PHARMACY INDIA

HUMAN ANATOMY AND PHYSIOLOGY, HOSPITAL AND CLINICAL PHARMACY, DRUG STORE & BUSINESS MANAGEMENT

MODULE-5

START YOUR PREPARATION WITH US!

USEFUL FOR

AIIMS, DSSSB, ESIC, RAILWAY, CGHS
ISRO, NHM, SECL, NTPC, NCL, SEPOY,
STATE & CENTRAL GOVT.
PHARMACIST EXAMINATION

PHARMACY INDIA

HUMAN ANATOMY AND PHYSIOLOGY

DRUG STORE & BUSINESS MANAGEMENT | HOSPITAL AND CLINICAL PHARMACY

Pharmacist Competitive Examination

Theory Book

ESIC | AIIMS | NHM | RRB | CGHS | ZILA PARISHAD | ISRO | DSSSB | RAJASTHAN | KERALA

Central Government Health Scheme

PHARMACY INDIA

DOWNLOAD OUR APP

Download PHARMACY INDIA App from Google Play Store

FOR PHARMA RELATED UPDATES

www.pharmacyindia.co.in

TABLE OF CONTENT

- Phagocytic in nature and produce antibodies.

Monocytes	Lymphocytes
o Largest of the white blood cells o 4%-8% WBCs o Nucleus → U-shaped o Development → 2-3 days o Life Span →months o Function → 1. As microphages 2. Fighting chronic infections	o Contains large nucleus o Mostly present in lymphatic tissues o Two types → T-lymphcytes B-lymphocytes o Provides specific immune response to infectious diseases. o Produce antibodies. o Normal leukocyte count in adults is 4000-11000/µl.

Normal leukocyte count

CELLS	NORMAL VALUE	PERCENTAGE
Neutrophil	2.5-7.5 × 10^9/l	40-75
Eosinophil	0.04-0.44 × 10^9/l	1-6
Basophil	0.015-0.1 × 10^9/l	<1
Monocytes	0.2-0.8 × 10^9/l	2-10
Lymphocytes	1.5-3.5 × 10^9/l	20-50

PLATELETS

- Very small non-nucleated discs.
- 2 to 4 µm in diameter.
- Derived from the cytoplasm of megakaryocytes in red bone marrow.
- It contains a variety of substances that promote blood clotting, which causes haemostasis (cessation of bleeding).
- Normal blood platelet count → 200000 to 350000/ mm^3.
- Thrombopoetin (Kidney) → stimulates platelet synthesis
- Life-span → 8-11 days

HOMEOSTASIS

- Hemostasis → process of how the body stops bleeding from a cut or injury.
- This involves forming a clot to close the hole in the blood vessel and repairing the blood vessel.
- When a blood vessel is injured →platelets stick together to form a plug.
- Homeostasis involves 3 steps-

Vasoconstriction
↓
Platelet plug formation
↓
Coagulation (Blood clotting)

- Pyloric- opens in the small intestine

Small Intestine: It is the longest part of the alimentary canal. Pyloric sphincter connects the stomach to the small intestine. It has three parts:

- Duodenum
- Jejunum
- Ileum

Large Intestine: It also has three parts:

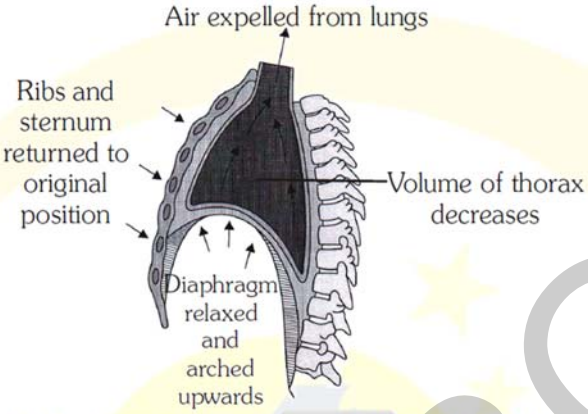
- **Caecum**- it is a blind sac, which hosts microbes and has vermiform appendix (a vestigial organ) attached to it
- **Colon**- it consists of four parts; ascending, transverse, sigmoid and descending
- **Rectum**- opens out of the body through the anus

