

## Test schedule and syllabus

Test	Test schedule	Syllabus
Pre-intermediate Assessment(PIA-1 to PIA-40)	As per your convenience Try to appear for test once a week after preparing the subject according to syllabus (Recommended)	As described below
Intermediate Assessment(IA)	As per your convenience Try to appear for test after finishing appropriate Pre intermediate assessment. Eg. For PIA-1 to PIA- 4, appear for IA-1 (Recommended)	IA-1 : Syllabus of PIA-1 to PIA-4 IA-2 : Syllabus of PIA-5 to PIA-8 IA-3 : Syllabus of PIA-9 to PIA-12 IA-4 : Syllabus of PIA-13 to PIA-16 IA-5 : Syllabus of PIA-17 to PIA-20 IA-6 : Syllabus of PIA-21 to PIA-24 IA-7 : Syllabus of PIA-24 to PIA-25 IA-8 : Syllabus of PIA-26 to PIA-30 IA-9 : Syllabus of PIA-31 to PIA-35 IA-10: Syllabus of PIA-36 to PIA-40
Summative Assessment (SA)	As per your convenience Try to appear after completing appropriate pre intermediate (PIA) and intermediate assessment (IA). Eg. For PIA-1 to PIA-8, or after IA-1 and IA-2 appear for SA-1(Recommended)	SA-1: Syllabus of PIA-1 to PIA-8 SA-2: Syllabus of PIA-9 to PIA-16 SA-3: Syllabus of PIA-17 to PIA-24 SA-4: Syllabus of PIA-25 to PIA-32 SA-5: Syllabus of PIA-33 to PIA-40

Test	Subject	Topics
Pre intermediate Assessment (PIA) -1	Inorganic Pharmaceutical & Medicinal Chemistry	Importance of inorganic compounds in pharmacy and medicine; An outline of methods of preparation, uses, sources of impurities, tests for purity and identity, including limit tests for iron, arsenic, lead, heavy metals, chloride, sulphate and special tests if any, of the following classes of inorganic pharmaceuticals included in Indian Pharmacopoeia:
	Pharmacology	Fundamentals of general pharmacology: Dosage forms and routes of administration, mechanism of action, combined effect of drugs, factors modifying drug action, tolerance and dependence; Pharmacogenetics
	Medicinal Chemistry	Medicinal Chemistry Basic Principles: Physico-chemical and stereoisomeric (Optical, geometrical) aspects of drug molecules and biological action,
	Pharmacognosy	Systematic pharmacognostic study of the followings: Carbohydrates and derived products: agar, guar gum acacia, Honey, Isabagol, pectin, Starch, sterculia and Tragacanth.
	Pharmaceutics	Micromeretics and Powder Rheology:
Pre intermediate Assessment (PIA) -2	Physical Chemistry	Behavior of Gases, Kinetic theory of gases, deviation from ideal behavior and explanation.
	Pharmacology	Principles of Basic and Clinical pharmacokinetics, absorption, Distribution, Metabolism and Excretion of drugs
	Medicinal Chemistry	Bioisosterism, Drug-receptor interactions including transduction mechanisms;
	Pharmaceutical Analysis	Different techniques of pharmaceutical analysis, Preliminaries and definitions Fundamentals of volumetric analysis: Acid Base Titrations: Non-aqueous titrations:
	Pharmaceutics	Prescription: Handling of prescription, source of errors in prescription, care required in dispensing procedures including labeling of dispensed products. General dispensing procedures including labeling of dispensed products; Pharmaceutical calculations: Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solutions, alligation, alcohol dilution, proof spirit, isotonic solutions, displacement value etc.
Pre intermediate Assessment (PIA) -3	Organic Chemistry	Importance of fundamentals of organic chemistry in pharmaceutical sciences; Structure and Properties: Atomic structure, Atomic orbitals, Molecular orbital theory, wave equation, Molecular orbitals, Bonding and Anti-bonding orbitals, Covalent bond, Hybrid orbitals, Intramolecular forces, Bond dissociation energy, Polarity of bonds, Polarity of molecules, Structure and physical properties, Intermolecular forces, Acids and bases;
	Pharmacology	Adverse Drug Reactions; Bioassay of Drugs and Biological Standardization
	Medicinal Chemistry	Drug metabolism and Concept of Prodrugs;
	Pharmacognosy	Lipids: Bees wax, Castor oil, Cocoa butter, Codliver oil, Hydnocarpus oil, Kokum butter, Lard, Linseed oil, Rice Bran oil, Shark liver oil and Wool fat.
