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PHARMACOGNOSY

A COMPETITIVE EXAMINATION BOOK

MODULE- 3

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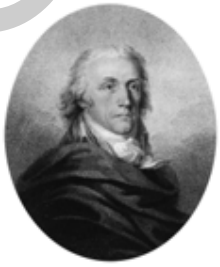
Chapter 1

INTRODUCTION OF PHARMACOGNOSY

History and origin of pharmacognosy

- The word 'pharmacognosy' had its debut in the early 19th century to designate the discipline related to medicinal plants.
- It is derived from the Greek pharmakon, 'a drug', and gignosco, 'to acquire a knowledge of' and, as recorded by Dr K. Ganzinger.
- Pharmacognosy is the study of medicines derived from natural sources. The American Society of Pharmacognosy defines it as physical, chemical, biochemical and biological properties of drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources."
- **Ancient India**
  - ✓ In India knowledge of medicinal plants is very old, and medicinal properties of plants are described in *Rigveda* and in *Atharvaveda* (3500–1500 B.C.) from which *Ayurveda* has developed.
  - ✓ The basic medicinal texts in this world region— The Ayurvedic writings—can be divided in three main ones *(Charaka Samhita, Susruta Samhita, Astanga Hrdayam Samhita)* and three minor ones (*Sarngadhara Samhita, Bhava Prakasa Samhita, Madhava Nidanam Samhita).*
  - ✓ Ayurveda is the term for the traditional medicine of ancient India. Ayur means life and veda means the study of which is the origin of the term.
- **Ancient Egypt:**
  - ✓ The most complete medical documents existing are the *Ebers Papyrus* (1550 B.C.), a collection of 800 prescriptions, mentioning 700 drugs.
  - ✓ The *Edwin Smith Papyrus* (1600 B.C.), which contains surgical instructions and formulas for cosmetics.
  - ✓ The *Kahun Medical Papyrus* is the oldest—it comes from 1900 B.C. and deals with the health of women, including birthing instructions.
- **Ancient China:**
  - ✓ Shen Nung (about 2700 B.C.) has written the first *Pen T-Sao*, or *Native Herbal*, recording 365 drugs.
  - ✓ These were subdivided as follows: 120 emperor herbs of high, food grade quality which are non-toxic and can be taken in large quantities to maintain health over a long period of time, 120 minister herbs, some mildly toxic and some not, having stronger therapeutic action to heal diseases and finally 125 servant herbs that having specific action to treat disease and eliminate stagnation.

The terms 'pharmacognosy' and 'pharmacodynamics' were probably first coined by Johann Adam Schmidt (1759-1809) in his hand-written manuscript Lehrbuch der Materia Medica, which was posthumously published in Vienna in 1811.



Johann Adam Schmidt

Antient china:
The most important clinical manual of traditional Chinese medicine is the *Shang Hang Lun* (*Treatise on the Treatment of Acute Diseases Caused by Cold*) written by Chang Chung-Ching (142–220).
The fame and reputation of the Shang Han Lun as well as its companion book, *Chin Kuei Yao Lueh* (*Prescriptions from the Golden Chamber*), is the historical origin of the most important classical herbal formulas that have become the basis of Chinese and Japanese-Chinese herbalism (called 'Kampo').

