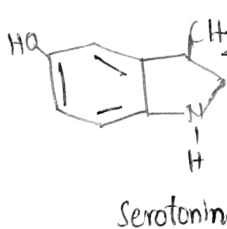
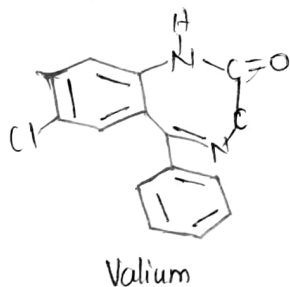
→ Aspirin has ^{anti} blood clotting action, prevent platelet function, anti-inflammatory, antipyretic for fever due to cold.

(vii) Ttranquilizers ← Sedatives - exert a quieting effect by sedation
 Ex: KBI
 Hypnotics - extend sleep
 Ex: thiopentone sodium

Major tranqulizers - psychoses
 (Hypnotics)

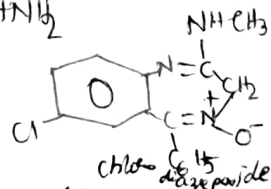
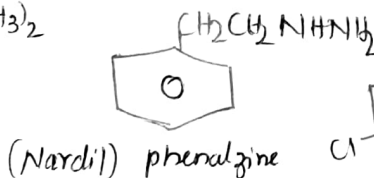
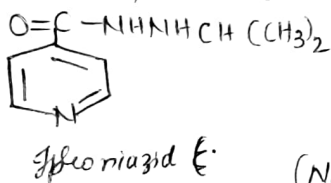
Ex: Barbituric acid & their derivatives - veronal, amytal, nembutal

Luminal & secenal; valium, seroton



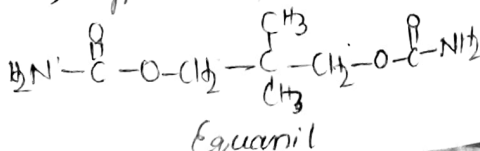
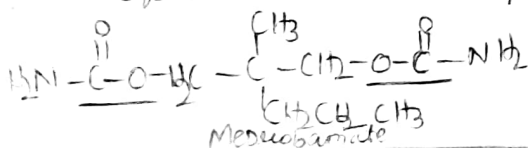
Minor tranqulizers - neuroses (anxiety, depression)
 (Sedatives)

Ex: Isoniazid; phenazine - antidepressant (produce not-adsorption)



Chlorazepoxide, meprobamate - tension relievers.

Equanil - controls depression, hyperemotion.



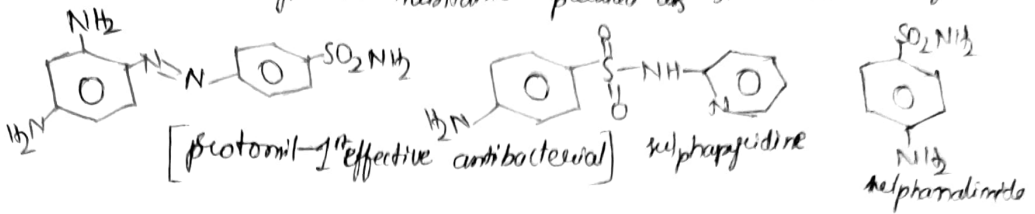
(iv) Antimicrobials: Microbes that cause disease are pathogens.

→ Lysozyme, fatty acids, lactic acid & hydrochloric acid are some antimicrobials (natural)

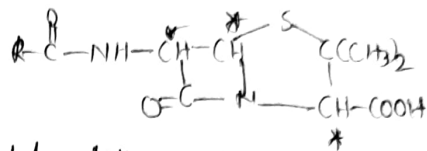
(a) Antibiotics: → should be product of metabolism

→ should be effective in low conc

→ synthetic substance produced as structural analogue of natural



→ Penicillin: $C_9H_{11}O_4N_2SR$



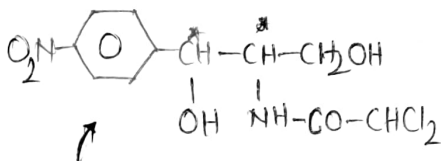
Antibiotics $\begin{cases} \text{Bactericidal} - \text{kill microorganisms} \\ \text{Ex: Penicillin, ofloxacin, aminoglycosides} \\ \text{Bacteriostatic} - \text{growth of microorganisms} \\ \text{Ex: Erythromycin, tetracycline, chloramphenicol} \end{cases}$

Broad spectrum - attack wide range of microorganisms.

Ex: Chloramphenicol, tetracycline, Vancomycin, ofloxacin.

Narrow spectrum - Gram +ve or gram -ve species will be attacked (only particular disease)

Ex: Penicillin, Ampicillin, amoxycillin.



Chloramphenicol - for typhoid fever, acute fever & dysentery, urinary infections, meningitis, & pneumonia.