	Pharmaceutics	Liquid Dosages Forms: Introduction, types of additives used in formulations, vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors, flavors and others, manufacturing packaging, labeling, evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia;
Pre intermediate Assessment (PIA) -4	Biochemistry	The concept of free energy, Determination of change in free energy - from equilibrium constant and reduction potential, bioenergetics, production of ATP and its biological significance;
	Pharmacology	Discovery and development of new drugs, Bioavailability and bioequivalence studies;
	Analysis	Oxidation Reduction Titrations: Precipitation Titrations:
	Pharmaceutics	Principles involved and procedures adopted in dispensing of : Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates, etc. Incompatibilities

Pre intermediate Assessment (PIA) -5	Inorganic Pharmaceutical & Medicinal Chemistry	Gastrointestinal Agents: Acidifying agents, Antacids, Protectives and Adsorbents, Cathartics;
	Pharmacology	Pharmacology of Peripheral Nervous System: Neurohumoral transmission (autonomic and somatic), Parasympathomimetics, Parasympatholytics,
	Medicinal Chemistry	Drugs acting at synaptic and neuro-effector junction sites: Cholinergics, anti-cholinergics and cholinesterase inhibitors
	Pharmacognosy	RESINS: Study of Drugs Containing Resins and Resin Combinations like Colophony, podophyllum, jalap, cannabis, capsicum, myrrh, asafoetida, balsam of Tolu, balsam of Peru, benzoin, turmeric, ginger.
	Pharmaceutics	Fluid Flow: Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow and pressure. Heat transfer: Concept of heat flow, applications of Fourier's law, forced and natural convection, surface coefficients, boiling liquids, condensing vapors, heat exchangers, heat interchangers, radiation, black body, Stefan Boltzmann equation, Kirchoff's law.
Pre intermediate Assessment (PIA) -6	Physical Chemistry	The Liquid State: Physical properties (surface tension, parachor, viscosity, refractive index, dipole moment);
	Pharmacology	Sympathomimetics
	Medicinal Chemistry	Adrenergic drugs,
	Analysis	Gravimetric Analysis: Complexometric titrations:
	Pharmaceutics	Viscosity and Rheology: Newtonian systems, Law of flow, kinematic viscosity, effect of temperature; non-Newtonian systems: pseudoplastic, dilatant, plastic; thixotropy, thixotropy in formulation, negative thixotropy, determination of viscosity, capillary, falling ball, rotational viscometers.
Pre intermediate Assessment (PIA) -7	Organic Chemistry	Stereochemistry: Nomenclature, isomerism, stereoisomerism, conformational and configurational isomerism, optical activity, specification of configuration, Reactions involving stereoisomers, chirality, conformations;
	Pharmacology	Adrenergic receptor and neuron blocking agents, Ganglion stimulants and blocking agents
	Pharmacognosy	TANNINS: Study of tannins and tannin containing drugs like Gambier, black catechu, gall and myrobalan.
	Pharmaceutics	Complexation: Classification of complexes, methods of preparation, analysis, & applications. Kinetics and Drug Stability: General considerations & concepts, half-life determination, Influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating.
Pre intermediate Assessment (PIA) -8	Biochemistry	Enzymes: Nomenclature, enzyme kinetics and their mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis.
	Pharmacology	Neuromuscular blocking Agents, Local anesthetic Agents.
	Medicinal Chemistry	Local Anesthetics, Neuromuscular blocking agents.
	Pharmaceutics	Semisolid Dosage Forms: Definitions, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging; Suppositories: Ideal requirements, bases, displacement value, manufacturing procedure, packaging and evaluation;
Pre intermediate Assessment (PIA) -9	Inorganic Pharmaceutical & Medicinal Chemistry	Major Intra- and Extra-cellular Electrolytes: Physiological ions. Electrolytes used for replacement therapy, acid-base balance and combination therapy;
	Pharmacology	Pharmacology of Central Nervous System: Neurohumoral transmission in the C.N.S., General Anesthetics, Alcohols and disulfiram, Sedatives,

		Hypnotics, Anti-anxiety agents and Centrally acting muscle relaxants
	Medicinal Chemistry	General Anesthetics, Hypnotics and Sedatives, Anxiolytics
	Pharmacognosy	VOLATILE OILS: General methods of obtaining volatile oils from plants, Study of volatile oils of Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass,
	Pharmaceutics	Importance of microbiology in pharmacy Structure of bacterial cell; Classification of microbes and their taxonomy: Actinomycetes, bacteria, rickettsiae, spirochetes and viruses. Identification of Microbes: Stains and types of staining techniques, electron microscopy; Nutrition, cultivation, isolation of bacteria, actinomycetes, fungi, viruses, etc; microbial genetics and variation.