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 • Stops secretion of gastric juice
3.	**Secretion**	Acidic Chyme entry into duodenum	Pancreas, liver, stomach	• Release of sodium bicarbonate in pancreatic juice • Steps up secretion of life. • Inhibit secretion of gastrin.
4.	**Cholecystokinin (pancreozymin)**	Presence of fats in duodenum	Pancreas, gall bladder	• Release of enzymes in pancreatic juice • Release of bile from gall bladder by stimulating gall bladder's contraction
5.	**Villikinin**	Food in small intestine	Intestine	• Accelerates movement of villi.



Mechanism of Breathing showing Expiration

RESPIRATORY VOLUME & CAPACITIES

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

EXCHANGE OF GASES

- Iris is also a part of the choroid.
- The iris partially covers the lens. It leaves a circular opening in the centre called a pupil.

3. Retina (Inner Layer)

- It has two types of sense cells—rods and cones.
- The rod cells are sensitive to dim light and do not respond to colour.
- The cone cells are sensitive to bright light and are responsible for colour vision.

COMPARISON BETWEEN RODS AND CONES

Rods	Cones
• More in number.	• Less in number.
• Located at the periphery of the retina.	• Located in the centre of the retina.
• Rapid generation of light-sensitive pigment **rhodopsin**.	• Slow generation of light-sensitive pigment **iodopsin**.

Yellow Spot and Blind Spot

Yellow Spot	Blind Spot
• Contains maximum number of sensory cells, particularly cones.	• It does not contain any sensory cells.
• This is the region of colour vision and the brightest vision.	• This is the region of no vision.

Lens

- It is transparent, biconvex and crystalline.
- It is held by a suspensory ligament which attaches the lens to the ciliary body.
- Aqueous and Vitreous Chambers

The lens divides the inner cavity of the eye ball into two chambers:

Aqueous Chamber	Vitreous Chamber
• Front chamber between the lens and the cornea.	• Larger chamber behind the lens.
• Filled with clear, watery liquid called **aqueous humour.**	• Filled with transparent, jelly-like fluid called **vitreous humour**.
• It refracts light.	• It protects the retina and its nerve endings.

Four Major Steps in Seeing an Object

Light rays reflected from the object enter the eyes through transparent structures.

↓

First, the curvature of the cornea converges the rays to some extent, and then the lens converges them further.

The image on the retina is inverted and real.

↓

Chapter 7

SKELETAL SYSTEM

INTRODUCTION

- **Skeletal system** → The entire framework of bones and their cartilages, along with ligaments and tendons.
- Two types of skeleton are endoskeleton and exoskeleton.
- **Exoskeleton** develops from epidermis e.g. nails, horns, hooves, feathers, scales, claws etc.
- **Endoskeleton** is mesodermal in origin and is living in nature.
- **Bone tissue** → a complex and dynamic living tissue, continually engages in a process called **remodelling.**
- Remodelling → construction of new bone tissue and breaking down of old bone tissue.
- Bone tissue is continuously growing, remodeling, and repairing itself.

DIVISION OF THE SKELETAL SYSTEM

- Adult human skeleton consists of 206 bones
- Most of which are paired, with one member of each pair on the right and left sides of the body.
- Skeletons of infants and children have more than 206 bones because some of their bones fuse later in life.
- Bones of the adult skeleton are grouped into two principal divisions:
  - **axial skeleton**
  - **appendicular skeleton**

HUMAN SKELETON - 206 bones			
Axial 80		Appendicular-126	
APPENDICULAR SKELETON - 126 BONES			
LIMB BONES - 120		**GIRDLE BONES - 06**	
Fore limb Bones - 60	Hind limb Bones - 60	Pectoral Girdle - 4	Pelvic Girdle - 2
Humerus - 1 x 2	Femur - 1 x 2	Scapula - 1 x 2	
Radius - 1 x 2	Patella - 1 x 2	Clavicle - 1 x 2	
Ulna - 1 x 2	Tibia - 1 x 2		(is formed by 2 hip bones and each hip bone is formed by fusion of 3 hip bones ilium, ischium and pubis)
Carpals - 8 x 2	Fibula - 1 x 2		
Metacarpals - 5 x 2	Tarsals - 7 x 2		
Phalanges - 14 x 2	Metatarsals - 5 x 2		
	Phalanges - 14 x 2		

