

HUMAN ANATOMY AND PHYSIOLOGY (THEORY)

1. Scope of Anatomy & Physiology. Basic Terminologies Used: Directional Terminologies, Plains & Sections and Body Cavities.
2. **Structure of the Cell:** Structure & Function of Plasma Membrane, Cell Cycle and Transport of Substances across Cell Membrane.
3. **Tissues:** Definition, Classification of Tissues, Location, Characteristics and Function of Epithelial, Connective, Muscular & Nervous Tissues. Definitions of Malignant & Benign Tumors
4. **Osseous System:** Structure & Composition of Bone. Functions of Skeleton. Classification of Joints. Definition of Disorders: Osteoporosis, Arthritis, Rickets & Gout
5. **Haemopoietic System :** Composition & Functions of Blood. Haemopoiesis. Blood Grouping. Mechanisms of Blood Clotting. Definitions of Disorders: Anaemias, Polycythaemia, Leukopenia, Leukocytosis, Leukaemia, Thrombocytopenia & Haemophilia.
6. **Lymphatic System :** Composition, Formation, Circulation & Functions of Lymph. Structure & Functions of Lymph Node, Spleen and Thymus Gland. Definitions of Disorders: Lymphoedema, Elephantiasis & Splenomegaly.
7. **Cardiovascular System:** Anatomy of Heart. Structure of Blood Vessels. Circulation: Pulmonary, Systemic (Coronary & Portal). Conduction System of the Heart, Cardiac Cycle & ECG. Blood Pressure: Mechanism of regulation, Factors determining Blood Pressure. Definitions of Disorders: Congestive Heart Failure, Cardiac Arrhythmias, Angina Pectoris, Myocardial Infarction, Atherosclerosis, Rheumatic Heart Disease, Hypertension & Hypotension.

Respiratory System: Anatomy & Functions of Respiratory Organs. Mechanisms of regulation of Respiration. Transport of Respiratory Gases. Definitions of Lung Volume &

Capacities, Hypoxia and Resuscitation. Definitions of Disorders: Asthma, COPD, Tuberculosis & Pneumonia

8. **Digestive System** :Anatomy & Functions of Salivary Gland, Stomach, Intestine, Liver, Gall Bladder and Pancreas. Digestion & Absorption. Definitions of Disorders: Peptic Ulcer, Constipation, Diarrhea, Emesis, Liver Cirrhosis, Hepatitis, Anorexia & GERD.
9. **Nervous Systems**: Classification of Nervous System. Meninges & Cerebrospinal Fluid. Functional Areas of Brain: Cerebrum, Cerebellum, Pons & Medulla, Thalamus & Hypothalamus and Basal Ganglia. Spinal Cord: Structure & Reflexes. Cranial Nerves & their Functions. Autonomic Nervous System: Anatomy & Functions of Sympathetic and Parasympathetic Nervous System. Somatic Nervous System. Definitions of Disorders: Epilepsy, Parkinson's Disease, Depression, Insomnia, Anxiety, Schizophrenia, Migraine & Alzheimer's Disease.
10. **Urinary System**: Parts of Urinary System: Structure & Functions of Kidney and Structure of Nephron. Mechanism of Urine Formation & Acid-Base Balance. Micturition Reflex & Renal Function Test. Definitions of Disorders: Renal Calculi, Cystitis, Glomerulonephritis Renal Fibrosis & Urinary Incontinence.
11. **Endocrine System**: Structure, Secretions & Functions of Hypothalamus & Pituitary Gland, Thyroid & Parathyroid Gland, Adrenal Gland, Pancreatic Islets. Definitions of Disorders: Hypothyroidism, Hyperthyroidism, Cushing's Syndrome, Addison's Disease, Diabetes Mellitus, Pheochromocytoma, Gigantism, Acromegaly, Diabetes insipidus & Dwarfism.
12. **Reproductive System**: Structure, Functions & Hormones of Male & Female Reproductive System. Physiology of Menstruation, Spermatogenesis & Oogenesis. Pregnancy & its maintenance and Parturition. Definitions of Disorders: Infertility, Polycystic Ovarian Disease, Erectile Dysfunction & AIDS.
13. **Sense Organs**: Structure and Functioning of Eye, Ear, Skin, Taste & Smell. Definitions of Disorders: Glaucoma, Cataract, Conjunctivitis, Psoriasis & Tinnitus.

14 Skeletal Muscles: Physiology of Muscle Contraction. Neuro-muscular Junction. Properties of Skeletal Muscles. Muscles in Exercise. Definitions of Disorders: Muscular Dystrophy, Myasthenia Gravis.

PATHOPHYSIOLOGY (THEORY)

1. a) Definition of pathology, health and disease. Terminologies used in pathology. b) Basic principles of cell injury and adaptation: Causes, pathogenesis and morphology of cell injury, Cellular adaptation's-physiologic and pathologic adaptations, Cellular ageing and death, Antioxidant enzymes-superoxide dismutase, catalase and glutathione peroxidase.