Dynidazine - for cancer cells.

Streptomycin - TB.

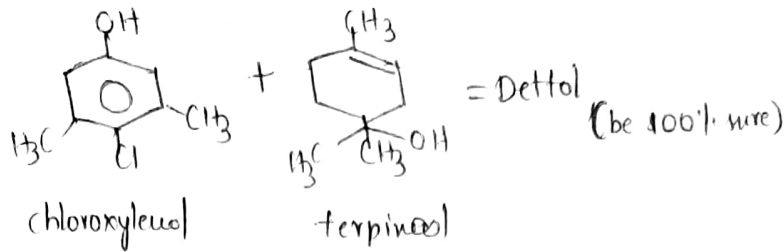
(v) Antiseptics - killing or preventing microorganisms.

for wounds, cuts, ulcers and diseased skin surface.

disinfectant - for floor.

→ 0.2% phenol, dettol, bithional, tincture of iodine, iodophor, boric acid, formalin, (2-3% in water) soframycin, H_2O_2 are antiseptics.

→ Aq. soln. of Cl_2 in 0.3 ppm, SO_2 in lowest conc, 1% phenol, formaldehyde are disinfectants.



(ix) Antacids - remove only excess of acid

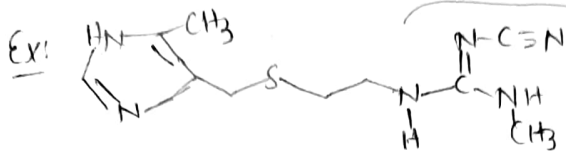
Ex: Omprefazole & lamoprefazole.

⑧ Antihistamine - secretion of pepsin, HCl - histamine.

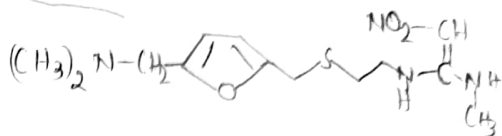
→ excess of acid in stomach causes inflammation in body, damage

inhibit action of histamine are antihistamine.

antacids



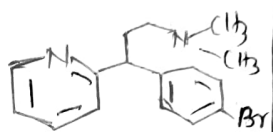
Cimetidine (tegamet)



Ranitidine (Zantac)

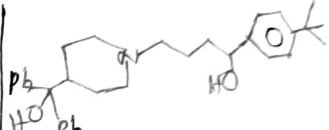


Histamine



Bromopheniramine

(di metappole) di metane)

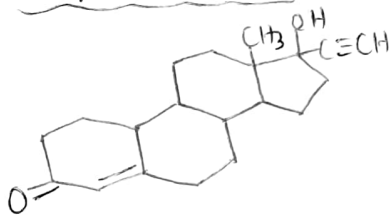


Terfenadine

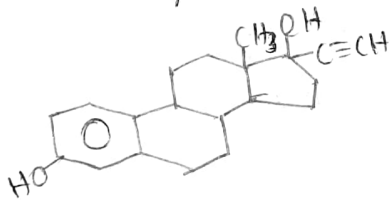
(reldom)

Antihistamines for anti allergic but no effect on histamine.

Antifertility drugs : Birth control pill.



Norethindrone - synthetic progestosterone



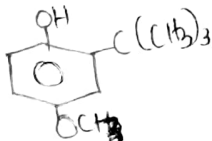
Ethyl(nyl)estradiol (Novestrol) - estrogen derivative

⇒ Chemicals in food

① Antioxidants - retard action of oxygen & preserve food.

Ex: CC(C)(C)C1C(C(C)(C)C)C(O)C1

Butylated hydroxytoluene (BHT)

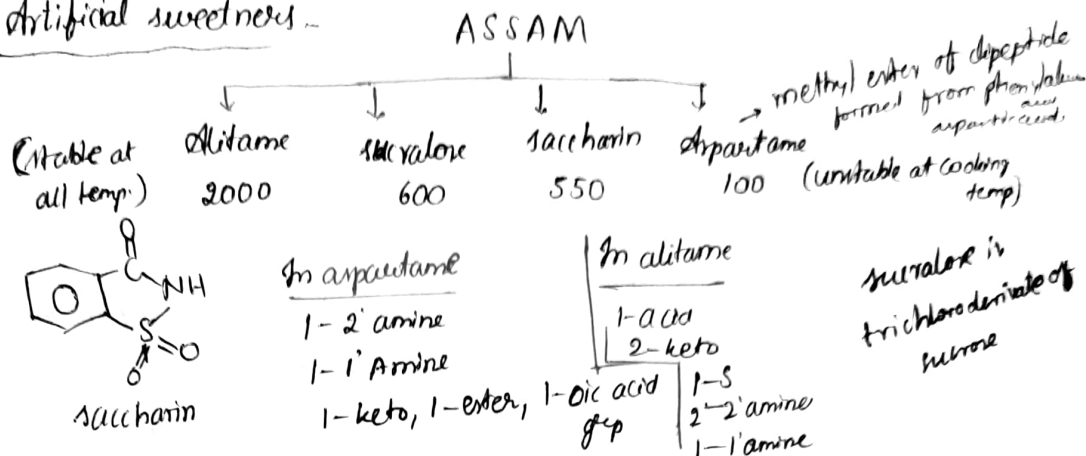


Butyated Hydroxy Anisole (BHA)

→ sulphur dioxide and sulphites are used as antioxidants for wine, sugar syrup, and peeled vegetables.

