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## **D.PHARM EXIT EXAM AT YOUR FINGERTIPS**



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Revision**

**Topper's Trusted Book**

## **Boost Your EXIT EXAM Score**

*by*

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# PREFACE

It is with great pleasure and enthusiasm that we present the book, **“Theory D. Pharm Exit Exam at your Fingertips”** designed to prepare you for success in the Diploma in Pharmacy Exit Examination (DPEE).

The Pharmacy Council of India has mandated Exit exam for D. Pharm candidates to register as pharmacists under the Pharmacy Act of 1948. Individuals must pass the Diploma in Pharmacy Exit Examination (DPEE) to be registered, and eligibility requires completion of a Diploma in Pharmacy course from a PCI approved institution. The exam will consist of a single paper with multiple-choice questions covering the subjects of Pharmaceutics, Pharmacology, Pharmacognosy, Pharmaceutical Chemistry, Biochemistry, Hospital and Clinical Pharmacy, Pharmaceutical Jurisprudence, and Drug Store Management.

This book provides an extensive and detailed coverage of the core subjects required for a diploma in pharmacy, making it an ideal resource for students preparing for the DPEE. The content is presented in a simple, clear, and self-explanatory manner, ensuring that it is accessible and easy to understand. Each chapter is meticulously designed, with the theory systematically organized to enhance the learning experience. The straightforward language and structured approach make it easier for students to grasp complex concepts, helping them to effectively prepare for their exams.

We hope this book, **“Theory D. Pharm Exit Exam at your Fingertips”** becomes your trusted companion on your journey to exam success.

Finally, we wish all the very best to every student preparing for the DPEE examination.

**Authors**

**Dr. PEEYUSH JAISWAL,  
Dr. ABHISHEK TRIPATHI**

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# PHARMACEUTICS

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## History of Profession of Pharmacy and Pharmacopoeia

### INTRODUCTION

- Pharmacy is the art, science and economics of preparing and dispensing medications and providing drug-related information to the public.
- The word “pharmacy” was coined from the Greek word “**pharmakon**” meaning “**medicine**” or “**drug**”.
- Pharmaceutics** is the branch of science which deals with the **formulation of drug into dosages form**. It is the science of **compounding/manufacturing and dispensing drugs**.

### HISTORY OF PHARMACY PROFESSION IN INDIA IN RELATION TO EDUCATION

YEAR	COLLEGE
<b>1842</b> 	<ul style="list-style-type: none"> <li>First pharmacy college in Asia was started in Goa by the Portuguese at the old Portuguese medical school known as “<b>Escola Medica de Goa</b>”</li> <li>Currently this school is known as ‘<b>Goa College of Pharmacy</b>’.</li> </ul>
<b>1912</b> 	The <b>International Pharmaceutical Federation</b> founded (FIP), head office in the Netherlands.
<b>1932</b> 	<ul style="list-style-type: none"> <li><b>Banaras Hindu University</b> under the leadership of <b>Professor Mahadev Lal Schroff</b>.</li> <li><b>IN 1937 BHU</b> became the first university in India to start <b>3-year B. Pharm</b> course.</li> </ul>
<b>1939</b> 	<ul style="list-style-type: none"> <li>The United Provinces Pharmaceutical Association (UPPA) was renamed as <b>Indian Pharmaceutical Association (IPA)</b>.</li> </ul>
<b>December 1948</b> 	The <b>First Indian Pharmaceutical Congress (IPC)</b> was organized at Calcutta with <b>Prof. M.L. Schroff</b> as its <b>First President</b> .
<b>6<sup>th</sup> March</b> <b>Every year</b> 	<b>National Pharmacy Education Day-</b> in honour of the birth anniversary of <b>Professor Mahadeva Lal Schroff</b> .

### HISTORY OF PHARMACY PROFESSION IN INDIA IN RELATION TO INDUSTRY

YEAR	NAME OF FOUNDER	NAME OF SHOP/ INDUSTRY
<b>1811</b>	<b>Mr. Bathgate (East India Company)</b>	<b>1<sup>st</sup> Chemist Shop in Kolkata</b>
<b>1821</b>	<b>Mr. Smith Stanistreet and Co.</b>	<b>Another Apothecary Shop opened</b>
<b>1901</b>	<b>Acharya Praffula Chandra Ray</b>	<b>Establishment of Bengal Chemicals and Pharmaceutical Works at Calcutta</b>

2016	5 <sup>th</sup> edition	Ministry of Health & Family Welfare, Govt. of India
2021	6 <sup>th</sup> edition	Mansukh Mandaviya

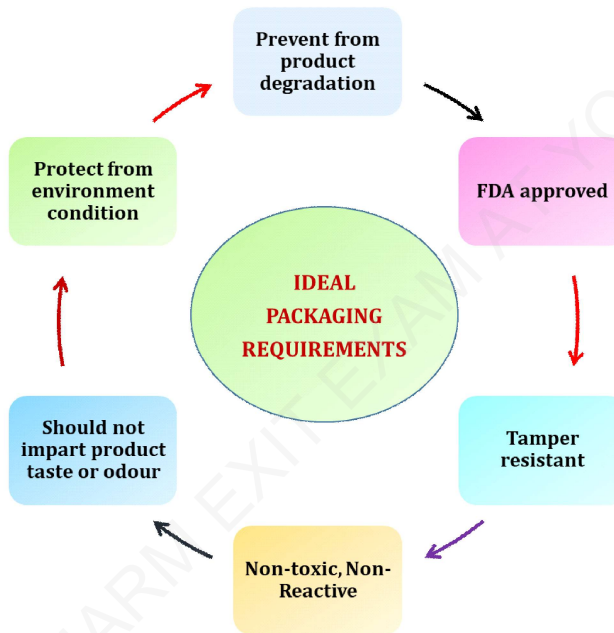
## Packaging Material

### INTRODUCTION

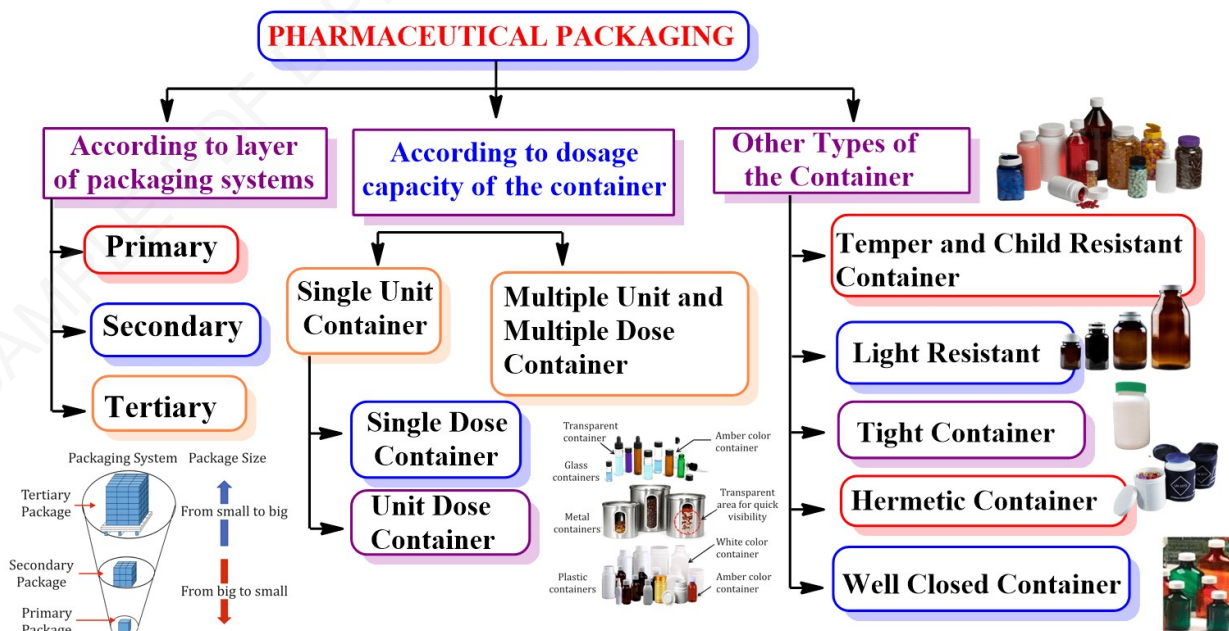
- Packaging is the study of **materials, methods, and machinery** used to pack **products**.
- Purpose of packaging is to **protect the integrity, purity, potency and quality of the product**.
- Packaging consist of **Container, Closure, Liner, Carton, Box**.








### Ideal Packaging Requirements










### CLASSIFICATION OF PHARMACEUTICAL PACKAGING

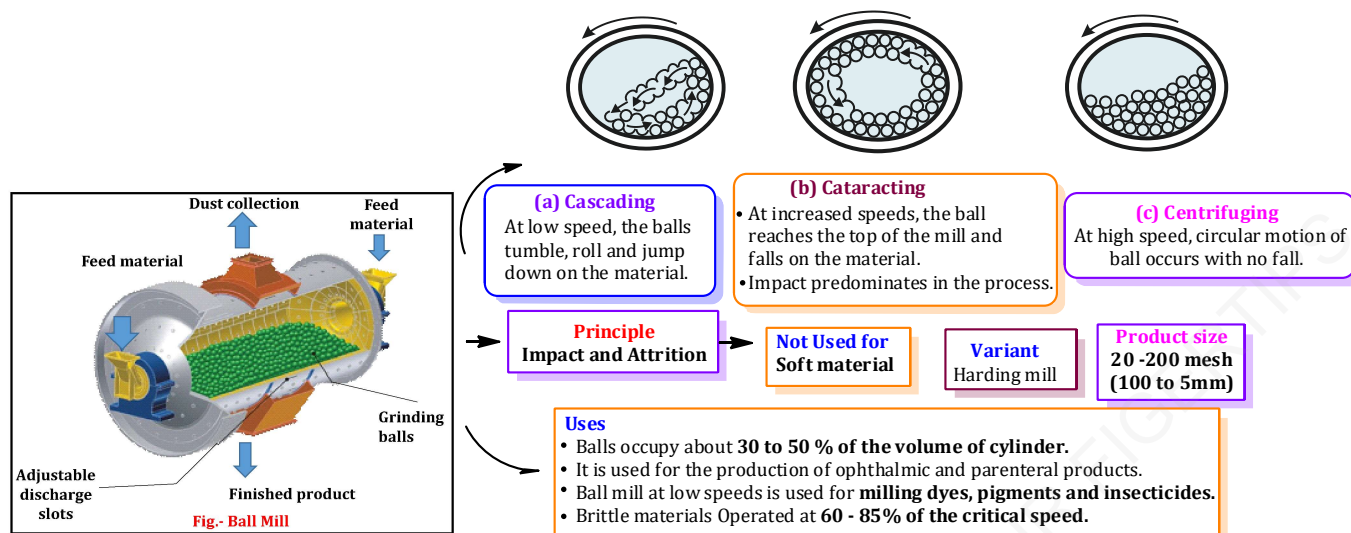


ACCORDING TO LAYER OF PACKAGING SYSTEM	
<b>Primary Packaging</b> 	Primary Packaging is the material that <b>first envelops the product and holds it</b> . The packaging needs to be such that there are <b>no interactions with the drug</b> . It comes in <b>direct contact with the product</b> . <b>e.g. Blister Packages, Strip Packages etc.</b>
<b>Secondary Packaging</b> 	Secondary Packaging is outside the primary packaging and <b>provide additional protection</b> for safe storage and refilling used to group primary packages together and will not be in direct contact with the dosage form. <b>e.g. Cartons, Boxes, Overwraps for blisters etc.</b>
<b>Tertiary Packaging</b> 	<ul style="list-style-type: none"> <li>• Tertiary packaging involves palletized unit loads for bulk handling, storage, and shipping.</li> <li>• <b>e.g. Containers, Barrels etc.</b></li> </ul>
ACCORDING TO DOSAGE CAPACITY OF THE CONTAINER	
<b>Single Unit Container</b> 	It is used immediately after opening or for administering a <b>single dose of a drug product</b> . A single-dose container is a single-unit container designed for parenteral administration only, while a unit-dose container is a single-unit container intended for <b>solid oral dosage forms</b> . ✓ <b>Single Dose Container</b> ✓ <b>Unit Dose Container</b>
<b>Multiple Unit Container</b> 	<ul style="list-style-type: none"> <li>• <b>Multiple Unit Container</b></li> </ul> It enables content withdrawal without affecting strength, quality, or purity. <ul style="list-style-type: none"> <li>• <b>Multiple Dose Container</b></li> </ul> It is a multiple unit container for drugs that are to be <b>administered via parenteral route only</b> .

❑ **DIFFERENT TYPES OF CONTAINER**

OTHER TYPES OF THE CONTAINER AND THEIR PACKAGING		
<b>Temper Resistant and Child Resistant Container</b> 	<b>Film wrapping</b> 	It is used for package integrity and environmental protection, with types including <b>end-folded, fin seal, and shrink wrappers</b>
	<b>Blister packaging</b> 	It is used in pharmaceuticals for environmental protection and aesthetic appeal. <b>Bubble test is used for Blister pack</b>
	<b>Bottle seals</b> 	Tamper-resistant bottles bond inner seals to rims, preventing product access by <b>irreparably destroying the seal</b>
	<b>Tape sealing</b> 	Involves applying <b>pressure-sensitive tape</b> or label to package closure, destroying it for product access
	<b>Strip packaging</b> 	Is unit dose packaging for tablet capsules, formed by feeding <b>heat-sealable flexible film</b> through a <b>heated crimping roller or platen</b>
	<b>Bubble packaging</b> 	Sandwiches product between <b>thermoformable film and rigid backing material</b> , using heat-softening and <b>vacuum-drawing pocket</b>

❖ Ball Mill



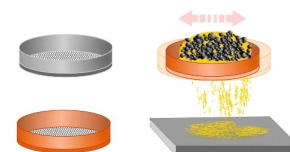
❑ **SIZE REDUCTION MILLS AND THEIR VARIANTS**

<b>Cutter mill</b>	Double runner disc mill, Single runner disc mill
<b>Roller mill</b>	Multiple smooth rollers or corrugated, ribbed or sawtoothed rollers
<b>Hammer mill</b>	Fitzpatric comminuting machine (Fitz mill), Stokes tornado mill
<b>Ball mill</b>	Hardinge mill, Continuous ball mills, Vibrating ball mill
<b>Fluid energy mill</b>	Centrifugal impact pulverizer
<b>Pin mill</b>	Mikro - ACM pulverizer, Killoplex mill

**SIZE SEPARATION**

❑ **INTRODUCTION**

- It is a unit operation that involves the **separation of a mixture** of various sizes of particles into **two or more portions** by means of screening surfaces.
- Size separation is also known as **Sieving, Sifting, Classifying or Screening.**



❑ **GRADES OF POWDERS AND SIEVE NUMBER ALONG WITH NOMINAL APERTURE SIZE AS PER IP**

GRADE OF POWDER	SIEVE THROUGH WHICH ALL PARTICLE MUST PASS	NOMINAL MESH APERTURE SIZE	SIEVE THROUGH < 40% PARTICLE PASS	NOMINAL MESH APERTURE SIZE
<b>Coarse</b>	10	1.7 mm	44	355 µm
<b>Moderately coarse</b>	22	710 µm	60	250 µm
<b>Moderately fine</b>	44	355 µm	85	180 µm
<b>Fine</b>	85	180 µm	120	-
<b>Very fine</b>	120	125 µm	-	-
<b>Microfine</b>	350(90% pass)	-	-	-
<b>Superfine</b>	90% pass through 10 micron	-	-	-

❖ **Silverson Mixer Homogenizer**

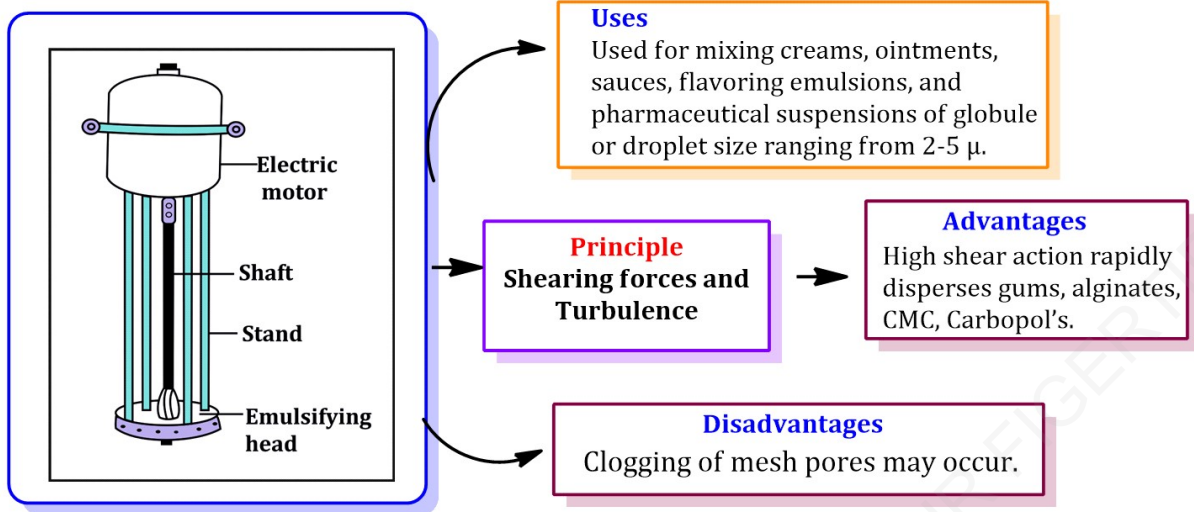
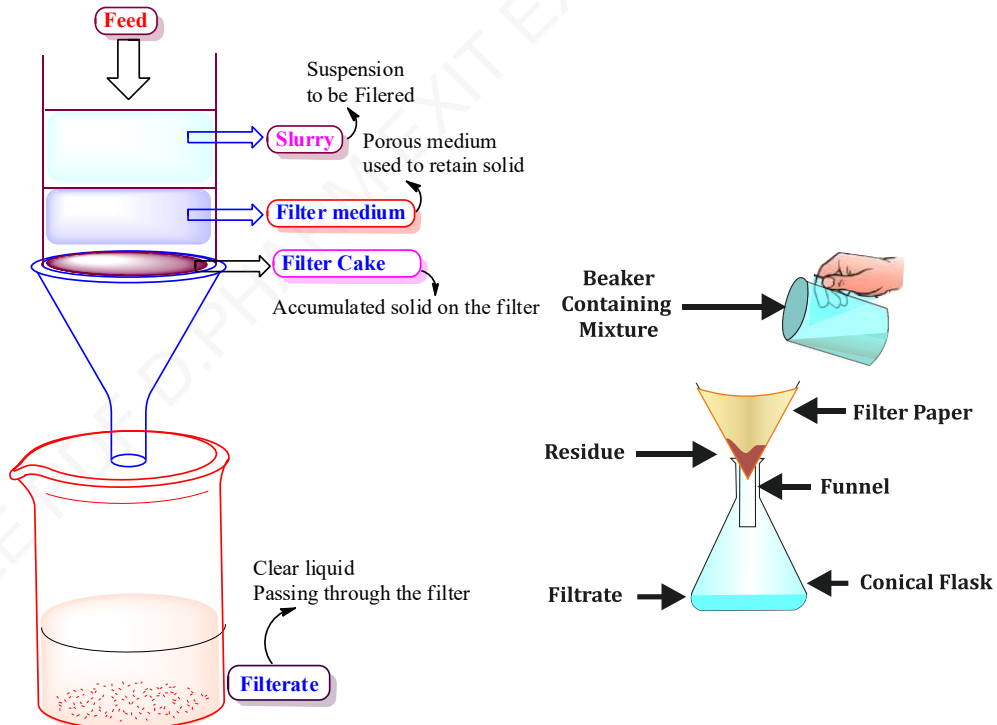


Fig.-Silverson Mixer Homogenizer

**FILTRATION**

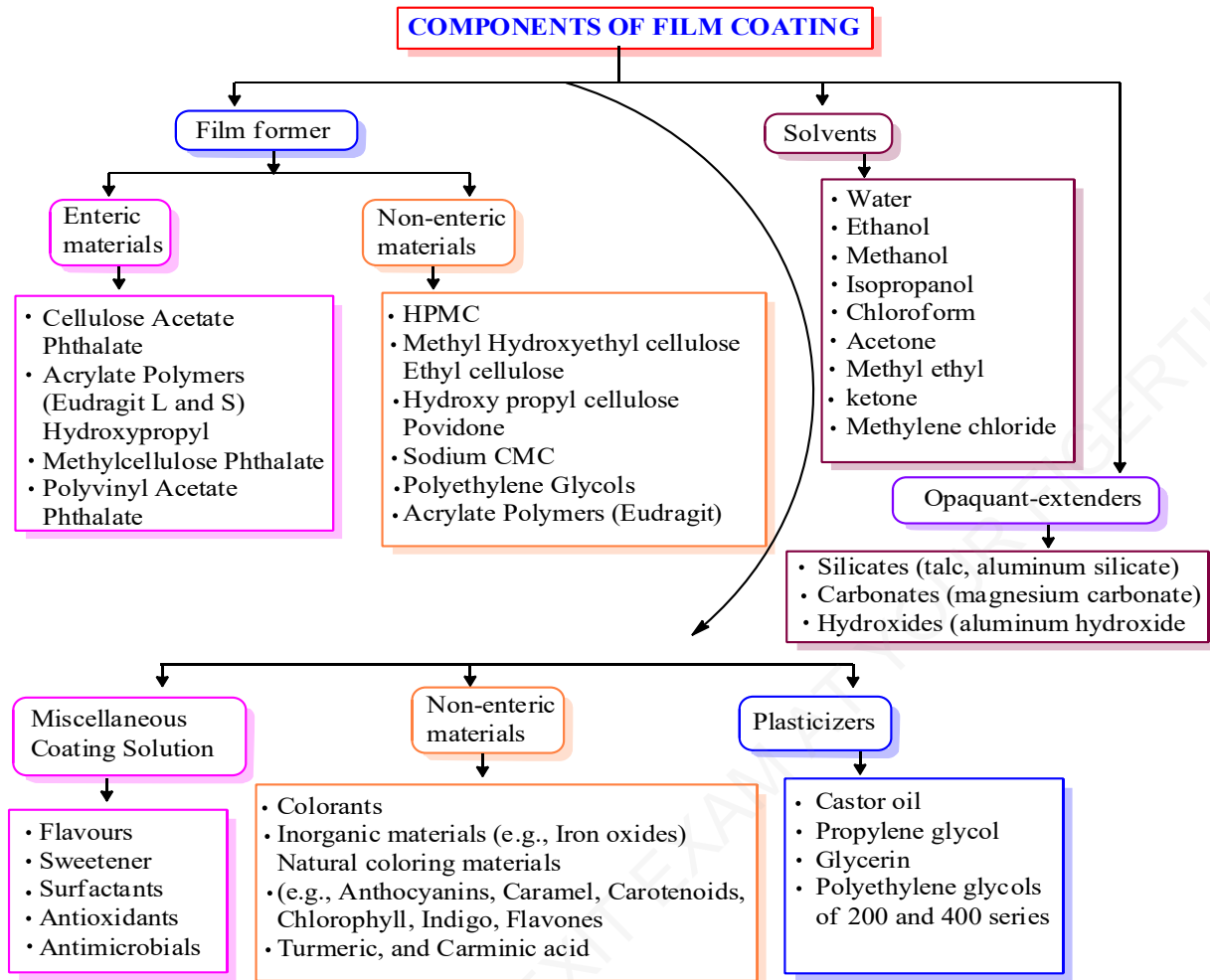
❑ **INTRODUCTION**

- Filtration can be defined as a **solid liquid separation process in which solids are separated from suspension** by passing through a porous medium that accumulate the **solids, but allows the passage of fluids**.