Pre intermediate Assessment (PIA) -10	Physical Chemistry	Solutions: Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel theory;
	Pharmacology	Psychopharmacological agents (anti-psychotics), anti-manics, and hallucinogens, Antidepressants
	Medicinal Chemistry	Psychopharmacological agents (Neuroleptics, Anti-depressants,
	Analysis	Miscellaneous Methods of Analysis: Diazotization titrations, Kjeldahl method of nitrogen estimation, Karl-Fischer aquametry, Oxygen flask combustion method, Gasometry.
	Pharmaceutics	Surface and Interfacial Phenomenon: Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties of interface.
Pre intermediate Assessment (PIA) -11	Organic Chemistry	Stereoselective and stereospecific reactions; Structure, Nomenclature, Preparation and Reactions of: Alkanes, Alkenes, Alkynes, Cyclic analogs, Dienes, Benzene, Polynuclear aromatic compounds,
	Pharmacology	Anti-epileptics drugs, Anti-Parkinsonian drugs, Analgesics, Antipyretics, non-steroidal anti-inflammatory and anti-gout agents.
	Medicinal Chemistry	Anticonvulsants, Anti-Parkinsonian drugs, Opioid analgesics, Analgesic-antipyretics, Anti-inflammatory (non-steroidal) agents.
	Pharmacognosy	VOLATILE OILS: General methods of obtaining volatile oils from plants, Study of volatile oils of Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Valerian, Musk, Palmarosa, Gaultheria, Sandal wood;
	Pharmaceutics	Evaporation: Basic concept of phase equilibria, factor affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, Mathematical problems on evaporation. Distillation: Roult's law, phase diagrams, volatility; simple steam and flash distillations, principles of rectification, Mc-Cabe Thiele method for calculations of number of theoretical plates, Azeotropic and extractive distillation.
Pre intermediate Assessment (PIA) -12	Biochemistry	Co-enzymes: Vitamins as co-enzymes and their significance. Metals as cofactors and their significance; Carbohydrate Metabolism: Conversion of polysaccharides to glucose-1-phosphate, Glycolysis, fermentation and their regulation, Gluconeogenesis and glycogenolysis, Metabolism of galactose and galactosemia, Role of sugar nucleotides in biosynthesis, and Pentose phosphate pathway;
	Pharmacology	Narcotic analgesics and antagonists, C.N.S. stimulants, Drug Addiction and Drug Abuse.
	Medicinal Chemistry	Opioid analgesics, CNS stimulants.

	Analysis	Coulometry: Polarography:
	Pharmaceutics	Blood Products and Plasma Substitutes: Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin, foam plasma substitutes, -ideal requirements, PVP, dextran Etc. for control of blood pressure as per I.P.;
PIA-13	Inorganic Pharmaceutical & Medicinal Chemistry	Essential and Trace Elements: Transition elements and their compounds of pharmaceutical importance, Iron and haematinics, mineral supplements; Cationic and anionic components of inorganic drugs useful for systemic effects;
	Pharmacology	Pharmacology of Cardiovascular System: Drugs used in the management of congestive cardiac failure, Antihypertensive drugs, Anti-anginal and Vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists
	Medicinal Chemistry	Anti-hypertensives, anti-anginal agents, Cardiotonics,
	Pharmacognosy	FIBERS: Study of fibers used in pharmacy such as cotton, silk, wool, nylon, glass-wool, polyester and asbestos.
	Pharmaceutics	Central Sterile Supply Unit and their Management: Types of materials for sterilization, Packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials.
PIA-14	Physical Chemistry	Thermodynamics: First, Second and Third laws, Zeroth law, Concept of free energy, enthalpy and entropy, absolute temperature scale;
	Pharmacology	Anti-arrhythmic drugs, Anti-hyperlipedemic drugs, Drugs used in the therapy of shock
	Medicinal Chemistry	Anti-arrythmic agents, Anti-hyperlipedemic agents,
	Analysis	Amperometry:Chromatography: Theory of chromatography, plate theory, Factors affecting resolution, van Deemter equation.
	Pharmaceutics	Manufacture of Sterile and Non-sterile Products: Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, Master formula Card, production control, Manufacturing records.
PIA-15	Organic Chemistry	Arenes, Alkyl halides, Alcohols, Ethers, Epoxides, Amines,
	Pharmacology	Drugs Acting on the Hemopoietic System: Hematinics, Anticoagulants, Vitamin K and hemostatic agents
	Medicinal Chemistry	Anticoagulants
	Pharmacognosy	Saponins : Liquorice, ginseng, dioscorea, sarsaparilla, and senega. 20 Cardioactive glycosides: Digitalis, squill, strophanthus and thevetia,
	Pharmaceutics	Drug Information Services: Sources' of Information on drugs, disease, treatment schedules, procurement of information, Computerized services (e.g., MEDLINE), Retrieval of information, Medication error- types of medication errors, correction and reporting.
