PHARMACIST SUCCESS KIT

MRB

TAMIL NADU

Theory Book

START YOUR PREPARATION WITH US!

SUBJECT COVERED

- PHARMACEUTICS
- PHARMACEUTICAL CHEMISTRY
- PHARMACOGNOSY
- PHARMACOLOGY
- BIOCHEMISTRY AND CLINICAL PATHOLOGY
- HOSPITAL AND CLINICAL PHARMACY
- PHARMACY LAW AND ETHICS
- COMMUNITY PHARMACY & MANAGEMENT
- HUMAN ANATOMY & PHYSIOLOGY
- SOCIAL PHARMACY
- PHARMACOTHERAPEUTICS

PHARMACY INDIA PUBLICATION

MRB TN PHARMACIST

SUCCESS KIT | **Theory Book**

As Per the Latest MRB TN Exam Pattern

Useful for

Tamil Nadu Pharmacist Examinations

Authors

Utsav Verma
M. Pharma
Director, Pharmacy India

Dhalendra Kothale
M. Pharma

Vinit Kumar
M. Pharma

Pharmacy India Publication

PREFACE

Welcome to the comprehensive guide designed to empower and guide Tamil Nadu Pharmacist aspirants through the intricacies of the MRB Tamil Nadu Pharmacist Exam. As we stand on the precipice of a dynamic and evolving field in pharmaceutical sciences, this book aims to be your steadfast companion on the journey towards success in the MRB Tamil Nadu Pharmacist Exam.

The MRB Tamil Nadu Pharmacist Exam Theory Book has been meticulously crafted to cover all essential subjects outlined in the D. Pharma syllabus. The core areas of focus include Pharmaceutics, Pharmaceutical Chemistry, Pharmacognosy, Human Anatomy and Physiology, Social Pharmacy, Biochemistry & Clinical Pathology, Hospital & Clinical Pharmacy, Pharmacology, Community Pharmacy & Management, Pharmacotherapeutics and Pharmacy Law & Ethics. Each chapter is thoughtfully organized to provide a comprehensive understanding of the subjects, ensuring that you are well-prepared for the challenges that lie ahead.

Pharmacy education is not just about acquiring knowledge; it is about developing a nuanced understanding of the intricate balance between science and practice. This book is a result of a collaborative effort by experienced educators and professionals who have distilled their expertise to create a resource that not only addresses the theoretical aspects but also integrates practical insights. By delving into the depths of each subject, this book equips you with the necessary tools to not only clear the MRB Tamil Nadu Pharmacist Exam but to excel in the field of pharmacy.

Every topic outlined in the D. Pharma syllabus is meticulously covered, providing a holistic approach to your exam preparation. Complex theories are presented in a simplified manner, ensuring a clear understanding of fundamental principles. The content is aligned with the latest advancements in pharmaceutical sciences, keeping you abreast of the ever-evolving field.

As you embark on this academic journey, let this book be your compass, guiding you through the realms of pharmaceutical knowledge and preparing you to excel in the MRB Tamil Nadu Pharmacist Exam. May this resource serve as a catalyst for your success and a cornerstone in your pursuit of excellence in the field of pharmacy.

Regards,
Authors

TABLE OF CONTENT

S. No.	Topic	Page No.
A.	**PHARMACEUTICS**	**1-55**
1.	History, Career and Pharmacopoeia	1-4
2.	Packaging Materials	5-7
3.	Pharmaceutical Aids & Preservatives	8-9
4.	Unit Operations	10-16
5.	Tablets, Capsule, Liquid Oral and Topical Preparation, Sterilization Formation, Immunological Products	17-49
6.	Quality Control and Quality Assurance	50-53
7.	Novel Drug Delivery Systems	54-55
B.	**PHARMACY LAW & ETHICS**	**56-86**
C.	**COMMUNITY PHARMACY AND MANAGEMENT**	**87-114**
D.	**HOSPITAL & CLINICAL PHARMACY**	**115-135**
E.	**HUMAN ANATOMY & PHYSIOLOGY**	**136-158**
F.	**PHARMACOLOGY**	**159-265**
1.	General Pharmacology	159-170
2.	Drugs acting on Peripheral Nervous System	171-186
3.	Drugs acting on the Eye	187-189
4.	Drugs acting on Central Nervous System	190-202
5.	Drugs acting on Cardiovascular System	203-212
6.	Drugs acting on Blood and Blood forming Agents	213-217
7.	Drugs acting on Respiratory System	218-221
8.	Drugs acting on Gastrointestinal Tract	222-226
9.	Drugs acting on the Kidney	227-229
10.	Hormones and Hormone Antagonists	230-243
11.	Autacoids	244-247
12.	Chemotherapeutic Agents	248-263
13.	Biologicals	264-265
G.	**PHARMACOTHERAPEUTICS**	**266-319**
H.	**PHARMACEUTICAL CHEMISTRY**	**320-396**
1.	Introduction to Pharmaceutical Chemistry	320-321
2.	Volumetric Analysis	322-327
3.	Inorganic Pharmaceuticals	328-336
4.	Introduction to nomenclature of organic chemical systems with reference to heterocyclic compounds containing up to Three rings	337-341
5.	Central Nervous System	342-351

6.	Autonomic Nervous System	352-363
7.	Cardiovascular System	364-368
8.	Diuretics	369-371
9.	Hypoglycemic Agents	372-375
10	Analgesic and Anti-inflammatory Agents	376-379
11.	Anti- infective Agents	380-390
12.	Antibiotics	391-393
13.	Anti- Neoplastic Agents	394-396
I.	**BIOCHEMISTRY & CLINICAL PATHOLOGY**	**397-430**
J.	**PHARMACOGNOSY**	**431-469**
1.	System of Medicine	431-432
2.	Classification of Drugs	433-435
3.	Quality Control of Crude Drugs	436-439
4.	Brief Outline of Occurrence, Distribution, Outline of Isolation, Identification tests, Therapeutic Effects and Pharmaceutical Applications	440-447
5.	Biological Source, Chemical Constituents and Therapeutic Efficacy of the crude drugs	448-455
6.	Plant Fibres used as Surgical Dressing	456-458
7.	Basic Principles Involved in the Traditional Systems of Medicine	459-461
8.	Role of Medicinal and Aromatic Plants in National Economy and their Export Potential	462
9.	Herbs as Health Food Nutraceuticals	463-465
10	Introduction To Herbal Formulation	466-467
11.	Herbal Cosmetics	468
12.	Phytochemical Investigation of Drugs	469
K.	**SOCIAL PHARMACY**	470-504

PHARMACEUTICS

1 HISTORY, CAREER AND PHARMACOPOEIA

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

Training programme for the chemists was started by the Madras Medical College	1870
Pharmacy education in India at the certificate level was started in the name of **ESCOLE MEDICO DE GOA** at Goa by the Portuguese.	1842
Formal training of the compounds was started in Bengal	1881
University education was initiated at the Banaras Hindu University pioneered the pharmaceutical education under the guidance of Professor Mahadeva Lal Schroff	1932
In Baghdad the first pharmacies or drug store, were established	754 AD
Graduate course in pharmacy started at Punjab University, Lahore (currently in Pakistan).	1944
Ph. D. course introduced at BHU	1945
Govt. of India brought Pharmacy Bill to standardize Pharmacy Education in India	1945
Government of India enacted "The Pharmacy Act' to control the pharmacy profession as well as education	1948
First D. Pharm. course started at **Institute of Pharmacy Jalpaiguri in West Bengal**	1949
First 'Education Regulation' (ER) was framed	1953
'Education Regulation' come in force	1954
PCI made D.Pharm as compulsory minimum qualification to work as a pharmacist in India	1953
Father of Pharmacy	**'William Procter Jr.' (American Pharmacist)**
Father of Indian Pharmacy	**Mahadev Lal Schroff'**

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

- In the year 1901 the first pharmaceutical manufacturing i.e., **Bengal Chemical and Pharmaceuticals works limited was started in Kolkata** by Acharya PC Ray.
- In 1903 a small factory at Parel (Bombay) started by Prof. T. K. Gajjar.
- In 1907 Prof. T. K. Gajjar started **Alembic chemical works** at Baroda Gujrat.

HISTORY OF THE PROFESSION OF PHARMACY IN INDIA IN RELATION TO PHARMACY PRACTICE, AND VARIOUS PROFESSIONAL ASSOCIATIONS

Abbreviations	Full Form	Function
PCI	Pharmacy Council of India	Pharmacy Council of India (PCI) Pharmacy education & profession in India up to graduate level regulated by PCI, a statutory body of GOI constituted under Pharmacy Act 1948.
AICTE	All India Council for Technical Education	AICTE responsible for proper planning & coordinated development of technical education & management education system in India.

2 PACKAGING MATERIALS

Introduction

- Packaging is the art of science and technology of enclosing or protecting products for distribution, storage, sale and use.
- Pharmaceutical packaging can be defined as the economical means of providing presentation, protection, identification, information, convenience compliance, integrity and stability of the product.

Types of Packaging

1. Primary packaging: In primary packaging material are directly covered the products and come close to the products and hold it. It provides the initial safety barrier for product. **Example: -** Strips, Blister, bottle, spray cane.	
2. Secondary packaging: These types of packaging apply, outside of the primary packaging and it facilitates the handling of smaller products by combining them into a single pack. **Example:** Boxes.	
3. Tertiary packaging: It is used for bulk handling and shipping. It facilitates the handling, storage and transport of goods. It provides the final barrier to products from damage. **Example:** Carton boxes.	

GLASS PACKAGING

Composition of glass

Sand (silicon dioxide) Soda ash (sodium carbonate) Limestone (calcium carbonate) Cullet (broken glass) aluminium, boron, potassiuum, magnesium, zinc, barium.

Colour	Description
Amber	light yellowish to deep reddish brown, carbon and sulphur or iron and manganese dioxide.
Yellow	Compounds of cadmium and sulphur.
Blue	Various shades of blue, cobalt oxide or occasionally copper (cupric) oxide
Green	Iron oxide, manganese dioxide and chromium dioxide.

Types of Glass

Glass	Composition	Description
Lime-soda glass	SiO2 (75%), Na_2O (15%), CaO (10%) alongwith traces of K_2O, MgO and Al2O3.	storage of solid medicaments not suitable for storage of parenteral products
Borosilicate glass	SiO2 (80%), B2O3 (12%), Al2O3 (6%) and mixture of Na2O, CaO and other oxides (2%)	highly resistant glass.
Silicone-treated glass	treated with silicone	store alkali sensitive products
Sulphured glass	exposed to moist SO2 at about 500°C	does not liberate alkali suitable for storage of parenteral products

5 PHARMACEUTICAL DOSAGE FORMS

TABLET

Introduction

- Tablets are the **solid unit dosage** forms of medicaments with or without excipients intended for oral administration. These are prepared either by compression or mold methods.