❑ **MECHANISMS OF FILTRATION**

<p><b>Straining</b></p>	<p>The particles of <b>larger size cannot pass</b> through the smaller pore size of the filter medium.</p> <p>← Filter Medium</p>
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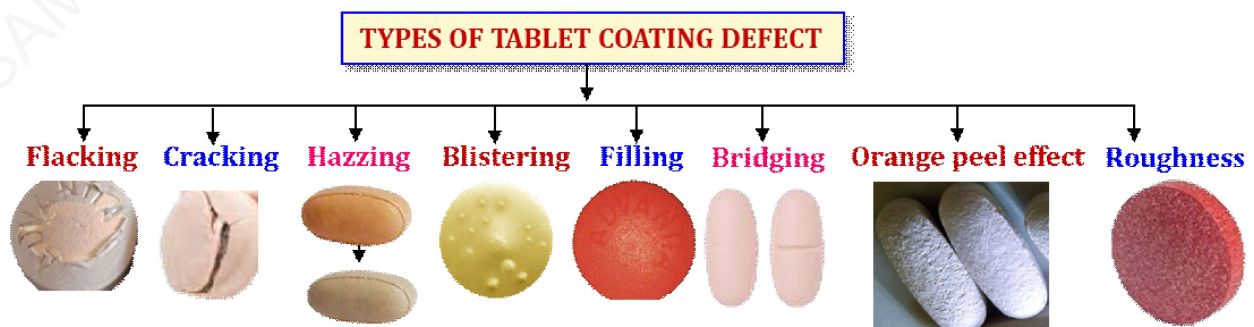
❖ **Terms related with Tablet coating**

TERMS	DEFINITION
Opalux	Opaquant colour concentrate for sugar coating
Opaspray	Opaquant colour concentrate for film coating.
Opadry	Complete film coating concentrate









**3. Enteric Coating**

- Special type of film coating
- Allows the tablet to pass intact through the stomach and disintegrate in the small intestine
- This method Protect acid-labile drugs from degradation in stomach.
- e.g.: Shellac, Cellulose acetate phthalate, Hydroxypropyl methyl-cellulose phthalate, Eudragit, Polyvinyl acetate phthalate, Diethyl phthalate.

❑ **TABLET COATING DEFECTS**



## ❖ Types of Tablet Coating Defects

DEFECTS	DESCRIPTION	CAUSES	REMEDIES
<b>Roughness</b> 	Rough or gritty surface	Droplets may dry too rapidly	Moving the nozzle closer to the tablet bed
<b>Orange peel effect</b> 	Film being rough and non-glossy	<ul style="list-style-type: none"> <li>Inadequate spreading of the coating solution.</li> <li>Too rapid drying</li> <li>High solution viscosity</li> </ul>	<ul style="list-style-type: none"> <li>Use of mild drying condition</li> <li>Thinning the solution</li> </ul>
<b>Bridging</b> 	Shrinking of film and pulling away from sharp corners	<ul style="list-style-type: none"> <li>Improper atomization pressure</li> <li>High viscosity of coating solution</li> </ul>	<ul style="list-style-type: none"> <li>Increase the plasticizer content</li> <li>Reduce the viscosity of solution</li> </ul>
<b>Blistering</b> 	Local detachment of film	<ul style="list-style-type: none"> <li>Too rapid evaporation of the solvent from the core</li> <li>Effect of high temperature</li> </ul>	<ul style="list-style-type: none"> <li>Use the mild drying condition</li> </ul>
<b>Hazing/ Dull film/ Blooming</b> 	Coating becomes dull immediately or after prolonged storage	<ul style="list-style-type: none"> <li>High temperature</li> <li>High humidity</li> </ul>	<ul style="list-style-type: none"> <li>Decrease the plasticizer</li> <li>Increase molecular weight</li> </ul>
<b>Cracking</b> 	Film cracks across the crown of the tablet	Internal stress in film exceeds than tensile strength	Adjusting the plasticizer type and concentration, and the pigment type and concentration
<b>Twinning</b> 	Two or more of the tablet cores are stuck together.	Cause due to over wetting	<ul style="list-style-type: none"> <li>Reducing spray rate</li> <li>Increased pan speed</li> </ul>
<b>Pitting</b> 	Holes appear on tablet surface	Melting of lubricant on tablet surface. Most common with stearic acid.	Decrease coating temperature to below melting point of lubricant

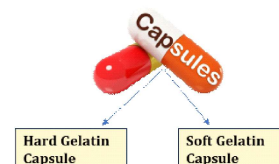
## CAPSULES

## ❑ INTRODUCTION

- “Capsules” are the solid dosage forms consisting of single dose of drug enclosed in a water-soluble shell of a suitable form of gelatin.
- Capsules are made of gelatin shells that are filled with substances in dry powders, semi solids and liquid that do not dissolve in gelatin.

## ❑ TYPES OF CAPSULES

- Capsule is of two types as given below
- Hard gelatin capsule
  - Soft gelatin capsule





# PHARMACOLOGY

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## General Pharmacology

### Introduction and Scope of Pharmacology

#### SCIENTIST'S NAME AND THEIR CONTRIBUTIONS

SCIENTISTS	CONTRIBUTIONS
Oswald Schmiedeberg	Father of Pharmacology
Ram Nath Chopra	Father of Indian Pharmacology
Prof. Mahadev Lal Schroff	Father of Indian pharmacy education
Paul Ehrlich	Father of chemotherapy
Hippocrates	Father of medicine
Alexander Fleming	Discovery of Penicillin
Selman Waksman	Discovery of Streptomycin
Banting and Best	Discovery of Insulin
Gerhard Domagk	Discovery of antimicrobial effect of Prontosil
Dr. Edward Jenner	Discovery of Vaccination

#### IMPORTANT TERMS AND THEIR RELATED DESCRIPTION

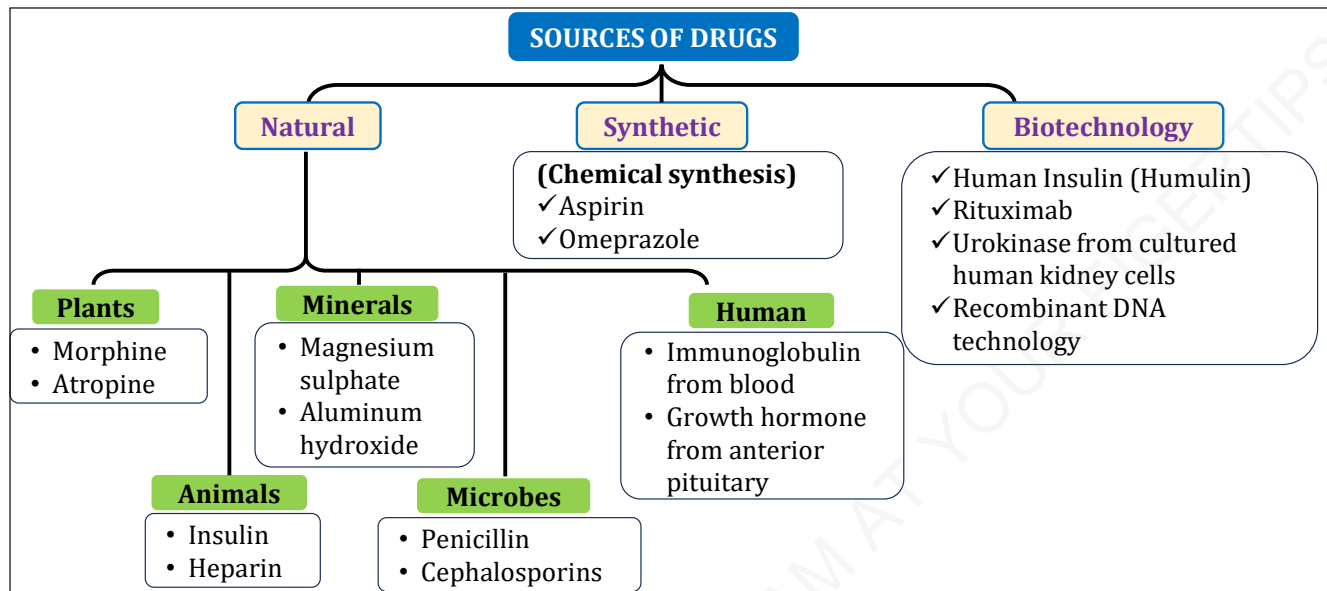
TERM	DESCRIPTION
Pharmacy	The art, practice, or profession of preparing, preserving, compounding, and dispensing medical drugs.
Pharmacology	Science dealing with drugs and their action on human body.
Drug	A chemical substance used for prevention, diagnosis, treatment or cure of diseases.
Prescription drugs	It is a pharmaceutical drug that legally requires medical prescription for dispensing. e.g. - Metformin, Amlodipine, Metoprolol, Isoniazid, Rifampicin etc.
Non - Prescription drugs	Also called over-the-counter drugs that can be obtained without a prescription. e.g. - ENO, Paracetamol, Aspirin, Aceclofenac etc
Teratology	Branch of science dealing with harmful effects of drugs on foetus.
Dose of drug	It is considered as the quantity of drug required to produce the desired therapeutic effect in the individual.
Affinity of drug	The ability of the drug to occupy and activate the receptors.
Efficacy of drug	The ability of a drug to produce the desired beneficial effect.
Potency of drug	The amount of drug required to produce a desired response.
Placebo drug	A dummy medicine that is inert in nature and given in the grab of original medicine.

**ESSENTIAL DRUGS**

According to WHO, essential drugs are drugs that **satisfy healthcare & need** of majority of population.

- ✓ **WHO List of essential drugs** - 1977 (First), 22<sup>nd</sup> list **2021 (Latest)** → 479 drugs.
- ✓ **Indian National Essential Drug List** - 1996 (First), revised in 2015 & **2022 (Latest)**.

**DRUGS ARE OBTAINED FROM A VARIETY OF SOURCES**

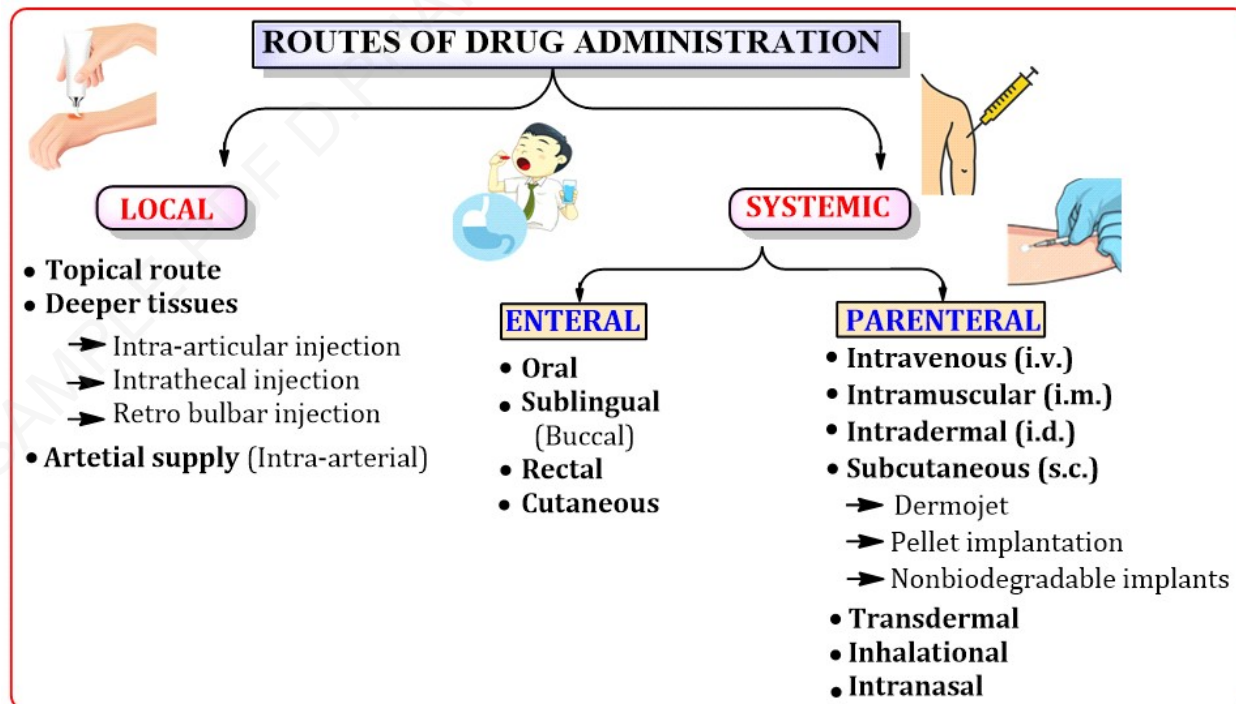


**Routes of Drug Administration**

**INTRODUCTION**

- A route of administration is the **path** by which a **drug, fluid** or other substance is **taken into the body**.
- Most of the drugs can be administered by different routes.

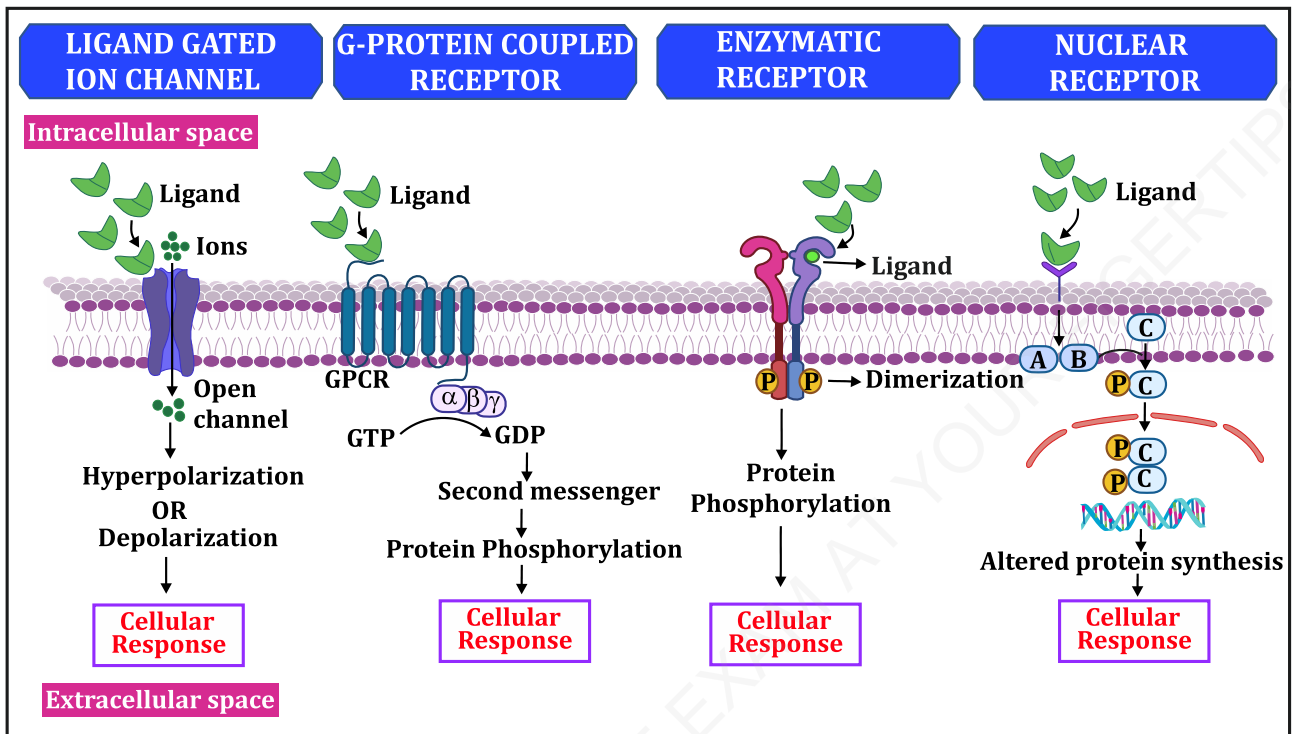
**CLASSIFICATION OF ROUTES OF DRUG ADMINISTRATION**



#### 4. Nuclear Receptors

- These are intracellular (cytoplasmic or nuclear) soluble proteins which respond to lipid soluble chemical messengers that penetrate the cell

e.g.: Steroidal hormones, Thyroxine hormone, Vitamin D and A



#### CLINICAL PHARMACOLOGY

- **Pharmacovigilance** is science that study detection, assessment, understanding & prevention of **adverse effect** or any other drug relating problem.
- Good clinical practice not required in **preclinical studies**.

