

As Per  
**PCI**  
Regulation

A  
*Text Book of*

ER20-11T

# PHARMACEUTICS

Diploma in Pharmacy



**1<sup>st</sup>**  
**YEAR**

Diploma in Pharmacy

- Dr. Shashi Kiran Mishra
- Ms. Tanisha Gupta
- Mr. Pratyush Swarnkar
- Mr. Surya Prakash

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ER20-11T

# A Text Book of **PHARMACEUTICS**



## **DIPLOMA IN PHARMACY** As per the PCI Education Regulation (ER-2020)

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### **A Text Book of Pharmaceutics**

As per the PCI Education Regulation (ER-2020)

**1<sup>st</sup> Year (Diploma in Pharmacy)**

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## Preface

It gives us immense pleasure to introduce “ A text book of Pharmaceutics” for D.Pharm Students according to Pharmacy Council of India syllabus, offering a comprehensive exploration of the Pharmaceutics subject.

The book is written in a simple and explanatory manner to cater to the needs of the Pharmacy students. It is compiled in an attempt to give elaborate knowledge to students in intelligible language. Moreover, the incorporation of coloured figures, concise tables and countless MCQs will encourage and ease out students problems and enable them to attempt diverse kinds of questions in their exam.

This textbook is not just an academic resource; it's a guide to inspire and equip future pharmacists with the knowledge and skills needed for a successful career in pharmacy.

We will be grateful to all students, teachers and readers for their constructive suggestions to improve the quality and content of this book. The suggestions from all the readers will be highly appreciate and will be incorporate in the next edition.

***“Education is the most powerful weapon you can use to change the world.”***

**Authors**



v

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# Syllabus

## Chapter 1

- History of the profession of Pharmacy in India in relation to Pharmacy education, industry, pharmacy practice, and various professional associations.
- Pharmacy as a career
- Pharmacopoeia: Introduction to IP, BP, USP, NF and Extra Pharmacopoeia. Salient features of Indian Pharmacopoeia (7 Hours)

## Chapter 2

- **Packaging materials:** Types, selection criteria, advantages and disadvantages of glass, plastic, metal, rubber as packaging materials. (5 Hours)

## Chapter 3

- **Pharmaceutical aids:** Organoleptic (Colouring, flavoring, and sweetening) agents
- **Preservatives:** Definition, types with examples and uses (3 Hours)

## Chapter 4

- Unit operations:** Definition, objectives/applications, principles, construction, and workings of:
- **Size reduction:** Hammer mill and Ball mill (9 Hours)
  - **Size separation:** Classification of powders according to IP, Cyclone separator, Sieves and standards of sieves
  - **Mixing:** Double cone blender, Turbine mixer, Triple roller mill and Silverson mixer homogenizer
  - **Filtration:** Theory of filtration, membrane filter and sintered glass filter
  - **Drying:** Working of fluidized bed dryer and process of freeze drying
  - **Extraction:** Definition, Classification, method, and applications

## Chapter 5

- **Tablets** - coated and uncoated, various modified tablets (sustained release, extended-release, fast dissolving, multi-layered, etc.) (8 Hours)
- **Capsules** - hard and soft gelatine capsules (4 Hours)
- **Liquid oral preparations** - solution, syrup, elixir, emulsion, suspension, dry powder for reconstitution (6 Hours)
- **Topical preparations** - ointments, creams, pastes, gels, liniments and lotions, suppositories, and pessaries (8 Hours)
- Nasal preparations, Ear preparations (2 Hours)
- **Powders and granules** - Insufflations, dusting powders, effervescent powders, and effervescent granules (3 Hours)
- **Sterile formulations** - Injectables, eye drops and eye ointments (6 Hours)
- **Immunological products** - Sera, vaccines, toxoids, and their manufacturing methods. (4 Hours)

## Chapter 6

- Basic structure, layout, sections, and activities of pharmaceutical manufacturing plants
- Quality control and quality assurance: Definition and concepts of quality control and quality assurance, current good manufacturing practice (cGMP), Introduction to the concept of calibration and validation (5 Hours)

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## 1.1 INTRODUCTION

The Pharmacy profession is a vital part of the healthcare system. The pharmacy profession is an ancient profession worldwide. The profession of pharmacy has a systematic and chronological development. It is a paramedical profession that links health sciences with basic sciences and works for safe and effective use of pharmaceutical drugs and dosage forms.

### ❖ Pharmacy

- The word “Pharmacy” was coined from the Greek word “Pharmakon” meaning “medicine” or “drug”.
- Pharmacy is the art and science of manufacturing and dispensing of drugs prepared from natural and synthetic sources and using them for the treatment and prevention of diseases.

### ❖ Pharmacist

- Pharmacist is a trained person who is certified to make, sell, or distribute medicine and medicine compounds.
- They are highly trained, skilled healthcare professionals with proper education and training.

### ❖ Pharmaceutics

- Pharmaceutics is a branch of pharmacy and is also called as science of dosage form design.
- It involves the design, development and evaluation of drugs in combination with an appropriate dosage form.

## 1.2 HISTORY OF PHARMACY PROFESSION IN INDIA

- The first college in India, Madras Medical College, was established in 1835, where professional training for treating patients with drugs was given to students from 1870.
- The first pharmacy college in Asia was started in Goa, India, in the year 1842, by the Portuguese at the old Portuguese medical school, known as “Escola Medica de



**Fig 1.1 Goa College of Pharmacy**

### 1.2.4 Pharmaceutical Associations in India

- Pharmacy organizations and association in India working for welfare of every individual.
- Here given description about all the pharmaceutical industries in Table 1.3

**Table 1.3: Different Pharmacy organizations and association**

YEAR	DESCRIPTION
1920	The 'Calcutta Chemist and Druggist Association' was formed which in 1926 changed their name to 'Bengal Chemist and Druggist Association'
1935	Qualified professionals at BHU formed 'BHU Pharmaceutical Society'
1940	'Allied Manufacturers and Distributors Association Ltd.' was formed in Mumbai
1948	'Indian Pharmaceutical Congress Association' (IPCA) was formed at Calcutta.
1963	'Indian Hospital Pharmacist Association' (IHPA) was formed in Delhi
1970	India joined 'Commonwealth Pharmaceutical Association' (CPA).
1973	'Indian Pharmacy Graduates Association' (IGPA) was established at New Delhi.
1979	All pharmacy associations merged to form 'All India Organization of Chemist and Druggist' (AIOCD).

The pharmacy professional association are as follows:

1. The Indian Pharmaceuticals Association (IPA)
2. The International Pharmaceutical Federation (IPF)
3. Indian Pharmacy Graduates Association (IPGA)
4. Indian Hospital Pharmacist Association (IHPA)
5. All India Drugs Control Officers Confederation (AIDCOC)
6. All India Organization of Chemist and Druggist (AIOCD)
7. All India Cosmetics Manufacturer Association (AICMA)
8. Association of Pharmacy Teachers of India (APTI)
9. Organization of Pharmaceutical Producers of India (OPPI)
10. Association of Community Pharmacist of India (ACPI)



#### 1. The Indian Pharmaceutical Association (IPA)

- Prof. M.L. Schroff, established United Province Pharmaceutical Association (UPPA) at Banaras Hindu University in 1935.
- The United Provinces Pharmaceutical Association (UPPA) was renamed as Indian Pharmaceutical Association (IPA) in 1939 and the publication of Indian Journal of pharmacy started.
- The IPA headquarters was shifted to Bombay on 1<sup>st</sup> January 1953.
- The Pharma Times started in 1963 as professional monthly publication of IPA.



### 5. All India Drugs Control Officers Confederation (AIDCOC)

- The 'All-India Drugs Control Officers Confederation' (AIDCOC) was framed on 28<sup>th</sup> December, 1995 at Visakhapatnam as a result of untiring efforts of many officers across the country and the initiative taken by the Andhra Pradesh Drugs Inspectors Association, the Kerala Drugs Control Enforcement Officers Association and Tamil Nadu Drugs Inspectors Association.



### 6. All India Organization of Chemist and Druggist (AIOCD)

- 'All India Organization of Chemist and Druggist' (AIOCD) consists of retail and wholesale pharmacist as its members.
- It has its offices at Taluka, district and state level with the name 'Chemist and Druggist Association'.