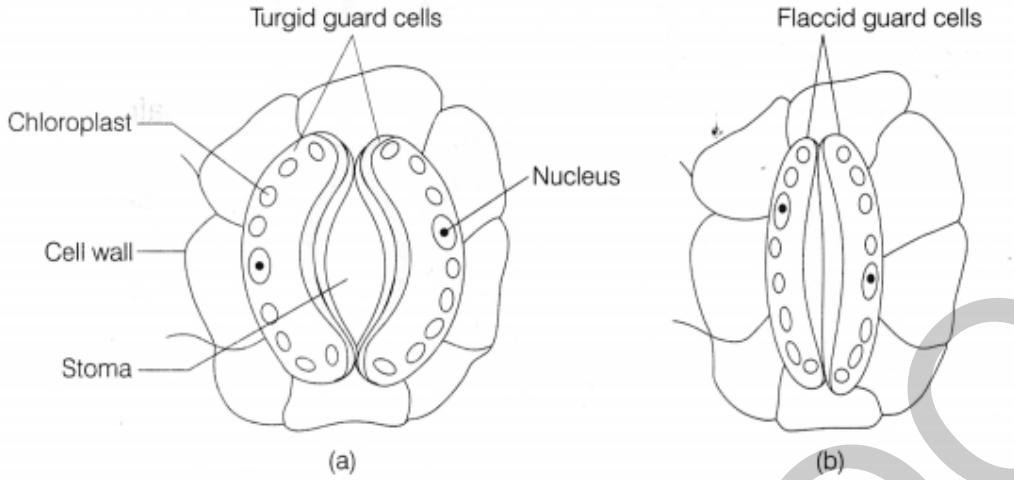


Figure: (a) Open stomata (b) Closed stomata

Types of stomatal arrangement

According to the arrangement of the epidermal cells surrounding the stomata, they have been grouped as follows:

S. No.	Stomatal arrangements	Other name	Examples
1.	**Diacytic or Caryophyllaceous (cross celled)** The stoma is accompanied by two subsidiary cells, the long axis of which is at right angles to that of the stoma.	Labiatae type	vasaka, tulsi, spearmint and peppermint.
2.	**Anisocytic or Cruciferous (unequal celled)** The stoma is surrounded by usually three subsidiary cells of which one is markedly smaller than the others.	Solanaceous type	Belladonna, Datura, Hyoscyamus, Stramonium, Tobacco
3.	**Anomocytic or Ranunculaceous (irregular celled)** The stoma is surrounded by a varying number of cells in no way differing from those of the epidermal cells.	-	Digitalis, eucalyptus, henna, lobelia, neem
4.	**Paracytic or Rubiaceous (parallel celled)** The stoma is surrounded usually by two subsidiary cells, the long axis of which is parallel to that of stoma.	-	Senna and many Rubiaceous plants
5.	**Actinocytic (radiate celled)** The stoma is surrounded by circle of radiating cells.	-	*Uva ursi*

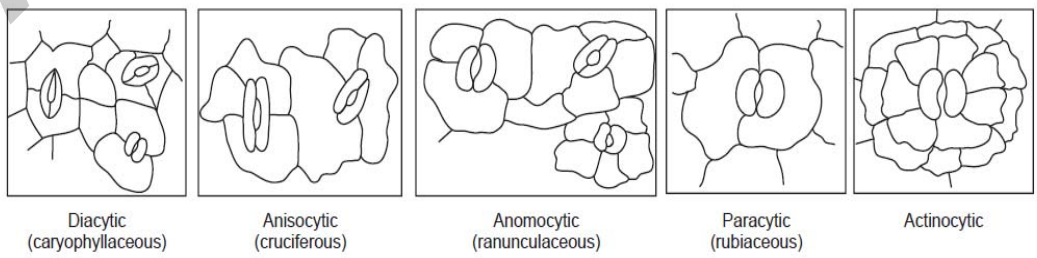


Figure: Different types of stomata

Chapter 2

IMPORTANT CHEMICAL TESTS

Alkaloids

S. No.	Test Name	Composition	Positive colour change
1.	**Dragendorff's Test**	Drug solution + Dragendroff 's reagent (Potassium Bismuth Iodide)	Orangish red colour
2.	**Mayer's Test**	Drug solution + few drops of Mayer's reagent (potassium mercuric iodide)	creamy-white precipitant
3.	**Hager's Test**	Drug solution + few drops of Hagers reagent (Saturated aq. Solution of Picric acid)	crystalline yellow precipitate
4.	**Wagner's Test**	Drug solution + few drops of Wagner's reagent (dilute Iodine solution)	reddish-brown precipitate
5.	**Tannic Acid Test**	Drug solution + few drops of tannic acid solution	buff coloured precipitate
6.	**Ammonia Reineckate Test**	Drug solution + slightly acidified (HCl) saturated solution of ammonia reineckate	pink flocculent precipitate

Vitali-Morin test:

Tropane alkaloid + fuming nitric acid

↓

Followed by evaporation to dryness

↓

Addition of methanolic KOH solution to an acetone solution of nitrated residue

↓

Violet colouration takes place due to tropane derivative.