PIA-16	Biochemistry	The Citric Acid Cycle: Significance, reactions and energetics of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle;
	Pharmacology	Fibrinolytic and anti-platelet drugs, Blood and plasma volume expanders.
	Medicinal Chemistry	Anti-platelet drugs.
	Analysis	TLC, Paper chromatography, GLC
	Pharmaceutics	Records and Reports: Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases. Pharmacoeconomics: Introduction to pharmacoeconomics, different methods of pharmacoeconomics, application of pharmacoeconomics. Pharmacoepidemiology: Definition and scope, method to conduct pharmacoepidemiological

		studies, advantages & disadvantages of pharmacoepidemiological studies.
PIA-17	Inorganic Pharmaceutical & Medicinal Chemistry	Topical Agents: Protectives, Astringents and Anti-infectives. Gases and Vapors: Oxygen, Anesthetics (inorganic) and Respiratory stimulants;
	Pharmacology	Drugs acting on urinary system: Fluid and electrolyte balance, Diuretics
	Medicinal Chemistry	Diuretics
	Pharmacognosy	Anthraquinone cathartics: Aloe, senna, rhubarb and cascara, Others: Psoralea, gentian, saffron, chirata, quassia.
	Pharmaceutics	Nuclear Pharmacy: Methods of handling radioisotopes, radioisotope committee.
PIA-18	Physical Chemistry	Thermochemical equations; Phase rule; Adsorption: Freudlich and Gibbs adsorption, isotherms, Langmuir's theory of adsorption.
	Pharmacology	Autacoids: Histamine, Antihistaminic drugs, 5-HT- its agonists and antagonists, Prostaglandins, thromboxanes and leukotrienes, Angiotensin, Bradykinin and Substance P and other vasoactive peptides,
	Medicinal Chemistry	Antihistamines, Eicosanoids,
	Analysis	Column chromatography, HPLC, HPTLC
	Pharmaceutics	Introduction to biopharmaceutics: Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion, ion-pair formation and pinocytosis); Factors influencing absorption- biological, physico-chemical, physiological and pharmaceutical; Drug distribution in the body, plasma protein binding.
PIA-19	Organic Chemistry	Phenols, Aldehydes and ketones, Carboxylic acids, Functional derivatives of carboxylic acids,
	Pharmacognosy	Alkaloids Pyridine-piperidine: Tobacco, areca and lobelia. Tropane: Belladonna, hyoscyamus, datura, duboisia, coca and withania.
	Pharmaceutics	Pharmacokinetics: Significance of plasma drug concentration measurement. Compartment model- Definition and Scope. Pharmacokinetics of drug absorption - Zero order and first order absorption rate constant using Wagner-Nelson and residual methods. Volume of distribution and distribution coefficient. Compartment kinetics- One compartment and two compartment models. Determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular and oral route. Clearance concept, mechanism of renal clearance, clearance ratio, determination of renal clearance. Extraction ratio, hepatic clearance, biliary excretion, extrahepatic circulation. Non-linear pharmacokinetics with special reference to one compartment model after I.V. drug administration.
PIA-20	Biochemistry	Lipids Metabolism : Oxidation of fatty acids, $\beta$ -oxidation & energetics, biosynthesis of ketone bodies and their utilization, biosynthesis of saturated and unsaturated fatty acids, Control of lipid metabolism, Essential fatty acids & eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids, and sphingolipids, Biosynthesis of eicosanoids, cholesterol, androgens, progesterone, estrogens corticosteroids and bile acids.
	Pharmacology	Drugs Acting on the Respiratory System: Anti-asthmatic drugs including bronchodilators, Anti-tussives and expectorants, Respiratory stimulants.
	Medicinal Chemistry	Anti-tussives,
	Analysis	Ultraviolet and visible spectrophotometry,
	Pharmaceutics	Clinical Pharmacokinetics: Definition and scope: Dosage adjustment in patients with and without renal and hepatic failure; Design of single dose bio-equivalence study and relevant statistics; Pharmacokinetic drug interactions and their significance in combination therapy.