AXIAL SKELETON – 80 BONES				
SKULL SKELETON – 29		**STERNUM - 01**	**RIBS - 24**	**VERTEBRAL COLUMN - 26**
SKULL BONES – 22			True – 14	Cervical – 7
Cranial - 8	Facial – 14		False - 10	Thoracic – 12
Frontal - 1	Maxilla – 2			Lumbar – 5
Parietal - 2	Palatine -2			Sacral – 5
Temporal - 2	Zygomatic – 2			Coccygeal – 4
Occipital - 1	Nasal – 2			

HYPOTHALAMUS	ANTERIOR PITUITARY	TARGET GLAND OR TISSUE
GHRH	GH	Most tissues Many organs
GHRIH	GH inhibition	Thyroid gland
	TSH inhibition	Pancreatic islets Most tissues
TRH	TSH	Thyroid gland
CRH	ACTH	Adrenal cortex
PRH	PRL	Breast
PIH	PRL inhibition	Breast
LHRH or	FSH	Ovaries and testes
GnRH	LH	Ovaries and testes

Summary of the hormones secreted by the anterior pituitary gland and their functions

HORMONE	FUNCTION
Growth hormone (GH)	Regulates metabolism, promotes tissue growth especially of bones and muscles
Thyroid stimulating hormone (TSH)	Stimulates growth and activity of thyroid gland and secretion of T, and T
Adrenocorticotrophic hormone (ACTH)	Stimulates the adrenal cortex to secrete glucocorticoids
Prolactin (PRL)	Stimulates milk production in the breasts
Follicle stimulating hormone (FSH)	Stimulates production of sperm in the testes, stimulates secretion of oestrogen by the ovaries, maturation of ovarian follicles, ovulation
Luteinising hormone (LH)	Stimulates secretion of testosterone by the testes, stimulates secretion of progesterone by the corpus luteum

Thyroid gland

- The thyroid gland, which is positioned in the neck, is a highly vascular organ.
- It has two lobes, one on each side of the trachea, located directly below the larynx or voice box.
- A small band of tissue called the isthmus connects the two lobes.
- Internally, the gland is made up of follicles that produce the hormones thyroxine (T3) and triiodothyronine (T4).
- Iodine is included in these hormones.

Common effects of abnormal secretion of thyroid hormone

HYPERTHYROIDISM: INCREASED T3, AND T4, SECRETION	HYPOTHYROIDISM: DECREASED T3, AND T4 SECRETION
Increased basal metabolic rate	Decreased basal metabolic rate
Anxiety, physical restlessness, mental excitability	Depression psychosis, mental slowness, lethargy
Hair loss	Dry skin, brittle hair
Tachycardia, palpitations, atrial fibrillation	Bradycardia
Warm sweaty skin, heat intolerance	Dry cold skin, prone to hypothermia
Diarrhoea	Constipation
Weight loss, good appetite	Weight gain, anorexia
Exophthalmos in Graves' disease	

- Mammalian sperms are transfered to vagina of female by the process called insemination.
- In 1 ml of semen, 20 to 120 millions of sperms are present in human being.
- Leydig's cells mature at 10 yrs. of age.
- In humans (and most vertebrates), the first polar body does not undergo meiosis II.
- The first polar body is, therefore, formed merely to get rid of unwanted chromosomes.
- 65-74 days are required to complete the cycle of spermatogenesis in human being.

