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ANNEXURE (A)

SCHEME OF EXAMINATION / SYLLABUS FOR POST OF DRUG INSPECTOR.

(I) The examination will comprise of :-

(a) **Written examination:** The Candidates will take the examination in the following two papers each of one & half hours duration each carrying a maximum of 150 marks the questions in both the papers will be so designed as to give the following different subjects.

Paper – I (Code No.1): 150 marks

(i)	General English & Essay :-	100 marks
(ii)	General Knowledge :-	50 marks

Paper – II (Code No.2): 150 marks

(i)	Pharmaceutical Jurisprudence (legal subject) :-	30 marks
(ii)	Human Anatomy & Physiology :-	20 marks
(iii)	Pharmaceutics :-	20 marks
(iv)	Pharmaceutical Microbiology :-	20 marks
(v)	Medical Chemistry :-	20 marks
(vi)	Pharmacology :-	20 marks
(vii)	Pharmacognosy & Phythochemistry :-	20 marks

(b) **VIVA –VOCE :- 40 marks**

(II) The examination in both the papers will be completely of objective (Multiple Choice answer type). The question papers (Test Booklets) will be set in English only.

(III) Candidates must write the papers in their own handwriting. In no circumstances will they be allowed the help of scribe to write answer for them.

(IV) Candidates are not permitted to use calculators for answering objective type paper (Test Booklets) they should not, therefore, bring the same inside the examination Hall.

(V) Selection will be made on the basis of combined maximum marks in written and Viva – Voce.

(VI) Minimum pass marks shall be as per the provisions contained in the OM No.54/2006,dated 07.01.2008.

Signed by Songnyan Tante
Date: 10-12-2021 14:16:17
Reason: Approved
(Songnyan. Tante)
Under Secretary (Health & Fw)
Govt. of Arunachal Pradesh
Itanagar.

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SYLLABUS FOR OPTIONAL PAPERS FOR THE POST OF DRUGS INSPECTOR

1. HUMAN ANATOMY AND PHYSIOLOGY

- **Introduction to human body**
  Definition and scope of anatomy and physiology, level of structural organization and body systems, basic life process, homeostasis, basic anatomical analysis.
- **Cellular level of organization**
  Structure and function of cell, transport across cell membrane, cell division, general principles of cell communication, Intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling.
- **Tissue level of organization**
  Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.
- **Integumentary system**
  Structure and functions of skin
- **Skeletal muscles**
  Divisions of skeletal system, Types of bone, salient features and functions of bones of axial and appendicular skeletal system, Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction.
- **Joints**
  Structural and functional classification, types of joints movements and its articulation.
- **Body fluids and blood**
  Body fluids, composition and functions of blood,hemopoeisis,formation of hemoglobin, anemia, mechanism of coagulation, blood grouping,RH factors, transfusion, Its significance and disorder of blood, Reticuloendothelial system.
- **Lymphatic system**
  Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.
- **Peripheral Nervous system**
  Classification of peripheral nervous system: Structure and functions of symphethetic and parasymphethetic nervous system.
- **Special senses**
  Structure and function of eye,ear,nose,and tongue and their disorders.
- **Cardiovascular system**
  Heart: anatomy of heart,blood circulation, bloodvessels, structures and functions of artery, veins and capillaries,elements of conduction system of heart and heart beats, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.
- **Nervous system**
  Organization of nervous system,neuron,neuroglia,classification and properties of nerves fiber,electrophysiology,action potential, nerveimpulse, receptors,synapse,neurotransmitters.
  Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and function of brain (cerebrum, brainstem, cerebellum), spinalcord(gross structure, function and afferent and efferent nerves tracts, reflex activity.
- **Digestive system**
  Anatomy of GI tract with special reference to anatomy and function of stomach(acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsinrole in protein digestion) small intestine and largeintestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT,digestion and absorption of nutrients and disorders of GIT.
- **Energetics**
  Formation and role of ATP.Creatinine phosphate and BMR.