2. **Inflammation:**a) Definition, causes, signs ,types of inflammation and chemical-mediators. b) Pathogenesis of acute inflammation (vascular events, Cellular events, transdate, exudate, edema, phagocytosis). c) Pathogenesis of chronic-inflammation and difference between acute and chronic inflammation. d) Tissue renewal and repair: regeneration healing and fibrosis. e) Wound healing: process of wound healing, types of cells, factors influencing healing of wounds.

3. Diseases of Immunity: Components of the immune system: Cells involved in immune response- T and B cells, Macrophages, Dendritic cells and Natural killer cells. MHC proteins or transplantation antigens. Immune Tolerance.

A) Hypersensitivity: Hypersensitivity type I, II, III, IV. Biological significance of hypersensitivity. Allergy due to food, chemicals and drugs. **B) Auto-immunity:** Mechanism of Autoimmunity. Classification of autoimmune diseases in man. Transplantation rejection (types and mechanisms). **C) Acquired Immune Deficiency Syndrome (AIDS) D) Amyloidosis.**

4. Cancer: General aspects of neoplasia, Definition, terminology, Differences between benign and malignant tumors. Etiology and pathogenesis of cancer. General biology and classification of malignant tumors. Invasions and metastasis of cancer.

5. Shock: Types, mechanism, stages and Management

6. Biological effects of radiation: Introduction on radiation, strength of radiation, mechanism of action of ionizing and non-ionizing radiations and their toxic effects.

7. Environment and Nutritional diseases: Obesity, Malnutrition, Pathogenesis of deficiency diseases with special reference to vitamins and minerals, Air pollution and smoking — SO₂, NO and CO.

8. Pathophysiology (etiology, pathogenesis, signs and symptoms) of common diseases/disorders: Peptic ulcer and inflammatory bowel disease, Gastritis, Hypertension, Angina, Myocardial Infarction, Congestive cardiac failure, Atherosclerosis, Stroke (Ischemic and Hemorrhage), Diabetes Mellitus, Hypo and hyperthyroidism, Cirrhosis and Alcoholic liver diseases, Asthma and chronic obstructive airway diseases, Parkinsonism, Schizophrenia, Depression and Mania, Alzheimer's disease, Acute and chronic renal failure.

9. Pathophysiology (causative organisms, mode of transmission, pathogenesis, signs and symptoms) of infectious diseases: Hepatitis - infective hepatitis, Sexually transmitted diseases (Syphilis, Gonorrhoea), Pneumonia, Typhoid, Urinary tract infections, Tuberculosis, Leprosy, Malaria, Dysentery (Bacterial and amoebic), Dengue and Chikungunya.

10. Genetics and chromosomal disorders: Mendelian disorders, Cytogenic disorders (Karyotypic abnormalities)

BIOCHEMISTRY

1. Bio energetics

- a) Concept of free energy and its determination; redox potential
- b) Energy rich compounds; ATP; Cyclic AMP; their biological significance

2. Biological Oxidation

- a) Electron transport chain (its mechanism and role)
- b) Inhibitors and Uncouplers of ETC
- c) Oxidative phosphorylation
- d) Substrate level phosphorylation and oxidative phosphorylation

3. Proteins

Definition, classification, biological significance, properties viz, denaturation, isoelectric point

4. Enzymes and Coenzymes

- a) Definition ; Nomenclature ; IUB Classification
- b) Properties of enzymes;
- c) Factors effecting enzyme activity;
- d) Enzyme kinetics (Michaelis plot ; Line Weaver Burke plot)
- e) Enzyme Inhibition (with examples)
- f) Iso-enzymes
- g) Enzyme Induction; repression
- h) Applications of enzymes
- i) Coenzymes, categories of reactions requiring coenzymes;
- j) Structure of coenzymes, and their biochemical role
- k) Vitamins - water soluble, fat soluble

5. Carbohydrate metabolism

- a) Introduction: Definition, classification and biological significance
- b) Glycolysis along with significance and energetics
- c) Glycogenesis glycogenolysis,
- d) TCA cycle; (Amphibolic nature of TCA cycle) along with significance and energetics
- e) Gluconeogenesis and its significance
- f) Various shuttle systems (glycerol phosphate; Malate aspartate)
- g) HMP Shunt Pathway and its significance
- h) Uronic acid pathway and galactose metabolism
- i) disorders of carbohydrate metabolism: glycogen storage diseases, Diabetes mellitus
- j) Hormonal regulation of carbohydrate metabolism**
- k) Glucose tolerance test and blood glucose regulation.

6. Lipid metabolism

- a) Introduction: Definition, classification, essential fatty acids
- b) Oxidation of saturated (palmitic acid) fatty acids
- c) Oxidation of unsaturated fatty acids (-linolenic acid) 4

- d) Oxidation of odd numbered fatty acids
- e) Formation and fate of ketone bodies
- f) Cholesterol metabolism,
- g) Biosynthesis of fatty acids (de novo)
- h) Phospholipids and sphingolipids.