### 7. All India Cosmetics Manufacturer Association (AICMA)

- Directors of 'All India Cosmetic Manufacturers Association' (AICMA) are **Kanubhai Talshibhai Vadher** and **Satish Mahadeo Thipsay**.
- This association promotes and protects the small-scale cosmetic industry in India.



### 8. Association of Pharmacy Teachers of India (APTII)

- 'Association of Pharmaceutical Teachers of India' (APTII) is an organisation of academics in India who teach in the area of pharmacy.
- It was established in 1966 by Prof. M. L. Schroff, Prof G.P. Srivastava and others pharmacy colleges.



### 9. Organization of Pharmaceutical Producers of India (OPPI)

- The 'Organization of Pharmaceutical Producers of India' (OPPI) established in 1965, represents the research-based global pharmaceutical companies in India.



### 10. Association of Community Pharmacist of India (ACPI)

- 'Association of Community Pharmacist of India' (ACPI) is a non-profit professional organization started with an aim to provide patient safety by pharmaceutical care.
- The Membership consists of pharmacists, pharmacy students, Nurses, Nursing student and patient groups in academic and non-academic settings.



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# PHARMACEUTICAL CHEMISTRY

Diploma in Pharmacy



**1<sup>st</sup>**  
**YEAR**  
Diploma in Pharmacy

⊙ Dr. Sant Kumar Verma

⊙ Mr. Pradeep Sahu

⊙ Ms. Pragati Kumari Verma

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# Syllabus

## Chapter 1

**Introduction to Pharmaceutical chemistry:** Scope and objectives (8 Hours)

**Sources and types of errors:** Accuracy, precision, significant figures

**Impurities in Pharmaceuticals:** Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic

## Chapter 2

(8 Hours)

**Volumetric analysis:** Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration

**Gravimetric analysis:** Principle and method

## Chapter 3

(7 Hours)

- **Inorganic Pharmaceuticals:** Pharmaceutical formulations, market preparations, storage conditions and uses of
- **Haematinics:** Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron
- **Gastro-intestinal Agents:** Antacids: Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate, Acidifying agents, Adsorbents, Protectives, Cathartics
- **Topical agents:** Silver Nitrate, Ionic Silver, Chlorhexidine Gluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate
- **Dental products:** Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes
- **Medicinal gases:** Carbon dioxide, nitrous oxide, oxygen

## Chapter 4

(2 Hours)

**Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings**

## Chapter 5

(9 Hours)

**Drugs Acting on Central Nervous System**

- **Anaesthetics:** Thiopental Sodium\*, Ketamine Hydrochloride\*, Propofol
- **Sedatives and Hypnotics:** Diazepam\*, Alprazolam\*, Nitrazepam, Phenobarbital\*
- **Antipsychotics:** Chlorpromazine Hydrochloride\*, Haloperidol\*, Risperidone\*, Sulpiride\*, Olanzapine, Quetiapine, Lurasidone
- **Anticonvulsants:** Phenytoin\*, Carbamazepine\*, Clonazepam, Valproic Acid\*, Gabapentin\*, Topiramate, Vigabatrin, Lamotrigine
- **Anti-Depressants:** Amitriptyline Hydrochloride\*, Imipramine Hydrochloride\*, Fluoxetine\*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine



## Chapter 6

(9 Hours)

### Drugs Acting on Autonomic Nervous System

- **Sympathomimetic Agents:**

**Direct Acting:** NorEpinephrine\*, Epinephrine, Phenylephrine, Dopamine\*, Terbutaline, Salbutamol (Albuterol), Naphazoline\*, Tetrahydrozoline.

**Indirect Acting Agents:** Hydroxy Amphetamine, Pseudoephedrine.

**Agents with Mixed Mechanism:** Ephedrine, Metaraminol

- **Adrenergic Antagonists:**

**Alpha Adrenergic Blockers:** Tolazoline, Phentolamine, Phenoxybenzamine, Prazosin.

**Beta Adrenergic Blockers:** Propranolol\*, Atenolol\*, Carvedilol

- **Cholinergic Drugs and Related Agents:**

**Direct Acting Agents:** Acetylcholine\*, Carbachol, And Pilocarpine.

**Cholinesterase Inhibitors:** Neostigmine\*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide

**Cholinergic Blocking Agents:** Atropine Sulphate\*, Ipratropium Bromide

**Synthetic Cholinergic Blocking Agents:** Tropicamide, Cyclopentolate Hydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride\*

## Chapter 7

(5 Hours)

### Drugs Acting on Cardiovascular System

- **Anti-Arrhythmic Drugs:** Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium\*, Lidocaine Hydrochloride, Lorcaïnide Hydrochloride, Amiodarone and Sotalol

- **Anti-Hypertensive Agents:** Propranolol\*, Captopril\*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine,

- **Antianginal Agents:** Isosorbide Dinitrate

## Chapter 8

(2 Hours)

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(3 Hours)

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## Chapter 11

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(8 Hours)

- **Antifungal Agents:** Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole\*, Itraconazole, Fluconazole\*, Naftifine Hydrochloride
- **Urinary Tract Anti-Infective Agents:** Norfloxacin, Ciprofloxacin, Ofloxacin\*, Moxifloxacin,
- **Anti-Tubercular Agents:** INH\*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid\*
- **Antiviral Agents:** Amantadine Hydrochloride, Idoxuridine, Acyclovir\*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir
- **Antimalarials:** Quinine Sulphate, Chloroquine Phosphate\*, Primaquine Phosphate, Mefloquine\*, Cycloguanil, Pyrimethamine, Artemisinin
- **Sulfonamides:** Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide\*, Mafenide Acetate, Cotrimoxazole, Dapsone\*

## Chapter 12

(8 Hours)

- **Antibiotics:** Penicillin G, Amoxicillin\*, Cloxacillin, Streptomycin,
- **Tetracyclines:** Doxycycline, Minocycline,
- **Macrolides:** Erythromycin, Azithromycin,
- **Miscellaneous:** Chloramphenicol\* Clindamycin

## Chapter 13

(3 Hours)

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# INTRODUCTION OF PHARMACEUTICAL CHEMISTRY



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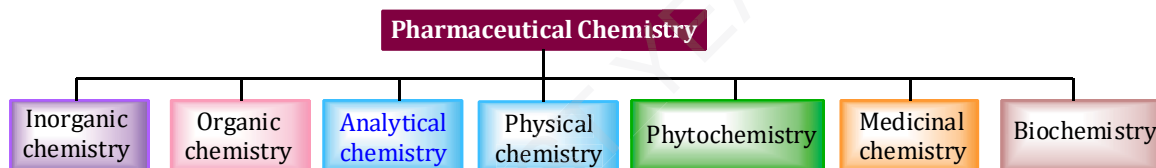
## 1.1

## INTRODUCTION TO PHARMACEUTICAL CHEMISTRY

### ❖ Introduction

- Pharmaceutical Chemistry is the branch of chemical science that deals with the study of drugs, and it involves drug development
- This includes drug discovery, delivery, absorption, metabolism, and more.
- Pharmaceutical chemistry involves cures and remedies for disease, analytical techniques, pharmacology, metabolism, quality assurance, and drug chemistry.
- Pharmaceutical chemistry leads to careers in drug development, biotechnology, pharmaceutical companies, research facilities, and more.

### ❖ The subject is further subdivided into various branches



- ✓ **Pharmaceutical Inorganic Chemistry-** Pharmaceutical inorganic chemistry is the branch of pharmaceutical chemistry that deals with the study of preparation, standards of purity, limit test for determining quality, purity and storage conditions of all inorganic compounds.
- ✓ **Pharmaceutical Organic Chemistry-** Pharmaceutical organic chemistry is the main branch of organic chemistry deals with the study of preparation, structure and reactions of organic (Hydrocarbon) compounds. As it deals with all the chemical reactions related to life-saving drug discovery and design.
- ✓ **Pharmaceutical Analytical Chemistry-** Pharmaceutical Analytical chemistry is the branch of pharmaceutical chemistry that deals science of obtaining, processing, and communicating information about the composition and structure of matter.
- ✓ **Pharmaceutical Physical Chemistry-** Pharmaceutical Physical Chemistry is the branch of pharmaceutical chemistry that concentrates on the applications of physics and chemistry to the study of pharmacy.
- ✓ **Pharmaceutical Phytochemistry-** Pharmaceutical Phytochemistry is the branch of pharmaceutical chemistry that deals & study of phytochemicals, which are chemicals derived from plants.