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- **Respiratory system**
  Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration, Lungs volumes and capacities transport of respiratory gases, artificial respiration and resuscitation methods.
- **Urinary system**
  Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidneys and disorders of kidneys.
- **Endocrine system**
  Classification of hormones, Mechanisms of action, structure and functions of pituitary glands, thyroid gland, parathyroid gland, adrenal gland, pancreases, pineal gland thymus and their disorder.
- **Reproductive system**
  Anatomy of male and female reproductive system, functions of male and female reproductive system,sex hormones, physiology of menstruation,fertilization,spermatogenesis, oogenesis, pregnancy and parturition.
- **Introduction of genetics**
  Chromosomes, genes and DNA, Protein synthesis, genetic pattern of inheritance.

2. PHARMACEUTICAL JURISPRUDENCE

- **Drugs and Cosmetics Act, 1940 and its rules 1945:**
  Objectives, Definitions, legal definitions of Schedules to the Act and Rules,
  Import of Drugs- Classes of drugs and, cosmetics prohibited from import, Import under license or permit, offences and penalties.
  Manufacture of drugs- Prohibition of manufacture and sale of certain drugs.
  Conditions of grant of license and conditions of license of manufacture of drugs, Manufacture of drugs for test, examination and, analysis, manufacture of new drugs, loan license and repacking license.
  Detailed; study of Schedule G,H,M,N, Part XII B,Sch F & DMR (OA)
  Sale of Drugs- Wholesale, Retail sale and restricted license, Offences and penalties.
  Labeling and Packing of Drugs-General labeling requirements and specimen labels for Drugs and Cosmetics, List of permitted colors, Offences and penalties.
  Administration of the Act and Rules- Drugs technical Advisory board,Central Drugs Laboratory, Drugs consultative Committee, Government Drugs Analysts, Licensing Authorities, Drugs Inspectors.
- **Medical Device Rules 2017**
- **Pharmacy Act-1948:** Objectives, definition, Pharmacy Council of India; its constitution and functions, Education regulations, State and Joint Pharmacy Councils; constitution and functions, Registration of Pharmacists, offences and penalties.
- **Medicinal and Toilet Preparation Act-1955:** Objectives,definitions,Licensing,Manufacture in bond and outside bond, export of alcoholic preparation, Manufacture of ayurvedic, Homeopathic, Patent and proprietary preparation, Offences and penalties.
- **Narcotic Drugs and Psychotropic substances Act-**1985 and Rules: Objectives, definitions, Authorities and Officers, Constitution and functions of Narcotics & Psychotropic consultative committee, National fund for controlling the drugs abuse, Control and Regulation, Opium poppy cultivation and production of poppy straw, Manufacture, Sale and export of opium, Offences and penalties.
- **Study of salient feature of drugs and Magic Remedies Act and its Rules:** Objectives, definitions, Prohibition of certain advertisements, Classes of exempted advertisements, Offences and penalties.
- **National Pharmaceutical Pricing Authorities:** Drugs Price Control Order (DPCO)-2013,Objectives ,Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail Price and Ceiling price of Scheduled formulations, National List of Essential Medicines (NLEM).
- **Pharmaceutical Legislations:** A brief review, Introduction, Study of Drugs inquiry Committee, Health Survey and development Committee, Hathi Committee and Mudallar Committee.
- **Code of Pharmaceutical Ethics:** Definitions, Pharmacist in relation to his job, Trade, Medical Profession and his profession, Pharmacists Oath.

