

School: Pharmaceutical Sciences	Programme: B.Pharmacy
Year : Second Year	Semester - IV
Course: Pharmaceutical Organic Chemistry III– Theory	Course Code: 17YBH401
Theory: 3Hrs/Week	Max.University Theory Examination:75 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 25 Marks

Objectives	
1	Explain the stereo chemical aspects of organic compounds and stereo chemical reactions
2	Clarify isomerism & apply that knowledge in understanding the structure property relationship.
3	Know the medicinal uses and other applications of organic compounds
4	Explain nomenclature aromaticity, reactivity synthesis, reactions and basicity of heterocyclic compounds.
5	Understand the reactions of synthetic importance

Unit Number	Details	Hours
1.	Note: To emphasize on definition, types, mechanisms, examples, uses/applications Stereo isomerism Optical isomerism –Optical activity, enantiomerism, diastereoisomerism, meso compounds Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers Reactions of chiral molecules Racemic modification and resolution of racemic mixture. Asymmetric synthesis: partial and absolute	10
2	Geometrical isomerism Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems) Methods of determination of configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions.	10
3	Heterocyclic compounds: Nomenclature and classification, Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene - Relative aromaticity, reactivity and Basicity of pyrrole	10
4	Synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine	8

	Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives	
5	Reactions of synthetic importance Metal hydride reduction (NaBH_4 and LiAlH_4), Clemmensen reduction, Birch reduction, Wolff Kishner reduction, Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation	7
Total		45

Resources	
Recommended Books	<ol style="list-style-type: none"> 1. Organic chemistry by I.L. Finar, Volume-I &II. 2. A text book of organic chemistry – Arun Bahl, B.S. Bahl. 3. Heterocyclic Chemistry by Raj K. Bansal 4. Heterocyclic Chemistry by T.L. Gilchrist
Reference Books	<ol style="list-style-type: none"> 1. Organic Chemistry by Morrison and Boyd 2. E. L. Eliel, John Wiley and Son, Stereochemistry of Organic Compounds. New York, 1993 3. J. A. Joule and L. K.Mills, Heterocyclic Chemistry Fourth edition, Blackwell Science Publisher, 2000. 4. S. M. Mukherji and S. P. Singh, Reaction Mechanisms in Organic Chemistry, Third Edition Macmillan publishers, 2001

School: Pharmaceutical Sciences	Programme: B.Pharmacy
Year : Second Year	Semester - IV
Course: Medicinal Chemistry I – Theory	Course Code: 17YBH402
Theory: 3Hrs/Week	Max.University Theory Examination:75 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 25 Marks

Objectives	
1	Understand the chemistry of drugs with respect to their pharmacological activity
2	Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3	Know the Structural Activity Relationship (SAR) of different class of drugs
4	Write the chemical synthesis of some drugs

Unit Number	Details	Hours
	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 (*)	
1	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.	10
2	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, 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.	10
3	Cholinergic neurotransmitters:	10

	<p>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, Isoflurophate, Echothiophate iodide, Parathione, Malathion. Cholinesterase reactivator: Pralidoxime chloride. Cholinergic Blocking agents: SAR of cholinolytic agents Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*. Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclimine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazinehydrochloride.</p>	
4	<p>Drugs acting on Central Nervous System A. Sedatives and Hypnotics: Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem Barbiturtes: SAR of barbiturates, Barbitol*, Phenobarbital, Mephobarbital, Amobarbital, Butobarbital, Pentobarbital, Secobarbital Miscellaneous: Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobonate, Ethchlorvynol. Aldehyde & their derivatives: Triclofos sodium, Paraldehyde. B. Antipsychotics Phenothiazines: SAR of Phenothiazines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. Ring Analogues of Phenothiazines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. Fluro buterophenones: Haloperidol, Droperidol, Risperidone. Beta amino ketones: Molindone hydrochloride. Benzamides: Sulpieride.</p>	8

	<p>C. Anticonvulsants: SAR of Anticonvulsants, mechanism of anticonvulsant action</p> <p>Barbiturates: Phenobarbitone, Methabarbital. Hydantoins: Phenytoin*, Mephenytoin, Ethotoin Oxazolidine diones: Trimethadione, Paramethadione</p> <p>Succinimides: Phensuximide, Methsuximide, Ethosuximide* Urea and monoacylureas: Phenacemide, Carbamazepine* Benzodiazepines: Clonazepam</p> <p>Miscellaneous: Primidone, Valproic acid, Gabapentin, Felbamate</p>	
5	<p>Drugs acting on Central Nervous System</p> <p>General anesthetics:</p> <p>Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.</p> <p>Ultra short acting barbiturates: Methohexital sodium*, Thiopental sodium, Thiopental sodium.</p> <p>Dissociative anesthetics: Ketamine hydrochloride.*</p> <p>Narcotic and non-narcotic analgesics</p> <p>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, Levorphanol tartarate.</p> <p>Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.</p> <p>Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepirac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.</p>	7
Total		45