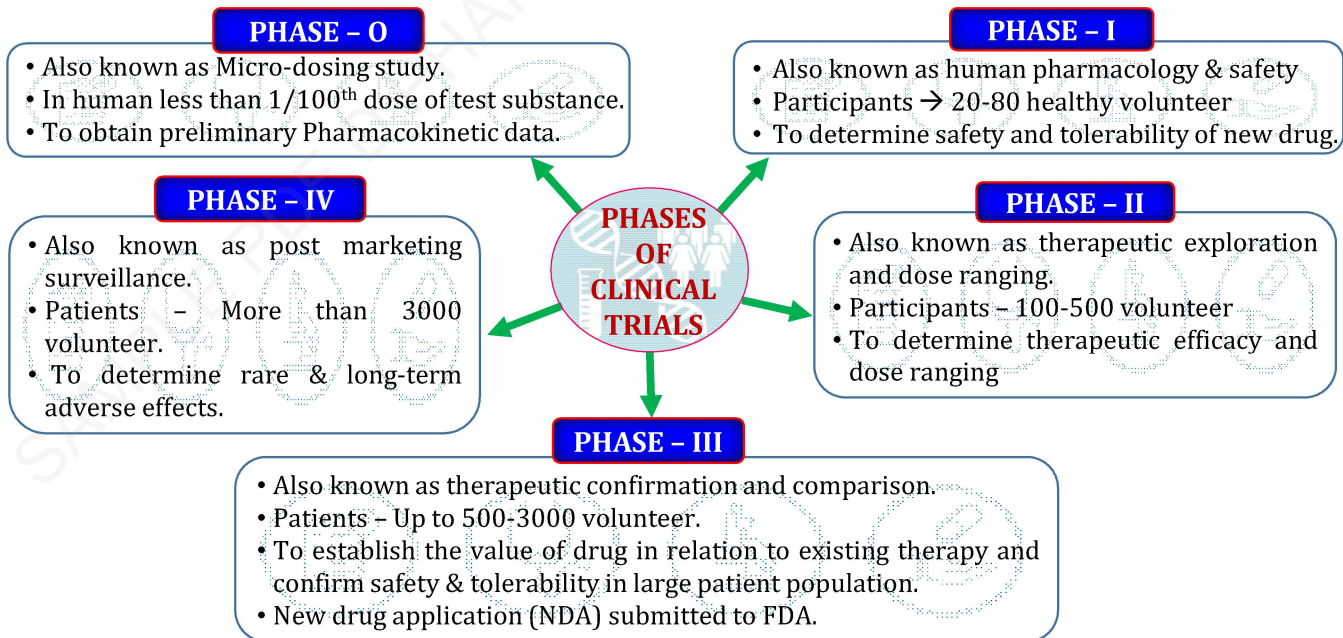
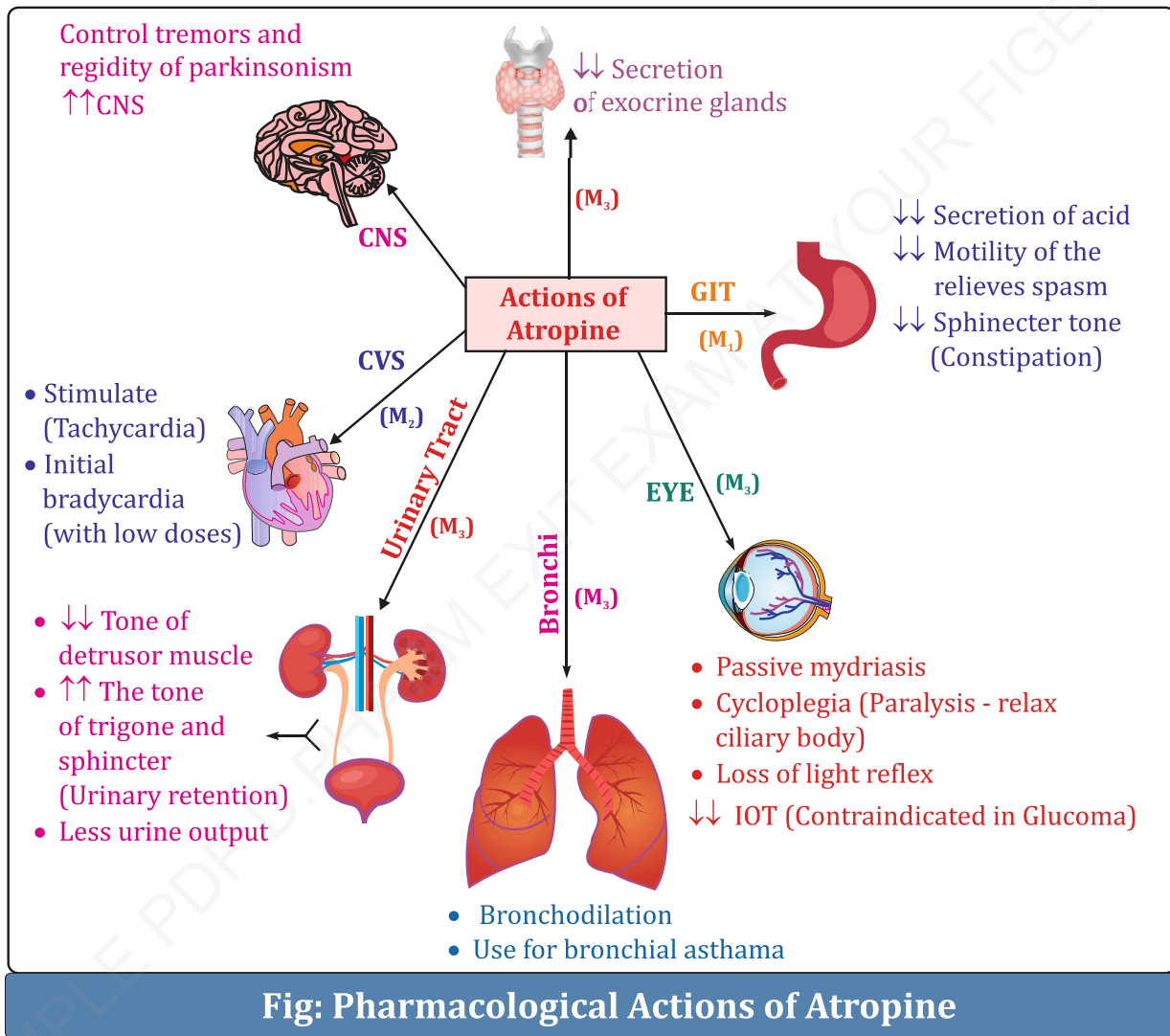


Fig.- Phases of Clinical Trials

Ipratropium Tiotropium Oxytropium	M <sub>3</sub> blocker	Asthma (Bronchodilator)
Cimetropium	M <sub>3</sub> blocker	Reduce tone of GI, biliary and urogenital tract
Dicyclomine	M <sub>3</sub> blocker	Antispasmodic, Anti-secretory, Motion Sickness
Pirenzepine	M <sub>1</sub> blocker	Peptic Ulcer

❖ Pharmacological Actions of Atropine



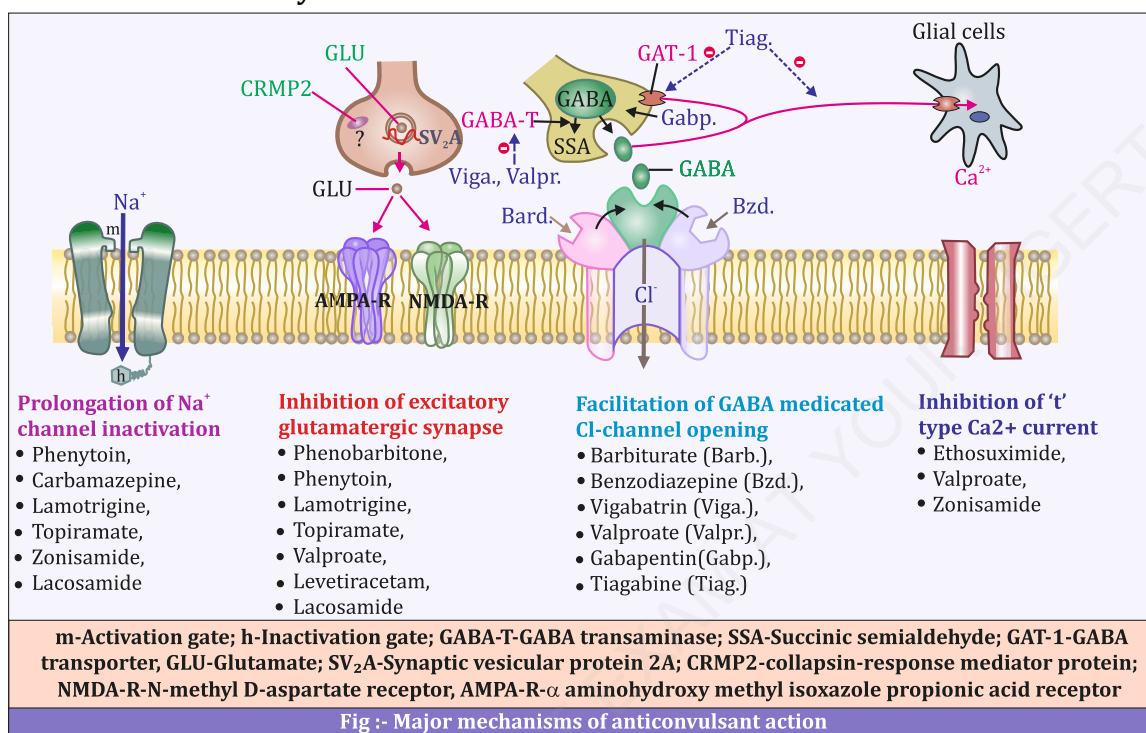
**Adrenergic Drugs**

❑ **INTRODUCTION**

- Adrenergic transmission is related to **sympathetic division of ANS**.
- Neurotransmitters released at the site of sympathetic nerve fiber is **Epinephrine/ Adrenaline**.
- Sympathomimetic are drugs that **imitate or mimics** the actions produced due to the **stimulation of sympathetic nerves**.

## ❖ Different Mechanism of Actions

1. Prolongation of Na<sup>+</sup> channel inactivation
2. Facilitation of GABA mediated Cl<sup>-</sup> channel opening
3. Inhibition of T type Ca<sup>+2</sup> current
4. Decrease in excitatory neurotransmission

1. Prolongation of Na<sup>+</sup> channel inactivation

- Normally sodium channel has following phases.

Resting → Activated(open) → Inactivated(open) → Resting

2. Facilitation of GABA mediated Cl<sup>-</sup> channel opening

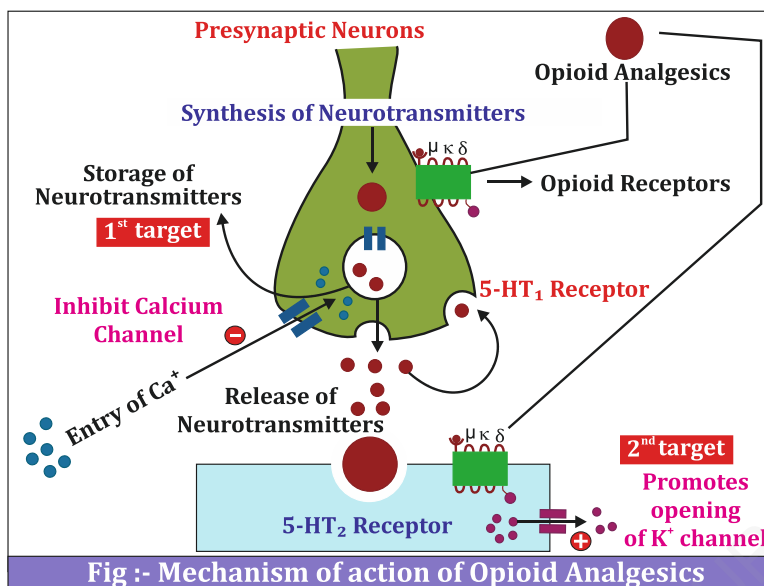
- **Barbiturates** and **Benzodiazepines** bind to GABA<sub>A</sub> receptor and Cl<sup>-</sup> channel.
- **Valproate** and **Vigabatrin** inhibits enzyme **GABA transaminase** which degrades → GABA Conc. of GABA.
- **Tiagabine** inhibits the uptake of GABA into the neurons by inhibiting GAT-1.
- **Gabapentin** enhances the GABA release from synaptic vesicles.

3. Inhibition of t type Ca<sup>+2</sup> current

- T (transient) current is low threshold Ca<sup>+2</sup> current (due to inward flow of Ca<sup>+2</sup> through **T-type** Ca<sup>+2</sup> channels.
- This is important in generation of **absence seizure**.
- It is inhibited by **Ethosuximide**, **Valproate** and **Zonisamide**.

## 4. Decrease in excitatory neurotransmission

- **Glutamate** and **Aspartate** act are **major excitatory amino acid** in the brain.
- **Glutamate** can act by **stimulating metabotropic** (GPCR) or **ionotropic NMDA** receptor
- **Felbamate** acts by **inactivating NMDA** receptors.
- **Topiramate** acts by **blocking sodium channels**, enhances GABA<sub>A</sub> receptor currents and thereby **potentiates the effects of GABA**, also **blocks AMPA receptors** (glutamate receptor).



❑ **CLASSIFICATION OF OPIOIDS**

CLASSES	SUBCLASS	DRUGS
<b>Opioid <math>\mu</math> receptor agonists</b>	<b>Natural opium alkaloids</b>	Morphine, Codeine, Thebaine*, Papaverine*, Noscipine*
	<b>Semisynthetic opioids</b>	Diacetylmorphine (Heroin), Pholcodeine*, Ethylmorphine
	<b>Synthetic opioids</b>	Pethidine (Meperidine), Fentanyl, Methadone, Tramadol, Tapentadol, Remifentanyl, Dextropropoxyphene
<b>Complex action opioids</b>	<b>Agonist-antagonist</b>	Nalorphine, Nalbuphine, Pentazocine, Butorphanol
	<b>Partial <math>\mu</math> agonist+ <math>\kappa</math> antagonist</b>	Buprenorphine
	<b>Pure opioid antagonists</b>	Naloxone, Naltrexone, Nalmefene

❖ **Pharmacological Actions of Morphine**

- Morphine is **prototype** opioids drugs.
- Acts by agonistic activity on  $\mu$ ,  $\kappa$  and  $\delta$  receptor but its affinity for  $\mu$  receptor is much higher than that for the other two.

**Trick- MARPHINE CVS**

<b>M</b>	→ <b>M</b> iosis	
<b>A</b>	→ <b>A</b> nalgesia	
<b>R</b>	→ <b>R</b> espiratory depression	
<b>P</b>	→ <b>P</b> hysical and Psychological dependence	
<b>H</b>	→ <b>H</b> istamine release, Hypotension, Hypothermia	
<b>I</b>	→ <b>I</b> tching	
<b>N</b>	→ <b>N</b> ausea & Vomiting	
<b>E</b>	→ <b>E</b> uphoria	
<b>C</b>	→ <b>C</b> ough suppression, Constipation	
<b>V</b>	→ <b>V</b> agal stimulation (bradycardia)	
<b>S</b>	→ <b>S</b> edation and Hypnosis	

**IRON**

- Iron is essential element for **blood production**. About **70% of iron** is found in RBCs of blood (**Haemoglobin**) and in muscle cells (**Myoglobin**).
- **Ferritin**: - Storage form of Iron in human body.

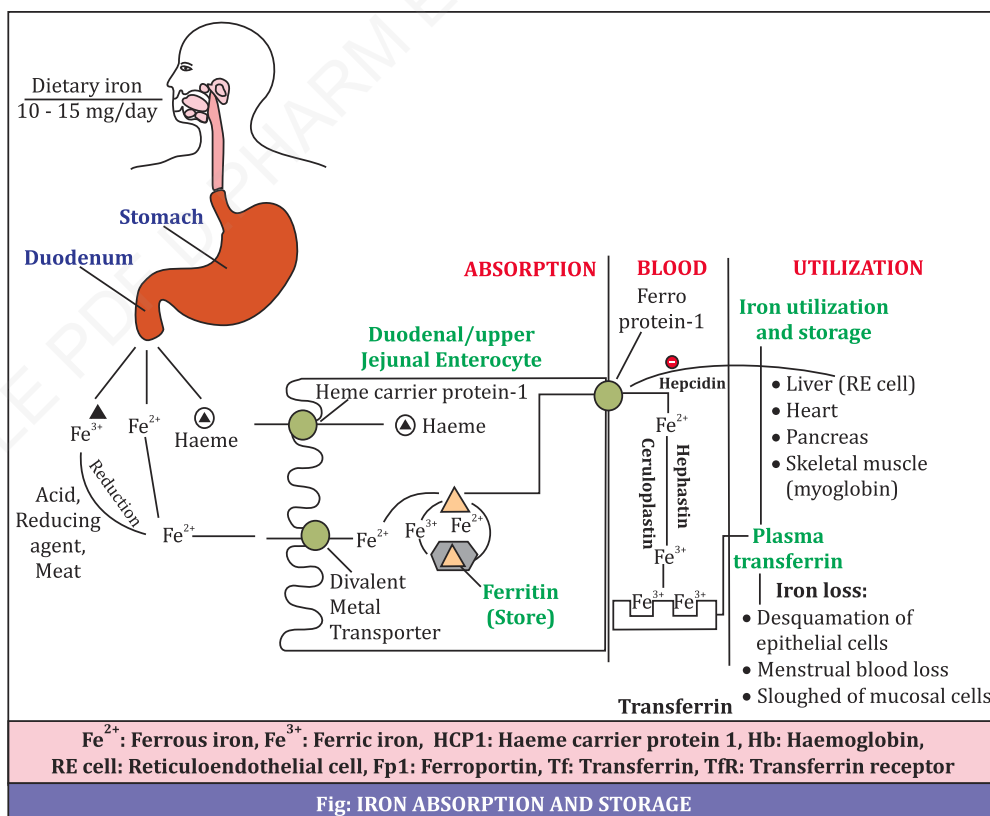
**Daily Requirement of Iron**

Daily requirement	
Adult male	0.5-1 mg (13 µg/kg)
Adult female	1-2 mg (21 µg/kg)
Pregnancy and lactation	3-5 mg (80 µg/kg)

**Preparation of Iron**

CLASS	DRUGS
<b>Oral iron</b>	<ul style="list-style-type: none"> <li>• Ferrous sulphate (hydrated salt 20% iron, dried salt 32% iron)</li> <li>• Ferrous gluconate (12% iron)</li> <li>• Ferrous fumarate (33% iron)</li> <li>• Colloidal ferric hydroxide (50% iron)</li> <li>• Carbonyl iron</li> </ul>
<b>Parenteral iron</b>	Iron dextran, Iron sorbitol, Citric acid
<b>Other forms of iron present in oral formulations</b>	<ul style="list-style-type: none"> <li>• Ferrous succinate (35% iron)</li> <li>• Iron choline citrate</li> <li>• Iron calcium complex (5% iron)</li> <li>• Ferric ammonium citrate (20% iron)</li> <li>• Ferrous aminoate (10% iron)</li> <li>• Ferric glycerophosphate</li> <li>• Ferric hydroxyl polymaltose</li> </ul>

**Iron Absorption and Storage**



- Hip surgery
- Arterial disease (MI)
- Thromboembolism
- Prosthetic heart valves

➤ **Drug interaction**

- **Warfarin** × **Aspirin**: Potentiate warfarin effect.
- **Warfarin** × **Tetracycline**: Potentiate warfarin effect.
- **Warfarin** × **Cholestyramine**: Reduces the absorption of warfarin from gut.
- **Warfarin** × **Vitamin K**: Antagonistic action

❑ **FACTORS INVOLVE IN BLOOD CLOTTING**

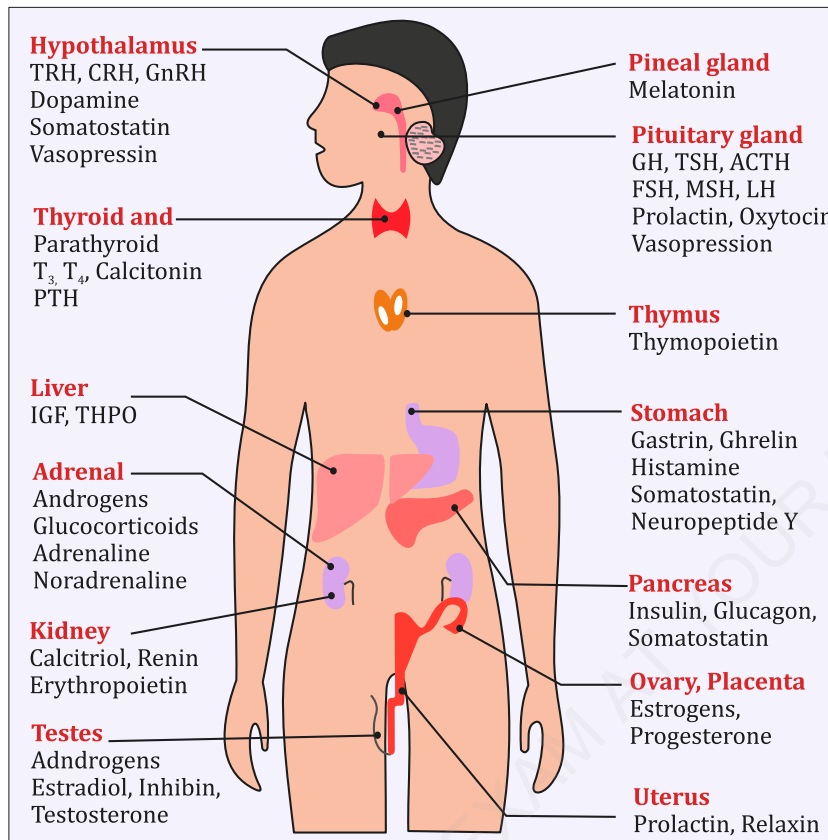
Trick - "Fresher's Party Tonight Come Lets Sing And Call Seniors....Please Have Fun"		
FACTORS	NAME	FUNCTION
Factor I	Fibrinogen	Convert to fibrin
Factor II	Prothrombin	Converted to <b>thrombin</b>
Factor III	Tissue thromboplastin	Essential in activating <b>in vivo coagulation</b>
Factor IV	Ca <sup>+</sup> ions	Required for coagulation factors <b>to bind phospholipid</b>
Factor V	Labile factor	Co-factor involved in converting <b>prothrombin to thrombin</b>
Factor VII	Stable factors	<b>In vivo</b> activates factor (IX)
Factor VIII	Antihemophilic factors	Co-factor involved in <b>activating factor X</b>
Factor IX	Christmas factor	Involved in <b>activating factor X</b> . Deficiency will cause Hemophilia B
Factor X	Stuart power factor	Involved in <b>converting prothrombin to thrombin</b>
Factor XI	Plasma thromboplastin antecedent (PTA)	<b>In vivo activated</b> by thrombin and factor XII and important at major <b>sites of trauma</b>
Factor XII	Hageman factors	Activates at <b>XI and VII</b> . Invitro (lab test) initiates the clotting process
Factor XIII	Fibrin stabilizing factor (Fibrinase)	Convert <b>fibrin polymer to stable insoluble fibrin</b>

**Anti-platelet Agents**

❑ **CLASSIFICATION OF ANTIPLATELET DRUGS**

CLASS	DRUGS	MECHANISM OF ACTION
<b>Thromboxane synthesis inhibitor</b>	Aspirin	It acetylated the enzyme <b>COX<sub>1</sub> and TX synthase - inactivating them irreversibly</b> .
<b>Platelet cAMP enhancer</b>	Dipyridamole	It <b>inhibits phosphodiesterase</b> as well as blocks uptake of adenosine to increase platelets cAMP in turn to potentiate PGI <sub>2</sub> and interfere with aggregation.
<b>P2Y<sub>12</sub> receptor</b>	Clopidogrel, Ticlopidine	It is act <b>by blocking the P2Y<sub>12</sub> type of purinergic receptor</b> on the surface of platelets and inhibit ADP-induced aggregation.
<b>GP II<sub>b</sub>/III<sub>a</sub> antagonist</b>	Abciximab, Tirofiban, Eptifibatide	Block <b>GP II<sub>b</sub>/III<sub>a</sub> receptor</b> for fibrinogen and von Willebrand's factor on platelet surface and thus inhibit the final step in the process of platelet aggregation.