- **Medical Termination of Pregnancy Act**
- **Right to Information Act**

3. PHARMACEUTICS

- Solubility Of Drugs: Solubility expressions, Mechanism of solute solvent interactions, Ideal solubility parameters, salvation and association, quantitative approach to the factor influencing solubility of drugs, quantitative approach to the factors of gas in liquids, Solubility of liquids in liquids,(Binary solution, Ideal solution),Raoults law, real solutions. Partiality miscible liquids, Critical solution temperature and application, Distribution law,its limitation and application.
- States of matter and Properties of matter: State of matter, Changes in the state of matter, latent heat, Vapour pressure, Sublimation critical point, eutectic mixture,aerosol inhalers,relative humidity,liquid complexes, Liquid crystal,glassy states,Solid crystalline,amorphous & Polymorphism.
- Physicochemical properties of drugs molecules: Refractive index,Optical rotation,dielectric constant, dipole moment, dissociation constant,determination and applications.
- Surface and Interfacial phenomenon:Liquid interface, Surface and interfacial tensions. Surface free energy, measurement of surface & interfacial tension, spreadingcoefficient, absorption at liquid interfaces,surface active agents,HLBScale,Solubilisation,detergency,absorption at solid interface.
- Complexation and protein binding: Introduction,Classification of complexation,Application,Methods of analysis,Protein binding,Complexation and drugs action, Crystalline structures of complexes and thermodynamic treatment of stability constant.
- pH,Buffers and Isotonic solution:Sorenson;s pH Scale, pH determination (electrometric and Calorimetric) Application of buffers,buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered Isotonic solutions.
- Colloidal dispersions: Classification of dispersed systems and their general characteristics,size and shapes of colloidal particles,classification of colloids and comparative account of their general properties,Optical,Kinetic and electrical properties. Effect of electrolytes,coacervation,peptization& protective action.
- Rheology: Newtonian System,Law of flow,Kinematic viscosity, effect of temperature, Non-Newtonian system, pseudo plastic,dilatants,plastic,thixotropy,thixotropy in formulation, determination of viscosity,capillary,falling sphere,rotational viscometer.
- Deformation of solid: Plastic and elastic deformation, Heckel equation,Stress,Strain,Elastic modules.
- Coarse dispersion: Suspension,Interfacial properties of suspended particles,settling in suspension,formulation of flocculated and deflocculated suspensions.Emulsion and theories of emulsification, micro emulsion and multiple emulsion; stability of emulsion,preservation of emulsions,rheological properties of emulsions and emulsion formulation by HLB method.
- Micromere tics: Particle size and distribution,mean particle size, number and weight distribution, particle number,methods of determining particle size by different methods,counting and separation method,particle shape,specific surface,methods for determining surface area,permeability,packing arrangement,densities, bulkiness& flow properties.
- Drugs stability: Reaction kinetics, Zero, Pseudo-zero, first & second order, unit of basic rate constant, determination of reaction order, Physical and chemical factors influencing the chemical degradation of pharmaceutical products, temperature, solvent, ionic strength, dielectric constant, specific and general acid base catalysis, simple numerical problems, Stabilization of medicinal agents against common reaction like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.

4. PHARMACEUTICAL MICROBILOGY

- Introduction,history of microbiology, its branches,scope and its importance.Introduction to prokaryotes and Eukaryotes.Study of ultra-structure and morphological classification of bacteria,nutritional requirements,raw materials used for culture media and physical parameters for growth,growth curve, isolation and preservation methods for pure cultures,cultivation of anaerobes,quantitative measurement of bacterial growth (total and viable count).Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.
- Identification of bacteria using staining techniques)simple,Grams & Acid fast staining) and biochemical tests (IMViC).Study of principle,Procedure, merits, demerits and application of physical,chemical gaseous,radiation and mechanical methods of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators.
- Study of morphology, classification,reproduction/Replication and cultivation of fungi and viruses.Classification and mode of action of disinfectants.Factors influencing disinfection.Antiseptics and their evolution.For bacteristatic and bactericidal actions. Sterility testing of products (Solid,Liquid,Opthalmic and other sterile products) according to IP,BP and USP.
- Designing of aseptic area, Laminar flow equipments,study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.Principles and methods of different microbiological assay.Methods for standardization of antibiotics, vitamins and amino acids.Assessment of a new antibiotic.
- Types of spoilage, Factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.Preservation and pharmaceutical products using antimicrobial agents, Evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.