## 1.2.1 Classification of Errors

## Two types of Error

## Determinate (Systematic) Error

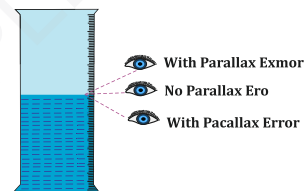
## Indeterminate (Random) Error

➤ **Determinant or Systemic or Constant Error**

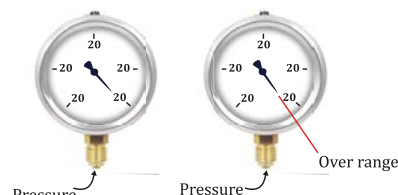
- These are ascertainable errors that can be either avoided or corrected. The error may be constant as in the case of weighing with uncalibrated weights or in measuring a volume using burette or pipette. Such measurable determinate errors are categorized as systematic errors.

- **The most vital errors having a place with this specific class are**

- ✓ **Personal error-** 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. This error is also called operative error.



- ✓ **Instrumental errors-** These errors are caused by faulty equipments or low quality equipments which do not perform well.

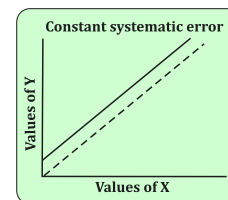


- ✓ **Chemical errors-** These errors are resulted by using chemicals and reagents with impurities or contaminants which may interfere with the reactions, thus affects the result.



- ✓ **Constant Errors-** Multiple measurements show the same constant error.

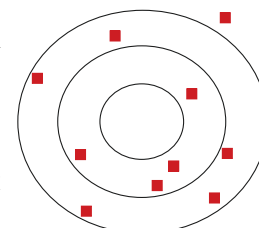
**Example-** If a scale of 15 cm actually measures 14.8 cm. Then it is measuring 0.2 cm more in every observation. This type of error will be same in all measurements done by the scale.



- ✓ **Errors due to Methodology-** This is a most serious error in analysis as the error arises due to faulty method, e.g. co-precipitation of impurities, slight solubility of precipitate, incomplete reactions etc. Errors of this category are usually detectable and can be eliminated to a large extent.

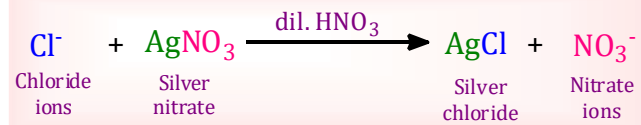
➤ **Indeterminate or accidental or random Error**

- These are often called **accidental or random errors**, which represent experimental uncertainty that occurs in any measurements.
- These errors are shown by small differences in successive measurements made by the same analyst under almost similar conditions.



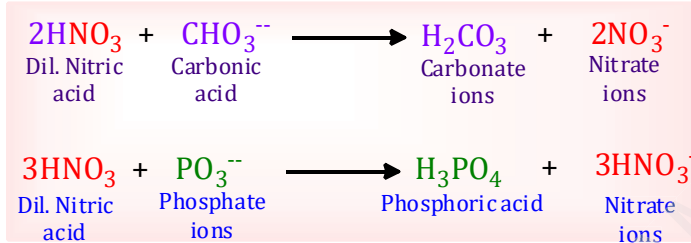
Random Error

### ➤ Chemical reaction



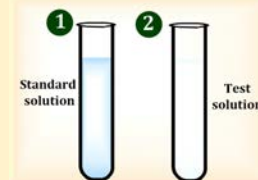
### ➤ Role of HNO<sub>3</sub>

It is used to dissolve other impurities like; carbonate and phosphate, which otherwise will precipitate along with silver chloride and unnecessarily intensify the opalescence of the test solution.



### ➤ Procedure

Standard Solution	Test Solution
<ul style="list-style-type: none"> <li>Place 1 ml of 10 ppm standard chloride solution and add 10 ml of dilute HNO<sub>3</sub> in Nessler's cylinder, mark 'S' diluting up to 50 ml with water and add 1 ml of 0.1 N AgNO<sub>3</sub> solution.</li> <li>Stir immediately with a glass rod and allow it to stand for 5 minutes.</li> </ul>	<ul style="list-style-type: none"> <li>Dissolve the specified quantity of test substance being examined in water or prepare a solution as directed in the monograph and transfer it to the Nessler's cylinder, mark 'T'.</li> <li>Add 10 ml of dilute HNO<sub>3</sub> except when HNO<sub>3</sub> is used in the preparation of solution in Nessler's cylinder, diluting up to 50 ml with water and add 1 ml of 0.1 N AgNO<sub>3</sub> solution stir immediately with a glass rod and allow it to stand for 5 minutes.</li> </ul>
<ul style="list-style-type: none"> <li>Protect the opalescence from the light and view it transversely against a black background and compare the opalescence produced by a test with that of standard opalescence.</li> <li>If test opalescence is less than or equal to Standard opalescence, then Limit test for chloride for given sample complies/passes with the official standards of I.P.</li> <li>If test opalescence is more than the Standard opalescence, then Limit test for chloride for a given sample doesn't comply/fails with the official standards of I.P.</li> </ul>	



## 1.4.2 Limit test of sulphate

### ➤ Principle

This test is based on the reaction between soluble sulphate as an impurity and barium chloride in the presence of dilute HCl. Barium chloride reacts with sulphate impurity and produces turbidity due to precipitation of sulphate as barium sulphate. Alcohol prevent supersaturation and more uniform turbidity develops.

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Diploma in Pharmacy



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**▶ YEAR**  
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# Syllabus

## Chapter 1

**Definition, history, present status and scope of Pharmacognosy** (2 Hours)

## Chapter 2

**Classification of drugs** (4 Hours)

- Alphabetical
- Taxonomical
- Morphological
- Pharmacological
- Chemical
- Chemo-taxonomicals

## Chapter 3

**Quality control of crude drugs** (6 Hours)

- Different methods of adulteration of crude drugs
- Evaluation of crude drugs

## Chapter 4

Brief outline of occurrence, distribution, isolation. (6 Hours)  
identification tests, therapeutic activity and pharmaceutical applications of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.

## Chapter 5

**Biological source, chemical constituents and therapeutic efficacy of the following categories of crude drugs.** (30 Hours)

Laxatives	-	Aloe, Castor oil, Ispaghula, Senna
Cardiotonic	-	Digitalis, Arjuna
Carminatives and G.I. regulators	-	Coriander, Fennel, Cardamom, Ginger, Clove, Black Pepper, Asafoetida, Nutmeg, Cinnamon
Astringents	-	Myrobalan, Black Catechu, Pale Catechu
Drugs acting on nervous system	-	Hyoscyamus, Belladonna, Ephedra, Opium, Tea leaves, Coffee seeds, Coca
Anti-hypertensive	-	Rauwolfia
Anti-tussive	-	Vasaka, Tolu Balsam
Anti-rheumatics	-	Colchicum seed
Anti-tumour	-	Vinca, Podophyllum
Antidiabetics	-	Pterocarpus, Gymnema
Diuretics	-	Gokhru, Punarnava
Anti-dysenteric	-	Ipecacuanha
Antiseptics and disinfectants	-	Benzoin, Myrrh, Neem, Turmeric



Antimalarials	-	Cinchona, Artemisia
Oxytocic	-	Ergot
Vitamins	-	Cod liver oil, Shark liver oil
Enzymes	-	Papaya, Diastase, Pancreatin, Yeast
Pharmaceutical Aids	-	Kaolin, Lanolin, Beeswax, Acacia, Tragacanth, Sodium alginate, Agar, Guar gum, Gelatine
Miscellaneous	-	Squill, Galls, Ashwagandha, Tulsi, Guggul

### Chapter 6

#### Plant fibres used as surgical dressings

(3 Hours)

- Cotton, silk, wool and regenerated fibres
- Sutures – Surgical Catgut and Ligatures

### Chapter 7

(8 Hours)

- **Basic principles involved in the traditional systems of medicine like :** Ayurveda, Siddha, Unani and Homeopathy
- **Method of preparation of Ayurvedic formulations like :** Arista, Asava, Gutika, Taila, Churna, Lehya and Bhasma

### Chapter 8

(2 Hours)

Role of medicinal and aromatic plants in national economy and their export potential.