❑ **INTRODUCTION TO ENDOCRINE SYSTEM AND HORMONES**



**Fig.: Diagrammatical representation of hormones and their locations**

TRH-Thyrotropin-releasing hormone, CRH-Corticotropin-releasing hormone, GnRH-Gonadotropin hormone-releasing hormone, PTH-Parathyroid hormone, IGF-Insulin-like growth factor, THPO- Thrombopoietin, GH- Growth hormone, TSH-Thyroid stimulating hormone, ACTH- Adrenocorticotrophic Hormone, FSH- Follicle-stimulating hormone, MSH-Melanocyte-stimulating hormone, LH- Luteinizing hormone.

❑ **CLASSIFICATION OF HORMONES**

1. Classification of hormones based on the nature

NATURE OF HORMONE	EXAMPLES
<b>Peptide</b>	Hypothalamus regulatory hormones, Pituitary hormones, Glucagon, Parathyroid hormone insulin
<b>Steroid</b>	Adrenocortical hormones, Sex steroids
<b>Catecholamines</b>	Adrenaline, Noradrenaline
<b>Others</b>	Triiodothyronine( $T_3$ ), Thyroxine( $T_4$ )

2. Classification of hormones based on the regulation

BODY FUNCTION	MAJOR REGULATOR HORMONES
<b>Somatic growth</b>	Growth hormone, Insulin like growth factors
<b>Metabolic growth</b>	Triiodothyronine( $T_3$ ), Thyroxine( $T_4$ )
<b>Availability of fuel metabolism</b>	Insulin, Glucagon, Growth hormone
<b>Sex and reproduction</b>	Gonadotropins, Androgens, Estrogens, Progestins
<b>Circulating volume</b>	Aldosterone, Antidiuretic hormone
<b>Adaptation to stress</b>	Adaptation to stress Glucocorticoids, Adrenaline
<b>Calcium balance</b>	Parathormone, Calcitonin, Vitamin D

## Chemotherapeutic Agents

### □ SOME IMPORTANT TERMS AND THEIR DEFINITIONS

TERMS	DEFINITION
<b>Chemotherapy</b>	Process of uses of <b>chemicals (synthetic or natural)</b> to <b>destroy harmful microbes without disturbing the host cell body.</b>
<b>Antibiotics</b>	<b>Produced by microbes</b> and <b>inhibits the growth of microbes</b> at very low concentration.
<b>Antimicrobial agent</b>	<b>Antimicrobial agent is the synthetic or natural substance</b> that are used to <b>treatment</b> of various infection e.g.- <b>bacterial, fungi and viral.</b>
<b>Bactericidal</b>	Means that <b>kills bacteria.</b>
<b>Bacteriostatic</b>	Means that the agent <b>prevents the growth</b> of bacteria.
<b>Antibiotics Resistance</b>	When germs like bacteria or fungi <b>no longer respond</b> to the drugs designed to kill them.

### □ ANTIBIOTICS ARE OBTAINED FROM

MICROORGANISMS	DRUG
<b>Fungi</b>	Penicillin, Griseofulvin, Cephalosporin
<b>Bacteria</b>	Polymyxin B, Tyrothricin, Colistin, Aztreonam, Bacitracin
<b>Actinomycetes</b>	Aminoglycosides, Macrolides, Tetracyclines, Polyenes, Chloramphenicol

### □ CLASSIFICATION OF ANTIMICROBIAL DRUGS

#### A. ACCORDING TO THEIR TYPES OF ACTION

BACTERICIDAL	BACTERIOSTATIC
<p><b>"I m Bactericidal Because A Very Quit Person is Rarely Protected"</b></p> <ul style="list-style-type: none"> <li>○ Isoniazid,</li> <li>○ Metronidazole,</li> <li>○ Beta-lactam antibiotics,</li> <li>○ Bacitracin,</li> <li>○ Aminoglycosides,</li> <li>○ Vancomycin,</li> <li>○ Quinolones,</li> <li>○ Pyrazinamide,</li> <li>○ Rifampicin,</li> <li>○ Polymyxin B</li> </ul>	<p><b>"Static Causes Non Total Or Non Complete Through Massive Elimination"</b></p> <ul style="list-style-type: none"> <li>○ Sulfonamide,</li> <li>○ Chloramphenicol,</li> <li>○ Nitrofurantoin,</li> <li>○ Tetracycline,</li> <li>○ Oxazolidinon,</li> <li>○ Novobiocin,</li> <li>○ Clindamycin,</li> <li>○ Trimethoprim,</li> <li>○ Macrolides,</li> <li>○ Ethambutol</li> </ul>

#### B. ACCORDING TO THEIR CHEMICAL STRUCTURE

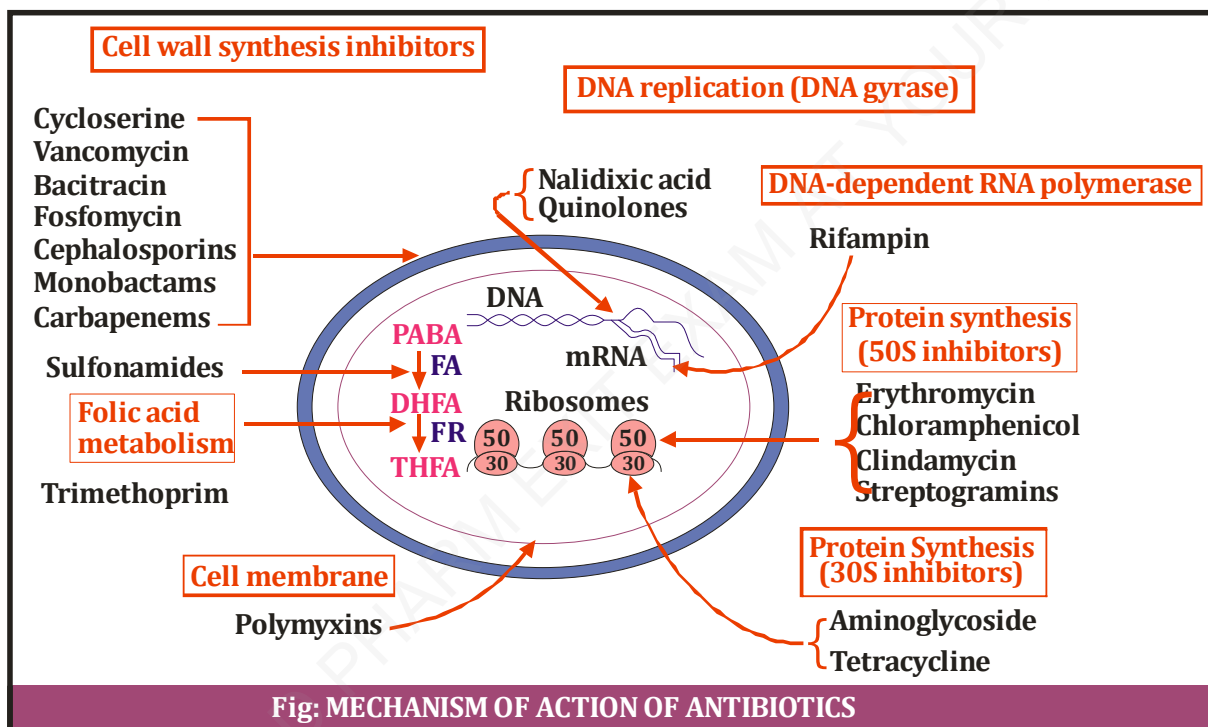
CHEMICAL CLASS	DRUGS
<b>Sulphonamides and related drugs</b>	Sulfadiazine and others, Sulfones, Dapsone (DDS), Para amino salicylic acid (PAS)
<b>Diaminopyrimidines</b>	Trimethoprim, Pyrimethamine
<b>Quinolones</b>	Nalidixic acid, Norfloxacin, Ciprofloxacin, Prulifloxacin.
<b>Beta-Lactam antibiotics</b>	Penicillin's, Cephalosporins, Monobactams, Carbapenems
<b>Tetracyclines</b>	Oxytetracycline, Doxycycline
<b>Nitrobenzene derivative</b>	Chloramphenicol
<b>Aminoglycosides</b>	Streptomycin, Gentamicin, Amikacin, Neomycin
<b>Macrolide antibiotics</b>	Erythromycin, Clarithromycin, Azithromycin, Roxithromycin
<b>Lincosamide antibiotics</b>	Lincomycin, Clindamycin
<b>Glycopeptide antibiotics</b>	Vancomycin, Teicoplanin
<b>Oxazolidinone</b>	Linezolid
<b>Polypeptide antibiotics</b>	Polymyxin B, Colistin, Bacitracin, Tyrothricin

<b>Nitrofuran derivatives</b>	Nitrofurantoin, Furazolidone
<b>Nitroimidazoles</b>	Metronidazole, Tinidazole
<b>Nicotinic acid derivatives</b>	Isoniazid, Pyrazinamide, Ethionamide
<b>Polyene antibiotics</b>	Nystatin, Amphotericin B, Hamycin
<b>Azole derivatives</b>	Miconazole, Clotrimazole, Ketoconazole, Fluconazole
<b>Others</b>	Rifampicin, Spectinomycin, Sod. fusidate, Cycloserine, Vancomycin, Ethambutol, Clofazimine, Griseofulvin

**C. ACCORDING TO THEIR SPECTRUM OF ACTIVITY**

NARROW SPECTRUM (Active against limited pathogens)	BROAD SPECTRUM (Active against Gram + & -ve bacteria)
Penicillin G, Streptomycin, Erythromycin	Tetracyclines, Chloramphenicol

**❖ Mechanism of action of antibiotics**



**❑ DRUGS AND THEIR TOXICITY/ SYNDROME**

DRUGS	TOXICITY/SYNDROME
<b>Aminoglycoside</b>	Ototoxicity, Nephrotoxicity, Neuromuscular blockade
<b>Tetracyclines</b>	Hepatotoxicity, Nephrotoxicity
<b>Chloramphenicol</b>	Gray baby syndrome, Bone marrow depression, Diarrhoea, Superinfection
<b>Quinolones</b>	Phototoxicity
<b>Bacitracin, Polyenes, Polypeptide</b>	Nephrotoxicity
<b>Polymyxin B</b>	Neurotoxicity, Nephrotoxicity
<b>Vancomycin</b>	Redman syndrome, Ototoxicity, Nephrotoxicity
<b>Penicillin, Cephalosporin</b>	Hypersensitivity reaction
<b>Sulphonamides</b>	Steven-Johnson syndrome, Kernicterus, Crystalluria, Hypersensitivity reaction



# PHARMACOGNOSY

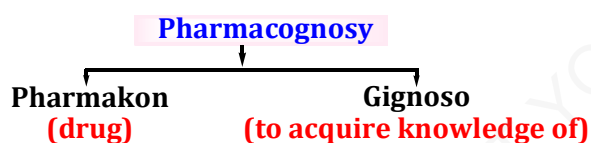
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## Definition, History, Present Status and Scope of Pharmacognosy

- Pharmacognosy, defined as the **scientific study of crude drugs** obtained from **plants, animals and mineral** kingdom and their constituents. Known initially as *materia medica*.  
Derived from **two Greek words**-



### ❑ BASIC SOURCE OF ORIGINS OF CRUDE DRUG

SOURCE OF ORIGIN	EXAMPLE
<b>Plant source</b>	Senna leaf, Cinchona bark, Nux- vomica seed, Rauwolfia root, Clove bud etc.
<b>Animal source</b>	Wool, Silk, Honey, Shark liver oil, Cantharides and Insulin etc.
<b>Mineral</b>	Asbestos, Chalk, Kaolin, Bentonite etc.
<b>Marine</b>	Agar-agar, Holotoxin A, Manoalide, Ciguatoxin, Ara-C etc.
<b>Microorganism</b>	<i>Bacillus subtilis</i> (Bacitracin) <i>Streptomyces venezuelae</i> (Chloramphenicol) <i>Streptomyces griseus</i> (Streptomycin)
<b>Biotechnology</b>	Recombinant DNA technology - Human growth hormone, Humulin.

### ❑ HISTORY OF PHARMACOGNOSY

SCIENTIST	CONTRIBUTION
<b>Dioscorides</b>	• <b>Father of Pharmacognosy</b> ( <i>Materia Medica</i> )
<b>Seydler</b>	• Coined the term " <b>Pharmacognosy</b> " 1815 ( <i>Analecta Pharmacognostica</i> )
<b>Theophrastus</b>	• <b>Father of Botany</b>
<b>Aristotle</b>	• <b>Father of Zoology</b> , Father of Natural History
<b>Hippocrates</b>	• <b>Father of Medicine</b>
<b>Galen</b>	• <b>First pharmacist</b> , Father of Experimental Physiology
<b>Bentham &amp; Hooker</b>	• <b>Plant classification</b> was further developed by them
<b>Shen Nung</b>	• <b>Pen-t Sao</b> (The oldest known herbal, Contain 365 drugs).
<b>Charaka</b>	• <b>Charaka Samhita</b> - Arranged 50 group of 10 Herbs.
<b>Sushruta</b>	• <b>Father of Cosmetic Surgery</b> , Arranged 760 herbs in 7 distinct set
<b>Haberlandt</b>	• <b>Father of Plant Tissue Culture</b>
<b>Stass and Otto</b>	• <b>A new extraction process for Alkaloid was developed.</b>
<b>Mahadeva Lal Schroff</b>	• <b>Father of Indian Pharmacy</b> • His birth anniversary (6 march) is celebrated as national pharmacy education day.

➤ Based on origin

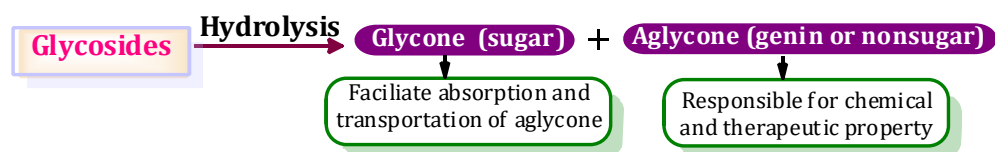
Types		Explanation and example
1.	<b>True alkaloids</b>	Nitrogen in heterocyclic ring and originate from amino acid. eg- Atropine, Morphine, Nicotine
2.	<b>Proto alkaloids (Amino alkaloids)</b>	Contains nitrogen but not in ring system and originate from amino acid. eg- Mescaline, Ephedrine, Colchicine.
3.	<b>Pseudo alkaloids</b>	Do not originate from amino acid. eg- Purine alkaloids, Terpenes and Steroid like alkaloids.

❖ Chemical test :-

General test		
Testname	Composition	Result
Mayer's reagent	Alkaloid + Mayer's reagent <b>(Potassium Mercuric iodide solution)</b>	Creamy precipitate
Wagner's reagent	Alkaloid + Wagner's reagent <b>(Iodine-Potassium iodide solution)</b>	Reddish brown precipitate
Dragendorff's reagent	Alkaloid + Dragendorff's reagent <b>(Potassium Bismuth iodide solution)</b>	Reddish brown precipitate
Hager's reagent	Alkaloid + Hager's reagent <b>(Picric acid)</b>	Yellow precipitate
Test for Tropane alkaloid		
Vitali-Morin Test	Test solution + Fuming HNO <sub>3</sub> + Evaporate to dry at 100°C + 3 % Methanolic KOH solution + acetone solution of nitrate	Violet colour Presence of tropane Alkaloids e.g.-Datura, Belladonna, Hyoscyamus
Test for Quinoline alkaloid (Cinchona)		
Thalleoquin test	Bromine water + Dilute ammonia solution	Emerald green colour
Blood red Test	Dry Powder + glacial Acetic acid	Red Fumes appears / Purple color vapour
Fluorescent test	Drug moisten with H <sub>2</sub> SO <sub>4</sub> under UV light	Blue fluorescence
Test for Iso-quinoline alkaloids		
Opium		
Marquis Test (test for morphine)	Conc. H <sub>2</sub> SO <sub>4</sub> + formaldehyde	Dark Violet / Deep reddish purple colour
Meconic Acid Test	Aqueous solution of drug + FeCl <sub>3</sub> solution	Deep reddish purple
Ipecacuanha (Emetine)		
Frohde's Reagent Test	Powdered drug + Conc. H <sub>2</sub> SO <sub>4</sub> + Sodium Molybdate (Frohde's Reagent)	Emerald green colour
Test for Indole alkaloids		
Ergot		
Van-Urk's test	Ergot + p dimethylaminobenzaldehyde	Blue colour
Fluorescent test	Ergometrine + Water	Blue Fluorescence
Test for Purine alkaloids		
Murexide test	Caffeine + HCl + Potassium chlorate	Purple colour on exposing vapours of dilute ammonia.

❑ **GLYCOSIDES**

- It may be defined as the organic compounds from plant or animal sources which on enzymatic or acid hydrolysis give one or more sugar and non-sugar moiety.



❖ **Surgical catgut**

Catgut is a suture obtained from the intestines of animals such as sheep, *Ovis Aries*.

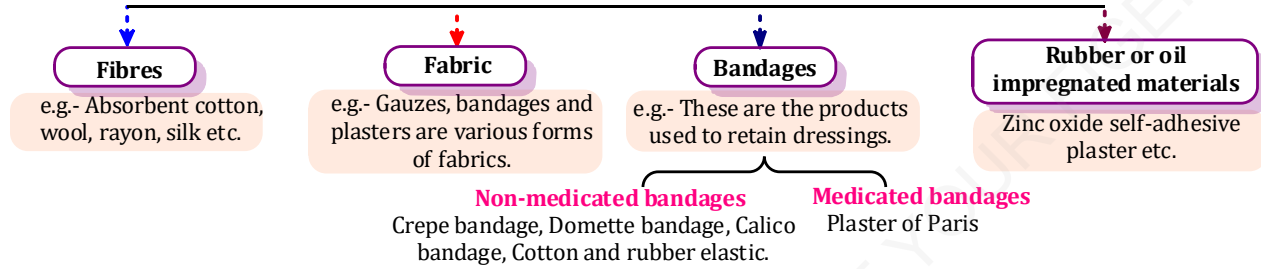
- It has high tensile strength to hold together the sewed tissues.
- It is degraded by the body's proteolytic enzymes.
- It is used as absorbable suture for internal surgeries.

❖ **Ligatures-** Ligatures It is a sterile strand used to stop bleeding.

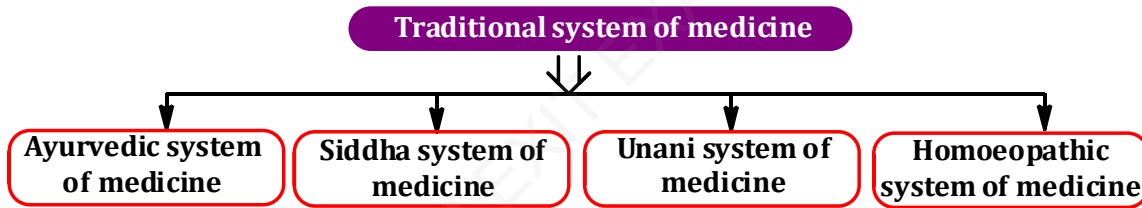
❖ **Surgical dressing-**

The word surgical dressing is used to include all the materials used, either alone or in combination, to cover the wound.

Surgical dressings are classified as:



**Basic Principles Involve in the Traditional System of Medicine**



❖ **Traditional and alternative system of medicine**

**Ayurveda System of Medicine**

- Dhanvantari is the divine founder of Ayurveda (Father of Ayurveda)
- The well-known treatises in Ayurveda are **Charaka Samhita** and **Sushruta Samhita**.
- Ayurveda is the science of life, **AYUR means Life** and **VEDA means Science**.

**Objectives** - The maintenance and promotion of positive health and the cure of disease through medicine, dietary restrictions, and a regulated lifestyle.

**PRINCIPLES OF AYURVEDA**

**Panchamahabhutas**

Everything in the universe is composed of five basic elements viz. **space, air, energy, liquid and solid.**

**Tridosha**

The elements exist in the human body in combined forms called **tridosha**.