5. MEDICINAL CHEMISTRY

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

- Introduction to Medicinal Chemistry, History and development of medicinal chemistry, Physicochemical properties in relation to biological action, Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein, binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.
  Drug metabolism, Drug metabolism principles- Phase I and Phase II.
  Factors affecting drug metabolism including stereo chemical aspects.
- **Drugs acting on Autonomic Nervous System**
  Adrenergic Neurotransmitters:
  Biosynthesis and catabolism of catecholamine.
  Adrenergic receptors (Alpha & Beta) and their distribution.
  Sympathomimetic agents: SAR of Sympathomimetic agents
  Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine,
  Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.
  Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
  Agents with mixed mechanism: Ephedrine, Metaraminol.
- **Adrenergic Antagonists:**
  Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

- **Cholinergic neurotransmitters:**
  Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. Parasympathomimetic agents: SAR of Parasympathomimetic agents. Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine. Indirect acting / Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion. Cholinesterase reactivator: Pralidoxime chloride. Cholinergic Blocking agents: SAR of cholinolytic agents Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyaminesulphate, Scopolamine hydrobromide, Homatropinehydrobromide, Ipratropium bromide. Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropinemesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.
- **Drugs acting on Central Nervous System**
  Sedatives and Hypnotics:
  Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem, Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital
  Miscelleneous:
  Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.
  Antipsychotics:
  Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.
  Ring Analogues of Phenothiazeomes: Chlorprothixene, Thiothixene,Loxapine succinate, Clozapine. Flurobuterophenones: Haloperidol, Droperidol, Risperidone.Beta amino ketones: Molindone hydrochloride. Benzamides:Sulpieride.
  Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action
  Barbiturates: Phenobarbitone, Methabarbital.
  Hydantoins: Phenytoin*, Mephenytoin, Ethotoin
  Oxazolidinediones: Trimethadione, Paramethadione
  Succinimides: Phensuximide, Methsuximide, Ethosuximide*
  Urea and monoacylureas: Phenacemide, Carbamazepine*
  Benzodiazepines: Clonazepam
  Miscellaneous: Primidone, Valproicacid , Gabapentin, Felbamate
- **Drugs acting on Central Nervous System**
  General anesthetics:
  Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane. Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.
  Dissociative anesthetics: Ketamine hydrochloride.
- **Narcotic and non-narcotic analgesics**
  Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanoltartarate.
- **Narcotic antagonists:**Nalorphine hydrochloride, Levallorphantartarate, Naloxone hydrochloride.
  Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

- **Antihistaminic agents**: Histamine, receptors and their distribution in the human body
  H1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylaminescuccinate, Clemastinefumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidaminetartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine
  Cromolyn sodium.
- **H2-antagonists:** Cimetidine*, Famotidine, Ranitidin. Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole
- **Anti-neoplastic agents:**
  Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa
  Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine
- **Antibiotics:**Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin
- **Plant products:**Etoposide, Vinblastinsulphate, Vincristinsulphate
- **Miscellaneous:**Cisplatin, Mitotane.
- **Anti-anginal:**
- **Vasodilators:** Amyl nitrite, Nitroglycerin*, Pentaerythritoltetranitrate, Isosorbidedinitrite*, Dipyridamole.
- **Calcium channel blockers:** Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.
- **Diuretics:**
- **Carbonic anhydrase inhibitors:** Acetazolamide*, Methazolamide, Dichlorphenamide.
- **Thiazides:**Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,
- **Loop diuretics:** Furosemide*, Bumetanide, Ethacrynic acid.
- **Potassium sparing Diuretics:** Spironolactone, Triamterene, Amiloride.
- **Osmotic Diuretics:** Mannitol
- **Anti-hypertensive Agents:** Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidinemonosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.
- **Anti-arrhythmic Drugs**: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.
- **Anti-hyperlipidemic agents:**Clofibrate, Lovastatin, Cholesteramine and Cholestipol
- **Coagulant & Anticoagulants:**Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel
- **Drugs used in Congestive Heart Failure:** Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.
- **Drugs acting on Endocrine system :**Nomenclature, Stereochemistry and metabolism of steroids
- **Sex hormones:** Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.
- **Drugs for erectile dysfunction:** Sildenafil, Tadalafil.
- **Oral contraceptives:** Mifepristone, Norgestril, Levonorgestrol
- **Corticosteroids:** Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone
- **Thyroid and antithyroid drugs:** L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.
- **Anti-diabetic agents:** Insulin and its preparations
- **Sulfonylureas:**Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.
- **Biguanides:** Metformin.
- **Thiazolidinediones:** Pioglitazone, Rosiglitazone.
- **Meglitinides:**Repaglinide, Nateglinide.
- **Glucosidase inhibitors:**Acrabose, Voglibose.