Test for Nux vomica:

1. **Strychnine Test:**

To a section of endosperm + ammonium vanadate + sulphuric acid

↓

Strychnine in the middle portion of endosperm is stained purple

2. **Potassium dichromate test:**

Strychnine + potassium dichromate + conc. Sulphuric acid

↓

Chapter 3

GLYCOSIDE

Introduction

- A glycoside is any molecule in which a sugar group is bonded through its **anomeric carbon to another group via glycosidic bond**.
- A glycosidic bond is a certain type of chemical bond that joins a sugar molecule to another molecule.
- Specifically, a glycosidic bond is formed between the **hemiacetal group of a saccharide** (or a molecule derived from a saccharide) and the **hydroxyl group of an alcohol.**
- A substance containing a **glycosidic bond is a glycoside**.
- The **sugar group** is known as the **glycone** and the **nonsugar group** as the **aglycone or genin** part of the glycoside.
- The **aglycone** part is **soluble in organic solvents** like benzene or ether. They are hydrolysed by water, enzymes and mineral acids. They are **optically active**.
- The sugars present in glycoside are of two isomeric forms, that is, α form and β form, but all the natural glycosides contain β-type of sugar.

Classification

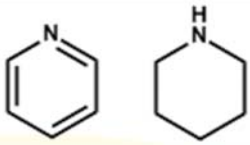
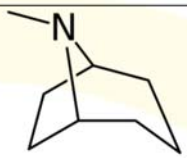
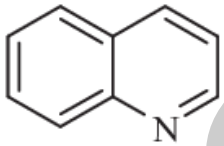
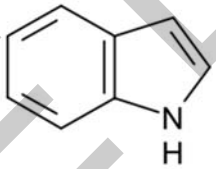
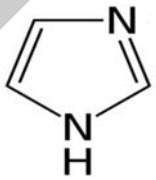
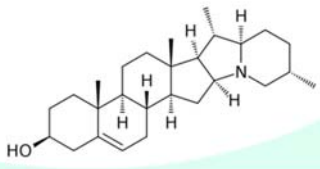
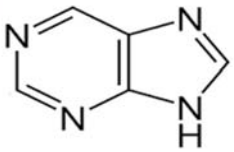
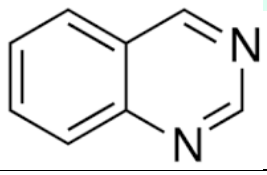
A. On the Basis of Glycosidic Linkage

1. **O-glycosides:**
   - Sugar molecule is combined with phenol or –OH group of aglycon.
   - **Example:** Amygdaline, Indesine, Arbutin, Salicin, cardiac glycosides, anthraxquinone glycosides like sennosides etc.
2. **N-glycosides:**
   - Sugar molecule is combined with N of the –NH (amino group) of aglycon.
   - **Example:** nucleosides
3. **S-glycosides:**
   - Sugar molecule is combined with the S or SH (thiol group) of aglycon.
   - **Example:** Sinigrin
4. **C-glycosides:**
   - Sugar molecule is directly attached with C—atom of aglycon.
   - **Example:** Anthraquinone glycosides like Aloin, Barbaloin, Cascaroside and Flavan glycosides, etc.

B. On the Basis of Aglycone

S. No.	Class	Examples
1.	Anthraquinone glycosides	Senna, Aloe, Rhubarb, Cascara
2.	Sterol or Cardiac Glycosides	Digitalis, Thevetia, Squill, etc.
3.	Saponin glycosides	Dioscorea, Liquorice, Ginseng, etc
4.	Cyanogenetic and Cyanophoric glycosides	Bitter almond, Wild cherry bark, etc.
5.	Thiocynate and Isothiocynate glycosides	Black mustard

Drug containing alkaloids: -

S. No.	Class	Structure	Example
1.	**Pyridine – Piperidine alkaloids**		Tobacco, Areca, Lobelia
2.	**Tropane alkaloids**		Belladona, Datura, Hyoscyamus, Stramonium, Dubosia, Coca leaves, Ashwgandha
3.	**Quinoline alkaloids**		Cinchona, Camptotheca
4.	**Isoquinoline alkaloids**		Opium, Ipecac, Curare, Berberis
5.	**Indole alkaloids**		Ergot, Nux vomica, Rauwolfia, Catharanthus, Physostigma
6.	**Imidazole alkaloids**		Pilocarpus
7.	**Steroidal alkaloids**		Veratrum, Kurchi
8.	**Alkaloidal amine**	**$CH–CH_2–CH_2-NH_2$**	Ephedra, Colchicum
9.	**Glycoalkaloids**	-	Solanum
10.	**Purine alkaloids**		Tea, coffee, Kola, Cocoa
11.	**Quinazoline alkaloids**		Vasaka
12.	**Terpenoid alkaloids**	-	Aconite