**Vata**:-space & air  
**Pitta**:-energy & liquid  
**Kapha**:-liquid & solid

**Saptadhatu**

Tridosha exist in human body in seven forms called **Saptadhatu**

- 1.Rasa (Lymph), 5.Majja (Bone marrow), 2.Rakta (Blood), 6.Shukra (Reproductive)
- 3.Mamsa (Flesh), 7.Asthi (Bones), 4.Meda (Adipose tissue),

**Panchsheel**

Five characters used to treat pathological condition

**Rasa**

Taste

**Guna**

Physico-chemical properties

**Virya**

Potency

**Vipak**




Post digestive effect

**Prabhava**





Unique effect of drug

200

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<p><b>Siddha System of Medicine</b></p> 	<ul style="list-style-type: none"> <li>The term Siddha means 'achievements' and Siddhars means 'perfection' in life or heavenly bliss.</li> <li>The origin of Siddha medicine is also attributed to <b>sage Agasthya</b>.</li> <li>Most Siddha literature is written in Tamil.</li> <li>In this system, mainly minerals and metals are used.</li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>Principle</b></p> <p>Matter <b>cannot exist without energy inherent in it</b> and vice versa. They are the primordial elements (bhutas), Their names are:- <b>Munn (solid), Neer (fluid), Thee (radiance), Vayu (gas) and Aakasam (ether).</b></p> </div>										
<p><b>Unani System of Medicine</b></p> 	<ul style="list-style-type: none"> <li>Originated in Greece by Greek philosopher, physician <b>Hippocrates. Who is considered the "Father of Medicine."</b></li> <li><b>Aristotle Golen</b>, made contribution in it.</li> <li>Aim at treating cause of disease and not its symptoms</li> </ul> <p style="text-align: center;"><b>This system is based on two theories</b></p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>Hippocratic theory of four humours</b></p> <p>Blood, Phelgm, Yellow bile and Black bile.</p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>Pythagorian theory of four proximate qualities</b></p> <p>The states of living human body like <b>hot, cold, moist and dry.</b></p> </div> </div>										
<p><b>Homeopathic System of Medicine</b></p> 	<ul style="list-style-type: none"> <li>Derived from the Greek words "<b>Homoios,</b>" meaning "<b>like,</b>" and "<b>Pathos,</b>" meaning "<b>treatment.</b>"</li> <li><b>Samuel Hahnemann</b> a German physician put forth the <b>Law of Similars</b> which says that "<b>like cures like</b>" (<i>Similae similibus curentur</i>).</li> <li>He proposed that the <b>cause of the disease itself could be used for its treatment.</b></li> </ul> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p><b>Fundamental Principles of Homoeopathy</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">1. Law of Similia.</td> <td style="width: 50%;">6. Vital force.</td> </tr> <tr> <td>2. Law of Simplex.</td> <td>7. Acute and Chronic Diseases.</td> </tr> <tr> <td>3. Law of minimum.</td> <td>8. Individualization.</td> </tr> <tr> <td>4. Drug proving.</td> <td>9. Direction of cure.</td> </tr> <tr> <td>5. Drug dynamization or potentization.</td> <td></td> </tr> </table> </div>	1. Law of Similia.	6. Vital force.	2. Law of Simplex.	7. Acute and Chronic Diseases.	3. Law of minimum.	8. Individualization.	4. Drug proving.	9. Direction of cure.	5. Drug dynamization or potentization.	
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5. Drug dynamization or potentization.											







❖ **Ayurvedic formulations**

AYURVEDIC FORMULATIONS	DESCRIPTION
<p><b>Arista</b></p> 	<ul style="list-style-type: none"> <li>The crude drugs are powdered and its decoction (kashaya) is prepared. The decoction is filtered and transferred to fermentation vessel. Sugar or jaggery as required is added to the vessel and boiled</li> </ul> <p><b>e.g:- ashokaista, Dashamoolarista</b></p>
<p><b>Asava</b></p> 	<ul style="list-style-type: none"> <li>The sugar or jaggery is added to water, boiled and cooled This is transferred to fermentation vessel and drugs in the powder form are added to it.</li> </ul> <p><b>e.g:- Vasakasava, Punarnavasava</b></p>
<p><b>Gutika</b></p> 	<ul style="list-style-type: none"> <li>Gutika are available as medicated pills.</li> <li>Gutika should be consumed within two years.</li> </ul> <p><b>e.g:- Lohsunadi gutika, Raj gutika, Marma gutka etc.</b></p>
<p><b>Taila</b></p> 	<ul style="list-style-type: none"> <li>Taila or medicated oils.</li> <li>Prepared by boiling oil with kashaya (decoction) and Kalka's (paste) of the drugs.</li> </ul> <p><b>e.g.- Bhringaraja Taila, Maha Narayan Taila</b></p>

## Herbal Cosmetics

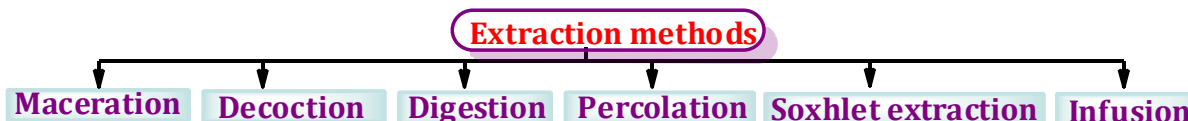
Herbal cosmetics are beauty products, formulated using various herbal ingredients to provide defined cosmetic benefits.

### ❖ Herbs used in cosmetics-

Crude drug	Biological source	Chemical constituent	Cosmetic use
<b>Aloe vera gel</b> 	Leaf parenchyma of Aloe species such as <i>Aloe vera</i> and <i>Aloe ferox</i> . <b>Family:</b> Liliaceae	<ul style="list-style-type: none"> <li>• Aloin</li> <li>• Aloe-emodin</li> <li>• Barbaloin</li> </ul>	Reduce sign of ageing, fight acne and even remove dark circles
<b>Almond oil</b> 	Obtained from <i>Prunus amygdalus var. amara</i> <b>Family:</b> Rosaceae	<ul style="list-style-type: none"> <li>• Amygdalin,</li> <li>• On hydrolysis, yields hydrocyanic acid and benzaldehyde</li> </ul>	Demulcent in skin lotions
<b>Lavender oil</b> 	Obtained by steam distillation of fresh flowering tops of <i>Lavandula officinalis</i> <b>Family:</b> Labiatae	<ul style="list-style-type: none"> <li>• Linalyl acetate</li> <li>• Pinene</li> <li>• Geraniol</li> <li>• Linalool</li> </ul>	Improving acne and soothes skin, reduces wrinkles
<b>Olive oil</b> (Salad oil) 	Fixed oil expressed from the ripe fruit of <i>Olea europaea</i> <b>Family:</b> Oleaceae	<ul style="list-style-type: none"> <li>• Olein,</li> <li>• Linolein</li> </ul>	Soften the skin, Demulcent
<b>Rosemary oil</b> 	Fresh flowering tops of the plant <i>Rosmarinus officinalis</i> <b>Family:</b> Labiatae	<ul style="list-style-type: none"> <li>• Borneol,</li> <li>• Bornyl acetate,</li> <li>• Camphor</li> </ul>	Glowing skin, soothes the skin, and revives dull skin
<b>Sandalwood oil</b> 	Obtained by steam distillation from the heart-wood of <i>Santalum album</i> <b>Family:</b> Santalaceae	<ul style="list-style-type: none"> <li>• <math>\alpha</math>-santalol</li> <li>• <math>\beta</math>-Santalol</li> </ul>	Perfumes, Powders, and facial creams and masks

## Phytochemical Investigation of Drugs

- ❖ **Phytochemicals** - Naturally occurring and biologically active chemical compounds present in plants.
- ❖ **Phytochemical investigation** - The study of identifying, isolating, and characterizing these bioactive compounds in plants using techniques.
- ❖ **Herbal extraction** - Technique for the separation of active ingredients from crude drug is called 'Extraction'.





# PHARMACEUTICAL CHEMISTRY

SCAN ME



EXIT EXAM  
Preparation App

## Introduction to Pharmaceutical Chemistry, Sources and Types of Errors and Impurities In Pharmaceuticals

### ❑ ERROR

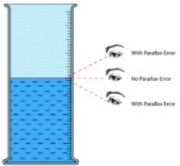
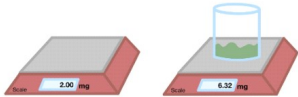

- The difference between the true value or standard value and observed value is called error.
- The difference between the experimental mean and a true value is known as 'absolute error'.
- The **relative error** is the value found by dividing the absolute error by the true value.

$$\text{Relative error} = \frac{\text{Measured mean value} - \text{True value}}{\text{True value}}$$

### ❖ Classification of Errors

Determinate errors or systematic errors	Indeterminate errors or random errors or accidental errors
These errors have definite values	These errors arise due to random fluctuations in procedures and measuring devices
They have assignable cause	They have no specific cause
They are unidirectional	They are bidirectional
They are under the control of the experimenter	They are beyond the control of the experimenter

### ➤ Determinate (Systematic) Errors

<b>Personal Errors</b>	These errors occur by persons who are handling the method of analysis. The error may be resulted due to carelessness or ignorance and even by unskilled persons.	
<b>Instrumental Errors</b>	These are invariably caused due to faulty and uncalibrated instruments, such as: pH meters, single pan electric balances, UV-spectrophotometers, potentiometers etc.	
<b>Reagent Errors</b>	These errors are resulted by using chemicals and reagents with impurities or contaminants which may interfere with the reactions, thus affects the result.	
<b>Constant Errors</b>	Multiple measurements show the same constant error.	
<b>Proportional Errors</b>	The absolute value of this kind of error changes with the size of the sample in such a fashion that the relative error remains constant.	

## Acid Base Titration

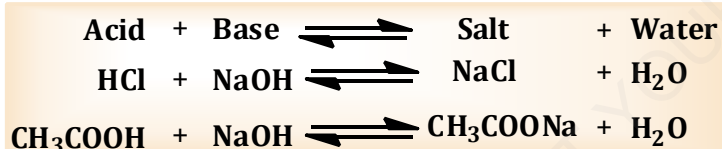
### ❑ ACID-BASE TITRATION

#### ❖ Introduction

- An acid base titration is a quantitative analysis method for estimating the **concentration of an acid or base** by precisely neutralizing it with a known **concentration standard solution of base or acid**.
- The titration of acids and bases is also known as neutralization titration.

#### ➤ An acid-base titration can be used to determine the following.

- The **strength of an acid or base**
- The **strength or weakness of an unknown acid or base**.
- The **pKa of an unknown acid or the pKb of an unknown base**, where pKa and pKb are numbers that describe the acidity and basicity respectively of a particular molecule.

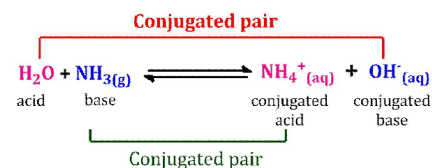


#### ❖ Theories of acid and Base

COMPOUND	ARRHENIUS	BRONSTED-LOWRY	LEWIS
<b>ACID</b>	Proton (H <sup>+</sup> ) donor in aqueous medium $\text{HCl} + \text{Water} \rightarrow \text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq})$	Proton (H <sup>+</sup> ) donor $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$	Electron pair acceptor $\text{Ag}^+, \text{Fe}^+, \text{Zn}^{2+}, \text{Na}^+, \text{Al}^{3+}, \text{AlCl}_3$
<b>BASE</b>	Hydroxide (OH <sup>-</sup> ) donor in aqueous medium $\text{NaOH} + \text{Water} \rightarrow \text{Na}^+(\text{aq}) + \text{OH}^-(\text{aq})$	Proton (H <sup>+</sup> ) acceptor $\text{NH}_3 + \text{H}^+ \rightarrow \text{NH}_4^+$	Electron pair donor $\text{NH}_3, \text{H}_2\text{O}, \text{OH}^-, \text{Cl}^-$

#### ❖ Conjugate Acid and Base

- Conjugated Acid:** Conjugated acid is the substance which can be formed by the loss of a proton.
- Conjugated Base:** Conjugated base is the substance which can be formed by the gain of a proton.
- Example of conjugate Acid & Base**



ACID	CONJUGATE BASE	BASE	CONJUGATE ACID
H <sub>2</sub> F <sup>+</sup>	HF	NH <sub>3</sub>	NH <sub>4</sub> <sup>+</sup>
H <sub>2</sub> SO <sub>4</sub>	HSO <sub>4</sub> <sup>-</sup>	OH <sup>-</sup>	H <sub>2</sub> O
HNO <sub>3</sub>	NO <sub>3</sub> <sup>-</sup>	CH <sub>3</sub> NH <sub>2</sub>	CH <sub>3</sub> NH <sub>3</sub> <sup>+</sup>
H <sub>3</sub> O <sup>+</sup>	H <sub>2</sub> O	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	C <sub>6</sub> H <sub>5</sub> NH <sub>3</sub> <sup>+</sup>

#### ➤ Types of Acid-base Titration

S.NO	TYPES	EXAMPLES
1.	Strong acid-strong base	Hydrochloric acid and Sodium hydroxide
2.	Weak acid-strong base	Ethanoic acid and Sodium hydroxide
3.	Strong acid-weak base	Hydrochloric acid and Ammonia
4.	Weak acid-weak base	Ethanoic and Ammonia

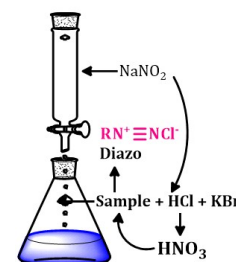
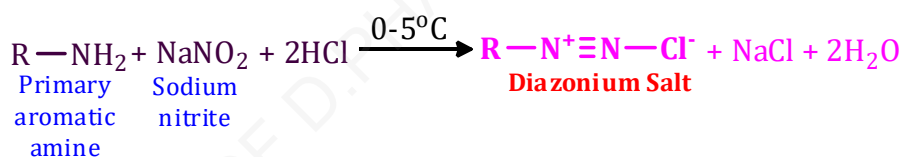
Types of Complexometric titration	
<b>Direct Titration</b>	It is the simplest and the most convenient method used in chelometry. In this method, the standard chelon solution is added to the metal ion solution until the end point is detected.
<b>Back Titration</b>	In this method, excess of a standard EDTA solution is added to the metal solution, which is to be analyzed, and the excess is back titrated with a standard solution of a second metal ion. <b>Example: Determination of Mn</b>
<b>Replacement Titration</b>	In this method the metal, which is to be analyzed, displaces quantitatively the metal from the complex.
<b>Indirect Titration</b>	This method also known as Alkalimetric titration. It is used for the determination of ions such as anions, which do not react with <b>EDTA chelate</b> .

### ❖ Indicators In Complexometric Titration

INDICATOR	pH RANGE	COLOUR CHANGE	METALS DETECTED
Sodium alizarie sulphate	4	Blue to red	Al, Th
Alizarine	4.3	Red to yellow	Pb, Zn, Co, Mg, Cu
Xylenol orange	1 to 6	Lemon to yellow	Bi, Pb, Zn, Cd, Hg, Th
Methyl blue	4 to 5	Blue to yellow	Pb, Zn, Cd, Hg
Murexide	12	Violet to blue	Ca, Cu, Co
Mordant Black II	6 to 7	Red to Blue	Ca, Ba, Mg, Zn, Cd, Mn, Pb, Hg
Eriochrome Black T	6 to 7	Red to Blue	
Solochrome black T	6 to 7	Red to Blue	
Catechol Violet	8 to 10	Violet to red	Mn, Mg, Fe, Co, Pb
Thymol blue	10 to 12	Blue to gray	Pb, Zn, Cd, Hg

### Diazotization Titration

The diazotization titration is simply conversion of the primary aromatic amine to a Diazonium compound. In this method, the primary aromatic amine is reacted with the sodium nitrite in acidic medium to form a Diazonium salt



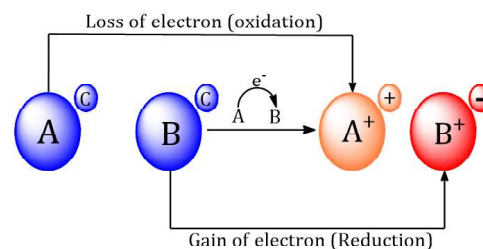
### Redox Titration

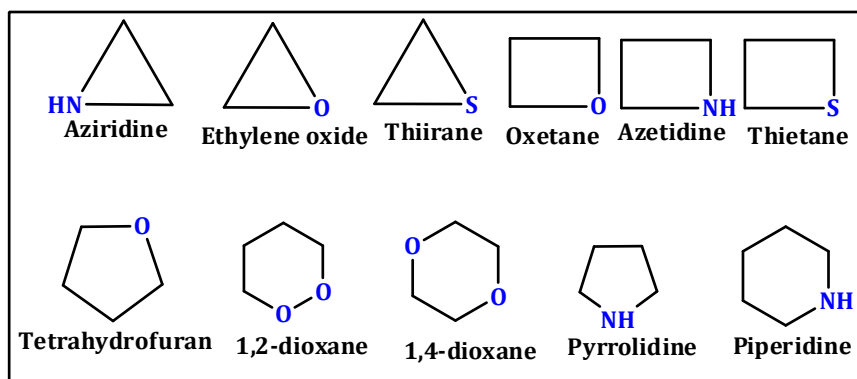
- Redox titration is a type of titration based on a **redox chemical reaction between analyte and titrant**.
- Redox titration refers to a laboratory method to **determine the analyte concentration** by carrying out a redox reaction between the analyte and the titrant
- The redox titration often needs a redox indicator or a potentiometer.

Reduction + Oxidation = Redox

#### ❑ PRINCIPLE

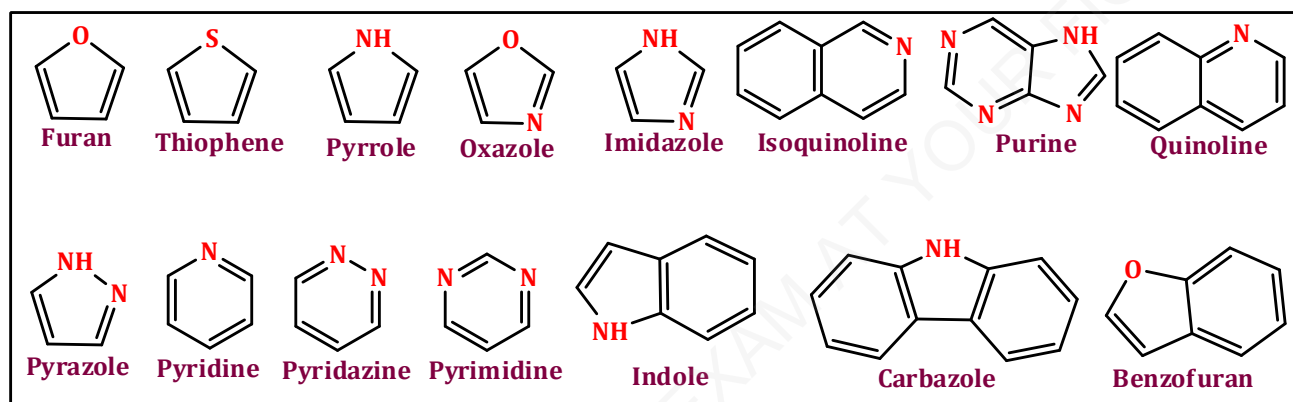
- The **loss of electrons** and the corresponding **increase in the oxidation state** of a given reactant is called oxidation.
- The **gain of electrons** and the corresponding decrease in the oxidation state of a reactant is called reduction.





### ❖ Aromatic Heterocyclic Compounds

- Aromatic heterocyclic compounds are **cyclic aromatic compounds**.



### ❖ Hantzsch-Widman System of Nomenclature

- This nomenclature system specifies the **nature, position, ring size, number and types of hetero atoms present in any heterocyclic compounds**.
- This system of nomenclature applies to monocyclic three to ten membered ring heterocycles.
- The nomenclature of heterocyclic compounds is assigned by combining '**Prefix**' (that indicate the heteroatom present) with '**Stem**' (that indicate the ring size as well as the saturation and unsaturation in the ring) and '**suffixes**'.