- **Local Anesthetics:** SAR of Local anesthetics
  Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.
  Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.
- **Lidocaine/Anilide derivatives:** Lignocaine, Mepivacaine, Prilocaine, Etidocaine.
- **Miscellaneous:** Phenacaine, Diperodon, Dibucaine.*
- **Antibiotics :**Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.
  B-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams
  Aminoglycosides: Streptomycin, Neomycin, Kanamycin
  Tetracyclines: Tetracycline, Oxytetracycline Chlortetracycline, Minocycline, Doxycycline
  Macrolide: Erythromycin Clarithromycin, Azithromycin.
  Miscellaneous: Chloramphenicol*, Clindamycin.
- **Prodrugs:** Basic concepts and application of prodrugs design.
- **Antimalarials:** Etiology of malaria.
- **Quinolines:** SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.
- **Biguanides and dihydrotriazines:**Cycloguanilpamoate, Proguanil.
- **Miscellaneous:** Pyrimethamine, Artesunete, Artemether, Atovoquone.
- **Anti-tubercular Agents: Synthetic anti tubercular agents:**Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*
- **Anti-tubercular antibiotics:** Rifampicin, Rifabutin, CycloserineStreptomycine, Capreomycinsulphate.
- **Urinary tract anti-infective agents: Quinolones:** SAR of quinolones, NalidixicAcid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin
- **Miscellaneous:**Furazolidine, Nitrofurantoin*, Methanamine.
- **Antiviral agents:** Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridinetrifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.
- **Antifungal agents:**
  Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.
  Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, OxiconazoleTioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.
  Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, PentamidineIsethionate, Atovaquone, Eflornithine.
- **Anthelmintics:**Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.
- **Sulphonamides and Sulfones:** Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.
- **Folatereductase inhibitors:** Trimethoprim*, Cotrimoxazole.
- **Sulfones:**Dapsone*.
- **Introduction to Drug Design : Various approaches used in drug design.**
  Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques.
- **Combinatorial Chemistry:** Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

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6. PHARMACOLOGY

- **General Pharmacology**

  Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, trans membrane enzyme linked receptors, trans membrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
- Adverse drug reactions.
- Drug interactions (pharmacokinetic and pharmacodynamics) : Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, linical trial phase, phases of clinical trials and pharmacovigilance.
- **Pharmacology of peripheral nervous system**

  Organization and function of ANS, Neurohumoraltransmission,co-transmission and classification of neurotransmitters, Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics, Neuromuscular blocking agents and skeletal muscle relaxants (peripheral), Local anesthetic agents, Drugs used in myasthenia gravis and glaucoma.
- **Pharmacology of central nervous system**

  Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. General anesthetics and pre-anesthetics. Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics. Alcohols and disulfiram.
- **Pharmacology of central nervous system**

  Psychopharmacological agents: Antipsychrotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Drugs used in Parkinsons disease and Alzheimer's disease. CNS stimulants and nootropics. Opioid analgesics and antagonists. Drug addiction, drug abuse, tolerance and dependence.
- **Pharmacology of drugs acting on cardio vascular system:**