Resources	
Recommended Books	<ol style="list-style-type: none"> 1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry. 2. Foye's Principles of Medicinal Chemistry. 3. Indian Pharmacopoeia 4. Text book of practical organic chemistry-A.I.Vogel
Reference Books	<ol style="list-style-type: none"> 1. Burger's Medicinal Chemistry, Vol I toIV. 2. Introduction to principles of drug design- Smith and Williams. 3. Remington's Pharmaceutical Sciences. 4. Martindale's extra pharmacopoeia 5. Organic Chemistry by I.L. Finar, Vol.II. 6. The Organic Chemistry of Drug Synthesis by Lednicer, Vol.1-5.

School: Pharmaceutical Sciences	Programme: B.Pharmacy
Year : Second Year	Semester - IV
Course: Physical Pharmaceutics II – Theory	Course Code: 17YBH403
Theory: 3Hrs/Week	Max.University Theory Examination:75 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 25 Marks

Objectives	
1	Understand various physicochemical properties of drug molecules in the designing the dosage forms.
2	Describe the degradation and stabilization of medicinal agents as well as accelerated stability testing. Know the principles of chemical kinetics & to use them in assigning expiry date for Formulation
3	Illustrate fundamentals and pharmaceutical applications of rheology & Understand the different types of flow in order to identify and choose suitable flow characteristics for the formulation.
4	Acquire sufficient knowledge of surface and interfacial tension between the surfaces.
5	Acquire skills and understanding of the principles, concepts of surface tension and its measurement.
6	Know types, properties and applications of colloids in the formulations.

Unit Number	Details	Hours
1	Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization & protective action	7
2	Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus	10
3	Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.	10
4	Micromeritics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	8

5	<p>Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems.</p> <p>Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention</p>	10
Total		45

Resources	
Recommended Books	<ol style="list-style-type: none"> 1. Physical Pharmacy by Alfred Martin, Sixth edition 2. Experimental pharmaceutics by Eugene, Parott. 3. Tutorial pharmacy by Cooper and Gunn. 4. Subrahmanyam CVS. Essentials of physical pharmacy. Delhi:Vallabh Prakashan; 2003 5. Physical Pharmaceutics by Ramasamy C, and Manavalan R.
Reference Books	<ol style="list-style-type: none"> 1. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia. 2. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc. 3. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume1, 2, 3. Marcel Dekkar Inc 4. Subrahmanyam CVS. Textbook of physical pharmaceutics. 2nd ed. New Delhi: Vallabh Prakashan;2003

School: Pharmaceutical Sciences	Programme: B.Pharmacy
Year : Second Year	Semester - IV
Course: Pharmacology I – Theory	Course Code: 17YBH404
Theory: 3Hrs/Week	Max.University Theory Examination:75 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 25 Marks

Objectives	
1	Study the introduction to pharmacology including pharmacokinetics & pharmacodynamics
2	Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3	Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4	Understand the pharmacological actions of different categories of drugs
5	Appreciate correlation of pharmacology with other bio medical sciences

Unit Number	Details	Hours
1	<p>1. General Pharmacology</p> <p>a. 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.</p> <p>b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination</p>	8
2	<p>General Pharmacology</p> <p>a. 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, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.</p> <p>b. Adverse drug reactions.</p> <p>c. Drug interactions (pharmacokinetic and pharmacodynamic)</p> <p>d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.</p>	12
3	<p>2. Pharmacology of peripheral nervous system</p> <p>a. Organization and function of ANS.</p> <p>b. Neurohumoral transmission, co-transmission and classification of neurotransmitters.</p> <p>c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.</p> <p>d. Neuromuscular blocking agents and skeletal muscle relaxants(peripheral).</p>	10

	e. Local anesthetic agents. f. Drugs used in myasthenia gravis and glaucoma	
4	3. Pharmacology of central nervous system a. Neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine. b. General anesthetics and pre-anesthetics. c. Sedatives, hypnotics and centrally acting muscle relaxants. d. Anti-epileptics e. Alcohols and disulfiram	8
5	3. Pharmacology of central nervous system a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. b. Drugs used in Parkinson's disease and Alzheimer's disease. c. CNS stimulants and nootropics. d. Opioid analgesics and antagonists e. Drug addiction, drug abuse, tolerance and dependence.	7
Total		45