### Chapter 9

#### Herbs as health food:

(4 Hours)

Brief introduction and therapeutic applications of: Nutraceuticals, Antioxidants, Pro-biotics, Pre-biotics, Dietary fibres, Omega-3-fatty acids, Spirulina, Carotenoids, Soya and Garlic.

### Chapter 10

Introduction to herbal formulations

(4 Hours)

### Chapter 11

**Herbal cosmetics :** Sources, chemical constituents, commercial preparations, therapeutic and cosmetic uses of: Aloe vera gel, Almond oil, Lavender oil, Olive oil, Rosemary oil, Sandal Wood oil.

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# DEFINITION, HISTORY, PRESENT STATUS AND SCOPE OF PHARMACOGNOSY

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## 1.1 DEFINITION OF PHARMACOGNOSY

In the beginning, man used products derived from numerous plants and animals as food. Due to the fact that diseases were created by man, these compounds were gradually used as pharmaceuticals to treat the illnesses. The utilization of plants as a source for medications has long historical roots. Nobody will ever know what inspired prehistoric man to choose particular plant ingredients to treat the illness, but it can be explained by the curious nature of man. Man's existence depends entirely on plants, and we now have a great understanding of the chemical and medicinal qualities of various plants. The plant kingdom is the source of a significant variety of medications.

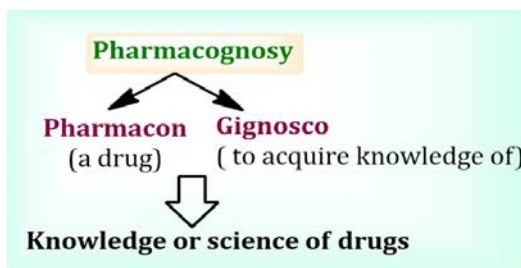


C. A. SEYDLER

**Pharmacognosy**, may be defined as the study of crude drugs obtained from plants, animals and mineral kingdom and their constituents. The term Pharmacognosy was first introduced by **C. A. Seydler**, in 1815 in his doctoral thesis titled "**Analecta Pharmacognostica**". The word pharmacognosy is derived from two greek words; Pharmakon and Gignosco.

**Pharmacognosy is mainly concerned with the drugs of biological origin. There are six basic origins of drugs:**

- 1. Animal sources:** Drugs obtained from animals are entire animals as glandular products, like thyroid organ or extracts like liver extracts, bees wax, certain hormones, enzymes and antitoxins.
- 2. Plant sources:** Drugs obtained from plant consist of entire plant or parts of plant and can be divide into organized or unorganized drugs.
  - Organized drugs are direct parts of plants and consist of **cellular tissues**.
  - Unorganized drugs, prepared from plants are not the direct parts of plants and do **not contain cellular tissue**, prepared by processes, such as incision, drying or extraction with water.
- 3. Mineral source:** These inorganic substances are found as mineral deposits of different types such as terrestrial deposits or fossil deposition of geological origin in ocean and seabeds. The natural ores or minerals are collected by mining in open quarries, and the product is further purified for various pharmaceutical uses.

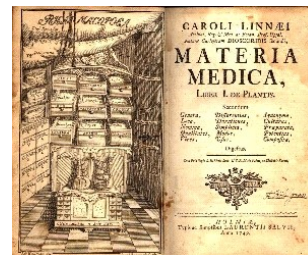


**Hippocrates:** The great Greek physician (460 - 360 B.C.) known as ‘**Father of Medicine**’, dealt with anatomy and physiology of human beings.

**Aristotle:** Aristotle, the renowned philosopher (384-322 B.C.), is well known for his studies on animal kingdom.

**Theophrastus:** Theophrastus (370 - 287 B.C.) is well known for his studies on plant kingdom.

**Dioscorides:** A Greek physician (40-80 A.D.) described several plants of medicinal importance in “*De Materia Medica*”. He is known as **Father of pharmacognosy**.



**Seydler:** Coined the term “Pharmacognosy” in his work titled “*Analecta Pharmacognostica*”.

**Galen:** The first pharmacist, Galen, was known to have had a number of pain-relieving materials, including opium in his apothecary. He described the different methods of preparation containing active constituents of crude drugs. The branch dealing with extraction of plant and animal drugs is still known as **Galenical Pharmacy**.



**Fig 1.1 : The Great contributors in the Profession of Pharmacy**

**Pliny the Elder:** It was Pliny the Elder, who compiled 37 volumes of natural history.

**Le'mery:** Le'mery (1645-1715) describe the importance of the extraction method and alcohol as an extractant

**William Withering:** William Withering in 1785 gave a description of some of the medicinal qualities of digitalis leaves.

**Derosne:** In 1803, the French pharmacist, Derosne isolated narcotine from opium.

**Sertuerner:** In 1806, Sertuerner isolated morphine from opium.

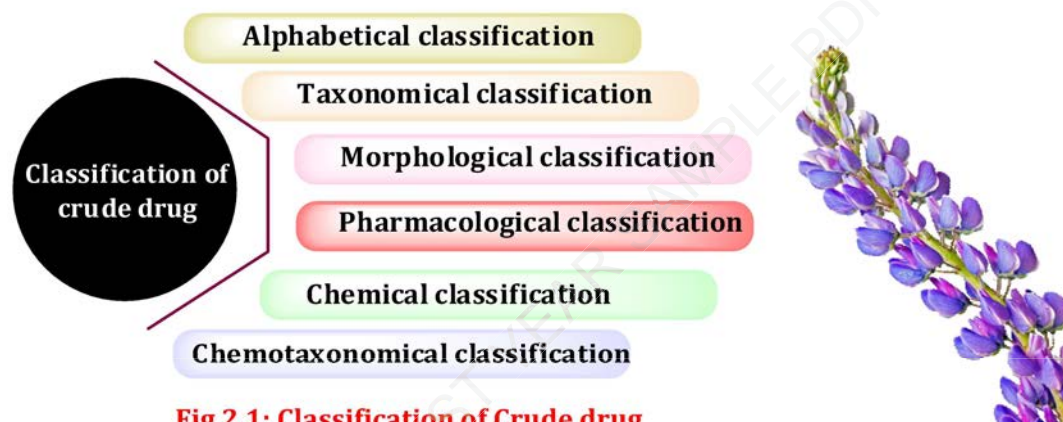
In the next few years, strychnine (1817), emetine (1817), brucine (1819), piperine (1819), quinine (1820) and colchicine (1820) were isolated.





The crude drugs obtained from different natural sources are used in the treatment of wide spectrum of disease. For their adequate study it is necessary to arrange them in scientific and systematic manner.

Each arrangement of classification has its own merits and demerits, but for the purpose of study the drugs are classified in the following different ways:



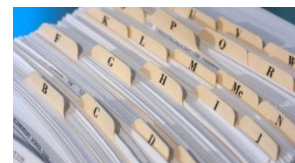
**Fig 2.1: Classification of Crude drug**

## 2.1

### ALPHABETICAL CLASSIFICATION

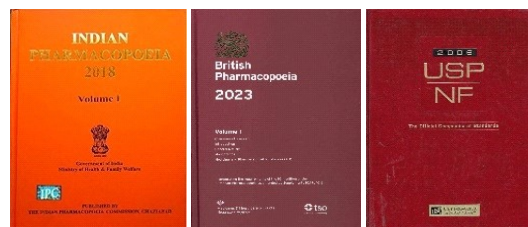
In this system of classification crude drugs are arranged in alphabetical order of their

- Local language names (vernacular names) or
- Latin and English names (common names)



Some pharmacopoeias, dictionaries, and reference books that use this technique to categorize crude medications include:

1. Indian Pharmacopoeia
2. British Pharmacopoeia
3. British Herbal Pharmacopoeia
4. United States Pharmacopoeia
5. British Pharmaceutical Codex
6. European Pharmacopoeia

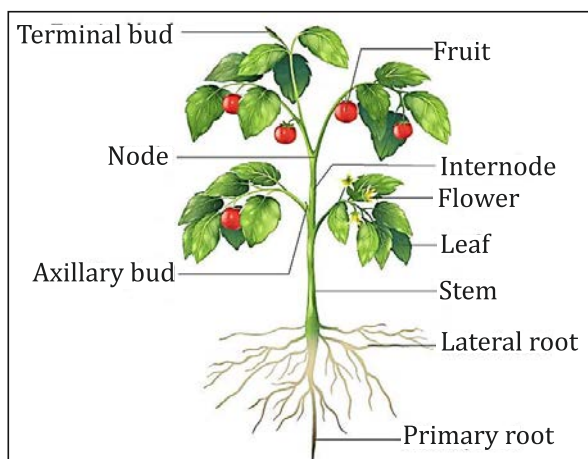


**Fig 2.2: Pharmacopoeias and National Formulary**

**Examples:**

<b>A</b>	Acacia, Agar, Amla, Ashoka, Aconite, Arjuna.
<b>B</b>	Benzoin, Belladonna, Bahera, Bentonite, Beeswax.
<b>C</b>	Clove, Cinchona, Chirata, Cinnamon, Cumin.