7. Amino acid metabolism

- a) Amino acids definition, classification and significance
- b) General reactions of amino acids: Transamination, deamination and decarboxylations of amino acids
- c) Urea cycle, deficiency symptoms of urea cycle enzymes
- d) Metabolism of sulphur containing amino acids
- e) Catabolism of tyrosine, tryptophan, phenylalanine, phenyl ketonurea alkaptonurea
- f) Synthesis & significance of biologically important substances: creatine, histamine, 5-HT, dopamine, noradrenaline, adrenaline.
- g) Porphyrins, Bile Pigments; Hyperbilirubinemia

8. Nucleotides and Nucleic acids

- a) Introduction: Structure and numbering of purine and pyrimidine nucleus
- b) Purine nucleotides biosynthesis
- c) Pyrimidine nucleotides biosynthesis
- d) Catabolism of purines and pyrimidines
- e) DNA structure, significance as genetic material
- f) RNA types, structure and significance
- g) DNA replication
- h) Mutation and repair of DNA
- i) Transcription or RNA synthesis
- j) Genetic code
- k) Translation or protein synthesis and its Inhibition

9. Principles and significance for following Biochemical tests

- a) Kidney function tests
- b) Liver function tests

- c) Lipid profile
- d) Gastric function test

MEDICINAL CHEMISTRY – I (THEORY)

I Basic Principles of Medicinal Chemistry

- a) History and development of Medicinal Chemistry, definition of hit, lead and drug.
- b) Effects of the following physicochemical properties of drug molecules on biological activity: Ionisation, hydrogen bonding, solubility, partition coefficient, logP, logD, protein binding, chelation and polar surface area.
- c) Receptor and drug receptor interactions.
- d) Drug metabolism: Biotransformation, sites of biotransformation, General pathways of drug biotransformation, role of cytochrome P-450 and monoaminoxygenase in oxidative biotransformation, oxidative, reductive, hydrolytic and conjugation reactions with examples.

A study of development of the following classes of drugs including structure activity relationship (SAR), mechanism of action, synthesis of compounds superscribed by 's', chemical nomenclature, generic names, brand names (a few important marketed products) and side effects.

II Central nervous system depressants

- A. General Anaesthetics: Definition, mode of action
 - 1. Inhalation anaesthetics: Halothane^s, Methoxyflurane, Nitrous oxide
 - 2. Ultra short acting barbiturates: Methohexitol sodium^s, Thiopental sodium
 - 3. Dissociative anaesthetics: Ketamine hydrochloride
- B. Tranquilizers, sedatives and hypnotics
 - 1. *Major tranquilizers*: SAR of Phenothiazines, Promethazine HCl, Chlorpromazine HCl^s, Prochlorperazine, thioridazine HCl

- Thioxanthenes: Chlorprothixene, thiothixine, clozapine
- Fluorobutyrophenones: Haloperidol^s, Risperidone
- Beta amino ketones: Molindone HCl, Benzamide surpierre
- Minor tranquilizers*: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam^s, Orazepam, Chlorazepam, Lorazepam, Flurazepam, Alprazolam^s, Triazolam^s
- 2. Barbiturates: Classification and SAR, Barbitol^s, Methobarbital^s, Phenobarbital, Amobarbital^s, Butarbital, Pentobarbital, Secobarbital
- 3. Miscellaneous sedative hypnotics:
 - a) Amides and imides: Glutethimide^s, Methyprylon, Methaqualone^s
 - b) Alcohols and their carbamate derivatives: Ethchlorvynol, Ethinamate, Meproamate^s
 - c) Aldehydes and their derivatives: Chloral hydrate, Paraldehyde
- C. Skeletal muscle relaxants: Chlorphenesin^s, Methocarbamol, Chlorzoxazone
- D. Drugs used in spasticity: Baclofen, Buspirone
- E. Anticonvulsants: Structural requirement for anticonvulsant activity, mechanism of anticonvulsant action
 - 1. Barbiturates: Phenobarbitone, Mepobarbitone
 - 2. Hydantoins: Phenytoin sodium^s, Ethotoin, Mephenytoin
 - 3. Oxazolidinediones: Trimethadione^s, Paramethadione
 - 4. Succinimides: Phensuximide^s, Methsuximide, Ethsuximide
 - 5. Urea and monoacyl ureas: Phenacemide, Carbamazepine^s
 - 6. Benzodiazepines: Clonazepam^s,
 - 7. Miscellaneous: Primidone, Valproic acid

III Adrenergic agents

- A. Adrenergic neurotransmitters and their biosynthesis and metabolism, adrenergic receptors their distribution and actions mediated by them
- B. Sympathomimetics
 - 1. Direct acting: SAR, Endogenous catecholamines,