PIA-21	Inorganic Pharmaceutical & Medicinal Chemistry	Dental Products: Dentifrices, Anti-caries agents; Complexing and chelating agents used in therapy;
	Pharmacology	Drugs acting on the Gastrointestinal Tract: Antacids, Anti-secretory and Anti-ulcer drugs, Laxatives and anti-diarrhoeal drugs, Appetite Stimulants and Suppressants
	Medicinal Chemistry	Antispasmodic and anti-ulcer drugs,
	Pharmacognosy	Quinoline and Isoquinoline: Cinchona, ipecac, opium. Indole: Ergot, rauwolfia, catharanthus, nux-vomica and physostigma.
	Pharmaceutics	Bioavailability and bioequivalence: Measures of bioavailability, C <sub>max</sub> , t <sub>max</sub> , K <sub>el</sub> and Area Under the Curve (AUC); Design of single dose bioequivalence study and relevant statistics; Review of regulatory requirements for conducting bioequivalent studies. Biopharmaceutical Classification System (BCS) of drugs.
PIA-22	Physical Chemistry	Photochemistry: Consequences of light absorption, Jabolenski diagram, Quantum efficiency;
	Pharmacology	Emetics and anti-emetics, Miscellaneous: Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics
	Analysis	IR spectroscopy
	Pharmaceutics	Performance evaluation methods: In-vitro dissolution studies for solid dosage forms methods, interpretation of dissolution data. Bioavailability studies and bioavailability testing protocol and procedures. In vivo methods of evaluation and statistical treatment. GMP and quality assurance, Quality audit. Design, development, production and evaluation of controlled/sustained/extended release formulations.
PIA-23	Organic Chemistry	$\alpha,\beta$ -Unsaturated carbonyl compounds, Reactive intermediates-carbocations, carbanions, carbenes and nitrenes;
	Pharmacology	Pharmacology of Endocrine System: Hypothalamic and pituitary hormones, Thyroid hormones and anti-thyroid drugs, parathormone, calcitonin and Vitamin D, Insulin, glucagons, incretins, oral hypoglycemic agents and insulin analogs
	Medicinal Chemistry	Thyroid and Anti thyroid drugs; Insulin and oral hypoglycemic agents:
	Pharmacognosy	Imidazole: Pilocarpus. Steroidal: Veratrum and kurchi. Alkaloidal Amine: Ephedra and colchicum. Glycoalkaloid: Solanum.
	Pharmaceutics	Designing of dosage forms: Pre-formulation studies, Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant. Solubility, dissolution and organoleptic properties and their effect on formulation, stability and bioavailability. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products. Study of pro-drugs in solving problems related to stability, bioavailability and elegance of formulations. Design, development and process validation methods for pharmaceutical operations involved in the production of pharmaceutical products with special reference to tablets, suspensions. Stabilization and stability testing protocol for various pharmaceutical products. ICH Guidelines for stability testing of formulations.
PIA-24	Biochemistry	Biological Oxidation: Redox-potential, enzymes and co-enzymes involved in oxidation reduction & its control, The respiratory chain, its role in energy capture and its control, energetics of oxidative phosphorylation. Inhibitors of respiratory chain and oxidative phosphorylation, Mechanism of oxidative phosphorylation.
	Pharmacology	ACTH and corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus
	Medicinal Chemistry	Steroidal Drugs: Steroidal nomenclature (IUPAC) and stereochemistry, Androgens and anabolic agents, Estrogens and Progestational agents, Oral contraceptives, Adrenocorticoids;
	Analysis	Mass spectrometry
	Pharmaceutics	Surgical products:

		<p>Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosic hemostatics, official dressings, absorbable and non-absorbable sutures, ligatures and catguts.</p> <p>Packaging of Pharmaceutical Products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influence choice of containers, legal and official requirements for containers, package testing.</p>
PIA-25	Biochemistry	<p>Biological Oxidation: Redox-potential, enzymes and co-enzymes involved in oxidation reduction &amp; its control, The respiratory chain, its role in energy capture and its control, energetics of oxidative phosphorylation. Inhibitors of respiratory chain and oxidative phosphorylation, Mechanism of oxidative phosphorylation.</p>
	Pharmacology	<p>ACTH and corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus</p>
	Medicinal Chemistry	<p>Steroidal Drugs: Steroidal nomenclature (IUPAC) and stereochemistry, Androgens and anabolic agents, Estrogens and Progestational agents, Oral contraceptives, Adrenocorticoids;</p>
	Analysis	<p>Mass spectrometry</p>