- (i) Organized drugs
- (ii) Unorganized drugs



**Fig 2.4: Morphology of Plant**



- **The Organized (cellular) Drugs:-** These are directly made from plant components that contain cellular tissues, such as rhizomes, barks, leaves, fruits, whole plants, hairs, and fibers.
- **The Unorganized (acellular) Drugs:-** These are not made directly from plant parts, These drugs does not represents any part of the plant like gums, resins, fat, waxes etc. Made through intermediary physical processes like cutting, drying, or water extraction.
- ❖ **Difference between Organized and Unorganized drugs**

**Table2.1: Difference between Organized and Unorganized drugs**

ORGANIZED DRUGS	UNORGANIZED DRUGS
These are direct part of the plant which include flowers, seeds, fruits, insects, etc.	These are obtained from plant or animal components by an extraction process, drying, incision.
Contain cellular structure.	Do not contain cellular structure.
One of the key characteristics for identifying organized drugs is their microscopic characteristics.	Confirmatory tests include those using chemical and physical standards.
Examples: Digitalis, Cinchona, Clove Fennel, Jalap, Ephedra, Cochineal, etc.	Examples: Aloe, Agar, Colophony, Opium, Castor oil, Bees-wax, Pepsin etc.

**Organized Drugs:-**

**Table2.2: Organized Drugs**

PARTS OF PLANT	IMAGE	EXAMPLE
<b>Woods</b>		Quassia, Sandalwood.
<b>Leaves</b>		Hamamelis, Hyoscyamus, Belladonna, Tea, Digitalis, Eucalyptus, Gymnema, Mint, Senna, Spearmint, Tulsi, Vasaka, Coca, Buchu.

- Infusion also prepared in muslin cloth. In that case, the drug is placed in muslin cloth and enclosed, then suspended just below the level of the water in a beaker.
- In this process, **stirring is not required**.

### 12.2.6 Decoction

Decoction is the ancient and more popular process of extracting water soluble and **heat stable constituents** from crude drugs by boiling them in water for about 15 min.

- It is a simple **boiled solution of the drug**.
  - Useful for a **water-soluble** and **heat-stable drug**.
  - Drugs are boiled with water for usually **10 minutes**.
  - Use for **hard** and **woody substances**.
- e.g.- Kwath preparation.



### MULTIPLE CHOICE QUESTIONS

- The solvent used for extraction is known as**
  - Distillate
  - Extract
  - Marc
  - Menstruum
- Identify the process used for extraction**
  - Infusion
  - Decoction
  - Digestion
  - All of these
- Extraction of vegetable drug with cold and boiling water for short time called**
  - Percolation
  - Maceration
  - Infusion
  - Spirit
- Water immiscible solvent, which is used for the extraction of fixed and essential oils**
  - Light petroleum
  - Benzene
  - Ether
  - Chloroform
- Extraction process in which aqueous solvent is use for extraction**
  - Infusion
  - Decoction
  - Maceration
  - Both (a) and (b)
- Extraction Process which is use only for heat liable drugs**
  - Infusion
  - Decoction
  - Percolation
  - Both (b) and (c)
- Extracts are subjected to Biuret tests to detect the presence of**
  - Fixed oils and fats
  - Saponin
  - Phenolic compound
  - Proteins and free amino acids
- Kwath preparation is an example of**
  - Decoction
  - Maceration
  - Percolation
  - Digestion
- Process of continuous downward movement of solvent through different level of drug material to get extract of desired drug the process are called**
  - Percolation
  - Maceration
  - Infusion
  - Spirit
- For unorganized state of crude drug material\_\_\_\_is preferred**
  - Percolation
  - Compression
  - Expression
  - Maceration
- The inert insoluble material that remains after extraction is called**
  - Distillate
  - Extract
  - Marc
  - Menstruum
- The residue remaining after incineration is called as**
  - Ash
  - Extract
  - Waste material
  - Foreign matter

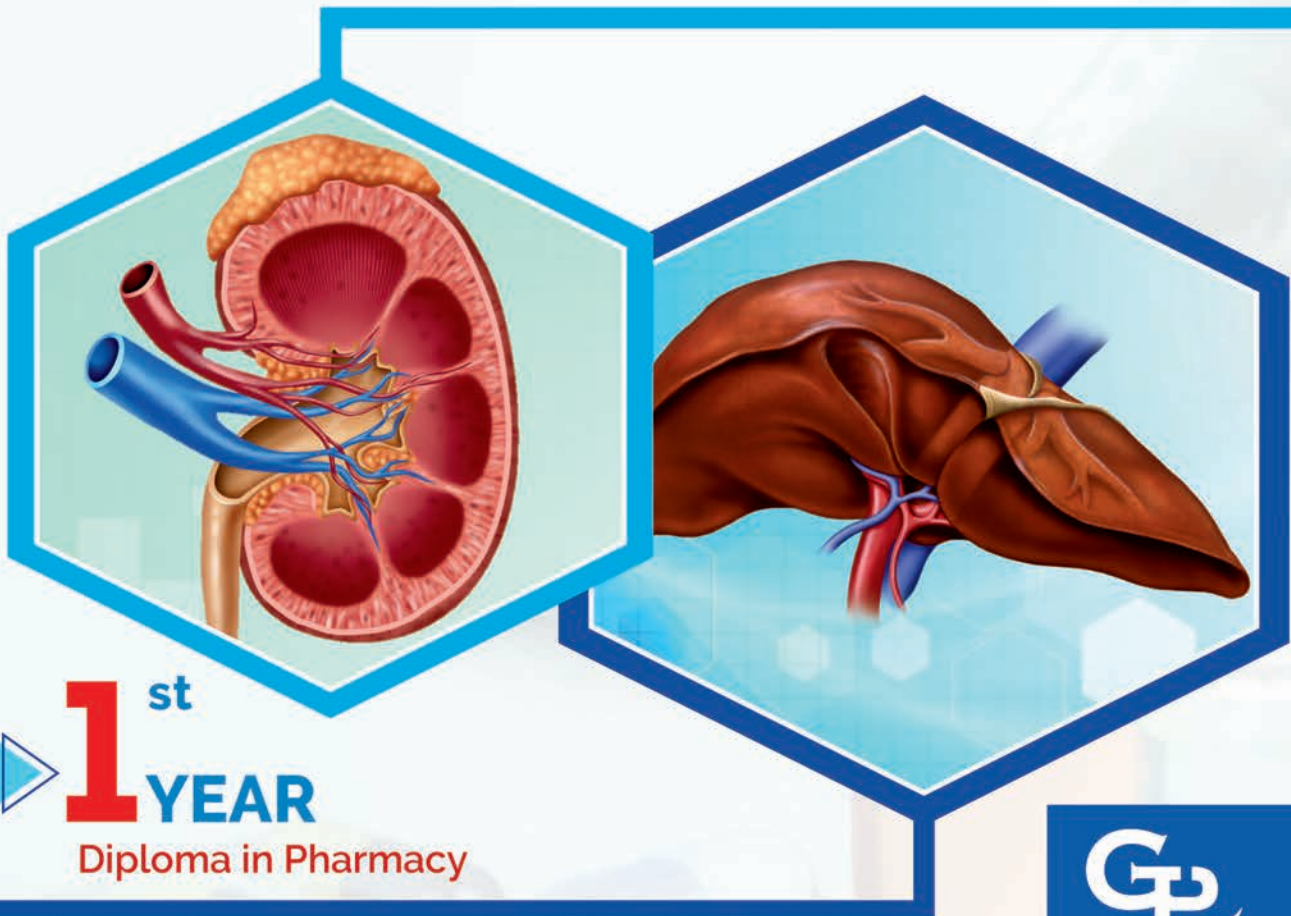
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# HUMAN ANATOMY AND PHYSIOLOGY