- a) Alpha adrenergic agonists: Phenylephrine^s, Methoxamine, Naphazoline, Xylometazoline^s, Oxymetazoline, Clonidine^s, Guanabenz, Methyldopa
 - b) Dual agonist/antagonist: Dobutamine
 - c) Beta adrenergic agonists: Isoproterenol^s, Metaproterenol, Terbutalin^s, Albuterol, Salbuterol, Bitolterol, Ritodrine
2. Indirect acting: Hydroxyamphetamine, Propylhexedrine
 3. Mixed acting: Ephedrine, Metaraminol
- C. Adrenolytics:
1. Alpha blockers:
 - a) Non selective: Tolazoline
 - b) Irreversible blockers: Phenoxybenzamine^s
 - c) Alpha1 blockers: Prazosin^s, Doxazosin, Tamsulosin
 - d) Alpha2 blockers: Yohimbine, Coryanthine
 2. Beta blockers: SAR
 - a) Non selective blockers: Propranolol^s, Nadolol, Pindolol, Timolol, Sotalol
 - b) Beta1 blockers: Acebutolol, Atenelol, Esmolol, Metaprolol^s
 - c) Betablockers with alpha1 antagonistic activity: Labetalol, Carvedilol

IV Cholinergic drugs and related agents

12 hours;15-16 marks

1. Cholinergic neurotransmitter: Biosynthesis, metabolism and functions of acetylcholine
 2. Cholinergic receptors: Nicotinic, muscarinic and their subtypes
- A. Cholinergic agonists:
1. Stereochemistry and SAR, Acetylcholine, Methacholine, Carbachol, Bethanechol, Pilocarpine
 2. Cholinesterase inhibitors:
 - a) Reversible: Mode of action, Physostigmine, Neostigmine^s, Ambenonium, Demecarium, Edrophonium, Tacrine
 - b) Irreversible: Mode of action, Isoflurophate, Ecothiophate, Malathion, Parathion, Pralidoxime.
- B. Cholinergic blockers: SAR
1. Postganglionic blockers: Structural considerations of solanaceous alkaloids and analogs, Atropine, Hyoscyamine, Scopolamine, Homatropine, Ipratropium
 2. Synthetic agents: Clidinium, Dicyclomine^s, Glycopyrrolate, Methantheline, Propantheline,

Benztropine, Procyclidine, Tropicamide^s

3. Ganglionic blockers: Mode of action, Trimethaphan, Mecamylamine
4. Neuromuscular blockers: Mode of action, Tubocurarine, Metocurine, Gallamine, Pancuronium, Vecuronium.

V Local anesthetics

- A. Definition, classification, and mechanism of action
- B. SAR of lidocaine derivatives
- C. 1. Benzoic acid derivatives: Hexylcaine, Cyclomethicaine, Piperocaine
2. Aminobenzoic acid derivatives: Benzocaine, Procaine^s, Procainamide
3. Lidocaine derivatives (Anilides): Lidocaine^s, Prilocaine
4. Miscellaneous: Dimethisoquin, Dibucaine

VI Histamine and antihistaminic agents

- A. Histamine: receptors and its actions
- B. Antihistaminics: H1 antagonists
 - a) Aminoalkyl ethers: Diphenhydramine HCl, Bromodiphenhydramine, Doxylamine
 - b) Ethylene diamines: Tripelenamine, Pyrilamine
 - c) Propylamine derivatives: Pheniramine, Chlorpheniramine^s
 - d) Phenothiazine derivatives: Promethazine^s, Trimeprazine
 - e) Piperazine derivatives: Cyclizine, Meclizine, Cetrizine^s
 - f) Miscellaneous compounds: Phenindamine, Cyproheptadine
- C. H2 antagonists: Mechanism, Cimetidine, Ranitidine, Famotidine
- D. Gastric proton pump inhibitors: Mechanism of action, Omeprazole^s, Pantoprazole, Rabiprazole, Lansoprazole.

VII Analgesic agents

- A. 1. Narcotic analgesics: Opioid receptors, SAR, Morphine, Codeine, Diacetyl morphine, Levorphanol, Dextromethorphan^s, Pentazocine, Meperidine, Loperamide, Fentanyl, Methadone^s, Propoxyphene, Tramadol
2. Narcotic antagonists: Butorphanol, Nalorphine, Levalorphan, Naltrexone, Naloxone
- B. Non narcotic analgesics

1. Steroidal anti-inflammatory agents: Cortisone, Hydrocortisone, Dexamethasone, Betamethasone, Triamcinolone, Fluocinolone
2. Non steroidal anti-inflammatory agents: Mechanism of action
 - a) Salicylic acid derivatives: Aspirin
 - b) N-aryl anthranilic acid derivatives: Mefenamic acid^s, Diclofenac, Aceclofenac
 - c) Aryl acetic acid derivatives: Indomethacin, Ibuprofen^s, Piroxicam^s, Naproxen^s
 - d) Aniline and paraaminophenol derivatives: Phenacetin, Acetaminophen^s
 - e) Pyrazolone and pyrazolidine dione derivatives: Antipyrin, Oxyphenbutazone, Phenylbutazone
 - f) Diaryl sulphonamides: Nimesulide^s, Rofecoxib, Valdecoxib