Types of Tablets

Oral Tablets for Ingestion	Tablets used in the oral cavity	Tablets administered by other routes	Tablets used to prepare solutions
• Compressed tablets or standard compressed tablets • Multiple compressed tablets • Chewable tablet • Sugar and chocolate coated tablet • Film coated tablet • Repeat action tablet • Delayed action tablet & enteric coated tablet • Controlled release tablets	• Buccal & sublingual tablets • Troches & lozenges • Dental cones	• Implantation tablet • Vaginal tablet	• Effervescent tablet • Dispensing tablet • Hypodermic tablet

ORAL TABLETS FOR INGESTION

Compressed Tablet

- Uncoated tablet intended to provide rapid disintegration & drug release.

Multiple Compressed Tablet (Layered tablets & Compression coated tablet)

Two components or three-layer tablets

- Tablets with in a tablet
- To produce repeat action & Prolonged action products
- Complete physical separation is required for stability purpose in case of three-layer tablets

Chewable Tablet

- Intended to be chewed in mouth.
- Most commonly used chewable tablet in market for children.
- Example - "Chewable Aspirin tablet" Antacid tablets, Anthelminthics
- Disintegrant not required

Sugar & Chocolate Coated

- In preparation of multivitamin and multivitamin mineral combination.

Film Coated Tablet

- Alternative procedure for drugs not requires coating
- Coating material: plasticizer + surfactant → Facilitate spreading
- POLYMER - Hydroxy Propyl cellulose (HPC) And HP Methyl Cellulose (HPMC)

Advantage of Film Coated Over Sugar Coated Tablet

- Mechanical Strength
- Little Increase in Tablet Weight
- Loss Likely to Be Mistaken for Candy.

IMPORTANT MILESTONES IN DRUG LEGISLATIONS AND PHARMACY PROFESSION

PRE-INDEPENDENCE ERA

Year	Important Milestones
1811	Young Scotch named Mr. Bathgate came to India with East India Company and opened Chemist's shop in Calcutta.
1820	Lord Cornwallis started Opium factory at Ghazipur (U.P.).
1824	Hindustani versions (Devnagri and persion scripts) of the London Pharmacopoeia were prescribed.
1857, 1878	The Opium Act enacted.
1868	The Pharmacopoeia of India published under the authority of Secretary of State for India.
1885	British Pharmacopoeia was made the sole authority for pharmacy profession.
1899	Achary P.C. Roy along with Karthik Chandra Bose established Bengal Chemical and Pharmaceutical Works at Calcutta.
1906	In U.S.A. - Federal Food & Drugs Act introduced.
1919	The Poisons Act enacted.
1920	In Canada - Food and Drugs Act introduced.
1925	In U.K. - The Therapeutic Substance Act introduced.
1928	In U.K. Drug Adulteration Act enacted.
11-8-1930	Drugs Enquiry Committee (D.E.C.) headed by Col. R. N. Chopra constituted.
1932	A two year Degree Course in Pharmaceutical Chemistry for B.Sc. - Beginning of pharmacy education at Banaras Hindu University by Prof. Mahadev Lal Schroff (Father of Pharmacy Education in country).
1939	United Provinces Pharmaceutical Association (U.P.P.A) was renamed as Indian Pharmaceutical Association (I.P.A). Publication of Indian Journal of pharmacy started.
1940	Drugs Bill introduced in the Parliament and Drugs Act later amended to Drugs & Cosmetic Act (D.C.A) was enacted. Biological Standardization Laboratory was named as Central Drugs Laboratory (COL) under DCA.
1940	Biological Standardization Laboratory was named as Central Drugs Laboratory (COL) under DCA.
1941	First Drugs Technical Advisory Board (DTAB) constituted.
1941	First All India Pharmaceutical Conference was held at B.H.U, Varanasi under the Presidentship of Prof. Mahadev Lal Schroff.
1944	First I. P. Committee constituted.
1945	Pharmacy Bill introduced in the Parliament.
1945	Rules for Drugs & Cosmetic Act framed.
1946	Indian Pharmaceutical Codex (I.P.C) published.

POST-INDEPENDENCE ERA

Year	Important Milestones
1948	The Pharmacy Act, 1948 enacted.
9-11-1949	First 'Pharmacy Council of India' (P.C.I.) constituted under the Pharmacy Act.
1949	Dr. K.C.K.E. Raja was nominated by the Central Government as the first President of Pharmacy Council of india.
1951	The Industries Act enacted.
11-7-1953	First Education Regulations (E.R) as approved by the Ministry of Health & F.W., Government of india was notified.
1954	The Drugs and Magic Remedies (Objectionable Advertisements) Act enacted.
1954	The first B. Pharmacy Course approved by Pharmacy Council of india at Birla College, Pilani.
1955	The first Diploma in Pharmacy Course approved by P.C.I. at Government Medical College, Amritsar.

CLASS – I	CLASS-III
• Ideal for oral route administration. • Drug absorbed rapidly. • Drug dissolved rapidly. • Rapid therapeutic action.	• Oral route for administration. • Drug absorbance is limited. • Drug dissolve rapidly. • Bioavailability is incomplete if drug is not release or dissolve in absorption window.
CLASS-II	**CLASS-IV**
• Oral route for administration. • Drug absorb rapidly. • Drug dissolve slowly. • Bioavailability is controlled by dosage form and rate of release of the drug substance	• Poorly absorbed by orally administration. • Both solubility & permeability limitation. • Low dissolution rate. • Slow or low therapeutic action. • An alternate route of administration may be needed.

BASIC CONCEPTS OF CLINICAL TRIALS

INTRODUCTION

- A set of tests in medical research and drug development that generate safety and efficacy data for health interventions in human beings.
- Clinical trials are conducted only after satisfactory information has been gathered on the quality of the nonclinical safety, and health authority/ethics committee approval is granted in the country where approval of the drug or device is sought.
- Clinical Trials are "real world" applications of the Scientific Method.

Pre-clinical Phase

- Involve in vitro (test tube or laboratory) studies and trials on animal populations.
- Wide ranging dosages of the compounds are introduced to the animal subjects or to an in vitro substrate.
- Obtain preliminary efficacy and pharmacokinetic informatics
- Decisions are made during this phase regarding further development of the test compound, test item, or test article.

Phases of Clinical Trials

Phase-I	Phase-II	Phase-III	Phase-IV
○ 15-30 people ○ What dosage is safe? ○ How should treatment be given? ○ How does treatment affect the body?	○ Less than 100 people ○ Does treatment do what it is supposed to? ○ How does treatment affect the body?	○ From 100 to thousands of people Compare new treatment with current standard.	○ From hundreds to thousands of people. ○ Usually takes place after drug is approved. ○ Used to further evaluate long-term safety and effectiveness of new treatment.

ABBREVIATED NEW DRUG APPLICATION (ANDA)

- An Abbreviated New Drug Application (ANDA) contains data which when submitted to FDA's CDER, Office of Generic Drugs, provides for the review and ultimate approval of a generic drug product.
- Once approved, an applicant may manufacture and market the generic drug product to provide safe, effective, low cost alternative to the public.
- All approved products, both innovator and generic, are listed in FDA's Approved Drug Products with Therapeutic Equivalence Evaluations (Orange Book).
- A drug product that is comparable to a brand/reference listed drug product in dosage form, strength, administration, quality .

COMMUNITY PHARMACY & MANAGEMENT

COMMUNITY PHARMACY PRACTICE

Community Pharmacy

- "Community pharmacy means any place under the supervision of a pharmacist where the practice of pharmacy occurs or where prescription orders are compounded and dispensed other than a hospital pharmacy or a limited-service pharmacy."
- Community pharmacy is also known as retail pharmacy.
- Community pharmacy is a diverse, dynamic and constantly changing practice environment comprising of several different practice settings and offering many opportunities for pharmacy practitioners.
- The main aim of community pharmacy is to educate the community about health and disease.

Role of Community Pharmacists

1. Processing prescription
2. Checking for drug interactions
3. Dispensing of medicines
4. Disposal of medicines
5. Providing advice
6. Counselling
7. Women welfare and infant care
8. Patient education
9. Alcohols, drug abuse and smoking cessation
10. Family planning

History and Development of Community Pharmacy

- In 1729, the first community pharmacy was founded in Philadelphia.
- The first college in India where professional training was given to students for treating patient with drugs was Madras Medical College established in 1835.
- The first two years professional course 'chemist and druggist diploma' was started in Madras Medical College in 1874.
- In 1932, pharmacy education was started at Banaras Hindu University introduced Bachelor's Pharmaceutical Chemistry and was the first university to start a 3-year bachelor's program in pharmacy.
- Proficient drugstore instruction began in Banaras Hindu College in 1937.

PROFESSIONAL RESPONSIBILITIES OF COMMUNITY PHARMACISTS

Professional Responsibilities of Community Pharmacists

1. Dispensing of Prescription
2. Communication
3. Patient Safety
4. Patient counselling
5. Dealing with general health of patient
6. Report important data to the physician
7. Drug Information Source
8. Healthcare accessories
9. Preventive health services
10. Formal Education & Training
11. Pregnancy & infant care
12. Manage stock & inventory of medicines

Good Pharmacy Practice (GPP)

- Good pharmacy practice defines pharmacists that provide quality pharmacy service to every patient.
- GPP is the practice of pharmacy that responds to the needs of the people, who use the pharmacist's services to provide optimal, evidence-based care.
- GPP guidelines are based on the pharmaceutical care given by pharmacists.
- In order to satisfy these requirements, WHO recommended that:
  a. Professional responsibility should be main philosophy underlying the practice.