Diploma in Pharmacy



**1<sup>st</sup>**  
**▶ YEAR**  
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# Syllabus

<b>Chapter 1</b> Scope of Anatomy and Physiology Definition of various terminologies	(2 Hours)
<b>Chapter 2</b> <b>Structure of Cell:</b> Components and its functions	(2 Hours)
<b>Chapter 3</b> <b>Tissues of the human body:</b> • Epithelial, Connective, Muscular and Nervous tissues – their sub-types and characteristics.	(4 Hours)
<b>Chapter 4</b> <b>Osseous system:</b> structure and functions of bones of axial and appendicular skeleton Classification, types and movements of joints, disorders of joints	(6 Hours)
<b>Chapter 5</b> <b>Haemopoietic system</b> • Composition and functions of blood • Process of Hemopoiesis • Characteristics and functions of RBCs, WBCs, and platelets • Mechanism of Blood Clotting • Importance of Blood groups	(8 Hours)
<b>Chapter 6</b> <b>Lymphatic system</b> • Lymph and lymphatic system, composition, function and its formation. • Structure and functions of spleen and lymph node.	(3 Hours)
<b>Chapter 7</b> <b>Cardiovascular system</b> • Anatomy and Physiology of heart • Blood vessels and circulation (Pulmonary, coronary and systemic circulation) • Cardiac cycle and Heart sounds, Basics of ECG • Blood pressure and its regulation	(8 Hours)
<b>Chapter 8</b> <b>Respiratory system</b> • Anatomy of respiratory organs and their functions. • Regulation, and Mechanism of respiration. • Respiratory volumes and capacities – definitions	(4 Hours)
<b>Chapter 9</b> <b>Digestive system</b> • Anatomy and Physiology of the GIT • Anatomy and functions of accessory glands • Physiology of digestion and absorption	(8 Hours)

**Chapter 10** (2 Hours)

**Skeletal muscles**

- Histology
- Physiology of muscle contraction
- Disorder of skeletal muscles

**Chapter 11** (8 Hours)

**Nervous system**

- Classification of nervous system
- Anatomy and physiology of cerebrum, cerebellum, midbrain
- Function of hypothalamus, medulla oblongata and basal ganglia
- Spinal cord-structure and reflexes
- Names and functions of cranial nerves.
- Anatomy and physiology of sympathetic and Parasympathetic nervous system (ANS)

**Chapter 12** (6 Hours)

**Sense organs - Anatomy and physiology of**

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- Ear
- Skin
- Tongue
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**Urinary system**

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# SCOPE OF ANATOMY AND PHYSIOLOGY DEFINITIONS OF VARIOUS TERMINOLOGIES



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## 1.1 INTRODUCTION

- The human body is composed of numerous smaller components or organs that function in an ordered way to keep the body functioning at all times, making humans the most complex living species.
- **Two main concepts are studied in the study of the human body**
  - Anatomy
  - Physiology

## 1.2 ORGANIZATION OF HUMAN BODY

- The major levels of organization in the body, from the simplest to the most complex are: **atoms, molecules, organelles, cells, tissues, organs, organ systems, and the human organism.**

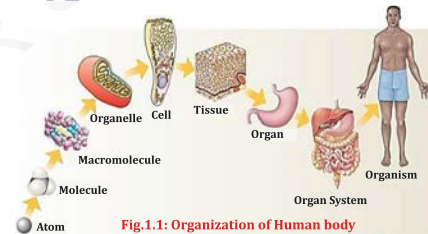
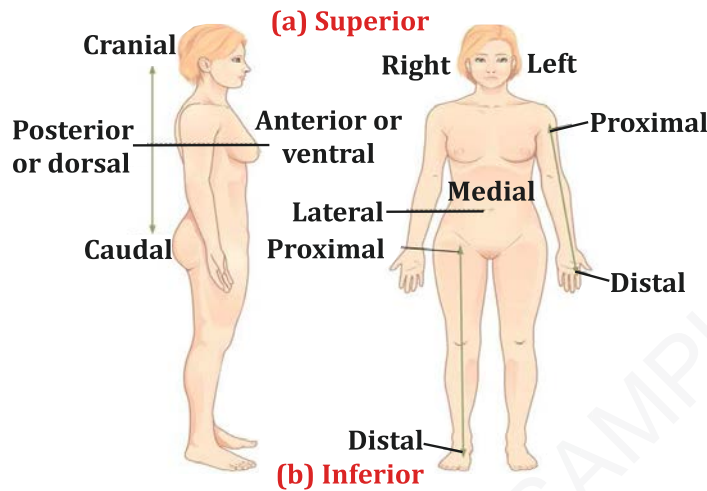


Fig.1.1: Organization of Human body

**Table 1.1 Levels of structural organization of the human body**

LEVELS	DEFINITION
<b>Chemical level</b>	It includes atoms; the smallest unit of matter that participates in chemical reactions. Two or more atoms join together to form molecules. Certain atoms like, <b>carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), calcium (Ca) and sulfur (S) are crucial for maintaining life.</b>
<b>Cellular Level</b>	There is only one cells or a loose aggregate of cells that work independently, without any coordination. <b>e.g.- Amoeba, Paramecium.</b>
<b>Tissue Level</b>	A group of cells that are structurally/ functionally similar work together to perform a common function. <b>e.g- Nervous tissue, Epithelial tissue, Muscle cells</b>
<b>Organ Level</b>	One or more tissues work together to achieve functions of the organ. <b>e.g-Heart, Lungs, Brain</b>
<b>Organ system</b>	An organ system is a collection of organs that work together to perform a similar function. <b>e.g- Digestive system, blood pressure, renal system (kidneys), circulatory system and nervous system.</b>
<b>Organism Level</b>	An organismal level, where all eleven-organ systems function in the human organism, the whole living person. <b>e.g- Human body</b>

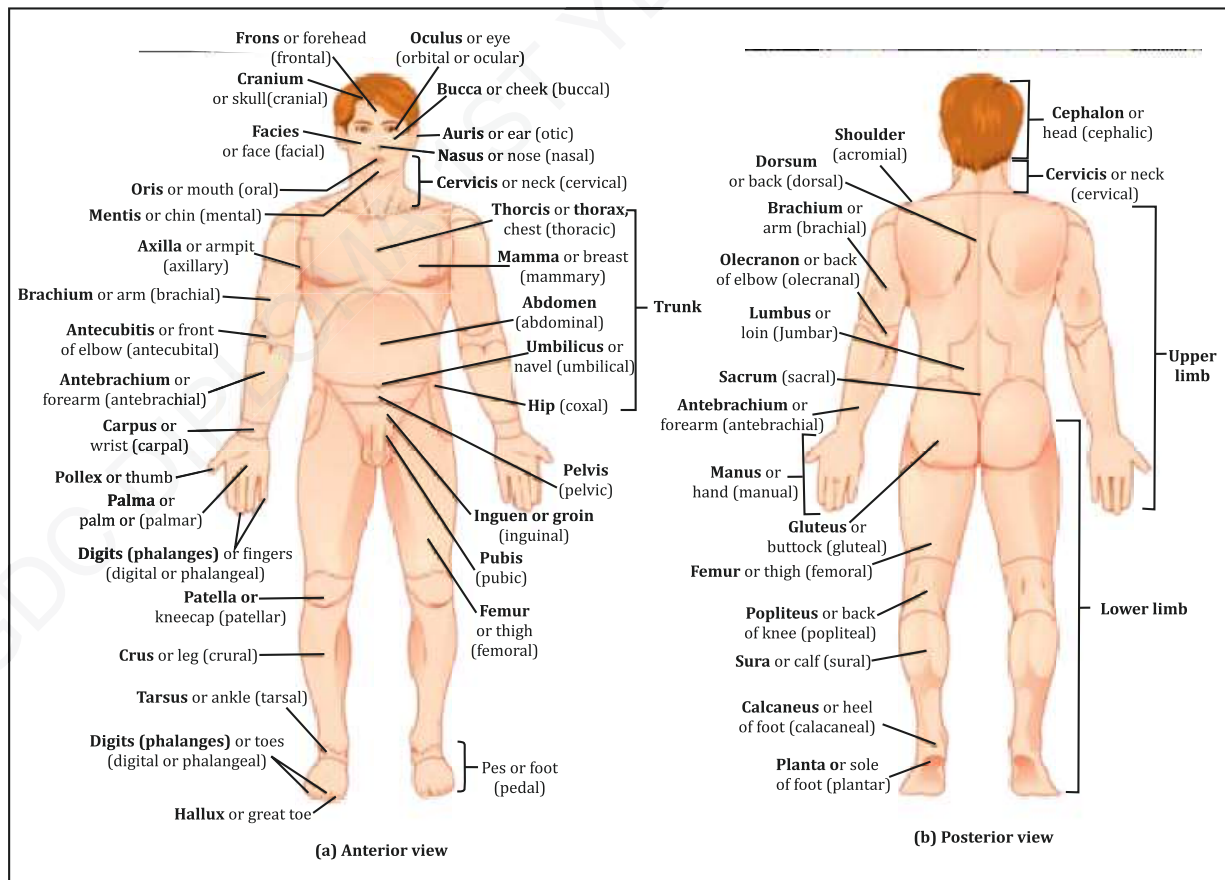
<b>Superficial</b>	A position closer to the surface of the body. The skin is superficial to the bones.
<b>Deep</b>	A position farther from the surface of the body. The brain is deep to the skull.