TABLET SIMPLIFIED MENSTRUAL CYCLE (28 DAYS CYCLE)

Phases	Days	Events
Menstrual phase	3-5	Endometrium breaks down, menstruation begins. The cells of endometrium, secretions, blood and the unfertilized ovum constitute the menstrual flow, progesterone production is reduced.
Follicular phase Proliferative phase)	6-13	Endometrium rebuilds, FSH and LH secretion increases that stimulates follicular development as well as secretion of Oestrogens.
Ovulatory phase	14	Both LH and FSH attain a peak level. Ovulation occurs.
Luteal phase Secretory phase)	15-28	Corpus luteum secretes progesterone. Endometrium thickens and uterine glands become secretory.

FERTILIZATION

- The process in which union of male and female gametes (formed by gametogenesis) and fusion of pronuclei of sperm and ovum takes place thus diploid zygote is formed, is called fertilization.
- **Fertilization has following processes: -**
  - The union of male and female gametes is called Syngamy, where as intermixing of their cytoplasm is called plasmogamy.
  - The fusion of pronuclei of sperm and ovum is called karyogamy.
  - The intermingling of their chromosomes is called amphimixis.
  - Due to fertilization, a diploid zygote is formed, by the union of two different types of gametes.
- **MECHANISM -** We can understand the process of fertilization in following steps-

1. Movement of sperms towards the secondary oocyte.
2. Penetration of corona radiata by the hyaluronidase enzyme.
3. Adherence of sperm to the ZP3 receptors/region on zona pellucida, the glycoprotein layer surrounding the
4. oocyte.
5. Sperm bind to a sperm receptor on the zona and this leads to initiation of acrosomal reaction. Various enzymes are released. eg. Acrosin (Zona lysin).
6. Acrosin facilitate the penetration of sperm through zona pellucida.
7. Fusion of sperm and membrane of secondary oocyte. (Syngamy).
8. Phagocytosis of sperm by the secondary oocyte.
9. Completion of meiosis-II of secondary oocyte during phagocytosis to form ovum and simultaneously it releases 2nd polar body.

DRUG STORE & BUSINESS MANAGEMENT

TRADE, INDUSTRY AND MANAGEMENT

IMPORTANT TERMS

TERMS	DEFINITION
Trade	Trade means buying and selling of goods. A trader purchases goods from producers or whole salers and sells them to consumers.
Industry	It is a part of business activities concerned with growing, extraction, production, conversion and processing or fabrication of goods.
Commerce	Commerce is a part of business activity which deals with the buying and selling of goods, exchange of commodities and distribution of finished products.
Economics	Economics is scientific study of economics activities. The primary goal of economics is to attain maximum profit, increasing productivity and growth through expansion and modernization.
Management	Management may be defined as the process of conducting and managing various business activities. When the practice of management is applied to pharmaceutical industry and drug stores, it is called as pharmaceutical management.
Transaction	It is a process to perform, to carry out, to conduct or to manage business in some way. It is an external event that affects assets, liabilities or capital.

TRADE & ITS CLASSIFICATION

Trade means buying and selling of goods. A trader purchases goods from producers or whole salers and sell them to consumers.

Classification:

A. Internal trade or Home Trade
B. External trade

A. Internal trade: It refers to buying and selling of goods within the boundaries of one country. Payments of such sale are made in National currency directly or through the banking system.

- **Internal trade may be subdivided into Whole Sale trade & Retail trade.**
- **Wholesale trade:** It involves the sale of goods in larger quantities to the retailers who are in direct contact with the consumers. Wholesale trade serves as a link between the producers and the retail traders.
- **Retail sale:** It involves the sale of goods in smaller quantities to the consumers. Retail trade serves as a link between the whole sales and the consumers.

B. External trade or foreign trade: It refers to buying and selling of goods between countries of the world. When goods are moved from one country to another country, payments have to be converted into the currency of the concerned country. Such trade is conducted mostly on whole sale basis. It is subdivided into

i) **Import trade:** It means purchasing goods from foreign countries.
ii) **Export trade:** It means selling goods to foreign countries.
iii) **Entrepot trade:** It means exchange of goods, between foreign producer and foreign consumers.

INDUSTRY & ITS CLASSIFICATION

- Industry is the part of business activity, which produces goods.