5. Poor dispensing procedures or techniques.

Strategies to Minimize Dispensing Errors

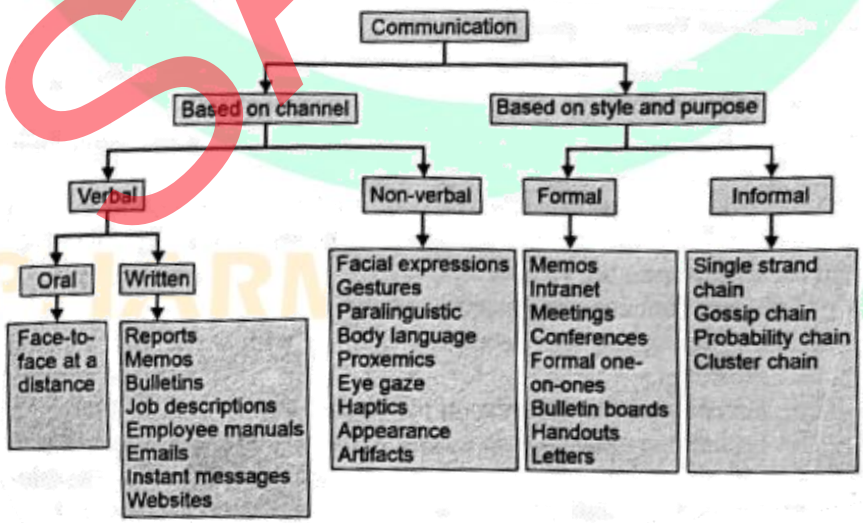
1. **Confirm contents of prescription:** It is important to call and verify with the prescriber to clarify any uncertainties or doubts regarding the prescription, if any.
2. **Beware of LASA medicines:** A new, unfamiliar drug may be read as an older, more familiar one. Some of these errors can be fatal.
3. **Be cautious while interpretation:** Inappropriate abbreviations, misplaced zeros, decimal points, and faulty units are common causes of medication errors due to misinterpretation.
4. **Organize workplace:** Proper lighting, adequate counter space, and comfortable temperature and humidity in pharmacy can help facilitate a smooth flow from one task to the next, thus reducing the chances of dispensing errors.
5. **Reduce distraction when possible:** Avoid multitasking and distractions by improving the pharmacy's internal work environment.
6. **Reducing stress and balance workloads:** Give regular breaks and freedom from certain secondary responsibilities.
7. **Store medicines properly:** Store look-alike drugs away from each other, lock-up drugs with a high potential of error.
8. **Thoroughly check all prescriptions:** Repeated checks and counterchecks is an important strategy to minimize dispensing errors. It is advisable to have the rechecks done by another person, typically a pharmacist. If not possible, delay self-checking rather than continuous self-checks.
9. **Always provide thorough patient counselling/guidance:** Counselling should involve providing information and instructions on how to take the medication by appropriate route of administration.
10. **Educating patients:** Educate patients about safe and effective use of their medicines to promote patient involvement in their healthcare to reduce medicine errors.

COMMUNICATION SKILLS

Definition

- Communication skills are the capability to use language in precise and express information in easy way to understand with patients and family members, other physicians nurses, pharmacist and other health care providers.

Types of Communication Skills



Verbal Communication Skills (One to one , Over the telephone)

- Verbal communication is a process in which a meaningful words or sounds are used as medium of communication.

2.	The premises should be under the control of registered pharmacist to supervise the sale, distribution and preservation of drugs
3.	The licenses shall be displayed at the prominent place, visible to public
4.	Purchases of drugs should be from duly licensed manufacturers or dealers.
5.	Drugs specified under Schedule C and C1 should have proper storage arrangements.
6.	The records/registers which are maintained shall be preserved for two years from the date of last entry.
7.	If there is change in premises, such change should be informed to licensing authority within one month.
8.	If the licensee wishes to sell an additional categories of drugs specified in Schedule C and C1 should take the permission of licensing authority.

SITE SELECTION REQUIREMENTS

- During the selection of a site for now pharmacy following factors should be considered:
  1. A needy town or city should be selected.
  2. Site of pharmacy in a particular city should be most suitable among those available.
- Site of pharmacy should be convenient and accessible to the majority of consumers. For this purpose site location should be center to population to be served.
- Pharmacy site should be equipped with adequate free parking facility.

PHARMACY DESIGNS AND INTERIORS

- While deciding the structure and design of a community pharmacy, the following factors need to be considered:
  1. **Ease and Convenience of Customers (Patients):**
     - The drug stores should not appear crowdy and messy.
  2. **Aesthetic Appearance:**
     - Not only front side but whole pharmacy should appear decorative as it will help to attract customers.
  3. **Adequate Space:**
     - Depending on services provided, there must be adequate space independently assigned for patient counseling, additional services like; B.P recording, blood sugar estimation, body weight measurement, etc.
  4. Ensure Healthy Environment in the pharmacy such as; adequate lighting and ventilation.
  5. Optimum utilization of available space.

Types of Materials Stocked

S. No.	Categories	Descriptions
1.	**Medicines**	• These include tablets, capsules, oral liquids, inhalations, external applications (gels, lotions, ointments, creams, sprays, tinctures, eye, ear, nose drops, gargles, vaginal and rectal preparations etc.
2.	**Cosmetics**	• Hundreds of cosmetic and toiletries are stocked and supplied to consumers by the community pharmacies.
3.	**Nutraceuticals**	• These are the substances that show physiological benefits and improve health, delay ageing process, prevent diseases, increase life expectancy or support the structure or functions of the body.
4.	**Miscellaneous items**	• Contraceptives, sanitary napkins, absorbent cotton, bandages etc.

Storage Conditions

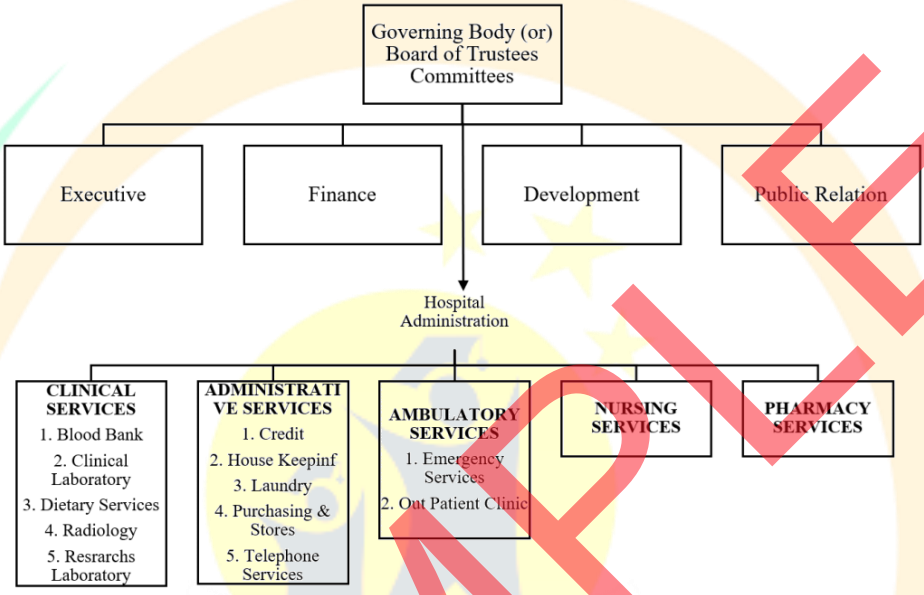
The Indian pharmacopoeia specifies the following storage conditions

HOSPITAL & CLINICAL PHARMACY

HOSPITAL PHARMACY

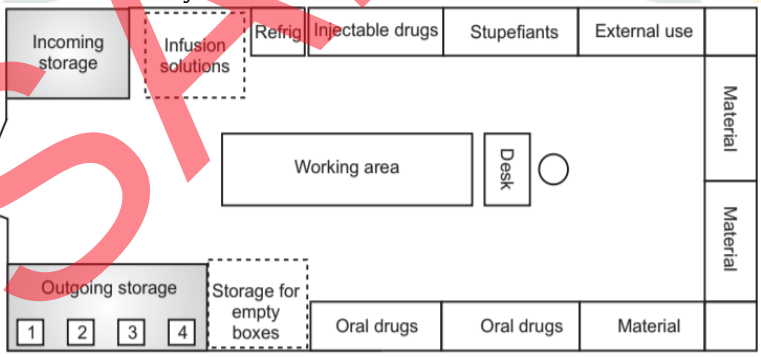
Organisational Structure

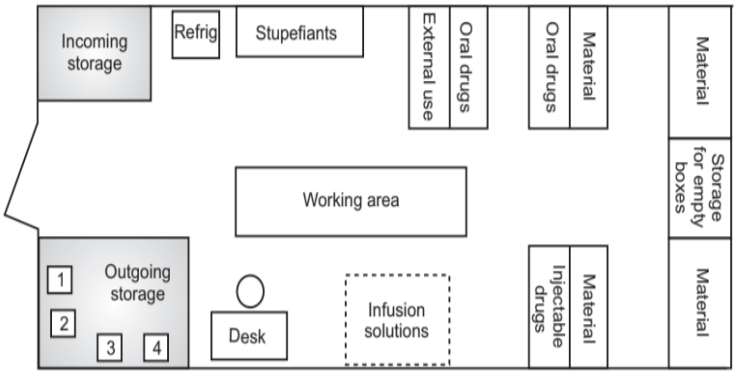
- The size and nature of a pharmacy department's management staff will depend on the number of personnel in the department and the scope of services delivered.



Location and lay out of Hospital Pharmacy

- Hospital pharmacy is mostly located in hospital premises only so that patients and staff can easily approach it.
- In the multi-stored building of a hospital, the pharmacy should be preferably located on the ground floor especially the dispensing unit.
- It should be laid in such a way that there is a continuous flow of men and materials.





Interpretation of Haematological Test

S. No.	Constituents	Normal range	Variation	Interpretation/ remarks
1.	**Heamoglobin**	**Men -** 16± 2 grams % **Women -** 14±2 grams %	Above upper limit of range	Condition known as polycythemia.
			Below lower limit	Condition is referred as anemia.
2.	**Hematocrit (volume of erythrocytes to that of whole blood)**	**Men –** 47 ± 5 % **Women –** 42 ±5 %	Increase	More fluid loss, cancer there is increase in erythropoietin
			Decrease	In anemia, hemorrhage or hemolysis
3.	**Leucocytes**	5000-8000/cu.mm	Increase	Leukocytosis, leukemia
4.	**Neutrophils**	50-70 %	Increase	In bacterial infections, necrosis, tumors
			Decrease	Neutropenia causes damage of bone marrow
5.	**Eosinophils**	1 - 5 %	Increase	In patients with asthma, parasitic infections, skin infections
			Decrease	In acute inflammatory conditions and in acute stress
6.	**Basophils**	0.5 %	Increase	Allergic reactions, hypothyroidism, anemia
			Decrease	Chronic corticosteroids, hyperthyroidism
7.	**Lymphocytes**	20-40 %	Increase	Tuberculosis, mumps,
			Decrease	Lymphopenia, congestive heart failure
8.	**Monocytes**	1 – 6%	Increased	Leukemias, lymphomas
9.	**Platelets**	200000 to 400000 per cu. Mm	Increased	Thrombocytosis
			Decreased	Thrombocytopenia

Liver Function Test

- Liver function tests are groups of clinical biochemistry laboratory blood assays designed to give information about the state of a patient's liver.

Interpretation of Liver Function Test

1. **Albumin Test**
   - Albumin is a protein specifically made by the liver, and can be measured cheaply and easily.
   - Albumin levels are decreased in chronic liver disease, such as cirrhosis. It is also decreased in nephrotic syndrome, where it is lost through the urine.
   - **Reference range: 3.5-5.3 gm/dl**

2. **Aspartate Transaminase Test (AST)**
   - Aspartate transaminase (AST) also called Serum Glutamic Oxaloacetic Transaminase (SGOT) or aspartate Amino transferase (ASAT).
   - It is an enzyme usually found inside liver parenchymal cells.
   - However, AST can also be released if heart or skeletal muscle is damaged because it is also present in red blood cells, cardiac and skeletal muscle.
   - For this reason ALT is usually considered to be more specifically related to liver problems.
   - Elevated AST levels are not specific for liver damage, and AST has also been used as a cardiac marker.