Tolu balsum	Thomas balsam, opobalsam	obtained by incision of the stem of *Myroxylon balsamum* **(Leguminoseae)**	Benzoyl benzoate, cinnamate, tolu resinotannol, vanillin	expectorant, stimulant, and antiseptic Flavouring agent.
Cannabis	Indian hemp, Marijuana, hashish, bhang, ganja, charas	Dried flowering tops of female plants of *Cannabis sativa* **(Cannabinaceae)**	Tetrahydrocanna binol, Cannabidiol, cannabidolic acid, cannabinol	Sedatives, analgesic, intoxicant, stomachic, antispasmodic, antianxiety, anticonvulsant, antitussive, and narcotic
Capsicum	Chillies, Spanish pepper, mirch (Hindi)	the dried, ripe fruits of *Capsicum minimum* and *Capsicum annum* **(Solanaceae)**	Capsaicin, capsanthin and carotene.	stimulant, counter irritant, rubefacient, sore throat, scarlatina, hoarseness, yellow fever, carminative, stomachic, dyspepsia, flatulence
Colocynth	Bitter apple	dried pithy pulp of the ripe fruits of *Citrullus colocynthis* **(Cucurbitaceae)**	Cucurbitacin-E(α-Elatrin) and Colocynthin	Purgative, stimulates or irritates the gastrointestinal tract, insecticidal
Colophony	Rosin, resin, coloponium	a solid residue left after distilling off the volatile oil from the oleoresin obtained from *Pinus palustris, P. pinaster, P. halepensis, P. massoniana, P. tabuliformis, P. carribacea* **(Pinaceae)**	Abietic acid, Resene	antimicrobial, antiulcer, cardiovascular activity, filmogenic, surfactant, antifeedant properties
Ginger	Adrak,	dried rhizomes of the *Zingiber officinale* **(Zingiberaceae)**	Zingiberene, gingerol, shagoal, gingediols	antiemetic, positive inotropic, spasmolytic, aromatic stimulant, carminative, condiment, flavouring agent
Guggul	Scented Bdellium, Gumgugul, Salai gogil.	obtained by incision of the bark of *Commiphora mukul* **(Burseraceae)**	guggulsterols I to VI, β-sitosterol, cholesterol, Z- and E-guggulsterone	inhibits platelet aggregation, increase thermogenesis, hypolipidemic, astringent, aritirheumatic, antiseptic, expectorant,

		by the puncture of ovums of insect *Cynips tinctoria* or *Adleria gallaetinctoriae* **(Cynipidae)**		

CONDENSED TANNINS

Drug name	Synonym	Biological source	Active constituents	Uses
Ashoka	ashoka bark	dried stem bark of the plant *Saraca indica* **(Leguminosae)**	stem bark contains about 6% of tannins and anthocyanin derivatives which includes leucopelargonidin-3-O-β-D-glucoside. root bark contains epicatechin, procyandin B2 pods consists of (+) catechol, (-) epicatechol, and leucocyanidin. flowers contain kaempterol, quercetin and its glycoside, gallic acid, and β-sitosterol	uterine tonic, sedative, stimulant effect on the endometrium and ovarian tissue, menorrhagia.
Pale catechu	Gambier	dried aqueous extract produced from the leaves and young twigs of *Uncaria gambier* **(Rubiaceae)**	7 to 30% of pseudotannin catechin, 22 to 55% of phlobatannin catechutannic acid	local astringent, diarrhoea
Black catechu	Cutch, kattha	dried aqueous extract prepared from the heartwood of *Acacia catechu* **(Leguminosae)**	2–12% catechin, 25 to 33% phlobatannin catechutannic acid, Acacatechin, Quercetin	Astringent, cures troubles of mouth, diseases of the throat and diarrhoea, increases appetite
Pterocarpus	Bijasal, Indian kino tree, Malbar kino	obtained by making vertical incisions to the stem bark of the plant *Pterocarpus marsupium* **(Leguminosae)**	70–80% kinotannic acid, kino-red, k-pyrocatechin (catechol)	Astringent, Diarrhoea, dysentery, passive haemorrhage, toothache, diabetes

Chapter 13

DRUGS OF MINERAL ORIGIN

INTRODUCTION

- The substances of mineral origin have been used for various pharmaceutical purposes ranging from therapeutic agents to nutritional supplements to pharmaceutical excipient.
- 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.