VIII Structure and medicinal uses of important prostaglandins

IX Natural Products

- A. Alkaloids: Definition, Classification, Structural elucidation of ephedrine
- B. Purines: Definition, Structural elucidation of caffeine, Interrelation among caffeine, theophylline, theobromine.
- C. Terpenoids: Definition, classification, isoprene and special isoprene rule, Interrelationship among monocyclic monoterpenoids like limonene, dipentene, alpha terpenoid, alpha terpenion, terpenolene, terpin, terpene hydrate, carvone and cineone.

PHARMACOLOGY (THEORY)

1. **General Pharmacology** : Introduction and definitions—Health, Drug, Pharmacology, Pharmacokinetics and Pharmacodynamics, Sources of drugs. Routes of administration of drugs. Absorption of drug and the factors affecting them. Drug distribution, metabolism and excretion. Mechanism of drug action—Drug-Receptor interactions and molecular & biochemical basis of drug action, additive effect, synergism, potentiation. Factors modifying drug effects; Patient related factors & Drug related factors. Classification and mechanism of action of ADR. Dose response relationship, structure activity relationship. Definitions, Basic concepts and mechanisms of Drug-Drug, Drug-Food interactions, classification of Drug-Drug interaction.

2. Pharmacology of drugs acting on Autonomic Nervous System : Introduction — Neurohumoral Transmission. Adrenergic Drugs ; Adrenergic transmission, adrenergic receptors and drugs affecting adrenergic transmission, Classification of drugs and mechanism of action, Pharmacology of adrenaline (a proto type adrenergic drug) and salient features of other adrenergic drugs. Adrenergic Blockers; Classification, pharmacology of phenoxybenzamine (a proto type Alpha blocker), pharmacology of propranolol (a proto type beta blocker), salient features of alpha & beta blockers. Adrenergic neuronal blockers & mechanism of action. Cholinergic Drugs: Cholinergic transmission, cholinergic receptors and drugs affecting cholinergic transmission, Classification of drugs and mechanism of action, Pharmacology of Acetylcholine (a proto type cholinergic drug). Salient features of other cholinergic drugs, including cholinesterase inhibitors and enzyme reactivators. Anti cholinergic Drugs; Pharmacology of atropine (a proto type anti cholinergic drug) and salient features of other anti cholinergic drugs; Ganglionic blockers and stimulants, Neuromuscular blocking agents and drugs used in myasthenia gravis.

3. Pharmacology of Drugs acting on Cardiovascular System: Anti- hypertensives agents: Classification and mechanism of action, Pharmacology of centrally acting drugs (Clonidine and methyldopa), Classification of vasodilators including calcium channel blockers, Pharmacology of drugs affecting Renin Angiotensin system. Anti - anginal drugs; Classification and pharmacology of anti -anginal drugs. Anti-arrhythmic drugs; Classification and mechanism of action, Pharmacology of quinidine (A proto type sodium channel blocker), Salient features of other anti-arrhythmic drugs, Drugs used for therapy of congestive cardiac failure (CCF); Classification and mechanism of action of drugs used for CCF, pharmacology of digoxin, Salient features of other drugs used in CCF. Drugs used in treatment of hyperlipidaemias; Classification and mechanism of action of anti- hyperlipidaemics, Pharmacology of atorvastatin (A proto type of HMG CoA reductase inhibitor), Salient features of other anti- hyperlipidaemic agents.

4. Pharmacology of Drugs Acting on Renal System (Diuretics) and antidiuretics; Classification and mechanism of action of diuretics, Pharmacology of furosemide, Salient features of other diuretics, Pharmacology of anti-diuretics, Uses and adverse effects of Urine acidifiers and alkalinizers.

5. Pharmacology of Drugs Acting on Blood and Blood forming Agents: Classification and mechanism of action & salient features of coagulants and anti-coagulants, haemopoietics, thrombolytics and antiplatelet agents.

6. Pharmacology of Autocoids & their antagonists: Histamine and antihistaminics, 5-Hydroxytryptamine and its antagonists, Lipid derived autocoids and platelet activating factor.

7. Pharmacology of Drug Acting on Respiratory Tract: Drugs used in asthma and COPD, mucolytics, expectorants, antitussives, nasal decongestants.

8. Pharmacology of Hormones and Hormones Antagonists: Thyroid and antithyroid drugs: Classification, mechanism of action and salient features of thyroid and antithyroid drugs, Anti-diabetic drugs, Insulin, Insulin preparations, Oral hypoglycemic agents: Classification, mechanism of action, salient features of oral anti-diabetics including newer agents, Pharmacology of corticosteroids, Pharmacology of sex hormones and oral contraceptives, Pharmacology of oxytocin, other uterine stimulants and relaxants.