CELL: THE UNIT OF LIFE

DEFINITION OF VARIOUS TERMS USED IN ANATOMY AND PHYSIOLOGY

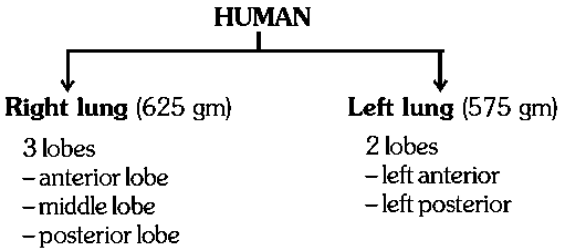
S.No.	Term	Definition
1.	Histology	Study of tissues
2.	Histopathology	Microscopic study of tissue for sign of disease
3.	Cytology	Study of structure and function of cells
4.	Pathology	Study of nature, cause and processes of disease
5.	Osteology	Study of bones
6.	Arthrology	Study of joints.
7.	Myology	Study of muscle
8.	Splanchnology	Study of organs of viscera
9.	Neurology	Study of nervous system
10.	Cardiology	Study of heart.
11.	Ophthalmology	Study of eyes.
12.	Endocrinology	Study of endocrine glands
13.	Otology	Study of ear
14.	Odontology	Study of teeth
15	Pulmonology	Study of respiratory system.
16.	Haematology	Study of blood

DIFFERENCE BETWEEN EUKARYOTIC AND PROKARYOTIC CELL

DEFINITIONS / DESCRIPTION	EUKARYOTIC CELL	PROKARYOTIC CELL
Organisms:	Plants, animals and fungi Jhave eukaryotic cells.	Only bacteria and Cyanobacteria Jhave prokaryotic cells.
Cell wall:	No (animals); Yes (plants)	Yes
Centrioles:	Yes (all animals and some lower plant forms)	NO
Cilia and Flagella:	Yes, simple	Yes, complex
Golgi Complex:	Yes	NO
Lysosomes:	Common in animals; Not present in plants	NO
Peroxisomes:	Yes	NO
Nucleus:	Yes	NO
Plasma membrane:	Yes	Yes
Chromosomes:	Several chromosomes	One long DNA strand
Ribosomes:	Yes	Yes
Endoplasmic Reticulum	Present	Absent

DESCRIPTOIN OF VARIOUS ORGANELLES PRESENT IN THE CELL

Organelles	Description
Nucleus	• It is the largest structure present almost at the center of a cell. The nucleus contains. • Nucleus: it is a highly coiled filamentous structure present in the nucleus • Chromatin: these are fibrous threads present in the nucleus
Mitochondria	• the mitochondria are made up of proteins, phospholipids and some ribonucleic acid. • known as the “power house” of a cell because “Adenosine tri phosphate” (ATP) is produced in mitochondria.



PULMONARY AIR VOLUMES

Pulmonary air volumes	Comments	Amount of air
Tidal volume (TV)	The volume of air inspired or expired with every normal breath without any effort	500 mL (0.5 L)
Inspiratory reserve volume (IRV)	The extra amount of air which can be inhaled forcibly after a normal inspiration	2500-3000 mL (3 L)
Expiratory reserve volume (ERV)	The extra amount of air that can be exhaled forcibly after a normal expiration	1000-1100 mL (1 L)
Residual volume (RV)	The volume of air that remains inside lungs at the end of maximum forceful expiration	1100-1200 mL (1.2 L)

PULMONARY CAPACITIES

Inspiratory capacity (IC)	Volume of air a person can inspire after a normal expiration	This includes TV + IRV
Expiratory capacity (EC)	Volume of air a person can expire after a normal inspiration	This includes TV + ERV
Functional residual capacity (FRC)	The volume of air that will remain in the lungs after a normal expiration	This include ERV + RV
Vital capacity	Amount of air which one can inhale and exhale with maximum effort	This includes ERV, TV and IRV
Total lung capacity	Total volume of air accommodated in the lungs and the respiratory passage after a maximum inspiration.	It includes VC + RV

DIGESTIVE SYSTEM

ENTERIC NERVES OF GIT

Nerve	Location and function
Auerbach's plexus	• Also known as myenteric nerve plexus, present between the inner circular muscle and outer longitudinal muscle layer. • Major function of this nerve is, to regulate the movement of GI tract.
Meissner's nerve plexus	• Also known as submucous nerve plexus, situated between the muscular layer and submucosal layer of GI Tract. • Major function of this nerve is, to regulation of secretory function of GI tract.

GASTROINTESTINAL HORMONE DIGESTION

S.No.	Source	Stimulus for secretion	Target organ	Action
1.	**Gastrin**	Distension of stomach on food entry	Stomach	• Stimulates secretion of gastric juice • Constricts cardiac sphincter
2.	**Enterogastrone**	Chyme entry into duodenum	Stomach	• Slows gastric contraction to delay emptying

PHARMACOLOGY

1 GENERAL PHARMACOLOGY

INTRODUCTION AND SCOPE OF PHARMACOLOGY

INTRODUCTION

- **Pharmacology** (an amalgam of the Greek pharmakos, medicine or drug and logos, study) is a broad discipline describing the use of chemicals to treat and cure disease.
- **Pharmacokinetics** deals with the absorption, distribution, metabolism and excretion of drugs in the human body.
- **Pharmacodynamics** is the study of the interaction of the drug molecule with the biological target (referred to generically as the "receptor," vide infra).

Essential medicines: -

- E → Effective and economical
- S → Safe
- S → Single drug formulation mostly
- E → Environmental factor are also considered in making the choice
- N → Needed by the majority of population
- T → They must be available at all times
- I → In proper dosage form
- A → Aim is to optimally use the limited financial resources
- L → List of essential drugs is made locally with the help of WHO model list

ORPHAN DRUGS	OVER THE COUNTER DRUGS	PRESCRIPTION DRUGS
Drugs that are used for the diagnosis, treatment or prevention of rare diseases	These drugs can be sold to a patient without the need for a doctor's prescription	These are drugs which can be obtained only upon producing the prescription of a RPM.
"SR DDLG Ka FAN Hai" S → Sumatriptan R → Rifabutin D → Digoxin immune fab L → Liyothyronine (T3) F → Fomipizole A → Amphoteracin B N → Nitrates	e.g., Paracetamol, antacids etc.	e.g., antibiotics, antipsychotics etc.

SCOPE OF PHARMACOLOGY

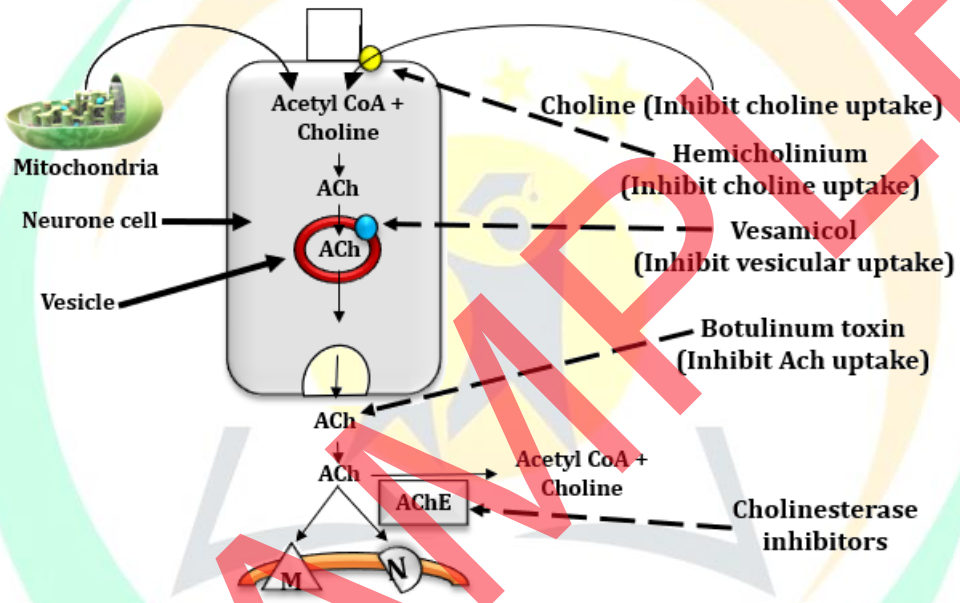
- **Pharmacotherapeutics: -**Use of drugs in prevention & treatment of disease.
- **Clinical pharmacology: -** Scientific study of drugs in man.
- **Toxicology: -** Aspect of pharmacology deals with adverse effects of Drugs.
- **Pharmacodynamic agents: -** Designed to have pharmacodynamic effects in the recipient.
- **Chemotherapeutic agents: -** Designed to inhibit/kill parasites/malignant cells & does not have or with minimal pharmacodynamic effects in recipient.
- **Clinical pharmacology: -** it is the systemic study of a drug in man both in kinetic healthy volunteers and in patients .it includes the evaluation of pharmacokinetics and pharmacodynamics data, safety, efficacy and adverse effect of a drug by comparative clinical trials.

2 DRUGS ACTING ON PERIPHERAL NERVOUS SYSTEM

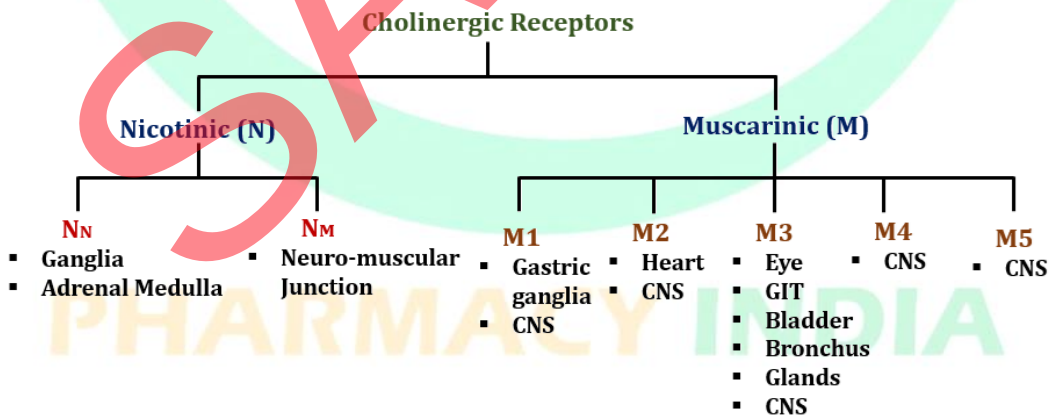
CHOLINERGIC DRUGS

- **Definition:** Cholinergic drugs are chemicals that act at the same site as acetylcholine, thereby mimicking its actions. They are therefore called parasympathomimetics or cholinomimetics.
- In the parasympathetic system, acetylcholine is the principal NT secreted by preganglionic and postganglionic fibres.
- Therefore, it is also known as cholinergic nervous system.
- ACh is synthesized (from acetyl Co-A and choline) and stored within the cholinergic neurons.