	Pharmaceutics	<p>Surgical products:            Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosic hemostatics, official dressings, absorbable and non-absorbable sutures, ligatures and catguts.</p> <p>Packaging of Pharmaceutical Products:            Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influence choice of containers, legal and official requirements for containers, package testing.</p>
PIA-26	Physical Chemistry	<p>Chemical Kinetics: Zero, First and Second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis;</p>
	Pharmacology	<p>Aminoglycosides, Chloramphenicol, Macrolides, Tetracyclines, Quinolones, fluoroquinolones and Miscellaneous antibiotics;</p>
	Medicinal Chemistry	<p>macrolides, tetracyclines, aminoglycosides, polypeptide antibiotics, fluoroquinolones,</p>
	Analysis	<p>NMR</p>
	Pharmaceutics	<p>Dehumidification and Humidity Control:            Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Hygrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for dehumidification operations; Refrigeration and Air Conditioning: Principle and applications of refrigeration and air conditioning;</p>
PIA-27	Organic Chemistry	<p>Nucleophilic and Electrophilic Aromatic Substitution Reactions: Reactivity and orientation;</p>
	Pharmacology	<p>Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, HIV and AIDS</p>
	Medicinal Chemistry	<p>Chemotherapeutic Agents used in bacterial, fungal, viral, protozoal, parasitic and other infections,</p>
	Pharmacognosy	<p>Amla, Kantkari, Satavari, Tylophora, Bhilawa, Kalijiri, Bach, Rasna,</p>
	Pharmaceutics	<p>Antibiotics:            Historical development of antibiotics. Antimicrobial spectrum and methods used for their standardization. Screening of soil for organisms producing antibiotics, fermenter, its design, control of different parameters. Isolation of mutants, factors influencing rate of mutation. Design of fermentation process. Isolation of fermentation products with special reference to penicillins, streptomycins, tetracyclines and vitamin B12.</p>
PIA-28	Biochemistry	<p>Metabolism of ammonia and nitrogen containing monomers: Nitrogen balance, Biosynthesis of amino acids, Catabolism of</p>



		amino acids, Conversion of amino acids to specialized products, Assimilation of ammonia, Urea cycle, metabolic disorders of urea cycle, Metabolism of sulphur containing amino acids.
	Pharmacology	urinary tract infections and sexually transmitted diseases, malaria, amoebiasis and other protozoal infections
	Medicinal Chemistry	protozoal, parasitic and other infections,
	Analysis	Fluorimetry, Flame photometry
	Pharmaceutics	Crystallization: Characteristics of crystals like-purity, size, shape, geometry, habit, forms size and factors affecting them, Solubility curves and calculation of yields. Material and heat balances around Swenson Walker Crystallizer. Supersaturation, theory and its limitations, Nucleation mechanisms, crystal growth. Study of various types of Crystallizers, tanks, agitated batch, Swenson Walker,
PIA-29	Inorganic Pharmaceutical & Medicinal Chemistry	Pharmaceutical Aids Used in Pharmaceutical Industry: Anti-oxidants, Preservatives, Filter aids, Adsorbents, Diluents, Excipients, Suspending agents, Colorants;
	Pharmacology	Anthelmintics. Chemotherapy of malignancy and immunosuppressive agents.
	Medicinal Chemistry	protozoal, parasitic and other infections, Anti-metabolites (including sulfonamides); Anti-neoplastic agents; Anti-viral agents (including anti-HIV); Immunosuppressives and immunostimulants;
	Pharmacognosy	Punamava, Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa, Atjuna, Ashoka,
	Pharmaceutics	Capsules: Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules, formulation, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms. Micro-encapsulation: Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi-orifice, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.
PIA-30	Physical Chemistry	Quantum Mechanics : Postulates of quantum mechanics, operators in quantum mechanics, the Schrodinger wave equation.
	Pharmacology	Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning, Heavy metals and heavy metal antagonists.
	Medicinal Chemistry	Microbial Transformations: Introduction, types of reactions mediated by micro-organisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids
	Analysis	Atomic Absorption Spectroscopy, X-ray Diffraction Analysis, Radioimmunoassay.
	Pharmaceutics	Mixing: Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments. Filtration and Centrifugation: Theory of filtration, continuous and batch filters, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, Etc. Factors affecting filtration, filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters.
PIA-31	Organic Chemistry	Electrophilic and Nucleophilic Addition Reactions; Rearrangements (Beckman, Hoffman, Benzilic acid, pinacole-pinacolone and Bayer-Villager).