PHARMACOLOGY & TOXICOLOGY (THEORY)

1. **Bio Assays:** Scope, General Principles and Methods
2. **Drug discovery and development:** a. Preclinical evaluation (Regulatory Toxicity Studies) b. Clinical evaluation including pharmacovigilance
3. **Pharmacology of Drugs Acting on Central Nervous System :** General consideration (Introduction), Alcohol, General anesthetics, Sedatives and hypnotics, Anti-Epileptics, Psychopharmacological agents, Classification and mechanism of action of drugs used in psychosis, Pharmacology of Chlorpromazine (a prototype drug), Salient features of Antipsychotics including atypical Antipsychotics. Drugs used in Parkinsonism and Alzheimer's disease. Antidepressants: Classification and mechanism of action of drugs used in Depression, Pharmacology of imipramine (a prototype TCA), Salient features of other Antidepressants, including SSRIs and atypical antidepressants, Pharmacology of Lithium and other agents used in bipolar disorder. Anxiolytics, Drug dependence and drug abuse
4. **Analgesics and anti-inflammatory agents :** Pain pathway, classification and mechanism of action of centrally acting analgesics, Pharmacology of Morphine (a prototype Opioid), Salient features of other opioids including antagonists, Classification and mechanism of action of NSAIDs, Pharmacology of Aspirin (a prototype NSAID), Salient features of other NSAIDs including COX-2 inhibitors
5. **Pharmacology of Drugs Acting on Gastro Intestinal Tract:** Antiulcer drugs, Antacids, Laxatives and Purgatives, Emetics and Antiemetics, Appetizers, Digestants, Carminatives
6. **Chemotherapy:** Introduction and principles of chemotherapy including general mechanisms of antimicrobials, mechanism of resistance, super infections, antimicrobial combinations. Classification, mechanism of action, spectrum of activity, resistance development, adverse drug reactions and therapeutic use of the following: 1. Sulfonamides and Co-trimoxazole, 2. Penicillins and Cephalosporins, 3. Tetracyclines and Chloramphenicol, 4. Macrolides, 5. Aminoglycosides, 6. Polyene & Polypeptide antibiotics, 7. Quinolones and Fluoroquinolones, 8 Lincosamides, Glycopeptides, urinary antiseptics, 9.

Antifungal agents, 10. Antiviral agents including anti-HIV, 11. Chemotherapy of Tuberculosis and Leprosy, 12. Chemotherapy of Malaria, 13. Chemotherapy of Protozoal infections (amoebiasis, Giardiasis), 14. Pharmacology of Anthelmintic drugs, 15. Chemotherapy of Cancer

7. Immunopharmacology Pharmacology of immunosuppressants and stimulants

8. Principles of Toxicology: General principles of treatment of acute toxicity and acute poisoning Signs, Symptoms and treatment of acute and chronic poisoning due to i) Barbiturates ii) Alcohols iii) Benzodiazapines iv) Antidepressants, v) Neuroleptics vi) Insecticides vii) Snake bite viii) Heavy metals (iron, lead, mercury, arsenic).

9. Pharmacology of Local anesthetics

MEDICINAL CHEMISTRY II (THEORY)

A. Introduction to QSAR: Study of hydrophobic, Electronic & Steric parameters

B. Prodrugs: Definition and examples

C. Introduction to drug discovery- Definition of lead molecule and its identification methods viz, high throughput screening, wholesale screening, and fragment based lead generation, fast followers

D. History and development of chemotherapeutic agents: Structure, uses and synthesis of only those compounds that are underlined and superscripted by 's'.

1. Antifungal agents:

a) Antifungal antibiotics- Nystatin, Griseofulvin, Amphoterecin-B, Synthetic anti fungal agents:

b) Substituted imidazoles: Clotrimazole, Miconazole^s, Ketoconazole, oxycnazole, Intraconazole.

c) Miscellaneous–Zinc propionate, Sodium caprylate, Tolnaftate^s.

2. Urinary tract anti-infectives:

a) Quinalones: Nalidixic acid, Cinoxacin, Norfloxacin, Ciprofloxacin^s, Pefloxacin, Ofloxacin, Sparfloxacin

b) Miscellaneous: Nitrofurantoin^s .