**Prefix + Stem + Suffix**

#### ➤ Common prefix for heteroatoms (arranged in the preferential order)

HETEROATOM	SYMBOL	PREFIX
Oxygen	O	Oxa
Sulphur	S	Thia
Nitrogen	N	Aza
Phosphorous	P	Phospha
Selenium	Se	Selena

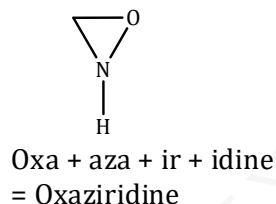
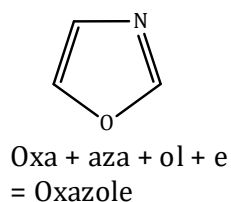
#### ➤ Common suffix for heteroatom (according to the ring size and preferential order)













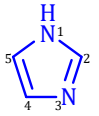
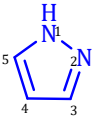
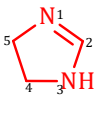
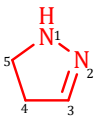
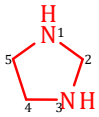
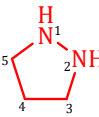


RING SIZE	SUFFIX	RING SIZE	SUFFIX
3	ir	7	ep
4	et	8	oc
5	ol	9	on
6	in	10	ec

➤ Size and Degree of Unsaturation

RING SIZE	SATURATED	UNSATURATED	SATURATED (WITH NITROGEN)
3	-irane	-irene	-iridine
4	-etan	-ete	-etidine
5	-olane	-ole	-olidine
6	-ane	-in	-
7	-epane	-epin	-
8	-ocane	-	-ocin
9	-onan	-onin	-
10	-ecan	-ecin	-

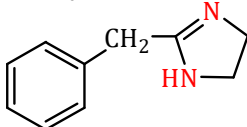
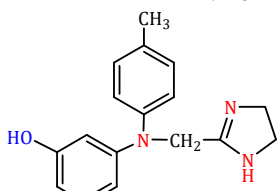
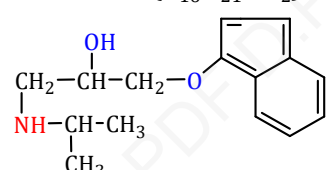
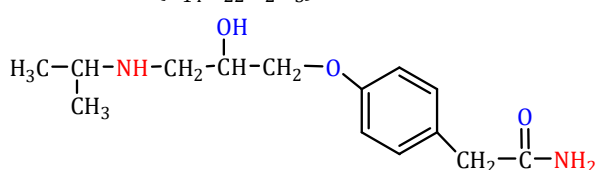
➤ Example



3-MEMBERED RINGS		4-MEMBERED RINGS	
COMPOUND	STRUCTURE	COMPOUND	STRUCTURE
Aziridine		Azetidine	
Oxirane		Azete	
Thiirane		Oxetane	
5-MEMBERED RINGS			
COMPOUND	STRUCTURE	COMPOUND	STRUCTURE
Pyrrole		Thiophene	
Furan		Pyrroline	
Pyrrolidine		Dihydrofuran	
Imidazole		Pyrazole	
Imidazoline		Pyrazoline	
Imidazolidine		Pyrazolidine	
Thiazole		Oxazole	

<b>β-blocker</b>	Non-selective	Propranolol
	β <sub>1</sub> -blocker	Atenolol
	α and β Blocker	Carvedilol

➤ **Antiadrenergic drugs**

<p><b>TOLAZOLINE</b> (C<sub>10</sub>H<sub>12</sub>N<sub>2</sub>)</p>  <p><b>IUPC Name-</b> 2-Benzyl-4,5-dihydro-1H-imidazole  <b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Tolazine, Tolazoline</li> </ul> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• For adults 25 mg slowly injected, then increased upto 50 to 75 mg twice/day to 2 or 3 times/week.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• It is used to treat peripheral vascular disorders. In Raynaud's disease</li> <li>• It also stimulates gastric secretion.</li> <li>• In treatment of iritis.</li> </ul>	<p><b>PHENTOLAMINE</b> (C<sub>17</sub>H<sub>19</sub>N<sub>3</sub>O)</p>  <p><b>IUPC Name-</b> 3-[(4,5-Dihydro-1H-imidazol-2-ylmethyl)(4-methylphenyl)amino]phenol  <b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Fentanor, Phentosol, Regitine</li> </ul> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• Its usual dose is 5 mg I.V. injection, repeated as required.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• It is used to control hypertension produced by Pheochromocytoma and cocaine-induced cardiovascular complications.</li> </ul>
<p><b>PHENOXYBENZAMINE</b> (C<sub>18</sub>H<sub>22</sub>ClNO)</p> <p><b>Popular Brand Names</b>  Dibenzyline, Fenoxene, Biophenox</p> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• The usual dose initially 10 mg/day, increased gradually to 60 mg/day in divided doses.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• It is used in the treatment of hypertension, specifically that caused by Pheochromocytoma.</li> </ul>	<p><b>PRazosin</b> (C<sub>19</sub>H<sub>21</sub>N<sub>5</sub>O<sub>4</sub>)</p> <p><b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Minipress, Prazocin – 5, Prazopil xl</li> </ul> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• Usual Dose 1–4 Mg two times a day/three times a day.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• Prazosin is a medication used to manage and treat hypertension, post-traumatic stress disorder (PTSD), and Raynaud disease.</li> </ul>
<p><b>PROPRANOLOL</b> (C<sub>16</sub>H<sub>21</sub>NO<sub>2</sub>)</p>  <p><b>IUPC Name-</b> 1-(1-methylethylamino)-3-(1-naphthoxy)propan-2-ol  <b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Inderal, P-nolol, Proplace</li> </ul> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• The oral adult dose for arrhythmias is 10 to 30 mg 3 to 4 times/day.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• It is used to treat high blood pressure, irregular heartbeats, shaking, and other conditions.</li> <li>• It is also used to prevent migraine headaches and chest pain.</li> </ul>	<p><b>ATENOLOL</b> (C<sub>14</sub>H<sub>22</sub>N<sub>2</sub>O<sub>3</sub>)</p>  <p><b>IUPC Name-</b> 2-{4-[2-Hydroxy-3-(propan-2-ylamino)propoxy]phenyl}acetamide  <b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Tenolol-50, Atenolol- Stada, Hipres – 50</li> </ul> <p><b>Dose</b></p> <ul style="list-style-type: none"> <li>• The usual dose is 50 mg/day once daily.</li> </ul> <p><b>Medicinal Uses</b></p> <ul style="list-style-type: none"> <li>• Atenolol is used to treat angina (chest pain), hypertension (high blood pressure) and cardiac arrhythmias.</li> </ul>

**CARVEDILOL** (C<sub>24</sub>H<sub>26</sub>N<sub>2</sub>O<sub>4</sub>)

**Popular Brand Names-** Carvenol – 25, Coreg, Carvedrol – 3.125

**Dose-** Start with 3.125 mg twice a day for 2 weeks or maximum 25 mg twice a day.

**Medicinal Uses**

- It is used to treat lowering high blood pressure and helps prevent strokes, heart attacks, and kidney problems.

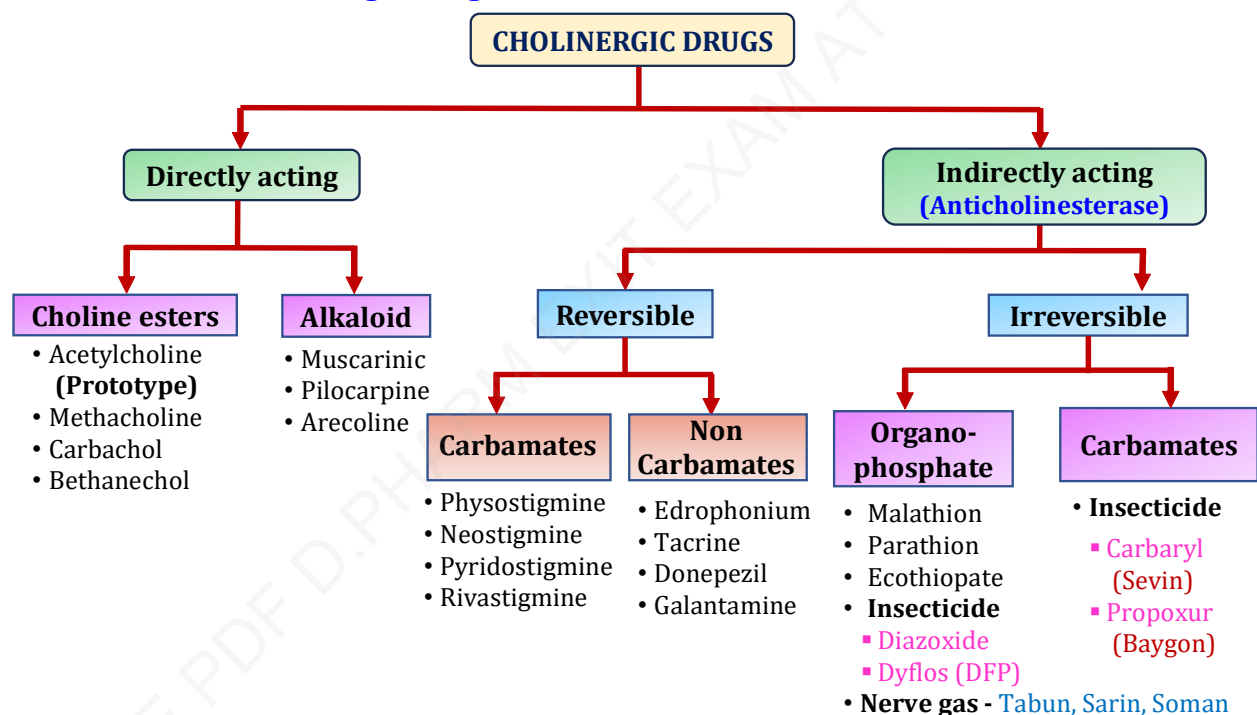
➤ **Important points -**

- **Propranolol-** Currently, it is approved for hypertension associated cardiac arrhythmia, angina pectoris, due to coronary atherosclerosis and prophylaxis of migraine headache.
- **Labetalol & Carvedilol-** It acts on both β and α-adrenergic receptors.
- **Pindolol** possesses partial agonist activity (**intrinsic sympathomimetic activity, ISA**).

❑ **CHOLINERGIC DRUGS (CHOLINOMIMETIC, PARASYMPATHOMIMETIC)**

- Acetylcholine receptor stimulants and cholinesterase inhibitors together comprise a large group of drugs, called as cholinergic drugs that mimic the actions of acetylcholine.
- Cholinoceptor stimulants are classified pharmacologically by the spectrum of action depending on the type of receptor **muscarinic or nicotinic**.

❖ **Classification of Cholinergic Drugs**



➤ **Cholinergic drugs**

<p><b>ACETYLCHOLINE</b> (C<sub>7</sub>H<sub>16</sub>NO<sub>2</sub>)</p> $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2-\text{CH}_2-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}^+}}-\text{CH}_3$ <p><b>IUPC Name-</b> 2-Acetoxy-N,N,N-trimethylethanaminium</p> <p><b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Miochol E, N-acetylcysteine, Mucomyst</li> </ul>	<p><b>CARBACHOL</b> (C<sub>6</sub>H<sub>15</sub>ClN<sub>2</sub>O<sub>2</sub>)</p> $\text{NH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2-\text{CH}_2-\overset{\text{CH}_3}{\underset{\text{CH}_3}{\text{N}^+}}-\text{CH}_3 \text{Cl}^-$ <p><b>IUPC Name-</b> 2-[(Aminocarbonyl)oxy]-N,N,N-trimethylethanaminium chloride</p> <p><b>Popular Brand Names</b></p> <ul style="list-style-type: none"> <li>• Isopto Carbachol, Miostat, Carbacare</li> </ul>
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# BIOCHEMISTRY

SCAN ME

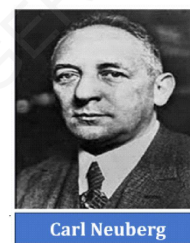


EXIT EXAM  
Preparation App

## Introduction of Biochemistry

### INTRODUCTION

- Biochemistry can be simply defined as, “**chemistry of the living cell**”.
- The term Biochemistry was introduced by **Carl Neuberg in 1903**.
- The living matter is composed of mainly six elements—carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur.

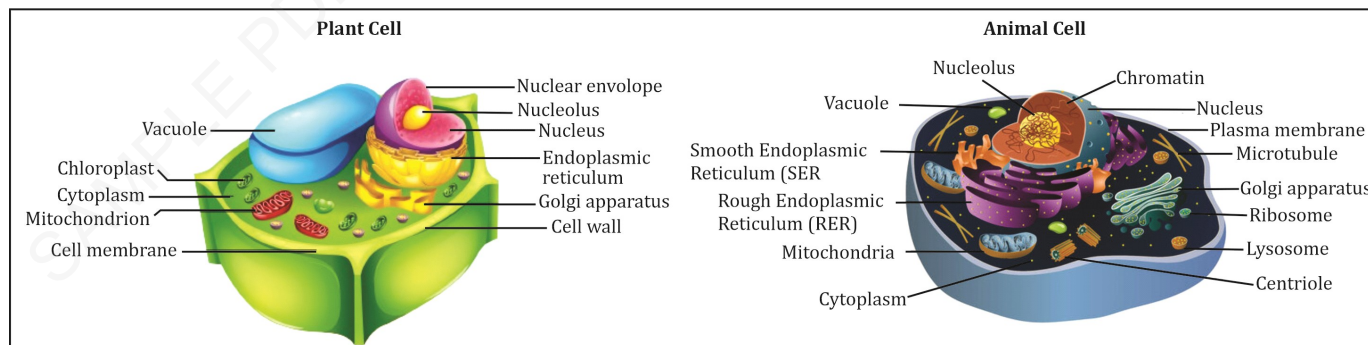


### The major complex biomolecules of cells

BIOMOLECULE	BUILDING BLOCK (REPEATING UNIT)	MAJOR FUNCTIONS
<b>Protein</b>	Amino acids	Fundamental basis of structure and function of cell (static and dynamic functions).
<b>Deoxyribonucleic acid (DNA)</b>	Deoxyribonucleotides	Repository of hereditary information.
<b>Ribonucleic acid (RNA)</b>	Ribonucleotides	Essentially required for protein biosynthesis.
<b>Polysaccharide (glycogen)</b>	Monosaccharides (glucose)	Storage form of energy to meet short term demands.
<b>Lipid</b>	Fatty acids, glycerol	Storage form of energy to meet long term demands; structural components of membranes.

### CELL

- The cell is the basic **unit of life, structural and functional unit of an organism**.
- Anton von leeuwenhoek first saw and described a living cells.
- Cell word was first introduced by **Robert Hooke in 1665**. he was observing some slices of bottle cork under microscope.



### TYPES OF CELLS

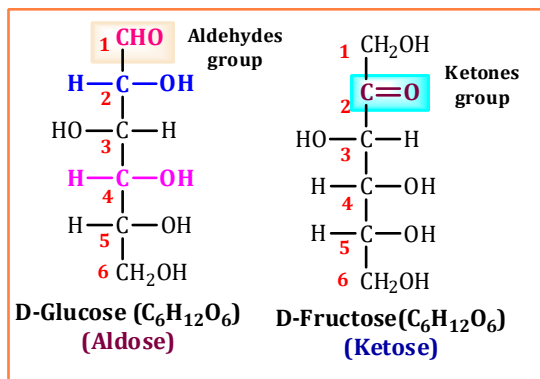
- **Two types**
  - Prokaryotes cells
  - Eukaryotes cells

<b>Cell wall</b>	<ul style="list-style-type: none"> <li>• Three-layered structure made up of lipids and proteins.</li> <li>• <b>Thickness</b> 70 Å in consists of <b>Lignin, hemi cellulose, pectin and cellulose.</b></li> </ul>
<b>Lysosomes</b>	<ul style="list-style-type: none"> <li>• "Suicide bags" of the cell.</li> <li>• <b>Sphere-shaped sacs filled with hydrolytic enzymes. Acid phosphatase</b> is the marker enzyme</li> </ul>
<b>Nucleolus</b>	<ul style="list-style-type: none"> <li>• Nucleolus is <b>synthesis of rRNA</b>. Stores ribosomal RNA and controls synthesis of <b>ribosomes and proteins.</b></li> </ul>
<b>Nuclear membrane</b>	<ul style="list-style-type: none"> <li>• <b>Protect nucleus and regulate the passage</b> of substances entering and leaving nucleus.</li> </ul>
<b>Chromatin</b>	<ul style="list-style-type: none"> <li>• Control <b>nuclear &amp; cell metabolism &amp; stores hereditary information</b></li> </ul>
<b>Microtubules</b>	<ul style="list-style-type: none"> <li>• <b>Tubulin protein</b> found within microtubules, structural support and cell movement</li> <li>• Move chromosomes during cell division</li> </ul>
<b>Microfilaments</b>	<ul style="list-style-type: none"> <li>• Tiny fibres, made of actin, are anchored to the inside of cell membrane and <b>give the cell support and shape</b></li> </ul>
<b>Centrosomes</b>	<ul style="list-style-type: none"> <li>• Organization of microtubules</li> <li>• Consist of pair of centrioles &amp; important role in cell division</li> </ul>

## Carbohydrates

### INTRODUCTION

- Carbohydrates may be **defined chemically** as **aldehyde or ketone** derivatives of **polyhydroxy (more than one hydroxy group) alcohols** or as compounds that yield these derivatives on **hydrolysis**.
- The general molecular formula of **carbohydrates** is  $C_n(H_2O)_n$ . For example, glucose has the molecular formula  $C_6H_{12}O_6$ .
- Ratio of hydrogen and oxygen is 2:1.



### CLASSIFICATION OF CARBOHYDRATES

CLASSIFICATION	TYPES	EXAMPLE
<b>MONOSACCHARIDES</b>	<b>Triose (C<sub>3</sub>H<sub>6</sub>O<sub>3</sub>)</b>	Glyceraldehyde, Dihydroxyacetone
	<b>Tetrose (C<sub>4</sub>H<sub>8</sub>O<sub>4</sub>)</b>	Erythrose, Erythrulose
	<b>Pentose (C<sub>5</sub>H<sub>10</sub>O<sub>5</sub>)</b>	Ribose, Ribulose, Deoxyribose, Xylose, Xylulose
	<b>Hexose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)</b>	Glucose, Galactose, Mannose, Fructose
	<b>Heptose (C<sub>7</sub>H<sub>14</sub>O<sub>7</sub>)</b>	D-Sedoheptulose
<b>OLIGOSACCHARIDES</b>	<b>Disaccharides</b>	Sucrose, Lactose, Maltose
	<b>Trisaccharides</b>	Raffinose, Gentianose
<b>POLYSACCHARIDES</b>	<b>Homopolysaccharide</b>	Starch, Dextrin, Inulin, Glycogen, Cellulose
	<b>Heteropolysaccharides</b>	Hyaluronic acid, Chondroitin, Heparin, Keratan sulphate, Dermatan sulphate.

**❑ NATURE CLASSIFICATION OF AMINO ACID**

CATEGORY	EXAMPLE
Neutral amino acid	Glycine, Alanine, Valine, Leucine, Isoleucine
Acidic amino acid	Aspartic acid, Asparagine, Glutamic acid, Glutamine
Basic amino acid	Arginine, Lysine
Sulphur amino acid	Cysteine, Methionine
Hydroxyl containing amino acid	Serine, Threonine
Aromatic amino acid	Phenylalanine, Tyrosine, Tryptophan
Heterocyclic amino acid	Histidine, Proline

**❑ NUTRITIONAL CLASSIFICATION OF AMINO ACID**

ESSENTIAL AA	NON-ESSENTIAL AA	SEMI-ESSENTIAL AA
The amino acids which <b>cannot be synthesized</b> by the body and need to be supplied through diet.	The amino acids which <b>can be synthesized</b> by human body and not essential to include in our diet.	Can be <b>synthesized</b> by <b>adults</b> but <b>not synthesized</b> by <b>growing children</b> .
<b>Examples</b> TRICK - <b>VIP HALL</b> for <b>MTT</b> <b>V</b> - Valine <b>I</b> - Isoleucine <b>P</b> - Phenylalanine <b>H</b> - Histidine <b>A</b> - Arginine <b>L</b> - Leucine <b>L</b> - Lysine <b>M</b> - Methionine <b>T</b> - Threonine <b>T</b> - Tryptophan	<b>Examples</b> TRICK - <b>CATAPAS GGG</b> <b>C</b> - Cysteine <b>A</b> - Alanine <b>T</b> - Tyrosine <b>A</b> - Asparagine <b>P</b> - Proline <b>A</b> - Aspartic acid <b>S</b> - Serine <b>G</b> - Glycine <b>G</b> - Glutamine <b>G</b> - Glutamic acid	<b>Examples</b> <b>A</b> - Arginine <b>H</b> - Histidine

**❑ CLASSIFICATION OF AMINO ACID BASED ON METABOLIC FATE**

KETOGENIC AMINO ACID		GLUCOGENIC (GLUCOGENIC) AMINO ACID
A ketogenic amino acid is an amino acid that can be degraded directly into <b>acetyl-CoA</b> , which is the <b>precursor of ketone bodies</b> and <b>myelin</b> .		A glucogenic amino acid is an amino acid that can be converted into <b>glucose through gluconeogenesis</b> .
S. NO.	TYPE	EXAMPLES
1.	Ketogenic Amino Acid	Leucine, Lysine
2.	Glucogenic (Glycogenic) Amino Acid	Arginine, Aspartate, Alanine, Cysteine, Glutamate, Glutamine, Glycine, Histidine, Hydroxyproline, Methionine, Serine, Threonine, Valine, and Proline
3.	Glucogenic and Ketogenic Amino Acid	Isoleucine, Phenylalanine, Tyrosine, Tryptophan



**❑ THE SPECIALIZED PRODUCTS FORMED/CONTRIBUTED BY AMINO ACIDS**

AMINO ACID	SPECIALIZED PRODUCT(S)	AMINO ACID	SPECIALIZED PRODUCT(S)
<b>Glycine</b>	Creatine, glutathione, heme, purines, conjugated bile acids	<b>Lysine</b>	Carnitine

❑ **TEST FOR PROTEINS**

TEST	REAGENT	OBSERVATION	AMINO ACID
<b>Biuret Test</b>	KOH + hydrated copper sulphate + sodium potassium tartrate	<b>Purple color</b> (Copper coordinate complex)	Confirms the presence of <b>peptide bond (CO-NH)/ linkage</b> (Protein)
<b>Millon's Test</b>	Mixture of sulphuric acid and mercury sulphate + Sodium nitrite	<b>Red</b>	Phenolic ( <b>Tyrosine</b> ) Presence of soluble protein
<b>Molisch Test</b>	10 % α-naphthol + ethanol	<b>Red purple</b> color	<b>Glycoprotein</b>
<b>Ninhydrin Test</b>	2,2 dihydroxy indane 1,3-dione	<b>Purple, Blue or Pink colour</b> complex (Ruhemann's purple)	<b>α-Amino acid</b> (Protein)
<b>Pauly's Test</b>	Diazotized sulfanilic acid	<b>Red color</b>	Imidazole ring ( <b>Histidine</b> )
<b>Sakaguchi Test</b>	α-naphthol + sodium hypochlorite	<b>Red color</b>	Guanidino group ( <b>Arginine</b> )
<b>Sanger Test</b>	1-Fluoro 2,4 dinitro benzene	By Chromatography	<b>Amino acid sequence</b>

❑ **PROTEIN-ENERGY MALNUTRITION (PEM) OR PROTEIN-CALORIE MALNUTRITION (PCM)**

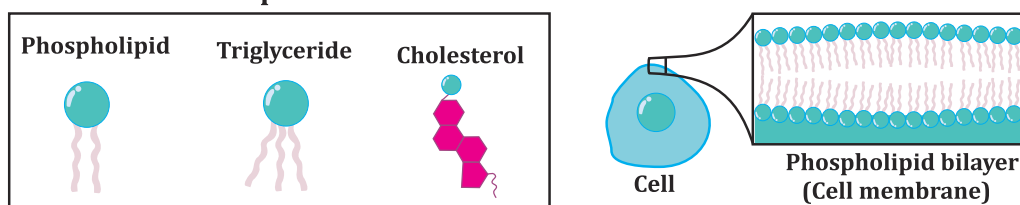
<p><b>Kwashiorkor</b></p> <p>Kwashiorkor, meaning "<b>sickness of the deposed child</b>," occurs when a child is displaced from <b>breastfeeding</b> upon the birth of a sibling. It is characterized by severe protein deficiency, leading to symptoms such as edema, an enlarged liver, and skin issues.</p> 	<p><b>Marasmus</b></p> <p>Marasmus, meaning "<b>to waste</b>," affects children under one year old. It is caused primarily by calorie deficiency, often seen in children fed watery cereal gruels alongside <b>inadequate breastfeeding</b>. Marasmus results in extreme weight loss, muscle wasting, and stunted growth.</p> 
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**Lipids**

❑ **INTRODUCTION**

- Lipids are a group of compounds related to fatty acids and are **insoluble in water** but **soluble in organic solvents**.
- They are **esters of fatty acids** with **alcohol esters** and are **utilizable by the living organism**.