Resources	
Recommended Books	<ol style="list-style-type: none"> 1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchill Livingstone Elsevier\ 2. Barar F.S.K., Essentials of Pharmacotherapeutics, 6th ed. Revised Edition, S.Chand & Co, 2011 3. Satoskar R.S., Bhandarkar S.D. and Rege N.N., Pharmacology and Pharmacotherapeutics, 21st Edition, Popular Prakashan Pvt Ltd, 2010. 4. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi. 5. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher 6. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan,
Reference Books	<ol style="list-style-type: none"> 1. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill 2. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins 3. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews- Pharmacology 4. Modern Pharmacology with clinical Applications, by Charles R. Craig & Robert 5. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata. 6. Goodman and Gilman's, The Pharmacological Basis of Therapeutics

School: Pharmaceutical Sciences	Programme: B.Pharmacy
Year : Second Year	Semester - IV
Course: Pharmacognosy and Phytochemistry I- Theory	Course Code: 17YBH405
Theory: 3Hrs/Week	Max.University Theory Examination:75 Marks
Max. Time for Theory Exam.:3 Hrs	Continuous Internal Assessment: 25 Marks

Objectives	
1	Explain meaning of term 'pharmacognosy' & also explain classification & quality control of natural products.
2	To know the techniques in the cultivation and production of crude drugs
3	To know the plant tissue culture
4	Know the different secondary metabolites
5	Study of biological source, chemical nature and uses of drugs of natural origin

Unit Number	Details	Hours
1	<p>Introduction to Pharmacognosy: (a) Definition, history, scope and development of Pharmacognosy (b) Sources of Drugs – Plants, Animals, Marine & Tissue culture (c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum-resins).</p> <p>Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs</p> <p>Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.</p>	10
2	<p>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</p> <p>Conservation of medicinal plants</p>	10
3	<p>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</p>	7
4	<p>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.</p> <p>Introduction to secondary metabolites:</p>	10

	Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins	
5	<p>Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs</p> <p>Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens</p> <p>Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:</p> <p>Carbohydrates: Acacia, Agar, Tragacanth, Honey</p> <p>Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).</p> <p>Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax</p> <p>Marine Drugs: Novel medicinal agents from marine sources</p>	8
Total		45

Resources	
Recommended Books	<ol style="list-style-type: none"> 1. Text Book of Pharmacognosy by T.E.Wallis 2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi. 3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhale (2007), 37th Edition, Nirali Prakashan, New Delhi. 4. Herbal drug industry by R.D. Choudhary (1996), 1st Edn, Eastern Publisher, New Delhi. 5. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhale 6. Anatomy of Crude Drugs by M.A. Iyengar
Reference Books	<ol style="list-style-type: none"> 1. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988. 2. W.C. Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Saunders & Co., London, 2009. 3. Essentials of Pharmacognosy, Dr. S.H. Ansari, 2nd edition, Birla publications, New Delhi, 2007 4. Indian Herbal Pharmacopoeia 1998 & 1999, Vol I & Vol II. Government of India, Ministry of Health. A Joint Publication of RRL, Jammu and IDMA, Mumbai.
Journals	Pharmacognosy Reviews, Pharmacognosy Magazine, Journal of Natural Products, Phytotherapy Research, Phytochemistry.

School: Pharmaceutical Science	Programme: Bachelor of pharmacy(B.Pharm.)
Year: Second Year	Semester -IV
Course: Medicinal Chemistry I – Practical	Course Code: 17YBH411
Practical: 4 Hrs./Batch (20 Students)	Max.University Practical Examination:35 Marks
	Continuous Internal Assessment: 15 Marks

Objectives	
1	Make correct use of various equipments & take safety measures while working in medicinal chemistry laboratory.
2	Synthesize, recrystallize and understand reaction mechanisms involved in synthesis of medicinally important organic compounds.
3	Determine the purity of drug samples by performing assay as per IP
4	Determine the partition co-efficient of compounds

Sr. No.	Description
I	Preparation of drugs/ intermediates
1	1,3-pyrazole
2	1,3-oxazole
3	Benzimidazole
4	Benztriazole
5	2,3- diphenyl quinoxaline
6	Benzocaine
7	Phenytoin
8	Phenothiazine
9	Barbiturate
II	Assay of drugs
1	Chlorpromazine
2	Phenobarbitone
3	Atropine
4	Ibuprofen
5	Aspirin
6	Furosemide
III	Determination of Partition coefficient for any two drugs

Practical/Oral/Presentation:
Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

School: Pharmaceutical Science	Programme: Bachelor of pharmacy(B.Pharm.)
Year: Second Year	Semester - IV
Course: Physical Pharmaceutics II – Practical	Course Code: 17YBH412
Practical: 4 Hrs./Batch (20 Students)	Max.University Practical Examination:35 Marks
	Continuous Internal Assessment: 15 Marks

Objectives	
1	To operate different pharmaceutical laboratory instruments used in determining various physical properties such as surface tension & viscosity.
2	Predict surface tension of given liquid.
3	Calculate critical micelle concentration and HLB value of given surfactant.
4	Understand working of Ostwald & Brookfield viscometer.
5	Study the effect of suspending agent on sedimentation volume.
6	Determine order of any reaction.