3. Antitubercular drugs:

a) Synthetic antitubercular agents: p-Aminosalicylic acid , Isoniazid , Ethambutol , Pyrazinamide, Ethionamide, Clofazamine, Bedaquiline

b) Antitubercular Antibiotics: Cycloserine, Viomycin sulfate, Capreomycin sulfate, Rifampicin.

c) Combination therapy for TB

4. Antiviral Agents

a) Amantidine hydrochloride, Idoxuridine, Acyclovir, Zidovudine.

b) Anti-AIDS: Zidovudine, Zalcitabine, Suramin

5. Antiprotozoal agents: Emetine hydrochloride, Metronidazole^s, tinidazole, ornidazole, secnidazole, Diloxanide furoate, 8-hydroxy quinoline derivatives (clioquinol, iodoquinol) Carbarsone

6. Anthelmintics: Piperazine, Diethyl carbamazine, Pyrantelpamoate, Thiabendazole^s Albendazole^s, Mebendazole

E. Sulfonamides, Sulfones as antibacterial agents :

1. SAR and mode of Sulfonamides.

2. Classification of sulfonamides based on duration of action and site of action with examples. Sulfamethiazole, Sulfisoxazole^s, Sulfapyridine, Sulfamethoxazole^s , Sulfadiazine, Sulfacetamide, sulfasalazine, Phthalyl sulfathiazole.

3. Folate reductase inhibitors: Trimethoprim, Synergistic action of the combination of sulfamethoxazole and trimethoprim^s.

4. Sulfone: Dapsone^s

F. Antimalarials: Etiology of malaria, History, Mechanism and SAR

1. Quinolines and analogues: 7-chloro-4-amino quinolines :Chloroquine phosphate^s , Hydroxychloroquine sulphate, Amodiaquine, 8-amino quinolines: Pamaquine, Primaquine , 9-amino acridines: Quinacrine.

2. Artimicin and its derivatives: Artemether, Artemether, Artesunate

1. Biguanides and Dihydrothiazines: Chloroguanide, Cycloguanil.

2. Miscellaneous: Mefloquine, Pyrimethamine, Trimethoprim.

G. Antibiotics: Classification and Mechanism of action

1. Beta lactam antibiotics: Penicillins – structures, chemical degradation, bacterial resistance. Penicillin G, Penicillin V, Cloxacillin sodium, Nafcillin sodium, Ampicillin, Amoxicillin.
2. Cephalosporins: Structure and uses of Cephalexin, Cephadrine, Cefadroxil, Cefixime, Cefaprydine, Cefuroxime⁹⁴
3. Monolactams: Sulfazecin, Aztreonam, Tigmonam.
4. Beta lactamase inhibitors: Clavulanic acid and its salts, Thienamycin.
5. Aminoglycosides: Structural features and Mechanism of action, Streptomycin, Amikacin, Neomycin, Kanamycin, Gentamycin, Netilmycin
6. Tetracyclines: Chemistry and SAR, tetracycline, Chlortetracycline, Methacycline, Demeclocycline, Oxytetracycline, Meclocycline, Doxycycline, Minocycline.
7. Macrolide: Structure and specific uses of Erythromycin, Azithrocin, leandomycin.
8. Lincomycins: Lincomycin, Clindamycin.
9. Polypeptides: Gramicidin, Bacitracin, Polymyxin B, Colistin.
10. Miscellaneous: Chlormphenicol^s, Vancomycin, Novobiocin.

H. Antineoplastic agents: Introduction, mechanism of action and classification with examples.

1. Alkylating agents: Mechlorethamine, Cyclophosphamide, Melphalan, Chlorambucil^s, Busulfan, Lomustine,
2. Antimetabolites: Mercaptopurine, Thioguanine, 5-Fluorouracil, Methotrexate^s,
3. Antibiotics: Dactinomycin, Bleomycin, Mitomycin, Streptozocin.
4. Plant products: Etoposide, Taxol, Camphothesin, Vincristine, Vinblastin.
5. Hormones: Dromostanalone, Megestrol,
6. Kinase inhibitors: Imatinibmesylate
6. Miscellaneous: Asparaginase, Cisplatin, Hydroxy urea.
7. Immunotherapy: Interferon alpha 2a and 2b.

I. Cardiovascular agents:

1. Antianginal agents and vasodilators: Chemical structure and specific uses of Amyl nitrite, Nitroglycerine, Isosorbide dinitrate.

2. Calcium antagonists: Brief introduction of calcium channels and their blockers. Chemical structures and uses of Verapamil, Diltiazem, Nifedepine, Nimodipine, Felodipine, Dipyridamole, Cyclosetate.

3. Antiarrhythmic drugs: Structure, chemical name, and classification of antiarrhythmics with examples

Class I- Membrane depressant drugs: Quinidine Procainamide, Phenytoin.