**Fig.1.4: Anatomical directional Terms of the human body (a) Superior (b) Inferior**

**3. Anatomical Regional terms**

- The study of anatomy based on regions or divisions of the body and emphasizing the relations between various structures (muscles and nerves and arteries etc).



**Fig.1.5: Regions of the Human Body. (a) Anterior view (b) Posterior view**

**viii. Digestive system-** Pharynx, Oesophagus, Stomach, Small and Large into Anus and Accessory Organs.

**ix. Nervous system-** Spinal cord, Nerves, and Special Sense Organs.

**x. Urinary system-** Ureters, Urinary Bladder and Urethra.

**xi. Reproductive system-** Gonads and Associated Organs.

## MULTIPLE CHOICE QUESTIONS

### 1. What is Human Anatomy

- (a) Human anatomy is the study of the functions of body parts
- (b) Human anatomy is the study of bacteria and viruses
- (c) Human anatomy is the study of the structure of the human body
- (d) Human anatomy is the study of disease and its causes

### 2. What is Human Physiology

- (a) Human physiology is the scientific study of the mind and behavior
- (b) Human physiology is the study of the internal and external structures of the human body
- (c) Human physiology is the study of the functions of body parts
- (d) Human physiology is the study of microscopic organisms

### 3. The study of cells known as

- (a) Cytology      (b) Histology
- (c) Organology    (d) Microbiology

### 4. The study of tissues known as

- (a) Anatomy      (b) Histology
- (c) Cytology      (d) Organology

### 5. The study of organ known as

- (a) Organology    (b) Histology
- (c) Physiology    (d) Cytology

### 6. Gross Anatomy is also called

- (a) Macroscopic Anatomy
- (b) Microscopic Anatomy
- (c) Anatomical position
- (d) Thoracic Cavity

### 7. Oral cavity contains

- (a) Elbow            (b) Skull
- (c) Neck             (d) Tongue and Teeth

### 8. Thoracic cavity is also known as

- (a) Abdominopelvic Cavity
- (b) Chest cavity
- (c) Ventral body cavity
- (d) Dorsal body cavity

### 9. Examples of organ level

- (a) Tongue, Teeth, Mouth
- (b) Ear, Eye, Nose
- (c) Human body
- (d) Heart, Lungs, Brain

### 10. Which of the following statement is CORRECT for Cellular level

- (a) There is only one cells or a loose aggregate of cells that work independently, without any coordination.
- (b) Group of cells that are structurally/ functionally similar work together to perform a common function.
- (c) Organ system is a collection of organs that work together to perform a similar function.
- (d) One or more tissues work together to achieve functions of the organ.

### 11. Systemic Anatomy termed as

- (a) Advanced scientific studies
- (b) Specific organ systems
- (c) The external body
- (d) Specific regions of the body

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*A Text Book of*

ER20-15T

# **SOCIAL PHARMACY**

Diploma in Pharmacy



**1<sup>st</sup>**  
**▶ YEAR**  
Diploma in Pharmacy

⊙ Dr. Mukesh Gupta

⊙ Mr. Shashank Gupta

⊙ Ms. Khyati Bhagdev

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### **A Text Book of Social Pharmacy**

As per the PCI Education Regulation (ER-2020)

**1<sup>st</sup> Year (Diploma in Pharmacy)**

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# Syllabus

## Chapter 1

(9 Hours)

### Introduction to Social Pharmacy

- Definition and Scope
- Social Pharmacy as a discipline and its scope in improving the public health
- Role of Pharmacists in Public Health
- Concept of Health, WHO Definition, various dimensions, determinants, and health indicators
- National Health Policy - Indian perspective
- Public and Private Health System in India, National Health Mission
- Introduction to Millennium Development Goals, Sustainable Development Goals, FIP Development Goals

## Chapter 2

(18 Hours)

### Preventive healthcare - Role of Pharmacists in the following

- Demography and Family Planning
- Mother and child health, importance of breastfeeding, ill effects of infant milk substitutes and bottle feeding
- Overview of Vaccines, types of immunity and immunization
- Effect of Environment on Health - Water pollution, importance of safe drinking water, waterborne diseases, air pollution, noise pollution, sewage and solid waste disposal, occupational illnesses, Environmental pollution due to pharmaceuticals
- Psychosocial Pharmacy: Drugs of misuse and abuse - psychotropics, narcotics, alcohol, tobacco products. Social Impact of these habits on social health and productivity and suicidal behaviours

## Chapter 3

(10 Hours)

### Nutrition and Health

- Basics of nutrition - Macronutrients and Micronutrients
- Importance of water and fibres in diet
- Balanced diet, Malnutrition, nutrition deficiency diseases, ill effects of junk foods, calorific and nutritive values of various foods, fortification of food
- Introduction to food safety, adulteration of foods, effects of artificial ripening, use of pesticides, genetically modified foods
- Dietary supplements, nutraceuticals, food supplements - indications, benefits, Drug-Food Interactions

## Chapter 4

(28 Hours)

### Introduction to Microbiology and common microorganisms

- Introduction to epidemiology, and its applications. Understanding of terms such as epidemic, pandemic, endemic, mode of transmission, outbreak, quarantine, isolation, incubation period, contact tracing, morbidity, mortality
- Causative agents, epidemiology and clinical presentations and Role of Pharmacists in educating the public in prevention of the following communicable diseases:



- Respiratory infections - chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1, SARS, MERS, COVID-19), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis, Ebola
- Intestinal infections - poliomyelitis, viral hepatitis, cholera, acute diarrheal diseases, typhoid, amebiasis, worm infestations, food poisoning
- Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya
- Surface infections - trachoma, tetanus, leprosy
- STDs, HIV/AIDS

### *Chapter 5*

#### **Introduction to health systems**

**(8 Hours)**

- Introduction to health systems and all ongoing National Health programs in India, their objectives, functioning, outcome, and the role of pharmacists

### *Chapter 6*

#### **Pharmacoeconomics**

**(2 Hours)**

- Introduction, basic terminologies, importance of pharmacoeconomics

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# INTRODUCTION TO SOCIAL PHARMACY



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## 1.1

### INTRODUCTION

- According to sociology, behavior is a type of social activity - an action that both influences and is impacted by society.
- Social pharmacy shows a broad understanding that the practice of pharmacy does not just involve giving out prescription drugs and advice to people who heed it blindly. Instead, the practice of pharmacy can be seen as a social activity that involves both pharmacists and the general population.
- As a result, they engage in social interaction and are mutually dependent on one another. The exchange between a pharmacist and a patient is an example of controlled behavior. It means that a pharmacist's actions and behavior are not solely determined by his or her will, but rather by regulatory forces that uphold societal order and prevent social deterioration and anarchy.