Cholinergic Transmission



Types of Cholinoceptors



Muscuranic Receptors

	M1	M2	M3
Location and Function	**Autonomic ganglia:** Depolarization **Gastric Gland:** Histamine release, Acid Secretion **CNS:** Learning, Memory, Motor activity.	**SA node:** Hyperpolarization, ↓se the rate of impulse generation. **AV node:** ↓se velocity of conduction **Atrium:** shortening of APD, ↓se contractility	**Visceral smooth muscle:** Contraction **Iris:** contraction of pupil **Ciliary muscle:** Contraction **Exocrine gland:** secretion

	maintenance anaesthetic after i.v. induction.	

Benzodiazepines (BZDs)

- In addition to pre-anaesthetic medication, BZDs are now frequently used for inducing, maintaining and supplementing anaesthesia as well as for 'conscious sedation'.

Pharmacological actions

- Benzodiazepines work by enhancing a very important neurotransmitter called GABA (gamma amino butyric acid) at the GABA A receptor. This results in the sedative, hypnotic (sleep-inducing), anxiolytic (anti-anxiety), anticonvulsant, and muscle relaxant properties

Dose	Indications	Contraindications
• 5 to 25 mg three times a day-four times a day Maximum 40 mg/day.	• Anxiety disorders • Insomnia • Acute status epilepticus • Induction of amnesia • Spastic disorders • Seizure disorders, and agitation.	• Sedation • Dizziness • Weakness, and • Unsteadiness

Ketamine

- In anaesthetic doses, it produces a trans-like state known as *dissociative anaesthesia* characterized by intense analgesia, immobility, amnesia and a feeling of dissociation from ones own body and surroundings with or without actual loss of consciousness. Thus, ketamine produces both analgesia and anaesthesia.

Pharmacological Action

- Ketamine acts by blocking the NMDA receptor which is an excitatory amino acid receptor.
- Ketamine is highly lipid-soluble and gets rapidly distributed into highly perfused organs and then redistributed to less vascular structures.

Dose	Indications	Contraindications
• 1 to 4.5 mg/kg IV; alternatively, 1 to 2 mg/kg IV at a rate of 0.5 mg/kg/min; (2 mg/kg dose provides 5 to 10 minutes of surgical anesthesia within 30 seconds)	• For short surgical and diagnostic procedures particularly in poor-risk patients.	• Hypertension, • CCF, • Cerebral haemorrhage, • Increased intracranial tension, • Psychiatric disorders and pregnancy before term.

HYPNOTICS AND SEDATIVES

Introduction

- **Sedative** is a drug that produces a calming or quietening effect and reduces excitement. It may induce drowsiness.
- **Hypnotic** is a drug that induces sleep resembling natural sleep.
- Both sedation and hypnosis may be considered as different grades of CNS depression.

Sleep Cycle:

- **Electroencephalography (EEG)** shows the timing of sleep cycles.
- **EOG (electrooculography)** is the measure of the eyes' movement.
- **The phase of sleep cycle includes –**
  - NREM (None-rapid eye movement sleep) (70 – 80%)
  - REM (Rapid eye movement sleep) (20 – 30%)
- **The different phase of sleep and their characteristic:**

PHASE	SLEEP TIME
0 (Awake)	1-2 %
I (Dozing)	3-6 %
II (Unequivocal sleep)	40–50 %
III (Deep sleep transition)	5–8 %
IV (Cerebral sleep)	10–20 %

12 CHEMOTHERAPEUTIC AGENTS

INTRODUCTION

- **Chemotherapy** can be defined as the use of a chemical substance in infectious diseases to destroy microorganisms without damaging the host tissues.
- **Antibiotics** are substances produced by microorganisms that suppress the growth of or destroy other microorganisms at low concentrations.
- **Antimicrobials:** (chemotherapeutic agent + Antibiotics) Any substance of natural, synthetic or semisynthetic origin which at low concentrations kill or inhibits the growth of microorganisms but causes little or no host damage.
- **Minimum inhibitory concentration (MIC)** is the minimum concentration of an antimicrobial agent that prevents visible growth of a microorganism.
- **Superinfection (Suprainfection)** is defined as the occurrence of a new infection due to antimicrobial therapy for another infection. The causative organism of superinfection should be different from that of the primary disease.
- **Chemoprophylaxis** is the administration of antimicrobial agents to prevent infection or to prevent development of disease in persons who are already infected.

Antimicrobials may also be classified as

Bacteriostatic agents	Suppress the growth of bacteria, **e.g.,** sulfonamides, tetracyclines, linezolid, chloramphenicol and clindamycin.
Bactericidal agents	kill the bacteria, e.g., penicillins, cephalosporins, aminoglycosides, fluoroquinolones, rifampicin, metronidazole and vancomycin.

Selection of an appropriate AMA depends on

Patient factors	Drug factors	Organism-related factors
○ Age ○ History of allergy ○ Genetic abnormalities ○ Pregnancy ○ Host defense ○ Hepatic dysfunction ○ Renal dysfunction ○ Local factors	○ Route of administration ○ Spectrum of antimicrobial activity ○ Bactericidal/Bacteriostatic effect ○ Pharmacokinetic/ Pharmacodynamic consideration ○ Cost of the AMA	○ Clinical diagnosis: empirical therapy ○ Bacteriological reports ○ Resistance to AMAS ○ Cross-resistance

Classification of Antimicrobial Agents
According to their spectrum of activity:

Narrow Spectrum	Broad Spectrum
Penicillin G, Streptomycin, Erythromycin	Tetracyclines, Chloramphenicol

Based on the type & site of action

Mechanism of action	Bacteriocidal	Bacteriostatic
Protein synthesis inhibitor	Aminoglycoside, Streptogramins	Tetracycline, Chloramphenicol, Lincosamide, Linezolid, Macrolides,
Cell wall synthesis inhibitor	Penicillin, Cephalosporins, Vancomycin, Bacitracin, Cycloserine, Fosfomycin	_
Drug acting on cell membrane	Polymyxin B, Colistin, Tyrothricin, Amphotericin B	_
Antitubercular	Isoniazid, Rifampicin, Pyrazinamide	Ethambutol

PHARMACOTHERAPEUTICS

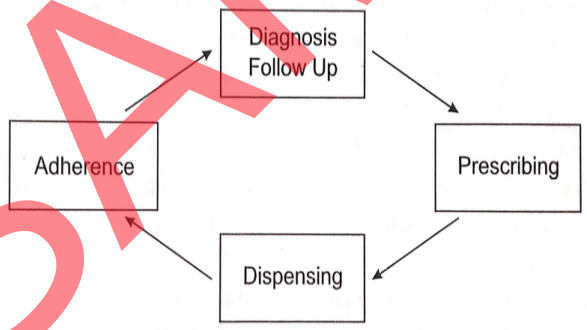
INTRODUCTION TO PHARMACOTHERAPEUTICS

RATIONAL USE OF MEDICINES

- Medication is an essential key in healthcare delivery. The purposes of its use like disease cure or prevention, symptom relief and pain palliation can be achieved when it is used properly.
- Irrational use of medicines is a major problem worldwide WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take them correctly Irrational drug use results in adverse drugs reactions (ADRs), drug-drug interactions, morbidity, mortality poor outcome of cure control, prevention of disease. antimicrobial resistance, financial loss and non-adherence of patients to the treatment.
- Irrational prescribing of drugs is a malady of excess and lack of access specially, in rural India both healthcare providers and patients contribute to irrational medicine use.
- Irrational use results in morbidity, mortality, adverse drug reactions (ADRs), poor outcome of cure, control, prevention of disease, antimicrobial resistance and financial loss.

Impact of Irrational use of Drugs

1. **Antibiotic resistance:** Due to the overuse and under therapeutic dosage use of antibiotics.
2. **Adverse, possibly lethal effects:** Due to antibiotic misuse or inappropriate use of drugs in self-medication.
3. **Drug dependence**: e.g., due to daily use of painkillers and tranquilizers.
4. **Increase the cost of treatment:** Unnecessary drug use can increase the cost of treatment and stay time in hospital.
5. **Risk of infection (due to improper use of injections):** Injection-related disorders are abscesses, polio, hepatitis and AIDs.
6. **Limited efficacy:** e.g., in the case of under-therapeutic dosage of antibiotics, tuberculosis of leprosy drugs.



Drug Use Process

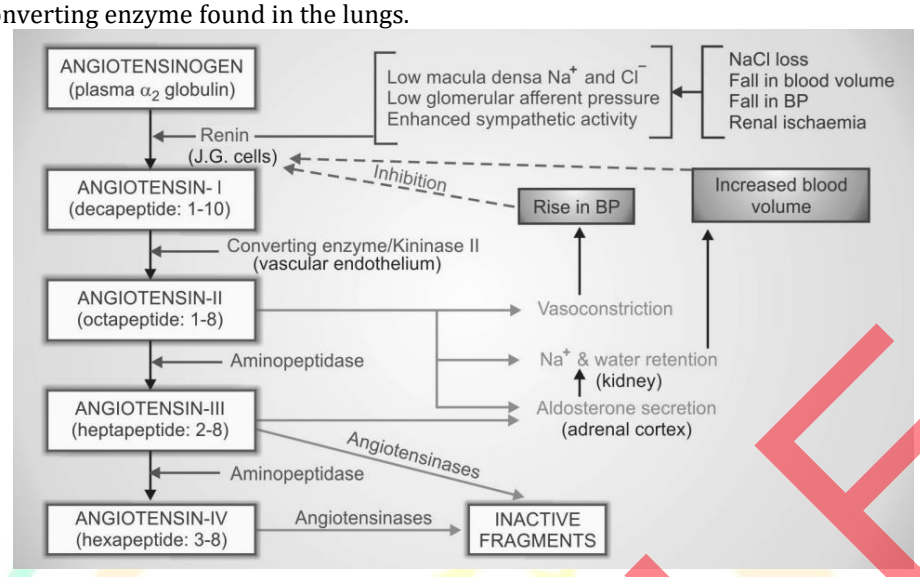
Rational use of drugs, especially rational prescribing, should meet certain criteria as follows

1. **Appropriate indication:** The decision to prescribe drug(s) is entirely based on medical rationale and the drug therapy is an effective and safe treatment.
2. **Appropriate drug:** The selection of drugs is based on efficacy, safety, suitability, and cost considerations for the patient.
3. **Appropriate patient:** No contraindications exist, the chance of adverse reactions is minimal and the drug is acceptable to the patient.
4. **Appropriate patient information:** Patients are provided with relevant, accurate, important and clear information regarding their conditions and the medication(s) that are prescribed.
5. **Appropriate evaluation and monitoring:** The anticipated and unexpected effects of medications are appropriately monitored and interpreted.

WHO advocates 12 key interventions to promote more rational use:

1. Establishment of a multidisciplinary national body to coordinate policies on medicine use
2. Use of clinical guidelines.
3. Development and use of national essential medicines list.

✓ Angiotensin-I is subsequently converted to angiotensin II by the enzyme angiotensin converting enzyme found in the lungs.