HOSPITAL & CLINICAL PHARMACY

CLASSIFICATION OF HOSPITALS

Type I. On Clinical Basis

CLINICAL-BASIS			NON-CLINICAL-BASIS	
Medicine	Surgery	Maternity	Governmental	Non-Governmental
1. Paediatrics 2. Psychiatric and Nervous diseases 3. T.B. 4. General medicine	1. Orthopaedic 2. Gynaecology 3. ENT	1. Short-term 2. Long-term	-Army hospital -Navy hospital City hospital -Civil hospital -Big hospitals -AIIMS/PGI etc.	Private Hospitals for Profit Non-Profit Church hospital Community hospital Missionary hospital Charitable hospital

Type II – On size basis

- Large hospitals – beds 1000 and above
- Medium hospitals – beds between 500 – 1000
- Small hospitals beds between 100 – 500
- Very small hospitals beds less than 100

Objectives of inventory control management

- To reduce the investment in inventories which are not required
- To minimise the wastage of time by avoiding "out of stock" situation

Number of techniques are available for inventory control

- ABC analysis
- Codifaction and standardization
- Determination of reorder quantities with special attention to EOQ Minimum Maximum Stocks
- Study of life cycle of each item

- Haematological tests, also known as blood tests, play a crucial role in diagnosing, monitoring, and managing various medical conditions.
- These tests provide valuable information about the composition, function, and health of blood cells and components. Here are some key significances of haematological tests:
    - Disease Diagnosis
    - Monitoring Disease Progression
    - Screening for Health Conditions
    - Assessment of Organ Function
    - Blood Transfusion Compatibility
    - Preoperative Evaluation
    - Medication Monitoring

Interpretation of Hematological Test

S. No.	Constituents	Normal range	Variation	Interpretation/ remarks
1.	**Hemoglobin**	**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

A. ANALGESICS	
1. Narcotics	1. Withdrawal syndrome 2. Decreased hyperbilirubinemia
2. Salicylates	1. Increased structure abnormally 2. Platelet dysfunction 3. Decreased factor XII
B. ANAESTHETICS	
1. General	1. Respiratory depression
2. Local	2. Respiratory depression, bradycardia, Acidosis, methemoglobinemia
C. ANTIBIOTICS	
1. Isoniazid	Encephalopathy
2. Nitrofurantoin	Haemolysis
3. Streptomycin	VIIth Nerve damage
4. Sulphonamides	Kernicterus
5. Tetracyclines	Dental staining
D. ANTICONVULSANTS	
1. Barbiturates	1. Enzymatic action 2. Decreased sucking
2. Diphenyl hydantoin	1. Cleft lip and palate 2. Coagulation defects
3. Phenobarbital	1. Coagulation defects 2. Induction of enzymes 3. Addition and withdrawal syndrome
E. ANTI-CANCEROUS DRUGS	
1. Chlorambucil	Unilateral Renal and Urten Agenesis
2. Methotrexate	Bone defects, Malformation of head
F. ANTI-DIABETICS	
1. Chlorpropamide	Morphological anomalies Severe Hypoglycaemia
2. Tolbutamide	Morphological anomalies
G. ANTI-THYROID DRUGS	
1. I_{131}	Hypothyroidism probably malignancy later in life
2. Tolbutamide	Goitre
3. Thiouracil	Goitre Hyposynthesis of T4
H. ALCOHOL	
1. Chronic alcohol intake	Intrauterine growth retardation Foetal alcohol intake
2. Short period alcohol intake	Withdrawal symptoms at birth
I. ATROPINE	Tachycardic
J. CHLOROQUINE	Deafness
K. DIURETICS THIAZIDE	Thrombocytopenia Hyponatremia Electrolyte disturbances
L. HOR1IONES	
1.Androgens	Muscularisation and tomboyish behaviour in females
2.Cortisone	Cleft palate, Haemorrhages, Hypoglycemia Disturbances with adrenal activity

Neomycin, Gentamycin, All Cephalosporin	
Carbamazepine, Isoniazid,	Neurotoxicity
Amikacin, Streptomycin, Tobramycin	Ototoxicity