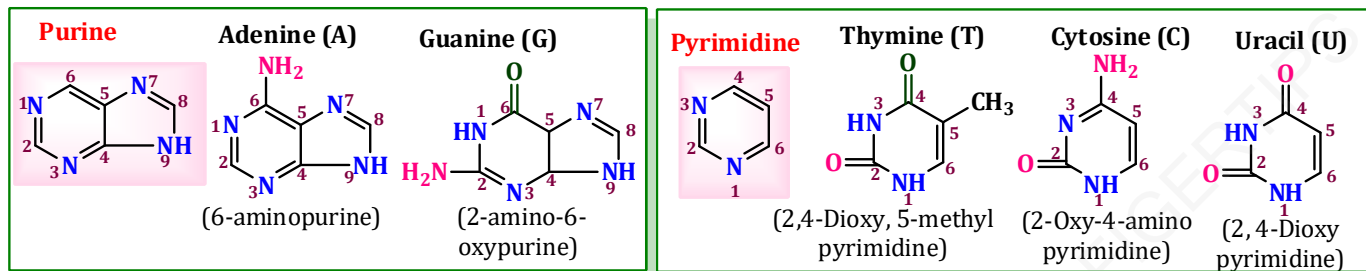
**Lipids**



**❑ NITROGENOUS BASE**

- Two classes of nitrogenous bases namely purines and pyrimidines are present in RNA and DNA.

TYPES	PURINE BASES	PYRIMIDINE BASES
DNA	Adenine, Guanine	Thymine, Cytosine
RNA	Adenine, Guanine	Uracil, Cytosine


**❑ TYPES OF NUCLEIC ACID**

- Deoxyribonucleic acid or DNA
- Ribonucleic acid or RNA

**1. Deoxyribonucleic acid or DNA**

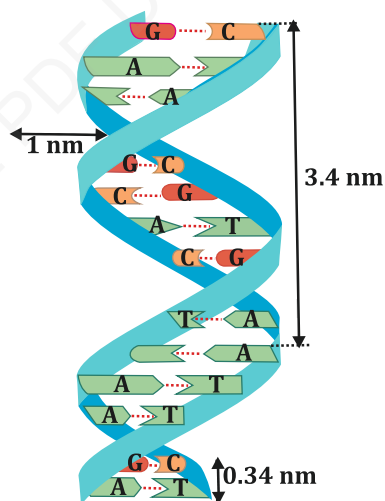
- DNA is Basic unit of genetic information.
- DNA is a polymer of deoxyribonucleotides.

**➤ History**

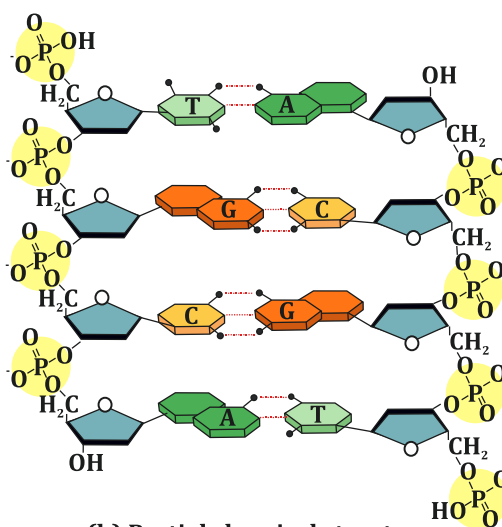
- DNA was discovered by Friedrich Miescher.
- Information of DNA containing genetic material - Avery, MacLeod and McCarty.

**➤ The DNA model features (Watson and Crick)**

- Double helical structure of DNA was proposed by Watson and Crick.**
- Right-handed double helix with two antiparallel polydeoxyribonucleotide chains.
- Strand directionality: one 5' to 3', the other 3' to 5'.
- Diameter: 20 Å; Pitch: 34 Å with 10 nucleotide pairs per turn.
- Hydrogen bonds:
  - A-T (2 bonds)
  - G-C (3 bonds)
- Supports Chargaff's rule: A = T, G = C.



(a) Key features of DNA structure

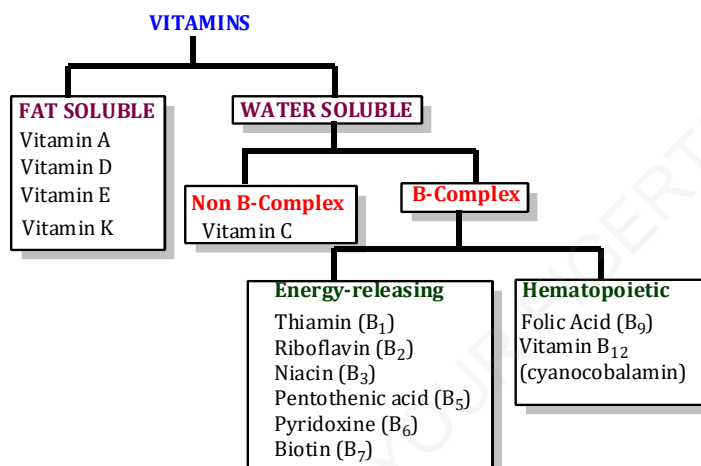


(b) Partial chemical structure

# Vitamins

## INTRODUCTION

- **Vitamins** are organic nutrients, essential for growth and development. They must be taken in the diet because the body either cannot synthesize them at all or not in sufficient amounts for its needs.
- Most of the water soluble vitamins function as coenzymes.



## VITAMINS, RINGS, CHEMICAL NAME AND THEIR ACTIVE FORM

VIT.	SOURCE	CHEMICAL NAME	RING	ACTIVE FORM
<b>Fat Soluble Vitamins</b>				
<b>A</b>	Fish liver oils, milk, milk products, Green leafy vegetables, carrots, yellow and red fruits	<b>Retinoids</b>	$\beta$ -ionone ring	Retinol, Retinal, Retinoic, acid
<b>D</b>	Cod liver oil, sunlight induced synthesis of vitamin D <sub>3</sub> in skin, egg yolk	<b>Cholecalciferol</b>	Steroidal ring	1,25, dihydroxy cholecalciferol
<b>E</b>	Soya and corn oils, germ oil, fish oil, eggs, alfalfa	<b>Tocopherol</b>	Chromane ring	$\alpha$ -tocopherol
<b>K</b>	Green leafy vegetables, tomatoes, cheese, meat, egg yolk	<b>Phylloquinone</b> <b>Menaquinone</b> <b>Menadione</b>	Naphthoquinone	<b>Vitamin K<sub>1</sub></b> (Phylloquinone) <b>Vitamin K<sub>2</sub></b> (Menaquinone) <b>Vitamin K<sub>3</sub></b> (Menadione)
<b>Water Soluble Vitamins</b>				
<b>B<sub>1</sub></b>	Cereals, meat, nuts green vegetables, eggs	<b>Thiamine</b>	Pyrimidine +Thiazole	<b>Thiamine Pyrophosphate (TPP)</b>
<b>B<sub>2</sub></b>	Yeast, germinating seeds, green leafy vegetables, milk, eggs, liver, meat	<b>Riboflavin</b>	Isoalloxazine	FMN, FAD
<b>B<sub>3</sub></b>	Yeast, legumes, liver, meat	<b>Niacin</b>	Pyridine-3-carboxylic acid	NAD <sup>+</sup> , NADP <sup>+</sup>
<b>B<sub>5</sub></b>	Wheat germs, cereals, yeast, liver, eggs	<b>Pantothenic acid</b>	Amide between Pantoic acid + $\beta$ -alanine	<b>Coenzyme A (CoA)</b>

## Hospital Pharmacy

❑ **HOSPITAL**

A hospital is a healthcare institution that provides specialized medical, surgical treatment and nursing care for sick and injured people.



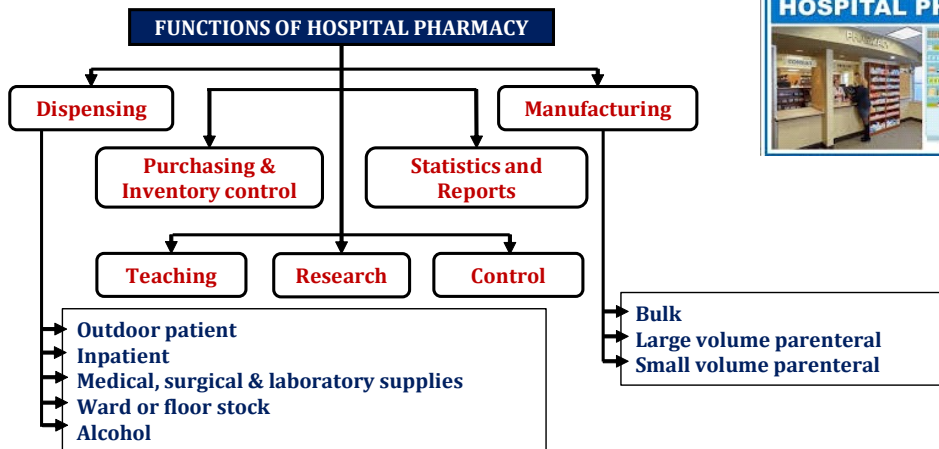
❖ **Classification of hospital**

CLASSIFICATION OF HOSPITAL			
CLINICAL BASIS OF CLASSIFICATION		NON-CLINICAL BASIS OF CLASSIFICATION	
<b>Basis of diseases treated</b>	<ul style="list-style-type: none"> <li>Cancer Hospitals</li> <li>Leprosy Hospitals</li> <li>T.B. Hospitals</li> <li>Psychiatric or Mental Hospitals</li> </ul>	<b>ON THE BASIS OF OWNERSHIP</b>	
		<b>Public ownership</b>	Central government hospitals, State Government Hospitals, Local self-government Hospitals
<b>Basis of patient</b>	<ul style="list-style-type: none"> <li>Maternity Hospitals</li> <li>Gynaecological Hospitals</li> <li>Paediatric Hospitals</li> </ul>	<b>Private ownership</b>	Trusts, Religious bodies/orders, Limited companies
		<b>ON THE BASIS OF SIZE</b>	
<b>Basis of anatomy/physiology involved</b>	<ul style="list-style-type: none"> <li>Eye Hospitals</li> <li>ENT Hospitals</li> <li>Orthopaedic Hospitals</li> <li>Kidney Hospitals</li> </ul>	<b>Large Hospitals</b>	Beds 1000 and above
		<b>Medium Hospitals</b>	500 to 1000 beds
		<b>Small Hospitals</b>	100 to 500 beds
		<b>Very small Hospitals</b>	Beds less than 100
<b>Basis of type of medicine</b>	<ul style="list-style-type: none"> <li>Allopathic Hospitals</li> <li>Ayurvedic Hospitals</li> <li>Homeopathic hospitals</li> <li>Unani hospitals</li> <li>Nature-care centers</li> <li>Physiotherapy centers</li> </ul>	<b>ON THE BASIS OF COST</b>	
		<b>Costly or Elite Hospitals</b>	Like five-star hospitals e.g. Jaslok and Hinduja Hospital
		<b>Budget Hospital</b>	e.g. Civil Hospitals, Corporation Hospital
		<b>Free Hospital</b>	-----

❑ **HOSPITAL PHARMACY**

The actual practice of pharmacy in the hospital is known as hospital pharmacy.

❖ **Function of Hospital Pharmacy**



❑ **ASHP GUIDELINES: MINIMUM STANDARD FOR PHARMACIES IN HOSPITALS**

STANDARDS	DESCRIPTION
<b>Standard-I</b>	Practice Management
<b>Standard-II</b>	Medication use policy development
<b>Standard-III</b>	Optimizing medication therapy
<b>Standard-IV</b>	Drug product procurement and inventory management
<b>Standard-V</b>	Preparing, packaging and labelling medications
<b>Standard-VI</b>	Medication dispensing and delivery
<b>Standard-VII</b>	Monitoring medication use
<b>Standard-VIII</b>	Evaluating the effectiveness of the medication use system
<b>Standard-IX</b>	Research

❑ **NABH ACCREDITATION**

- **National Accreditation Board for Hospitals and Healthcare Providers** (NABH) August 2020.
- **NABH:** NABH is a constituent board of the Quality Council of India (QCI), set up to establish and operate accreditation programs for healthcare organizations.
- **Introduction to Accreditation:** The hospital accreditation program was started in the year 2005. Hospital Standards (current) 5<sup>th</sup> Edition, launched in **February 2020**.
- **NABH Standard:** NABH Standard has **10 chapters** incorporating **100 standards** and **651 objective elements**.



❑ **IMPORTANT FULL FORMS OF HOSPITAL PHARMACY**

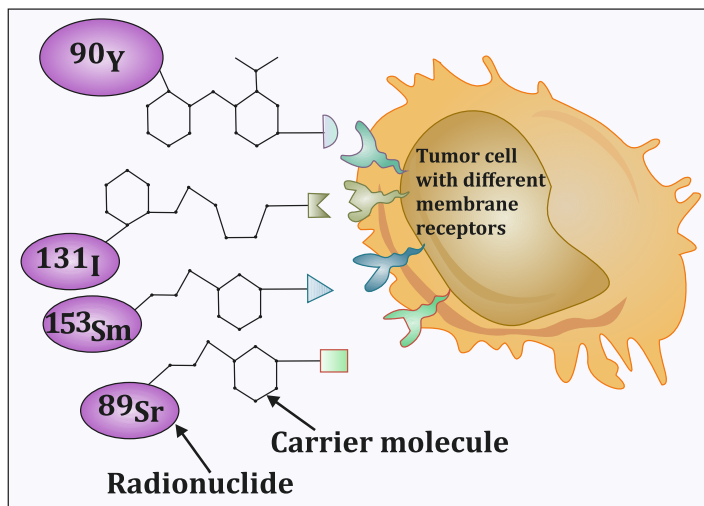
IMPORTANT FULL FORMS OF HOSPITAL PHARMACY	
<b>ASHP</b>	American Society of Health-System Pharmacy
<b>IHPA</b>	Indian Hospital Pharmacist Association
<b>PCI</b>	Pharmacy Council of India
<b>GPP</b>	Good Pharmacy Practice
<b>FIP</b>	International Pharmaceutical Federation
<b>NQAS</b>	National Quality Assurance Standards
<b>NABH</b>	National Accreditation Board for Hospitals and Healthcare Providers
<b>HCO</b>	Healthcare organization

**Different Committees in the Hospital**

❑ **PHARMACY AND THERAPEUTICS COMMITTEE (PTC)**

- The pharmacy and therapeutic committee is a policy framing and recommending body to the medical staff and the administration of hospital on matters related to **therapeutic use of drugs**.
- **WHO** formed a committee in the hospital setting is **responsible for overall pharmaceutical care** is termed as **Pharmacy and therapeutics committee (PTC)**.
- The guidelines for **inclusion and non-inclusion** of drugs in the hospital formulary are **framed by PTC**.



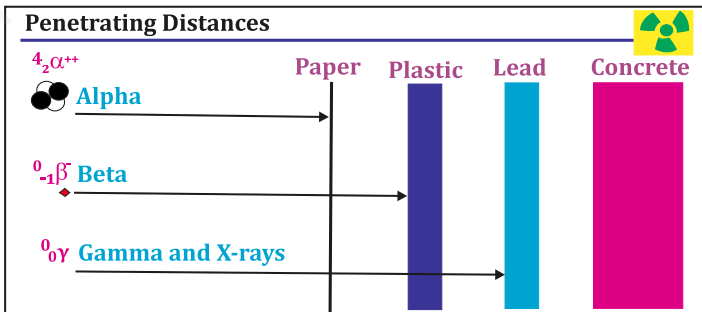


❖ Measurement of Radioactivity

<b>Measurement of Radioactivity</b>	To measure the radiations of alpha, beta and gamma particles, many techniques involving detection and counting of individual particles or photons are used.
<b>Gas ionization devices</b>	<ul style="list-style-type: none"> <li>• Ionization chambers</li> <li>• Proportional counters</li> <li>• Geiger Muller counters</li> <li>• Scintillation Counters</li> <li>• Autoradiography</li> <li>• Solid state detectors</li> </ul>

❖ Decay of radionuclide

- Radionuclides are unstable nuclei that are stabilized upon radioactive decay.
- To protect from gamma rays (high penetration power), **lead shielding has to be used.**
- Radioactive materials should be kept in suitable labeled containers **shielded by lead bricks** and preferably **in remote area.**



Type of radiation emitted & symbol	Nature of the radiation formation, structure, relative mass, electric charge	Penetrating power	Ionizing power
<b>Alpha (<math>\alpha</math>) radiations</b>	A helium nucleus of 2 protons and 2 neutrons, <b>mass = 4</b> , <b>charge = +2</b> , is expelled at high speed from the nucleus	<b>Low penetration</b> , slowest speed, biggest mass and charge, stopped by a few cm of air or thin sheet of paper	<b>Very high ionizing power</b> , the biggest mass and charge of the three radiations.
<b>Beta (<math>\beta</math>) radiations</b>	High kinetic energy electrons	Moderate penetration	Moderate ionizing power
<b>Gamma (<math>\gamma</math>) radiations</b>	<b>Very high frequency</b> electromagnetic radiation <b>mass 0</b> , <b>charge = 0</b> , gamma emission often accompanies beta decay	<b>Very high penetrating power</b>	<b>Lowest ionizing power</b>



# PHARMACY LAW AND ETHICS

## History and Various Acts Related to Drugs and Pharmacy Profession

### □ HISTORY OF PHARMACEUTICAL LEGISLATION

1811	First chemist shop opened by Mr. Bathgate, who came to India with East India company in Calcutta.
1821	Smith Stanistreet and co.started apothecary shop.
1901	Acharya Prafulla Chandra Ray established Bengal Chemical and Pharmaceutical Works as a small factory, in Calcutta.
1903	A small factory at Parel (Bombay) by Prof. T.K. Gajjar.
1907	Alembic Chemical Works Ltd. at Baroda by Prof. T.K. Gajjar.
1930	Drug Enquiry Committee under the chairmanship of R.N. Chopra and also known as Chopra Committee.
1932	First Department of pharmaceutics was started at Banaras Hindu University (BHU).
1935	Pharmaceutical Association was organised, now it is known as IPA.
1937	Government introduced the Import of Drugs bill in the Legislative Assembly.
1939	Indian Journal of Pharmacy was started by Prof. M. L. Schroff
1940	All India Pharmaceutical Conference organized by Indian Pharmaceutical Association.
1943	Health Survey and Development Committee was appointed by the Government of India on October 1943 under the chairmanship of Sir Joseph Willliam Bhore. Also known as Bhore committee.
1953	Pharmaceutical Enquiry Committee was framed by the Government of India under chairmanship of Major General S.L. Bhatia, this committee was known as Bhatia Committee.
1959	Government of India appointed another Committee known as "Health Survey and Planning Committee", under the chairmanship of Dr. A.L. Mudaliar. Also known as the Mudaliar Committee.
1974	Drug and Pharmaceutical Industry was framed by the Government of India on 8 <sup>th</sup> February 1974 under the chairmanship of Mr. Jaisukhlal Hathi and also known as Hathi Committee.






### □ VARIOUS ACTS RELATED TO DRUGS AND PHARMACY PROFESSION

1. **The Pharmacy Act 1948** to regulate the profession of pharmacy.
2. **The Drugs and Cosmetics Act, 1940** to regulate the import, manufacture, distribution and sale of drugs and cosmetics.
3. **The Drugs and Cosmetics Rules, 1945** further strengthen the Drugs and Cosmetics Act 1940.
4. **The Drugs and Magic (Objectionable Remedies) Remedies Act, 1954** to control advertisements related to drugs.