	Pharmacology	Basic Concepts of Pharmacotherapy: Clinical Pharmacokinetics and individualization of Drug therapy, Drug delivery systems and

		<p>their Biopharmaceutics &amp; Therapeutic considerations, Drugs used during infancy and in the elderly 18 persons (Pediatrics &amp; Geriatrics), Drugs used during pregnancy, Drug induced diseases, The basics of drug interactions, General principles of clinical toxicology, Common clinical laboratory tests and their interpretation. Important Disorders of Organs, Systems and their Management:</p> <p>Cardio-vascular disorders- Hypertension, Congestive heart failure, Angina, Acute myocardial infarction, Cardiac arrhythmias</p>
	Medicinal Chemistry	Enzyme Immobilization: Techniques of immobilization, factors affecting enzyme kinetics,
	Pharmacognosy	Methi, Lahsun, Palash, Guggal, Gymnema, Shilajit, Nagarmotha and Neem.
	Pharmaceutics	Cosmeticology and Cosmetic Preparations: Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair, dentifrice and manicure preparations like nail polish, nail polish remover, Lipsticks, eye lashes, baby care products Etc.
PIA-32	Biochemistry	Purine biosynthesis: Purine nucleotide inter-conversions. Pyrimidine biosynthesis and formation of deoxyribonucleotides.
	Pharmacology	CNS Disorders: Epilepsy, Parkinsonism, Schizophrenia, Depression. Respiratory disease- Asthma. Gastrointestinal Disorders- Peptic ulcer, Ulcerative colitis, Hepatitis, Cirrhosis.
	Medicinal Chemistry	Study of enzymes such as hyaluronidase, penicillinase, streptokinase, amylases and proteases, Immobilization of bacteria and plant cells.
	Analysis	Quality assurance: GLP, ISO 9000, TQM, Quality Review and Quality documentation, Regulatory control, regulatory drug analysis, interpretation of analytical data, Validation, quality audit: quality of equipment, validation of equipment, validation of analytical procedures.
	Pharmaceutics	Ophthalmic Preparations: Requirements, formulation, methods of preparation, labeling, containers, evaluation;
PIA-33	Inorganic Pharmaceutical & Medicinal Chemistry	Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
	Pharmacology	Endocrine Disorders- Diabetes mellitus and Thyroid disorders. Infectious Diseases- Tuberculosis, Urinary tract infections, Enteric infections, Upper respiratory infections. Hematopoietic Disorders- Anemias
	Medicinal Chemistry	Principles of Drug Design (Theoretical Aspects): Traditional analog and mechanism based approaches, QSAR approaches
	Pharmacognosy	Biogenesis
	Pharmaceutics	Immunology and Immunological Preparations: Principles, antigens and heptans, immune system, cellular/humoral immunity, immunological tolerance, antigen-antibody reactions and their applications. Hypersensitivity, active and passive immunization. Vaccines and sera: their preparation, standardization and storage. Genetic Recombination: Transformation, conjugation, transduction, protoplast fusion and gene cloning and their applications. Development of hybridoma for monoclonal antibodies. Study of drugs produced by biotechnology such as Activase, Humulin, Humatrope, HB etc.
PIA-34	Pharmacology	Joint and Connective tissue disorders- Rheumatic diseases, Gout and Hyperuricemia. Neoplastic Diseases- Acute Leukaemias, Hodgkin's disease. Therapeutic Drug Monitoring, Concept of Essential Drugs and Rational Drug use
	Medicinal Chemistry	Applications of quantum mechanics, Computer Aided Drug Designing (CADD) and molecular modeling.
	Pharmacognosy	Plant tissue culture and marine pharmacognosy
	Pharmaceutics	A brief study of the following Acts with special reference to the

		<p>main provisions and the latest amendments:          Poisons Act 1919; Drugs and Magic Remedies (Objectionable Advertisements) Act 1954; Medical Termination of Pregnancy Act 1970 &amp; Rules 1975; Prevention of Cruelty to Animals Act 1960; States Shops &amp; Establishments Act &amp; Rules; Insecticides Act 1968; AICTE Act 1987; Factories Act 1948; Minimum Wages Act 1948; Patents Act 1970.          A brief study of the various Prescription/Non-prescription Products. Medical/Surgical accessories, diagnostic aids, appliances available in the market.</p>
PIA-35	Organic Chemistry	Elimination reactions; Conservation of Orbital Symmetry and Rules: Electrocyclic, Cycloaddition and Sigmatropic reactions;
	Pharmacology	Pathophysiology of common diseases; Basic Principles of Cell Injury and Adaptations: Causes of Cellular injury, pathogenesis, morphology of cell injury, adaptations and cell death
	Pharmaceutics	<p>Drying: Moisture content and mechanism of drying, rate of drying and time of drying calculations; classification and types of dryers, dryers used in pharmaceutical industries and special drying methods.</p> <p>Size Reduction: Definition, objectives of size reduction, mechanisms of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mills including ball mill, hammer mill, fluid energy mill. Size separation: Different techniques of size separation, sieves, sieve shakers, sedimentation tank, cyclone separators, bag fillers Etc.</p>
PIA-36	Biochemistry	Biosynthesis of Nucleic Acids: Brief introduction of genetic organization of the mammalian genome, alteration and rearrangements of genetic material, Biosynthesis of DNA and its replications.