Clinical Manifestation

1. Dizziness 2. Irregular heartbeat 3. Fainting 4. Low BP 5. Fatigue 6. Nausea

Diagnosis

- Blood pressure should be measured by using a sphygmomanometer of validated accuracy:

Category	Blood Pressure(mmHg)	
Normal	<120	<80
Prehypertension	120-139	80-89
Hypertension		
Stage1	140-159	90-99
Stage2	>160	>100

Non-Pharmacological Management

Lifestyle Modification to Control Blood Pressure

Modification	Recommendation	Avg. SBP Reduction Range
Weight reduction	Maintain normal body weight (body mass index 18.5-24.9 kg/m^2).	5-20 mmHg/10 kg
DASH eating plan	Adopt a diet rich in fruits, vegetables and low-fat dairy products with reduced content of saturated and total fat.	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to < 100 mol per day (2.4 g 2-8 mmHg sodium or 6 g sodium chloride).	**2-**8mmHg
Aerobic physical activity	Regular aerobic physical activity (e.g., brisk walking)at least 30 minutes per day,most days of the week.	4-9 mmHg
Moderation of alcohol consumption	Men: limit to <2 drinks* per day. Women and lighter weight per-sons: limit to < 1 drink* per day	2-4 mmHg

Pharmacological Management

Drugs	Mechanism of action
ACE enzyme inhibitor	Captopril, Enalapril, Lisinopril, Fosinopril, Perindopril
Angiotensin receptor antagonist	Losartan, Candesartan, Valsartan, Telmisartan, Irbesartan
Direct renin inhibitor	Aliskiren

- Sometimes diets are also required to manage the disease so, always follow the rules and regulations which are regulated by our government.

ENDOCRINE SYSTEM

DIABETES MELLITUS

Introduction

- Diabetes mellitus (DM) is derived from the Greek word diabetes which means to pass and the Latin word mellitus which means sweet.
- DM is a metabolic disorder of carbohydrate, fat and protein that is characterized by hyperglycemia and glucose intolerance.

Type of diabetes

1. **Insulin-dependent diabetes (Type 1 Diabetes) TIDM**
   - In case of TIDM autoimmune destruction of beta cells in the pancreas result in low or minimum insulin level. TIDM can be controlled by diet plan and insulin injections.
2. **Non-Insulin-dependent diabetes (Type 2 Diabetes) T2DM**
   - This is the commonest form of DM. Nearly 80% of diabetics belong to T2DM.
   - In Type 2 diabetes, there is a relatively deficiency of insulin which is not enough to keep blood sugar normal. Insulin resistance is multifactorial but commonly develops from overeating, obesity, under activity and aging.

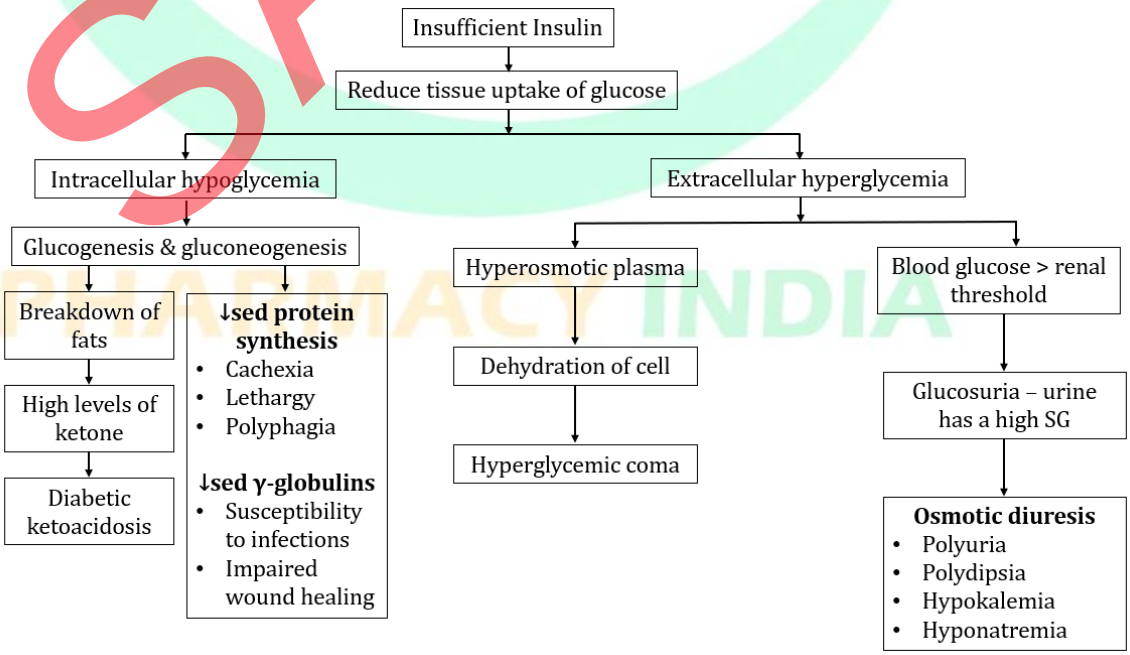
Etiopathogenesis

Etiology

- There are mainly two types of cells: insulin-producing beta cells and glucagon secreting alpha cells present in the Langerhans of pancreas.
- The secretions of insulin and glucagon depend on the blood sugar level cells.
- The hyperglycemia which is the main feature of DM occurs due to the relative or absolute deficiency of insulin.

Pathophysiology

- Type 1 DM accounts for 5% to 10% of all diabetes cases. It generally develops in childhood or early adulthood and results from immune mediated destruction of pancreatic β-cells, resulting in an absolute deficiency of insulin.



Clinical Manifestations

- Polyurea (frequent urination) increased hunger

1 INTRODUCTION TO PHARMACEUTICAL CHEMISTRY

SOURCES AND TYPES OF ERRORS

Error

- Error is the difference between the true result (accepted true result) and the measured result.

Types of errors

- **Determinate (systematic) Errors:** they are those errors that are known and controllable errors e.g., instrument errors, personal errors.
- **Indeterminate (random) Errors:** these are random errors that are caused by uncontrollable or unknown fluctuations in variables that may affect experimental results.

Sources of Errors

Personal errors	They are exclusively caused due to 'personal equation' of an analyst and do not due to either on the prescribed procedure or methodology involved.
Instrumental errors	These are invariably caused due to faulty and uncalibrated instruments, such as: pH meters, UV-spectrophotometers, potentiometers etc.
Reagent errors	• The errors that are solely introduced by virtue of the individual reagents, for examples. • High temperature volatilization of platinum (Pt).
Constant Errors	• Multiple measurements show the same constant error. • E.g., if a scale of 15 cm actually measures 14.8 cm. Then it is measuring 0.2 cm more in every observation. This type of error will be same in all measurements done by the scale.
Proportional Errors	Proportional errors decrease or increase in proportion to the size of the sample taken for analysis. A common cause of proportional errors is the presence of interfering contaminants in the sample.
Errors due to Methodology	Both improper (incorrect) sampling and incompleteness of a reaction often lead to serious errors. A few typical examples are invariably encountered in titrimetric and gravimetric analysis.

Accuracy

- Accuracy is the degree of closeness of the measurements to the target or ref. value.
- Accuracy often referred as Bias error.
- Accuracy is measuring near the target or true or ref. value
- ISO defines accuracy as describing a combination of both types of observational error above (random and systematic), so high accuracy requires both high precision and high trueness.

Precision

- Precision is the degree of closeness of the measurements with each other.
- Precision - often referred as Repeatability and Reproducibility error.

Significant Figures

7 DRUGS ACTION ON CARDIOVASCULAR SYSTEM

ANTI-ARRHYTHMIC DRUGS

Introduction

- Antiarrhythmics are medications that prevent and treat a heart rhythm that's too fast or irregular.
- They can reduce symptoms and help avoid life-threatening complications.

CLASSIFICATION OF ANTIARRHYTHMIC DRUGS

CLASSES	DRUGS
Class I	A. Quinidine, Procainamide, Disopyramide
	B. Lidocaine, Mexiletine
	C. Flecainide, Propafenone
Class II	Propanolol, esmolol sotalol
Class III	Amiodarone
Class IV	Verapamil
Miscellaneous	Purine nucleotide: Adenosine

QUINIDINE SULPHATE

Description	Quinidine is cinchona alkaloid obtained along with quinine. It contains quinoline nucleus.
Brand Name	Natcardine, 5k-Quinidine sulphate, Quinidex, Kinidin, Kinidrin.
Formulation	Quinidine Tablet
Storage	well closed container
Uses	➢ It is used in the treatment of cardiac arrhythmias. ➢ It has been found to be effective moderately against Ventricop premature systoles and paroxysmal atrial tachycardia.

PROCAINAMIDE HYDROCHLORIDE

Description	Procainamide is the amide of procaine. It is not easily hydrolyzed by acid like procaine. This makes the use of procainamide by oral route.
Brand Name	Pronestyl, Procan, Procapan, Norocoinamid
Formulation	Procainamide Injection/Tablet
Storage	air-tight container
Uses	➢ Treatment of cardiac arrhythmias. ➢ Local anaesthetic.

VERAPAMIL

Description	Verapamil is a calcium channel blocker; class iv anti-arrhythmic drug. It is a derivative of papaverine.
Brand Name	Isoptin, Verelan, Verelan PM, Calan, Bosoptin, Covera-HS
Formulation	Verapamil tablets
Storage	In well closed air tight container.
Uses	➢ It is used in the treatment of angina pectoris and supraventricular arrhythmias. ➢ The immediate-release tablets are also used alone or with other medications to prevent and treat irregular heartbeats.

PHENYTOIN SODIUM

Description	Phenytoin Sodium is the sodium salt of phenytoin a hydantoin derivative.

BIOCHEMISTRY & CLINICAL PATHOLOGY

INTRODUCTION TO BIOCHEMISTRY

Introduction

- Biochemistry is a discipline of Chemistry that deals with the chemical composition of living organisms.
- 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
Protein	Amino acids	The fundamental basis of structure and function of cell (static and dynamic functions).
Deoxyribonucleic acid (DNA)	Deoxyribonucleotides	Repository of hereditary information.
Ribonucleic acid (RNA)	Ribonucleotides	Essentially required for protein biosynthesis.
Polysaccharide (glycogen)	Monosaccharides (glucose)	Storage form of energy to meet short term demands.
Lipid	Fatty acids, glycerol	Storage form of energy to meet long term demands; structural components of membranes.