Class II-Beta adrenergic blocking agents. Tocainide, propranolol

Class III-Repolarization prolongators. Bretylium, Amiodarone

Class IV-Calcium channel blocker. Diltiazem, Verapamil

4. Antihypertensive agents:

Beta-blockers: Propranolol. Timolol

ACE Inhibitors: Captopril, Enalapril

Diuretics: Hydrochlorothiazide, Spiranolactone

Calcium channel blockers: Nifedipine, Felodipine, Amlodipine

α_1 -Antagonist: Prazocin

α_2 -agonist: Clonidine, Guanithedine

Angiotensin –II receptor antagonist: Losartan, Valsartan

Miscellaneous: Reserpine, Hydralazine, Minoxidil

5. Antihyperlipidemic agents: Structure and specific uses.

Clofibrate, Lovastatin, Cholesteramine, Colestipol, Atorvastatin

6. Anticoagulants: Dicumorol, Warfarin^s, Phenindione

J. Hypoglycemic agents: Insulin and its preparations.

Sulfonylureas–Chlorpropamide^s, Acetohexamide, Glipizide,

Biguanides-Phenformin, Metformin

Substituted benzoic acid derivatives – Meglitinides, Nateglinide

Thiazolidinediones –Glitazones, Pioglitazone, Ciglitazone, Rosiglitazone

Glipitines – Sitagliptin, Anagliptin

K. Thyroid hormones : L-thyroxine, L-thyronine,

L. Antithyroid drugs: Propylthiouracil, Methimazole.

M. Estrogens and progesterones- Skeletal structure and their uses

N. Diuretics: Introduction

1. Carbonic anhydrase inhibitors: Acetazolamide^s, Methazolamide.

2. Thiazide and Thiazide like diuretics: Chlorthiazides, Benzthiazide, Xipamide, Chlorthalidone.
3. High-ceiling or loop diuretics: Furosemide^s, Ethacrynic acid^s .
4. Potassium sparing diuretics: Spironolactone, Triamterene, Amiloride.
5. Miscellaneous: Mannitol.

ENVIRONMENTAL SCIENCE (THEORY)

Unit 1 : Multidisciplinary nature of environmental studies ; Definition, scope and importance

Unit 2 : Natural Resources : Renewable and non-renewable resources :

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit 3 : Ecosystems

• Concept of an ecosystem.

• Structure and function of an ecosystem.

• Producers, consumers and decomposers.

• Energy flow in the ecosystem.

• Ecological succession.

• Food chains, food webs and ecological pyramids.

• Introduction, types, characteristic features, structure and function of the following ecosystem :-

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5 : Environmental Pollution

Definition

- Cause, effects and control measures of :-
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Unit 6 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit 7 : Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit 8 : Field work

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.

- Study of simple ecosystems-pond, river, hill slopes, etc

HUMAN VALUES

COMMUNITY PHARMACY (THEORY)

1. Scope: In the changing scenario of pharmacy practice in India, Community Pharmacists are expected to offer various pharmaceutical care services. In order to meet this demand, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling, health screening services for improved patient care in the community set up.

2. Objectives: Upon completion of the course, the student shall be able to –

- a. know pharmaceutical care services;
- b. know the business and professional practice management skills in community pharmacies;
- c. do patient counselling & provide health screening services to public in community pharmacy;
- d. respond to minor ailments and provide appropriate medication;
- e. show empathy and sympathy to patients; and
- f. appreciate the concept of Rational drug therapy.

1. Either the college is having model community pharmacy (meeting the schedule N requirement) or sign MoU with at least 4 -5 community pharmacies nearby to the college for training the students on dispensing and counselling activities.

2. Special equipments like B.P apparatus, Glucometer, Peak flow meter, and apparatus for cholesterol estimation.

Topics

1 Definition, scope, of community pharmacy

Roles and responsibilities of Community pharmacist

2 Community Pharmacy Management

a) Selection of site, Space layout, and design

b) Staff, Materials- coding, stocking

c) Legal requirements

d) Maintenance of various registers

e) Use of Computers: Business and health care soft wares

3 Prescriptions – parts of prescription, legality & identification of medication related problems like drug interactions.

4 Inventory control in community pharmacy

Definition, various methods of Inventory Control

ABC, VED, EOQ, Lead time, safety stock

5 Pharmaceutical care

Definition and Principles of Pharmaceutical care.

6 Patient counselling

Definition, outcomes, various stages, barriers, Strategies to overcome barriers Patient information leaflets- content, design, & layouts, advisory labels

7 Patient medication adherence

Definition, Factors affecting medication adherence, role of pharmacist in improving the adherence.

8 Health screening services Definition, importance, methods for screening Blood pressure/ blood sugar/ lung function and Cholesterol testing

9 OTC Medication- Definition, OTC medication list & Counselling

10 Health Education

WHO Definition of health, and health promotion, care for children, pregnant & breast feeding women, and geriatric patients. Commonly occurring Communicable Diseases, causative agents,

Clinical presentations and prevention of communicable diseases – Tuberculosis, Hepatitis, Typhoid, Amoebiasis, Malaria, Leprosy, Syphilis, Gonorrhoea and AIDS Balance diet, and treatment & prevention of deficiency disorders Family planning – role of pharmacist

11 Responding to symptoms of minor ailments

Relevant pathophysiology, common drug therapy to, Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Pyrexia, Ophthalmic symptoms, worms infestations.

12 Essential Drugs concept and Rational Drug Therapy Role of community pharmacist

13 Code of ethics for community pharmacists