#### 1.1.1 Definition Social Pharmacy

- A science that addresses the social aspects of the pharmacy profession is known as "social pharmacy," and it deals with the function of medicines from social, scientific, and humanistic perspectives.

#### 1.1.2 Social Pharmacy as a discipline

- Pharmacy's fundamental knowledge base has historically consisted of chemistry, biochemistry, physics, and physiology. The foundation of a pharmacist's professional skill is their understanding of drugs and their effects.
  - They are interconnected among families, organizations, and health systems across various nations and cultural backgrounds.
  - The humanistic and social sciences, which deal with people and systems, need to be added to them. The drug and medicine industry is examined from social, scientific, and humanistic angles within Social Pharmacy.
  - The social aspects of drugs themselves, such as drug discovery, production, distribution, prescription, information, and control, are a general area of academic attention.
- **Scope of Social Pharmacy in improving Public Health**
- Any person who wishes to define, explain, comprehend, and/or modify practice using a scientific method can benefit from the help of social pharmacy.

- ✓ **Addressing tobacco, alcohol and substance abuse:** The success of Nasha Mukti Abhiyan would be judged in terms of a measurable decrease in the use of tobacco, alcohol and substance abuse.
- ✓ **Yatri Suraksha:** The Indian Railway Protection Force (RPF), has launched a pan-India operation known as Operation Yatri Suraksha. Under this initiative, several steps are taken to provide round-the-clock security to passengers.
- ✓ **Nirbhaya Nari:** The Nirbhaya Fund Framework provides for a non-lapsable corpus fund for the safety and security of women to be administered by the Department of Economic Affairs (DEA) of the Ministry of Finance (MoF) of the Government of India.

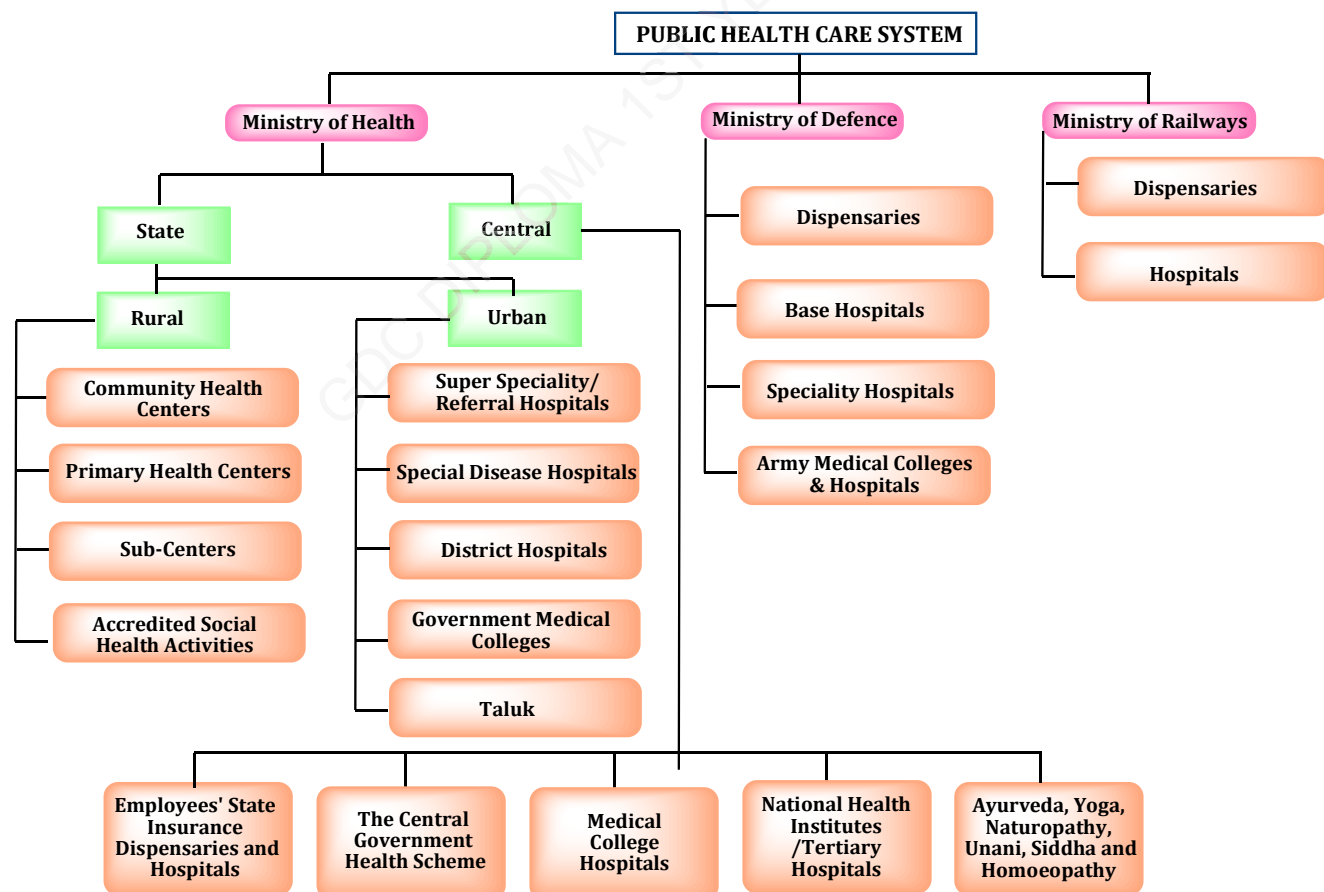
## 1.7

**PUBLIC AND PRIVATE HEALTH SYSTEM IN INDIA**

India has a diverse healthcare system that includes both public and private sectors. Here's an overview of the public and private health systems in India:

**1. Public Healthcare System:**

- The state and federal governments in India oversee public hospitals and healthcare systems. Every patient has the right to enter a public healthcare facility for treatment, and these facilities are not permitted to turn away any patients.
- The majority of Indians would rather use the public healthcare system than the private one because the former requires significantly less funding than the latter. Almost every Indian city has access to a public healthcare system.



**Fig. 1.3: Public Health care system**

14. Medicines expertise.
15. People-centered care.
16. Communicable diseases.
17. Antimicrobial stewardship.
18. Access to medicines, devices and services.
19. Patient safety.
20. Digital health.
21. Sustainability in pharmacy.

## MULTIPLE CHOICE QUESTIONS

- 1. Which of the following is not the dimension of health**
  - (a) Mental
  - (b) Physical
  - (c) Social
  - (d) Nutritional
- 2. Full form of FIP**
  - (a) Federation Indian pharmacy
  - (b) International pharmaceutical federation
  - (c) Indian pharmaceutical federation
  - (d) All of these
- 3. The aim of the National health programme in India is/to are**
  - (a) To provide proper health services for checking infectious diseases
  - (b) To establish health sub-centers primary health centers and community health centers
  - (c) To provide proper treatment measures in rural and sub-rural areas 10%
  - (d) All of these
- 4. National health program was declared by the Indian government in**
  - (a) 1968
  - (b) 1983
  - (c) 1970
  - (d) 1999
- 5. FIP development goal is/are**
  - (a) Access to medicines, devices and services
  - (b) Pharmacy intelligence
  - (c) Medicine expertise
  - (d) All of these
- 6. What is the full form of CHC**
  - (a) Common health centers
  - (b) Community Health Centers
  - (c) City Health Centers
  - (d) Child Health Centers
- 7. Which of the following statements is true about the private health care system in India**
  - (a) Free medication and checkup facilities are provided
  - (b) These systems are very useful in rural area
  - (c) Provide all necessary facilities and charge the fees accordingly
  - (d) All of these
- 8. Which of the following is the role of the pharmacist in the public health care system**
  - (a) To review prescription
  - (b) Patient counseling
  - (c) Dispense medications
  - (d) All of these
- 9. Diseases can be produced by**
  - (a) Bacteria and viruses
  - (b) Deficiency of nutrients
  - (c) Physical agents such as heat and cold
  - (d) All of these