CARBOHYDRATES

Introduction to Carbohydrates

- Carbohydrates are organic compounds with general formula $C_n(H_2O)_n$.
- They are composed of carbon, hydrogen, and oxygen having the ratio of oxygen and hydrogen atom 2:1. Eg :- Glucose ($C_6H_{12}O_6$)
- Carbohydrates are the primary source of energy as cells utilize carbohydrate directly for cellular respiration in the presence of oxygen.
- At the end of reaction, carbon dioxide, water, and energy is obtained (in the form of ATP), as shown below:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$$

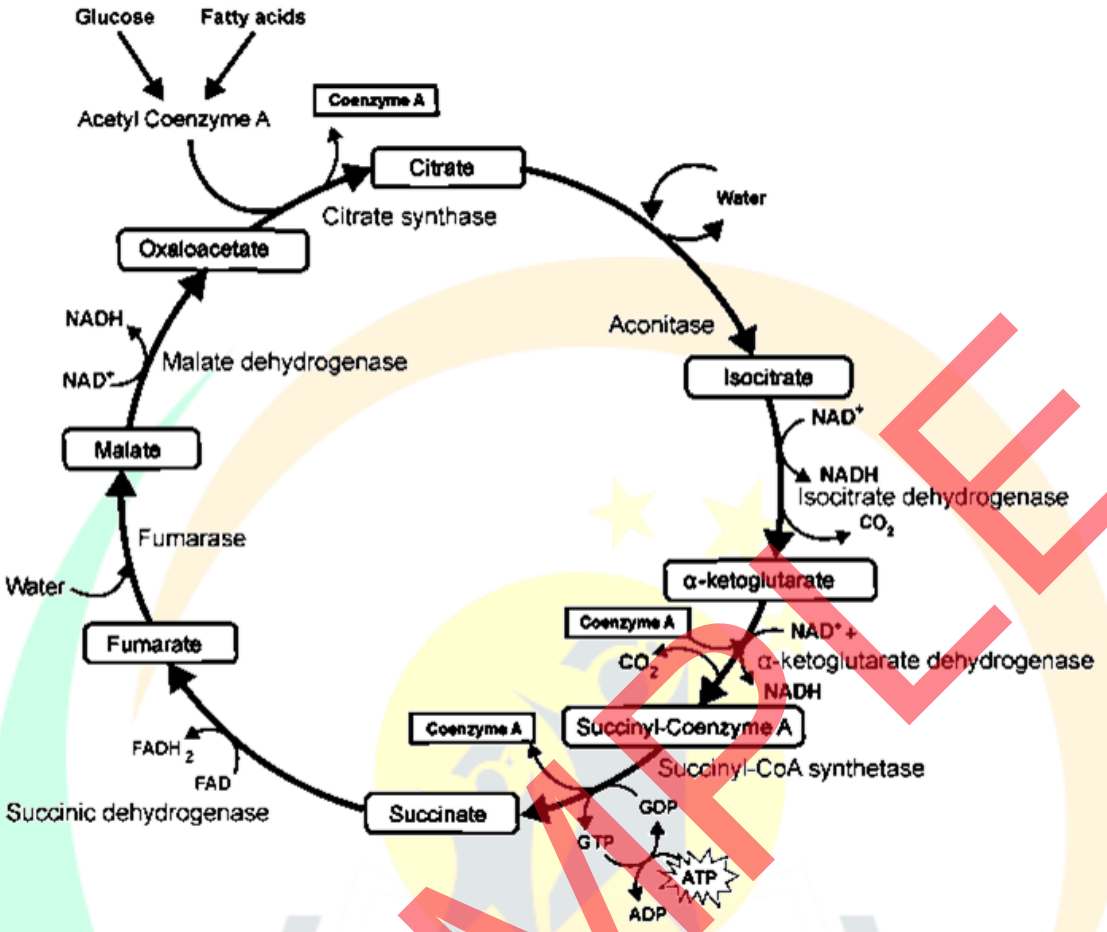
Carbohydrates contain the following functional groups:

1. Alcoholic hydroxyl groups (-OH),
2. Aldehyde group (CHO), and
3. Ketone group (C=O)

Classification of Carbohydrates on the basic of complexity

Class	Types	Examples
Monosaccharides	Triose ($C_3H_6O_3$)	Glyceraldehyde, Dihydroxyacetone
	Tetrose ($C_4H_8O_4$)	Erythrose, Erythrulose
	Pentose ($C_5H_{10}O_5$)	Ribose, Ribulose, Deoxyribose, Xylose, Xylulose
	Hexose ($C_6H_{12}O_6$)	Glucose, Galactose, Mannose, Fructose
	Heptose ($C_7H_{14}O_7$)	D - Sedoheptulose
Disaccharides		Sucrose, Lactose, Maltose
Trisaccharides		Raffinose, Gentianose
Polysaccharides	Homopolysaccharide	Starch, Dextrin, Inulin, Glycogen, Cellulose

Citric Acid Cycle (Tricarboxylic acid cycle, TCA cycle, Krebs cycle)



- A sequence of reaction in which acetyl-CoA (two carbon unit) completely oxidized to carbon dioxide. The reactions of citric acid cycle occur in mitochondria.
- Almost 65-70% of the ATP is synthesized in Krebs cycle.

ATP generation steps

Step	Reactions	Co-enzyme	No. of ATP generated
3	**Isocitrate → alpha ketoglutarate**	NADH	3 × 2 = 6
4	**Alpha ketoglutarate → succinyl CoA**	NADH	3 × 2 = 6
5	**Succinyl CoA →Succinate**	GTP	1 × 2 = 2
6	**Succinate →Fumarate**	$FADH_2$	2 × 2 = 4
8	**Malate →Oxaloacetate**	NADH	3 × 2 = 6
		Total=	**12**

Energy yield (number of ATP generated) per molecule of glucose when it is completely oxidized through glycolysis plus citric acid cycle, under aerobic conditions

Pathway	Step	Enzyme	Source	No.of ATP gained per glucose
Glycolysis	1	Hexokinase	-	-1
	3	Phosphofructokinase	-	-1
	5	Glyceraldehyde-3-P DH	NADH	3 × 2 = 6
	6	1,3-BPG kinase	ATP	1 × 2 = 2
	9	Pyruvate kinase	ATP	1 × 2 = 2
Pyruvate to Acetyl CoA	-	Pyruvate dehydrogenase	NADH	3 × 2 = 6
TCA cycle	3	Isocitrate DH	NADH	3 × 2 = 6
	4	alpha keto glutarate DH	NADH	3 × 2 = 6

PHARMACOGNOSY

1 DEFINITION, HISTORY OF PHARMACOGNOSY

- A branch of bioscience which treats in details medicinal and related products of crude or primary type obtained from plant, animal and mineral origins.

Derived from Greek word

***Pharmakon*, 'a drug'** + ***gignosco* or *gnosis*, 'to acquire the knowledge of'**

- "It is a branch of science and a tool for crude drug standardization which deals with the scientific and systematic
  - study of structural,
  - physical,
  - chemical and
  - biological characters
  - and evaluation of crude drugs

along with geographical sources, history, method of cultivation, collection and preparation for the market, their proper storage and their application in the improvement of health."
- **Drugs -** all medicines for external or internal use of human beings or animals and all substances or in the diagnosis, treatment, and mitigation to be used for prevention of any disease or disorder in human being or animals.
- **Crude Drugs -** Naturally occurring substances either obtained from plants/ animals/ minerals which is used in their natural state (without any processing except drying & side reduction).
- Examples –
  - ✓ Vinca, Punarnava (Whole plant)
  - ✓ Clove (flower bud)
  - ✓ Coriander, Cumin (fruit)
  - ✓ Tulsi, Neem (leaf)

➢ Pharmacognosy term – first used by *Johann Adam Schmidt* in his manuscript *Lehrbuch der Materia Medica* in 1811.

➢ First coined by *C.A. Seydler* (Germen scientist) by in 1815 in the title of his work "Analecta Pharmacognostica".

Seydler

History of Pharmacognosy

- China- many medicinal plants had been in use since 5000 B.C. The oldest known herbal is- pen-t'sao written by emperor *Shen Nung* (around 3000 B.C). It contains 365 drugs, one for each day of year.
- India- A large portion of Indian population even today depends on the Indian system of Medicine- Ayurveda, "An ancient science of life". (Ayur- Life and Veda –study of).
- **Charaka Samhita-** made 50 groups of 10 herbs for illness, according to physician's need
- **Sushrutha Samhita-** arranged 760 herbs in 7 distinct sets based on their common properties.
- The oldest written book- Rig ved and Atharva ved represent medical knowledge and practices that formed the basis of the Ayurveda system.

Scientists and their Contributions

Scientist	Their contribution
Hippocrates (460-360 B.C)	Greek scientist, known as Father of Medicine.

Senna	Tulsi	Uncaria gambier
Vinca	Wool fat	Yellow bees-wax
Zedoary		

2. Taxonomical (Biological) Classification

- The drugs are classified according to plants or animals from which they are obtained in –
  - Phyla
  - Orders
  - Families,
  - Genera,
  - Species,
  - Subspecies, etc.

- It is purely a type of botanical classification or biological classification and restricted mainly to crude drugs from plant source.
- The taxonomical classification for few crude drugs derived from dicot plants is as follows:

Example		**Example**	
Phylum	Spermatophyta	**Phylum**	Spermatophyta
Division	Angiospermae	**Division**	Angiospermae
Class	Dicotyledons	**Class**	Dicotyledons
Order	Rosales	**Order**	Rutales
Family	Leguminosae	**Family**	Rutaceae
Genus	Glycyrrhiza	**Genus**	Atropa, Datura
Species	*Glycyrrhiza glabra*	**Species**	Atropa belladonna, Datura stramonium

3. Morphological Classification

- Here, the crude drugs are grouped according to the part of the plant or animal represented into organized and unorganized drugs.
- Some of the examples of crude drugs under this type of classification are as:

Parts	**Drugs**	**Parts**	**Drugs**
Seeds	Isabgol, Castor	**Fruits**	Fennel, Coriander
Leaves	Senna, Eucalyptus	**Entire drugs**	Ephedra, Belladonna
Bark	Cinchona, Cinnamon	**Dried latex**	Opium, Papain
Woods	Sandalwood, Quassia	**Dried extracts**	Gelatin, Agar
Roots	Rauwolfia, Jalap	**Dried juices**	Aloe
Rhizomes	Turmeric, Ginger	**Resins**	Asafoetida
Flowers	Clove, Saffron	**Gums**	Acacia, Tragacanth

4. Chemical Classification

- Here, the crude drugs are divided into different groups according to the chemical nature of their most important constituent.
- Since the pharmacological activity and therapeutic significance of crude drugs are based on - the nature of their chemical constituents, it would appear that chemical classification on crude drugs is the preferred method of study.
- The crude drugs belonging to different morphological or taxonomical categories may be brought together, provided there is some similarities in the chemical nature of active principle.