(ii) Preservatives: (C_6H_5COONa) sodium metabisulphite (or) potassium metabisulphite, salts of sorbic acid, propionic acid, SO_2 in low conc.

(iii) Artificial sweeteners -



⇒ Cleaning agents -

(i) Soap: salts of fatty acids of Na, K.

→ K^{39} soaps are soft on skin, transparent soaps are made by dissolving soap in ethanol.

→ Shaving cream/soaps contain glycerol prevent rapid drying, skin gum for shaving soaps.

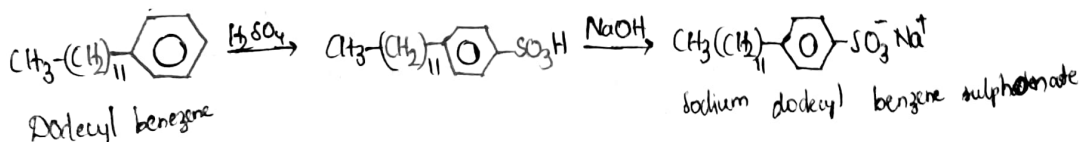
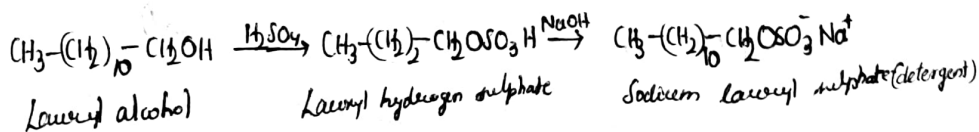
(ii) Detergents: - Synthetic detergents are salts of fatty sulphonic acids.

→ does not precipitate with Ca^{2+} & Mg^{2+} .

→ Detergents $\begin{cases} \text{non-ionic} \\ \text{cationic} \\ \text{anionic} \end{cases}$ → for household purpose.

→ Anionic detergents - largest part is anion.

Large chain alcohol + con. H_2SO_4 + $NaOH$ (alkali) → anionic detergent.



⇒ Cationic detergents: Cationic detergents are mostly acetates, chlorides, bromides

of 4th amines

Ex) Cetyl^{trimethyl} ammonium bromide, $(\text{CH}_3-(\text{CH}_2)_{15}-\text{N}(\text{CH}_3)_3^+ \text{Br}^-$

→ Cationic detergents have germicidal properties and are germicides.

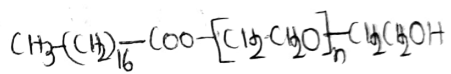
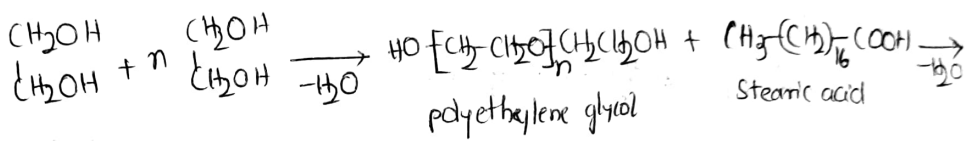
→ Cetyl trimethyl ammonium bromide popular cationic detergents for hair conditioners.

⇒ Non-ionic detergents — Stearic acid with polyethylene glycol gives an ester.

Polyethylene glycol is from ethylene glycol & ethylene oxide.

→ large branched chain of these detergents were not attacked by bacteria and causes pollution.

→ unbranched was attacked by bacteria, prevents pollution.



⇒ Drug-target interaction:

Enzyme — protein.

→ Catalytic action of enzyme: first function of enzyme is to hold substrate for chemical reaction.

2nd function of enzyme is to provide functional groups that will attack the substrate and carry out chemical reaction.

→ Drug-enzyme interaction: drugs which can block the binding site of enzyme and prevent the bonding of substrate.

Some drugs compete with natural substrate for their attachment are competitive inhibitors. (steering covalent bond).

Some drugs do not bind to the enzyme's active site but bind to a different site are called allosteric site.

→ Receptors as drug targets: "Receptors are crucial for body's communication process."

Messengers are transferred b/w neurons to muscles through chemical messengers.

→ Drugs that bind to receptor site and inhibit its natural function are called antagonists.

Drugs that mimic the natural messenger by switching on the receptor are called agonists.