	Pharmacology	Basic Mechanisms involved in the process of inflammation and repair: Vascular and cellular events of acute inflammation, chemical mediators of inflammation, pathogenesis of chronic inflammation, brief outline of the process of repair.
	Pharmaceutics	<p>Pharmaceutical Aerosols: Definition, propellants, general formulation, manufacturing' and packaging methods, pharmaceutical applications;</p> <p>Community Pharmacy: Organization and structure of retail and whole sale drug store-types of drug store and design, legal requirements for establishment, maintenance and drug store-dispensing of proprietary products, maintenance of records of retail and wholesale, patient counseling, role of pharmacist in community health care and education (First aid, communicable diseases, nutrition, family planning).</p>
PIA-37	Inorganic Pharmaceutical & Medicinal Chemistry	Inorganic Radiopharmaceuticals: Nuclear reaction, radioisotopes, radiopharmaceuticals, Nomenclature, Methods of obtaining their standards and units of activity, half-life, measurement of activity, clinical applications, dosage, hazards and precautions.
	Pharmacology	Immunopathophysiology: T and B cells, MHC proteins, antigen presenting cells, immune tolerance, pathogenesis of hypersensitivity reactions, autoimmune diseases, AIDS, Amyloidosis.
	Pharmaceutics	<p>An elaborate study of the followings:          Pharmaceutical Ethics; Pharmacy Act 1948; Drugs and Cosmetics Act 1940 and Rules 1945;          Medicinal &amp; Toilet Preparations (Excise Duties) Act 1955;          Narcotic Drugs &amp; Psychotropic Substances Act 1985 &amp; Rules; Drugs Price Control Order.          Organization and Structure of hospital pharmacy:          Organization of a hospital and hospital pharmacy, Responsibilities of a hospital pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation.</p>

PIA-38	Pharmacology	Pathophysiology of Common Diseases: Asthma, diabetes, rheumatoid arthritis, gout, ulcerative colitis, neoplasia, psychosis, depression, mania, epilepsy
	Pharmaceutics	Control of microbes by physical and chemical methods: Disinfection, factors influencing disinfectants, dynamics of disinfection, disinfectants and antiseptics and their evaluation.; Sterilization: Different methods, validation of sterilization methods & equipments; Sterility testing of all pharmaceutical products. Microbial assays of antibiotics, vitamins & amino acids. Hospital Formulary: Contents, preparation and revision of hospital formulary.
PIA-39	Organic Chemistry	Neighboring group effects; Catalysis by transition metal complexes; Heterocyclic Compounds: Nomenclature, preparation, properties and reactions of 3, 4, 5, 6 & 7-membered heterocycles with one or two heteroatoms like O, N, S. Chemistry of lipids, Carbohydrates and Proteins.
	Pharmacology	acute and chronic renal failure, hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction, congestive heart failure, peptic ulcer, anemias
	Pharmaceutics	Tablets: Advantages and disadvantages of tablets, Application of different types of tablets, Formulation of different types of tablets, granulation, technology on large-scale by various techniques, different types of tablet compression machinery and the equipments employed, evaluation of tablets. Coating of Tablets: Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process, evaluation of coated tablets. Stability kinetics and quality assurance. Drug Store Management and Inventory Control: Organization of drug store, Types of materials stocked, storage conditions; Purchase and Inventory Control principles, purchase procedures, Purchase order, Procurement and stocking.
PIA-40	Biochemistry	Mutation: Physical & chemical mutagenesis/carcinogenesis, DNA repair mechanism. Biosynthesis of RNA; Genetic Code and Protein Synthesis: Genetic code, Components of protein synthesis and Inhibition of protein synthesis.
	Pharmacology	hepatic disorders, tuberculosis, urinary tract infections and sexually transmitted diseases. Wherever applicable the molecular basis should be discussed.
	Pharmaceutics	Dispersion Systems: Colloidal dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy; Suspensions and Emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian motion, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations; Emulsions-types, theories, physical stability. Drug distribution Systems in Hospitals: Out-patient dispensing, methods adopted; Dispensing of drugs to in-patients. Types of drug distribution systems. Charging policy, labeling; Dispensing of drugs to ambulatory patients; Dispensing of controlled drugs, Dispensing of ancillary supplies.