❑ **CHAPTERS**

CHAPTERS	DESCRIPTION
Chapter I	Introductory
Chapter II	Administrative Bodies: The Drugs Technical Advisory Board, The Central Drugs Laboratory and The Drugs Consultative Committee
Chapter III	Import of Drugs and Cosmetics
Chapter IV	Manufacture, Sale and Distribution of Drugs and Cosmetics
Chapter IVA	Provisions relating to Ayurvedic, Siddha and Unani Drugs
Chapter V	Miscellaneous

❑ **DEFINITION**

<p><b>DRUGS</b></p> 	<ul style="list-style-type: none"> <li>Medicines for internal or external use in humans or animals, or substances for <b>diagnosis, treatment, mitigation, or prevention</b> of diseases or disorders in humans or animals.</li> <li><b>e.g.-</b> Empty gelatin capsules, I.V. solution, Water for injection, Distilled water; Gripe water; Sanitary pad, Boroline, blood, Arjuna, Absorbent Cotton wool, roller bandage and gauze.</li> </ul>
<p><b>COSMETICS</b></p> 	<ul style="list-style-type: none"> <li>Any article intended to be <b>rubbed, poured, sprinkled or sprayed</b> on or introduced into or otherwise applied to human body or any part thereof for cleansing, beautifying, promoting attractiveness or altering the appearance and includes any article intended for use as a component of cosmetic.</li> <li><b>e.g.-</b> Gudakhu, Cream, Powder, Tooth paste, Powder, Nail polish</li> </ul>
<p><b>MISBRANDED DRUGS</b></p> 	<ul style="list-style-type: none"> <li>If it is <b>not labelled</b> in the prescribed manner</li> <li>If it is so <b>coloured, coated, powdered or polished</b> that damage is concealed or if it is made to appear of better or greater therapeutic value than it's really.</li> <li>If its <b>label or container or anything</b> accompanying the drug bears any statement, design or device <b>which makes any false claim</b> for the drug or which is false or misleading in any particular</li> </ul>
<p><b>ADULTERATED DRUGS</b></p> 	<ul style="list-style-type: none"> <li>If it consists, in <b>whole or in part, of any filthy, putrid, or decomposed</b> substance.</li> <li>If it has been prepared, packed or stored under <b>insanitary conditions</b> whereby have been render injurious to health.</li> <li>If its container is composed in <b>whole or in part, of any poisonous or deleterious</b> substance which may render the contents injurious to health.</li> <li>If it <b>bears or contains</b>, for purposes of <b>colouring only</b>, a colour other than one which is prescribed.</li> <li>If it contains any <b>harmful or toxic substance</b> which may render it injurious to health.</li> <li>If any substance has been mixed therewith so as to reduce its <b>quality or strength</b>.</li> </ul>
<p><b>SPURIOUS DRUGS</b></p> 	<ul style="list-style-type: none"> <li>If it is imported under a name which <b>belongs to another drug</b>.</li> <li>If it is an <b>imitation of, or a substitute for, another drug</b> or resembles <b>another drug in a manner</b>.</li> <li>If the <b>label or the container bears the name</b> of an individual or company purporting to be the manufacturer of the drug, which individual or company is fictitious.</li> <li>If it has been <b>substituted wholly</b> or in <b>part</b> by another drug or substance.</li> <li>If it <b>purports to be the product</b> of a manufacturer of whom it is not truly a product.</li> </ul>

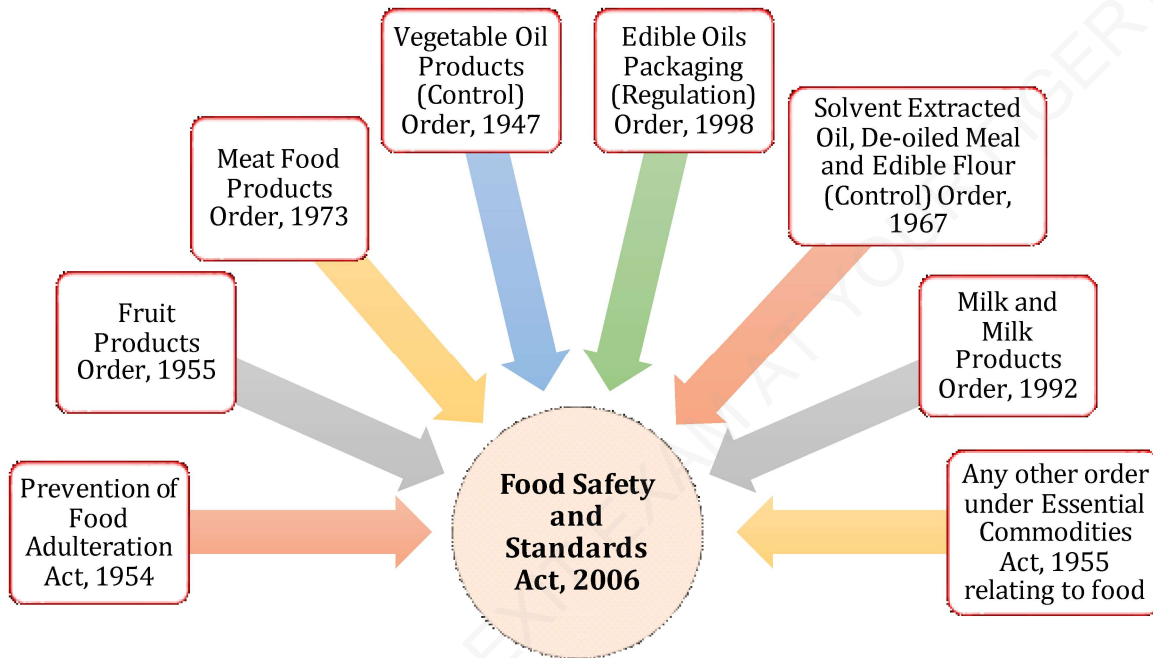
F <sub>1</sub>	<b>Part I A</b>	Production of <b>bacterial vaccines</b>
	<b>Part I B</b>	Production of <b>viral vaccines</b>
	<b>Part II</b>	Production of <b>all sera from living animals</b>
	<b>Part III</b>	Manufacture and standardization of <b>diagnostic agents (bacterial origin)</b>
F <sub>2</sub>	Standards of <b>surgical dressings</b>	
F <sub>3</sub>	Standards of sterilized <b>umbilical tapes</b>	
FF	Standards for <b>ophthalmic preparations</b>	
G	List of substances to be used under the <b>medical supervision</b> and which are to be labelled accordingly	
H	List of drugs to be sold on the <b>prescription of an RMP/ List of prescription drugs</b>	
J	<b>Diseases and ailments</b> which a drug may not purport to prevent or cure or make <b>claims to prevent or cure</b>	
K	Drugs <b>exempted</b> from provisions related to <b>manufacture of drugs</b>	
L <sub>1</sub>	<b>Good Laboratory Practices</b> and requirements of premises and Equipment's	
M	<b>GMP requirements of factory premises, plants and equipment for pharmaceutical product</b>	
	<b>Part I</b>	<b>Good manufacturing practices for premises and materials</b>
	<b>Part IA</b>	Specific requirements for manufacture of <b>sterile products, parenteral preparations</b> (small volume injectables and large volume parenterals) and sterile ophthalmic preparations
	<b>Part IB</b>	Specific requirements for manufacture of <b>oral solid dosage forms</b> (Tablets and Capsules)
	<b>Part IC</b>	Specific requirements for manufacture of <b>oral liquids</b> (Syrups, Elixirs, Emulsions and Suspensions)
	<b>Part ID</b>	Specific requirements for manufacture of <b>topical products</b> , i.e., external preparations (creams, ointments, pastes, lotions etc.)
	<b>Part IE</b>	Specific requirements for manufacture of <b>metered-dose-inhalers (MDI)</b>
	<b>Part IF</b>	Specific requirements of premises, plant and materials for manufacture of <b>Active Pharmaceutical Ingredients</b> (Bulk drugs)
M <sub>1</sub>	Requirements for factory premises, etc. for the <b>manufacture of Homeopathic drugs</b>	
M <sub>2</sub>	Requirements for factory premises for the <b>manufacture of cosmetics</b>	
M <sub>3</sub>	Requirements for factory premises for the <b>manufacture of medical devices</b>	
N	List of manufacture <b>equipment for the efficient running of a pharmacy</b>	
O	Standard for <b>disinfectant fluids</b>	
P	<b>Life period</b> of drugs	
P <sub>1</sub>	<b>Pack sizes</b> of drugs	
Q	<b>Part I</b>	List of <b>dyes, colours and pigments</b> permitted in cosmetics and soaps
	<b>Part II</b>	List of <b>colours</b> permitted to be used in soaps
R	Standards for condoms made of rubber latex intended and other mechanical contraceptives	
R <sub>1</sub>	Standards for <b>medical devices</b>	
S	Standards for <b>cosmetics</b>	
T	<b>GMP</b> for Ayurvedic, Siddha and Unani medicines	
U	Maintenance of manufacturing and analytical <b>records of drugs</b>	
U <sub>1</sub>	Maintenance of manufacturing, raw material and analytical <b>records of cosmetics</b>	
V	Standards for <b>patent and proprietary</b> medicines	

## FSSAI (Food Safety and Standards Authority of India) Act and Rules

**❑ IMPORTANT DATE**

<b>FSSAI Act passed in</b>	23 <sup>rd</sup> August 2006
<b>Food Safety and Standards Bill</b>	2005

**❑ LAWS RELATING TO FOOD IN VARIOUS MINISTRIES AND DEPARTMENTS**



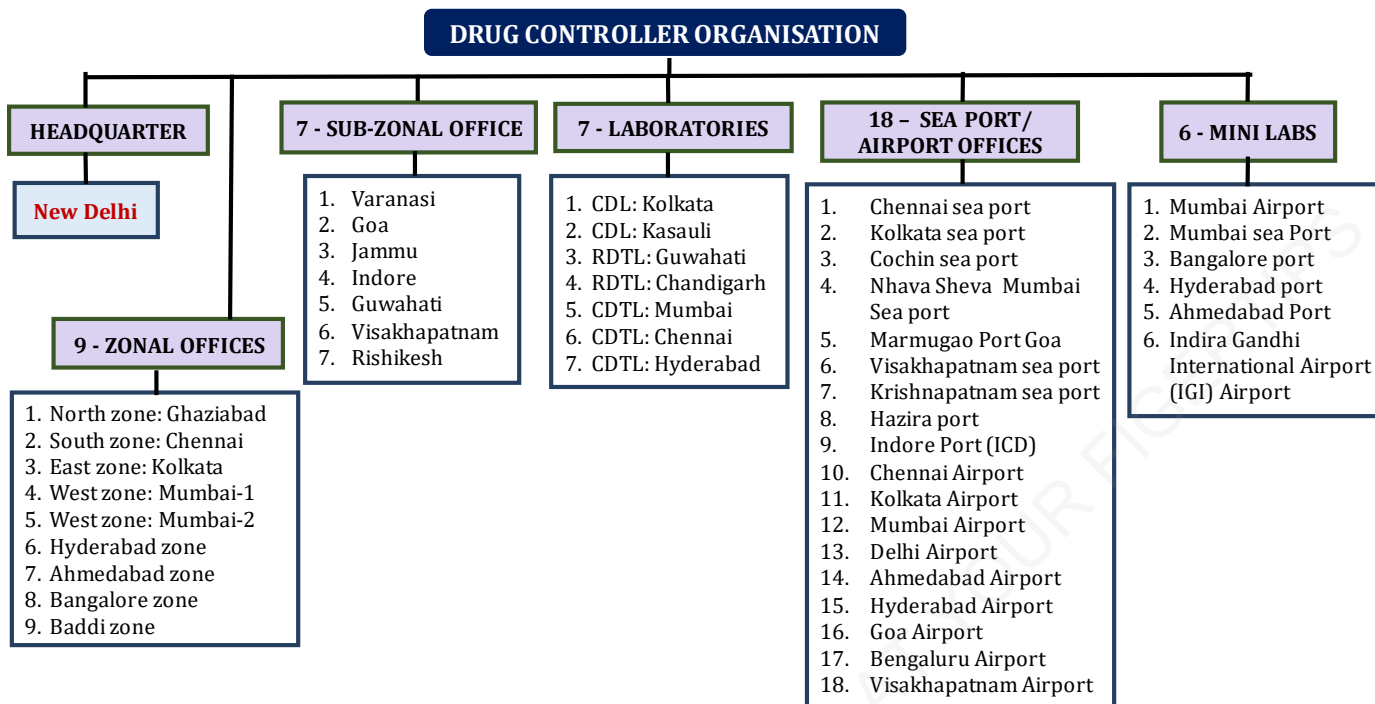
**❑ DEFINITION**

<b>Food Authority</b>	The Food Safety and Standards Authority of India. Headquarter at Delhi and six regional offices located at Delhi, Guwahati, Mumbai, Kolkata, Cochin and Chennai
<b>Food Safety</b>	Assurance that food is acceptable for human consumption according to its intended use
<b>Food</b>	Any substance or treatment but does not include any animal feed, live animals unless they are prepared or processed for placing on the market for human consumption and medicinal products, cosmetics, narcotic or psychotropic substances
<b>Food Laboratory</b>	Any food laboratory or institute established by the Central or a State Government or any other agency, accredited by the National Accreditation Board for Testing and Calibration Laboratories or an equivalent accreditation agency, and recognized by the Food Authority.

**❑ COMPOSITION OF FSSAI (FOOD AUTHORITY)**

- Chairman – appointed by the Central Government
- Twenty-two members out of which one-third shall be women
  - ✓ Seven ex officio members appointed by the Central Government
  - ✓ Two representatives from food industry
  - ✓ Two representatives from consumer organizations

❖ Organization of CDSCO

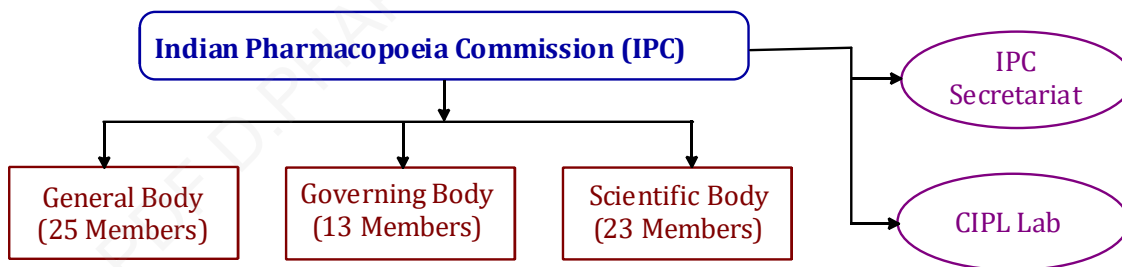


❑ **INDIAN PHARMACOPOEIA COMMISSION (IPC)**

- Indian Pharmacopoeia Commission (IPC) is an Autonomous Institution of the Ministry of Health and Family Welfare, Government of India on 9<sup>th</sup> December 2004.
- Headquarters: Ghaziabad Uttar Pradesh, India

<b>Mission</b>	To promote public and animal health in India by establishing authoritative standards for drug quality
<b>Vision</b>	To promote the highest standards of drugs for use in humans and animals

❖ Composition of IPC



❑ **FUNCTIONS OF CDSCO AND IPC**

Functions of CDSCO	Functions of IPC
<ol style="list-style-type: none"> <li>1. Laying down the standards of drugs, cosmetics, diagnostics, and devices.</li> <li>2. Regulating the Import of drugs and Licensing</li> <li>3. To have regulatory control on approval of new drugs and clinical trials</li> <li>4. Grant of the license of Blood Banks, LVPs, Vaccines &amp; Sera, r-DNA products &amp; some medical devices (CLAA Scheme)</li> </ol>	<ol style="list-style-type: none"> <li>1. Publishing new edition and addendums of the Indian Pharmacopoeia (IP)</li> <li>2. Certification, and distribution of IP Reference Substances (IPRS)</li> <li>3. Publishing National Formulary of India (NFI) for rational use of medicines by health professionals.</li> <li>4. Running Pharmacovigilance Programme of India (PvPI) through National Coordination Centre (NCC) at IPC.</li> </ol>



# DRUG STORE AND BUSINESS MANAGEMENT

SCAN ME



EXIT EXAM  
Preparation App

## Commerce

### INTRODUCTION

- Is that aspect of business activity which is concerned with the distribution of goods and services produced by industry.
- Serves as a valuable link between the producer and the consumer.

❑ **TRADE** - The word "Trade" means **buying, selling and exchange** of goods.

**Classified into two broad categories:**

1. **Internal Trade** - Also known as "home trade" and consist of sale and exchange of goods within the boundaries of the country.

❖ **The internal trade is carried in the following basis:**

<b>Wholesale trade</b>	Serves as a link between the <b>producer or manufacturer</b> of goods and the retail traders
<b>Retail trade</b>	Serves link between the <b>wholesale and the actual consumer</b>

2. **International Trade** - Means the **exchange of goods and services** between citizens, business firms or government of different countries.

❖ **Subdivided into:**

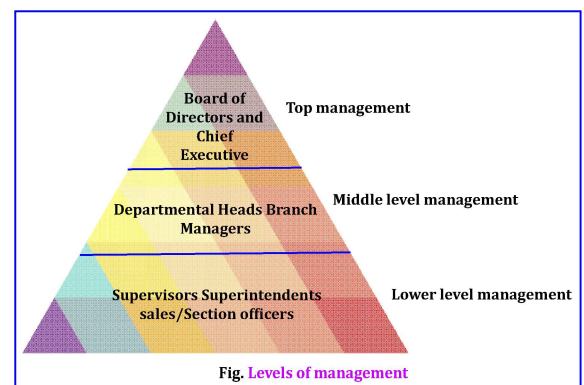
<b>Import trade</b>	When a trader of one country <b>purchases goods</b> from the <b>traders of other countries</b>
<b>Export trade</b>	When a trader of one country <b>sells goods to the trader of other countries</b>
<b>Entreport trade</b>	When a trader purchases goods from <b>one country and sells the same goods to another country</b>

### PHARMACEUTICAL MANAGEMENT

When the principle and practices of management are applied to pharmaceutical industry and drug store, it is known as "Pharmaceutical Management".

❖ **Level of management :**

- I. **Top level management** - It is the ultimate source of authority which **frame the policies** for the enterprise.
- II. **Middle level management** - They are responsible to the top management for the **efficient functioning of their department**.
- III. **Lower level management** - They issue orders and instructions and guide **day to day activities**.



C. **Perpetual Inventory System** – Method of recording the store balance after every receipt and issue to facilitate regular checking and to prevent closing down for stock-taking.

❖ **Setting of Various Levels**

I. **Maximum Stock Level** – Represents the upper limit beyond which the quantity of any item is not normally allowed to rise.

The formula for computing maximum level is as follows –

$$\text{Maximum level} = \text{Reorder level} + \text{Reorder quantity} - \text{Minimum consumption}$$

$$\text{Minimum consumption} = \text{Minimum consumption per week} \times \text{Minimum re-order period}$$

II. **Minimum Stock Level or Safety Stock** - Lower limit below which the stock of any item should not normally be allowed to fall.

The formula for computing minimum stock level is as follows:

$$\text{Minimum level} = \text{Re-order level} - [\text{Normal consumption per week} \times \text{Average delivery time}]$$

III. **Lead Time** – Total time consumed between the recognition of the need of an item, till the time it is received for use.

IV. **Re-Order Level** – Fixed between the minimum and maximum stock levels.

$$\text{Reorder level} = \text{Minimum consumption during the period} \times \text{Maximum re-order period}$$

❖ **VED Analysis** – VED analysis is a valuable technique for inventory management that can help businesses of all sizes to improve their performance. Based on the utility of the material.

V= Vital items

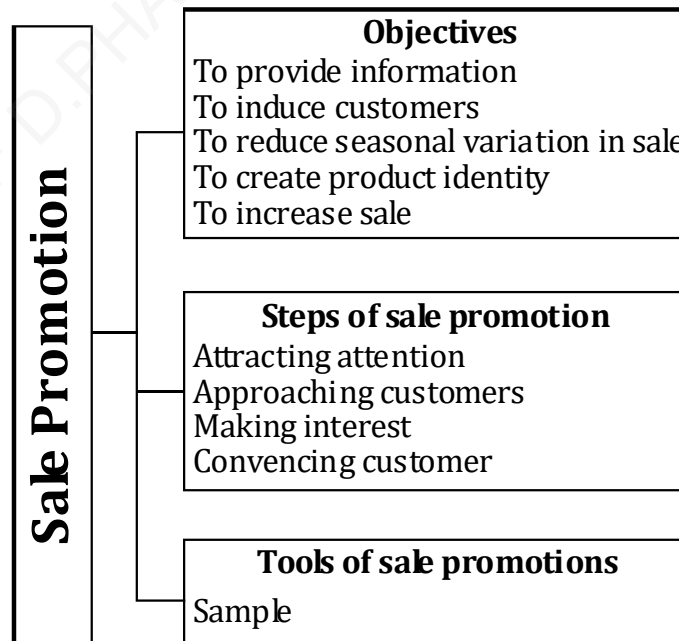
E= Essential items

D= Desirable items

## Sales Promotion

❑ **SALES PROMOTION**

It is a marketing activity that is designed to increase sales, encourage customer loyalty, or generate brand awareness.



## About the Author

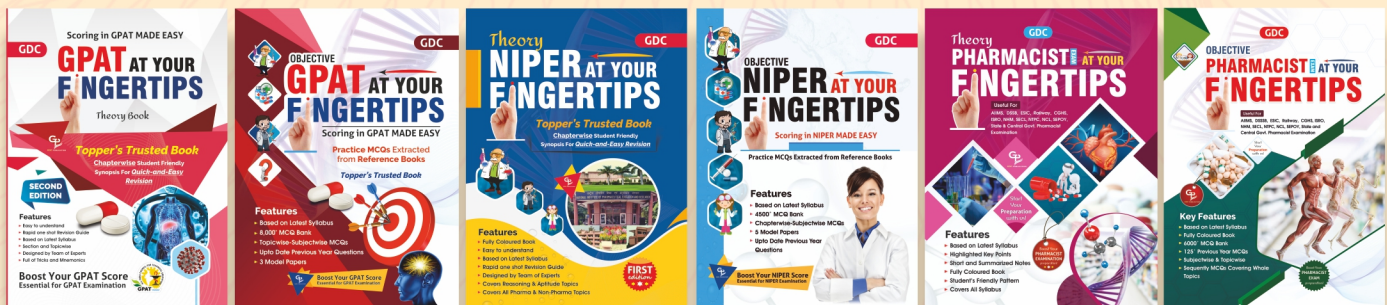


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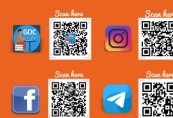
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