Sr. No.	Description
1	Determination of particle size, particle size distribution using sieving method
2	Determination of particle size, particle size distribution using Microscopic method
3	Determination of bulk density, true density and porosity
4	Determine the angle of repose and influence of lubricant on angle of repose
5	Determination of viscosity of liquid using Ostwald's viscometer
6	Determination sedimentation volume with effect of different suspending agent
7	Determination sedimentation volume with effect of different concentration of single suspending agent
8	Determination of viscosity of semisolid by using Brookfield viscometer
9	Determination of reaction rate constant first order.
10	Determination of reaction rate constant second order
11	Accelerated stability studies

Practical/Oral/Presentation:
Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

School: Pharmaceutical Science	Programme: Bachelor of pharmacy(B.Pharm.)
Year: Second Year	Semester - IV
Course: Pharmacology I – Practical	Course Code: 17YBH413
Practical: 4 Hrs./Batch (20 Students)	Max.University Practical Examination:35 Marks
	Continuous Internal Assessment: 15 Marks

Objectives	
1	Introduction to commonly used instruments in experimental pharmacology.
2	Care and handling of common laboratory animals, animal welfare and introduction of CPCSEA and its guidelines, OECD guidelines.
3	Introduction to animal physiology with their biochemical reference values in various Animal species
4	Study of various routes of drug administration
5	Study of different pharmacological activities of drug on animals
6	Study of various anesthetics employed to anesthetize laboratory animals.
7	Introduction to the techniques of Euthenasia
8	Study of the miotic and mydriatic effect of drugs using rabbit eyes
9	Computer simulations of following experiments through computerized simulated software programme using software such as X-Pharma, X-cology etc

Sr. No.	Description
1	Introduction to experimental pharmacology.
2	Commonly used instruments in experimental pharmacology
3	Study of common laboratory animals.
4	Maintenance of laboratory animals as per CPCSEA guidelines.
5	Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6	Study of different routes of drugs administration in mice/rats.
7	Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8	Effect of drugs on ciliary motility of frog oesophagus
9	Effect of drugs on rabbit eye
10	Effects of skeletal muscle relaxants using rota-rod apparatus
11	Effect of drugs on locomotor activity using actophotometer
12	Anticonvulsant effect of drugs by MES and PTZ method.
13	Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14	Study of anxiolytic activity of drugs using rats/mice
15	Study of local anesthetics by different methods
<i>Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos</i>	

Practical/Oral/Presentation:

Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.

School: Pharmaceutical Science	Programme: Bachelor of pharmacy(B.Pharm.)
Year: Second Year	Semester - IV
Course: Pharmacognosy & Phytochemistry I – Practical	Course Code: 17YBH414
Practical: 4 Hrs./Batch (20 Students)	Max.University Practical Examination:35 Marks
	Continuous Internal Assessment: 15 Marks

Objectives	
1	Explain & demonstrate correct handling of inflammable solvents & corrosive chemicals.
	Analyze crude drugs by chemical tests
2	Generate micrometric data & identify the crude drugs
3	Undertake various estimations/determinations; infer from results obtained & report evaluation results.
4	Apply theoretical knowledge obtained for extraction of phytochemicals, set extraction assembly, process material before extraction; explain significance of use of various chemicals/solvents/conditions; undertake extraction, verify extracted material by qualitative tests & report yield.

Sr. No.	Description
1	Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2	Determination of stomatal number and index
3	Determination of vein islet number, vein islet termination and palisade ratio.
4	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5	Determination of Fiber length and width
6	Determination of number of starch grains by Lycopodium spore method
7	Determination of Ash value
8	Determination of Extractive values of crude drugs
9	Determination of moisture content of crude drugs
10	Determination of swelling index and foaming

Practical/Oral/Presentation:
Practical/Oral/Presentation shall be conducted and assessed jointly by internal and external examiners. The performance in the Practical/Oral/Presentation examination shall be assessed by at least a pair of examiners appointed as examiners by the University. The examiners will prepare the mark/grade sheet in the format as specified by the University, authenticate and seal it. Sealed envelope shall be submitted to the head of the department or authorized person.