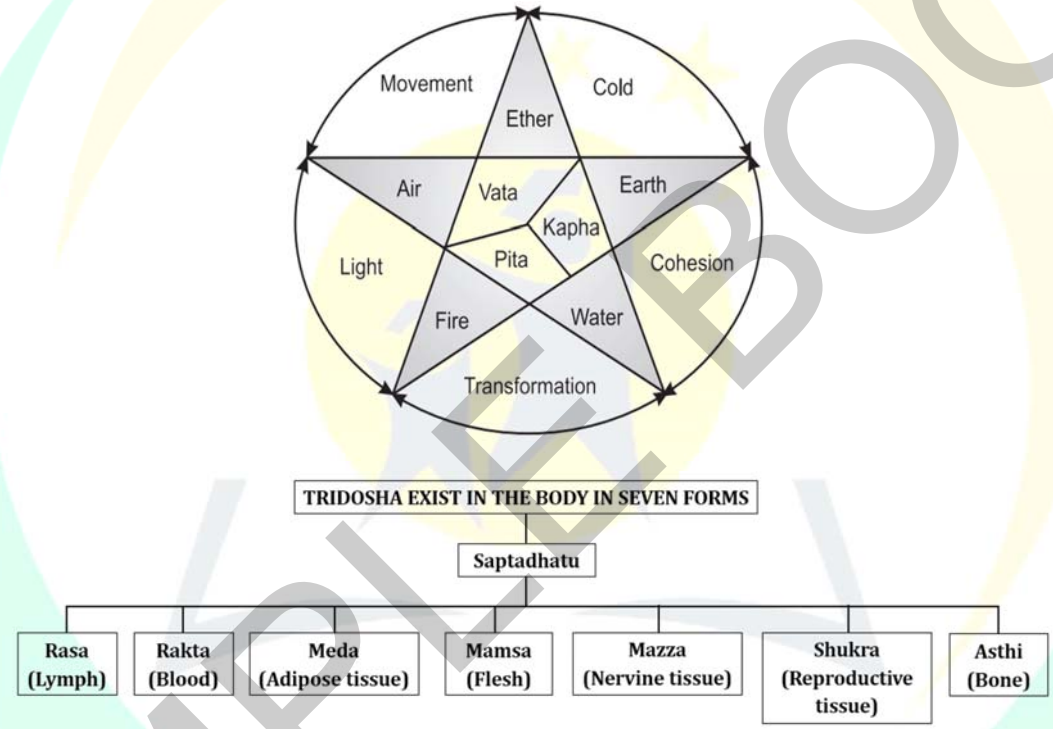
Mineral	Other name	Source	Uses
Kaolin	Hydrated aluminium silicate	Feldspar deposits	In gastric affection
Asbestos	Silicates of calcium-magnesium	Hornblende	For bacterial filter
Talc	Hydrated magnesium silicate	Sleatite/soap stone	Filtration
Bentonite	Hydrated aluminium silicate	Mineral deposits	Emulsion, cosmetics
Fueller's Earth	Aluminium magnesium silicate	Siliceous earth	Dusting powder
Prepared chalk	Calcium carbonate	Calcarious remains of algae	Antacid
Kieselguhr	Aluminium silicate	Fossil diatoms	Filtration aid
Calamine	Zinc oxide	Hemimorphites	Cosmetics
Shilajit	Herbo-mineral	Iron rich rocks	Aphrodisiac
Mica	Alumino-silicate	Metamorphic rocks	Manufacturing of furnaces, transformers, transmitters etc.