  Introduction of hemodynamic and electrophysiology of heart, Drugs used in congestive heart failure, Anti-hypertensive drugs, Anti-anginal drugs, Anti-arrythmic drugs, Anti-hyperlipidemic drugs, Drugs used in the therapy of shock, Hematinics,coagulants and anti-coagulants, Febrinolytics and anti-platelets drugs, Plasma volume expanders.
- **Pharmacology of drugs acting on urinary system.**

  Diuretics, Anti-diuretics.
- **Autocoids and related drugs:**

  Introduction of autocoids and classification.Histamine, 5-HT and their antagonists. Prostaglandins,Thromboxanes and Leukotrienes. Angiotensin,Bradykinin and Substance P. Non-steriodal anti-inflamatory agents. Anti-gout drugs. Antirheumatic drugs
- **Pharmacology of drugs acting on Respiratory system**

  Anti -asthmatic drugs, Expectorants and antitussives, Nasal decongestants, Respiratory stimulants, COPD
- **Pharmacology of drugs acting on the Gastrointestinal Tract**

  Antiulcer agents. Drugs for constipation and diarrhoea. Appetite stimulants and suppressants. Digestants and carminatives. Emetics and anti-emetics.
- **Chemotherapy**

  General principles of chemotherapy. Sulfonamides and cotrimoxazole. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides, Antitubercular agents, Antifungal drugs, Antileprotic agents, Antifungal agents, Antiviral drugs, Anthelmintics, Antimalarial drugs, Antiamoebic agents, Urinary tract infections and sexually transmitted diseases, Chemotherapy of malignancy.

- **Immunopharmacology**
  Immunostimulants, Immunosuppressant, Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars
- **Principles of toxicology**
  Definition and basic knowledge of acute, subacute and chronic toxicity. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity. General principles of treatment of poisoning. Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.
- **Chronopharmacology**
  Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.

7. PHARMACOGNOSY AND PHYTOCHEMISTRY

- **Introduction to Pharmacognosy :**Definition, history, scope and development of Pharmacognosy. Source of Drugs – Plants,Animals,Marine& Tissue culture.Organized drugs, unorganized drugs (dried latex,driedjuices,driedextracts,gumsandmucilages,oleoresins and oleo-gum-resins).
- **Classificatiion of drugs:**
  Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and serotaxonomical classification of drugs.
- **Quality control of Drugs of Natural Origin:**
  Adulteration of drugs of natural origin.Evaluatin by organoleptic, microscopic, physical, chemical and biological Methods and properties.Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, Cameralucida and diagrams of microscopic objects to scale with camera lucida.
- **Cultivation, collection, Processing and storage of drugs of natural origin:**
  Cultivation and Collection of drugs of Natural origin.Factors influencing cultivation of medicinal plants.Plant hormones and their applications.Polyploidy, mutation and hybridization with reference to medicinal plants.
- **Conservation of medicinal plants**
  Plant tissue culture:
  Historical development of plant tissue culture, types of cultures, Nutritional requirements,Growth and their maintenance.Applications of plant tissue culture in pharmacognosy. Edible vaccines.
- **Pharmacognosy in various systems of medicine:**Role of Pharmacognosy in allopathy and traditional systems of medicine namely,Ayurveda,Unani, Siddha, Homeopathy and Chinese systems of medicine.
- **Introduction to secondary metabolites:**Definition, classification, properties and test for identification of Alkaloids, Glycosides,Flavonoids, Tannins, Volatile oil and Resins.
- **Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs.**
  Plant Products: Fibers – Cotton, Jute, Hemp, Hallucinogens,Teratogens, Natural allergens.
  Primary metabolites: General introduction, detailed study with respect to chemistry, source, preparation, Evaluation, preservation, storage, therapeutic used and commercial utility as PharmaceuticalAids and / or Medicines for the following Primary metabolites:
  Carbohydrates: Acacia, Agar, Tragacanth, Honey
  Proteins and Enzymes: Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, Streptokinase, pepsin).Lipids (Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax
  Marine Drugs : Novel medicinal agents from marine sources.