LATIN TERMS & THEIR MEANINGS

LATIN TERM	ABBREVIATION	ENGLISH MEANING
(d) Correlated time		
Ante cibos	a.c.	Before meals
Post cibos	p.c.	After meals
Inter cibos	i.c.	Between meals
(e) Other terms	dol. urg.	when the pain is severe
Dolore urgentae	m.d.	As directed
More dicto	m.d.	As directed
Modo dicto	p.r.n.	Occasionally
Pro re nata	quot. o.s.	As often as necessary
Quoties opus sit Si dolor urgente	si dol. urg.	If the pain is severe
Si opus sit	s.o.s.	When required
Statim	stat.	Immediately, at once
Tussi urgente	tuss. urg.	If the cough is troublesome
Cum	c.	With
Cum duplo	c. dup	With twice as much
Cum parte aequale	c. pt. aeq.	With an equal quantity
Cum tanto	c. tant.	With as much
Cyathus	cyath.	A glass
Cyathus vinousus	cyath, vin.	A wineglass
E lacte	e lact.	With milk
Ex aqua	ex aq. Isin	With water
Dexter	dext.	Right
Laevus	laev.	Left
Parti affectae applicandus	p.a.a. lino	To be applied on the affected part
Partibus affectis	p.a.	To the affected parts
Sinister	sinist.	Left
Auri	auri	To the ear
Naso		To the Nose
Oculis	ocul.	To the eyes
Pro oculils	pro ocul.	For the eyes

LATIN TERM	ABBREVIATION	ENGLISH MEANING
Time of Administration of Application		
(a) Times per day		
Semel in die	sem. in die	Once a day
Bis in die, Bis die Ter in die,	b.i.d., b.d.	Twice a day
Ter die	t.i.d., t.d.	Three times a day
Quater in die	q.i.d., q.d.	Four times a day
Sexies in die	sex in d.	Six times a day

AIIMS

RRB

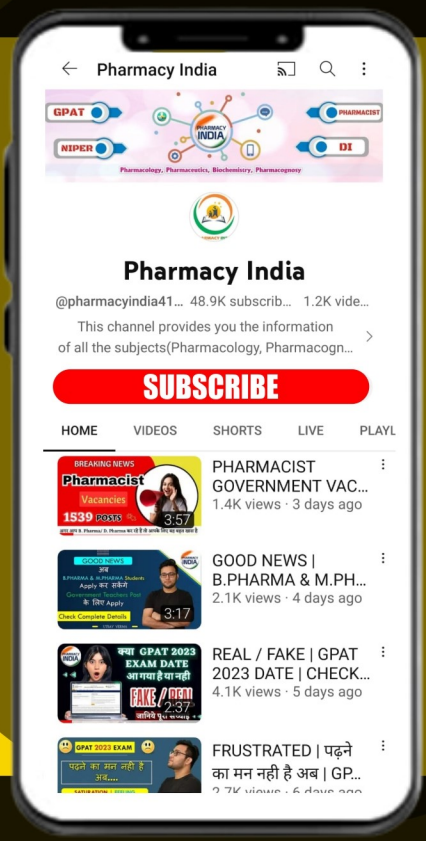
CGHS,
HPPSC, BTSC, ISRO,
KERALA PSC,
MP PHARMACIST,
SECL, DSSSB,
BCCL

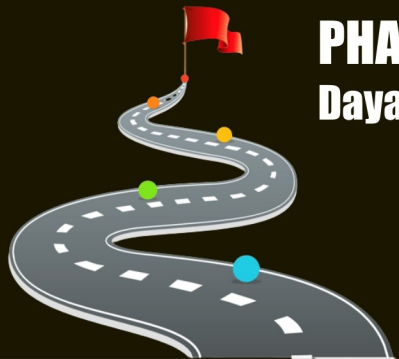
ESIC

UP NHM

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

Dayalpuram, Street-4, Khatauli Muzaffarnagar, 251201

8171313561, 8006781759

pharmacyindia24@gmail.com