Chapter 14

TRADITIONAL AND ALTERNATIVE SYSTEMS OF MEDICINES

AYURVEDA -INDIAN SYSTEM OF MEDICINE

- **Main objective -** To maintain and promotion of positive health and cure of disease.
- 5 elements combine in body they form-



5 characters used to treat Pathological Condition

PROPERTIES	MEANING
RASA	Taste
GUNA	Physicochemical properties
VIRYA	Potency
VIPAKA	Post digestive effect
PRABHAVA	Unique effect of the drug (Pharmacotherapeutic Action)

Ayurvedic dosage form and their description

S. NO.	AYURVEDIC DOSAGES FORM	DESCRIPTION
1.	Arishta	Fermented preparation, prepare with heat, It is more become older more effective they are in action. E.g., Ashokarishta
2.	Asava	Fermented preparation, prepare without beat. E.g., Punarnavasava

3.	**Avaleha**	Prepared by repeatedly boiling the decoaction and extract of drug and condensing with sugar or jaggery
4.	**Anjana/Varti**	Eye preparation
5.	**Arka**	Liquid preparation obtained by distillation
6.	**Bhasmas**	Powder of a substance obtained by calcination is called bhasmas
7.	**Churna**	Fine powder of drugs
8.	**Ghulika/Vati**	Tablet and pills
9.	**Ghrita and Taila**	Medicated ghee and oils.

HOMEOPATHY SYSTEM OF MEDICINE

- Was developed by German Physician Hahnemann
- Hahnemann law of Similarity-Fundamental Principle of Homeopathy
- "Like can be Cured by like" (Simile smilibus curentur)
- In homeopathy the drug treatment depends upon the systems as described by the patients

7 Principles of homeopathy

INDIVIDUALISATION	Disease affecting individual can't be similar
PRINCIPLE OF SIMILIA	"Similia Similibus Curantus" - like be Cured by like
PRINCIPLE OF SIMPLEX	Only one single & Simple medicine at a time
PRINCIPLE OF MINIMUM DOSE	Minimum dose of medicine at a time
LAW OF PROVING	If drug produces similar symptoms in a healthy person as that of diseased person
LAW OF POTENTIZATION/ DYNAMISATION	Drug are potentized to enhance curative power
VITAL FORCE	It is a Dynamic Power which preserve life force

SIDDHA SYSTEM OF MEDICINE

- **Ayurveda and Siddha –** Truly Indian in their origin and development.
- Ayurveda is practiced throughout India, Siddha is restricted to Tamil Nadu.
- Exclusively linked with Tamil culture and civilization.
- Siddha system was flourished during first Tamil sangram.
- Earliest references on Siddha medicine – Tholakapium and Thirumandiram.
- **Agasthier -** First Siddha physician.
- Origin of Siddha system – Devine theory.
- **Devine theory –** origin is credited to god shiva.
- **Siddha –** Therapeutics, astrology, yoga and philosophy.

Principle: According to Siddha system

- Human body is not merely a composite of muscles, bones, tissues and nerves.
- There is a close relation and intimate connections between nature and man.
- Man is not free from the influence of nature.

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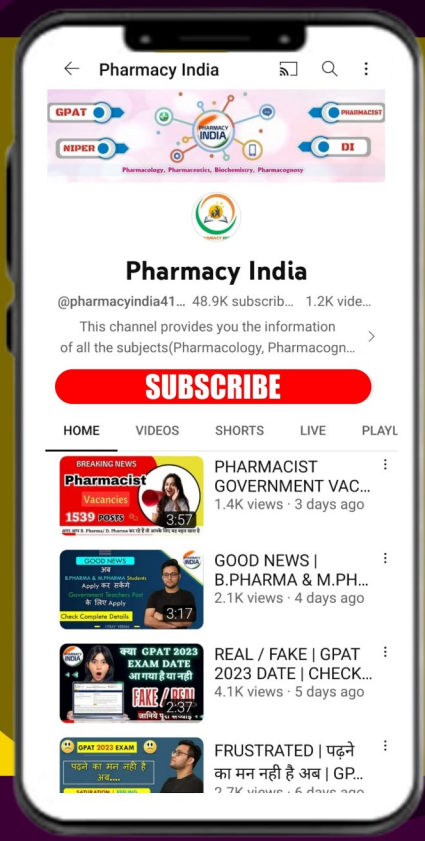

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