Chemical Classification	**Crude drugs**
Glycosides	Digitalis, Senna, Liquorice
Alkaloids	Cinchona, Nux-vomica, Datura
Tannins	Ashoka, Amla
Volatile oils	Peppermint, Eucalyptus, Gaultheria
Lipids	Castor oil, Cod liver oil, Bees wax
Carbohydrates	Acacia, Agar, Pectin, Honey
Resins	Jalap, Balsam of Tolu

5. Pharmacological (Therapeutic) Classification

SOCIAL PHARMACY

INTRODUCTION TO SOCIAL PHARMACY

Social Pharmacy

- "Social pharmacy is defined as science which deals with social aspects of the profession of pharmacy".
- "Social pharmacy is the multidisciplinary field of education and research that focuses on the role, provision, regulation and use of medicines in the society."
- "Social pharmacy may be defined as the discipline dealing with the role of medicines from a social, scientific and humanistic approach."

National Health Policy (NHP)

- Health policy of a nation is its strategy for controlling and optimizing the social uses of its health knowledge of intended objectives.
- In 2015, the Government has announced the health policy.
- It is the third policy announcement about health policy after 1983 and 2002.

The Salient Features of the National Health Policy (NHP), 2015 are divided into 13 Sections

1. Introduction.
2. Situation analysis.
3. Goals, principles and objectives.
4. Policy directions.
5. Human resources for health.
6. Financing of healthcare and engaging the private sector.
7. Regulatory framework.
8. Medical technologies.
9. Information and computer technology for health and health information needs.
10. Knowledge for health.
11. Governance.
12. Legal framework for healthcare and the right to health.
13. Concluding note—implementation framework and way forward.

National Health Policy Identifies Co-ordinated Action on Priority Areas for Improving the Environment for Health

S. No.	Policy	Description
1.	**The Swachh Bharat Abhiyan**	To reduce water and vector-borne diseases and proper disposal of solid waste.
2.	**Balanced & healthy diets**	To provide fresh cooked food at Anganwadi centres to reduce malnutrition and improved food safety.
3.	**Deaddiction**	To reduce the use of tobacco, alcohol, gutka, etc. by the success of 'Nasha Mukti Abhiyan'.
4.	**Yatri Suraksha**	To control the deaths due to rail and road traffic accidents by taking preventive measures of road and rail safety.
5.	**Nirbhaya Nari**	To enforce the stringent laws against gender violence.
6.	**Reduced stress & improved safety**	Actions taken on the issues of employment security and preventive measures at workplace to reduce stress and improve safety.
7.	**Control on air pollution**	To control indoor and outdoor air pollution by taking suitable actions.

National Disease Control Programmes

For Communicable Diseases	Non-communicable diseases

- **Incomplete Proteins:** Proteins which do not contain all essential amino acids are called incomplete proteins, e.g. gelatin, zein of maize.

Amino Acids

- Amino acids are the building blocks of proteins.

Classification of Amino Acids

Class	Amino acid
Amino acids with aliphatic side chains	Glycine, Alanine, Valine, Leucine, Isoleucine
Amino acids containing hydroxyl groups	Serine, Threonine
Sulfur-containing amino acids	Cysteine, Methionine
Acidic amino acids	Aspartic acid, Asparagine, Glutamic acid, Glutamine
Basic amino acids	Lysine, Arginine, Histidine
Aromatic amino acid	Phenylalanine, Tyrosine, Tryptophan
Imino acid	Proline

Nutritional classification of amino acids

- **Essential amino acids → "A**ny **H**elp **I**n **L**earning **T**hese **L**ittle **M**olecules **P**roves **T**ruely **V**aluable"
- Arginine and Histidine are semi-essential amino acids; while others are essential.

Essential amino acids	Nonessential amino acids
Arginine	Glycine
Histidine	Alanine
lsoleucine	Serine
Leucine	Cysteine
Threonine	Aspartate
Lysine	Asparagine
Methionine	Glutamate
Phenylalanine	Glutamine
Tryptophan	Tyrosine
Valine	Proline

Malnutrition

- Malnutrition is defined as the lack of necessary or proper food substances in the body or defective absorption and distribution of them.

Protein-energy Malnutrition (PEM)

- Protein-energy malnutrition (PEM) is supposed to be a major health problem in India.
- It is common among children during the first few years of life.

Causes of PEM

- Consumption of food inadequate in quantity and quality.
- Infections like diarrhoea, respiratory infections, intestinal worms.
- Decrease in absorption and utilization of proteins.
- Clinically the protein-energy malnutrition is manifested in two forms:
  i. Kwashiorkor disease and ii. Marasmus disease.

Kwashiorkor Disease

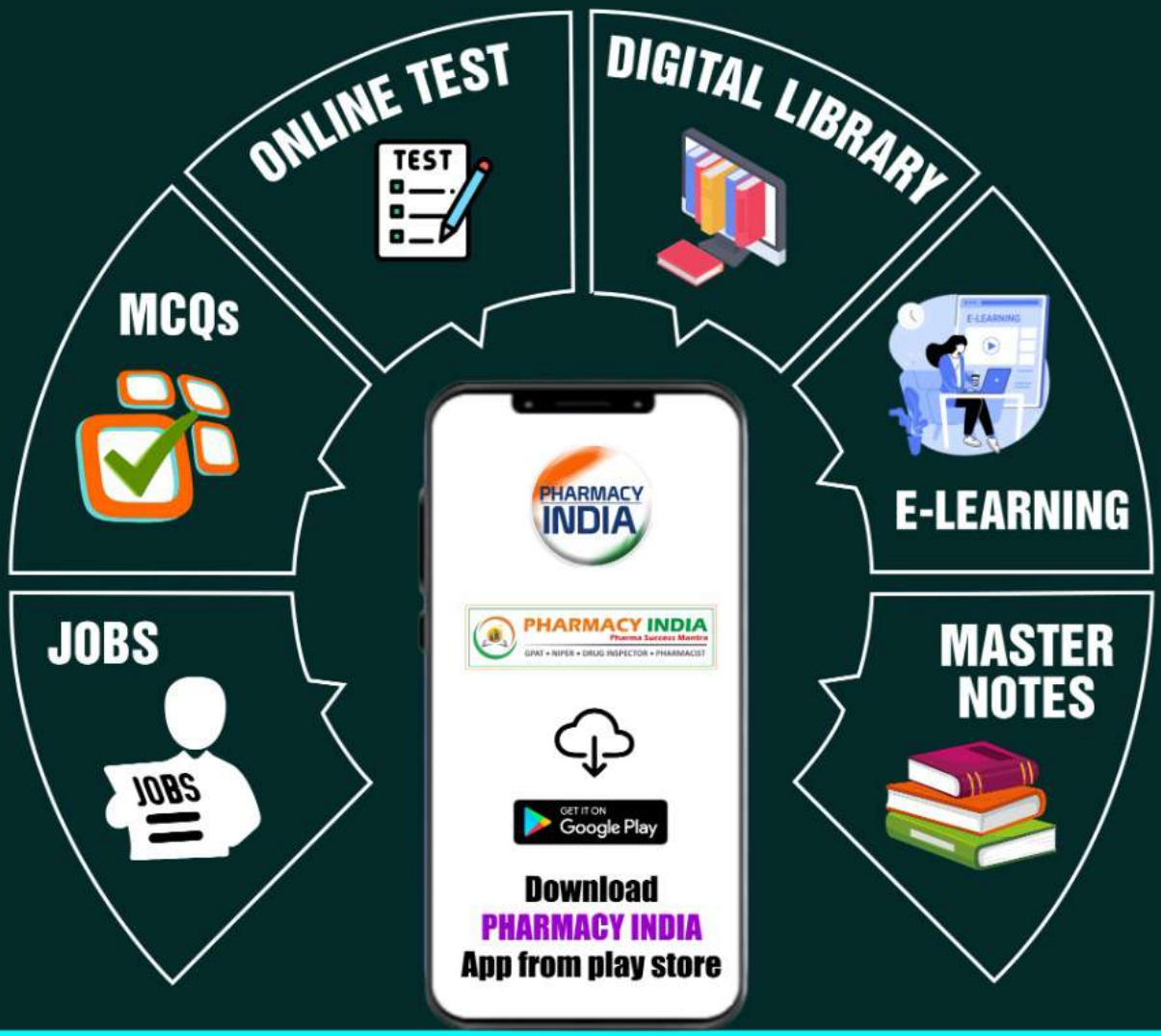
- It is a protein deficiency disease occurring commonly in the children. It is characterized by qualitative and quantitative deficiency of proteins.

Causes/Contributory Factors	Symptoms/Effects
• Large family size. • Poor health of mother. • Premature termination of breastfeeding. • Poor environmental condition. • Delayed supplementary feeding.	• Retarded growth. • Oedema. • Changes or alteration in pigmentation of skin and hair. • Changes in texture of skin.

				infected mother.	of breeding places of mosquito.
Filariasis	W. bancrofti and B. malayi	Lymphangitis, Lymph adenitis, Elephantiasis of scrotum, Legs and arms swelling, Itchy skin	6–18 months (average 9 months).	bite of infective female culex mosquito.	Protection from mosquito bite by using mosquito nets, repellant creams, etc.
Chikungunya	chikungunya virus (CHIKV)	Ffever, chills, headache, nausea, vomiting, Joint pain and rash, Fatigue.	3–7 days (range, 1–12 days)	Aedes mosquitoes transmit chikungunya virus to people	Use of insect repellent, wearing long-sleeved shirts and pants, treat clothing, take steps to control mosquitoes indoors and outdoors.

Surface Infections

Name	Causative Organism	Signs and symptoms	Incubation period	Mode of transmission	Prevention
Trachoma	Chlamydia trachomitis	Development of granular elevations in the conjunctiva (outer covering of the eye), Keratoconjunctivitis, Epithelial keratitis	5 to 12 days	1. Direct or indirect contact with ocular discharges of infected persons. 2. Contact with infected towels, clothes, handkerchiefs, fingers, etc.	Antifly measures should be taken. Maintaining personal hygiene.
Tetanus	Clostridium tetani	Irritability restlessness, Headache, fever, Neck becomes stiff, Difficulty in chewing and swallowing, Spasms of muscles of the jaw and face take place and thus 'Lock jaw' occurs.	3 to 21 days	It is always transmitted through injury and abrasion from where the contaminated matter with tetanus spores enter into the body	Infants and children are best immunized giving DPT. Infants and children are best immunized giving DPT.
Leprosy/ Hansen's disease	'Mycobacterium leprae	An appearance of small patch on skin, Less sensation surrounding area of skin, The skin becomes thick, wrinkled, Ears are swollen, Nasal and throat discharges contain lepra bacilli which are even passed in urine and	6 months to 8 years	-	BCG vaccination can be done as a protection, Multi-drug therapy



ABOUT PHARMACY INDIA

Our classes set up with an aim to provide coaching to the aspiring students who are dedicated and want to achieve excellence in their career. we nurture aspirants and facilitated achievement and we specialized in providing correct and relevant information related to Pharma institute admission for higher education.

PHARMACY INDIA
Street no.-4, Dayalpuram, Khatauli, Muzaffarnagar, 251201
8171313561, 8006781759
pharmacyindia24@gmail.com
Pharmacyindia.co.in

NOW WE ARE AVAILABLE ON
Flipkart amazon

PRICE:- ₹699.00/-